



passive
components

KOA[®]
KOA SPEER ELECTRONICS, INC.



From **Concept to Reality**

**Our wide range of passive component solutions
will help you make the leap**

Whether you're designing the car of tomorrow or connecting the Internet of Things, you need cutting-edge product solutions to bring your design to fruition. At KOA Speer, we're the ideal partner to help you do just that. Our constantly expanding line of passive components will give you the solution to make your concept a reality!

Quality 1st



You expect product quality from any component that makes it into one of your designs. But in today's competitive global marketplace, there's so much more to the quality equation.

At KOA Speer, our Quality 1st initiative reinforces our organization wide focus on serving you at the highest possible level.



Our commitment to quality in everything we do is paying off... in the past two years we've received ten major customer quality awards. We're the industry's most recognized and awarded supplier for achieving the highest product quality, on-time delivery and responsive customer service.

ISO 9001:2015 CERTIFIED IATF16949:2016 CERTIFIED

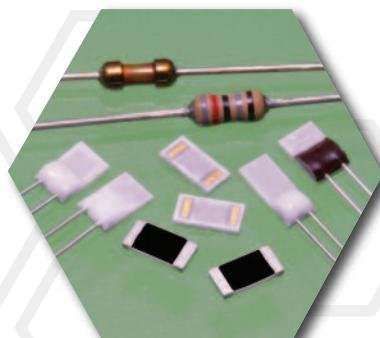
KOA SPEER... More Than Just Resistors

Resistors



Precision • Surge • Wide Terminal
High Voltage • Thin Film
High Temperature • Embedded • General Purpose
Networks • Anti-Sulfur • Fusing • Melf

Thermistors/ Thermal Sensors



Platinum Thin Film
Thin Film Linear PTC
Thick Film Linear PTC
NTC Thermistors • PTC Thermistors

Varistors



Chip Varistors • Automotive Varistors

Low Resistance Current Sense/Shunts



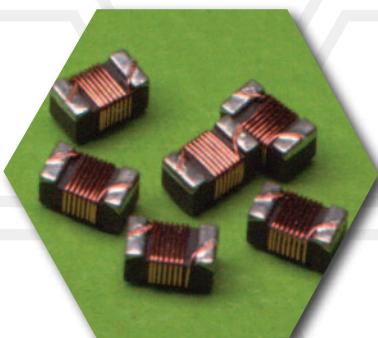
Metal Plate • Thick Film • Power Shunt
Molded • Wide Terminal

Leaded Resistors



General Purpose Carbon Film
Precision Metal Film • High Voltage • Power
Wirewound • Current Sense • Networks
Fusing • Jumpers

Inductors



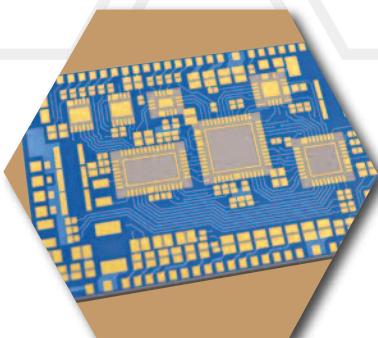
Chip Inductors • Power Inductors

Fuses



Thin Film • Automotive • Anti-Pulse
Fast Blow • Anti-Surge

LTCC Substrates



LTCC Substrates • Hybrid IC

Other Products



Check Terminal • Lab Kits



Current Sense Selection Guide

KOA SPEER ELECTRONICS, INC.

Applications: Current management sensor including charge/discharge of secondary batteries • Current control sensor of motors and DC/DC converters • Circuit protecting sensor by overcurrent detection

Current Sense Resistors

Part Number	Current Ratings (A)	Specifications		
		Resistance	Rated Power	Size
HSAN2PP4015	100	0.1m/0.2mΩ	18W/36W	40x15mm
Large Current Shunt Resistors	10	0.1m/0.2mΩ	18W/36W	40x15mm
• Metal Plate Resistive Element	1	0.1m/0.2mΩ	18W/36W	40x15mm
• Large Current, High Precision	0.1	0.1m/0.2mΩ	18W/36W	40x15mm
Power Shunt Chip Resistors	New PSJ2	54.8	244.9	0.2m~4mΩ
• Metal Plate Resistive Element	New PSL2	126.5	212.1	0.2m~0.5mΩ
• Large Current, High Precision	PSG4	89.4	141.4	0.5m/1mΩ
PSF4	54.8	100.0	0.5m/1mΩ	0.5m/1mΩ
PSB	77.5	250	0.2m/0.75m/1mΩ	5W/3W
PSE	50.0	100.0	0.5m/1m/1.5m/2mΩ	12.5W/6W
PSI	27.4	31.6	3m/4mΩ	5W
Metal Plate Chip Type Low Resistance Resistors	TLR 3AP	17.3	77.5	0.5m~10mΩ
• Metal Plate Resistive Element	TLR 3AW	14.1	63.2	0.5m~10mΩ
• High Precision	TLR 2HW	14.1	63.2	0.5m~10mΩ
TLR 2BP	8.7	54.8	0.5m~20mΩ	1.5W
TLR 2BW	7.1	44.7	0.5m~20mΩ	1W
TLR 2H	10.0	31.6	0.5m~10mΩ	1W
TLR 2A	10.0	22.4	2m~10mΩ	1W
TLR 2B/2BN	5.0	22.4	1m~20mΩ	0.5W
TLR 1E	4.5		10mΩ	0.2W
TLRH 3AP	5.8	28.9	6m~120mΩ	4~5W
TLRH 3AW	2.7	14.1	10m~270mΩ	2W
TLRH 2A	1.6	7.1	10m~100mΩ	0.25~0.5W
Current Sense Chip Resistors	SLN5	5.9	48.3	3m~200mΩ
• Metal Plate Resistive Element	SLN3	5.2	24.5	5m~110mΩ
• Mold Package	SLN2	3.2	20.0	5m~200mΩ
• High Reliability	SL2	2.4	25.8	3m~360mΩ
SLW1/SL17/TSL1	2.2	18.3	3m~200mΩ	1.5W/1W/W
SLW07/SL07	2.7	14.1	5m~100mΩ	1W/0.75W
				2010 ±1.5%



Current Sense Resistors Selection Guide

Current Sense Resistors

Current Ratings (A)

		Current Ratings (A)		Specifications	
		100 Current (A)	100 Current (A)	Resistance Range	Rated Power
				100m~9.1Ω	0.05W
Wide Terminal Flat Chip Resistors	New WK73S 2A	0.33	3.2	10m~9.1Ω	1.5~2W/3W
• Thick Film Resistive Element	WK73S 3A/3A3	0.41	17.3	10m~9.1Ω	0.612W
• High Power	WK73S 2H/2H2	0.33	14.1	10m~9.1Ω	1W/2W
WK73S 2B/2B15	0.29	12.2	10m~9.1Ω	0.75~1W/1.5W	0.612W
WK73S 2J	0.33	10.0	10m~9.1Ω	1W	1.218W
WU73 2B/2B15	0.32	12.2	10m~100mΩ	1W/1.5W	0.612W
Low Resistance Flat Chip Resistors*1	UR73V/ND 2B	2.2	8.7	10m~100mΩ	0.5~0.75W
• Thick Film Resistive Element	UR73V/ND 2A	2.2	7.1	10m~100mΩ	0.5W
UR73D 3A	3.2	10.0	10m~100mΩ	1W	2.512W
UR73D 2H	2.7	8.7	10m~100mΩ	0.75W	2.010W
UR73D 2B	2.2	7.1	10m~100mΩ	0.5W	1.206W
UR73D 2A	1.8	5.7	10m~100mΩ	0.33W	0.805W
UR73D 1J	1.6	5.0	10m~100mΩ	0.25W	0.603W
UR73D 1E	1.1	2.3	24m~100mΩ	0.125W	0.402W
Low Resistance Flat Chip Resistors	SR73 W3A/W3A2	0.32	7.2	39m~10Ω	1W/2W
• Thick Film Resistive Element	SR73 W2H	0.27	4.8	33m~10Ω	0.75W
• General-Purpose Type	SR73 2E	0.22	5.2	24m~10Ω	0.5~0.66W
SR73 2B	0.18	4.1	30m~10Ω	0.33~0.5W	1.210W
SR73 2A	0.18	4.1	30m~10Ω	0.33~0.5W	1.210W
SR73 1J	0.14	1.6	100m~10Ω	0.2~0.25W	0.603W
SR73 1E	0.13	1.3	100m~10Ω	0.166W	0.402W
SR73 1H	0.10	0.75	180m~10Ω	0.1W	0.201W
Large Current Chip Type Jumper	SLZ1	1	10	100 Current (A)	Resistance Range
• Metal Plate	TLRZ2B	44.0	44A	Max. 0.5mΩ	2512
• Anti-Pulse	TLRZ2A	40.0	40A	Max. 0.2mΩ	1206
TLRZ1J	31.6	31.6A	31.6A	Max. 0.2mΩ	0805
New TLRZ1E	26.0	26A	26A	Max. 0.2mΩ	0603
	10.0	10A	10A	Max. 0.5mΩ	0402
				Resistance Range	Size (inch)
				Max. 0.5mΩ	44A
				Max. 0.2mΩ	40A
				Max. 0.2mΩ	31.6A
				Max. 0.2mΩ	26A
				Max. 0.5mΩ	10A
				Resistance Range	Rated Current
				Max. 0.5mΩ	44A
				Max. 0.2mΩ	40A
				Max. 0.2mΩ	31.6A
				Max. 0.2mΩ	26A
				Max. 0.5mΩ	10A
				Resistance Range	Size (inch)

* This selection guide plots the current value calculated from (Power rating±upper or lower limit of resistance). Please build the design considering heat dissipation.

*1 This is the guideline to select products by current value. Please confirm product specification for actual design and selecting products and use the products based on the precautions to use.

* Please confirm our catalog or delivery specification for the details of each product.

*1 UR73/UR73D is only applied for car accessories as automotive use. Please ask us for details.



KOA SPEER ELECTRONICS, INC.

Passive Components

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Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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Passive Components

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At KOA, we know taking care of the environment is important. That is why we have taken the steps to ensure we offer a product that fits your needs while adhering to global environmental regulations. In 2006, we complied with the EU's RoHS Directive, allowing us to offer products that are RoHS compliant, and in 2007 we met guidelines outlined in the IT Products Pollution Control Act for the People's Republic of China. In addition, we are now enforcing stricter chemical regulations set by Europe through watching the chemical input of our products. Our laboratory is now ISO/IEC 17025 certified, and we are constantly working to think of ways to improve our technology, such as by offering halogen-free specifications. By actively addressing our environmental impact today, you can be certain KOA will be there in your future.

What is EU RoHS?

The Restriction of Hazardous Substances Directive (2002/95/EC), (RoHS), has become effective on July 1 of 2006 requiring the usage restriction of following six hazardous substances in the manufacture of electrical and electronic equipment placed on the market. This directive was amended on 8 June 2011, to Directive 2011/65/EU of the European Parliament and of the Council and each EU member state must adopt it into national law by 2 January 2013. RoHS 2002/95/EC before the amendment is replaced by RoHS 2011/65/EU where the restricted materials or maximum concentration value remain unchanged.

- Lead (0.1wt%)
- Mercury (0.1wt%)
- Cadmium (0.01wt%)
- Hexavalent Chromium (0.1wt%)
- PBBs (Polybrominated biphenyls) (0.1wt%)
- PBDEs (Polybrominated diphenyl ethers) (0.1wt%)

* The percentage in parentheses shows the maximum concentration value in the homogeneous material.

The restriction of applications in the annex in the directive is exempted. KOA's products applicable with this exemption to EU RoHS are as follows (as of July, 2016):

- Copper alloy containing up to 4% lead by weight
- Lead in high melting temperature type solders (i.e. lead-based alloys containing 85% by weight or more lead)
- Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound.

To meet EU RoHS, you have to choose lead (Pb) free material for termination surface material when our product has both type designation, leaded and lead free.

Please contact our sales representatives for details.

Revised Chinese RoHS

(Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products)

Chinese RoHS became effective in March 2007 and the Revised Chinese RoHS was promulgated in January 2016 and became effective on July first 2016. However, the Compliance management catalogue of the second step (inclusion restriction) is not established at the present moment, so only the first step (obligation for applying identification) is valid.

Index page of this catalog shows the products that contain six hazardous substances less than threshold level, indicated by O-mark.

For each product, we disclose the content information of the six hazardous substances directed by Chinese RoHS. Please contact our sales representatives for details.

REACH

"Regulation concerning the Registration, Evaluation, Authorization and Restriction of Chemicals" (REACH) has been enforced on June 1 of 2007 in EU area.

This regulation is aiming at safety evaluation and risk management of chemical substances, which are required to register according to the amount if used in businesses. Substance of Very High Concern (SVHC) must be registered if it is included in article. Information on such substances is also required through supply chain.

Precautions

All product specifications and data are subject to change without prior notice. Be sure to request and confirm the latest technical specifications before you order or use a part.

The following precautions apply to all products

General

- For precautions in general, refer to “JEITA RCR-1001B Safety application guide on components for using electronic and electrical equipment” issued by JEITA.

Application

- Confirm application parameters before the use of products, and please contact KOA in advance when products are to be used in critical, high-reliability equipment such as transportation (automobiles, airplanes, trains, boats, and ships), medical equipment, space equipment, energy, traffic, and information facilities. Unless the particular conditions and scope of liability is defined in mutually accepted contract documents, KOA will not be liable for issues arising from design or use in these applications.
- Consider sufficient fail-safe design if the products are used in high-reliability applications. Ensure the safety of the whole system by using proactive and redundant circuits to avoid unsafe operation due to a single product failure.

Environment for Use

- Unless otherwise specified, these products are not to be used in special environments. Examine and confirm performance and reliability before you use KOA products in any of the following environments:
 - Under direct sunlight, exposed to the outside or to dust.
 - In liquids such as water, oil, organic solvent, or liquid chemicals or in areas where these liquids are used.
 - In locations where the products are exposed to salt-water breezes or corrosive gases, including SO₂, H₂S, Cl₂, NH₃, NO₂, etc.
 - In locations with high static electricity and strong electromagnetic waves.
 - In locations subject to condensation from dew.
 - When the products or PCBs are sealed and coated by resin or other coating materials.
 - In locations where the products are exposed to the fumes of lubricating oil.

Sulfuration

- Products with silver-based electrodes may increase in resistance in atmospheres containing sulfur gases (H₂S, SO₂, etc.) or when exposed to sulfide compounds. Take anti-sulfur measures in these environments.

Anti-pulse Characteristics

- If transient overloads such as power pulse or voltage/current surges are applied to KOA products, performance and reliability may be degraded. Contact KOA for data on antipulse characteristics and design help.
- Pay attention to discharges between terminations (arc-over) when high voltages are applied.

Storage

- Store KOA products in dust-free areas and keep them away from extreme temperatures; moisture; condensation; direct sunlight; salt-water breezes; corrosive gases such as SO₂, H₂S, Cl₂, NH₃, NO₂, etc.; or fumes from lubricating oil. Use desiccants if necessary.
- Please contact KOA for conditions and length of storage.

Storage of the Products with Lead-free Termination

- Solderability may degrade faster for products with Pb-free terminals than for products with Pb-bearing terminals.

Mounting

- Avoid physical damage or shock to the products, which may happen by holding them with hard tools like pliers or tweezers or by imperfect mounting-machine alignment. This damage may affect electrical characteristics or lead to disconnection or cracking.
- If the bottom point of the mounting nozzle is too low, a product could be pushed onto the PCB, which may deteriorate electrical characteristics or lead to cracking. Decelerate the nozzle just before mounting, and mount the product after correcting PCB deformations.
- Do not use products that have fallen during mounting or that have already been removed from a PCB.
- Contact KOA if PCBs are molded or sealed by coating material after component mounting.
- Do not stack PCBs after mounting, because this may damage the components.
- The electrical characteristics of film-type resistors and sensors may be changed by electrostatic overvoltage. Keep electrostatic discharge away from components when assembling and handling by monitoring machines and human contact.
- Prevent or eliminate the introduction of ionic substances like salt, salinity, or sweat, as these substances may degrade resistance due to moisture or corrosion.

Soldering

- Perform soldering within the temperature, time, and number of cycles specified for the product or its precautions. If a product is exposed to high temperatures for long periods of time, its color or electrical characteristics may change or disconnection may occur.
- Prevent any external force from being applied to the products until solder has cooled.
- Handle carefully to prevent mechanical stresses, such as from the bending or warping of a PCB, on the solder fillet.
- Confirm that solder flux residue does not affect the product.
- Confirm that components are in place when conductive adhesive is used in place of solder.

Precautions for Soldering with Lead-free Solder

- In Pb-free soldering, temperature may be higher than in the use of eutectic solder. Confirm that soldering is acceptable under actual conditions.
- Solder fillets may lift off double-sided boards with through holes. Confirm the solder strength on actual board material before assembly.

Washing

- Confirm that solder flux residue does not remain after washing, because it may cause deterioration of moisture and corrosion resistance.
- Confirm reliability in advance when using no-clean solder, water, or a soluble agent.
- Since Pb-free solder may contain many ionic materials, use RMA type solder or flux or wash sufficiently.
- Wash thoroughly after soldering to remove ionic substances like sweat and salinity. Control the washing agent appropriately to remove all ionic substances. Consult KOA when using a washing agent such as acid, alkaline, or organic solvent other than alcohol.
- Ultrasonic washing may damage products due to vibration resonance. High hydraulic pressure may also damage products. Ask KOA in advance for washing conditions.
- Dry products thoroughly after washing.

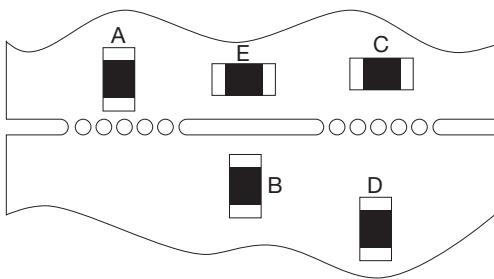
Dispose of the Products

- Observe appropriate laws and regulations for handling and disposal of products or packing materials.

The following precautions apply to surface mount devices

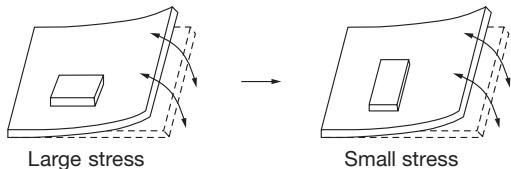
Precautions Related to PCB Bending Stress

- Arrange the long side of chip components parallel with the direction of the smaller coefficient of thermal expansion in anisotropic PCBs.
- Cracking of the solder fillet may occur with thermal cycling, because of mismatch of coefficients of thermal expansion between the board and the component. Pad size, amount of solder, and amount of heat radiating from the PCB must be designed carefully, especially with large components of 5 mm x 2.5 mm or larger.
- If products are mounted near a depaneling line, the termination or component may be damaged by large stresses during depaneling. Mount the products as shown in the following figure to minimize depaneling stress.



The level of stress on terminations A>B>C>D>E

- Use proper layouts to avoid stress from warping, bending, or deformation of the board in order to avoid solder cracking or component damage.



- Pay careful attention to products mounted near the edge of the board or near connectors, since stresses may happen during connection.
- Pay careful attention to layout when products are mounted near large components, when solder solidifies, it creates a stress in directions based on the large components, and cracking may occur.
- Design solder pads to be equal. If solder pads differ in size, they may change electrical characteristics or cause cracking and tombstoning when solder is cooling.

Mounting and Soldering

- Poor mounting machine adjustment may cause cracking, chipping, or alignment errors. Check and inspect the mounting machine in advance.
- Set backup pins in an appropriate layout to avoid damage to components mounted on the back of the board. Do not set these pins at nozzle positions.
- Adjust the bottom dead point of a dispenser away from the board when you apply adhesive to avoid damage to components mounted on the back of the board.
- Confirm that products solder properly if wave soldering is used.
- Pay close attention to amount of solder, since an improper amount may create a large stress on the component and cause cracking or malfunctions.

Soldering with a Soldering Iron

- Solder using a soldering iron at the temperature specified in the technical specifications or precautions for each product.
- Perform preheating as much as possible.
- Keep the tip of the soldering iron away from the body and the product terminal.
- Avoid physical damage or shock to components when using hard tools like pliers and tweezers.

The following precautions apply to through-hole devices

Mechanical Stress

- Pay close attention to vibration resonance after mounting.
- Do not add additional bending or twisting stresses to the product.
- Fix large components firmly.
- When lead wires are to be bent, use a large radius of curvature to avoid excessive stress on the terminal joint. Excessive stresses may cause the lead wire to separate from the electrode cap and damage the product.
- Do not add excessive stresses to the product body when lead wires are cut or held by the mounting machine.

Temperature Rise

- Pay close attention to heat radiation and interaction with other components, since large resistors generate a large amount of heat when the rated power is applied.

Higher Power Ratings

In some cases, KOA will increase the power rating for a given component. Often, the older power rating and newer power rating are both given on the specification, in order to create a transition period. During this time, the new power rating will often have a note asking for discussion with KOA.

A higher power rating is based on appropriate resistance stability, but other ratings and parameters still require attention. For example, voltage rating is based on a separate failure mechanism and will not be increased in the same ratio. In mid- and high-value resistors, power dissipation will still be kept lower than the new rating by the voltage limit. In addition, using a resistor at a higher power than its previous rating will create a greater rise in temperature on the surface of the component. This temperature rise should be checked for acceptability and to make sure that the layout does not place the resistor near a board material or component that could be damaged by greater heat.

Introduction of the Derating Curves Based on the Terminal Part Temperature

Background

Recent studies have led to better practices for miniaturizing high-power components in high-temperature automotive environments. Applications that require high-temperature resistors have increased dramatically. Recently, derating guidelines based on the resistor's terminal temperature, such as the diagram in figure 1, have been introduced to respond to these requirements.

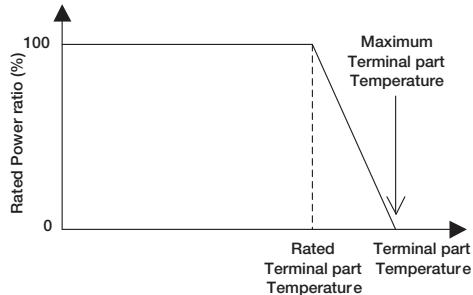


Figure 1. Derating curve based on the terminal part temperature

Derating by terminal temperature has already been used for metal-plate current-sense resistors with very low resistance values (such as the PSB and PSE series). These resistors are used to sense large currents in inverters and converters, and nearby switching elements or high-current conductors can lead to a local temperature increase at the resistor terminal beyond the temperature generated by the resistor itself. The techniques learned in designing these applications are now being extended to general-purpose components.

Overview of the Establishment of the Derating Curves Based on Ambient Temperature

The traditional derating curve, which is based on ambient temperature, was defined by IEC and JIS during the vacuum tube era, long before the appearance of surface-mount resistors. At the time, there were no printed circuit boards, and cylindrical resistors with lead wires were held above the board by lug terminals, as shown in figure 2.

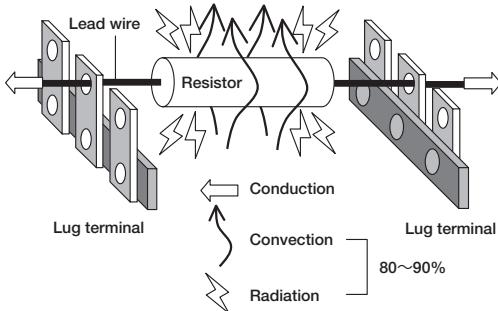


Figure 2. Heat dissipation of cylindrical resistors

Regardless of the shape of the resistor, the heat generated by its use is dissipated through three pathways. One path is conduction through solids such as the terminal. The second path is convection, usually heat transfer into the air by natural convection. The third path is radiation of infrared. Of these pathways, conduction increases with the area of solid connected the resistor. Convection and radiation increase with the total surface area of the resistor.

When cylindrical resistors with lead wires are mounted on lug terminals, the lead wire is long and thin, so the thermal resistance to conduction is high, and heat dissipation through that path is low. On the other hand, the dissipation of heat by convection and radiation is high, because the surface area of the resistor is large. Simulation shows that 80% to 90% of the heat from a cylindrical, lead-wire

resistor is dissipated directly into the ambient air. The temperature of the resistor can be calculated by adding the temperature rise caused by self-heating to the ambient temperature. Because the ambient is sufficient to estimate the thermal resistance for most of the heat dissipation, the traditional derating curve was based on it.

Heat Dissipation of Surface Mount Resistors

Figure 3 shows the main heat dissipation paths for modern surface mount resistors. This type of resistor has only a small surface area, so convection and radiation have proportionally less heat dissipation. On the other hand, since the device is directly connected to the PCB pattern by a large part of the surface area, conduction will be the primary path for heat dissipation. In general, conduction through the terminal to the board represents over 90% of the heat dissipation, even when convection and radiation are presumed to be at their maximum levels. Therefore, the terminal temperature, on the main heat pathway, is the best location to monitor for controlling power dissipation.

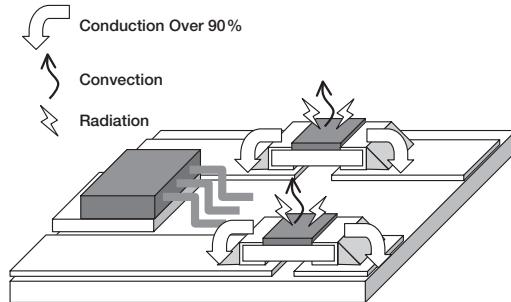


Figure 3. Heat dissipation of surface mount resistors

Derating Curve Suitable for the Surface Mount Resistor

As shown in figure 4, when a given amount of power is applied to the resistor, any given point on the resistor's surface will have the same temperature rise over the terminal temperature, regardless of ambient temperature. This is because there is very little heat dissipation from the resistor's surface to the ambient air.

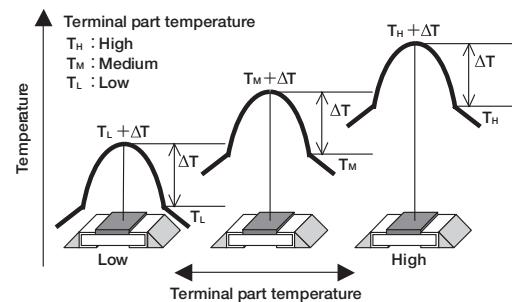


Figure 4. Contributing factor to the temperature of the surface mount resistor

However, surface temperatures at a given power will differ between different PCB designs, since the terminal temperature will be different. When resistors are mounted close to each other or other heat-generating devices, as shown in figure 5, there is a possibility that the temperature will be higher than the 70°C ambient temperature threshold used in the traditional JIS/IEC derating curve.

The traditional derating curve based on ambient temperature usually uses 70°C as the ambient temperature above which parts are to be derated. There will be no problem if resistors are used with sufficient electrical and thermal margin, but recent trends to miniaturization, high power density, and high-temperature use have reduced margins on design.

Redefining derating based on terminal temperature is a way to better represent the capabilities of the part. KOA will provide a derating curve suitable for surface mount resistors, based on testing under conditions where power rating is defined in terms of terminal temperature (as seen in terms & definitions).

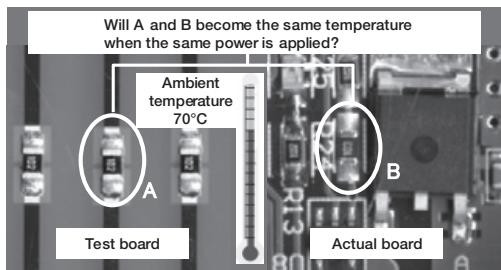


Figure 5. Temperature differs depending on the board

How to Use the Derating Curve Based on the Terminal Part Temperature

Here are some examples on using terminal temperature derating that lead to greater factors of safety, reduction in number of resistors, or use of a smaller component. The prior conditions will be the following (Be aware that the terminal part temperature does not always become 120°C when the ambient temperature is 100°C):

- (1) Ambient temperature of the board: 100°C
- (2) Terminal temperature of the surface mount resistor: 120°C
- (3) Actual power load: 0.05W

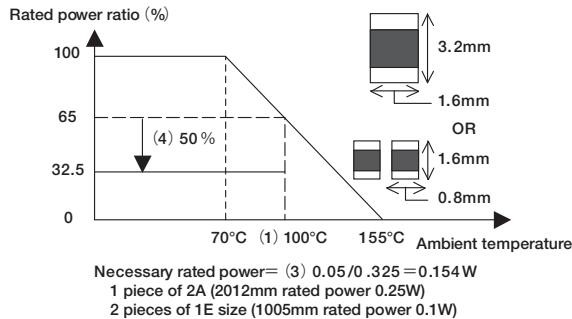


Figure 6. Selection by the traditional derating curve

- (4) Required margin of safety below rating according to designer's internal guidelines: 50%

The required power rating for the resistor using the ambient-temperature derating curve is calculated from conditions (1), (3), and (4). Figure 6 shows this result. For KOA's RK73B resistor series, one piece of 2A size, or two pieces of 1W size will be required.

However, when a resistor is selected using the terminal-temperature derating curve, which is better suited to surface-mount parts, conditions (2), (3), and (4) show that a single 1E (0402) size RK73B resistor would be sufficient.

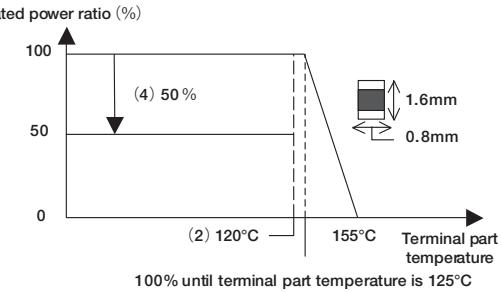


Figure 7. Selection using a terminal-temperature derating curve

As seen above, the number of resistors and the mounting area can be reasonably reduced by using the proper derating curve based on terminal temperature, and this will lead to cost savings.

Type	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.
SG73S 2A	0.25W	70°C	125°C
SG73P 2A	0.5W	—	100°C

Table 1. Rating column of products with 2 rated power

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/10/19

Derating curve suitable for the surface mount resistor

As shown in Table 1, for the surface mount resistors, there are products that have 2 rated powers for the same type in the rating column. The high rated power is basically available and applicable only to boards with adequate heat dissipation design for example multilayer boards, DCB (direct copper bonding) boards and single layer boards with wide heat dissipation area land. Therefore, the horizontal axis of the derating curve for high rated power is only defined with the terminal part temperature and please be careful that the conventional derating curve defined by the ambient temperature cannot be used in this case. For these products, “-” will be shown in the rated ambient temperature column which means “Not Applicable.”

In addition, we implement load life tests for the products with high rated power by using a test board that can specially control the terminal part temperature.

In the case of Table 1, there will be 3 derating curves as shown from Figure 8 to Figure 10.

How to use each derating curve is shown as the following.

When 0.25W is the rated power

When the terminal part temperature can be measured:

The derating curve in Figure 8 can be applicable and it can be used with rated power 0.25W up to terminal part temperature 125°C. The derating curve with the horizontal axis based on the terminal part temperature supersedes the conventional derating curve with the horizontal axis based on the ambient temperature. Therefore, even when the ambient temperature exceeds 100°C, it can be used with rated power 0.25W as long as the terminal part temperature is below 125°C.

When the terminal part temperature is not measured and only the ambient temperature is measured:

The product may be used by derating the load power from the ambient temperature 70°C according to the conventional derating curve shown in Figure 9. However, as mentioned in the past descriptions, the temperature of the resistor differs according to the wiring patterns and heat generating components nearby, even when the ambient temperature is the same, so it is not a derating method with good precision.

When 0.5W is the rated power

Managing the terminal part temperature is the requirement to apply the rated power 0.5W. Only the derating curve with the horizontal axis based on the terminal part temperature as shown in Fig.10 can be used but it can assure up to the high power. The product can be used with 0.5W if the terminal part temperature is below 100°C.

Reference: IEC TR 63091:2017 “Study for the derating curve of surface mount fixed resistors-derating curves based on the thermal part temperature.”

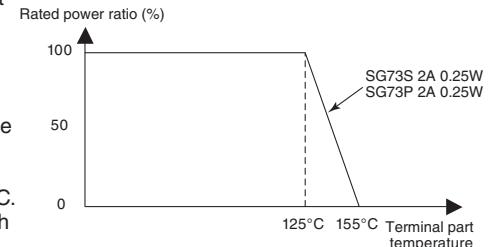


Figure 8. Derating curve of 0.25W rated power based on terminal part temperature

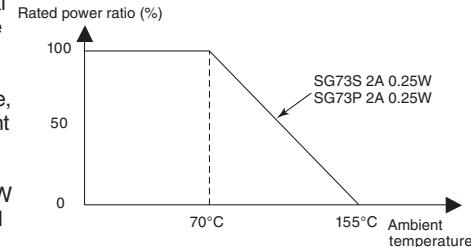


Figure 9. Derating curve of 0.25W rated power based on ambient temperature

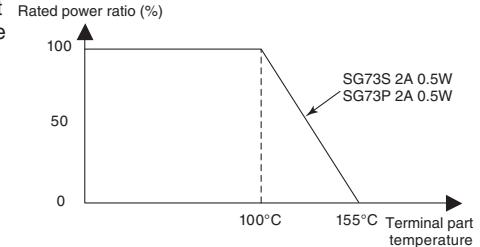


Figure 10. Derating curve of 0.5W rated power based on terminal part temperature

Precautions for the Resistors

Refer to the precautions of common matters for all products in the beginning of this catalog.

General in Fixed Resistors

- For basic precautions of using resistors, refer to the technical report "JEITA RCR-2121B Safety application guide for fixed resistors for use in electronic equipment" issued by JEITA.
- When the resistors are operated in ambient temperature above the rated temperature, the power rating must be derated according to the derating curve.
- Resistors in general may emit flame, fire or smoke when overload is applied.
- Flame retardant resistors may emit smoke or appear red hot when overload is applied but are unlikely to emit flame or fire.
- When the resistors are sealed and coated by coating materials such as resin, deterioration of the resistor by thermal stress or resin may affect the characteristics. Confirm with KOA for the performance and reliability specifications in advance.

When the resin absorbs moisture, the resistance to moisture and corrosion of the resistor may deteriorate, so be aware.

- When the resistor is coated, potted or molded by resin materials, the curing stress could cause peeling of protective coating and cracking of solder fillet, resulting in resistance change and disconnection. Do not coat nor seal the flame retardant coated resistors.
- Allow enough time for cooling after mounting metal film resistors, before washing off the flux. Residues of ionic substances may deteriorate resistances to moisture and corrosion.
- KOA can only guarantee safety when the average power is below the rated power. When power, exceeding the rated power, is applied for a short duration, please contact us with the surge voltage or current waveform for advice.
- Cylindrical film resistors have inductance due to the spiral trimming. Please be aware when using in a high-frequency circuit.
- The flame retardant resistors are weak against mechanical stress compared with the general resistors due to the special coating. Please do not apply impact, vibration or pinching with pliers, tweezers to the resistor body. Do not apply any external force to the protective coating until drying is fully completed after washing.

Chip Resistor Array and Networks

- Misalignment of the mounting, abnormal solder amount or a loading direction mistake in the flow soldering process could cause a solder bridge to the neighboring terminations.
- Adhesive of ionic residuals on the resistor or board could cause migration between the neighboring terminations.

Wirewound Type Resistors

- Wirewound type resistors have inductances and parasitic capacitances resulting from the winding structure. Therefore, they could resonate when used in a high frequency circuit.

Fusing Resistors

- Confirm beforehand that the overload condition of the abnormal situations are within the fusing characteristics.
- Contact KOA in advance when excess overload above the rated voltage is continuously applied, since there is a possibility of damage accumulated in the resistor.
- The arc phenomenon may occur when high voltage is applied again after fusing by over current. Make sure to use the product below the maximum open circuit voltage.
- Contact KOA about the maximum open circuit voltage, it varies depending on the product type and resistance.
- The fusing characteristics could change when the resistors are coated, potted and molded by resin materials.

Terms and Definitions

Nominal Resistance

- Designed resistance value usually indicated on the resistor.

Power Rating

- Maximum allowable power at rated temperature. Some of our chip resistor arrays and networks specify the power rating for the entire package, as opposed to each element.

Rated Temperature

- Maximum ambient temperature at which the power rating may be applied continuously. The rated ambient temperature refers to the temperature around the resistor mounted inside the equipment, not to the air temperature outside the equipment.

Derating Curve

- Plot that expresses the relation between ambient temperature and the maximum allowable power, which is generally expressed in percentage.

Rated Voltage

- Maximum allowable D.C. or A.C. voltage, to be continuously applied to a resistor or a resistor element.

$$\text{Rated Voltage (V)} = \sqrt{\text{Rated Power (W)} \times \text{Nominal Resistance Value} (\Omega)}$$

Rated voltage shall be the calculated value or max. working voltage, whichever is lower.

Critical Resistance

- The maximum nominal resistance value at which the rated power can be applied without exceeding the maximum working voltage. The rated voltage is equal to the max. working voltage at the critical resistance value.

Max. Working Voltage

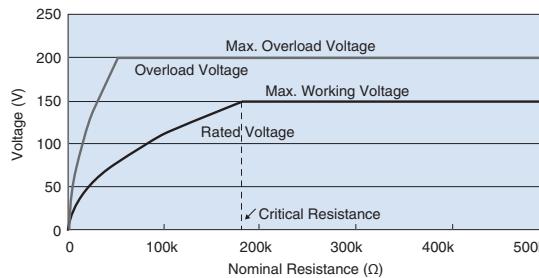
- Maximum D.C. or A.C. voltage that can be continuously applied to the terminations of a resistor. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

Overload Voltage

- Allowable voltage which is applied for 5 sec. according to the short time overload test. Overload voltage shall be 2.5 times of rated voltage or max. overload voltage, whichever is lower.

Maximum Overload Voltage

- Largest value of overload voltage



Example of Various Voltage of RK73G 2A

Dielectric Withstanding Voltage

- A.C. voltage (rms) that can be applied to a designated spot between the electrode and the outer coating for one minute according to the proof test.

Temperature Coefficient of Resistance (T.C.R.)

- Relative variation of resistance between two given temperatures when temperature is changed by 1K, which is calculated by the following formula.

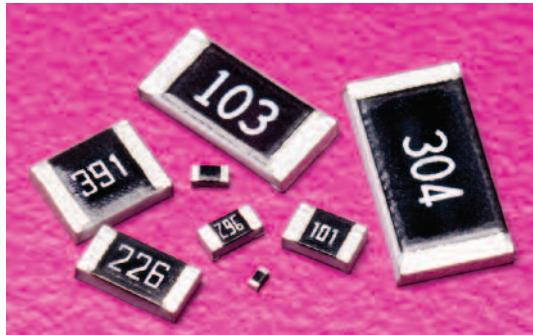
$$\text{T.C.R. } (\times 10^{-6}/\text{K}) = \frac{R - R_0}{R_0} \times \frac{1 \times 10^6}{T - T_0}$$

R : Resistance value (Ω) at T

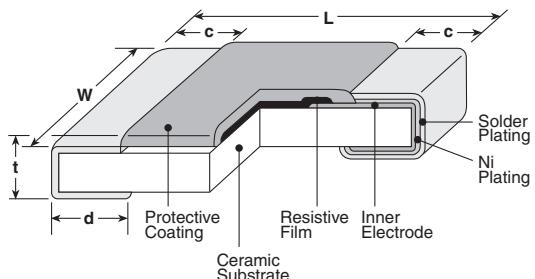
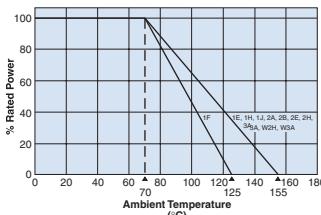
R_0 : Resistance value (Ω) at T_0

T : Measured test temperature ($^{\circ}\text{C}$)

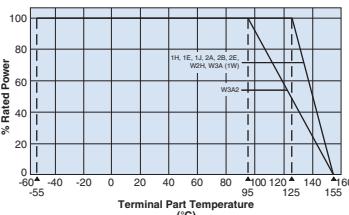
T_0 : Measured base temperature ($^{\circ}\text{C}$)


features

- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified: 0201 (1H), 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (2H/W2H), 2512 (3A/W3A/W3A2)


dimensions and construction

Derating Curve


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Type* (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1F (01005)	.015±.001 (0.4±0.02)	.007±.001 (0.2±0.02)	.004±.001 (0.10±0.03)	.004±.001 (0.11±0.03)	.005±.001 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 .002 (1.0 +.01 .05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 .004 (0.25 +.05 .1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 .004 (0.3 +.02 .1)	.02±.004 (0.5±0.1)
2B (1206)		.063±.008 (1.6±0.2)			
2E (1210)		.126±.008 (3.2±0.2)	.102±.008 (2.6±0.2)		.016 +.008 .004 (0.4 +.02 .1)
2H (2010)		.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)		
W2H (2010)				.02±.012 (0.5±0.3)	.026±.006 (0.65±0.15)
3A (2512)		.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 +.008 .004 (0.4 +.02 .1)
W3A/W3A2 (2512)					.026±.006 (0.65±0.15)

* Parentheses indicate EIA package size codes.

ordering information

RK73B	2B	T	TD	102	J
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
1F	T: Sn (1F ~ W3A2)		TX: 01005 only: 4mm width - 1mm pitch plastic embossed	2 significant figures + 1 multiplier	G: ±2%
1H		Contact factory for below options:	TBL: 01005 only: 2mm pitch pressed paper	"R" indicates decimal on value <10Ω	J: ±5%
1E	L: SnPb (1E, 1J, 2A, 2B, 2E, 2H, 3A)		TC: 0201 only: 7" 2mm pitch pressed paper (TC: 10,000 pcs/reel, TCM: 15,000 pcs/reel)		
1J		G: Au (1E ~ 2A: 10Ω ~ 1MΩ)	TPL: 0402 only: 2mm pitch punched paper		
2A			TP: 0402, 0603 & 0805: 7" 2mm pitch punched paper		
2B			TD: 0603, 0805, 1206 & 1210: 7" 4mm pitch punched paper		
2E			TE: 0805, 1206, 1210, 2010 & 2512: 7" plastic embossed		
W2H			For further information on packaging, please refer to Appendix A		
W3A					
2H					
3A					
W3A2					

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/08/19

**general purpose 2%, 5% tolerance
thick film chip resistor**

applications and ratings

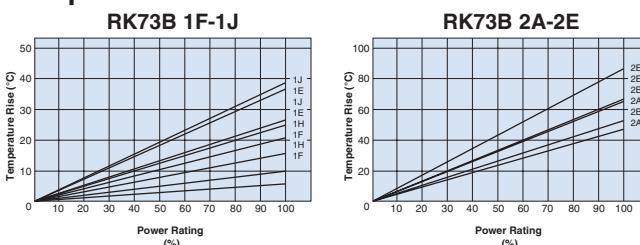
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (x10 ⁻³ /K)	Resistance Range		Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range			
RK73B1F (01005)	0.03W		—	±200	100kΩ - 1MΩ	100kΩ - 10MΩ	20V	30V	-55°C to +125°C			
				±250	10Ω - 91kΩ	10Ω - 91kΩ						
				0~+300	1Ω - 9.1Ω	1Ω - 9.1Ω						
RK73B1H (0201)	0.05W	70°C	125°C	±200	10Ω - 10MΩ	10Ω - 10MΩ	25V	50V	-55°C to +155°C			
RK73B1E (0402)	0.1W			±400	—	1Ω - 9.1Ω	75V	100V				
RK73B1J (0603)	0.1W			±200	1Ω - 10MΩ	1Ω - 10MΩ						
	0.125W			±200	1.1kΩ - 1MΩ	1.1kΩ - 10MΩ	75V	100V				
RK73B2A (0805)	0.25W			±400	—	11MΩ - 22MΩ						
RK73B2B (1206)	0.25W			±200	1Ω - 1kΩ	1Ω - 1kΩ	150V	200V				
	±200			1Ω - 1MΩ	1Ω - 1MΩ							
RK73B2E (1210)	0.50W			±400	1.1MΩ - 10MΩ	1.1MΩ - 10MΩ						
	±200			1Ω - 5.6MΩ	1Ω - 5.6MΩ	200V	400V					
RK73BW2H/2H (2010)	0.75W			±400	6.2MΩ - 10MΩ					6.2MΩ - 22MΩ		
				±200	10Ω - 5.6MΩ					1Ω - 5.6MΩ		
RK73BW3A/3A (2512)	1.0W			±400	—	6.2MΩ - 22MΩ	200V	400V				
				±200	10Ω - 5.6MΩ	1Ω - 5.6MΩ						
RK73BW3A2 (2512)	2.0W	—	95°C	±400	—	6.2MΩ - 22MΩ	200V	400V				
				±200	10Ω - 5.6MΩ	1Ω - 5.6MΩ						

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

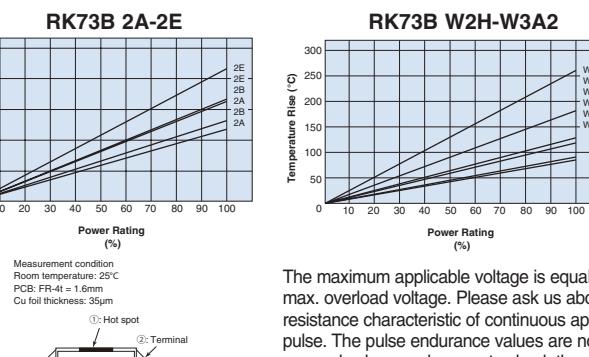
If any questions arise on whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature" in your usage conditions, please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details, refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog. Temperature rise at high power will depend on PCB layout. Be sure to contact factory prior to use and monitor terminal part temperature.

environmental applications

Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



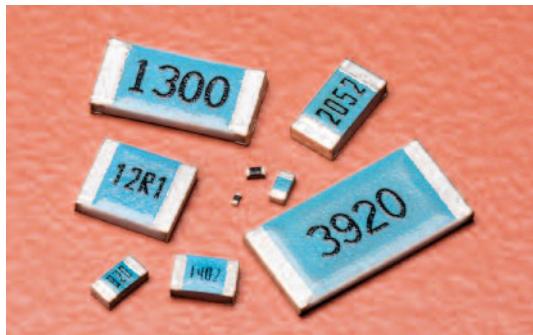
The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

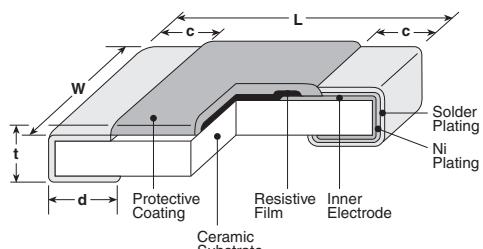
Parameter	Requirement Limit	△ R (%+0.1Ω)	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±1%: 1F ±0.5%: Another	Rated Voltage x 2.5 for 5 seconds (1E, 2B, W3A2: Rated Voltage x 2 for 5 seconds)
Resistance to Soldering Heat	±1%: 1F~W3A2 (10Ω≤R≤1MΩ) ±3%: 1F~W3A2 (R<10Ω, R>1MΩ)	±0.5%: 1F~W3A2 (10Ω≤R≤1MΩ); ±1%: 1F~W3A2 (R<10Ω, R>1MΩ)	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%: 1F ±0.5%: Another	±0.5%: 1F ±0.3%: Another	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: Another	±0.75%: 1J, 2A, 2B ±1.5%: 1F; ±1%: Another	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: Another	±0.75%: 1J, 2A, 2B ±1%: Another	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.5%: 1F ±0.3%: Another	+125°C, 1000 hours: 1F; +155°C, 1000 hours: 1E, 1H, 1J, 2A, 2B, 2E, 2H/W2H, 3AW3A/W3A2

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

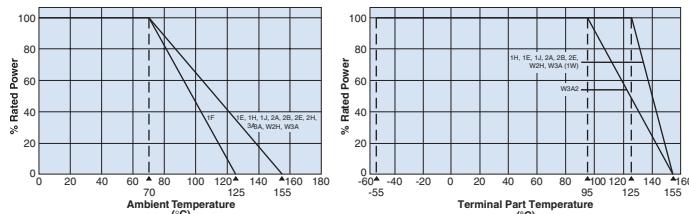
10/22/19



dimensions and construction



Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

features

- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified: 0201 (1H), 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (2H/W2H), 2512 (3A/W3A/W3A2)



Type* (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1F (01005)	.016±.0008 (0.4±0.02)	.008±.0008 (0.2±0.02)	.004±.001 (0.1±0.03)	.004±.001 (0.11±0.03)	.005±.0008 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 ±.004 (1.0 ±.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 ±.002 (0.25 ±.05)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ±.008 (0.3 ±.01)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)			
2E (1210)		.102±.008 (2.6±0.2)		.016 ±.008 (0.4 ±.04)	
2H (2010)		.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)	.024±.004 (0.6±0.1)
W2H (2010)					.026±.006 (0.65±0.15)
3A (2512)		.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 ±.008 (0.4 ±.02)
W3A/W3A2 (2512)					.026±.006 (0.65±0.15)

* Parentheses indicate EIA package size codes.

ordering information

RK73H	2B	T	TD	1003	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
Type 1F 1H 1E 1J 2A 2B 2E W2H W3A 2H 3A W3A2	Size 1F 1H 1E 1J 2A 2B 2E W2H W3A 2H 3A W3A2	Termination Material T: Sn (1F ~ W3A2) Contact factory for below options: L: SnPb (1E, 1J, 2A, 2B, 2E, 2H, 3A) G: Au (1E ~ 2A: 10Ω ~ 1MΩ)	TX: 01005 only: 4mm width - 1mm pitch plastic embossed TBL: 01005 only: 2mm pitch pressed paper TC: 0201 only: 7" 2mm pitch pressed paper (TC: 10,000 pcs/reel, TCM: 15,000 pcs/reel) TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A	Nominal Resistance 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	Tolerance D: ±0.5% F: ±1%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/08/19



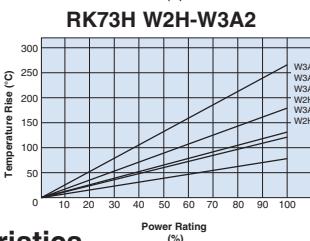
KOA SPEER ELECTRONICS, INC.

applications and ratings**RK73H****precision 0.5%, 1% tolerance
thick film chip resistor**

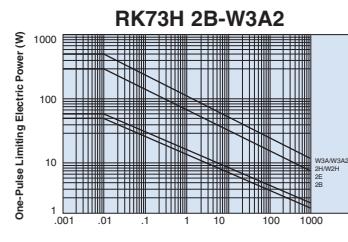
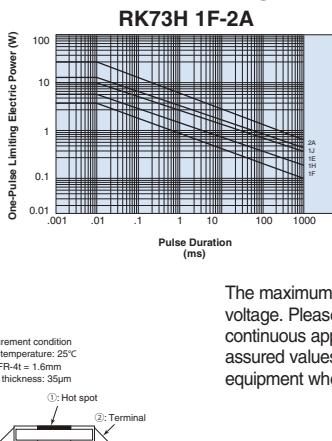
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (x10 ³ /K)	Resistance Range	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range			
				D±0.5% E-24, E-96	F±1% E-24, E-96*						
RK73H1F (01005)	0.03W	70°C	—	±200	—	100kΩ - 2MΩ*	20V	-55°C to +125°C			
				±250	—	10Ω - 91kΩ*					
RK73H1H (0201)	0.05W		±200	10Ω - 1MΩ	10Ω - 10MΩ*	25V	50V				
				±400	—	1.0Ω - 9.1Ω*					
RK73H1E (0402)	0.1W			±100	10Ω - 1MΩ	10Ω - 1MΩ	75V				
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 10MΩ					
RK73H1J (0603)	0.1W		±100	1.02kΩ - 1MΩ	1.02kΩ - 1MΩ	75V	100V				
	0.125W			±200	—	1.02MΩ - 10MΩ					
			±100	10Ω - 1kΩ	10Ω - 1kΩ	75V					
				±200	—	1.0Ω - 9.76Ω					
RK73H2A (0805)	0.25W		±100	10Ω - 1MΩ	10Ω - 1MΩ	150V	200V				
				±200	—	1.0Ω - 9.76Ω					
			±400	—	1.02MΩ - 10MΩ	200V					
				±100	10Ω - 1MΩ	10Ω - 1MΩ					
RK73H2B (1206)	0.25W		±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ	200V	400V				
				±400	—	5.62MΩ - 10MΩ					
			±100	10Ω - 1MΩ	10Ω - 1MΩ						
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ					
RK73H2E (1210)	0.5W		±200	—	5.62MΩ - 10MΩ	200V	400V				
				±400	—	1.0Ω - 9.76Ω					
			±100	10Ω - 1MΩ	10Ω - 1MΩ						
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ					
RK73HW2H/2H (2010)	0.75W		±200	—	5.62MΩ - 10MΩ	200V	400V				
				±400	—	1.0Ω - 9.76Ω					
			±100	10Ω - 1MΩ	10Ω - 1MΩ						
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ					
RK73HW3A/3A (2512)	1.0W		±200	—	5.62MΩ - 10MΩ	200V	400V				
				±400	—	1.0Ω - 9.76Ω					
			±100	10Ω - 1MΩ	10Ω - 1MΩ						
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ					
RK73HW3A2 (2512)	2.0W		95°C	±100	10Ω - 1MΩ	5.62MΩ - 10MΩ	200V	400V			
				±200	—	1.0Ω - 9.76Ω, 1.02MΩ - 5.6MΩ					
				±400	—	5.62MΩ - 10MΩ					

Rated voltage = √(Power rating x resistance value or max. working voltage), whichever is lower

* 1F: E-24. 1H: 1.0~9.1, 1M~10MΩ: E-24. If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of the catalog. While using under high power, the temperature of the product may increase depending on the condition of heat dissipation from PCB. Be sure to check the terminal part temperature as well as precautions to use on delivery specification before use.

environmental applications**Temperature Rise**

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

One-Pulse Limiting Electric Power

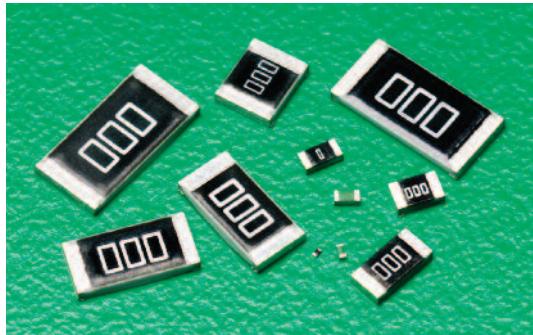
The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement	△ R (%+0.1Ω)	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±1%: 1F; ±0.5%: Another	Rated Voltage x 2.5 for 5 seconds (1E, 2B, W3A2: Rated Voltage x 2 for 5 seconds)
Resistance to Soldering Heat	±1%: 1F ~ W3A2 (10Ω≤R≤1MΩ); ±3%: 1H ~ W3A2 (R>10Ω, R>1MΩ)	±0.5%: 1F ~ W3A2 (10Ω<R<1MΩ); ±1%: 1H ~ W3A2 (R<10Ω, R>1MΩ)	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%: 1F; ±0.5% Another	±0.5%: 1F; ±0.3% Another	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: Another	±0.75%: 1J, 2A, 2B; ±1.5%: 1F, ±1%: Another	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B; ±3%: Another	±0.75%: 1J, 2A, 2B; ±1%: Another	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.5%: 1F ±0.3%: Another	+125°C, 1000 hours: 1F; +155°C, 1000 hours: 1E, 1H, 1J, 2A, 2B, 2E, 2H/W2H, 3AW3A/W3A2

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

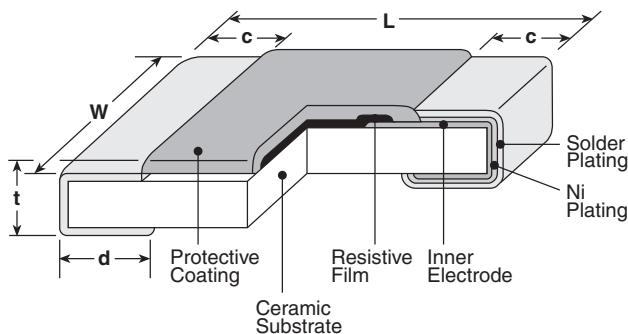
10/28/19



features

- Silver element
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified: 0201(1H), 0402(1E), 0603(1J), 0805(2A), 1206(2B), 1210(2E), 2010(2H/W2H), 2512(3A/W3A)

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1F (01005)	.016±.0008 (0.4±0.02)	.008±.0008 (0.2±0.02)	.004±.001 (0.10±0.03)	.004±.001 (0.11±0.03)	.005±.0008 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 (1.0 +.1 -.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +.05 -.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +.2 -.1)	.02±.004 (0.5±0.1)
2B (1206)		.063±.008 (1.6±0.2)			
2E (1210)		.102±.008 (3.2±0.2)		.016 +.008 -.004 (0.4 +.2 -.1)	
2H (2010)		.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)		
W2H (2010)				.026±.006 (0.65±0.15)	.024±.004 (0.6±0.1)
3A (2512)		.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.016 +.008 -.004 (0.4 +.2 -.1)	
W3A (2512)				.026±.006 (0.65±0.15)	

ordering information

RK73Z	2B	T	TD
Type	Size	Termination Material	Packaging
		T: Sn (1F, 1H, 1E, 1J, 2A, 2B, 2E, 2H/W2H, 3A/W3A) Contact factory for below options: L: SnPb (1E, 1J, 2A, 2B, 2E, 2H, 3A only) G: Au (1E, 1J, 2A)	TX: 01005 only: 4mm width - 1mm pitch embossed plastic TBL: 01005 only: 2mm pitch pressed paper TC: 0201 only: 7" 2mm pitch pressed paper (TC: 10,000 pcs/reel, TCM: 15,000 pcs/reel) TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

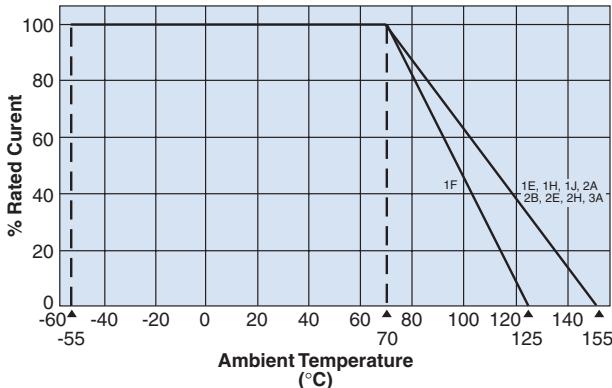
11/08/19

applications and ratings

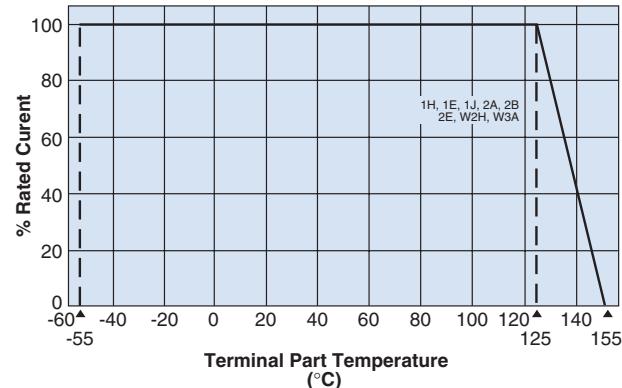
Part Designation	Rated Ambient Temperature	Rated Terminal Part Temperature	Maximum Continuous Current @ 70°C	Maximum Overload Current @ 70°C (for < 1 second)	Maximum Resistance	Operating Temperature Range
RK73Z1F	70°C	—	0.5 Amps	1.0 Amp Max.	50mΩ	-55°C to +125°C
RK73Z1H			0.5 Amps	1.0 Amp Max.		
RK73Z1E		125°C	1.0 Amps	2 Amp Max.		
RK73Z1J			2.0 Amps	5 Amp Max.		
RK73Z2A			2.0 Amps	10 Amp Max.		-55°C to +155°C
RK73Z2B RK73Z2E RK73Z2H/W2H RK73Z3A/W3A						

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a current rating shall be derated in accordance with the above derating curve.

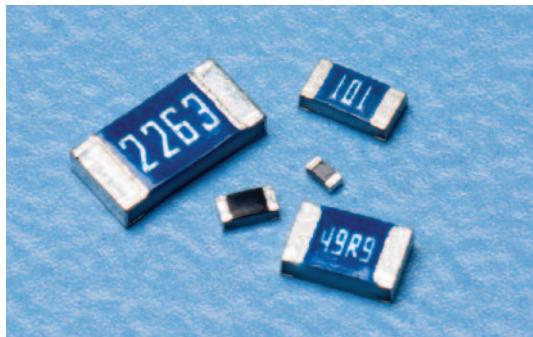


For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

Parameter	Requirement Limit	Typical	Test Method
Resistance	50mΩ Max. after the test	15mΩ Max. after the test	25°C
Overload (Short time)	50mΩ Max. after the test	18mΩ Max. after the test	Maximum overload current for 5 seconds, 1 cycle
Resistance to Solder Heat	50mΩ Max. after the test	15mΩ Max. after the test	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	50mΩ Max. after the test	15mΩ Max. after the test	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	100mΩ Max. after the test	18mΩ Max. after the test	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	100mΩ Max. after the test	18mΩ Max. after the test	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	100mΩ Max. after the test	15mΩ Max. after the test	+125°C, 1000 hours: 1F +155°C, 1000 hours: 1H, 1E, 1J, 2A, 2B, 2E, W2H/W3A, W3A/3A

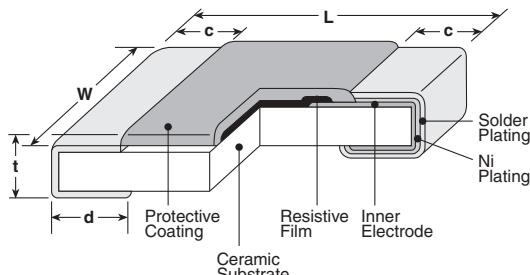


features

- High precision resistor with T.C.R. of ± 50 ppm/ $^{\circ}\text{C}$ and tolerance of $\pm 0.25\%$, $\pm 0.5\%$ or $\pm 1\%$
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

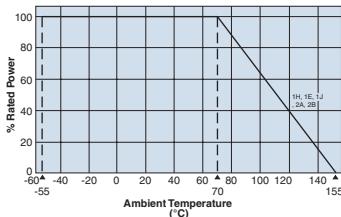


dimensions and construction

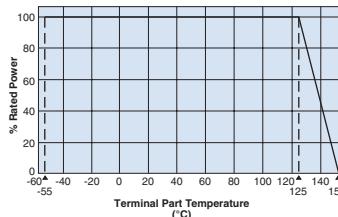


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1H (0201)	.024 \pm .001 (0.6 \pm 0.03)	.012 \pm .001 (0.3 \pm 0.03)	.004 \pm .002 (0.1 \pm 0.05)	.006 \pm .002 (0.15 \pm 0.05)	.009 \pm .001 (0.23 \pm 0.03)
1E (0402)	.039 $^{+.004}_{-.002}$ (1.0 $^{+.1}_{-.05}$)	.02 \pm .002 (0.5 \pm 0.05)	.008 \pm .004 (0.2 \pm 0.1)	.01 $^{+.002}_{-.004}$ (0.25 $^{+.05}_{-.1}$)	.014 \pm .002 (0.35 \pm 0.05)
1J (0603)	.063 \pm .008 (1.6 \pm 0.2)	.031 \pm .004 (0.8 \pm 0.1)	.012 \pm .004 (0.3 \pm 0.1)	.012 \pm .004 (0.3 \pm 0.1)	.018 \pm .004 (0.45 \pm 0.1)
2A (0805)	.079 \pm .008 (2.0 \pm 0.2)	.049 \pm .004 (1.25 \pm 0.1)	.016 \pm .008 (0.4 \pm 0.2)	.012 $^{+.008}_{-.004}$ (0.3 $^{+.2}_{-.1}$)	.02 \pm .004 (0.5 \pm 0.1)
2B (1206)	.126 \pm .008 (3.2 \pm 0.2)	.063 \pm .008 (1.6 \pm 0.2)	.02 \pm .012 (0.5 \pm 0.3)	.016 $^{+.008}_{-.004}$ (0.4 $^{+.2}_{-.1}$)	.024 \pm .004 (0.6 \pm 0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RK73G	1J	T	TD	1003	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
1H 1E 1J 2A 2B	1H 1E 1J 2A 2B	T: Sn (1H, 1E, 1J, 2A, 2B) L: SnPb (1E, 1J, 2A, 2B)	TC: 0201 only: 7" 2mm pitch pressed paper (TC: 10,000 pcs/reel, TCM: 15,000 pcs/reel) TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206: 7" 4mm pitch punched paper TE: 0805, 1206: 7" embossed plastic For further information on packaging, please refer to Appendix A	3 significant figures + 1 multiplier "R" indicates decimal on value <100 Ω	New C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/08/19

thick film 0.25%, 0.5%, 1% tolerance, 50ppm/°C chip resistor

applications and ratings

Part Designation*	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	New E-24, E-96 (C±0.25%)	Resistance Range	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	
					E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)			
RK73G1H (0201)	1/20W (.05W)				—	100Ω - 1MΩ**	100Ω - 1MΩ**	25V	50V
RK73G1E (0402)	1/10W (.10W)							50V	100V
RK73G1J (0603)	1/10W (.10W)							75V	150V
RK73G2A (0805)	1/8W (.125W)				100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 1MΩ	150V	200V
RK73G2B (1206)	1/4W (.25W)							200V	400V

Operating Temperature Range: -55°C ~ +155°C

* Parentheses indicate EIA package size codes.

** RK73G1H available in E-24 decade values only

environmental applications

Temperature Rise

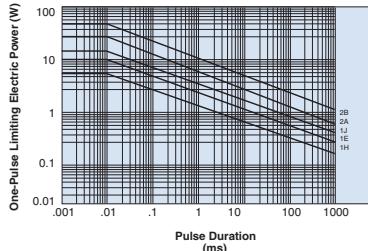
RK73G 1E-1J


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

RK73G 2A-2B


Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

One-Pulse Limiting Electric Power

RK73G 1H-2B


The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

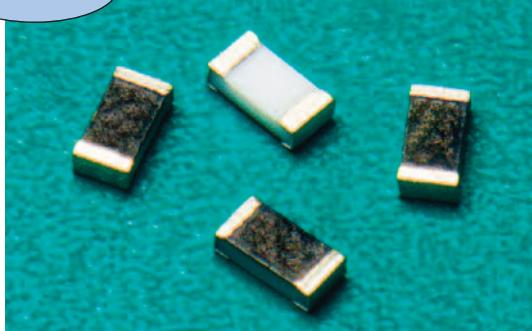
Performance Characteristics

Parameter	Requirement $\Delta R \pm(\%+0.1\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	1H: +25°C/+125°C, 1E, 1J, 2A, 2B: +25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.6%	Rated Voltage x 2.5 for 5 seconds (1E, 2B: Rated Voltage x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±1%: 1H, ±0.4%: 1E, 1J, 2A, 2B	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: 1H, 1E	±0.6%: 1J, 2A, 2B; ±1%: 1H, 1E	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: 1H, 1E	±0.6%: 1J, 2A, 2B; ±1%: 1H, 1E	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.6%	+155°C, 1000 hours

 For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

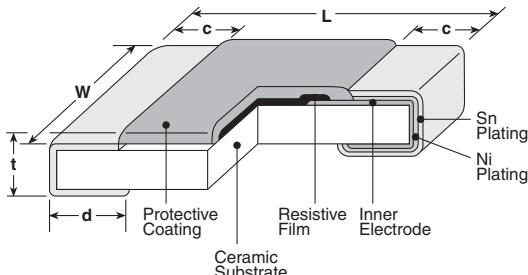
10/28/19

NEW

**EU
RoHS
C O M P L I A N T**

features

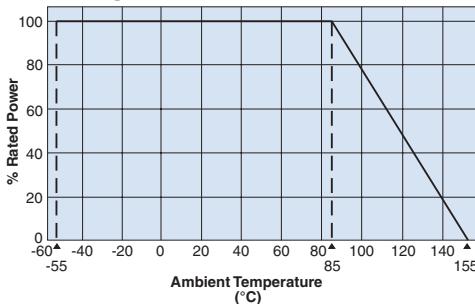
- Metal-glaze thick film resistor for surface mounting
- High precision resistor with T.C.R. $\pm 25 \times 10^{-6}/K$ and tolerance $\pm 0.1\%$
- High reliability with ΔR of $\pm 0.2\%$ and $\pm 0.5\%$ in the reliability test
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

dimensions and construction

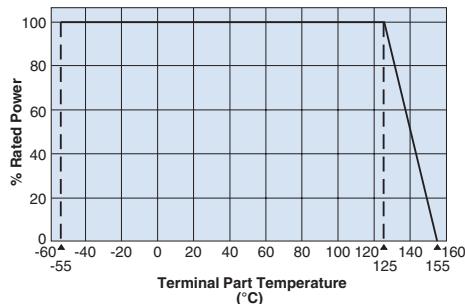


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.008±.004 (0.2±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.010±.006 (0.25±0.15)	.012 ^{+0.08} _{-0.04} (0.3 ^{+0.2} _{-0.1})	.020±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.014±.006 (0.35±0.15)	.016 ^{+0.08} _{-0.04} (0.4 ^{+0.2} _{-0.1})	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RS73F	1J	T	TD	1002	B
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
RS73F RS73G	1J: 0.2W 2A: 0.25W 2B: 0.33W	T: Sn	TD: 4mm pitch punched paper For further information on packaging, please refer to Appendix A	4 digits	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

7/01/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10 ⁻⁶ /K)	Resistance Range ^{*2}				Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
					B±0.1% E-24, E-96	C±0.25% E-24, E-96	D±0.5% E-24, E-96	F±1% E-24, E-96			
RS73F1J (0603)	.2W	85°C	+125°C	±25 ^{*1}	100Ω - 1MΩ	100Ω - 1MΩ	100Ω - 1MΩ	100Ω - 1MΩ	100V	150V	-55°C to +155°C
RS73G1J (0603)				±50							
RS73F2A (0805)	.25W		+125°C	±25 ^{*1}	10Ω - 3MΩ	10Ω - 6.8MΩ	10Ω - 10MΩ	10Ω - 10MΩ	150V	300V	
RS73G2A (0805)				±50							
RS73F2B (1206)	.33W		+125°C	±25 ^{*1}	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	10Ω - 10MΩ	200V	400V	
RS73G2B (1206)				±50							

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower^{*1} Measurement Temperature: +25°C/+125°C. Cold T.C.R. (-55°C/+25°C) is -50~+25x10⁻⁶/K^{*2} Please inquire about E-192

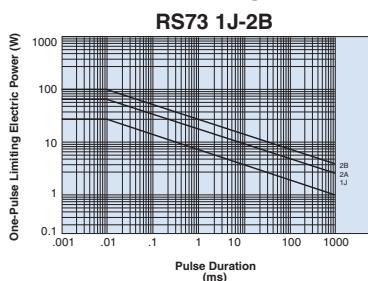
If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.

environmental applications**Temperature Rise**

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

One-Pulse Limiting Electric Power

The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±0.2%	±0.03%	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±0.2%	±0.1%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.2%	±0.05%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±0.2%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4%: other	±0.04%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.08%: other	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.2%	±0.05%	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.2%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.4~0.5%: other	±0.1%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.2~0.3%: other	+155°C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

1/24/20

long term precision thin (metal) film flat chip resistors (high reliability, for automotive)

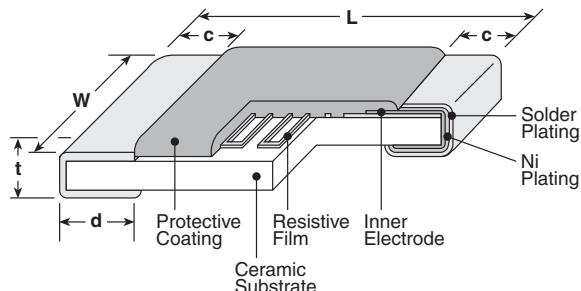


EU
RoHS
C O M P L I A N T

features

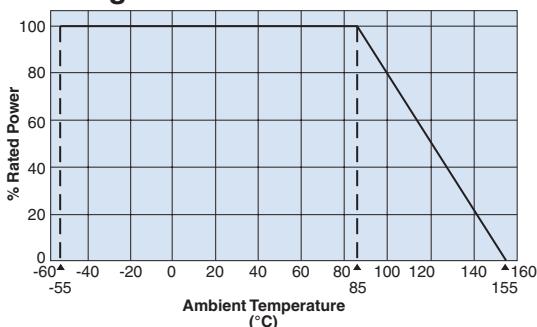
- AEC-Q200 Qualified
- Endurance at 85°C (3,000h): ΔR of $\pm 0.1\%$
- High temperature exposure: ΔR of $\pm 0.1\%$
- High precision type $\pm 0.05\%$ is available
- Low current noise
- High reliability and high stability at elevated temperatures
- Improved moisture resistance by glass passivation layer
- Products meet EU RoHS requirements
- Rated ambient temperature: 85°C, rated up to +155°C

dimensions and construction

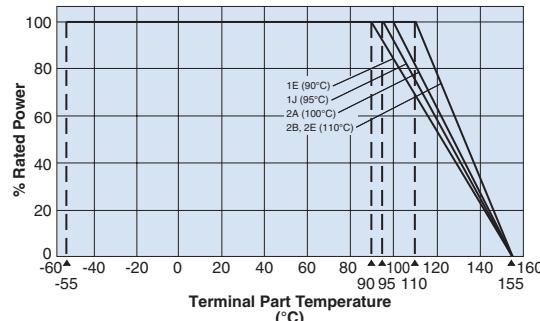


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1E (0402)	.039 ^{+.004} _{-.002} (1.0 ^{+.01} _{-.05})	.020 ^{+.002} _{-.002} (0.5 ^{+.05} _{-.05})	.010 ^{+.004} _{-.004} (0.25 ^{+.1} _{-.1})	.010 ^{+.002} _{-.004} (0.25 ^{+.05} _{-.1})	.014 ^{+.002} _{-.002} (0.35 ^{+.05} _{-.05})
1J (0603)	.063 ^{+.008} _{-.008} (1.6 ^{+.2} _{-.2})	.031 ^{+.004} _{-.004} (0.8 ^{+.1} _{-.1})	.012 ^{+.004} _{-.004} (0.3 ^{+.1} _{-.1})	.012 ^{+.004} _{-.004} (0.3 ^{+.1} _{-.1})	.018 ^{+.004} _{-.004} (0.45 ^{+.1} _{-.1})
2A (0805)	.079 ^{+.008} _{-.008} (2.0 ^{+.2} _{-.2})	.049 ^{+.008} _{-.008} (1.25 ^{+.2} _{-.2})	.016 ^{+.008} _{-.008} (0.4 ^{+.2} _{-.2})	.012 ^{+.008} _{-.004} (0.3 ^{+.2} _{-.1})	.02 ^{+.004} _{-.004} (0.5 ^{+.1} _{-.1})
2B (1206)	.126 ^{+.008} _{-.008} (3.2 ^{+.2} _{-.2})	.063 ^{+.008} _{-.008} (1.6 ^{+.2} _{-.2})	.02 ^{+.012} _{-.012} (0.5 ^{+.3} _{-.3})	.016 ^{+.008} _{-.004} (0.4 ^{+.2} _{-.1})	.024 ^{+.004} _{-.004} (0.6 ^{+.1} _{-.1})
2E (1210)		.098 ^{+.008} _{-.008} (2.5 ^{+.2} _{-.2})			

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with derating curve. Please refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RN73H	2B	T	TD	1002	B	25
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (ppm/°C)
1E: 0.063W 1J: 0.1W 2A: 0.125W 2B: 0.25W 2E: 0.25W	1E: 0.063W 1J: 0.1W 2A: 0.125W 2B: 0.25W 2E: 0.25W	T: Sn G: Au (1E, 1J only)	TP: 0402 only: 7" 2mm pitch punched paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" embossed plastic For further information on packaging, please refer to Appendix A	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	A: $\pm 0.05\%$ B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1.0\%$	05 10 25 50 100

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

1/24/20

**long term precision thin (metal) film flat chip
resistors (high reliability, for automotive)**

applications and ratings

Part Designation	Power Rating @ 85°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) E-24, E-96, E-192*					Maximum Working Voltage	Maximum Overload Voltage
RN73H1E	1/16W (.063W)	85°C	90°C	±10	—	47 - 100k	47 - 100k	47 - 100k	47 - 100k	50V	100V
				±25	—	47 - 300k	47 - 300k	47 - 300k	47 - 300k		
				±50	—	47 - 300k	47 - 300k	10 - 300k	10 - 300k		
RN73H1J	1/10W (.10W)	85°C	95°C	±5	100 - 59k	100 - 59k	—	—	—	75V	150V
				±10	47 - 59k	47 - 360k	47 - 360k	47 - 360k	47 - 360k		
				±25	47 - 59k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73H2A	1/8W (.125W)	85°C	100°C	±5	100 - 100k	100 - 100k	—	—	—	150V	300V
				±10	47 - 100k	47 - 1M	47 - 1M	47 - 1M	47 - 1M		
				±25	47 - 100k	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±50	—	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±100	—	—	—	10 - 1.5M	10 - 1.5M		
RN73H2B	1/4W (.25W)	85°C	110°C	±5	100 - 300k	100 - 300k	—	—	—	200V	400V
				±10	47 - 300k	47 - 1M	47 - 1M	47 - 1M	47 - 1M		
				±25	47 - 300k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73H2E	1/4W (.25W)	85°C	110°C	±10	100 - 510k	100 - 510k	100 - 510k	100 - 510k	100 - 510k	200V	400V
				±25	51 - 510k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		

* No marking on E-192 values

Operating Temperature: -55°C to +155°C

environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C: T.C.R. +5 ($x 10^{-6}$ K); +15°C/-55°C and +25°C/+155°C: other
Overload (Short time)	±0.05%	±0.01%	Rated Voltage x 2.5 or Max. overload voltage, whichever is less for 5 seconds
Resistance to Solder Heat	±0.05%*	±0.01%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.1%*	±0.02%	1E, 1J, 2A: -55°C (30 minutes), +155°C (30 minutes), 1000 cycles 2B, 2E: -55°C (30 minutes), +155°C (30 minutes), 500 cycles
Moisture Resistance	±0.1%*	±0.05%	85°C ± 2°C, 85% ± 5% RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.1%*	±0.03%	85°C ± 2°C, 3000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.1%*	±0.05%	+155°C, 1000 hours

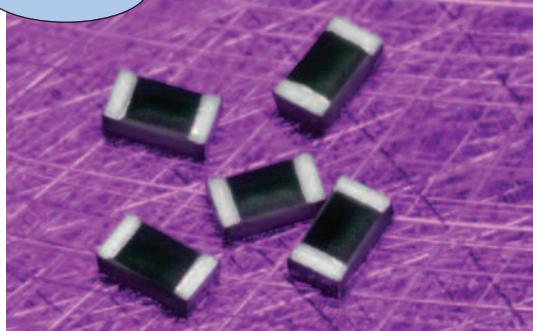
* Depends on resistance value, please contact KOA Speer for details.

Precautions for Use

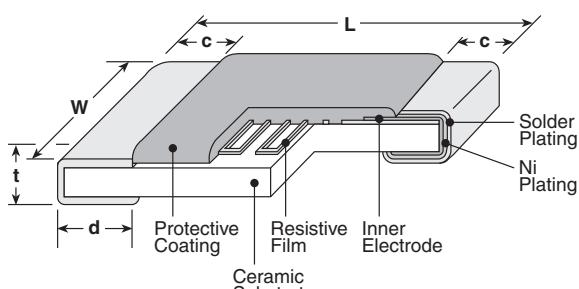
- The properly and electrostatically measured taping materials are used for the components, but attention should be paid to the fact that there is some danger the parts absorb on the top tapes to cause a failure in the mounting and the parts are destructed by static electricity (1J, 2A, 2B, 2E: 1kV and more, 1E: 0.5kV and more at Human Body Model 100pF, 1.5kΩ) to change the resistance in the conditions of an excessive dryness or after the parts are given vibration for a long time as they are packaged on the tapes. Similarly, care should be given not to apply the excessive static electricity when mounting on the boards.
- Ionic impurities such as flux etc. that are attached to these products or those mounted onto a PCB, negatively affect their moisture resistance, corrosion resistance, etc. The flux may contain ionic substances like chlorine, acid, etc. while perspiration and saliva include ionic impurities like sodium (Na+), chlorine (Cl-) etc. Therefore these kinds of ionic substances may induce electrical corrosion when they invade into the products. Either thorough washing or using RMA solder and flux are necessary since lead free solder contains ionic substances. Washing process is needed, before putting on moisture proof material in order to prevent electrical corrosion.
- The upper electrodes could be peeled off when a heat-resistant masking tape is attached to the mounted chip resistors and then detached from them. It is confirmed that the adhesiveness gets stronger due to the exposure to heat under mounting. Accordingly, we recommend the use of masking tape be refrained. If the use of heat-resistant masking tape is unavoidable, please make sure that the adhesives on the tape do not directly come in contact with the product.
- When high-pressure shower cleaning is implemented, there is a possibility of exfoliation of the top electrodes caused by the water pressure stress so please avoid the implementation.
- If the implementation is unavoidable, then please evaluate the products beforehand.

For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

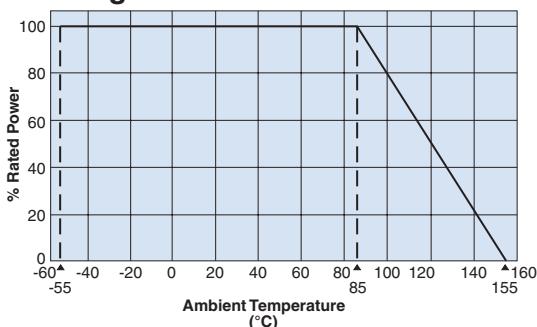
9/30/19

NEW

**EU
RoHS
COMPLIANT**
features

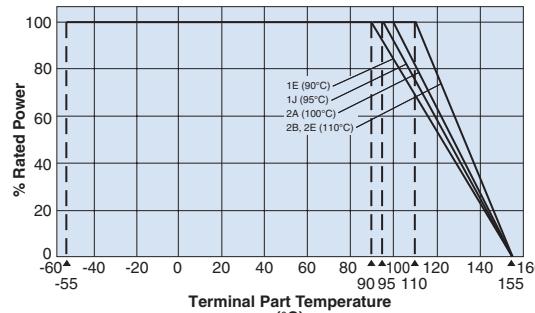
- AEC-Q200 Qualified
- Endurance at 85°C (1,000h): ΔR of $\pm 0.1\%$
- High temperature exposure: ΔR of $\pm 0.25\%$
- High precision type $\pm 0.05\%$ is also available
- Low current noise
- Improved moisture resistance by high humidity protective coating
- Suitable for control circuits in various industrial equipment
- Products meet EU-RoHS requirements
- Rated ambient temperature: 85°C, rated up to +155°C

dimensions and construction


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1E (0402)	.039 ^{.004} _{-.002} (1.0 ^{+0.1} _{-0.05})	.020 ^{±0.002} (0.5 ^{±0.05})	.010 ^{±0.004} (0.25 ^{±0.1})	.010 ^{.002} _{-.004} (0.25 ^{+0.05} _{-0.1})	.014 ^{±0.002} (0.35 ^{±0.05})
1J (0603)	.063 ^{±0.008} (1.6 ^{±0.2})	.031 ^{±0.004} (0.8 ^{±0.1})	.012 ^{±0.004} (0.3 ^{±0.1})	.012 ^{±0.004} (0.3 ^{±0.1})	.018 ^{±0.004} (0.45 ^{±0.1})
2A (0805)	.079 ^{±0.008} (2.0 ^{±0.2})	.049 ^{±0.008} (1.25 ^{±0.2})	.016 ^{±0.008} (0.4 ^{±0.2})	.012 ^{.008} _{-.004} (0.3 ^{+0.2} _{-0.1})	.02 ^{±0.004} (0.5 ^{±0.1})
2B (1206)	.126 ^{±0.008} (3.2 ^{±0.2})	.063 ^{±0.008} (1.6 ^{±0.2})	.02 ^{±0.012} (0.5 ^{±0.3})	.016 ^{.008} _{-.004} (0.4 ^{+0.2} _{-0.1})	.024 ^{±0.004} (0.6 ^{±0.1})
2E (1210)	.126 ^{±0.008} (3.2 ^{±0.2})	.098 ^{±0.008} (2.5 ^{±0.2})	.02 ^{±0.012} (0.5 ^{±0.3})	.016 ^{.008} _{-.004} (0.4 ^{+0.2} _{-0.1})	.024 ^{±0.004} (0.6 ^{±0.1})

Derating Curve


For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with derating curve. Please refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RN73R	2B	T	TD	1002	B	25
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (ppm/°C)
RN73R	2B	T	TD	1002	B	25
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (ppm/°C)
1E: Type	1E: 0.063W	T: Sn	TP: 2mm pitch punched paper	3 significant figures + 1 multiplier	A: $\pm 0.05\%$	05
1J: Type	1J: 0.1W		TD: 4mm pitch punched paper	1 "R" indicates decimal on value <100Ω	B: $\pm 0.1\%$	10
2A: Type	2A: 0.125W		TE: 4mm pitch plastic embossed	C: $\pm 0.25\%$	C: $\pm 0.25\%$	25
2B: Type	2B: 0.25W		For further information on packaging, please refer to Appendix A	D: $\pm 0.5\%$	D: $\pm 0.5\%$	50
2E: Type	2E: 0.25W			E: $\pm 1.0\%$	F: $\pm 1.0\%$	100

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

1/24/20

applications and ratings

Part Designation	Power Rating @ 85°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (x10 ⁻⁶ /K)	Resistance Range (Ω) E-24, E-96, E-192					Maximum Working Voltage	Maximum Overload Voltage
					(A±0.05%)	(B±0.1%)	(C±0.25%)	(D±0.5%)	(F±1.0%)		
RN73R1E	1/16W (.063W)	85°C	90°C	±10	—	47 - 10k	47 - 10k	47 - 10k	47 - 10k	50V	100V
				±25	—	47 - 300k	47 - 300k	47 - 300k	47 - 300k		
				±50	—	47 - 300k	47 - 300k	10 - 300k	10 - 300k		
RN73R1J	1/10W (.10W)	85°C	95°C	±5	100 - 59k	100 - 59k	—	—	—	75V	150V
				±10	47 - 59k	47 - 59k	47 - 59k	47 - 59k	47 - 59k		
				±25	47 - 59k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73R2A	1/8W (.125W)	85°C	100°C	±5	100 - 100k	100 - 100k	—	—	—	150V	300V
				±10	47 - 100k	47 - 100k	47 - 100k	47 - 100k	47 - 100k		
				±25	47 - 100k	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±50	—	15 - 1.5M	15 - 1.5M	10 - 1.5M	10 - 1.5M		
				±100	—	—	—	10 - 1.5M	10 - 1.5M		
RN73R2B	1/4W (.25W)	85°C	110°C	±5	100 - 300k	100 - 300k	—	—	—	200V	400V
				±10	47 - 300k	47 - 300k	47 - 300k	47 - 300k	47 - 300k		
				±25	47 - 300k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		
RN73R2E	1/4W (.25W)	85°C	110°C	±10	100 - 510k	100 - 510k	100 - 510k	100 - 510k	100 - 510k	200V	400V
				±25	51 - 510k	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±50	—	15 - 1M	15 - 1M	10 - 1M	10 - 1M		
				±100	—	—	—	10 - 1M	10 - 1M		

Operating Temperature: -55°C to +155°C

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower

environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C: T.C.R. ±5 (x10 ⁻⁶ /K); +25°C/-55°C and +25°C/+155°C: another
Overload (Short time)	±0.05%	±0.01%	Rated Voltage x 2.5 or Max. overload voltage, whichever is less for 5 seconds
Resistance to Solder Heat	±0.05%*	±0.01%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.1%*	±0.04%	1E, 1J, 2A: -55°C (30 minutes), +155°C (30 minutes), 1000 cycles 2B, 2E: -55°C (30 minutes), +155°C (30 minutes), 500 cycles
Moisture Resistance	±0.25%	±0.07%	85°C ± 2°C, 85%±5%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.1%	±0.04%	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.25%	±0.10%	+155°C, 1000 hours

* Depends on resistance value, please contact KOA Speer for details.

Precautions for Use

- The properly and electrostatically measured taping materials are used for the components, but attention should be paid to the fact that there is some danger the parts absorb on the top tapes to cause a failure in the mounting and the parts are destructed by static electricity (1J, 2A, 2B: 1kV and more, 1E: 0.5kV and more at Human Body Model 100pF, 1.5kΩ) to change the resistance in the conditions of an excessive dryness or after the parts are given vibration for a long time as they are packaged on the tapes. Similarly, care should be given not to apply the excessive static electricity when mounting on the boards.
- Ionic impurities such as flux etc. that are attached to these products or those mounted onto a PCB, negatively affect their moisture resistance, corrosion resistance, etc. The flux may contain ionic substances like chlorine, acid, etc. while perspiration and saliva include ionic impurities like sodium (Na⁺), chlorine (Cl⁻) etc. Therefore these kinds of ionic substances may induce electrical corrosion when they invade into the products. Either thorough washing or using RMA solder and flux are necessary since lead free solder contains ionic substances. Washing process is needed, before putting on moisture proof material in order to prevent electrical corrosion.
- When heat-resistant masking tapes are attached to the chip resistors at the time of mounting and then detached, there is a possibility of exfoliation of the top electrodes. It is known that the heat applied in the mounting process will enhance the adhesion strength of the tape adhesive so please avoid the use. If the use of masking tapes are unavoidable, then please be sure not to attach the tape adhesives directly on the products.
- When high-pressure shower cleaning is implemented, there is a possibility of exfoliation of the top electrodes caused by the water pressure stress so please avoid the implementation. If the implementation is unavoidable, then please evaluate the products beforehand.

For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com
 Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

9/27/19

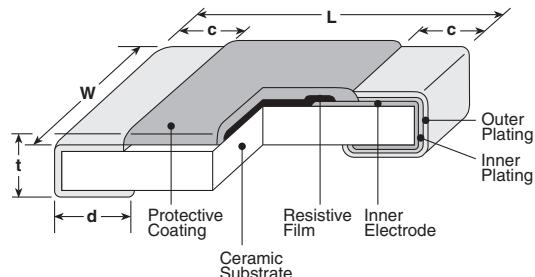


features

- Maximum operating temperature is 200°C. Suitable for soldering mounting (Sn plating products) or conductive glue mounting (Au plating products).
- Excellent heat resistance and weather resistance are ensured by the use of metal glaze thick film
- High stability and high reliability with the triple-layer structure of electrode
- Applicable to various kinds of automatic mounters for taping, etc
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

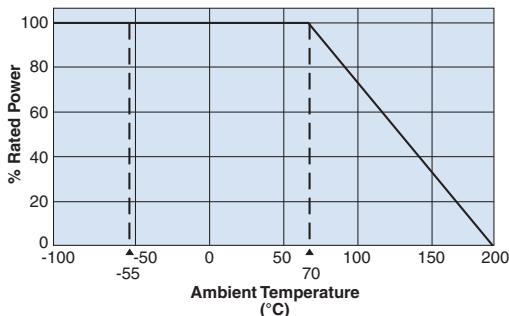
**EU
RoHS
C O M P L I A N T**

dimensions and construction



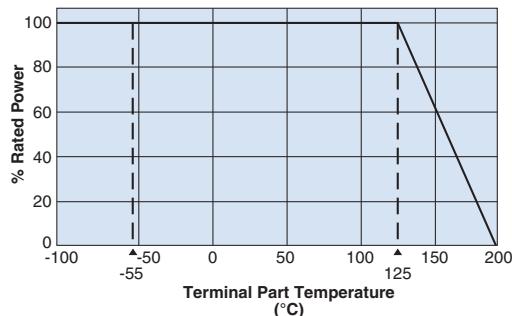
Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.014±.006 (0.35±0.15)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.018±.010 (0.45±0.25)	.012 ^{+.008} _{-.004} (0.3 ^{+0.2} _{-0.1})	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.022±.014 (0.55±0.35)	.016 ^{+.008} _{-.004} (0.4 ^{+0.2} _{-0.1})	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

Applied to Sn Plating Products



When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown above, the power shall be derated according to the derating curve.

Please refer to "Introduction of the derating curves based on the terminal part temperature" on the beginning of our catalog before use.

ordering information

HRK73B	2B	G	TD	103	J
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
HRK73B HRK73H	1J: 0.1W 2A: 0.125W 2B: 0.25W	T: SN* G: Au * Under Development	TD: 4mm pitch punched paper For further information on packaging, please refer to Appendix A	F: 4 digits J: 3 digits	F: ±1% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

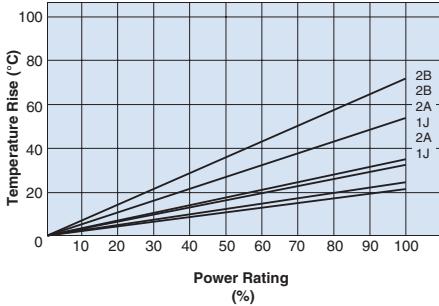
10/29/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Ambient Temp.	T.C.R. (x10 ⁻³ /K) Max.	Resistance Range HRK73H F: ±1% E24*	Resistance Range HRK73B J: ±5% E24	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
HRK731J (0603)	0.1W	70°C	125°C	±200	10Ω~1MΩ	1Ω~1MΩ	50V	100V	-55°C to +200°C
				±400	—	1.1MΩ~10MΩ			
HRK732A (0805)	0.125W	70°C	125°C	±200	10Ω~1MΩ	1Ω~1MΩ	150V	200V	-55°C to +200°C
				±400	—	1.1MΩ~10MΩ			
HRK732B (1206)	0.25W	70°C	125°C	±200	10Ω~1MΩ	1Ω~1MΩ	200V	400V	-55°C to +200°C
				±400	—	1.1MΩ~10MΩ			

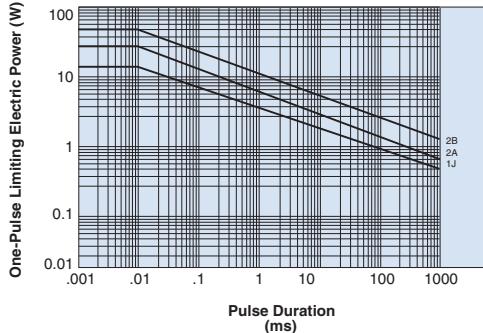
Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

* Under development

environmental applications**Temperature Rise****HRK73 1J-2B**

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

One-Pulse Limiting Electric Power**HRK73 1J-2B**

The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement $\Delta R \pm(\%+0.1\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2B: Rated Voltage x 2 for 5 seconds)
Moisture Resistance	±2%:	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C or Rated Terminal Part Temperature	±2%	±0.75%	70°C ± 2°C or rated terminal part temperature ±2%, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.5%	+200°C, 1000 hours

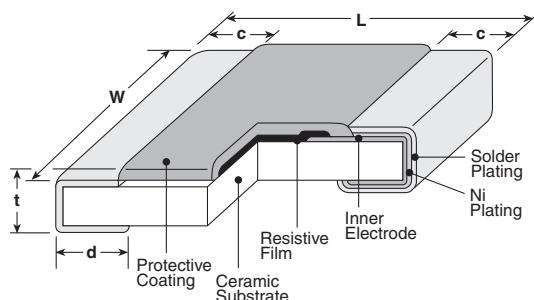
For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

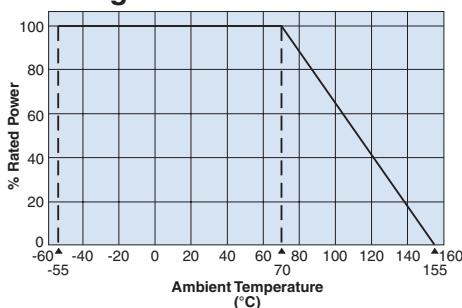
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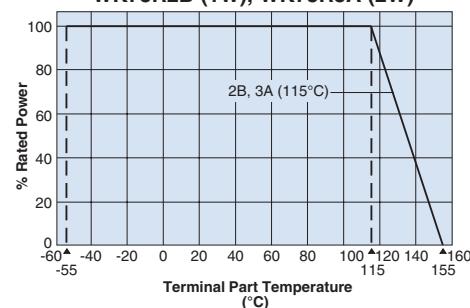
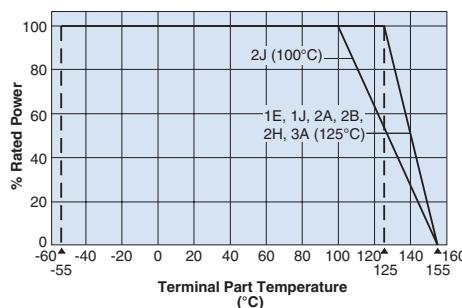
dimensions and construction



Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

If you want to use at rated power (*1), use derating curves based on the terminal part temperature on the right side graph.

ordering information

WK73R	2J	T	TE	33L0	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
WK73R	1E: 0.33W 1J: 0.5W 2A: 0.75W, 1W 2B: 0.75W, 1W 2H: 1W 2J: 1W 3A: 1.5W, 2W	T: Sn	TP: 0204: 7" 2mm pitch punched paper TD: 0306, 0508, 0612: 7" 4mm pitch punched paper TE: 1020, 1218, 1225: 7" embossed plastic For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal. Ex: 33mΩ, 1% = 33L0	D: ±0.5% F: ±1% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/17/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10 ⁻⁶ /K)	Resistance Range (Ω)			Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range	
WK73R1E	0.33W ¹	—	125°C	±100	—	10 - 1M	10 - 1M	75V	100V	-55°C to +155°C	
WK73R1J	0.5W ¹	—	125°C	±100	—	10 - 1M	10 - 1M	150V	200V		
WK73R2A	0.75W ¹	—	125°C	±100	—	20.5k - 1M	22k - 1M	200V	400V		
	1.0W ¹	—	125°C	±100	—	10 - 20k	10 - 20k				
WK73R2B	0.75W	70°C	125°C	±100	10 - 1M	10 - 1M	10 - 1M	200V	400V		
	1.0W ¹	—	115°C	±100	10 - 9.76k	10 - 9.76k	10 - 9.1k				
WK73R2H	1.0W	70°C	125°C	±100 ±200	— —	10 - 430k 432k - 1M	10 - 430k 470k - 1M	200V	400V		
WK73R2J	1.0W	70°C	100°C	±100 ±200	— —	10 - 510k 511k - 1M	10 - 510k 560k - 1M				
WK73R3A	1.5W	70°C	125°C	±100 ±200	— —	10 - 330k 332k - 1M	10 - 330k 360k - 1M	200V	400V		
	2.0W ¹	—	115°C	±100 ±200	— —	10 - 330k 332k - 1M	10 - 330k 360k - 1M				

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

¹ If you want to use at rated power use derating curves based on the terminal part temperature on the right side graph located on previous page.

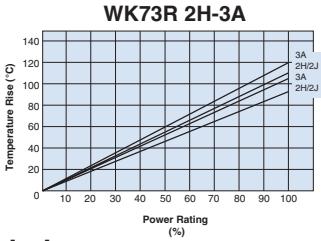
If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature", please give priority to the "Rated Terminal Part Temperature." For more details refer to the "Introduction of the derating curves based on the terminal part temperature" in the beginning of the catalog

environmental applications

Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



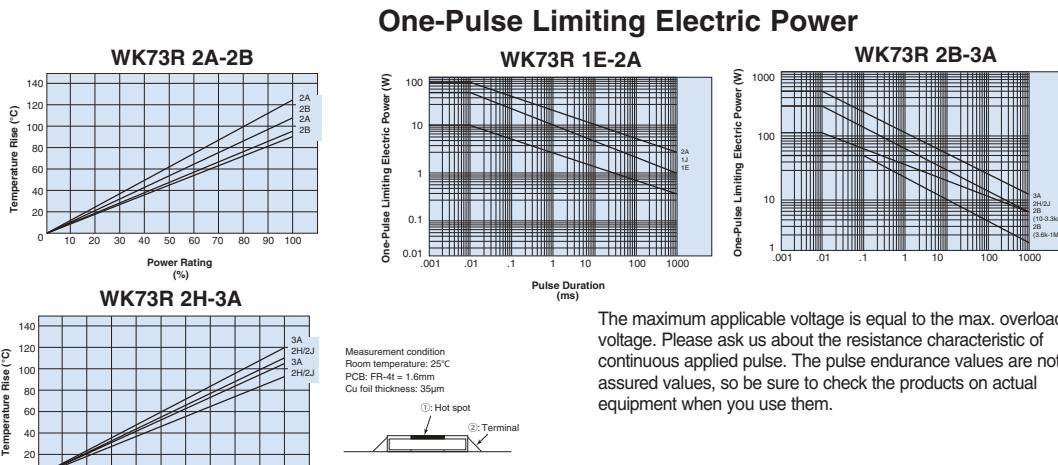
Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	WK73R1E (0.33W), WK73R1J (0.5W), WK73R2A (0.75W, 1W) WK73R3A (2W): Rated voltage x2.0 for 5 seconds. WK73R2B, R2H, R2J, R3A: Rated voltage x2.5 for 3 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%: 1E ±2%: All others	±1%: 1E ±0.2%: All others	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%: 1E ±2%: All others	±1%: 1E ±0.2%: All others	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/12/19



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

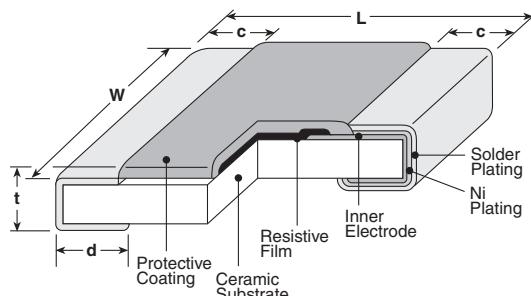


features

- Wide-side termination (reverse-geometry) type flat chip resistor
- High reliability and performance with T.C.R. $\pm 100 \times 10^{-6}/\text{K}$, resistance tolerance $\pm 0.5\%$
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

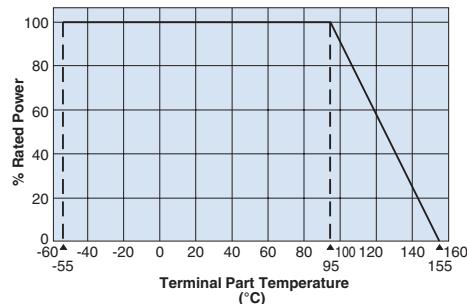
EU
RoHS
C O M P L I A N T

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
2B15 (0612)	.063 \pm .006 (1.6 \pm 0.15)	.126 \pm .008 (3.2 \pm 0.2)	.012 \pm .008 (0.3 \pm 0.2)	.018 \pm .006 (0.45 \pm 0.15)	.024 \pm .004 (0.6 \pm 0.1)
2H2 (1020)	.098 \pm .006 (2.5 \pm 0.15)	.197 \pm .006 (5.0 \pm 0.15)	.016 \pm .008 (0.4 \pm 0.2)	.030 \pm .006 (0.75 \pm 0.15)	
3A3 (1225)	.122 \pm .006 (3.1 \pm 0.15)	.252 \pm .006 (6.3 \pm 0.15)	.018 \pm .008 (0.45 \pm 0.2)		

Derating Curve



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WK73R	2H2	T	TE	1002	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
WK73R	New 2B15: 0.15W 2H2: 2W 3A3: 3W	T: Sn	TD: 0612: 7" 4mm pitch punched paper TE: 1020, 1225: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	$\pm 1\%$: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω $\pm 5\%$: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/12/19

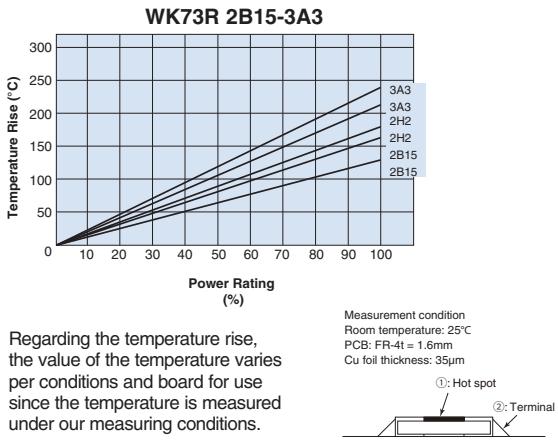
applications and ratings

Part Designation	Power Rating	Rated Terminal Part Temp.	T.C.R. (X 10 ⁻³ /K)	Resistance Range (Ω)			Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range	
				D±0.5% E-24/E-96	F±1% E-24/E-96	J±5% E-24				
WK73R2B15	1.5W	95°C	±100	10 - 9.76k	10 - 9.76k	10 - 9.1k	200V	400V	-55°C to +155°C	
WK73R2H2	2.0W	95°C	±100	—	10 - 430k	10 - 430k	200V	400V		
			±200	—	432k - 1M	470k - 1M				
WK73R3A3	3.0W	95°C	±100	—	10 - 330k	10 - 330k	200V	400V		
			±200	—	332k - 1M	360k - 1M				

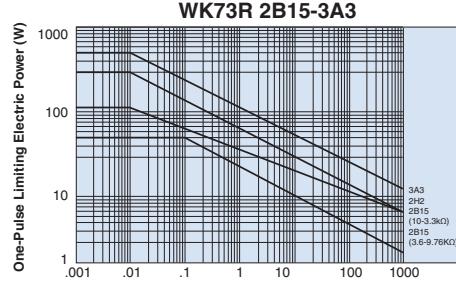
Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

environmental applications

Temperature Rise



One-Pulse Limiting Electric Power



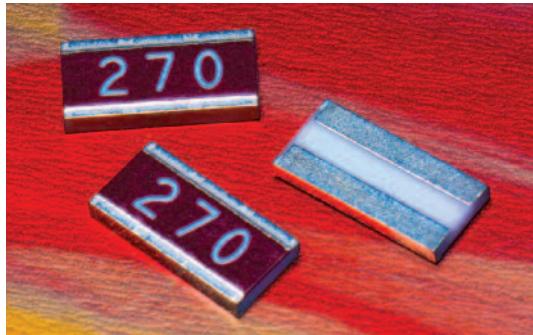
Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/08/19

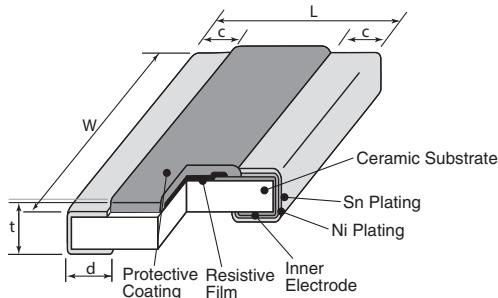


features

- Superior to WK73 series in pulse withstand voltage
- Suitable for both flow and reflow solderings
- This products meet EU RoHS requirements
- AEC-Q200 Qualified

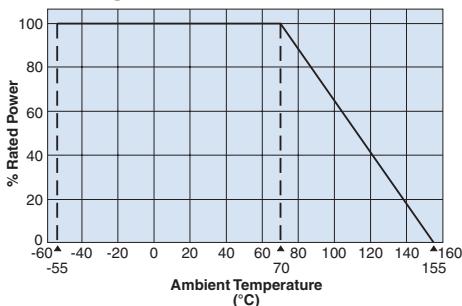


dimensions and construction

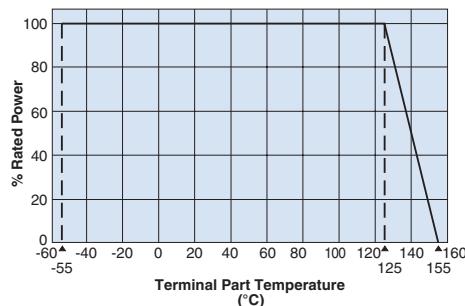


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
2B (0612)	.063 ^{+.004} (1.6 ^{+.1} ±.008 (.2±.02)	.126 ^{+.004} (3.2 ^{+.1} ±.012 (.3±.02)	.012 ^{+.008} (.3±.02) ±.008	.018 ^{+.006} (.45±.015) ±.006	.024 ^{+.004} (.6±.01) ±.004
2H (1020)	.098 ^{+.006} (2.5±.015)	.197 ^{+.006} (5.0±.015)	.016 ^{+.008} (.4±.02)	.030 ^{+.006} (.75±.015)	.024 ^{+.004} (.6±.01)
3A (1225)	.122 ^{+.008} (3.1 ^{+.2} ±.004 (.1±.01)	.248 ^{+.006} (6.3±.015)	.018 ^{+.008} (.45±.02) ±.008	.030 ^{+.006} (.75±.015)	.024 ^{+.004} (.6±.01)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WG73	2H	T	TE	101	K
Type	Power Rating	Termination Surface Material	Packaging	Nominal Resistance	Resistance Tolerance
2B: 1W NEW 2H: 1.5W 3A: 2W		T : Sn	TD: 4mm pitch punch paper TE: 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	3 digits	K: ±10% M: ±20%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/29/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10 ³ /K)	Resistance Range (Ω) K±10% E-12	M±20% E-12	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
WG732B	1.0W	70°C	±125°C	±200	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C
WG732H	NEW 1.5W	70°C	±125°C	±200	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C
WG733A	2.0W	70°C	±125°C	±200	560m ~ 1k	560m ~ 1k	200V	400V	-55°C to +155°C

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower

If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature" in your usage conditions, please give priority to the "Rated Terminal Part Temperature."

Prior to use and for more details, please refer to the "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog.

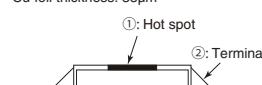
environmental applications

Temperature Rise

WG73 2B-3A

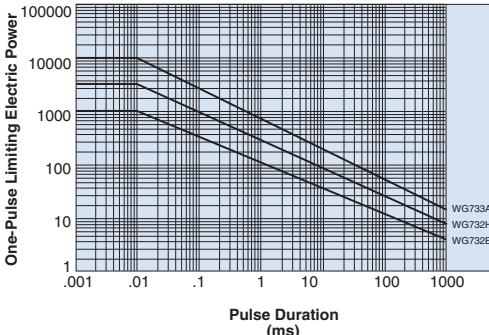


Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



One-Pulse Limiting Electric Power

WG73 2B-3A



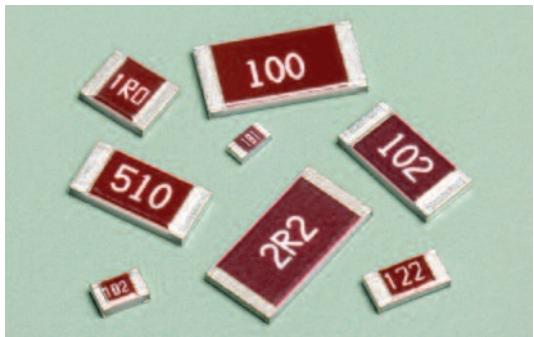
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage (DC) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

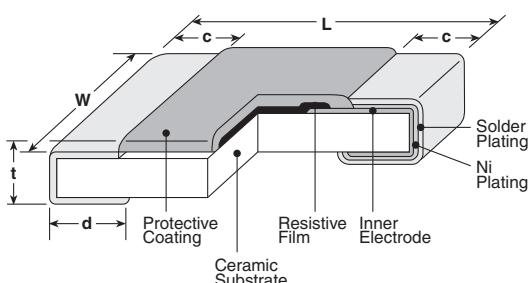
11/12/19



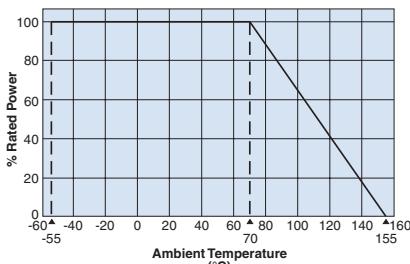
features

- Superior to RK73B/RK73H series in surge/pulse withstand voltage
 - Untrimmed, superior surge/pulse and ESD withstand
 - Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
 - AEC-Q200 Qualified: 0603(1J), 0805(2A), 1206(2B), 1210(2E), 2010(2H/W2H), 2512(3A/W3A)

dimensions and construction

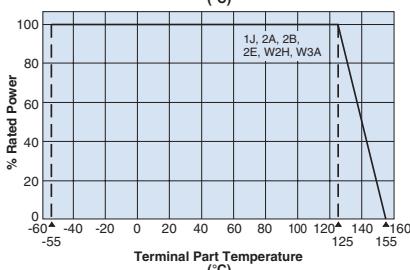


Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
SG731J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG732A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+.2} _{-.1})	.02±.004 (0.5±0.1)
SG732B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.2} _{-.1})	.024±.004 (0.6±0.1)
SG732E (1210)		.102±.008 (2.6±0.2)	.02±.012 (0.5±0.3)		
SG732H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)	.026±.006 (0.65±0.15)	.024±.004 (0.6±0.1)
SG73W2H (2010)					
SG733A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.016 ^{+.008} _{-.004} (0.4 ^{+.2} _{-.1})	
SG73W3A (2512)				.026±.006 (0.65±0.15)	



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

SG73	2B	T	TD	102	K
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
SG73	1J 2A 2B 2E W2H W3A 2H 3A	T: Sn L: SnPb: (NOT available in SG732H/W2H, SG733A/W3A)	TP: 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A	±10%, ±20%: 2 significant figures + 1 multiplier "R" indicates decimal on value <100	K: ±10% M: ±20%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/30/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (E-12) (K±10%, M±20%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
SG731J (0603)	0.1W	70°C	125°C	±400	1Ω - 8.2Ω	50V	100V	-55°C to +155°C
				±200	10Ω - 1MΩ			
SG732A (0805)	0.125W	70°C	125°C	±400	1Ω - 8.2Ω	150V	200V	-55°C to +155°C
				±200	10Ω - 1MΩ			
SG732B (1206)	.33W	70°C	125°C	±400	1Ω - 8.2Ω	200V	400V	-55°C to +155°C
				±200	10Ω - 1MΩ			
SG732E (1210)	0.5W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			
SG732H/W2H (2010)	0.75W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			
SG733A/W3A (2512)	1W	70°C	125°C	±400	1Ω - 8.2Ω			
				±200	10Ω - 1MΩ			

Parentheses indicate EIA package size codes.

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

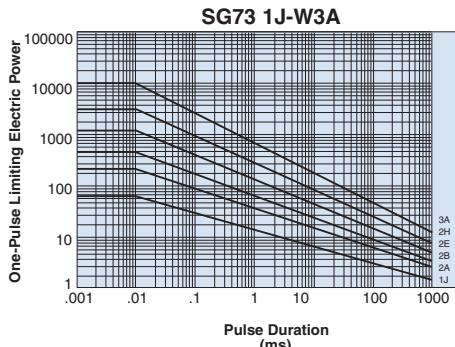
Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

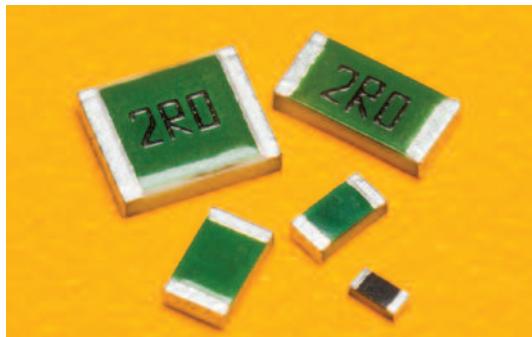
Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% \pm 0.1)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

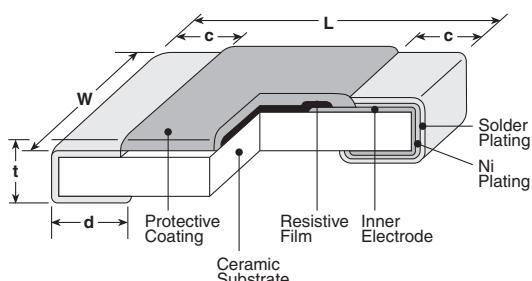
Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

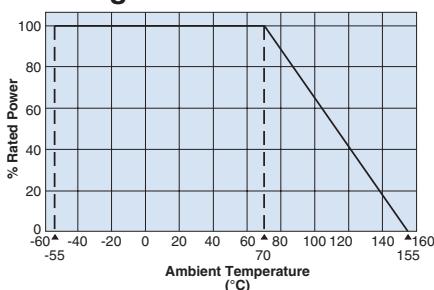
10/30/19



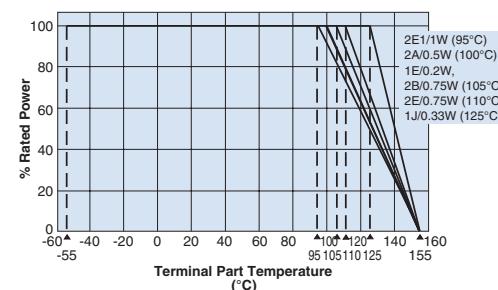
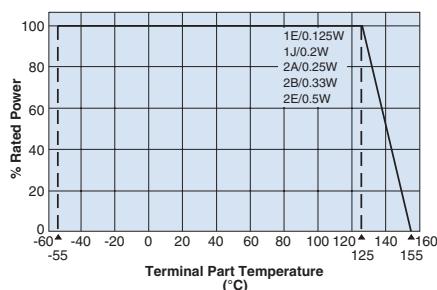
dimensions and construction



Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use. If you want to use the rated power of ^{**}, ^{***}, please use the derating curve based on the terminal part temperature on the right hand side.

ordering information

SG73P	2B	T	TD	102	K
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
SG73P	1E 1J 2A 2B 2E 2E1	T: Sn	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	D: ±0.5% F: ±1% G: ±2% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/12/19

applications and ratings

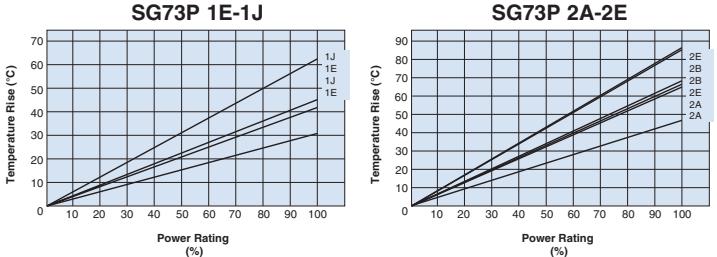
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range (Ω)			Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range	
SG73P1E (0402)	0.125W		125 $^{\circ}$ C	± 200	10 - 1M	1 - 1M	1 - 10M	75V	100V	-55 $^{\circ}$ C to +155 $^{\circ}$ C	
	0.2W ^{*2}				105 $^{\circ}$ C						
SG73P1J (0603)	0.33W ^{*2}		125 $^{\circ}$ C	± 100 $\pm 100^{**1}$	510 - 576k 590k - 1M	510 - 576k 590k - 1M	510 - 560k 620k - 10M	150V	200V	-55 $^{\circ}$ C to +155 $^{\circ}$ C	
					10 - 499	1 - 499	1 - 470				
SG73P2A (0805)	0.25W	70 $^{\circ}$ C	125 $^{\circ}$ C	± 100 ± 200	100 - 100k 102k - 1M	100 - 100k 102k - 1M	100 - 100k 110k - 10M	400V	600V (800V) ^{*3}	-55 $^{\circ}$ C to +155 $^{\circ}$ C	
					10 - 97.6 102k - 1M	1 - 97.6 102k - 1M	1 - 91 110k - 10M				
	0.5W ^{*2}		100 $^{\circ}$ C	± 100 ± 200	100 - 100k 102k - 1M	100 - 100k 102k - 1M	100 - 100k 110k - 10M				
					10 - 97.6 102k - 1M	1 - 97.6 102k - 1M	1 - 91 110k - 10M				
SG73P2B (1206)	0.33W		125 $^{\circ}$ C	± 100 ± 200	300 - 1M	300 - 1M	300 - 1M	200V	400V	-55 $^{\circ}$ C to +155 $^{\circ}$ C	
					10 - 294	1 - 294	1 - 270 1.2M - 10M				
	0.75W ^{*2}		105 $^{\circ}$ C	± 100 ± 200	300 - 1M	300 - 1M	300 - 1M				
					10 - 294	1 - 294	1 - 270 1.2M - 10M				
SG73P2E (1210)	0.5W		125 $^{\circ}$ C	± 200	10 - 1M	1 - 1M	1 - 10M	200V	400V	-55 $^{\circ}$ C to +155 $^{\circ}$ C	
	0.75W ^{*2}				110 $^{\circ}$ C						
SG73P2E1 (1210)	1.0W ^{*2}		95 $^{\circ}$ C	± 200	10 - 1M	1 - 1M	1 - 10M	200V	400V		

Parentheses indicate EIA package size codes.

^{*1} Cold T.C.R. (-55 $^{\circ}$ C ~ +25 $^{\circ}$ C) is +150 x 10⁻⁶/K Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower. Please contact KOA Speer for how to handle a specific surge/pulse. If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. ^{*2} Rated power derating applies only if permitted Terminal Part Temp is not exceeded. ^{*3} Applies when power rating is 0.4W or lower.

environmental applications

Temperature Rise



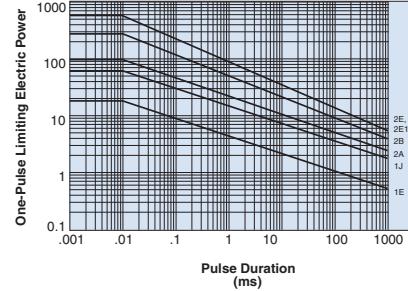
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Performance Characteristics

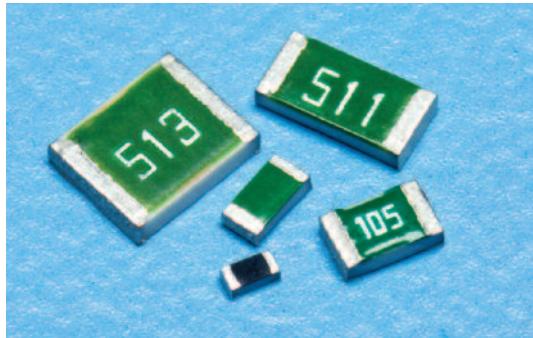
Parameter	Requirement Limit	$\Delta R \pm (\% + 0.1\Omega)$	Typical	Test Method
Resistance	Within specified tolerance	—	25 $^{\circ}$ C	
T.C.R.	Within specified T.C.R.	—	+25 $^{\circ}$ C/-55 $^{\circ}$ C and +25 $^{\circ}$ C/+125 $^{\circ}$ C	
Overload (Short time)	$\pm 2\%$	$\pm 0.5\%$	Rated Voltage x 2.5 for 5 seconds (2A: 0.4W, 0.5W; 2B: 0.75W; 2E1: 1W rated power x 2 for 5 seconds)	
Resistance to Solder Heat	$\pm 1\%$	$\pm 0.75\%$	260 $^{\circ}$ C ± 5 $^{\circ}$ C, 10 seconds ± 1 second	
Rapid Change of Temperature	$\pm 0.5\%$	$\pm 0.3\%$	-55 $^{\circ}$ C (30 minutes), +125 $^{\circ}$ C (30 minutes), 100 cycles	
Moisture Resistance	$\pm 3\%$	$\pm 0.75\%$	40 $^{\circ}$ C ± 2 $^{\circ}$ C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle	
Endurance at 70 $^{\circ}$ C	$\pm 3\%$	$\pm 0.75\%$	70 $^{\circ}$ C ± 2 $^{\circ}$ C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
High Temperature Exposure	$\pm 1\%$	$\pm 0.3\%$	+155 $^{\circ}$ C, 1000 hours	

Additional environmental applications can also be found at www.koaspeer.com

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

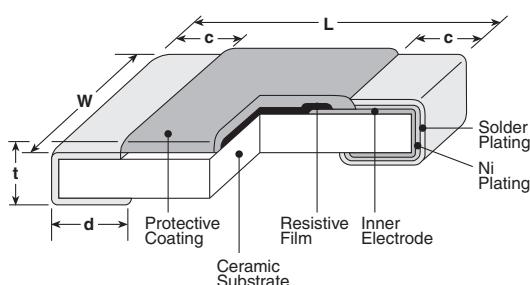


features

- Superior to RK73B/RK73H series in surge withstand voltage and high power
- ESD withstand; down to $\pm 0.5\%$ tolerance
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

**EU
RoHS
COMPLIANT**

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
SG73S1E (0402)	.039 ^{+.004} .002 (1.0 ^{+.01} -.05)	.02 ^{+.002} (0.5 ^{+.05} -.05)	.006 ^{+.004} (0.15 ^{+.1} -.1)	.010 ^{+.002} (0.25 ^{+.05} -.1)	.014 ^{+.002} (0.35 ^{+.05} -.05)
SG73S1J (0603)	.063 ^{+.008} (1.6 ^{+.2} -.2)	.031 ^{+.004} (0.8 ^{+.1} -.1)	.012 ^{+.004} (0.3 ^{+.1} -.1)	.012 ^{+.004} (0.3 ^{+.1} -.1)	.018 ^{+.004} (0.45 ^{+.1} -.1)
SG73S2A (0805)	.079 ^{+.008} (2.0 ^{+.2} -.2)	.049 ^{+.004} (1.25 ^{+.1} -.1)	.012 ^{+.008} (0.3 ^{+.2} -.1)	.012 ^{+.008} (0.3 ^{+.2} -.1)	.02 ^{+.004} (0.5 ^{+.1} -.1)
SG73S2B (1206)	.126 ^{+.008} (3.2 ^{+.2} -.2)	.063 ^{+.008} (1.6 ^{+.2} -.2)	.016 ^{+.008} (0.4 ^{+.2} -.1)	.016 ^{+.008} (0.4 ^{+.2} -.1)	.024 ^{+.004} (0.6 ^{+.1} -.1)
SG73S2E SG73S2E1 (1210)		.102 ^{+.008} (2.6 ^{+.2} -.2)			

ordering information

SG73S	2B	T	TD	102	K
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
SG73S	1E 1J 2A 2B 2E 2E1	T: Sn	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" embossed plastic For further information on packaging, please refer to Appendix A	$\pm 0.5\%$, $\pm 1\%$: 3 significant figures + 1 multiplier "R" indicates decimal on value <100 Ω $\pm 2\%$, $\pm 5\%$: 2 significant figures + 1 multiplier "R" indicates decimal on value <10 Ω	D: $\pm 0.5\%$ F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/05/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range (Ω)			Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range	
SG73S1E (0402)	0.125W	70°C	125°C	± 200	10 - 1M	1 - 1M	1 - 10M	75V	100V	-55°C to +155°C	
	0.2W ^{*2}	—	105°C								
SG73S1J (0603)	0.2W	70°C	125°C	± 100	510 - 576k	510 - 576k	510 - 560k	150V	200V		
				$\pm 100^{*1}$	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M				
	0.33W ^{*2}	—	125°C	± 100	510 - 576k	510 - 576k	510 - 560k	150V	200V		
				$\pm 100^{*1}$	10 - 499 590k - 1M	1 - 499 590k - 1M	1 - 470 620k - 10M				
SG73S2A (0805)	0.25W	70°C	125°C	± 200	10 - 1M	1 - 1M	1 - 10M	400V	600V (800V) ^{*3}	-55°C to +155°C	
	0.5W ^{*2}	—	100°C								
SG73S2B (1206)	0.33W	70°C	125°C	± 200	10 - 1M	1 - 1M	1 - 10M	200V	400V		
	0.75W ^{*2}	—	105°C								
SG73S2E (1210)	0.5W	70°C	125°C	± 200	10 - 1M	1 - 1M	1 - 10M	200V	400V		
	0.75W ^{*2}	—	110°C								
SG73S2E1 (1210)	1W	—	95°C	± 200	10 - 1M	1 - 1M	1 - 10M	200V	400V		

Parentheses indicate EIA package size codes.

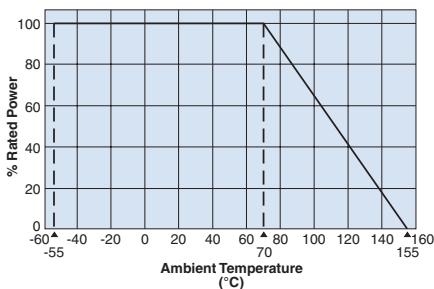
^{*1} Cold T.C.R. (-55°C ~ +25°C) is $+150 \times 10^{-6}/K$ Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

Please contact KOA Speer for how to handle a specific surge/pulse

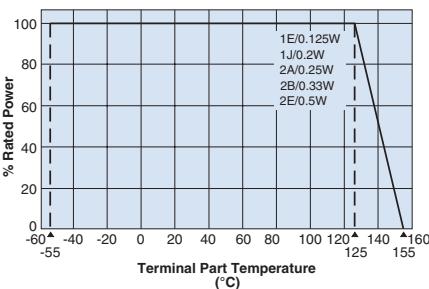
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. ^{*2} If you want to use the rated power of ^{*2}, ^{*3} please reference below. ^{*3} Applies when power rating is 0.4W or lower.

environmental applications

Derating Curve

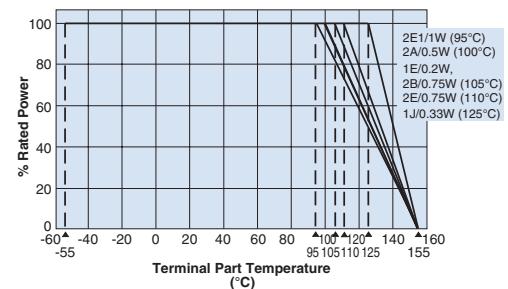


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

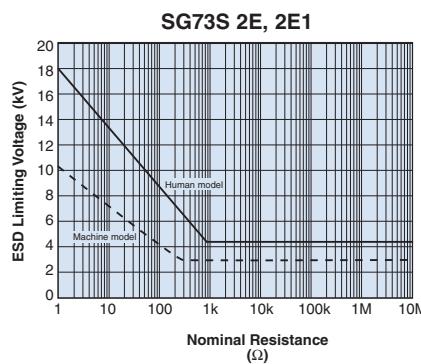
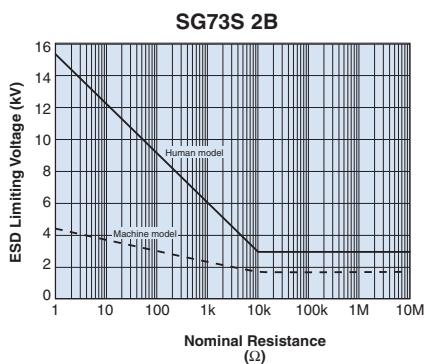
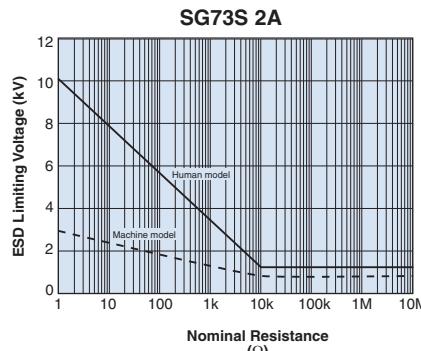
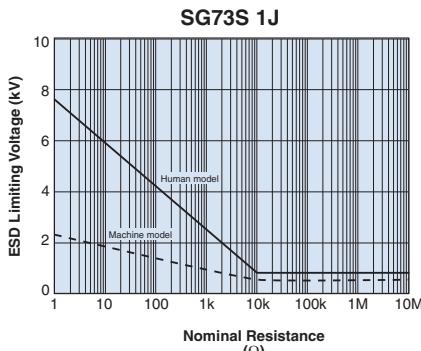
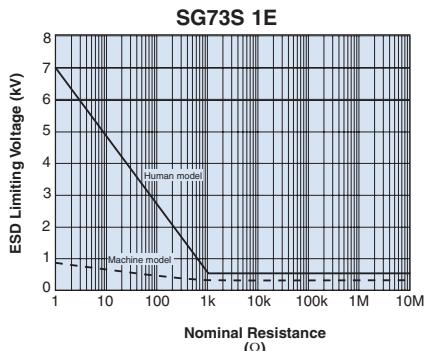
If you want to use the rated power of ^{*2}, ^{*3} please use the derating curve based on the terminal part temperature on the right hand side.Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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environmental applications (continued)

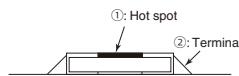
ESD Limiting Voltage



Temperature Rise



Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm



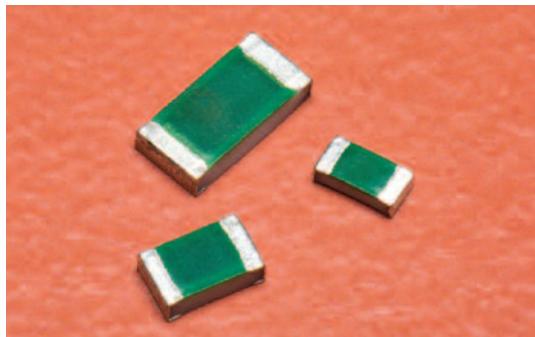
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Performance Characteristics

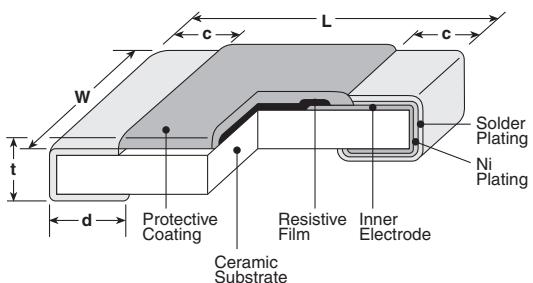
Parameter	Requirement $\Delta R \pm (% + 0.1\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.4W, 0.5W; 2B: 0.75W; 2E: 0.75W; 2E1: 1W rated power x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

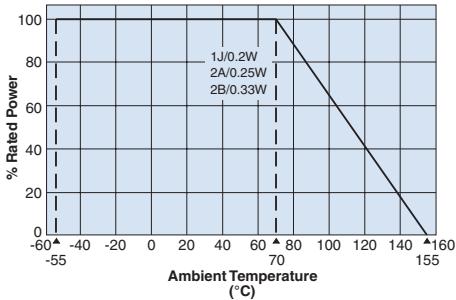
11/05/19

**features**

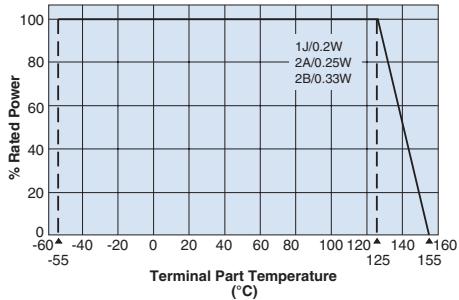
- Superior to RK73 series chip resistors in pulse withstanding voltage and high power
- High precision resistor with T.C.R. $\pm 50 \times 10^{-6}/\text{K}$ and tolerance $\pm 0.25\%$, $\pm 0.5\%$
- Suitable for both reflow and flow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

dimensions and construction

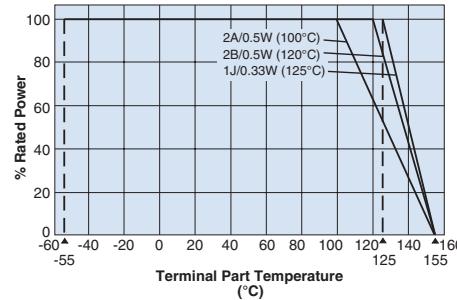
Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
SG73G1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73G2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.012 ^{+.008} _{-.004} (0.3 ^{+.02} _{-.01})	.012 ^{+.008} _{-.004} (0.3 ^{+.02} _{-.01})	.02±.004 (0.5±0.1)
SG73G2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)

Derating Curve

For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use. *1 If you want to use the rated power of *1, please use the derating curve based on the terminal part temperature on the right hand side.

**ordering information**

SG73G	2A	T	TD	1002	D
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
SG73G	1J: 0.33W 2A: 0.5W 2B: 0.5W	T: Sn	TP: 2mm pitch punch paper TD: 4mm pitch punched paper TE: 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	D: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	C: $\pm 0.25\%$ D: $\pm 0.5\%$

applications and ratings

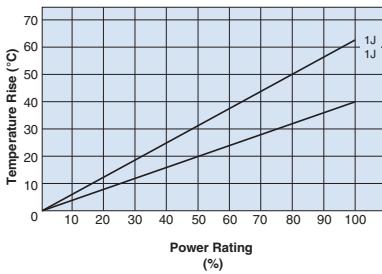
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω) C±0.25%, D±0.5% E-24/E-96	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
SG73G1J (0603)	0.2W	70°C	125°C	±50	10 - 1M	150V	200V	-55°C to +155°C
	0.33W*¹	—	125°C					
SG73G2A (0805)	0.25W	70°C	125°C	±50	10 - 1M	200V	400V	-55°C to +155°C
	0.5W*¹	—	100°C					
SG73G2B (1206)	0.33W	70°C	125°C	±50	10 - 1M	200V	400V	-55°C to +155°C
	0.5W*¹	—	120°C					

Parentheses indicate EIA package size codes. Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower. If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. *¹ If you want to use the rated power of *¹, please use the derating curve based on the terminal part temperature on the previous page.

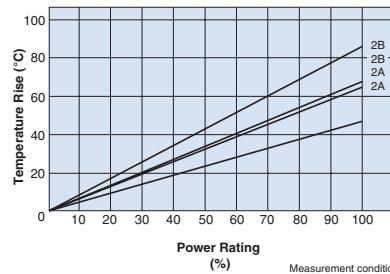
environmental applications

Temperature Rise

SG73G 1J



SG73G 2A-2B



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

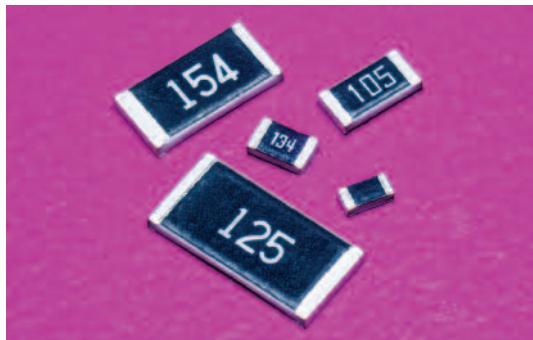
Performance Characteristics

Parameter	Requirement $\Delta R \pm(0.1\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.5W rated power x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

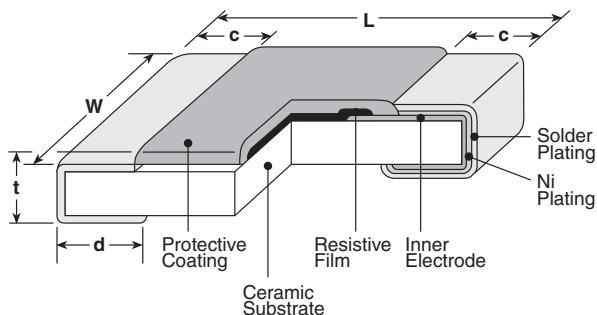
11/06/19



features

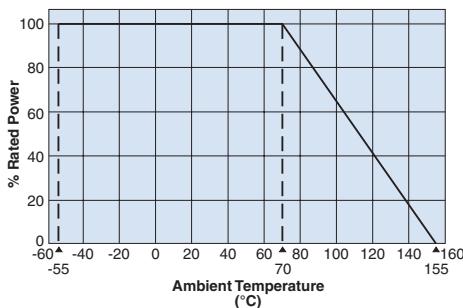
- Superior to RK73 series in maximum working voltage
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction

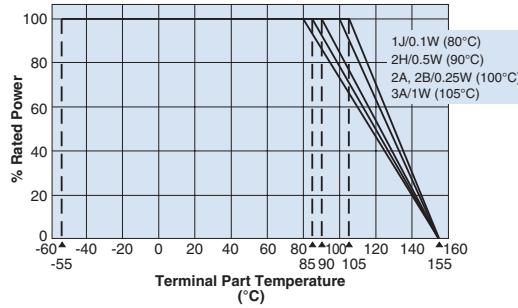


Type (Inch Size Code)	L	Dimensions inches (mm)			
	W	c	d	t	
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+.02} _{-.01})	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

HV73	2B	T	TD	1004	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
	1J: 0.1W 2A: 0.25W 2B: 0.25W 2H: 0.5W 3A: 1W	T: Sn	TD: 0603, 0805, 1206: 7" 4mm pitch punched paper TE: 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/06/19

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)				Absolute Maximum Working Voltage	Maximum Overload Voltage (D.C.)*	Operating Temp. Range	
					E-24/E-96 (D±0.5%)	E-24/E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)				
1J	0.1W	70°C	80°C	±100**	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C	
2A	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	400V	800V*		
				±200	—	—	—	11M - 51M				
2B	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	800V	1000V*		
				±200	—	—	—	11M - 51M				
2H	0.5W	70°C	90°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	2000V (D.C.)	3000V*	-55°C to +155°C	
				±200	—	10.2M - 51M	11M - 51M	11M - 51M				
				±300	—	51.1M - 100M	56M - 100M	56M - 100M				
3A	1W	70°C	105°C	±100	43k - 1M	43k - 10M	43k - 10M	43k - 10M	3000V (D.C.)	4000V*	-55°C to +155°C	
				±200	—	10.2M - 20M	11M - 20M	11M - 51M				

* Max. overload voltage is specified by D.C. voltage

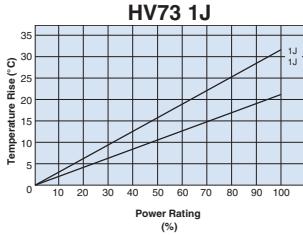
** Cold T.C.R. (-55°C ~ +25°C) of 1.02MΩ ~ 10MΩ is +200x10⁻⁶/K

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

Rated voltage = √Power rating x resistance value or max. working voltage, whichever is lower

environmental applications

Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



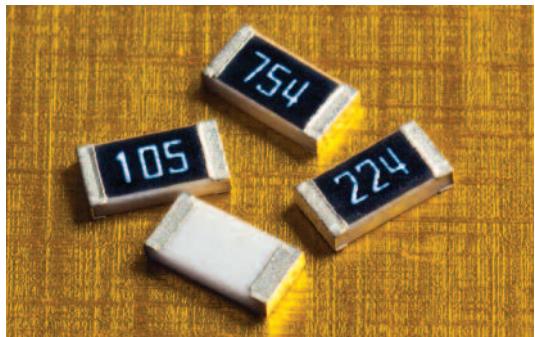
Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.1\Omega)$ Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: (10kΩ ≤ R ≤ 10MΩ) ±1%: (10MΩ ≤ R ≤ 100MΩ)	±0.3%: (10kΩ ≤ R ≤ 10MΩ) ±0.5%: (10MΩ ≤ R ≤ 100MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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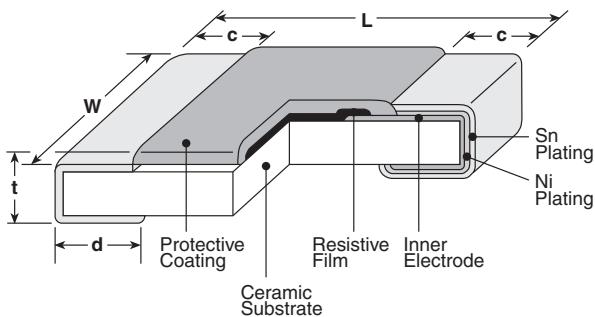


features

- Superior to RK73 series in maximum working voltage
- Suitable for flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Suitable for high reliable applications like automotives
- AEC-Q200 qualified

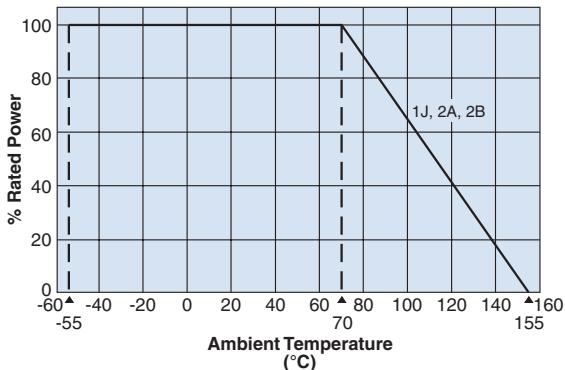


dimensions and construction

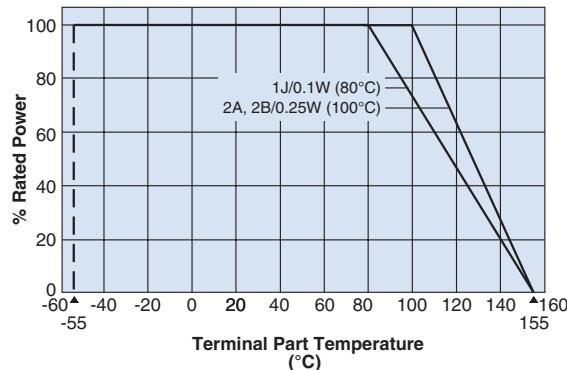


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+.02} _{-.01})	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

HV73V	2A	T	TD	104	J
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
HV73V	1J: 0.1W 2A: 0.25W 2B: 0.25W	T: Sn	TD: 7" 4mm pitch punched paper TE: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/05/19

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)				Maximum Working Voltage	Maximum Overload Voltage (D.C.)*	Operating Temperature Range	
					E-24/E-96 (D±0.5%)	E-24/E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)				
HV73V1J	0.1W	70°C	80°C	±100**	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C	
HV73V2A	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	400V	800V*		
				±200	—	—	—	11M - 51M				
HV73V2B	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	800V	1000V*		
				±200	—	—	—	11M - 51M				

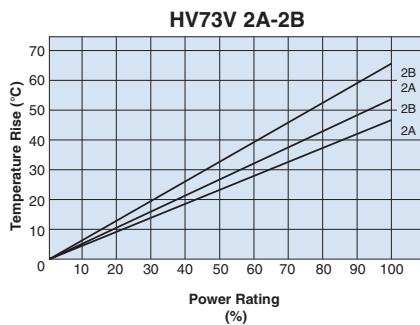
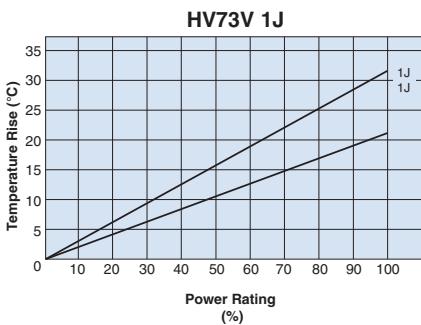
Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

* Maximum Overload Voltage is specified by D.C. voltage ** Cold T.C.R. (-55°C ~ +25°C) of 1.02MΩ ~ 10MΩ is +200x10⁻⁶/K

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

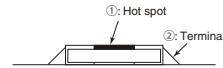
environmental applications

Temperature Rise

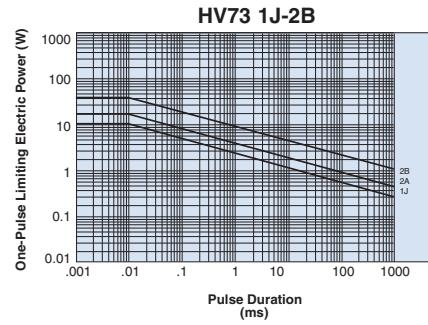


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.

Measurement condition
Room temperature: 25°C
PCB: FR-4 = 1.6mm
Cu foil thickness: 35μm



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

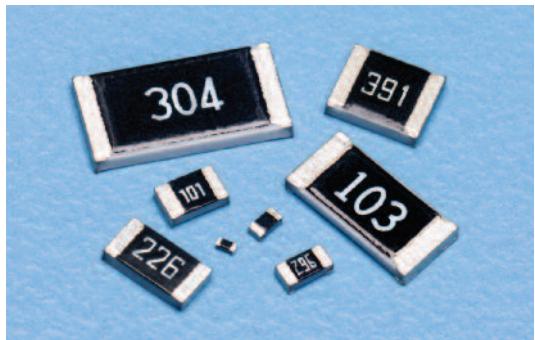
Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm (\% + 0.1\Omega)$	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C	
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C	
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds	
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second	
Rapid Change of Temperature	±0.5%: (10kΩ ≤ R ≤ 10MΩ) ±1%: (11MΩ ≤ R ≤ 51MΩ)	±0.3%: (10kΩ ≤ R ≤ 10MΩ) ±0.5%: (11MΩ ≤ R ≤ 51MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles	
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours	

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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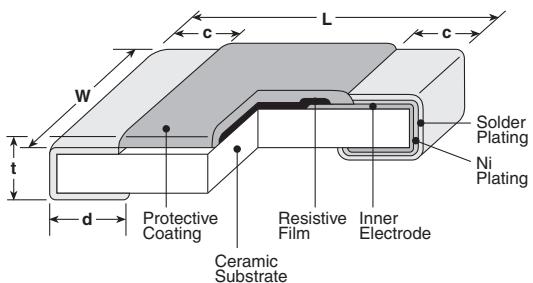


features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Excellent heat resistance and weather resistance are ensured by the use of metal glaze thick film
- High stability and high reliability with the triple-layer structure of electrode
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified: 0201 (1H), 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (W2H), 2512 (W3A)



dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1F (01005)	.016±.001 (0.4±0.02)	.008±.001 (0.2±0.02)	.004±.001 (0.1±0.03)	.004±.001 (0.11±0.03)	.005±.001 (0.13±0.02)
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.004±.002 (0.1±0.05)	.006±.002 (0.15±0.05)	.009±.001 (0.23±0.03)
1E (0402)	.039 +.004 -.002 (1.0 +0.1 -.05)	.02±.002 (0.5±0.05)	.008±.004 (0.2±0.1)	.01 +.002 -.004 (0.25 +0.05 -.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +0.2 -.1)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)		.016 +.008 -.004 (0.4 +0.2 -.1)	
2E (1210)		.102±.008 (2.6±0.2)			
W2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			
W3A/ W3A2* (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)		.023±.006 (0.65±0.15)	
					.024±.004 (0.6±0.1)

* RK73Z exempt

ordering information

RK73H	2A	RT	TD	1002	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
RK73B RK73H RK73Z	1F 1H 1E 1J 2A 2B 2E W2H W3A W3A2	RT: Sn Anti-Sulfur	TX: 01005 only: 4mm width - 1mm pitch plastic embossed TBL: 01005 only: 2mm pitch pressed paper TC: 0201 only: 7" 2mm pitch pressed paper (TC: 10,000 pcs/reel, TCM: 15,000 pcs/reel) TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A	RK73B: 3 digits RK73H: 4 digits RK73Z: None	D: ±0.5% F: ±1% G: ±2% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings

RK73B/RK73H

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range				Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range		
					RK73H D±0.5% E24, E96	F±1% E24, E96*	RK73B G±2% E24	J±5% E24					
1F	0.03W	70°C	—	±200	100kΩ - 2MΩ*	100kΩ - 1MΩ	100kΩ - 10MΩ	20V	30V	-55°C to +125°C			
				±250	—	10Ω - 91kΩ*	10Ω - 91kΩ						
				0 - +300	—	1Ω - 9.1Ω	1Ω - 9.1Ω						
	0.05W		125°C	±200	100Ω - 100kΩ	100Ω - 1MΩ	—	100 - 1M	25V	50V			
				±300	—	10Ω - 97.6Ω	—	10Ω - 91Ω					
	0.1W		125°C	±100	100Ω - 1MΩ	10Ω - 1MΩ	—	—	75V	100V			
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ					
	0.1W		125°C	±100	1.02kΩ - 1MΩ	1.02kΩ - 1MΩ	—	—					
				±200	—	1.02MΩ - 10MΩ	1.1kΩ - 10MΩ	1.1kΩ - 10MΩ					
	0.125W			±100	100Ω - 1kΩ	10Ω - 1kΩ	—	—					
				±200	—	—	10Ω - 1kΩ	1Ω - 1kΩ					
2A	0.25W	95°C	—	±100	100Ω - 1MΩ	10Ω - 1MΩ	—	—	150V	200V	-55°C to +155°C		
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ					
2B	0.25W	95°C	—	±100	100Ω - 1MΩ	10Ω - 1MΩ	—	—	200V	400V			
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ					
2E	0.5W	95°C	—	±100	100Ω - 1MΩ	10Ω - 10MΩ	—	—					
				±200	—	—	10Ω - 1MΩ	1Ω - 1MΩ					
W2H	0.75W	95°C	—	±100	10Ω - 1MΩ	10Ω - 1MΩ	—	—					
				±200	—	1 - 9.76	1.02MΩ - 10MΩ	1Ω - 10MΩ					
W3A	1W	95°C	—	±100	10Ω - 1MΩ	10Ω - 1MΩ	—	—					
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ					
W3A2	2W	95°C	—	±100	10Ω - 1MΩ	10Ω - 1MΩ	—	—					
				±200	—	1.02MΩ - 10MΩ	10Ω - 10MΩ	1Ω - 10MΩ					

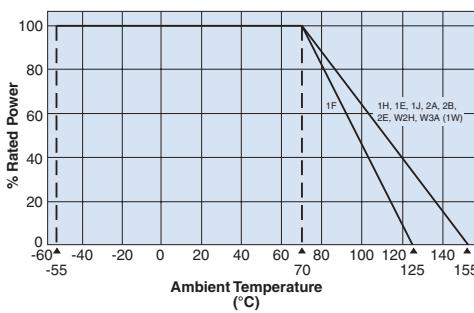
Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

*The nominal resistance value for RK73H1F (F:±1%) is E24

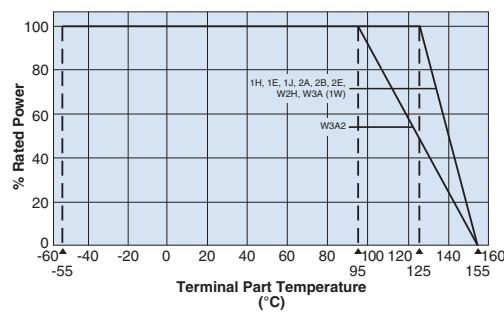
If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.

While using under high power, the temperature of the product may increase depending on the condition of heat dissipation from PCB. Be sure to check the terminal part temperature as well as precautions to use on delivery specification before use.

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/03/17

applications and ratings (continued)**RK73Z**

Part Designation	Rated Ambient Temperature	Rated Terminal Part Temperature	Resistance	Current Rating	Maximum Surge Current	Operating Temperature Range			
1H	+70°C	+125°C	100mΩ max.	0.5A	1A	-55°C to +155°C			
1E			50mΩ max.	1A	2A				
1J				5A	10A				
2A									
2B				2A					
2E									
W2H									
W3A									

environmental applications**Performance Characteristics**

Parameter	RK73H, RK73B Requirement $\Delta R \pm (% + 0.1\Omega)$		RK73Z Requirement		Test Method
	Limit	Typical	Limit	Typical	
Resistance	Within specified tolerance	—	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	$R \leq 90m\Omega$: 1H $R \leq 40m\Omega$: All others	25°C
T.C.R.	Within specified T.C.R.	—	—	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	$\pm 2\%$	$\pm 1\%$: 1F $\pm 0.8\%$: All others	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	$R \leq 90m\Omega$: 1H $R \leq 40m\Omega$: All others	RK73B, RK73H Rated Voltage x 2.5 for 5 seconds (1E, 2B, W3A2: Rated Voltage x 2 for 5 seconds) RK73Z: Max. overload current for 5 seconds
Resistance to Solder Heat	$\pm 1\%$: $10\Omega \leq R \leq 1M\Omega$ $\pm 3\%$: $R < 10\Omega$, $R > 1M\Omega$	$\pm 1\%$: $R < 10\Omega$, $R > 1M\Omega$ $\pm 0.5\%$: All others	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	$R \leq 90m\Omega$: 1H $R \leq 40m\Omega$: All others	260°C $\pm 5^\circ\text{C}$, 10 seconds ± 1 second
Rapid Change of Temperature	$\pm 1\%$: 1F $\pm 0.5\%$: All others	$\pm 0.5\%$: 1F $\pm 0.3\%$: All others	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	$R \leq 90m\Omega$: 1H $R \leq 40m\Omega$: All others	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	$\pm 2\%$: 1J, 2A, 2B $\pm 3\%$: All others	$\pm 0.75\%$: 1J, 2A, 2B $\pm 1.5\%$: 1F $\pm 1\%$: All others	$R \leq 150m\Omega$: 1H $R \leq 100m\Omega$: All others	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	40°C $\pm 2^\circ\text{C}$, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	$\pm 2\%$: 1J, 2A, 2B $\pm 3\%$: All others	$\pm 0.75\%$: 1J, 2A, 2B $\pm 1\%$: All others	$R \leq 150m\Omega$: 1H $R \leq 100m\Omega$: All others	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	70°C $\pm 2^\circ\text{C}$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	$\pm 1\%$	$\pm 0.5\%$	$R \leq 150m\Omega$: 1H $R \leq 100m\Omega$: All others	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	+125°C, 1000 hours: 1F; +155°C, 1000 hours: 1H, 1E, 1J, 2A, 2B, 2E, W2H, W3A
Sulfuration Test	$\pm 5\%$	$\pm 0.3\%$: 1F, 1H $\pm 0.2\%$: All others	$R \leq 150m\Omega$: 1H $R \leq 100m\Omega$: All others	$R \leq 100m\Omega$: 1H $R \leq 50m\Omega$: All others	Soaked in industrial oil with 3.5% sulfur concentration 105°C $\pm 3^\circ\text{C}$, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

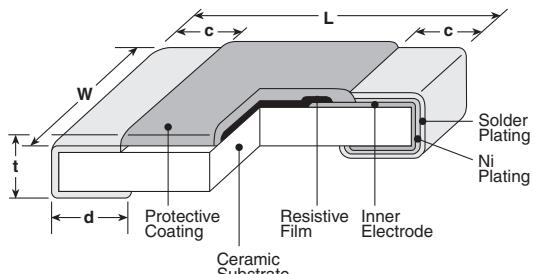


features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Metal-glaze thick film resistor for surface mounting
- High precision resistor with T.C.R. $\pm 50 \times 10^{-6}/\text{K}$ and tolerance $\pm 0.25\%$
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

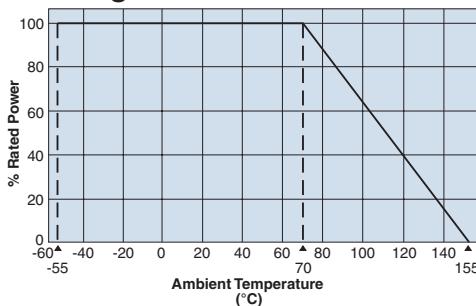


dimensions and construction

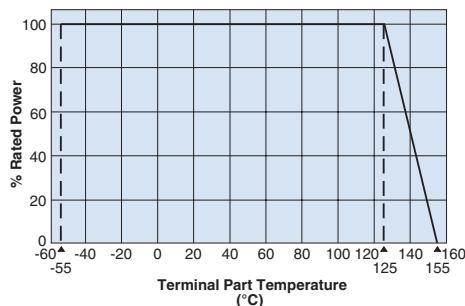


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1E (0402)	.039 ^{+.004} .02 ^{-.002} (1.0 ^{+.1} -.05)	.02 ^{+.002} (0.5 ^{±0.05})	.008 ^{+.004} (0.2 ^{±0.1})	.01 ^{+.002} .004 ^{-.004} (0.25 ^{+.05} -.1)	.014 ^{±.002} (0.35 ^{±0.05})
1J (0603)	.063 ^{±.008} (1.6 ^{±0.2})	.031 ^{±.004} (0.8 ^{±0.1})	.012 ^{±.004} (0.3 ^{±0.1})	.012 ^{±.004} (0.3 ^{±0.1})	.018 ^{±.004} (0.45 ^{±0.1})
2A (0805)	.079 ^{±.008} (2.0 ^{±0.2})	.049 ^{±.004} (1.25 ^{±0.1})	.016 ^{±.008} (0.4 ^{±0.2})	.012 ^{+.008} .004 ^{-.004} (0.3 ^{+.2} -.1)	.02 ^{±.004} (0.5 ^{±0.1})
2B (1206)	.126 ^{±.008} (3.2 ^{±0.2})	.063 ^{±.008} (1.6 ^{±0.2})	.02 ^{±.012} (0.5 ^{±0.3})	.016 ^{+.008} .004 ^{-.004} (0.4 ^{+.2} -.1)	.024 ^{±.004} (0.6 ^{±0.1})

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RK73G	2A	RT	TD	1002	D
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
RK73G	2A	RT	TPL: 0402 only: 2mm pitch punched paper TPD: 0402 only: 10" plastic embossed TP: 0402, 0603: 7" 2mm pitch punched paper TD: 0603, 0805, 1206: 7" 4mm pitch punched paper TE: 0805, 1206: 7" plastic embossed For further information on packaging, please refer to Appendix A	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$
1E: 0.1W 1J: 0.1W 2A: 0.125W 2B: 0.25W		RT: Sn Anti-Sulfur			

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/06/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10 ⁻⁶ /K)	Resistance Range			Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range	
RK73G1E (0402)	1/10W (.10W)	+70°C	+125°C	±50	—	E-24, E-96 (C±0.25%)	E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)	50V	100V	-55°C to +155°C
RK73G1J (0603)	1/10W (.10W)				100Ω - 1MΩ	30Ω - 1MΩ	30Ω - 1MΩ	75V	150V		
RK73G2A (0805)	1/8W (.125W)				—	—	—	150V	200V		
RK73G2B (1206)	1/4W (.25W)				—	—	—	200V	400V		

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower

If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.

environmental applications

Performance Characteristics

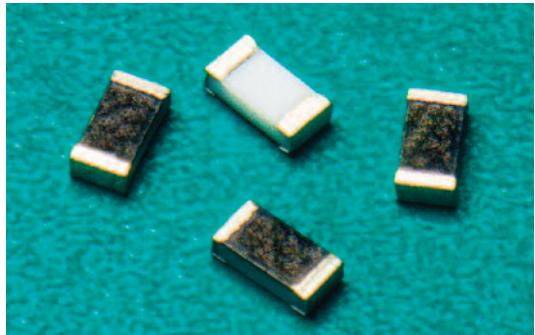
Parameter	Requirement $\Delta R \pm(\%+0.1\Omega)$	Test Method	
Resistance	Within specified tolerance	—	
T.C.R.	Within specified T.C.R.	+25°C/-55°C and +25°C/+125°C	
Overload (Short time)	±2%	±0.6%	Rated Voltage x 2.5 for 5 seconds (1E, 2B: Rated Voltage x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.4%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%: 1J, 2A, 2B ±3%: 1E	±0.6%: 1J, 2A, 2B; ±1%: 1E	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%: 1J, 2A, 2B ±3%: 1E	±0.6%: 1J, 2A, 2B; ±1%: 1E	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.6%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% contained 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

For Surface Temperature Rise Graph see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/06/19

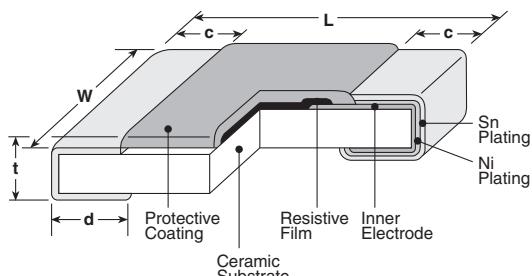


features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Metal-glaze thick film resistor for surface mounting
- High precision resistor with T.C.R. down to 25 ppm and tolerance as tight as $\pm 0.1\%$
- High reliability with ΔR of $\pm 0.2\%$ and $\pm 0.5\%$ in the reliability test
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

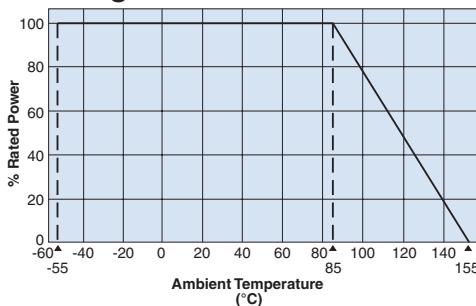
EU
RoHS
C O M P L I A N T

dimensions and construction

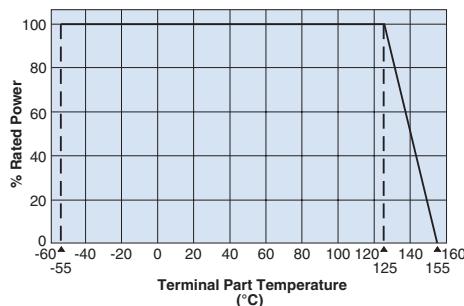


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063 \pm .008 (1.6 \pm 0.2)	.031 \pm .004 (0.8 \pm 0.1)	.008 \pm .004 (0.2 \pm 0.1)	.012 \pm .004 (0.3 \pm 0.1)	.018 \pm .004 (0.45 \pm 0.1)
	.079 \pm .008 (2.0 \pm 0.2)	.049 \pm .004 (1.25 \pm 0.1)	.010 \pm .006 (0.25 \pm 0.15)	.012 $^{+.008}_{-.004}$ (0.3 $^{+.02}_{-.01}$)	.020 \pm .004 (0.5 \pm 0.1)
	.126 \pm .008 (3.2 \pm 0.2)	.063 \pm .008 (1.6 \pm 0.2)	.014 \pm .006 (0.35 \pm 0.15)	.016 $^{+.008}_{-.004}$ (0.4 $^{+.02}_{-.01}$)	.024 \pm .004 (0.6 \pm 0.1)

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

RS73F	1J	RT	TD	1002	B
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
RS73F RS73G	1J: 0.2W NEW 2A: 0.25W NEW 2B: 0.33W	RT: Sn Anti-Sulfur	TD: 4mm pitch punched paper For further information on packaging, please refer to Appendix A	4 digits	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/17/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10 ⁻⁶ /K)	Resistance Range ^{*2}				Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
RS73F1J (0603)	.2W	85°C	+125°C	±25 ^{*1}	B±0.1% E-24, E-96	C±0.25% E-24, E-96	D±0.5% E-24, E-96	F±1% E-24, E-96	100V	150V	-55°C to +155°C
RS73G1J (0603)				±50	100Ω - 1MΩ	100Ω - 1MΩ	100Ω - 1MΩ	100Ω - 1MΩ			
RS73F2A (0805)			+125°C	±25 ^{*1}	10Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	10Ω - 10MΩ	150V	300V	
RS73G2A (0805)				±50							
RS73F2B (1206)			+125°C	±25 ^{*1}					200V	400V	
RS73G2B (1206)				±50							

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower^{*1} Measurement Temperature: +25°C/+125°C. Cold T.C.R. (-55°C/+25°C) is -50~+25x10⁻⁶/K^{*2} Please inquire about E192

If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves in the terminal part temperature" in the beginning of the catalog.

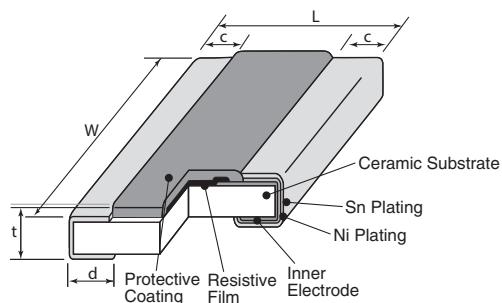
environmental applications**Performance Characteristics**

Parameter	Requirement Limit	Δ R ±(%+0.05Ω) Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±0.2%	±0.03%	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±0.2%	±0.1%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.2%	±0.05%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±0.2%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.4%: other	±0.04%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤10MΩ) ±0.08%: other	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.2%	±0.05%	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.2%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.4~0.5%: other	±0.1%: 1J (100Ω≤R≤200kΩ) 2A, 2B (10Ω≤R≤100kΩ) ±0.2~0.3%: other	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% contained 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.



dimensions and construction



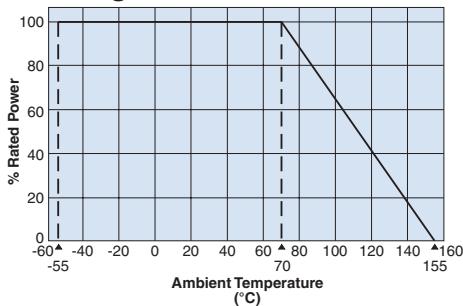
features

- Anti-sulfuration type, wide-side termination (reverse-geometry)type flat chip resistor
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Suitable for both flow and reflow solderings
- This products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

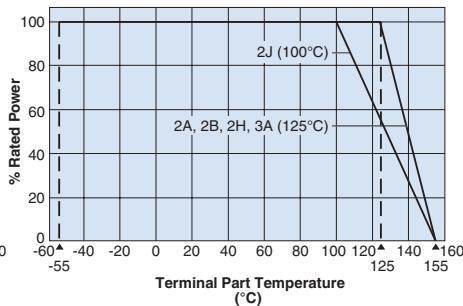
**EU
RoHS**
C O M P L I A N T

	Type (Inch Size Code)	Dimensions inches (mm)				
		L	W	c	d	t
NEW	2A (0508)	.049±.006 (1.25±0.15)	.079±.006 (2.0±0.15)	.012±.008 (0.3±0.2)	.014±.008 (0.35±0.2)	.022±.004 (0.55±0.1)
	2B (0612)	.063±.004 (1.6±.02) +.004 (.1±.01)	.126±.012 (3.2±.03) +.004 (.1±.01)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.024±.004 (0.6±0.1)
	2H (1020)	.098±.008 (2.5±.02) +.004 (.1±.01)	.197±.008 (5.0±.02) +.004 (.1±.01)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	
	2J (1218)	.122±.008 (3.1±.02) +.004 (.1±.01)	.181±.008 (4.6±.02) +.004 (.1±.01)	.016±.008 (0.4±0.2)	.030±.006 (0.75±0.15)	.024±.004 (0.6±0.1)
	3A (1225)	.122±.004 (3.1±.01) +.008 (.1±.01)	.248±.006 (6.3±0.15)	.018±.008 (0.45±0.2)	.030±.006 (0.75±0.15)	

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

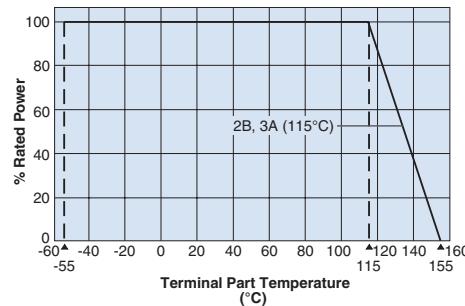


For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

When using Power Rating, please use the derating curves based on the terminal part temperature on the right side.

WK73S/R2B (1W), WK73S/R3A (2W)



ordering information

WK73R	R2B	RT	TD	10R0	F
Type	Size	Termination Material	Packaging	Nominal Resistance*	Resistance Tolerance
WK73S WK73R	NEW 2A: 0.75W, 1W 2B: 0.75W, 1W 2H: 1W 2J: 1W 3A: 1.5W, 2W	RT: Sn Anti-Sulfur	TD: 4mm pitch punched paper TE: 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±1%: 4 digits ±5%: 3 digits	F: ±1% J: ±5%
				* Resistance value, 3 digits: 1~9.1Ω, 1R0~9R1 Resistance value, 4 digits: 1~9.76Ω, 1R00~9R76	

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

3/28/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10 ³ /K)	Resistance Range (Ω) F±1% E-24 • E-96	J±5% E-24	Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
NEW WK73S2A	1.0W ¹	—	125°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
	0.75W	—	125°C	±100	20.5k ~ 1M	22k ~ 1M			
	1.0W ¹	—	125°C	±100	10 ~ 20k	10 ~ 20k			
WK73R2A	0.75W	70°C	115°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
	1.0W ¹	—	115°C	±100	1 ~ 9.76	1 ~ 9.1			
	1.0W ¹	—	115°C	±150	0.3 ~ 0.976	0.3 ~ 0.91			
WK73S2B	0.75W	70°C	125°C	±100	10 ~ 9.76k	10 ~ 9.1k	200V	400V	-55°C to +155°C
	1.0W ¹	—	125°C	±200	10k ~ 1M	10k ~ 1M			
	1.0W ¹	—	115°C	±100	10 ~ 9.76k	10 ~ 9.1k			
WK73R2B	0.75W	70°C	125°C	±100	10 ~ 9.76k	10 ~ 9.1k	200V	400V	-55°C to +155°C
	1.0W ¹	—	115°C	±200	10k ~ 1M	10k ~ 1M			
WK73S2H	1.0W	70°C	125°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
WK73R2H	1.0W	70°C	125°C	±150	0.2 ~ 0.976	0.2 ~ 0.91			
WK73S2J	1.0W	70°C	100°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
WK73R2J	1.0W	70°C	100°C	±100	10 ~ 510k	10 ~ 510k			
WK73S2J	1.0W	70°C	100°C	±200	511k ~ 1M	560k ~ 1M	200V	400V	-55°C to +155°C
WK73R2J	1.0W	70°C	100°C	±200	432k ~ 1M	470k ~ 1M			
WK73S3A	1.5W	70°C	125°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
	2.0W ¹	—	115°C	±100	1 ~ 9.76	1 ~ 9.1			
WK73R3A	1.5W	70°C	125°C	±100	10 ~ 330k	10 ~ 330k	200V	400V	-55°C to +155°C
	2.0W ¹	—	115°C	±200	332k ~ 1M	360k ~ 1M			

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower¹ When using Power Rating, please use the derating curves based on the terminal part temperature on the right side of the graph located on the previous page.

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature", please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to the "Introduction of the derating curves based on the terminal part temperature" in the beginning of the catalog.

environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R \pm(0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	WK732B, S2H, R2H, S2J, R2J: Rated voltage x 2.5 for 5 seconds WK73S/R2A (0.75W, 1W), WK73S/R2B (1W), WK73S/R3A (2W): Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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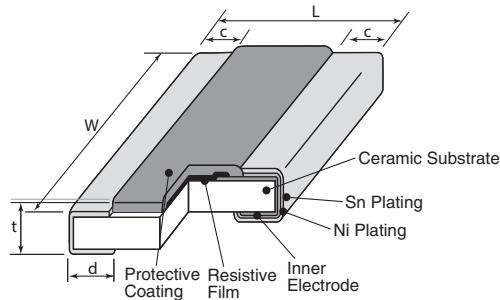


features

- Anti-sulfuration type, wide-side termination (reverse-geometry) type flat chip resistor
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Suitable for both flow and reflow solderings
- This products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

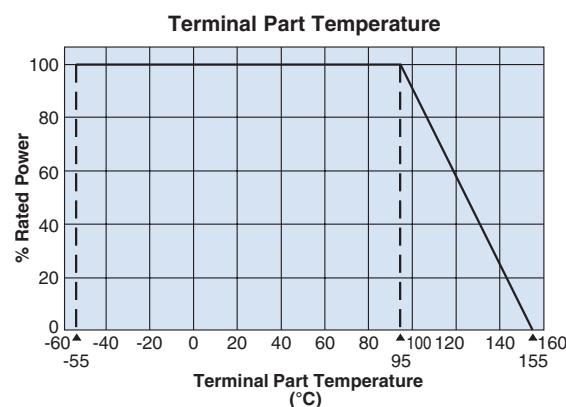


dimensions and construction



	Type (Inch Size Code)	Dimensions inches (mm)				
		L	W	c	d	t
NEW	2B15 (0612)	.063 ^{+.004} (1.6 ^{+.01} -.02)	.126 ^{+.004} (3.2 ^{+.01} -.03)	.012 ^{+.008} (0.3 ^{+.02} -.02)	.018 ^{+.006} (0.45 ^{+.15} -.15)	.024 ^{+.004} (0.6 ^{+.01} -.01)
	2H2 (1020)	.098 ^{+.004} (2.5 ^{+.01} -.02)	.197 ^{+.004} (5.0 ^{+.01} -.02)	.016 ^{+.008} (0.4 ^{+.02} -.02)	.030 ^{+.006} (0.75 ^{+.15} -.15)	.024 ^{+.004} (0.6 ^{+.01} -.01)
	3A3 (1225)	.122 ^{+.008} (3.1 ^{+.02} -.01)	.248 ^{+.006} (6.3 ^{+.15} -.15)	.018 ^{+.008} (0.45 ^{+.02} -.02)	.030 ^{+.006} (0.75 ^{+.15} -.15)	.024 ^{+.004} (0.6 ^{+.01} -.01)

Derating Curve



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WK73R	2B15	RT	TD	10R0	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
WK73S WK73R	NEW 2B15: 1.5W 2H2: 2W 3A3: 3W	RT: Sn Anti-Sulfur	TD: 0612: 7" 4mm pitch punched paper TE: 1020, 1225: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω	F: ±1% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

3/28/19

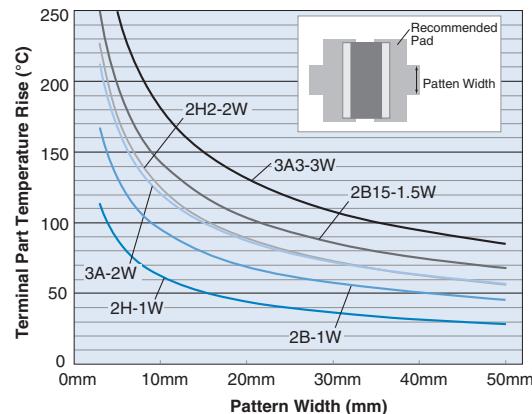
applications and ratings

Part Designation	Power Rating	Rated Terminal Part Temperature	T.C.R. (X 10 ⁻³ /K)	Resistance Range (Ω)		Maximum Working Voltage	Maximum Overload Voltage	Operating Temperature Range
NEW WK73S2B15	1.5W	95°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
			±150	0.3 ~ 0.976	0.3 ~ 0.91			
WK73R2B15	1.5W	95°C	±100	10 ~ 9.76k	10 ~ 9.1k	200V	400V	-55°C to +155°C
WK73S2H2RT	2.0W	95°C	±100	1 ~ 9.76	1 ~ 9.1			
			±150	0.2 ~ 0.976	0.2 ~ 0.91	200V	400V	
WK73R2H2RT	2.0W	95°C	±100	10 ~ 430k	10 ~ 430k			
			±200	432k - 1M	470k - 1M	200V	400V	
WK73S3A3RT	3.0W	95°C	±100	1 ~ 9.76	1 ~ 9.1	200V	400V	-55°C to +155°C
WK73R3A3RT	3.0W	95°C	±100	10 ~ 330k	10 ~ 330k			
			±200	332k - 1M	360k - 1M			

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

environmental applications

Device Temperature Data



Room Temperature 25°C
 PCB: FR-4 t=1.6mm Cu foil thickness=35μm
 While using under high power, the temperature of the product may increase depending on the condition of heat dissipation from PCB.
 Be sure to check the terminal part temperature as well as precautions for use on delivery specifications before use.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.2%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/06/19

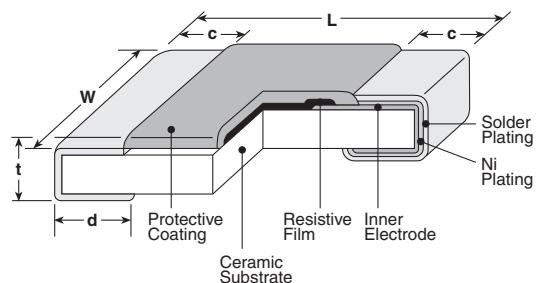


features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material/pulse
- Superior to RK73 series chip resistors in pulse withstand voltage
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified



dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
SG73 1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73 2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ±.008 (0.3 ±.0.1)	.02±.004 (0.5±0.1)
SG73 2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)		.016 ±.008 (0.4 ±.0.2)	
SG73 2E (1210)		.102±.008 (2.6±0.2)		.02±.012 (0.5±0.3)	.024±.004 (0.6±0.1)
SG73 W2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			.026±.006 (0.65±0.15)
SG73 W3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)			

ordering information

SG73	2A	RT	TD	103	K
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
SG73	1J 2A 2B 2E W2H W3A	RT: Sn Anti-Sulfur	TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TDD: 0603, 0805, 1206, 1210: 10" paper tape TE: 0805, 1206, 1210, 2010 & 2512: 7" embossed plastic TED: 0805, 1206, 1210, 2010 & 2512: 10" embossed plastic For further information on packaging, please refer to Appendix A	±10%, ±20%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	K: ±10% M: ±20%

applications and ratings

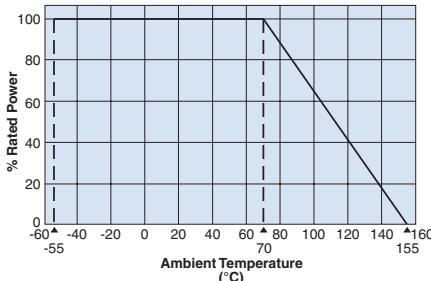
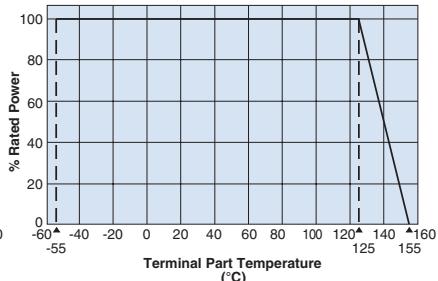
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range K: $\pm 10\%$ M: $\pm 20\%$ E-12	Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
SG73 1J (0603)	0.1W	70 $^{\circ}$ C	125 $^{\circ}$ C	± 400	1 Ω - 8.2 Ω	50V	100V	-55° C to +155 $^{\circ}$ C
				± 200	10 Ω - 1M Ω			
SG73 2A (0805)	0.125W	70 $^{\circ}$ C	125 $^{\circ}$ C	± 400	1 Ω - 8.2 Ω	150V	200V	-55° C to +155 $^{\circ}$ C
				± 200	10 Ω - 1M Ω			
SG73 2B (1206)	0.33W	70 $^{\circ}$ C	125 $^{\circ}$ C	± 400	1 Ω - 8.2 Ω	200V	400V	-55° C to +155 $^{\circ}$ C
				± 200	10 Ω - 1M Ω			
SG73 2E (1210)	0.50W	70 $^{\circ}$ C	125 $^{\circ}$ C	± 400	1 Ω - 8.2 Ω	200V	400V	-55° C to +155 $^{\circ}$ C
				± 200	10 Ω - 1M Ω			
SG73 W2H (2010)	0.75W	70 $^{\circ}$ C	125 $^{\circ}$ C	± 400	1 Ω - 8.2 Ω	200V	400V	-55° C to +155 $^{\circ}$ C
				± 200	10 Ω - 1M Ω			
SG73 W3A (2512)	1W	70 $^{\circ}$ C	125 $^{\circ}$ C	± 400	1 Ω - 8.2 Ω	200V	400V	-55° C to +155 $^{\circ}$ C
				± 200	10 Ω - 1M Ω			

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

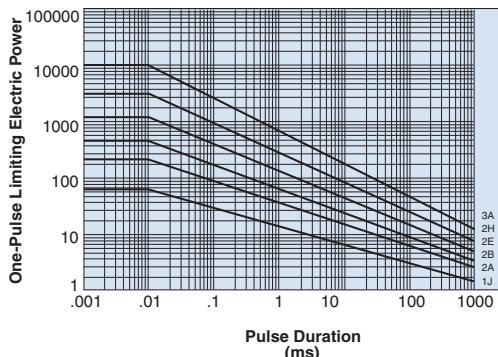
Derating Curve

For resistors operated at an ambient temperature of 70 $^{\circ}$ C or above, a power rating shall be derated in accordance with the derating curve.

For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

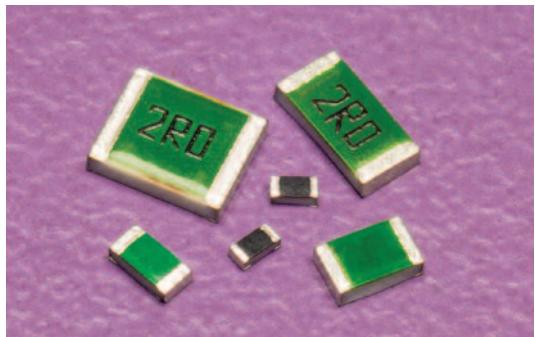
Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.1\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25 $^{\circ}$ C
T.C.R.	Within specified T.C.R.	—	+25 $^{\circ}$ C/-55 $^{\circ}$ C and +25 $^{\circ}$ C/+125 $^{\circ}$ C
Overload (Short time)	$\pm 2\%$	$\pm 0.5\%$	Rated Voltage x 2.5 for 5 seconds
Resistance to Solder Heat	$\pm 1\%$	$\pm 0.75\%$	260 $^{\circ}$ C $\pm 5\%$, 10 seconds ± 1 second
Rapid Change of Temperature	$\pm 0.5\%$	$\pm 0.3\%$	-55 $^{\circ}$ C (30 minutes), +125 $^{\circ}$ C (30 minutes), 100 cycles
Moisture Resistance	$\pm 3\%$	$\pm 0.75\%$	40 $^{\circ}$ C $\pm 2\%$, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70 $^{\circ}$ C	$\pm 3\%$	$\pm 0.75\%$	70 $^{\circ}$ C $\pm 2\%$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	$\pm 1\%$	$\pm 0.3\%$	+155 $^{\circ}$ C, 1000 hours
Sulfuration Test	$\pm 5\%$	$\pm 0.2\%$	Soaked in industrial oil with 3.5% sulfur concentration 105 $^{\circ}$ C $\pm 3\%$, 500 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/06/18

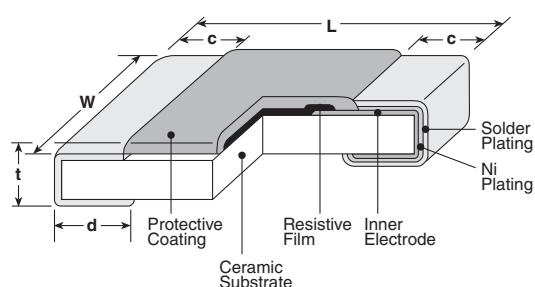


features

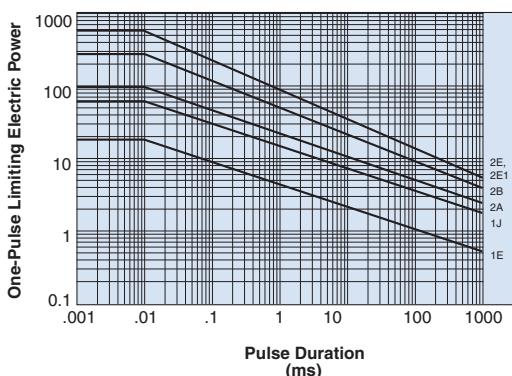
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Superior to RK73 series chip resistors in pulse withstand voltage and high power
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified



dimensions and construction



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for the resistance characteristics of continuous applied pulse.

Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
SG73P 1E (0402)	.039 ^{+.004} .002 (1.0 ^{+.01} -.05)	.020±.002 (0.5±0.05)	.006±.004 (0.15±0.1)	.010 ^{+.002} .004 (0.25 ^{+.05} -.1)	.014±.002 (0.35±0.05)
SG73P 1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
SG73P 2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.012 ^{+.008} .004 (0.3 ^{+.02} -.1)	.012 ^{+.008} .004 (0.3 ^{+.02} -.1)	.020±.004 (0.5±0.1)
SG73P 2B (1206)		.063±.008 (1.6±0.2)	.016 ^{+.008} .004 (0.4 ^{+.02} -.1)	.016 ^{+.008} .004 (0.4 ^{+.02} -.1)	.024±.004 (0.6±0.1)
SG73P 2E SG73P 2E1 (1210)	.126±.008 (3.2±0.2)	.102±.008 (2.6±0.2)			

ordering information

SG73P	2A	RT	TD	103	J
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
SG73P	1E 1J 2A 2B 2E1	RT: Sn Anti-Sulfur	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	D: ±0.5% F: ±1% G: ±2% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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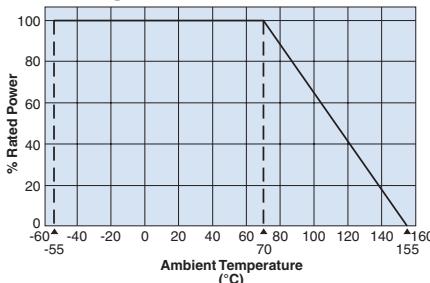
applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range				Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
					D: ±0.5% E-24, E-96	F: ±1% E-24, E-96	G: ±2% E-24	J: ±5% E-24			
SG73P 1E	0.125W	70°C	125°C	±200					75V	100V	-55°C to +155°C
	0.2W ^{*2}	—	105°C						150V	200V	
SG73P 1J	0.2W	70°C	125°C	±100 ^{*1}					400V	600V (800V) ^{*3}	-55°C to +155°C
	0.33W ^{*2}	—	—						200V	400V	
SG73P 2A	0.25W	70°C	125°C	±200							-55°C to +155°C
	0.5W ^{*2}	—	100°C								
SG73P 2B	0.33W	70°C	125°C	±200							-55°C to +155°C
	0.75W ^{*2}	—	105°C								
SG73P 2E	0.5W	70°C	125°C	±200							-55°C to +155°C
	0.75W ^{*2}	—	110°C								
SG73P 2E1	1.0W ^{*2}	—	95°C	±200							

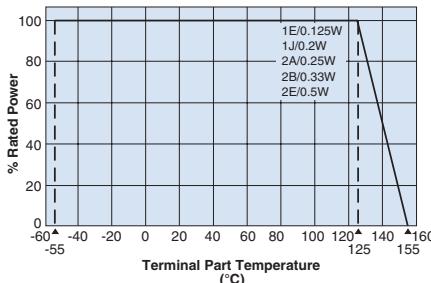
^{*1} Cold T.C.R. (-55°C ~ +25°C) is ±150x10⁻⁶/K ^{*2} If you want to use the rated power of ^{*2}, ^{*3} please reference below. ^{*3} Applies when power rating is 0.4W or lower.

Rated voltage = √Power rating x resistance value or max. working voltage, whichever is lower

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. Also, contact KOA prior to usage and for the max. working voltage and max. overload voltage.

environmental applications**Derating Curve**

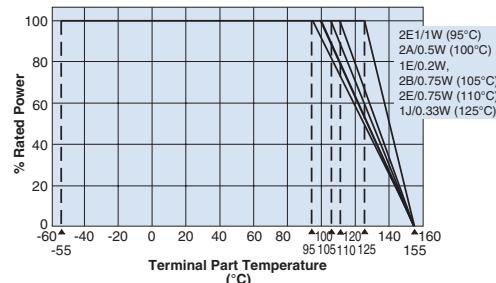
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

^{*2}, ^{*3} If you want to use the rated power of ^{*2}, ^{*3} please use the derating curve based on the terminal part temperature on the right hand side.

**Performance Characteristics**

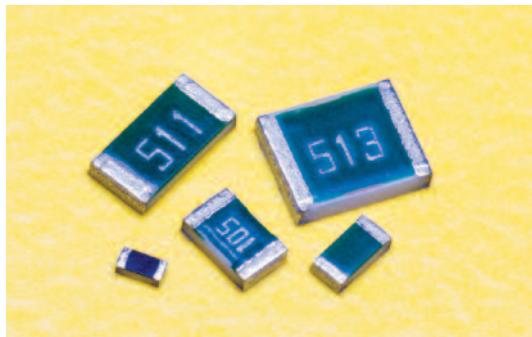
Parameter	Requirement	△ R ±(%+0.1Ω)	Test Method
Parameter	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.4W, 0.5W; 2B: 0.75W; 2E1: 1W x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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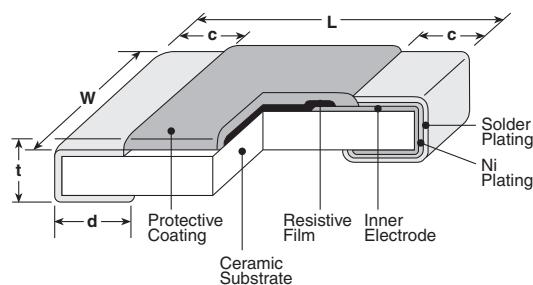


features

- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Superior to RK73 series chip resistors in pulse withstanding voltage and high power
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified



dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
SG73S 1E, (0402)	.039 ^{+.004} .002 (1.0 ^{+.01} -.05)	.020 ^{+.002} -.002 (0.5 ^{+.05} -.05)	.006 ^{+.004} -.004 (0.15 ^{+.1} -.1)	.010 ^{+.002} -.004 (0.25 ^{+.05} -.1)	.014 ^{+.002} -.002 (0.35 ^{+.05} -.05)
SG73S 1J, (0603)	.063 ^{+.008} -.008 (1.6 ^{+.02} -.02)	.031 ^{+.004} -.004 (0.8 ^{+.01} -.01)	.012 ^{+.004} -.004 (0.3 ^{+.01} -.01)	.012 ^{+.004} -.004 (0.3 ^{+.01} -.01)	.018 ^{+.004} -.004 (0.45 ^{+.1} -.1)
SG73S 2A, (0805)	.079 ^{+.008} -.008 (2.0 ^{+.02} -.02)	.049 ^{+.004} -.004 (1.25 ^{+.01} -.01)	.012 ^{+.008} -.008 (0.3 ^{+.02} -.1)	.012 ^{+.008} -.008 (0.3 ^{+.02} -.1)	.020 ^{+.004} -.004 (0.5 ^{+.01} -.01)
SG73S 2B, (1206)		.063 ^{+.008} -.008 (1.6 ^{+.02} -.02)	.016 ^{+.008} -.008 (0.4 ^{+.02} -.1)	.016 ^{+.008} -.008 (0.4 ^{+.02} -.1)	.024 ^{+.004} -.004 (0.6 ^{+.01} -.01)
SG73S 2E, SG73S 2E1 (1210)		.126 ^{+.008} -.008 (3.2 ^{+.02} -.02)	.102 ^{+.008} -.008 (2.6 ^{+.02} -.02)		

ordering information

SG73S	2A	RT	TD	103	J
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
SG73S	1E 1J 2A 2B 2E 2E1	RT: Sn Anti-Sulfur	TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210: 7" embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	D: ±0.5% F: ±1% G: ±2% J: ±5%

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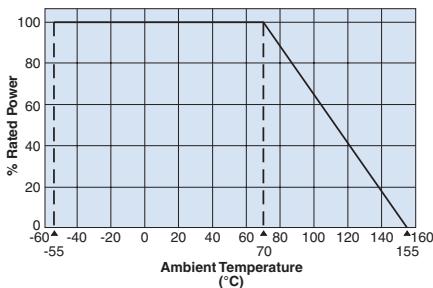
applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range				Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range	
SG73S 1E	0.125W	70°C	125°C	± 200	D: $\pm 0.5\%$ E-24, E-96	F: $\pm 1\%$ E-24, E-96	G: $\pm 2\%$ E-24	J: $\pm 5\%$ E-24	75V	100V	-55°C to +155°C	
	0.2W* ²	—	105°C									
SG73S 1J	0.2W	70°C	125°C	$\pm 100^{*1}$					150V	200V		
	0.33W* ²	—										
SG73S 2A	0.25W	70°C	125°C	± 200	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	1Ω - 10MΩ	400V	600V (800V)* ³		
	0.5W* ²	—	100°C									
SG73S 2B	0.33W	70°C	125°C	± 200	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	1Ω - 10MΩ	200V	400V		
	0.75W* ²	—	105°C									
SG73S 2E	0.5W	70°C	125°C	± 200	100Ω - 1MΩ	10Ω - 1MΩ	10Ω - 10MΩ	1Ω - 10MΩ	200V	400V		
	0.75W* ²	—	110°C									
SG73S 2E1	1.0W* ²	—	95°C	± 200								

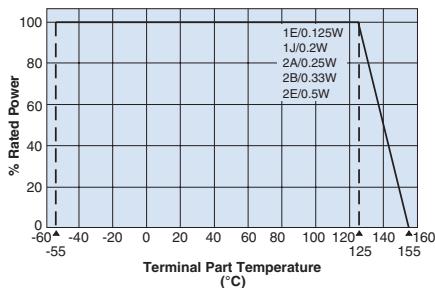
*¹ Cold T.C.R. (-55°C ~ +25°C) is $\pm 150 \times 10^{-6}/K$ *² If you want to use the rated power of *², *³ please reference below. *³ Applies when power rating is 0.4W or lower.

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog. Also, contact KOA prior to usage and for the max. working voltage and max. overload voltage.

environmental applications**Derating Curve**

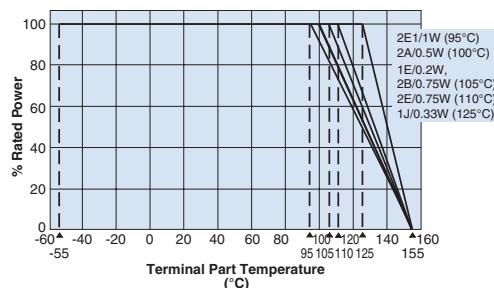
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

*², *³ If you want to use the rated power of *², *³, please use the derating curve based on the terminal part temperature on the right hand side.



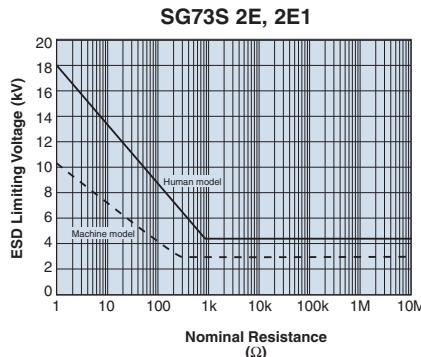
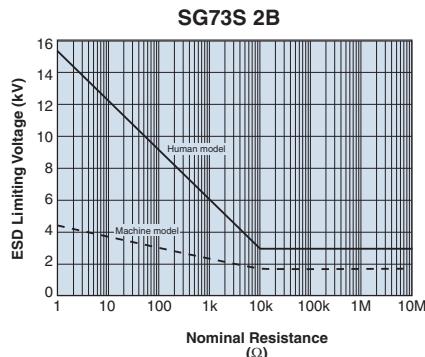
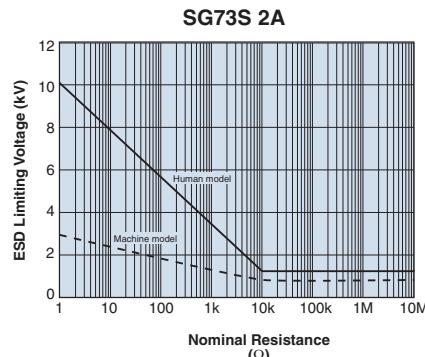
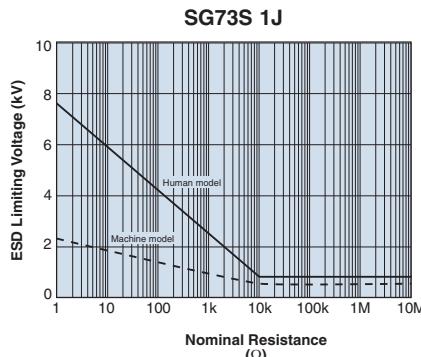
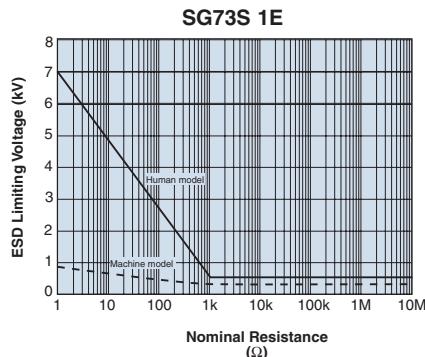
Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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environmental applications (continued)

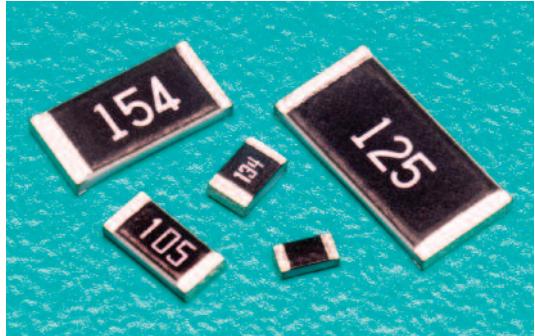
ESD Limiting Voltage



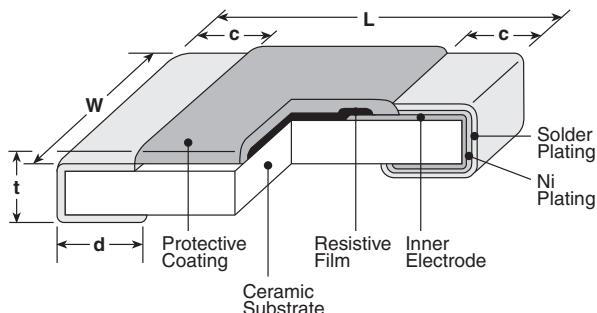
Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm (% + 0.1\Omega)$ Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage x 2.5 for 5 seconds (2A: 0.4W, 0.5W; 2B: 0.75W; 2E: 0.75W; 2E1: 1W x 2 for 5 seconds)
Resistance to Solder Heat	±1%	±0.75%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±0.75%	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

**features**

- Superior to RK73 series in maximum working voltage
- Suitable for flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Excellent anti-sulfuration characteristics due to using high sulfuration-proof inner top electrode material

**dimensions and construction**

Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+.02} _{-.01})	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)

ordering information

HV73	2B	RT	TD	1004	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
HV73	2B	RT	TD	1004	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
1J: Type	1J: 0.1W 2A: 0.25W 2B: 0.25W 2H: 0.5W 3A: 1W	2B: Sn Anti-Sulfur	TD: 7" 4mm pitch punched paper TE: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures +1 multiplier ±2%, ±5%: 2 significant figures +1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

3/28/19

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)				Maximum Working Voltage	Maximum Overload Voltage (D.C.)*	Operating Temperature Range
					E-24/E-96 (D±0.5%)	E-24/E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)			
1J	0.1W	70°C	80°C	±100**	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C
2A	0.25W	70°C	100°C	±100 ±200	100k - 1M —	100k - 10M —	100k - 10M —	100k - 10M 11M - 51M	400V	800V*	
2B	0.25W	70°C	100°C	±100 ±200	100k - 1M —	100k - 10M —	100k - 10M —	100k - 10M 11M - 51M	800V	1000V*	-55°C to +155°C
2H	0.5W	70°C	90°C	±100 ±200	100k - 1M —	100k - 10M —	100k - 10M —	100k - 10M 11M - 51M	2000V (D.C.)	3000V*	
3A	1W	70°C	105°C	±100 ±200	43k - 1M —	43k - 10M 10.2M - 20M	43k - 10M 11M - 20M	43k - 10M 11M - 51M	3000V (D.C.)	4000V*	

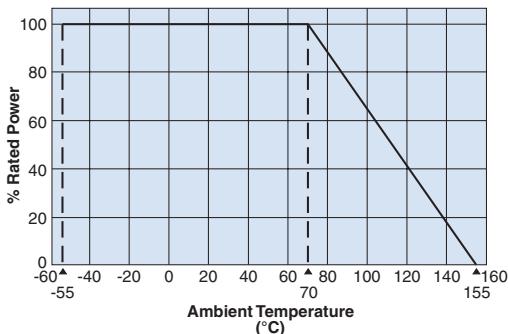
Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

* Maximum Overload Voltage is specified by D.C. voltage ** Cold T.C.R. (-55°C ~ +25°C) of $1.02\text{M}\Omega \sim 10\text{M}\Omega$ is $+200 \times 10^{-6}/\text{K}$

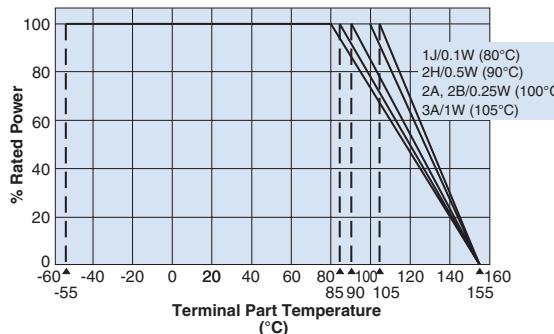
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.

Please refer to "Introduction of the derating curves based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: (10kΩ ≤ R ≤ 10MΩ) ±1%: (11MΩ ≤ R ≤ 51MΩ)	±0.3%: (10kΩ ≤ R ≤ 10MΩ) ±0.5%: (11MΩ ≤ R ≤ 51MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with 3.5% sulfur concentration 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

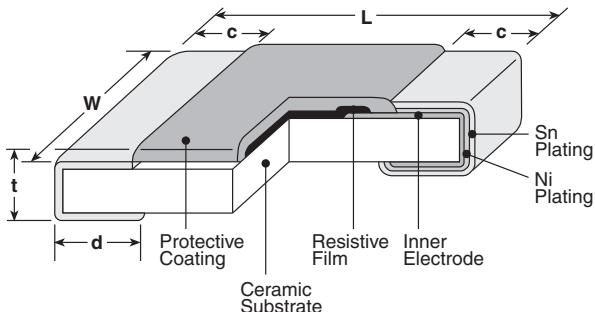
11/06/19



features

- Superior to RK73 series in maximum working voltage
- Suitable for flow and reflow solderings
- Products meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Suitable for high reliable applications like automotives
- AEC-Q200 qualified

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+0.2} _{-0.1})	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+0.2} _{-0.1})	.024±.004 (0.6±0.1)

ordering information

HV73V	2A	RT	TD	104	J
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
HV73V	1J: 0.1W 2A: 0.25W 2B: 0.25W	RT: Sn Anti-Sulfur	TD: 7" 4mm pitch punched paper TE: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier ±2%, ±5%: 2 significant figures + 1 multiplier	D: ±0.5% F: ±1% G: ±2% J: ±5%

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)				Maximum Working Voltage	Maximum Overload Voltage (D.C.)*	Operating Temperature Range	
HV73V1J	0.1W	70°C	80°C	±100**	—	10k - 10M	10k - 10M	10k - 10M	350V	500V*	-55°C to +155°C	
HV73V2A	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	400V	800V*		
				±200	—	—	—	11M - 51M				
HV73V2B	0.25W	70°C	100°C	±100	100k - 1M	100k - 10M	100k - 10M	100k - 10M	800V	1000V*		
				±200	—	—	—	11M - 51M				

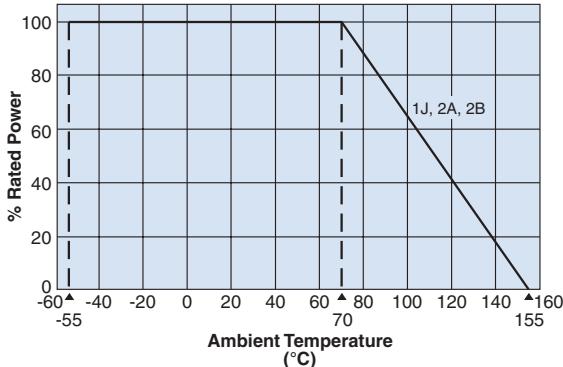
Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

* Maximum Overload Voltage is specified by D.C. voltage ** Cold T.C.R. (-55°C ~ +25°C) of $1.02\text{M}\Omega \sim 10\text{M}\Omega$ is $+200 \times 10^{-6}/\text{K}$

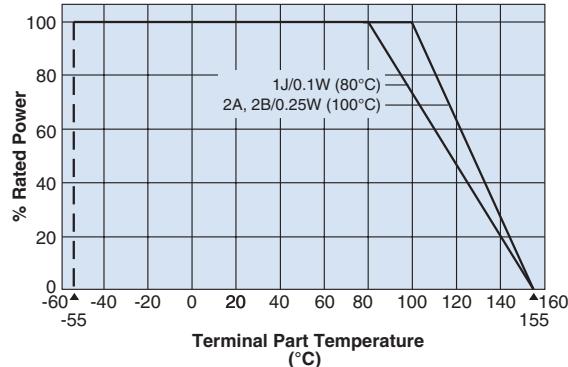
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the above derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

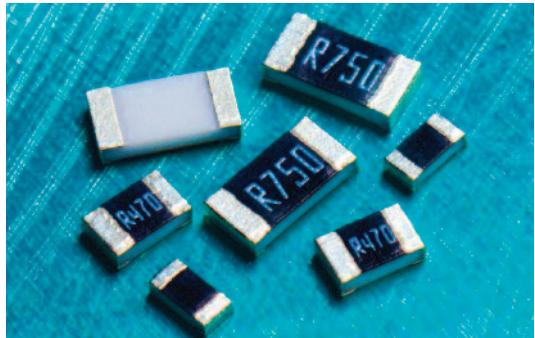
Parameter	Requirement Δ R ±(%+0.1Ω) Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated Voltage (D.C.) x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.5%: (10kΩ ≤ R ≤ 10MΩ) ±1%: (11MΩ ≤ R ≤ 51MΩ)	±0.3%: (10kΩ ≤ R ≤ 10MΩ) ±0.5%: (11MΩ ≤ R ≤ 51MΩ)	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.75%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% contained 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

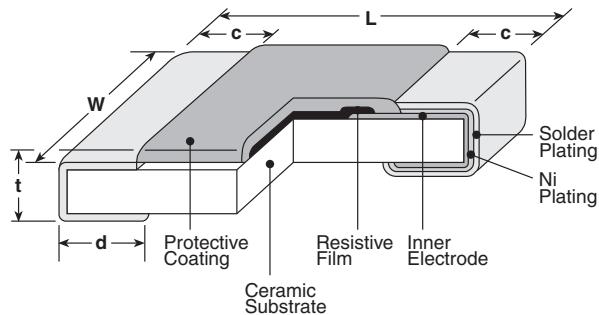
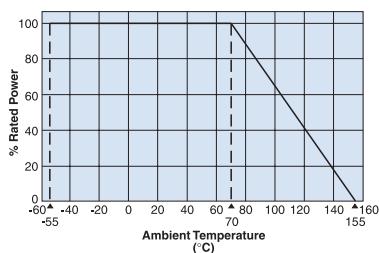
Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/06/19

**features**

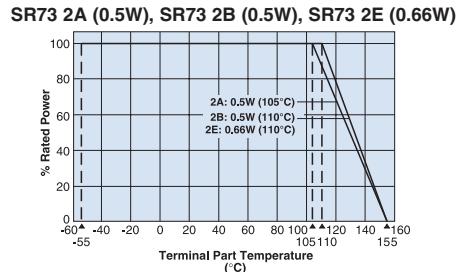
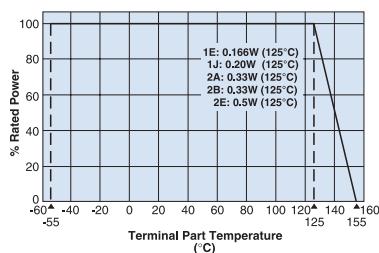
- Excellent anti-sulfuration characteristic due to using high sulfuration-proof inner top electrode material
- Current detecting resistors for power supply, motor circuits, etc
- High reliability and performance with resistance tolerance $\pm 1.0\%$, T.C.R. $\pm 100 \times 10^{-6}/K$
- Suitable for both reflow and flow solderings
- Products with lead free termination meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

**dimensions and construction****Derating Curve**

For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

ordering information

SR73	2B	RT	TD	R10	J
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
1E: Type	1E: 0.166W 1J: 0.2W 2A: 0.33W, 0.5W 2B: 0.33W, 0.5W 2E: 0.5W, 0.66W	RT: Sn Anti-Sulfur	TD: 7" 4mm pitch punch paper TP: 0402 only, 7" 2mm pitch paper TPL: 0402 only, 2mm pitch paper	$\pm 2\%$, $\pm 5\%$: 2 significant figures + 1 multiplier "R" indicates decimal on values $< 10\Omega$ $\pm 1\%$: 3 significant figures + 1 multiplier "R" indicates decimal on values $< 100\Omega$	F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$
			For further information on packaging, please refer to Appendix A		



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			Operating Temperature Range
					F (±1%) E-24, E-96 ¹	G (±2%) E-24	J (±5%) E-24	
SR731ERT (0402)	0.166W	70°C	125°C	±200	1Ω - 10Ω	1Ω - 10Ω	1Ω - 10Ω	-55°C to +155°C
SR731JRT (0603)	0.2W	70°C	125°C	±200	0.2Ω - 10Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±300	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
SR732ART (0805)	0.33W	70°C	125°C	±100	0.47Ω - 10Ω	—	—	
				±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
	0.5W*	—	105°C	±100	0.47Ω - 10Ω	—	—	
				±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
				±100	0.47Ω - 10Ω	—	—	
SR732BRT (1206)	0.33W	70°C	125°C	±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
				±100	0.47Ω - 10Ω	—	—	
	0.5W*	—	110°C	±200	0.2Ω - 0.43Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω	
				±100	0.43Ω - 10Ω	—	—	
SR732ERT (1210)	0.5W	70°C	125°C	±200	0.2Ω - 0.39Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	—	—	0.1Ω - 0.18Ω	
				±100	0.43Ω - 10Ω	—	—	
	0.66W*	—	110°C	±200	0.2Ω - 0.39Ω	0.2Ω - 10Ω	0.2Ω - 10Ω	
				±250	—	—	0.1Ω - 0.18Ω	
				±100	0.43Ω - 10Ω	—	—	

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

¹ The nominal resistance for SR731E (F:±1%), SR731J, 2A, 2B (0.1~0.43) and SR732E (0.1~0.39) is E-24 only

* Please use the derating curve based on the terminal part temperature in graph below.

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

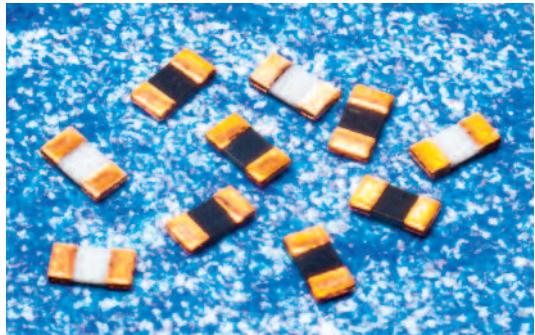
Performance Characteristics

Parameter	Requirement $\Delta R \pm(0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±1%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±1%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours
Sulfuration Test	±5%	±0.2%	Soaked in industrial oil with sulfur substance 3.5% contained, 105°C ± 3°C, 500 hours

Please refer to conventional products for characteristic data such as temperature rise.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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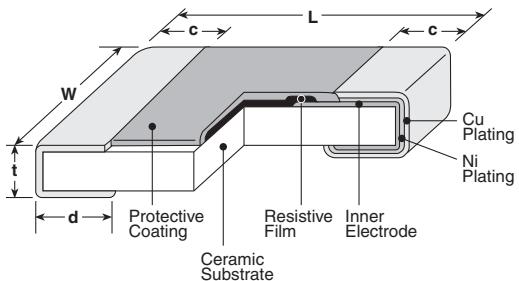


features

- Interlayer embedding in the multilayer substrate is applicable from the height of 0.13 to 0.14mm
- Cu via hole connection is applicable by the Cu electrode



dimensions and construction



Type (Inch Size Code)	L	Dimensions inches (mm)			
W	c	d	t		
1H (0201)	.024±.001 (0.6±0.03)	.012±.001 (0.3±0.03)	.009±.001 (0.23±0.03)	.009±.001 (0.23±0.03)	.005±.001 (0.13±0.02)
1E (0402)	.039±.002 (1.0±0.05)	.020±.002 (0.5±0.05)	.011±.002 (0.28±0.05)	.011±.002 (0.28±0.05)	.006±.001 (0.14±0.03)

ordering information

XR73H	1E	U	TWL	1001	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
XR73B XR73H	1H, 1E: 0.063W	U: CU	TWL: 2mm pitch plastic embossed TWA: 1mm pitch plastic embossed (1H only) For further information on packaging, please refer to Appendix A	±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	F: ±1% J: ±5%
XR73Z	1E	U	TWL		
Type	Power Rating	Termination Material	Packaging		
XR73Z	1H, 1E: 1A	U: CU	TWL: 2mm pitch plastic embossed TWA: 1mm pitch plastic embossed (1H only) For further information on packaging, please refer to Appendix A		

applications and ratings

XR73B, XR73H

Part Designation	Power Rating*	Rated Ambient Temp.	T.C.R. (x10 ⁻⁶ /K) Max.	Resistance Range		Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
1H	0.063W	70°C	±200	10Ω~1MΩ	10Ω~10MΩ	50V	100V	-55°C to +155°C
			±400	1.0Ω~9.1Ω**	1.0Ω~9.1Ω			
1E	0.063W	70°C	±100	10Ω~1MΩ	—	50V	100V	-55°C to +155°C
			±200	1.0Ω~9.76Ω 1.02MΩ~10MΩ	1.0Ω~10MΩ			

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

* The ratings will be for the surface mounted condition

** The nominal resistance value for XR73H1H (1Ω R 9.1Ω) is E24

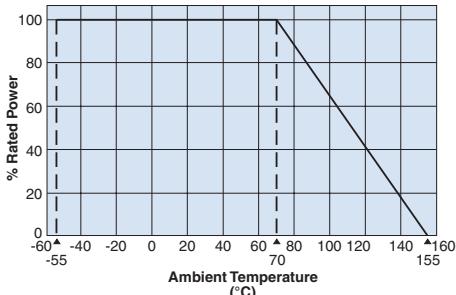
XR73Z

Part Designation	Resistance	Current Rating*	Rated Ambient Temp.	Maximum Overload Current	Operating Temp. Range
1H	50mΩ max.	1A	70°C	2A	-55°C to +155°C
1E	50mΩ max.	1A	70°C	2A	-55°C to +155°C

* The ratings will be for the surface mounted condition

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

Performance Characteristics

Parameter	XR73H, XR73B Requirement $\Delta R \pm (% + 0.05\Omega)$		XR73Z Requirement		Test Method
	Limit	Typical	Limit	Typical	
Resistance	Within specified tolerance	—	50mΩ max. after the test	15mΩ max. after the test	25°C
T.C.R.	Within specified T.C.R.	—	—	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	50mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	Rated Voltage x 2.5 for 5 seconds 1H: Rated voltage (DC) x 2 for 5 seconds
Rapid Change of Temperature	±1%	±0.5%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±3%	±1.5%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	40°C ± 2°C, 90%~95%RH, 1000 hours; 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±1%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.5%	100mΩ max. after the test	1E: R 20mΩ 1H: R 40mΩ	+155°C, 1000 hours

The performance will be for the surface mounted condition.

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

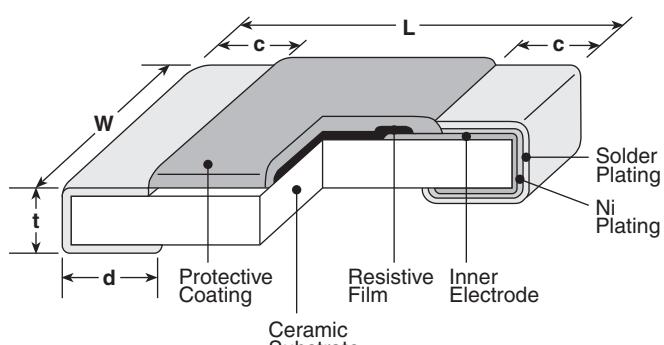
11/06/19



features

- Performs like RK73 under normal conditions
- Fuses when overloaded
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Recognized by safety standard UL1412. (0603 (1J) is not recognized)

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.02±.004 (0.5±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 +.008 -.004 (0.3 +.0.2 -.1)	
2B (1206)		.063±.008 (1.6±0.2)			
2E (1210)		.126±.008 (3.2±0.2)	.102±.008 (2.6±0.2)	.02±.012 (0.5±0.3)	.016 +.008 -.004 (0.4 +.0.2 -.1)
2H (2010)	.197±.008 (5.0±0.2)	.098±.008 (2.5±0.2)			.024±.004 (0.6±0.1)
3A (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)			

ordering information

RF73	2B	T	TD	100	J
Type	Size Code	Termination Material	Packaging	Nominal Resistance	Tolerance
1J: 0603 2A: 0805 2B: 1206 2E: 1210 2H: 2010 3A: 2512	1J: 0603 2A: 0805 2B: 1206 2E: 1210 2H: 2010 3A: 2512	T: Sn (Other termination styles may be available, please contact factory for options)	TD: 7" paper tape (0603, 0805, 1206, 1210: 5,000 pieces/reel) TE: 7" embossed plastic (0805, 1206, 1210, 2010, 2512: 4,000 pieces/reel)	2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	J: ±5%

For further information on packaging, please refer to Appendix A.

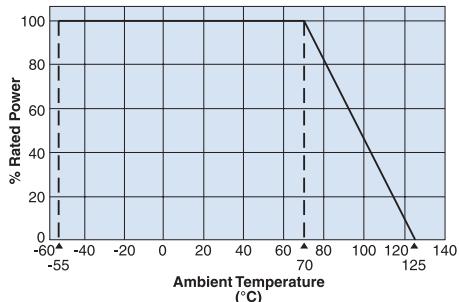
applications and ratings

Part Designation	Power Rating @ 70°C	T.C.R. (ppm/°C) Max.	Resistance Range E-24	Resistance Tolerance	Maximum Open Circuit Voltage	Fusing Characteristics					Fusing Time	Operating Temperature Range
Fusing Power												
RF731J	0.063W	+1000 ~ -500 (1.0Ω-3.3Ω) ±500 (3.6Ω-100Ω)	1Ω-100Ω	J: ±5%	50V	—	2.6W 1.0Ω	2.4W 1.1Ω-20Ω	2.1W 22Ω-100Ω	—	60 sec. max.	-55°C to +125°C
RF732A	0.1W	3.0W 0.2Ω-0.47Ω	2.6W 0.51Ω-1.0Ω			2.4W 1.1Ω-20Ω	2.1W 22Ω-100Ω	2.0W 110Ω-510Ω				
RF732B	0.125W	3.75W 0.2Ω-0.47Ω	2.875W 0.51Ω-10Ω			2.5W 11Ω-24Ω	2.0W 27Ω-100Ω	1.75W 110Ω-510Ω				
RF732E	0.25W	+1000 ~ -500 (0.2Ω-4.3Ω) ±500	4.5W 0.2Ω-0.47Ω			4.1W 0.51Ω-4.7Ω	3.5W 5.1Ω-27Ω	3.2W 30Ω-100Ω	3.0W 110Ω-510Ω			
RF732H	0.50W	5.5W 0.2Ω-0.47Ω	5.0W 0.51Ω-4.7Ω			4.0W 5.1Ω-27Ω	3.5W 30Ω-100Ω	3.2W 110Ω-510Ω				
RF733A	1.0W	6.5W 0.2Ω-0.47Ω	6.0W 0.51Ω-4.7Ω			5.0W 5.1Ω-30Ω	4.5W 33Ω-100Ω	4.0W 110Ω-510Ω				

Rated ambient temperature: +70°C

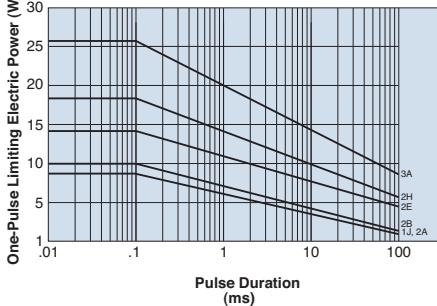
environmental applications

Derating Curve

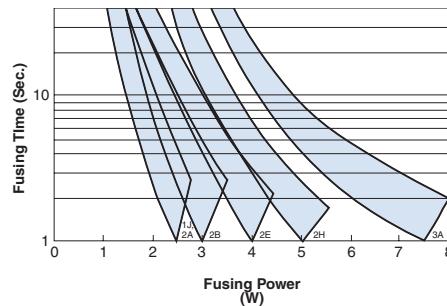


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

One-Pulse Limiting Electric Power



Example of Fusing Characteristics



Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.1\Omega)$	Test Method
Parameter	Limit	Typical
Resistance	Within specified tolerance	—
T.C.R.	Within specified T.C.R.	—
Overload (Short Time)	±5.0%	±2.0%
Resistance to Solder Heat	±3.0%	0.5%
Rapid Change of Temperature	±0.5%: 2A~3A ±3.0%: 1J	±0.3%: 2A~3A ±0.6%: 1J
Moisture Resistance	±5.0%	±2.0%
Endurance at 70°C	±5.0%	±1.0%
High Temperature Exposure	±1.0%	±0.6%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

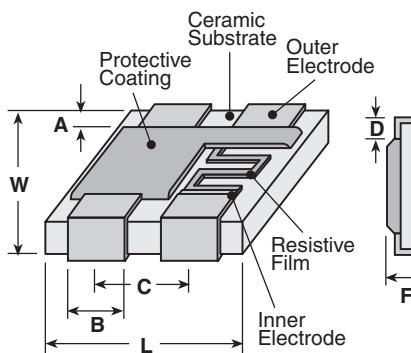
11/21/16



features

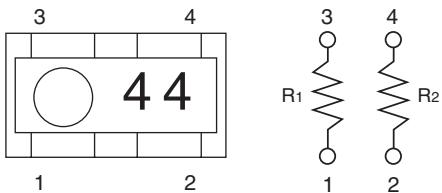
- Metal film chip network resistors
- Excellent in relative T.C.R. and relative accuracy
- Pair resistors for high precision OP-amplifiers
- As custom products, any pairs between 1kΩ and 100kΩ are available on request
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm)							
	A	B	C	D	E	F	L	W
CNN	.016±.012 (0.4±0.3)	.028±.006 (0.7±0.15)	.050 (1.27)	.016±.012 (0.4±0.3)	.012±.008 (0.3±0.2)	.020±.004 (0.5±0.1)	.10±.008 (2.54±0.2)	.079±.008 (2.0±0.2)

circuit schematic



	Resistance					
R1	1kΩ	1kΩ	1kΩ	10kΩ	10kΩ	100kΩ
R2	1kΩ	10kΩ	100kΩ	10kΩ	100kΩ	100kΩ

CNN: Custom products of any pairs between 1kΩ and 100kΩ are available on request

	Marking					
R1*	3	3	3	4	4	5
R2**	3	4	5	4	5	5

* First marking number

** Second marking number

ordering information

CNN	2A	2	T	TE	103/103	B	A
Type	Style	Number of Elements	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	Resistance Ratio
CNN		2	T: Sn (Other termination styles may be available, please contact factory for options)	TE: 4 mm pitch embossed plastic	2 significant figures + multiplier	B: ±0.1% C: ±0.25%	A: 0.05% B: 0.1%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

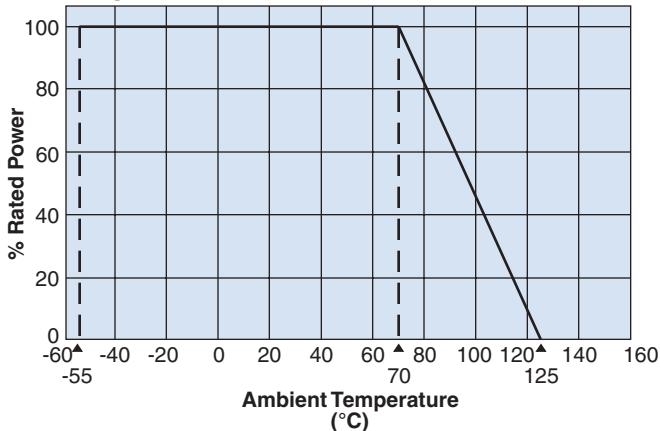
11/14/17

applications and ratings

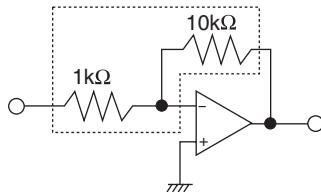
Part Designation	Power Rating w/Element	Resistance (Ω)	Resistance Tolerance		T.C.R. (ppm/ $^{\circ}$ C)		Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
			Absolute	Relative	Absolute	Relative				
CNN	0.05	1K,10k,100k	B: $\pm 0.1\%$ C: $\pm 0.25\%$	A: $\pm 0.05\%$ B: $\pm 0.1\%$	± 25	5	50V	100V	+70°C	-55°C to +125°C

environmental applications

Derating Curve



Application Example

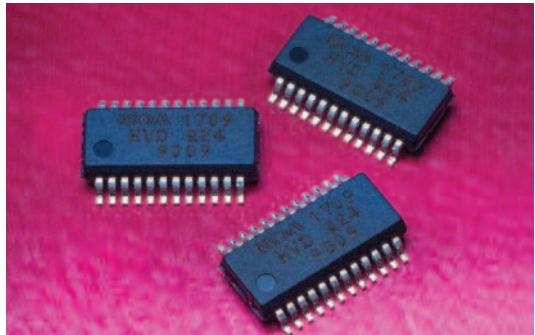


Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\%)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C, +25°C/+125°C
Overload (Short time)	$\pm 0.1\%$	$\pm 0.01\%$	Rated voltage x 2.5 or Max. overload volume, whichever is less, for 5 seconds
Resistance to Soldering Heat	$\pm 0.1\%$	$\pm 0.02\%$	260°C $\pm 5^{\circ}$ C, 10 seconds ± 1 second
Rapid Change of Temperature	$\pm 0.25\%$	$\pm 0.01\%$	-55°C (30 minutes), +125°C (30 minutes), 5 cycles
Moisture Resistance	$\pm 0.25\%$	$\pm 0.03\%$	40°C $\pm 2^{\circ}$ C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	$\pm 0.25\%$	$\pm 0.03\%$	70°C $\pm 2^{\circ}$ C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	$\pm 0.25\%$	$\pm 0.02\%$	+125°C, 100 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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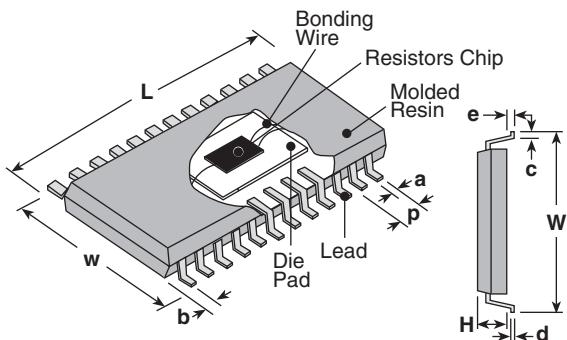


features

- High precision high voltage divider
- Maximum resistance value 11.5MΩ, maximum working voltage 1000V, maximum resistance ratio 1:1000
- Relative precision of pair resistors are guaranteed
- Higher integration saves board space and overall assembly costs
- Excellent reliability with standard molded IC package
- Suitable for reflow soldering
- Products meet EU RoHS requirements
- AEC-Q200 qualified



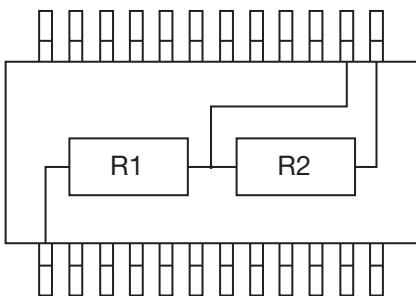
dimensions and construction



Type	Dimensions inches (mm)				
	L ±0.2	W ±0.2	w ±0.2	H ±0.2	p ±0.1
HVD	.341 (8.66)	.236 (5.99)	.150 (3.81)	.063 (1.60)	.025 (0.635)

Type	a ±0.1	b ±0.1	c ±0.2	d ±0.1	e ±0.1
HVD	.010 (0.25)	.033 (0.84)	.026 (0.66)	.008 (0.20)	.007 (0.18)

circuit schematic



ordering information

HVD	Q24	T	TEB	9XXX
Circuit Code	Package Symbol	Termination Surface Material	Packaging	Custom Code
HVD: High Voltage Divider	Package type symbol + Number of pins	T: Sn	TEB: Embossed plastic	

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/29/18

applications and ratings

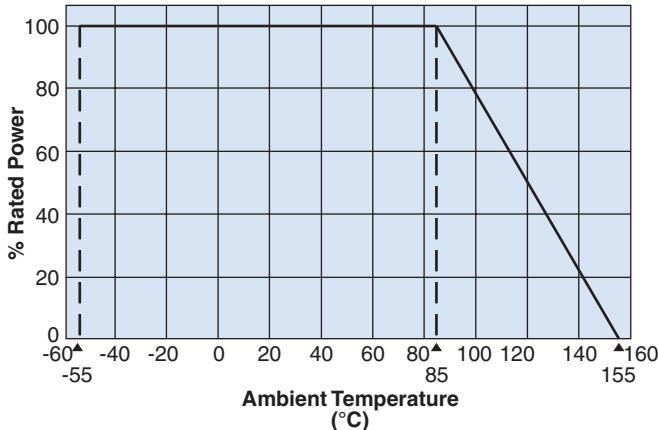
Part Designation	Power Rating	Power Rating /Resistor Element	Resistance Range (Max. Resistance Ratio 1:1000)	Absolute Resistance Tolerance	Relative Resistance Tolerance	T.C.R. (X10 ⁻⁶ /K)	Relative T.C.R. Tracking	Rated Ambient Temperature	Operating Temperature Range
R1	1000V	250mW	0.5MΩ ~ 11.5MΩ	±0.1%, ±0.25%, ±0.5%, ±1%	0.1% 0.25% 0.5%	±25 ±50	10 25	+85°C	-55°C to +155°C
R2	15V	50mW	1.5kΩ ~ 1MΩ	—					

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower

Guaranteed value differs depending on resistance value

environmental applications

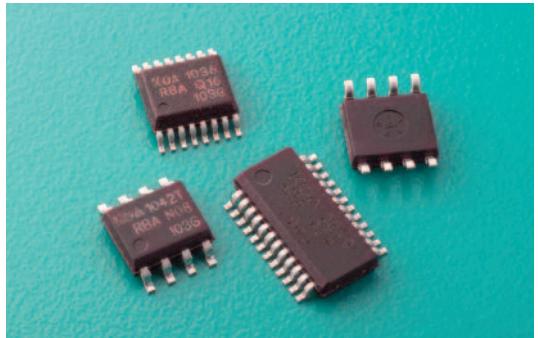
Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the derating curve.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.05Ω)	Test Method
Resistance	Within specified tolerance	—
T.C.R.	Within specified T.C.R.	+25°C/-55°C, +25°C/+155°C
Resistance to Soldering Heat	±0.1%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±0.1%	-55°C (30 minutes), +155°C (30 minutes), 1000 cycles
Moisture Resistance	±0.1%	85°C ± 2°C, 85% ± 5% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 85°C	±0.1%	85°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±0.1%	+155°C, 1000 hours

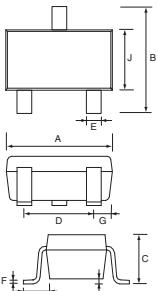


features

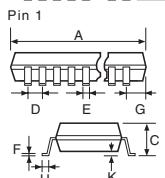
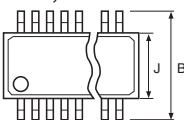
- Thin film (metal film) resistor array on silicon wafer
- Excellent resistance matching, TCR tracking and stabilities
- Custom circuits are available with flexible layout (Different resistance combinations possible)
- High integration saves board space and overall assembly costs
- Excellent reliability with standard molded IC package
- Suitable for reflow soldering
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction

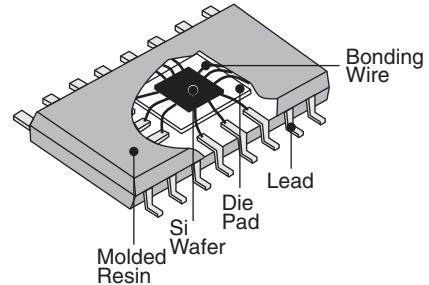
SOT-23



QSOP, SOIC-N



Package Symbol	Package	Pins	Dimensions inches (mm)									
			A ±0.2	B ±0.2	C ±0.2	D ±0.1	E ±0.1	F ±0.1	G ±0.1	H ±0.2	J ±0.2	K ±0.1
S03	SOT-23	3	.115 (2.92)	.091 (2.3)	.037 (0.95)	.075 (1.910)	.017 (0.44)	.005 (0.13)	.020 (0.51)	.021 (0.53)	.051 (1.3)	.004 (0.11)
Q16	QSOP	16	.193 (4.90)			.236 (5.99)	.063 (1.60)	.010 (0.25)	.008 (0.20)	.008 (0.20)		
		20	.341 (8.66)							.058 (1.47)		
		24								.033 (0.84)		
Q20	SOIC-N	8	.190 (4.83)							.026 (0.66)		.150 (3.81)
		14	.341 (8.66)							.020 (0.52)		
		16	.390 (9.91)									
Q24												



ordering information

RBA, RBB

RBA	Q20	T	TEB	1002	B	E	B	T
Circuit Code	Package Symbol	Termination Material	Packaging	Nominal Resistance	Absolute Tolerance	T.C.R.	Relative Res. Toler.	T.C.R. Tracking
RBA: Bussed resistor network RBB: High speed bussed network	Package type symbol + number of pins Q16, Q20, Q24: QSOP N08, N14, N16: SOIC narrow	T: Sn (L: Sn/Pb)	TEB: 13" embossed plastic	B,C,D,F: 4 digits G,J: 3 digits	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% J: ±5%	T: ±10 E: ±25 C: ±50 H: ±100	A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% Blank: Not specified	Y: ±05 T: ±10 E: ±25 C: ±50 Blank: Not specified

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

3/03/17

ordering information (continued)

RTX

RTX	S03	T	TE	7011
Circuit Code	Package Symbol	Termination Material	Packaging	Custom Code
RTX: SOT-23 Resistor network	Package type symbol + number of pins	T: Sn (L: Sn/Pb)	TE: 7" embossed plastic (RTX, RTY SOT-23 only)	

RDA, RDB

RDA	Q20	T	TEB	471J	511J	E
Circuit Code	Package Symbol	Termination Material	Packaging	Nominal Resistance & Tolerance of R1	Nominal Resistance & Tolerance of R2	T.C.R.
RDA: Dual terminator network RDB: Differential terminator network	Package type symbol + number of pins Q16, Q20: QSOP N16: SOIC narrow	T: Sn (L: Sn/Pb)	TEB: 13" embossed plastic	3 digits: G: ±2%, J: ±5%	3 digits: G: ±2%, J: ±5%	E: ±25 C: ±50 H: ±100

ratings

Package		QSOP			SOIC		SOT-23	
Package Symbol		Q16	Q20	Q24	N08	N14	N16	S03
Package Power Rating		0.8W	1.0W	1.0W	0.4W	0.6W	0.8W	0.2W
Resistance Range	10Ω ~ 1kΩ				Power rating 200mW/resistor element *			
	1.1kΩ ~				Power rating 50mW/resistor element *			
Max. Working Voltage					100V			
Rated Voltage		√ Rated power x nominal resistance value, rated voltage should not exceed max. working voltage						
Rated Ambient Temp.					+70°C			
Operating Temp. Range					-55°C ~ +125°C **			

Above ratings are based on the thermal resistance using multi-layer circuit board (EIA/JESD51). For mounting on a mono-layer board, power derating shall be needed. Please contact us about conditions.

* Total power consumption of all elements should not exceed the package power rating.

** About operating temperature range -55°C ~ +155°C. We can provide custom devices. Please contact us.

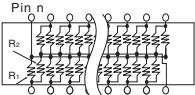
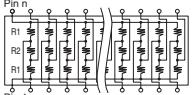
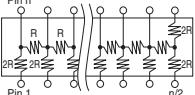
applications and ratings

Circuit Code	Circuit Schematics	Number of Pins	T.C.R. (x10 ⁻⁶ /K)	Resistance Range (Ω) E24 & Absolute Tolerance	
				F: ±1%	G: ±2%, J: ±5%
RBA		8, 14, 16, 20, 24	E: ±25	100 ~ 100k	100 ~ 100k
			C: ±50	51 ~ 100k	51 ~ 100k
			H: ±100	30 ~ 100k	10 ~ 100k
RBB		8, 14, 16, 20, 24	E: ±25	100 ~ 100k	100 ~ 100k
			C: ±50	51 ~ 100k	51 ~ 100k
			H: ±100	30 ~ 100k	10 ~ 100k
RTX, RTY		3(SOT- 23 only)	E: ±25	100 ~ 40k	100 ~ 40k
			C: ±50	51 ~ 40k	51 ~ 40k
			H: ±100		

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/30/17

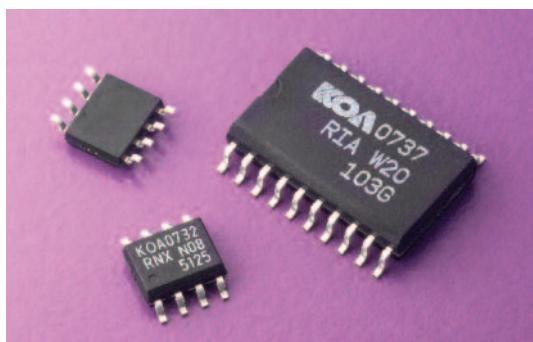
applications and ratings (continued)

Circuit Code	Circuit Schematics	Number of Pins	T.C.R.	Resistance Range (Ω) E24 & Absolute Tolerance G: $\pm 2\%$, J: $\pm 5\%$
RDA		16, 20	E: ± 25	R1 = 150 ~ 10k R1: R2 = 1:1 ~ 1:4
			C: ± 50	
			H: ± 100	
RDB		16, 20	E: ± 25	R1 = 150 ~ 10k R1: R2 = 1:1 ~ 1:4
			C: ± 50	
			H: ± 100	
RLA		14, 16	H: ± 100	1k ~ 30k

environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.05\Omega)$		Test Method
	Limit	Typical	
Resistance	Within specified tolerance		25°C
T.C.R.	Within specified T.C.R.		+25°C/-55°C, +25°C/+125°C
Resistance to Soldering Heat	$\pm 0.1\%$	$\pm 0.05\%$	260°C $\pm 5^\circ\text{C}$, 10 seconds ± 1 second
Rapid Change of Temperature	$\pm 0.5\%$	$\pm 0.05\%$	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	$\pm 0.5\%$	$\pm 0.05\%$	40°C $\pm 2^\circ\text{C}$, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	$\pm 0.25\%$	$\pm 0.05\%$	70°C $\pm 2^\circ\text{C}$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	$\pm 0.25\%$	$\pm 0.1\%$	+125°C, 1000 hours



features

- High precision resistor networks
- Combination of different resistance is available for custom circuit
- Relative resistance tolerance 0.05%~
- TCR tracking $5 \times 10^{-6}/K$ ~
- Marking: Black body color

ordering information

RIA

RIA	Q20	T	TEB	1002	B	E	B	T
Circuit Code	Package Symbol	Termination Material	Packaging	Nominal Resistance	Absolute Tolerance	T.C.R.	Relative Res. Toler.	T.C.R. Tracking
RIA: Isolated resistor network	Package type symbol + number of pins Q16, Q20, Q24: QSOP N08, N14, N16: SOIC narrow	T: Sn (L: Sn/Pb)	TEB: 13" embossed plastic	4 digits	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: ±10 E: ±25 C: ±50 H: ±100	A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% G: ±2% Blank: Not specified	Y: ±05 T: ±10 E: ±25 C: ±50 Blank: Not specified

RNX

RIA	Q20	T	TEB	5128
Circuit Code	Package Symbol	Termination Material	Packaging	Custom Code
RNX: Custom Resistor network	Package type symbol + number of pins	T: Sn (L: Sn/Pb)	TEB: 13" embossed plastic	

For further information on packaging, please refer to Appendix A.

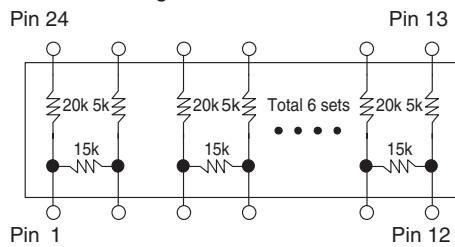
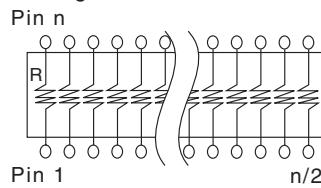
ratings

Product Code	Number of Pins	T.C.R.	Resistance Range () (E24) and Resistance Tolerance					Relative Resist. Tol.	TCR Tracking
			B: ±0.1%	C: ±0.25%	D: ±0.5%	F: ±1%	G: ±2%, J: ±5%		
RIA RNX	8, 14, 16, 20, 24	T: ±10	510Ω ~ 100kΩ	510Ω ~ 100kΩ	510Ω ~ 100kΩ	510Ω ~ 100kΩ	510Ω ~ 100kΩ	0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%	5, 10, 25, 50
		E: ±25			100Ω ~ 510kΩ	100Ω ~ 510kΩ	100Ω ~ 510kΩ		
		C: ±50			51Ω ~ 510kΩ	51Ω ~ 510kΩ	51Ω ~ 510kΩ		
		H: ±100			30Ω ~ 510kΩ	10Ω ~ 510kΩ	10Ω ~ 510kΩ		

Please ask about your custom devices and circuits (Different resistance combinations available). Depending on the circuit and package, much higher resistances are possible. For RIA20, 24 pin, highest resistance value/element is up to 100kΩ

circuit schematic

RIA - High Precision Resistor Networks RNX - Custom High Precision Resistor Networks

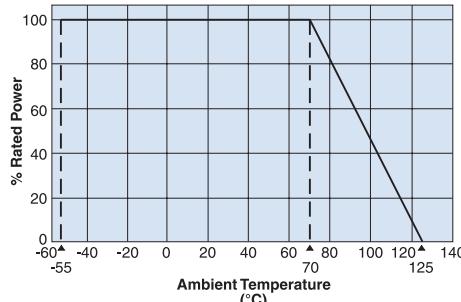


Please ask about your custom devices and circuits.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

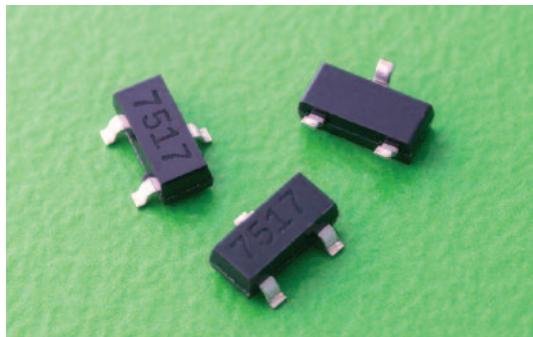
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

3/03/17



features

- Expanded flexibility of component layout
- Relative precision of pair resistors are guaranteed
- Relative resistance tolerance 0.05% ~
- TCR tracking $5 \times 10^{-6} K$ ~

ordering information

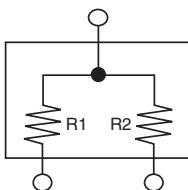
RTY	S03	T	TE	7516
Circuit Code	Package Symbol	Termination Material	Packaging	Custom Code
RTY: SOT-23 Resistor network	Package type symbol + number of pins	T: Sn (L: Sn/Pb)	TE: 7" embossed plastic	

ratings

Product Code	T.C.R.	Resistance Range (Ω) (E24) and Resistance Tolerance					Relative Resist. Tol.	TCR Tracking
		B: $\pm 0.1\%$	C: $\pm 0.25\%$	D: $\pm 0.5\%$	F: $\pm 1\%$	G: $\pm 2\%$, J: $\pm 5\%$		
RTY	T: ± 10	1k Ω ~ 40k Ω	1k Ω ~ 40k Ω	1k Ω ~ 40k Ω	1k Ω ~ 40k Ω	1k Ω ~ 40k Ω	0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%	5, 10, 25, 50
	E: ± 25	1k Ω ~ 150k Ω	1k Ω ~ 150k Ω	100 Ω ~ 150k Ω	100 Ω ~ 150k Ω	100 Ω ~ 150k Ω		
	C: ± 50			51 Ω ~ 200k Ω	51 Ω ~ 200k Ω	51 Ω ~ 200k Ω		
	H: ± 100			30 Ω ~ 200k Ω	30 Ω ~ 200k Ω	30 Ω ~ 200k Ω		

Please ask about your custom devices and circuits. (Different resistance combination available) Depending on the circuit and package, much higher resistances are possible. For RIA20, 24 pin, highest resistance value/element is up to 100k Ω

circuit schematic



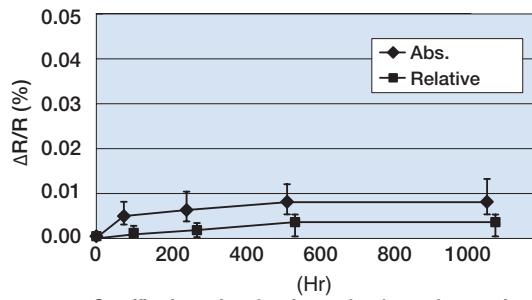
ratings

Package Symbol	Package	Number of Pins	Package Power Rating (W)
S03	SOT-23	3	0.2

typical characteristics

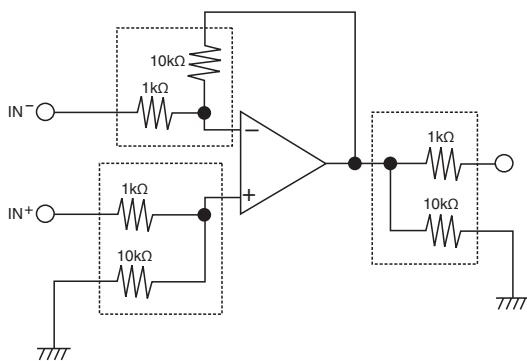
Endurance at 70°C (Typical: 1k Ω , 8 resistors/package)

Endurance at 70°C



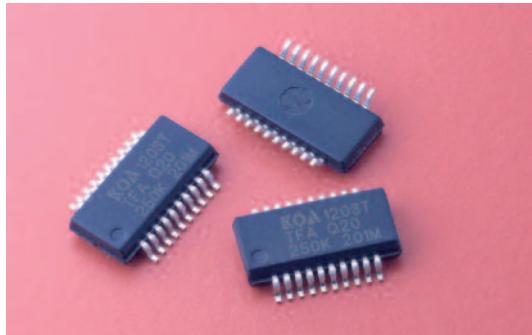
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

example of application



merit of thin film resistor networks

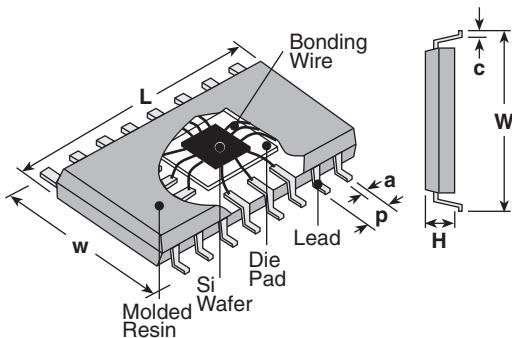
Metal thin film resistors formed by sputtering method have very similar characteristic among pair resistors. When their characteristic of T.C.R., aging, etc. for relative precision is requested, it's very suitable to apply thin film resistor networks to utilize the characteristic as above.



features

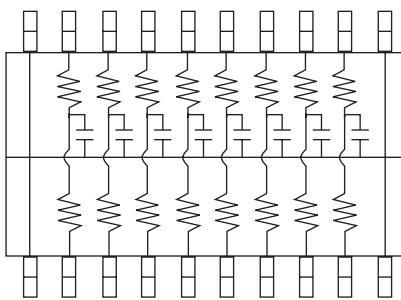
- Thin film construction
- Surface mount package
- Stable resistor technology
- High component density
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction

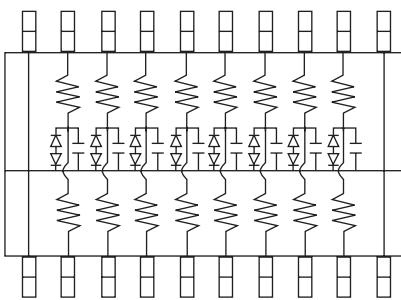


Package Code	Total Power	Pins	Dimensions inches (mm)						
			L ± 0.2	W ± 0.2	w ± 0.2	H ± 0.2	p ± 0.1	a ± 0.1	c ± 0.1
Q20	1 watt	20	.341 (8.66)	.236 (5.99)	.150 (3.81)	.063 (1.60)	.025 (0.635)	.010 (0.25)	.026 (0.66)
Q24	1 watt	24	.341 (8.66)	.236 (5.99)	.150 (3.81)	.063 (1.60)	.025 (0.635)	.010 (0.25)	.026 (0.66)

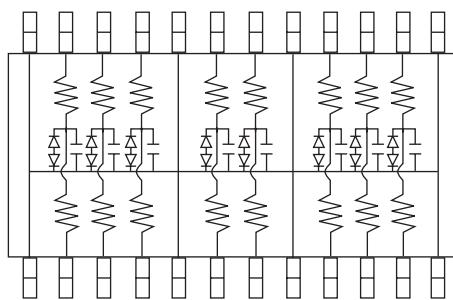
circuit schematic



TFA: 20 pins



TFB: 20 pins



TFB: 24 pins

ordering information

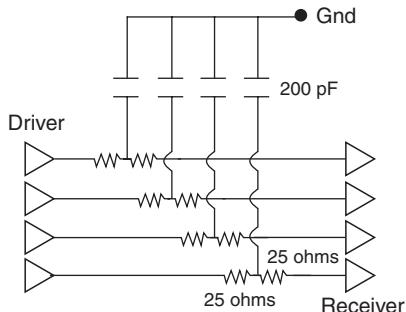
TFB	Q20	T	TEB	250	K	/	201	M
Type	Package Code	Termination Material	Packaging	Nominal Resistance	Tolerance		Nominal Capacitance	Tolerance
TFA TFB	Reference above table	T: Sn (Other termination styles available, contact factory for options)	TEB: 13" embossed plastic tape	2 significant digits + number of zeros	K: $\pm 10\%$		2 significant digits + number of zeros	M: $\pm 20\%$

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

1/24/14

Parallel Termination



applications and ratings

Part Designation	Power Rating @ 70°C (Per Element)	T.C.R. (ppm/°C)	Capacitor Voltage Rating	Operating Temperature Range	Resistance Range Ω (E-24)	Resistance Tolerance	Capacitor Range pF (E-24)	Capacitor Tolerance	ESD* Rating IEC 61000-4-2	Diode* Breakdown Voltage (@1ma)
TFA TFB	100mW	±200	20V	-55°C to +155°C	10 ~ 1,000	K: ±10%	33 ~ 400pF	M: ±20%	8kV*	6.5v Min.

* TFB only

environmental applications

Performance Characteristics

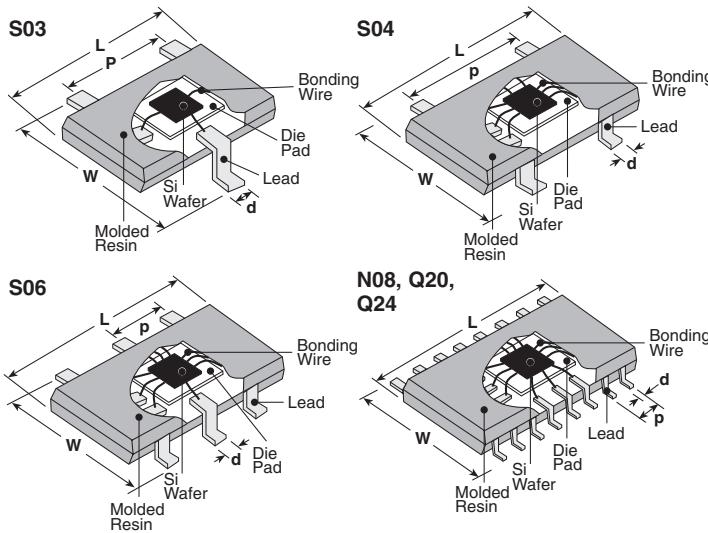
Parameter	Maximum Δ R	Test Method
Resistance to Soldering Heat	+0.25%	MIL-R-55342 4.7.7
Short Time Overload	+0.50%	MIL-R-55342 4.7.5
Moisture Resistance	+0.50%	MIL-STD-202 method 103
Thermal Shock	+0.50%	MIL-STD-202 method 107
H.A.S.T.	+1%	2 Atm., 121°C, 96 hrs



features

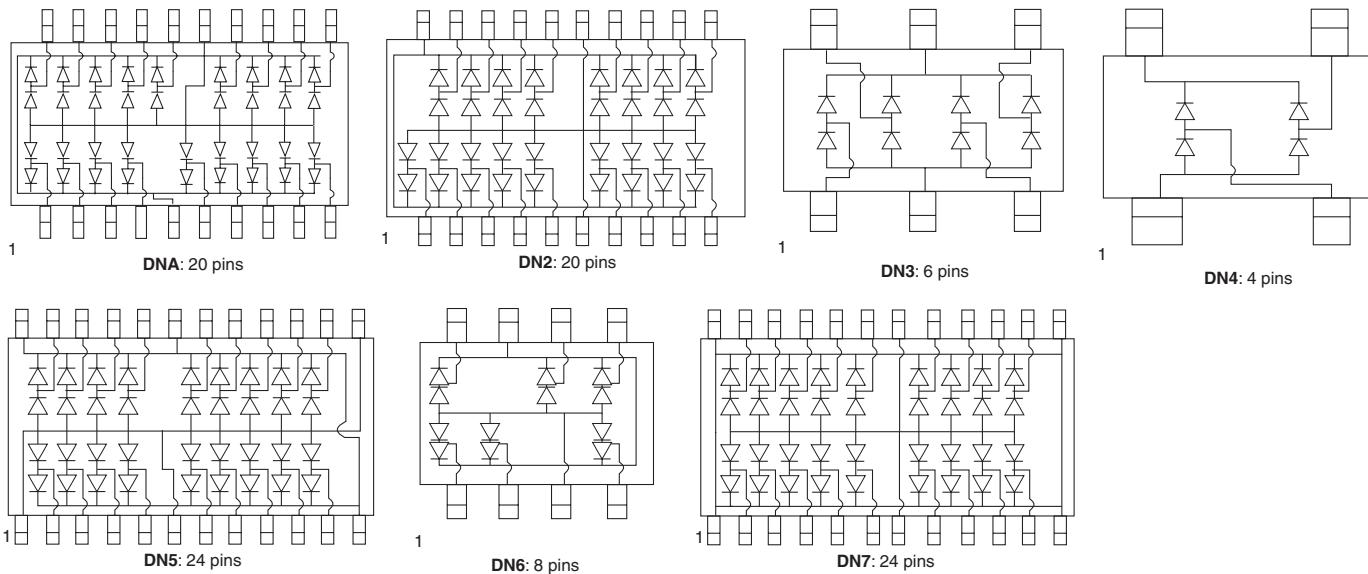
- Fast reverse recovery time
- Fast turn on time
- Low capacitance
- SMD packages
- 16 kV IEC61000-4-2 capable
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Package Code	Total Power	Pins	Dimensions inches (mm)				
			L ±0.2	W ±0.2	p ±0.1	Pkg Ht ±0.2	d ±0.05
S03	225mw	3	.115 (2.92)	.091 (2.30)	.075 (1.91)	.037 (0.95)	.017 (0.43)
S04	225mw	4	.115 (2.92)	.091 (2.30)	.075 (1.91)	.037 (0.95)	.017 (0.43)
S06	225mw	6	.115 (2.92)	.110 (2.80)	.037 (0.95)	.037 (0.95)	.017 (0.43)
N08, Q20, Q24	400mw	8	.190 (4.83)	.236 (5.99)	.050 (1.27)	.063 (1.60)	.016 (0.41)
Q20	1000mw	20	.341 (8.66)	.236 (5.99)	.025 (0.635)	.063 (1.60)	.010 (0.25)
Q24	1000mw	24	.341 (8.66)	.236 (5.99)	.025 (0.635)	.063 (1.60)	.010 (0.25)

circuit schematic



For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/28/10

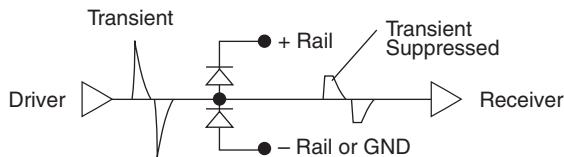
ordering information

DNA	Q20	T	TEB
Type	Package Symbol	Termination Material	Packaging
DNA			
DN2			
DN3			
DN4			
DN5			
DN6			
DN7			
	Package type symbol + number of pins		
	S03: 3 pin SOT23	T: Sn	
	S04: 4 pin SOT23	(Other termination styles available, contact factory for options)	
	S06: 6 pin SOT23		
	N08: 8 pin Narrow SOIC		
	Q20: 20 pin QSOP		
	Q24: 24 pin QSOP		

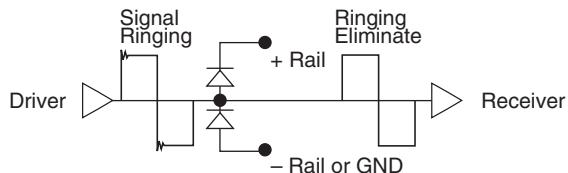
For further information on packaging, please refer to Appendix A.

application schematic

ESD Suppression



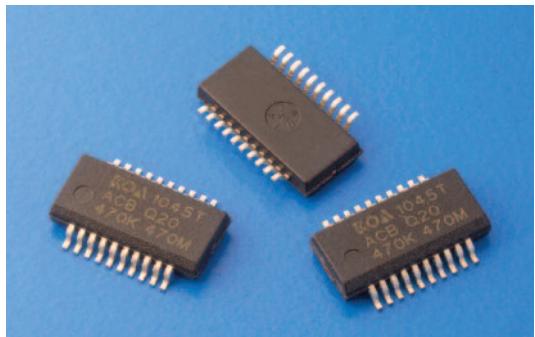
Signal Conditioning



applications and ratings

Part Designation	Forward Voltage 1F=50ma	Reverse Breakdown Voltage 1R=1ma	Leakage Current @7V	Capacitance @1Mhz	ESD Voltage Capability IEC 61000-4-2	Operating Temperature Range	Continuous Forward Current*
DN(X)	0.4 to 1.2V	7.2V	1uA	2pF	16kV	-55°C to +155°C	50mA

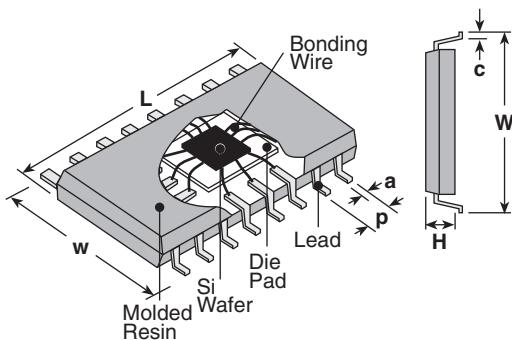
* One diode conducting



features

- Thin film construction
- Surface mount package
- Stable resistor technology
- High component density
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

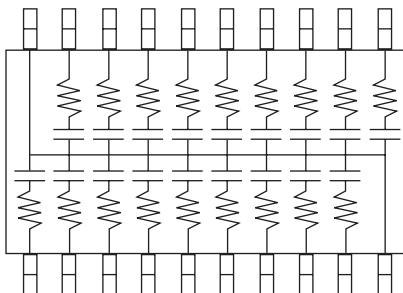
dimensions and construction



Package Code	Total Power	Pins	Dimensions inches (mm)					
			L ±0.2	W ±0.2	w ±0.2	H ±0.2	p ±0.1	a ±0.1
Q20	1 watt	20	.341 (8.66)	.236 (5.99)	150 (3.81)	.063 (1.60)	.025 (0.635)	.010 (0.25)
Q24	1 watt	24	.341 (8.66)	.236 (5.99)	150 (3.81)	.063 (1.60)	.025 (0.635)	.010 (0.25)

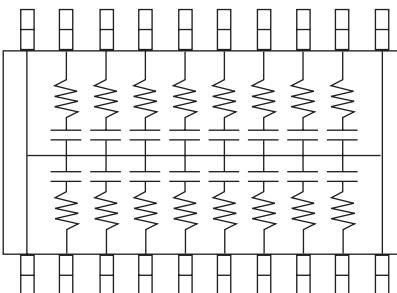
circuit schematic

Single Common



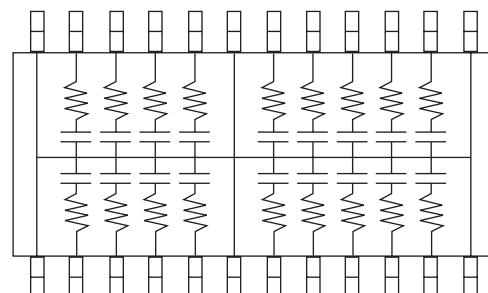
ACB: 20 pins

4 Commons



ACC: 20 pins

6 Commons



ACD: 24 pins

ordering information

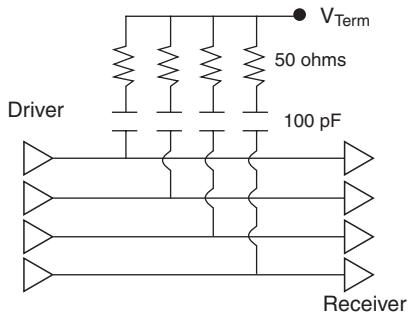
ACB	Q20	T	TEB	500	K	/	101	M
Type	Package Code	Termination Material	Packaging	Nominal Resistance	Tolerance		Nominal Capacitance	Tolerance
ACB ACC ACD	Reference above table	T: Sn (Other termination styles available, contact factory for options)	TEB: 13" embossed plastic tape	2 significant digits + number of zeros	K: ±10%		2 significant digits + number of zeros	M: ±20%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

1/27/14

Parallel Termination



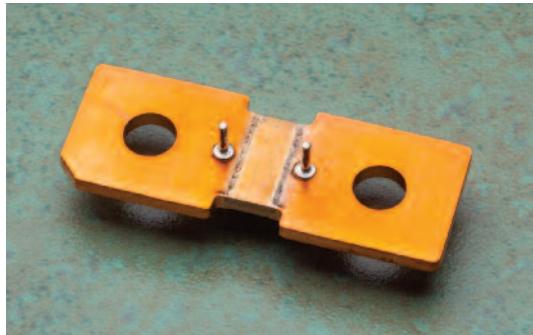
applications and ratings

Part Designation	Power Rating @ 70°C (Per Element)	T.C.R. (ppm/°C)	Capacitor Voltage Rating	Operating Temperature Range	Resistance Range (E-24)	Resistance Tolerance	Capacitor Range pF (E-24)	Capacitor Tolerance
ACB ACC ACD	100mW	±200	20V	-55°C to +155°C	10 ~ 1,000	K: ±10%	33 ~ 400pF	M: ±20%

environmental applications

Performance Characteristics

Parameter	Maximum ΔR	Test Method
Resistance to Soldering Heat	+0.25%	MIL-R-55342 4.7.7
Short Time Overload	+0.50%	MIL-R-55342 4.7.5
Moisture Resistance	+0.50%	MIL-STD-202 method 103
Thermal Shock	+0.50%	MIL-STD-202 method 107
H.A.S.T.	+1%	2 Atm., 121°C, 96 hrs



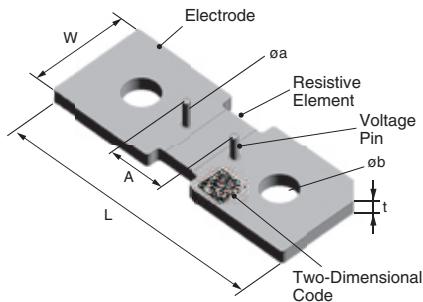
features

- Ultra low resistance, suitable for large current sensing
- Excellent T.C.R. achieved ($50\pm25 \times 10^{-6}/K$)
- Correct electric current detection by a voltage pin is possible
- Bus bar and cable can be screwed on
- 2D code means individual resistance information
- Products meet EU RoHS requirements
- AEC-Q200 Qualified

EU
RoHS
C O M P L I A N T

current
sense

dimensions and construction*1



Type (Inch Size Code)	Resistance (Ω)	L	Dimensions inches (mm)				
			W	A	oa	ob	t
HSAN2P402 2M5	50 μ	.866±.010 (22.0±0.25)					
	100 μ						
	200 μ	.591±.010 (15.0±0.25)	.335±.008 (8.5±0.2)	.039±.008 (1.0±0.2)	.213±.004 (5.4±0.1)		.039±.008 (1.0±0.2)

*1 Contact KOA factory for custom type request

ordering information

HS	A	N	2P	4015
Type	Size	Surface Condition	Number of Voltage Pin	Outward Form Size
HS	A: 5mm x 11mm	N: No surface treatment	0P: 0 pin *2 2P: 2 pin	4022: 50 μ Ω ** 4015: 100 μ Ω 200 μ Ω Length x Width *1
M5	PT	L10	J	Y
Fastening Hole	Packing Form	Nominal Resistance	Resistance Tolerance	2D Code
M5: M5 Hole *1	PT: Tray	50U: 50 μ Ω ** L10: 100 μ Ω L20: 200 μ Ω	J: ±5%	Nil: Non code Y: With Resistance Value

** Under Development

*1 Contact KOA factory for custom type request

*2 Standard voltage pin: ϕ 1mm, length 4mm, Sn plating. Contact KOA factory for custom type request

Contact KOA factory when you have control request for environmental hazardous material other than the substance specified by EU-RoHS

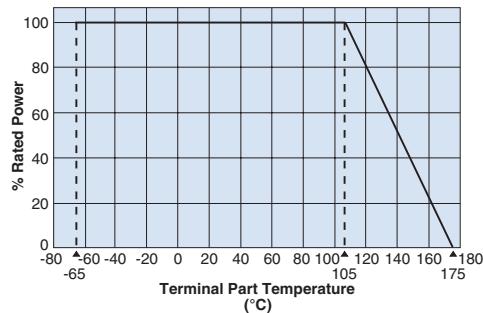
applications and ratings

Part Designation	Power Rating* ³	T.C.R. (X 10 ⁻³ /K)	Resistance Range (Ω)	Rated Terminal Part Temp.	Operating Temp. Range
HSAN2P	50W (1000A Under Development)	50±25	50μ	105°C	-65°C to +175°C
	36W (600A)		100μ		
	18W (300A)		200μ		

*3 A power rating shall be guaranteed with a method shown in the item (: Performance)

environmental applications

Derating Curve



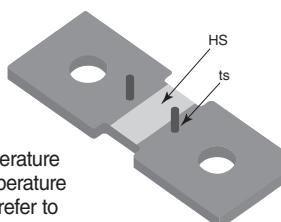
For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Thermal Resistance

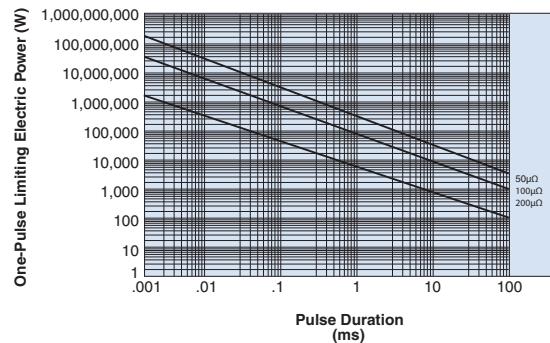
Resistance (Ω)	R _{th} (°C/W)
50μ	0.57
100μ	1.2
200μ	2.3

$$R_{th} = (Hs-ts)/Power$$



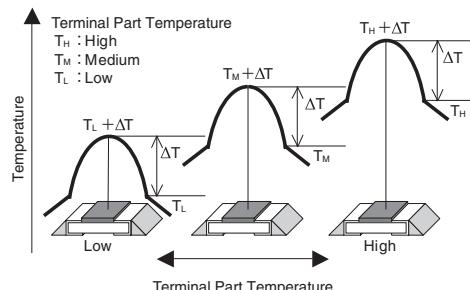
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.



Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.005\Omega)$ Limit	Test Method
T.C.R.	Within specified T.C.R.	50μΩ: +25°C/+125°C; 100μΩ, 200μΩ: +25°C/+100°C
Rapid Change of Temperature	±0.5%	-55°C (30 minutes), +150°C (30 minutes), 1000 cycles
Endurance at 105°C and less of Terminal Part Temperature	±1%	105°C ± 3°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±0.5%	-65°C, 1000 hours
High Temperature Exposure	±1%	+175°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

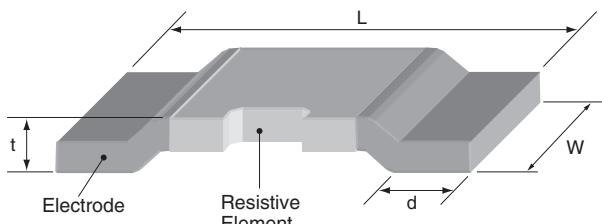
11/11/19



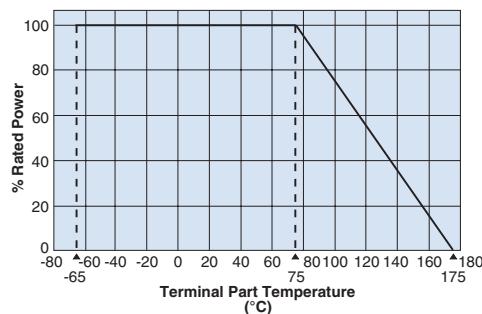
features

- Ultra low resistance, suitable for large current sensing
- Automatic mounting machines are applicable
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 qualified

dimensions and construction



Derating Curve



Type (Inch Size Code)	Resist. (Ω)	Dimensions inches (mm)			
		L	W	d	t
PSJ2 (3920)	0.2m	.394±.010 (10.0±0.25)	.205±.010 (5.2±0.25)	.079±.010 (2.0±0.25)	.078±.008 (1.98±0.2)
	0.5m				.05±.008 (1.27±0.2)
	1m				.035±.008 (0.89±0.2)
	2m				.046±.008 (1.17±0.2)
	3m				.037±.008 (0.95±0.2)
	4m				.033±.008 (0.84±0.2)
PSL2 (2512)	NEW 0.2m	.248±.006 (6.3±0.15)	.124±.006 (3.15±0.15)	.045±.006 (1.15±0.15)	.055±.006 (1.40±0.15)
	0.3m				.052±.006 (1.32±0.15)
	0.5m				.044±.006 (1.12±0.15)

For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

PS	J	2	N	TEB	L500	F
Type	Power Rating	Termination Number	Termination Material	Packaging	Nominal Resistance	Tolerance
	J: 0.2m: 12W 0.5m: 10W 1m: 8W 2m: 6W 3m: 5W 4m: 5W New L: 0.2m: 9W 0.3m: 8W 0.5m: 8W		N: No surface treatment	TEB: 8mm pitch plastic embossed	4 digits: all values less than 100m Ω are expressed in m Ω with "L" as decimal Ex: 0.5m Ω - L500 1m Ω = 1L00	F: ±1%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

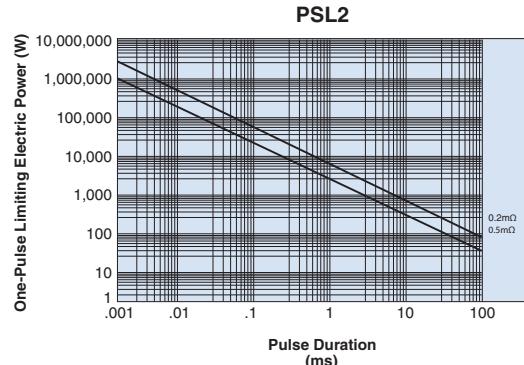
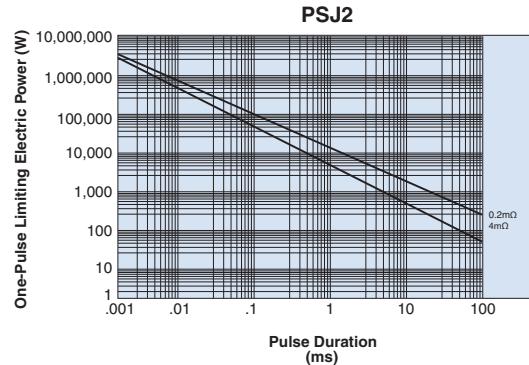
11/11/19

applications and ratings

Part Designation	Power Rating (Current Rating)	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range	Resistance Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
PSJ2	12W (244A)	± 200	0.2m Ω	F: $\pm 1\%$	75 $^{\circ}$ C	-65 $^{\circ}$ C to +175 $^{\circ}$ C
	10W (141A)	± 100	0.5m Ω			
	8W (89A)	± 75	1m Ω			
	6W (54A)	± 75	2m Ω			
	5W (41A)	± 50	3m Ω			
	5W (35A)	± 50	4m Ω			
PSL2	NEW 9W (212A)	250 ± 100	0.2m Ω	F: $\pm 1\%$	75 $^{\circ}$ C	-65 $^{\circ}$ C to +175 $^{\circ}$ C
	8W (163A)	± 175	0.3m Ω			
	8W (126A)	± 115	0.5m Ω			

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse.

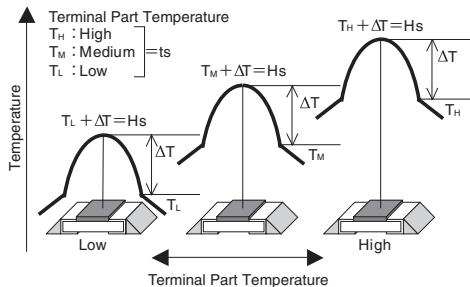
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance ()	Rth ($^{\circ}$ C/W)
PSJ2	0.2m	4
	4m	27
PSL2	0.2m	3.2
	0.5m	6.7

$$R_{th} = (H_s - t_s) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm \%$ Typical	Test Method
T.C.R.	Within specified T.C.R.	—	+25 $^{\circ}$ C/+125 $^{\circ}$ C
Overload (Short time)	$\pm 0.5\%$	$\pm 0.1\%$	PSJ (0.2m): 36W for 5 seconds; PSJ (0.5m): 30W for 5 seconds; PSJ (1m): 20W for 5 seconds; PSJ (2m): 18W for 5 seconds; PSJ (3m): 12.5W for 5 seconds; PSJ (4m): 10W for 5 seconds; PSL (0.2m): 27W for 5 seconds; PSL (0.3m, 0.5m): 24W for 5 seconds
Resistance to Solder Heat	$\pm 0.5\%$	$\pm 0.1\%$	260 $^{\circ}$ C $\pm 5^{\circ}$ C, 15 seconds ± 1 second
Rapid Change of Temperature	$\pm 0.5\%$	$\pm 0.1\%$	-55 $^{\circ}$ C (30 minutes), +150 $^{\circ}$ C (30 minutes), 1,000 cycles
Moisture Resistance	$\pm 0.5\%$	$\pm 0.05\%$	85 $^{\circ}$ C $\pm 3^{\circ}$ C, 85% $\pm 3^{\circ}$ C RH, 1000 hours, 10% Bias
Endurance at 75 $^{\circ}$ C and Less of Terminal Part Temperature	$\pm 1.0\%$	$\pm 0.3\%$	Terminal part temperature: 75 $^{\circ}$ C $\pm 3^{\circ}$ C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	$\pm 0.5\%$	$\pm 0.02\%$	-65 $^{\circ}$ C, 1000 hours
High Temperature Exposure	$\pm 1\%$	$\pm 0.5\%$	+175 $^{\circ}$ C, 1,000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/26/18



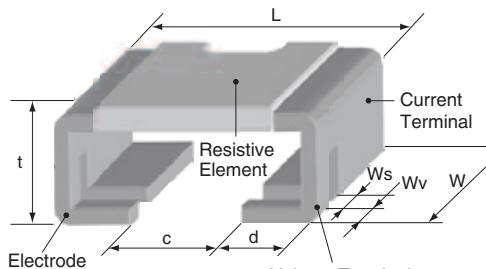
features

- Correcter electric current detection is possible to 4-terminal construction
- Excellent T.C.R. achieved ($\pm 50 \times 10^{-6}/\text{K}$)
- Ultra low resistance, suitable for large current sensing
- Automatic mounting machines are applicable
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 qualified

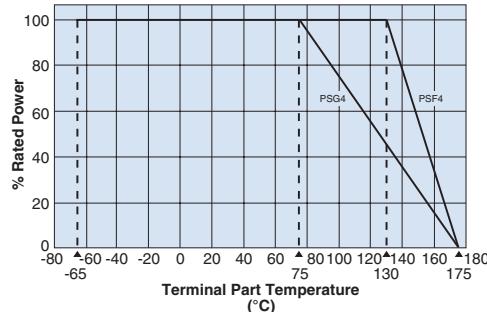
current
sense

dimensions and construction

Type (Inch Size Code)	Resist. (Ω)	Dimensions inches (mm)						
		L	W	d	C	Ws	Wv	t
PSG4 (2726)	0.5m	.272±.010 (6.9±0.25)	.260±.010 (6.6±0.25)	.079±.004 (2.0±0.1)	—	.039±.004 (1.0±0.1)	.028±.010 (0.7±0.1)	.120±.008 (3.05±0.2)
	1m							.110±.008 (2.8±0.2)
PSF4 (1216)	0.5m	.118±.004 (3.0±0.1)	.150±.004 (3.8±0.1)	—	.037±.006 (0.95±0.15)	.028±.002 (0.7±0.05)	.020±.002 (0.5±0.05)	.071±.004 (1.8±0.1)
	1m							



Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

PS	G	4	N	TEB	L500	F
Type	Power Rating	Termination Number	Termination Material	Packaging	Nominal Resistance	Tolerance
	G: 0.5m: 10W 1m: 8W F: 0.5m: 5W 1m: 3W		N: No surface treatment	TEB: 12mm pitch plastic embossed	4 digits: all values less than 100m Ω are expressed in m Ω with "L" as decimal Ex: 0.5m Ω - L500 1m Ω - 1L00	F: ±1%

Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

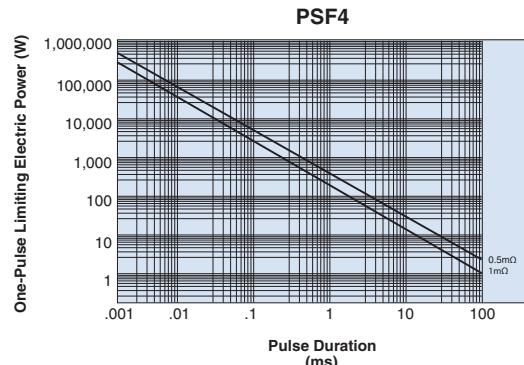
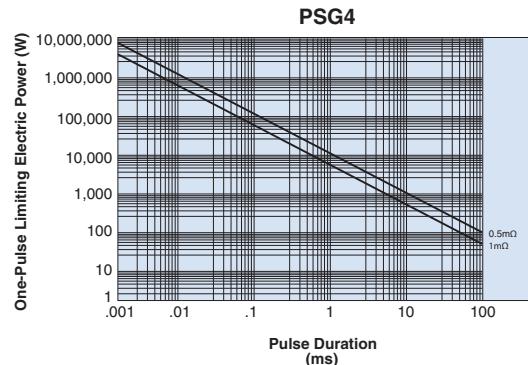
For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Power Rating (Current Rating)	T.C.R. (ppm/°C) Max.	Resistance Range	Resistance Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
PSG4	10W (141A)	±50	0.5mΩ	F: ±1%	75°C	-65°C to +175°C
	8W (89A)		1mΩ			
PSF4	5W (100A)	±50	0.5mΩ	F: ±1%	130°C	-65°C to +175°C
	3W (54A)		1mΩ			

environmental applications

One-Pulse Limiting Electric Power

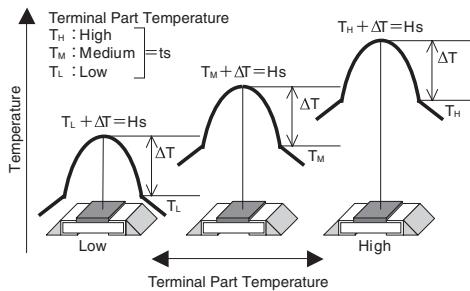


Thermal Resistance

Type	Resistance ()	Rth (°C/W)
PSG4	0.5m	9
	1m	12
PSF4	0.5m	8
	1m	14

$$R_{th} = (H_s - ts) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse.

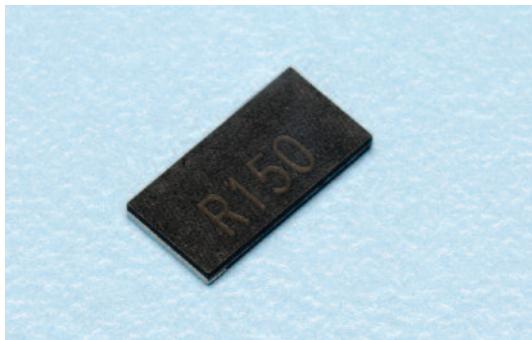
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement Limit	Δ R ±%	Test Method
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±0.5%	±0.1%	PSG4 (0.5mΩ): 30W for 5 seconds; PSG4 (1mΩ): 20W for 5 seconds PSF4 (0.5mΩ): 15W for 5 seconds; PSF4 (1mΩ): 9W for 5 seconds
Resistance to Solder Heat	±0.5%	±0.1%	260°C ± 5°C, 15 seconds ± 1 second
Rapid Change of Temperature	±0.5%	±0.1%	-55°C (30 minutes), +150°C (30 minutes), 1,000 cycles
Moisture Resistance	±0.5%	±0.05%	85°C ± 3°C, 85% ± 3°C RH, 1000 hours, 10% Bias
Endurance of Rated Terminal Part Temperature	±1.0%	±0.5%	PSG4: Terminal part temperature: 75°C ± 3°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle PSF4: Terminal part temperature: 130°C ± 3°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±0.5%	±0.01%	-65°C, 1000 hours
High Temperature Exposure	±1%	±0.6%	+175°C, 1,000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

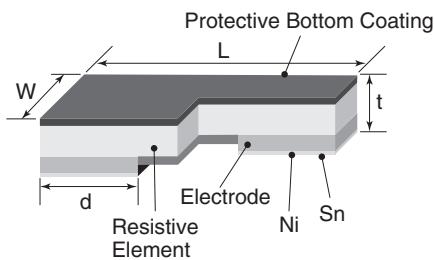
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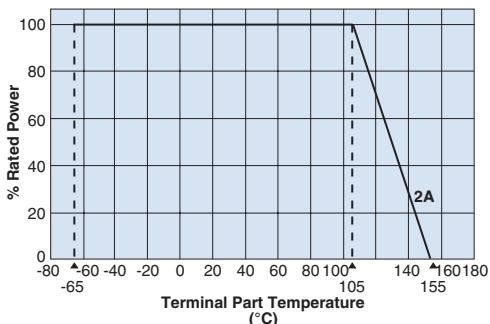
features

- SMD type of small size, metal plate low resistance resistor for current detection
- Low height suitable for use of small equipment such as mobile phone
- High reliability and performance with T.C.R $\pm 100 \times 10^{-6}/K$
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 Qualified 0805 (2A)

dimensions and construction



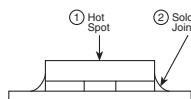
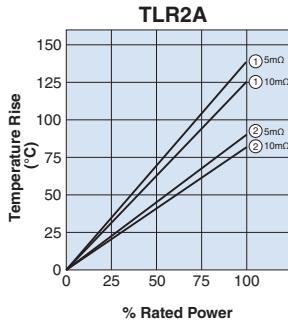
Derating Curve



For resistors operated at an ambient temperature of 105°C or above, a power rating shall be derated in accordance with the above derating curve.

Size Code	Resistance	Dimensions inches (mm)			
		L	W	d	t
TLR2A (0805)	2mΩ	.079±.008 (2.00±0.20)	.049±.008 (1.25±0.20)	.024±.008 (0.60±0.20)	.012±.006 (0.30±0.15)
	3mΩ			.024±.008 (0.60±0.20)	.010±.006 (0.25±0.15)
	4mΩ			.018±.008 (0.45±0.20)	
	5mΩ			.026±.008 (0.65±0.20)	
	6mΩ			.022±.008 (0.55±0.20)	
	7mΩ			.020±.008 (0.50±0.20)	
	8mΩ			.020±.008 (0.50±0.20)	
	9mΩ			.018±.008 (0.45±0.20)	.016±.006 (0.26±0.15)
	10mΩ			.014±.008 (0.35±0.20)	

Temperature Rise



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

TLR	2A	T	TD	10L0	J
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
TLR	2A: 1W	T: Sn	TD: 7" 4mm pitch punch paper	±1%: 4 digits All values less than 0.1Ω (100m) are expressed in mΩ with "L" as decimal Ex: 1mΩ = 1L00	F: ±1%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

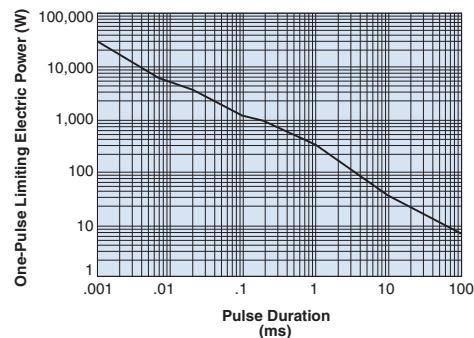
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applications and ratings

Part Designation	Power Rating	Current Rating	T.C.R. (ppm/°C) Max.	Standard Resistance (Ω)	Resistance Tolerance	Rated Terminal Part Temperature	Connection Temperature	Operating Temperature Range
TLR2A	1W	—	±100	2m, 3m, 4m, 5m, 6m, 7m, 8m, 9m, 10m	F: ±1%	105°C	—	-65°C to +155°C

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

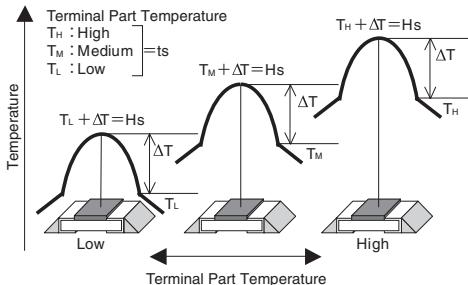
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	R _{th} (°C/W)
TLR2A	2m	26.1
	10m	54.7

$$R_{th} = (Hs-ts)/Power$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Limit	$\Delta R\%$ Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1	±0.05	Rated power x 2.5 for 5 seconds
Resistance to Solder Heat	±1	±0.01	260°C ± 5°C, 10 ~ 12 seconds
Rapid Change of Temperature	±1	±0.2	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±1	±0.3	85°C, 85%RH, 1000 hours, 10% Bias
Endurance at 105°C and Less of Terminal Part Temperature	±1	±0.4	Terminal part temperature: 105°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	±1	±0.05	-65°C, 96 hours
High Temperature Exposure	±1 (2~4m, 7~10m) ±2 (5m, 6m)	±0.5 (2~4m, 7~10m) ±0.8 (5m, 6m)	155°C, 1000 hours

Note: Please contact factory for the TLRZ Performance Characteristics

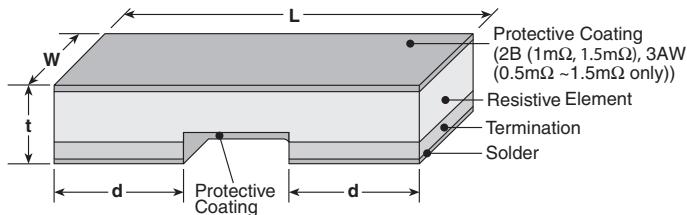


features

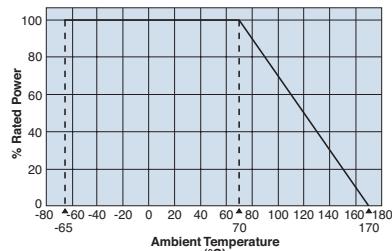
- Ultra-low TCR (+50ppm/ $^{\circ}\text{C}$) available
- Metal alloy: superior corrosion and heat resistance
- Applications include current sensing, voltage division and pulse applications
- Ultra low resistance (0.5m Ω - 20m Ω)
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Qualified

current
sense

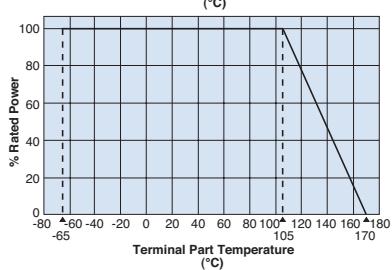
dimensions and construction



Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Size Code	Resistance	Dimensions inches (mm)			
		L	W	d	t
TLR2B	1m	.126±.008 (3.20±0.20)	.063±.008 (1.60±0.20)	.043±.008 (1.10±0.20)	.024±.008 (0.60±0.20)
	1.5m			.020±.008 (0.50±0.20)	
	2m, 3m, 4m, 5m, 6m, 7m, 8m, 9m, 10m, 11m, 12m, 13m, 15m, 16m, 18m, 20m				
TLR2H	1m	.200±.008 (5.00±0.20)	.100±.008 (2.50±0.20)	.071±.008 (1.80±0.20)	.026±.008 (0.65±0.20)
	2m - 6m			.060±.008 (1.50±0.20)	
	7m - 10m			.020±.008 (0.50±0.20)	
TLR3AW	0.5m Ω	.25±.01 (6.35±0.25)	.125±.01 (3.18±0.25)	.107±.01 (2.725±0.25)	.024±.008 (0.60±0.25)
	0.68m Ω - 0.75m Ω , 0.82m Ω			.105±.01 (2.675±0.25)	
	1m Ω , 1.5m Ω , 2m Ω , 3m Ω , 4m Ω			.087±.01 (2.20±0.25)	
	5m Ω , 6m Ω , 7m Ω , 8m Ω			.047±.01 (1.20±0.25)	
	9m Ω , 10m Ω			.030±.01 (0.77±0.25)	

ordering information

TLR	3AW	D	TE	2L00	F	75
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance	T.C.R.
2B: 0.5W 2H: 1W 3AW: 2W	2B: 0.5W 2H: 1W 3AW: 2W	D: SnAgCu	TE: 7" 8mm pitch embossed plastic (3AW) TE: 7" 4mm pitch embossed plastic (2H only) TD: 7" 4mm pitch punched paper (2B only)	±1%: 4 digits All values less than 0.1 Ω (100m) are expressed in mW with "L" as decimal Ex: 2m Ω = 2L00	F: ±1%	New 50: 50ppm/ $^{\circ}\text{C}$: 75ppm/ $^{\circ}\text{C}$ Blank: 150ppm/ $^{\circ}\text{C}$ Blank: 200ppm/ $^{\circ}\text{C}$

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings

Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (ppm/ $^{\circ}$ C) Max.*	Standard Resistance (Ω)	Resistance Tolerance	Operating Temperature Range
TLR2B	1/2W (.5W)	70 $^{\circ}$ C	105 $^{\circ}$ C	± 50	2m,3m,4m,5m,6m,7m,8m, 9m,10m,11m,12m,13m, 15m,16m,18m,20m	F: $\pm 1\%$	-65 $^{\circ}$ C to +155 $^{\circ}$ C** -65 $^{\circ}$ C to +170 $^{\circ}$ C**
				± 75	1m,1.5m,2m,3m,4m,5m, 6m,7m,8m,9m,10m,11m, 12m,13m,15m,16m,18m,20m		
TLR2H	1W	70 $^{\circ}$ C	105 $^{\circ}$ C	± 50	1m,2m,3m,4m,5m, 6m,7m,8m,9m,10m	F: $\pm 1\%$	-65 $^{\circ}$ C to +155 $^{\circ}$ C** -65 $^{\circ}$ C to +170 $^{\circ}$ C**
				± 75	2m,3m,4m,5m, 6m,7m,8m,9m,10m		
TLR3AW	2W	70 $^{\circ}$ C	105 $^{\circ}$ C	± 50	0.5m,0.68m,0.75m,0.82m,1m,1. 5m,2m*,3m,4m,	F: $\pm 1\%$	-65 $^{\circ}$ C to +155 $^{\circ}$ C** -65 $^{\circ}$ C to +170 $^{\circ}$ C**
				± 75	5m,6m,7m,8m,9m,10m		
				± 150			

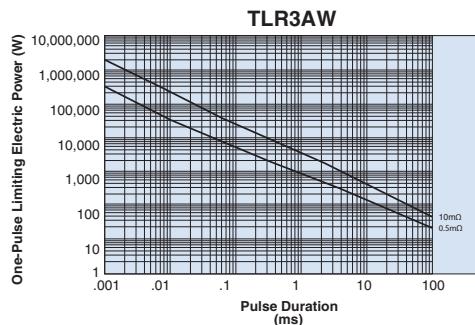
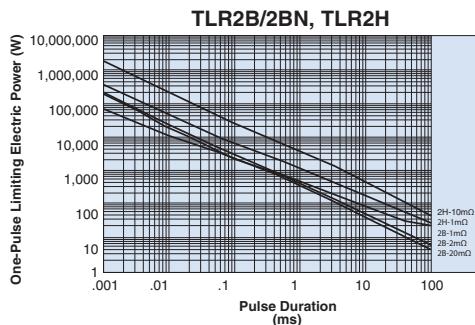
* Contact factory for 2m Ω dimensions

** Please reference High Temperature Performance Characteristics in the below table

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

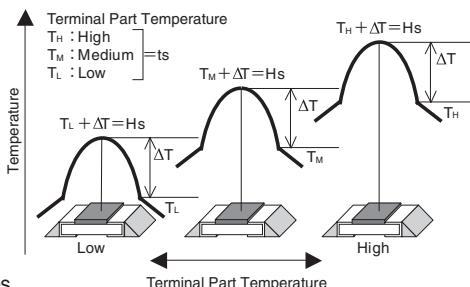
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	Resistance (Ω)	R _{th} ($^{\circ}$ C/W)
TLR	2B 2BN	1m	7.2
		2m	18.3
		20m	116
	2H	1m	17
		10m	61.1
	3AW	0.5m	6
		10m	62

$$R_{th} = (H_s - ts) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



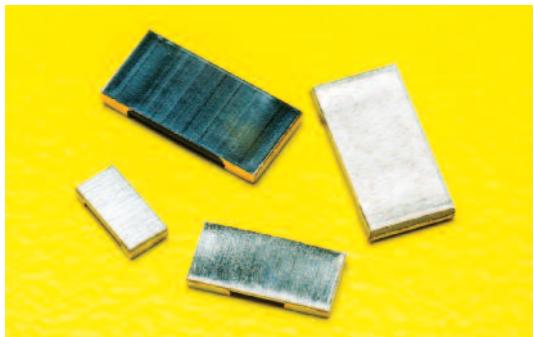
The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement $\Delta R \pm \%$ Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25 $^{\circ}$ C
T.C.R.	Within specified T.C.R.	—	+25 $^{\circ}$ C/+125 $^{\circ}$ C
Resistance to Solder Heat	$\pm 0.5\%$	$\pm 0.3\%$	260 $^{\circ}$ C $\pm 5^{\circ}$ C, 10 seconds +2/-0 seconds
Rapid Change of Temperature	$\pm 0.5\%$	$\pm 0.4\%$	-55 $^{\circ}$ C (15 minutes), +150 $^{\circ}$ C (15 minutes), 1000 cycles
Moisture Resistance	$\pm 0.5\%$	$\pm 0.1\%$	MIL-STD-202, Method 106, 0% power, 7a and 7b not required
Biased Humidity	$\pm 0.5\%$	$\pm 0.1\%$	85 $^{\circ}$ C $\pm 2^{\circ}$ C, 85% RH, 1000 hours, 10% bias
Endurance (Ambient Temp.)	$\pm 1.0\%$	$\pm 0.3\%$	70 $^{\circ}$ C $\pm 2^{\circ}$ C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure**	$\pm 1.0\%$	$\pm 0.6\%$	$\pm 155^{\circ}$ C (2B, 2H, 3AW), 1000 hours
	$\pm 2.0\%$	—	$\pm 170^{\circ}$ C (2B, 2H, 3AW), 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

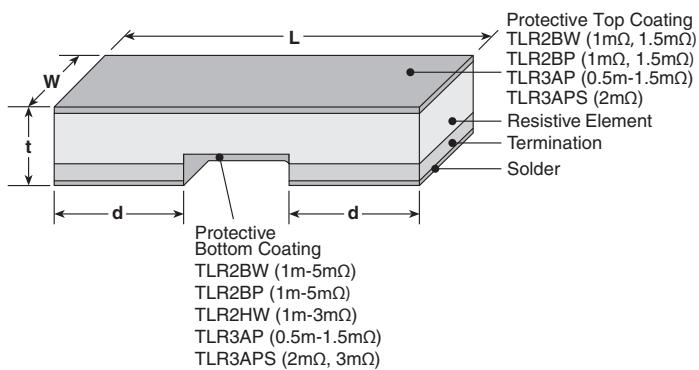
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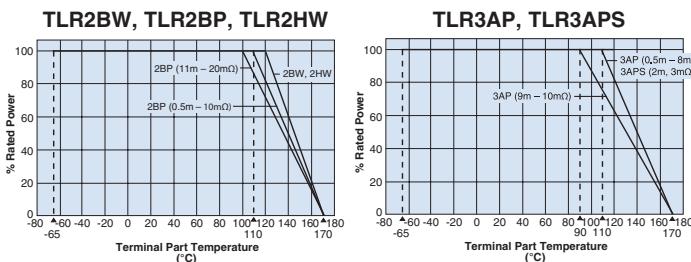
features

- Ultra-low TCR (+50ppm/ $^{\circ}$ C) available
- Metal alloy: superior corrosion and heat resistance
- Applications include current sensing, voltage division and pulse applications
- Ultra low resistance (0.5m Ω - 20m Ω)
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Qualified

dimensions and construction



Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based in the terminal part temperature" in the beginning of our catalog before use.

Size Code	Resistance	Dimensions inches (mm)			
		L	W	d	t
TLR2BW	New 0.5m Ω	.126±.008 (3.20±0.20)	.063±.008 (1.60±0.20)	.049±.008 (1.25±0.20)	.028±.008 (0.70±0.20)
	1m Ω			.043±.008 (1.10±0.20)	.024±.008 (0.60±0.20)
	New 1.5m Ω			.020±.008 (0.50±0.20)	
TLR2BP	2m Ω - 20m Ω				
	New 0.5m Ω	.126±.008 (3.20±0.20)	.063±.008 (1.60±0.20)	.049±.008 (1.25±0.20)	.028±.008 (0.70±0.20)
	1m Ω , 1.5m Ω			.043±.008 (1.10±0.20)	.024±.008 (0.60±0.20)
TLR2HW	2m Ω - 20m Ω			.020±.008 (0.50±0.20)	
	New 0.5m Ω	.200±.008 (5.00±0.20)	.100±.008 (2.50±0.20)	.075±.008 (1.90±0.20)	.028±.008 (0.70±0.20)
	1m Ω			.071±.008 (1.80±0.20)	.026±.008 (0.65±0.20)
TLR3AP	2m Ω - 6m Ω			.060±.008 (1.50±0.20)	.024±.008 (0.60±0.20)
	7m Ω - 10m Ω	.25±.01 (6.35±0.25)	.125±.01 (3.18±0.25)	.020±.008 (0.50±0.20)	
	0.5m Ω				.107±.01 (2.725±0.25)
TLR3APS	0.68m Ω , 0.75m Ω , 0.82m Ω				.105±.01 (2.675±0.25)
	1m Ω , 1.5m Ω , 3m Ω , 4m Ω				.087±.01 (2.20±0.25)
	2m Ω				.098±.01 (2.50±0.25)
TLR3APS	5m Ω , 6m Ω , 7m Ω , 8m Ω				.047±.01 (1.20±0.25)
	9m Ω , 10m Ω				.030±.01 (0.77±0.25)
	2m Ω , 3m Ω	.25±.01 (6.35±0.25)	.125±.01 (3.18±0.25)	.047±.01 (1.20±0.25)	.024±.01 (0.60±0.25)

ordering information

TLR	2BW	D	TD	10L0	F	75
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance	T.C.R.
2BW: 1W 2BP: 1.5W 2HW: 2W 3AP: 3W, 5W (New) 3APS: 3W	2BP: 1.5W 2HW: 2W 3AP: 3W, 5W (New) 3APS: 3W	D: SnAgCu	TD: 7" 4mm pitch punched paper TE: 7" 4mm embossed plastic	±1%; 4 digits All values less than 0.1 Ω (100m) are expressed in mW with "L" as decimal Ex: 2m Ω = 2L00	F: ±1%	50: 50ppm/ $^{\circ}$ C 75: 75ppm/ $^{\circ}$ C

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/22/19

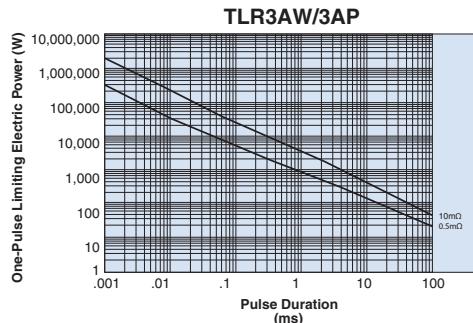
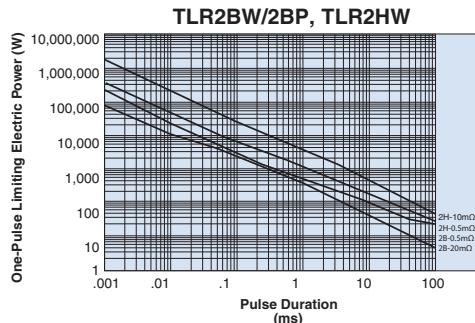
applications and ratings

Current

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.**	Standard Resistance (Ω)	Resistance Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
TLR2BW	1W	±50	2m,3m,4m,5m,6m,7m,8m,9m,10m,11m,12m,13m,15m,16m,18m,20m	F: ±1%	+120°C and less	-65°C to +170°C
		±75	0.5m,1m,1.5m,2m,3m,4m,5m,6m,7m,8m,9m,10m,11m,12m,13m,15m,16m,18m,20m			
TLR2BP	1.5W	±50	2m,3m,4m,5m,6m,7m,8m,9m,10m,11m,12m,13m,15m,16m,18m,20m	F: ±1%	+110°C and less	-65°C to +170°C
		±75	0.5m,1m,1.5m,2m,3m,4m,5m,6m,7m,8m,9m,10m,11m,12m,13m,15m,16m,18m,20m		+100°C and less	
		±50	0.5m,1m,2m,2.5m,3m,4m,5m,6m,7m,8m,9m,10m		+110°C and less	
		±75	0.5m,1m,2m,2.5m,3m,4m,5m,6m,7m,8m,9m,10m		+100°C and less	
TLR2HW	2W	±50	0.5m,1m,2m,2.5m,3m,4m,5m,6m,7m,8m,9m,10m	F: ±1%	+120°C and less	-65°C to +170°C
		±75	0.5m,1m,2m,2.5m,3m,4m,5m,6m,7m,8m,9m,10m		+120°C and less	
TLR3AP	3W	±50	2m,3m,4m,5m,6m,7m,8m,9m,10m	F: ±1%	0.5m ~ 8m: +110°C and less	-65°C to +170°C
		±75	0.5m,0.68m,0.75m, 0.82m,1m,1.5m,2m,3m,4m, 5m,6m,7m,8m,9m,10m		9m, 10m: +90°C and less	
	5W (New)	±50	2m,3m,4m	F: ±1%	+110°C and less	-65°C to +170°C
		±75	1m,2m,3m,4m		+110°C and less	
TLR3APS	3W	±50, ±75	2m,3m	F: ±1%	+110°C and less	-65°C to +170°C

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

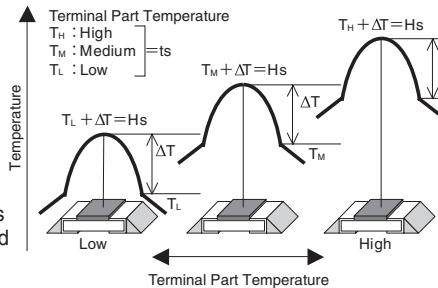
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	Resistance (Ω)	R _{th} (°C/W)
TLR	2BW	0.5m	7.2
		20m	116
	2HW	0.5m	9
		10m	61.1
	3AP	0.5m	6
		10m	62

$$R_{th} = (H_s \cdot ts) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Δ R ±%	Test Method
Resistance	Within regulated tolerance	—
T.C.R.	Within specified T.C.R.	—
Resistance to Solder Heat	±0.5%	260°C ± 5°C, 10 ± 2 seconds
Rapid Change of Temperature	±0.5%	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±0.5%	MIL-STD-202-106, 0% power, 7a and 7b not required
Biased Humidity	±0.5%	85°C ± 2°C, 85% RH, 1000 hours, 10% bias
Endurance of Rated Terminal Part Temperature	±1.0%	120°C ± 2°C (2BW, 2HW), 110°C ± 2°C (3AP 0.5mΩ~8mΩ) 90°C ± 2°C (3AP 9mΩ~10mΩ), 110°C ± 2°C (2BP 1mΩ~10mΩ) 100°C ± 2°C (2BP 11mΩ~20mΩ), 110°C ± 2°C (3APS 2mΩ, 3mΩ) 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1.0%	±155°C, 1000 hours
	±2.0%	±170°C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/22/18

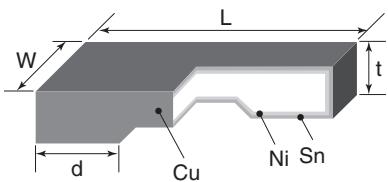


features

- SMD type of small size, metal plate low resistance resistor for current detection
- Low height suitable for use of small equipment such as mobile phone
- High reliability and performance with T.C.R $\pm 100 \times 10^{-6}/K$
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products meet EU RoHS requirements
- AEC-Q200 Qualified

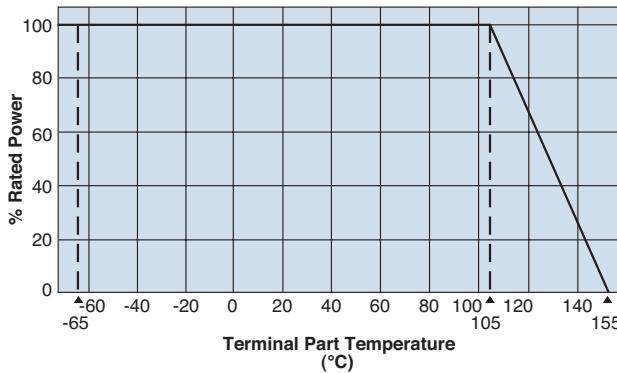
current
sense

dimensions and construction



Size Code	Resistance	Dimensions inches (mm)			
		L	W	d	t
TLRZ1E (0402)	—	.039±.004 (1.00±0.10)	.020±.004 (0.50±0.10)	.008±.004 (0.20±0.10)	.016±.002 (0.40±0.005)
TLRZ1J (0603)	—	.063±.004 (1.60±0.10)	.031±.004 (0.80±0.10)	.012±.004 (0.30±0.10)	.020±.002 (0.5±0.05)
TLRZ2A (0805)	—	.079±.004 (2.00±0.10)	.049±.004 (1.25±0.10)	.012±.004 (0.30±0.10)	
TLRZ2B (1206)	—	.126±.004 (3.20±0.10)	.063±.004 (1.60±0.10)	.012±.004 (0.30±0.10)	

Derating Curve



For resistors operated at an ambient temperature of 105°C or above, a power rating shall be derated in accordance with the above derating curve.

ordering information

TLRZ	1E	T	TP
Type	Power Rating	Termination Material	Packaging
TLRZ	1E: 10A 1J: 26A 2A: 31.6A 2B: 50A	T: Sn	TB: 7" pitch pressed paper (TLRZ1E only) TD: 7" 4mm pitch punch paper

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

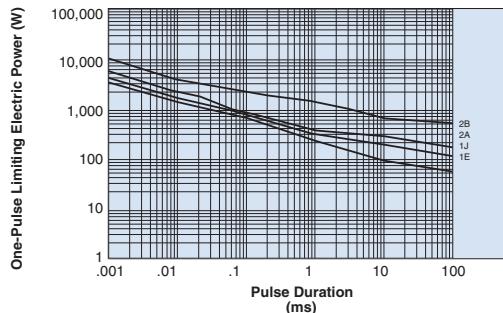
10/26/18

applications and ratings

Part Designation	Current Rating	Standard Resistance (Ω)	Rated Terminal Part Temperature	Operating Temperature Range
TLRZ1E	10A	0.5m max.	105°C and less	-55°C to +170°C
TLRZ1J	26A	0.2m max.	105°C and less	
TLRZ2A	31.6A	0.2m max.	105°C and less	
TLRZ2B	50A	0.2m max.	105°C and less	

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

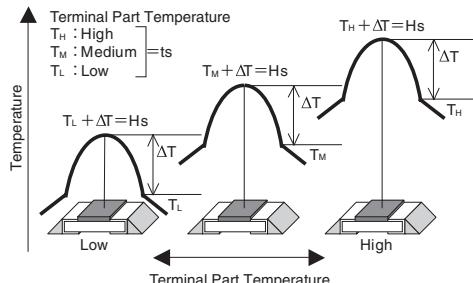
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	R _{th}
TLRZ	1E	$\approx 0^{\circ}\text{CW}$
	1J	
	2A	
	2B	

$$R_{th} = (H_s - ts) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement Limit	$\Delta R\%$	Test Method
Resistance			25°C
Overload (Short time)			1E: 20A; 1J/2A: 40A; 2B: 80A for 5 seconds
Resistance to Solder Heat			260°C $\pm 5^{\circ}\text{C}$, 10 ~ 12 seconds
Rapid Change of Temperature			-55°C (30 minutes), +155°C (30 minutes), 1000 cycles
Moisture Resistance			85°C, 85%RH, 1E: 1A; 1J/2A: 2A; 2B: 4A, 1000 hours
Endurance of Rated Terminal Part Temperature	1E: Max 0.5mΩ 1J/2A/2B: Max 0.2mΩ	1E: Max 0.25mΩ 1J/2A/2B: Max 0.15mΩ	Terminal part temperature: 105°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure			-55°C, 1000 hours
High Temperature Exposure			155°C, 1000 hours

Note: Please contact factory for the TLRZ Performance Characteristics

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

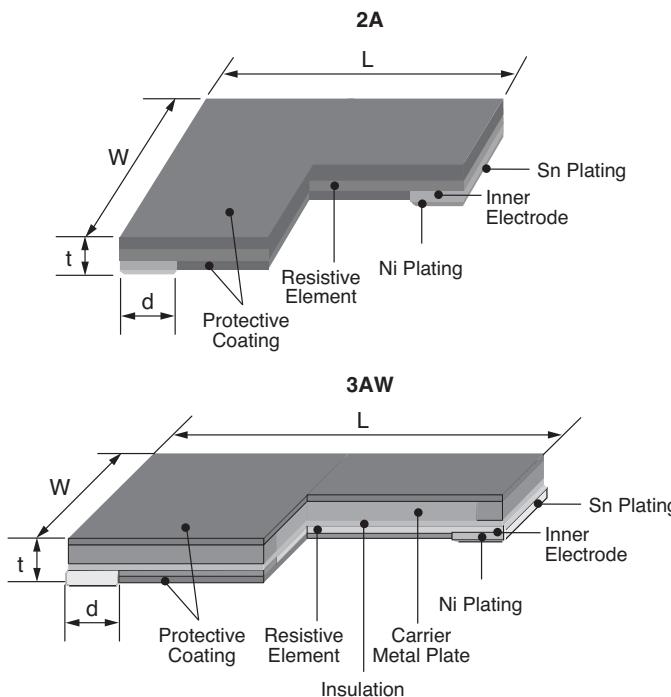
11/22/19



features

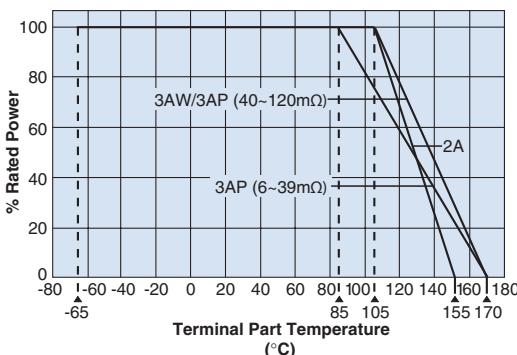
- SMD Type of small size, low resistance resistor for current detection
- Carrier metal plate inside, resistor of high radiation of heat structure (3AW, 3AP)
- High reliability and performance with low T.C.R.
- Automatic mounting machines are applicable
- Suitable for reflow soldering (Not suitable for flow soldering)
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Qualified

dimensions and construction



Size Code (Inch)	Resistance (Ω)	Dimensions inches (mm)			
		L	W	d	t
TLRH 2A (0805)	12m~100m	.079±.008 (2.00±0.20)	.049±.008 (1.25±0.20)	.014±.008 (0.35±0.20)	.010±.008 (0.25±0.20)
TLRH 3AW (2512)	10m~270m	.248±.008 (6.30±0.20)	.126±.008 (3.20±0.20)	.030±.008 (0.75±0.20)	.020±.008 (0.50±0.20)
TLRH 3AP (2512)	6m~39m	.248±.008 (6.30±0.20)	.126±.008 (3.20±0.20)	.071±.008 (1.8±0.20)	.020±.008 (0.50±0.20)
	40m~120m			.051±.008 (1.3±0.20)	

Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

TLRH	3AW	T	TE	33L0	F
Type	Power Rating	Terminal Surface Material	Packaging	Nominal Resistance	Tolerance
2A (12~27mΩ): 0.5W (33~50mΩ): 0.33W (56~100mΩ): 0.25W 3AW: 2.0W 3AP: (6~39mΩ): 5.0W (40~120mΩ): 4.0W	TD: 7" 4mm pitch punched paper 3AW, 3AP: TE: 7" punched plastic	T: Sn	2A: TD: 7" 4mm pitch punched paper 3AW, 3AP: TE: 7" punched plastic	±1%: 4 digits All values less than 0.1Ω (100m) are expressed in mW with "L" as decimal Ex: 2mΩ = 2L00 2A: No marking	F: ±1%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

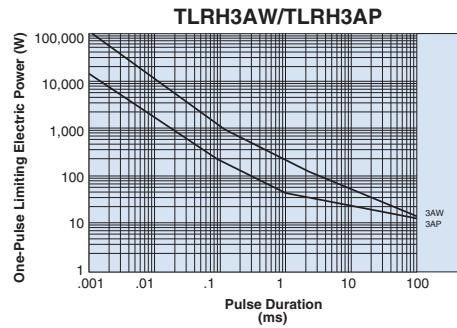
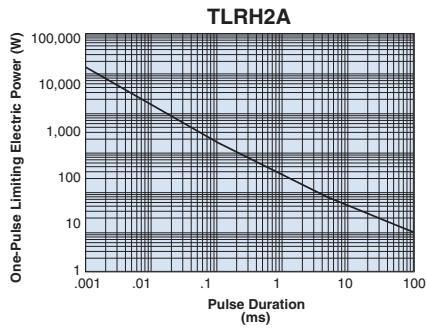
9/24/19

applications and ratings

Part Designation	Power Rating	T.C.R. ($\times 10^{-6}/K$)	Resistance Range (Ω) F: $\pm 1\%$ (E12)	Tolerance	Rated Terminal Part Temperature	Operating Temperature Range
TLRH 2A	0.25W	± 75	56m~100m	F: $\pm 1\%$	$+105^\circ C$	$-65^\circ C \sim +155^\circ C$
	0.33W		33m ~ 50m			
	0.50W		12m ~ 27m			
TLRH 3AW	2.0W	± 75	10m~22m	F: $\pm 1\%$	$85^\circ C$	$-65^\circ C \sim +170^\circ C$
		± 50	24m~270m			
TLRH 3AP	4.0W	± 50	40m, 47m, 50m, 56m~120m	F: $\pm 1\%$	$85^\circ C$	$-65^\circ C \sim +170^\circ C$
	5.0W	± 50	18m, 20m, 22m, 25m~39m			
		± 75	6m, 7m, 8m, 9m, 10m, 12m			

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

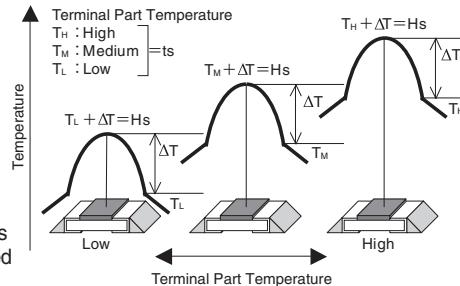
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Size	Resistance (Ω)	Rth ($^\circ C/W$)
TLRH	2A	27m	123
		50m	195
		100m	280
TLRH	3AW	10m	5.2
		270m	7.4
		18m	7.4
		120m	4.1

$$Rth = (Hs-ts)/Power$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement $\Delta R\%$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+100°C
Overload (Short time)	$\pm 0.5\%$	2A: $\pm 0.05\%$ 3AW,3AP: $\pm 0.2\%$	2A, 3AW: Rated power x 2.5 for 5 seconds 3AP: Rated power x 8W for 5 seconds
Resistance to Soldering Heat	$\pm 0.5\%$	$\pm 0.1\%$	260°C $\pm 5^\circ C$, 10 seconds ~ 12 seconds
Rapid Change of Temperature	$\pm 0.5\%$	2A: $\pm 0.2\%$ 3AW,3AP: $\pm 0.1\%$	-55°C (15min.)/+150°C (15min.) 1000 cycles
Moisture Resistance	$\pm 0.5\%$	$\pm 0.1\%$	85°C $\pm 2^\circ C$, 85% RH, 1000 hours, 10% Bias
Endurance at 105°C and Less of Terminal Part Temperature	$\pm 1\%$	2A: $\pm 0.45\%$ 3AW,3AP: $\pm 0.3\%$	2A, 3AW, 3AP (40~120mΩ): 105°C, $\pm 2^\circ C$; 3AP (6~39mΩ): 85°C $\pm 2^\circ C$ 1000 hours, 1.5 hours ON/0.5 hour OFF cycle
Low Temperature Exposure	$\pm 0.5\%$	2A: $\pm 0.05\%$ 3AW,3AP: $\pm 0.02\%$	-65°C, 96 hours
High Temperature Exposure	$\pm 1\%$	2A: $\pm 0.5\%$ 3AW,3AP: $\pm 0.2\%$	2A, 3AP: +155°C, 1000 hours (6~12mΩ) 3AW, 3AP: +170°C $\pm 3^\circ C$, 1000 hours (18~120mΩ)
	$\pm 2\%$	3AP: $\pm 0.2\%$	3AP: +170°C $\pm 3^\circ C$, 1000 hours (6~12mΩ)

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/22/19

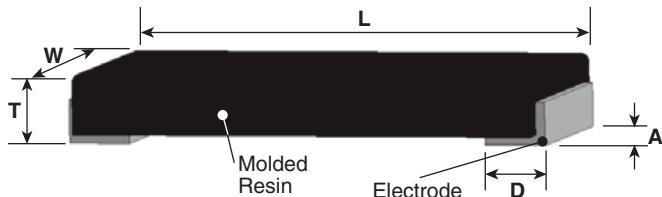


features

- High-precision ($TCR \pm 50 \times 10^{-6}/K$)
- SLP has a suitable termination structure with solder fillets
- Suitable for flow, reflow and iron solderings
- Products meet EU RoHS requirements
- AEC-Q200 qualified

current
sense

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	D	T	A
2H (2010)	.201±.010 (5.1±0.25)	.098±.010 (2.5±0.25)	.020±.010 (0.5±0.25)	.025±.010 (0.635±0.25)	.087±.010 (2.2±0.25)
2HW (2010)	.201±.010 (5.1±0.25)	.098±.010 (2.5±0.25)	.020±.010 (0.5±0.25)	.025±.010 (0.635±0.25)	.087±.010 (2.2±0.25)
3A (2512)	.25±.010 (6.35±0.25)	.126±.010 (3.2±0.25)	.030±.010 (0.77±0.25)	.025±.010 (0.635±0.25)	.102±.010 (2.6±0.25)
3AW (2512)	.25±.010 (6.35±0.25)	.126±.010 (3.2±0.25)	.030±.010 (0.77±0.25)	.025±.010 (0.635±0.25)	.102±.010 (2.6±0.25)

SLP	2H	T	TE	10L0	F
Type	Power Rating 2H: 1W 2HW: 2W 3A: 1W 3AW: 2W	Termination Material T: Sn	Packaging TE: Plastic embossed	Nominal Resistance Ex: 10L0 = 10mΩ R100 = 100mΩ	Tolerance D: ±0.5% F: ±1%

Resistance Value (Ω)	4 Digits
10m ~ 97.6m	10L0 ~ 97L6
0.1	R100

Contact us when you have control request for environmental hazardous material other than the substance specified by EU RoHS. For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

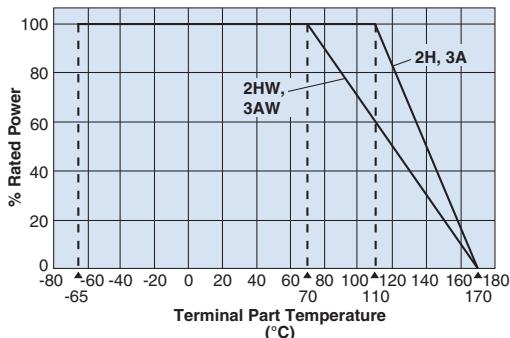
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applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range (Ω)	Resistance Tolerance	Rated Terminal Part Temp.	Operating Temperature Range
SLP 2H	1W	± 50	10m - 100m	D: 0.5% F: 1%	110 $^{\circ}$ C and less	-65 $^{\circ}$ C to +170 $^{\circ}$ C
SLP 2HW	2W	± 50	10m - 40m		70 $^{\circ}$ C and less	
SLP 3A	1W	± 50	10m - 100m		110 $^{\circ}$ C and less	
SLP 3AW	2W	± 50	10m - 40m		70 $^{\circ}$ C and less	

environmental applications

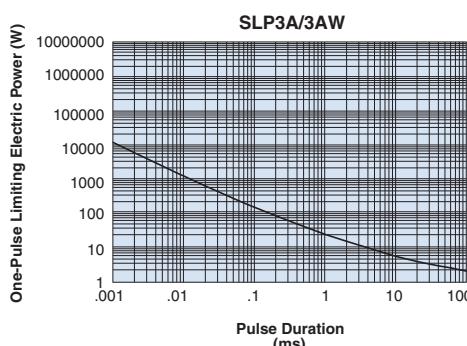
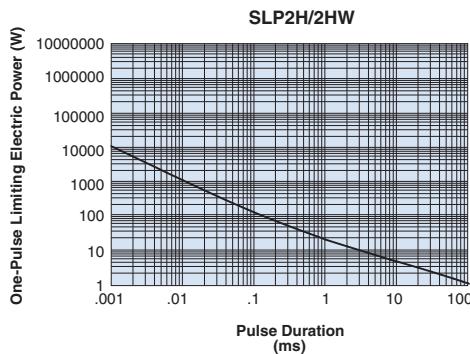
Derating Curve



When the terminal part temperature of the resistor exceeds the rated terminal part temperature shown above, the power shall be derated according to the derating curve.

Please refer to "Introduction of the derating curves based on the terminal part temperature" on the beginning of our catalog before use.

One-Pulse Limiting Electric Power



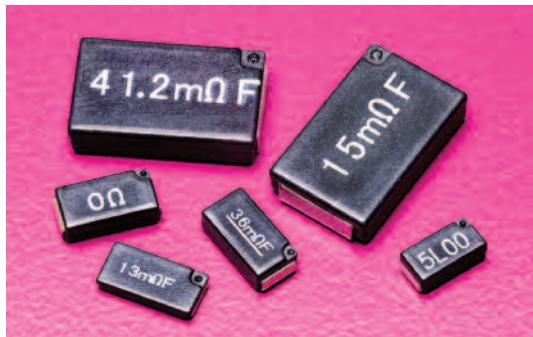
The maximum applicable voltage is equal to the max. overload voltage. Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Performance Characteristics

Parameter	Requirement $\Delta R \pm\%$ Limit	Test Method
Resistance	Within specified tolerance	25 $^{\circ}$ C
T.C.R.	Within specified T.C.R.	+25 $^{\circ}$ C/+125 $^{\circ}$ C
Resistance to Solder Heat	$\pm 0.5\%$	260 $^{\circ}$ C $\pm 5\%$, 10 ~ 12 seconds
Rapid Change of Temperature	$\pm 0.5\%$	-55 $^{\circ}$ C (15 minutes), +150 $^{\circ}$ C (15 minutes), 1000 cycles
Biased Humidity	$\pm 0.5\%$	85 $^{\circ}$ C $\pm 2\%$, 85%RH, 1000 hours, 10% Bias
Endurance of Rated Terminal Part Temperature	$\pm 1\%$	Terminal temp. 70 $^{\circ}$ C (2HW, 3AW), 110 $^{\circ}$ C (2H, 3A), 1000 hours (1.5 hr ON, 0.5 hr OFF)
Low Temperature Operation	$\pm 0.5\%$	-65 $^{\circ}$ C, 24 hours
High Temperature Exposure	$\pm 1\%$	+170 $^{\circ}$ C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

1/21/20

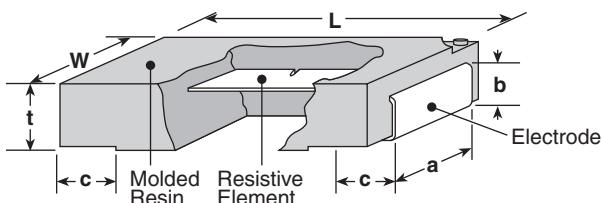


features

- Surface mount type
- Flameproof UL94V0 molded polymer case
- Excellent dimension accuracy, mountability and shock resistance
- Low profile type available (TSL)
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

current
sense

dimensions and construction



Size Code	Dimensions inches (mm)					
	L	W	t	a	b	c
SL07 (2010)	.197±.012 (5.0±0.3)	.098±.008 (2.5±0.2)	.067±.008 (1.7±0.2)	.079±.008 (2.0±0.2)	.047±.008 (0.9±0.2)	.035±.012 (1.2±0.3)
TSL1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.039±.008 (1.0±0.2)	.094±.008 (2.4±0.2)	.028±.008 (0.7±0.2)	.047±.012 (1.2±0.3)
SL1,SLZ1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.075±.008 (1.9±0.2)	.094±.008 (2.4±0.2)	.047±.008 (1.2±0.2)	.047±.012 (1.2±0.3)
SL2 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.098±.008 (2.5±0.2)	.197±.008 (5.0±0.2)	.067±.008 (1.7±0.2)	.102±.02 (2.6±0.5)
SLN2 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.094±.008 (2.4±0.2)	.217±.008 (5.5±0.2)	.063±.008 (1.6±0.2)	.100±.016 (2.55±0.4)
SL3 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.098±.008 (2.5±0.2)	.197±.008 (5.0±0.2)	.067±.008 (1.7±0.2)	.102±.02 (2.6±0.5)

ordering information

SL	1	T	TE	10L0	F	75
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance	T.C.R. (x10 ⁻⁴ /K)
TSL	07: 0.75W	T: Sn	TE: 7" embossed plastic For further information on packaging please refer to Appendix A	±0.5%, ±1%: 4 digits ±2%, ±5%: 3 digits All values less than 0.1Ω (100m) are expressed in mΩ with "L" as decimal Ex: 2mΩ = 2L00 0.1Ω: R100; 5mΩ: 5L0	D: ±0.5% F: ±1% G: ±2% J: ±5%	Nil: 0-150 0-200 ±75 (SLN2) ±100 ±110 ±180 50: ±50 (SL1) 75: ±75 (SL1)
SL	1: 1W	L: Sn/Pb*				
SLN	2: 2W					
SLZ	3: 3W					

* SL07 and SLN2, only the symbol T is available as the terminal surface material

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temperature	Resistance Range (Ω)*				T.C.R. (ppm/ $^{\circ}$ C) Max.	Operating Temp. Range
				D: $\pm 0.5\%$ E24,E96***	F: $\pm 1\%$ E24,E96***	G: $\pm 2\%$ E24	J: $\pm 5\%$ E24		
SL07	0.75W	70°C	125°C	—	5m - 100m	—	5m - 100m	0~200: R<11m Ω 0~150: R=>11m Ω	-55°C to +180°C
TSL1	1W		125°C	10m - 100m	5m - 100m	—	5m - 100m	± 180 : R<15m Ω ± 100 : R=>15m Ω	
SL1	1W		125°C	10m - 102m	5m - 102m	3m, 4m	5m - 100m	± 180 : R<15m Ω ± 100 : R=>15m Ω	
SL1 (TCR \pm 50ppm)	1W		125°C	34.8m - 200m	34.8m - 200m	—	36m - 200m	± 50 ppm	
SL1 (TCR \pm 75ppm)	1W		125°C	20m - 200m	20m - 200m	—	20m - 200m	± 75 ppm	
SL2	2W		125°C	10m ~ 360m	5m ~ 360m	3m, 4m	3m ~ 360m	± 180 : R<11m Ω ± 100 : R=>11m Ω	
SLN2	2W		105°C	5m - 200m	5m - 200m	—	5m - 200m	± 110 : R<10m Ω ± 75 : R=>10m Ω	
SL3	3W		125°C: R \leq 100m Ω 90°C: R \geq 110m Ω	10m Ω - 100m Ω	5m Ω - 100m Ω	—	5m Ω - 100m Ω	± 180 : R=<10m Ω ± 100 : R=>11m Ω	
SLZ1**	—		—	0.5m Ω Max.	0.5m Ω Max.	0.5m Ω Max.	0.5m Ω Max.	4000 Max.	

* 3m, 4m, 5m, 6m, 7m, 8m, 9m also available inside each resistance range

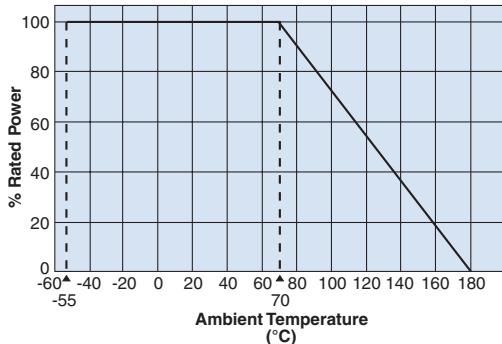
** SLZ1: Current rating: 44A

*** SL07 and SL1 (T.C.R.: $\pm 50/\pm 75$ ppm, $102m\Omega \leq R \leq 200m\Omega$) offer only E24 series

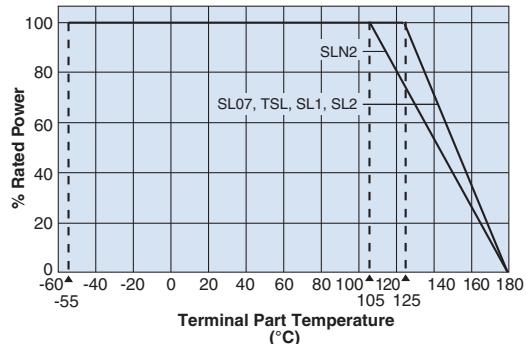
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Derating Curve



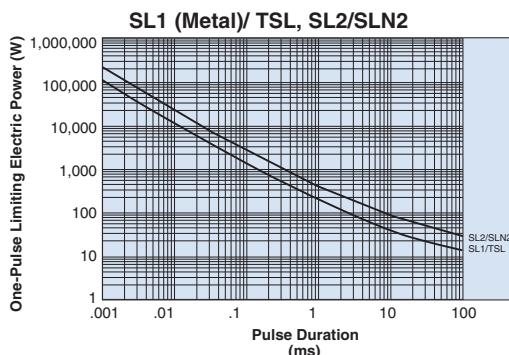
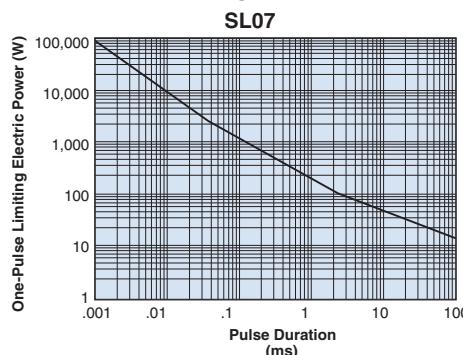
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

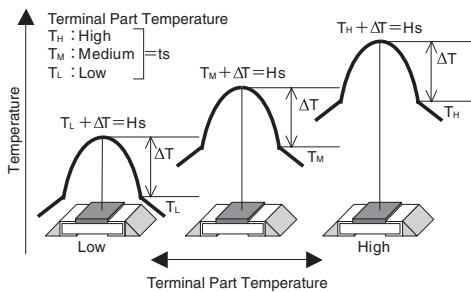
Please ask us about the resistance characteristic of continuous applied pulse. The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	R _{th} ($^{\circ}\text{C}/\text{W}$)
SL07	5m	26
	22m	48
	100m	78
SL1 TSL	5m	16
	20m	39
	100m	59
SL2	5m	16
	20m	41
	200m	55
SLN2	5m	19
	11m	24
	200m	46

$$R_{th} = (H_s - ts) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement	$\Delta R \pm \%$	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	$\pm 1\%:$ SL07, TSL1, SL1, SL2, SL3 $\pm 0.5\%:$ SLN2	$\pm 1\%:$ SL07, TSL1, SL1, SL2, SL3 $\pm 0.25\%:$ SLN2	SL07: Rated power x 4 for 5 seconds, TSL1: Rated power x 2.5 for 5 seconds, SL1, SL2, SLN2, SL3: Rated power x 5 for 5 seconds, SL1 (T.C.R.: +50/-75): Rated power x4 for 5 seconds
Resistance to Solder Heat	$\pm 1\%:$ SL07, TSL1, SL1, SL2, SL3	$\pm 1\%:$ SL07, TSL1, SL1, SL2, SL3	260°C $\pm 5^{\circ}\text{C}$, 10 ± 1 second
	$\pm 0.5\%:$ SLN2	$\pm 0.5\%:$ SLN2	260°C $\pm 5^{\circ}\text{C}$, 10~12 seconds
Rapid Change of Temperature	$\pm 1\%:$ SL07, TSL1, SL1, SL2, SL3	$\pm 0.5\%:$ SL07, TSL1, SL1, SL2, SL3	-55°C (30 minutes), +150°C (30 minutes), 100 cycles
	$\pm 0.5\%:$ SLN2	$\pm 0.25\%:$ SLN2	-55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	$\pm 2\%:$ SL07, TSL1, SL1, SL2, SL3	$\pm 0.5\%:$ SL07, TSL1, SL1, SL2, SL3	40°C $\pm 2^{\circ}\text{C}$, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
	$\pm 0.5\%:$ SLN2	$\pm 0.25\%:$ SLN2	85°C $\pm 2^{\circ}\text{C}$, 85% $\pm 3\%$ RH, 1000 hours, Rated power x 0.1
Endurance at 70°C	$\pm 2\%:$ SL07, TSL1, SL1, SL2, SL3 $\pm 1\%:$ SLN2	$\pm 1\%$	70°C $\pm 2^{\circ}\text{C}$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Low Temperature Exposure	$\pm 0.5\%$	$\pm 0.25\%$	SL07, TSL1, SL1, SL2, SL3: -55°C, 1 hour; SLN2: -65°C, 24 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

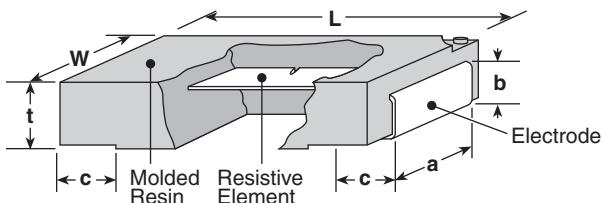
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features

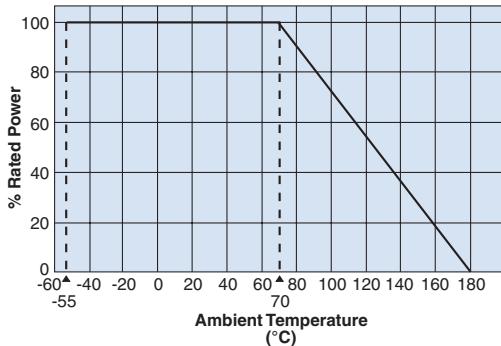
- Surface mount type
- Flameproof UL94V0 molded polymer case
- Excellent dimension accuracy, mountability and shock resistance
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

dimensions and construction

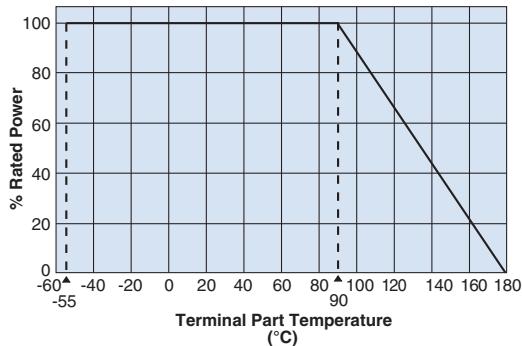


Size Code	Dimensions inches (mm)					
	L	W	t	a	b	c
SL1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.075±.008 (1.9±0.2)	.094±.008 (2.4±0.2)	.047±.008 (1.2±0.2)	.047±.012 (1.2±0.3)
SL2 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.098±.008 (2.5±0.2)	.197±.008 (5.0±0.2)	.067±.008 (1.7±0.2)	.102±.02 (2.6±0.5)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

SL	1	T	TE	10L0	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
SL	1: 1W 2: 2W	T: Sn	TE: 7" embossed plastic For further information on packaging please refer to Appendix A	±0.5%, ±1%: 4 digits ±2%, ±5%: 3 digits All values less than 0.1Ω (100m) are expressed in mΩ with "L" as decimal Ex: 2mΩ = 2L00 0.1Ω: R100; 5mΩ: 5L0	D: ±0.5% F: ±1% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/22/19

applications and ratings

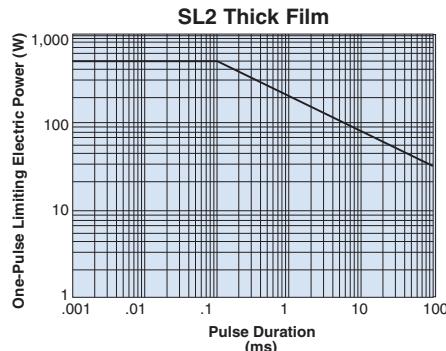
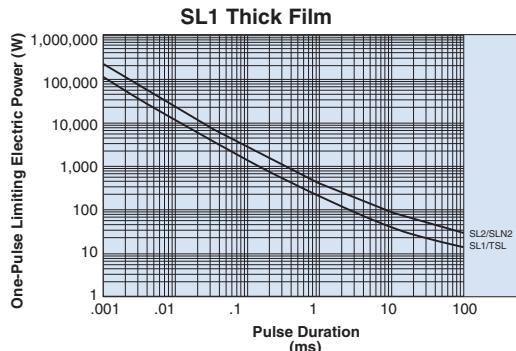
Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temperature	Resistance Range (Ω)*			T.C.R. (ppm/ $^{\circ}$ C) Max.	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temp. Range
SL1	1W	70 $^{\circ}$ C	90 $^{\circ}$ C	105m - 1M	105m - 1M	110m - 22M	\pm 100	200V	400V	-55 $^{\circ}$ C to +180 $^{\circ}$ C
SL2	2W		90 $^{\circ}$ C	365m ~ 1M	365m ~ 1M	390m ~ 22M	\pm 100	500V	1000V	

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value or Max. working voltage}}$, whichever is lower

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

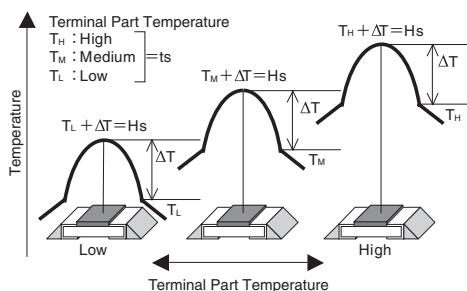
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	R _{th} (°C/W)
SL1 (Thick film)	14
SL2 (Thick film)	6

$$R_{th} = (H_s - t_s)/\text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



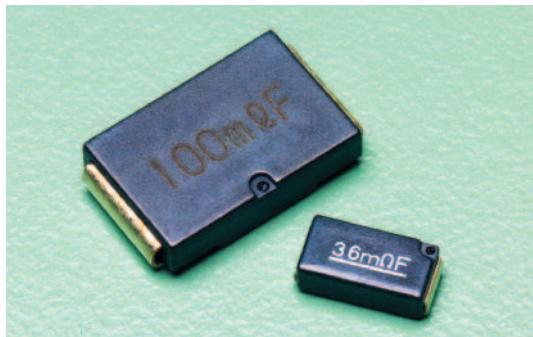
The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

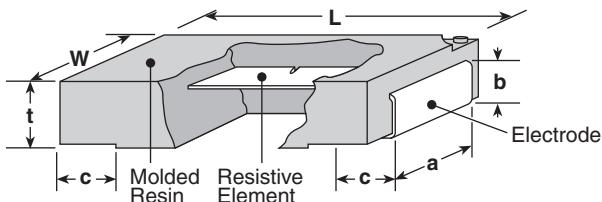
Parameter	Requirement	ΔR \pm % Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C	
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C	
Overload (Short time)	\pm 1%	\pm 1%	Rated power x 5 for 5 seconds	
Resistance to Solder Heat	\pm 1%	\pm 1%	260°C \pm 5°C, 10 \pm 1 second	
Rapid Change of Temperature	\pm 1%	\pm 1%	-55°C (30 minutes), +150°C (30 minutes), 100 cycles	
Moisture Resistance	\pm 2%	\pm 0.5%	40°C \pm 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
Endurance at 70°C	\pm 2%	\pm 0.5%	70°C \pm 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
Low Temperature Exposure	\pm 0.5%	\pm 0.25%	-55°C, 1 hour	

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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features

- Surface mount type
- Flameproof UL94V0 molded polymer case
- Excellent dimension accuracy, mountability and shock resistance
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

dimensions and construction


Size Code	Dimensions inches (mm)					
	L	W	t	a	b	c
SLW07 (2010)	.197±.012 (5.0±0.3)	.098±.008 (2.5±0.2)	.067±.008 (1.7±0.2)	.079±.008 (2.0±0.2)	.047±.008 (0.9±0.2)	.035±.012 (1.2±0.3)
SLW1 (2512)	.248±.012 (6.3±0.3)	.122±.008 (3.1±0.2)	.075±.008 (1.9±0.2)	.094±.008 (2.4±0.2)	.047±.008 (1.2±0.2)	.047±.012 (1.2±0.3)
SLN3 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.094±.008 (2.4±0.2)	.217±.008 (5.5±0.2)	.063±.008 (1.6±0.2)	.100±.016 (2.55±0.4)
SLN5 (4527)	.453±.012 (11.5±0.3)	.276±.008 (7.0±0.2)	.098±.008 (2.5±0.2)	.217±.008 (5.5±0.2)	.075±.008 (1.9±0.2)	.100±.016 (2.55±0.4)

ordering information

SL	1	T	TE	10L0	F	75
Type	Size & Power Ratings	Termination Material	Packaging	Nominal Resistance	Tolerance	T.C.R. (x10 ⁻⁴ /K)
SL SLN	W07: 1W W1: 1.5W 3: 3W 5: 7W	T: Sn	TE: Embossed plastic TED: 10" embossed plastic (SLN5 only) For further information on packaging please refer to Appendix A	±0.5%, ±1%: 4 digits ±5%: 3 digits All values less than 0.1Ω (100m) are expressed in mW with "L" as decimal Ex: 2mΩ = 2L00	D: ±0.5% F: ±1% J: ±5%	Nil: 0-150 0-200 ±75 (SLN3/SLN5) ±100 ±110 ±180 50: ±50 (SLW1) 75: ±75 (SLW1)

applications and ratings

Part Designation	Power Rating	Resistance Range (Ω)*			T.C.R. (ppm/°C) Max.	Rated Terminal Part Temperature	Operating Temperature Range
		D: ±0.5% E24, E96***	F: ±1% E24, E96***	J: ±5% E24			
SLW07	1W	—	5m - 100m		0~200: R=<10mΩ 0~150: R=>11mΩ	125°C	-55°C to +180°C
SLW1	1.5W	10m - 100m	5m - 100m		±180: R=<13mΩ ±100: R=>15mΩ ±75: 20m=<R=<100mΩ ±50: 34.8m=<R=<100mΩ	120°C	
SLN3	3W	5m - 110m			±110: R<10mΩ ±75: R=>10mΩ	105°C	
SLN5	7W (5W)**	3m - 200m		—	±110: R<10mΩ ±75: R=>10mΩ	70°C (120°C)**	-65°C to +180°C

* 5m, 6m, 7m, 8m, 9mΩ also available inside resistance range

** In case the rated terminal part temperature of 120°C, the rated power shall be 5W

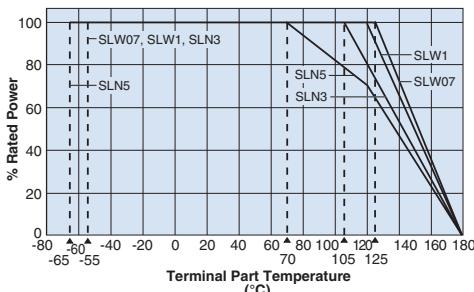
*** SLW07 offers only E24 series

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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environmental applications

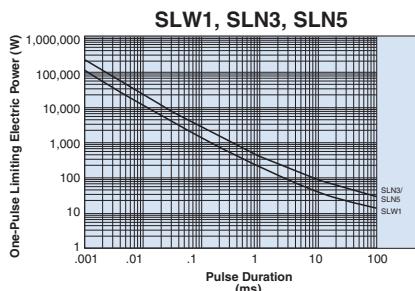
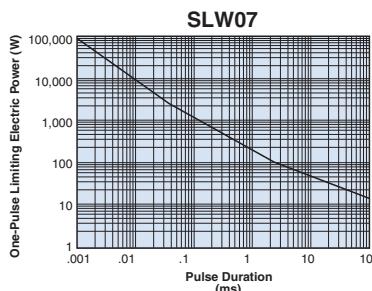
Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage.

Please ask us about the resistance characteristic of continuous applied pulse.

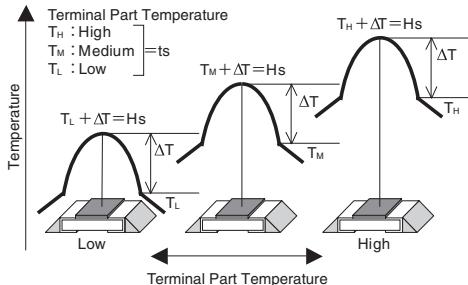
The pulse endurance values are not assured values, so be sure to check the products on actual equipment when you use them.

Thermal Resistance

Type	Resistance (Ω)	R _{th} ($^{\circ}\text{C}/\text{W}$)
SLW07	5m	26
	22m	48
	100m	78
SLW1	5m	16
	20m	39
	100m	59
SLN3	5m	11
	11m	19
SLN5	5m	11
	11m	19
	200m	15

$$R_{th} = (H_s - t_s) / \text{Power}$$

Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.



The temperature of the resistor will increase the same ΔT from the standard terminal part temperature regardless of the ambient temperature when the same power is applied. This is because there is hardly any heat dissipation from the resistor surface to the ambient air.

Performance Characteristics

Parameter	Requirement $\Delta R \pm \%$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1%: SLW07, SLW1 ±0.5%: SLN3 ±2%: SLN5	±1%: SLW07, SLW1 ±0.25%: SLN3 ±0.5%: SLN5	SLW07: 3W for 5 seconds, SLW1: 5W for 5 seconds, SLW1 (T.C.R.: ±50/±75): 4W for 5 seconds, SLN3: 10W for 5 seconds, SLN5: 15W for 5 seconds
Resistance to Solder Heat	±1%: SLW07, SLW1 ±0.5%: SLN3, SLN5	±1%: SLW07, SLW1 ±0.5%: SLN3, SLN5	260°C ± 5°C, 10 ± 1 second 260°C ± 5°C, 10~12 seconds
Rapid Change of Temperature	±1%: SLW07, SLW1 ±0.5%: SLN3, SLN5	±0.5%: SLW07, SLW1 ±0.3%: SLN3, SLN5	-55°C (30 minutes), +150°C (30 minutes), 100 cycles -55°C (15 minutes), +150°C (15 minutes), 1000 cycles
Moisture Resistance	±2%: SLW07, SLW1 ±0.5%: SLN3, SLN5	±1%: SLW07, SLW1 ±0.35%: SLN3, SLN5	40°C ± 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle SLN3: 85°C ± 2°C, 85% RH, 1000 hours, 0.3W SLN5: 85°C ± 2°C, 85% RH, 1000 hours, 0.7W
Endurance of Rated Terminal Part Temperature	±2%	±1% ±1.2%: SLN5	Terminal part temperature: 125°C (SLW07), 120 °C (SLW1, SLN5: 5W), 105°C (SLN3), 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle, 70°C (SLN5: 7W)
Low Temperature Exposure	±0.5%	±0.25%	SLW07, SLW1: -55°C, 1 hour; SLN3, SLN5: -65°C, 24 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

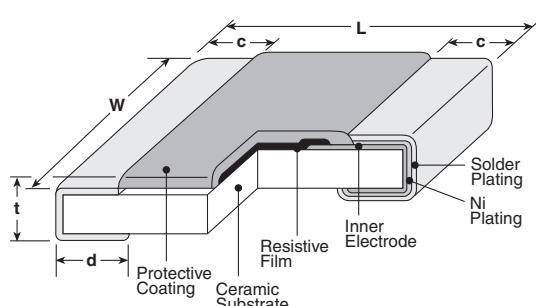
12/11/19



features

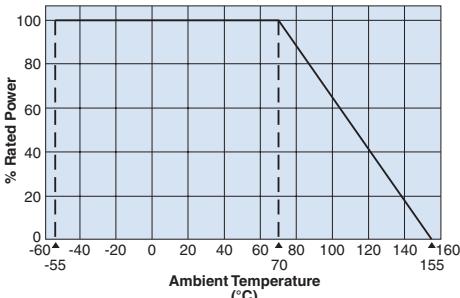
- Wide-side termination (reverse-geometry) type flat chip resistor
- High reliability and performance with T.C.R. $\pm 100 \times 10^{-6}/\text{K}$, resistance tolerance $\pm 0.5\%$
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

dimensions and construction

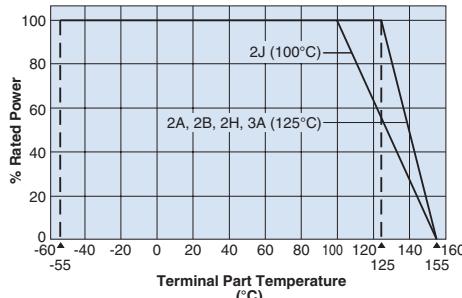


Type (Inch Size Code)	Dimensions inches (mm)					
	L	W	c	d	t	
NEW	2A (0508)	.049 \pm .006 (1.25 \pm 0.15)	.079 \pm .006 (2.0 \pm 0.15)	.012 \pm .008 (0.3 \pm 0.2)	.014 \pm .008 (0.35 \pm 0.2)	.022 \pm .004 (0.55 \pm 0.1)
	2B (0612)	.063 \pm .006 (1.6 \pm 0.15)	.126 \pm .008 (3.2 \pm 0.2)	.012 \pm .008 (0.3 \pm 0.2)	.018 \pm .006 (0.45 \pm 0.15)	.024\pm.004 (0.6\pm0.1)
	2H (1020)	.098 \pm .006 (2.5 \pm 0.15)	.197 \pm .006 (5.0 \pm 0.15)	.016 \pm .008 (0.4 \pm 0.2)		
	2J (1218)	.122 \pm .006 (3.1 \pm 0.15)	.181 \pm .006 (4.6 \pm 0.15)	.016 \pm .008 (0.4 \pm 0.2)	.030 \pm .006 (0.75 \pm 0.15)	
	3A (1225)	.122 \pm .006 (3.1 \pm 0.15)	.252 \pm .006 (6.3 \pm 0.15)	.018 \pm .008 (0.45 \pm 0.2)		

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

If you want to use at rated power (*1), use derating curves based on the terminal part temperature on the right side graph.

ordering information

WK73S	2J	T	TE	33L0	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
WK73S	New 2A: 1W 2B: 0.75W, 1W 2H: 1W 2J: 1W 3A: 1.5W, 2W	T: Sn	TD: 0508, 0612: 7" 4mm pitch punched paper TE: 1020, 1218, 1225: 7" embossed plastic For further information on packaging, please refer to Appendix A	$\pm 1\%$: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω $\pm 5\%$: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal. Ex: 33mΩ, 1% = 33L0	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/11/19

applications and ratings

Part Designation	Power Rating	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (X 10 ⁻³ /K)	Resistance Range (Ω)			Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range	
					D±0.5% E-24/E-96	F±1% E-24/E-96	J±5% E-24				
NEW WK73S2A	1.0W ¹	—	125°C	±100	—	1 - 9.76	1 - 9.1	200V	400V	-55°C to +155°C	
				0~+200	—	30m - 976m	30m - 910m				
				0~+300	—	20m - 29.4m	20m - 27m				
WK73S2B	0.75W	70°C	125°C	±800	—	—	10m - 27m	200V	400V		
				±200	—	30m - 422m	30m - 390m				
				±100	430m - 9.76	430m - 9.76	430m - 9.1				
	1.0W ¹	—	115°C	±800	—	—	10m - 27m				
WK73S2H	1.0W	70°C	125°C	±200	—	30m - 422m	30m - 390m	200V	400V		
				±100	430m - 9.76	430m - 9.76	430m - 9.1				
				±800	—	—	10m - 24m				
WK73S2J	1.0W	70°C	100°C	±200	—	27m - 215m	27m - 200m	200V	400V		
				±100	—	220m - 9.76	220m - 9.1				
				±800	—	—	10m - 30m				
WK73S3A	1.5W	70°C	125°C	±200	—	33m - 237m	33m - 220m	200V	400V		
				±100	—	240m - 9.76	240m - 9.1				
				±800	—	—	10m - 20m				
				±300	—	22m - 32.4m	22m - 30m				
				±200	—	33m - 357m	33m - 330m				
	2.0W ¹	—	115°C	±100	—	360m - 9.76	360m - 9.1	200V	400V		
				±800	—	—	10m - 20m				
				±300	—	22m - 32.4m	22m - 30m				
				±200	—	33m - 357m	33m - 330m				
				±100	—	360m - 9.76	360m - 9.1				

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

¹ If you want to use at rated power use derating curves based on the terminal part temperature on the right side graph located on previous page.

If any questions arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature", please give priority to the "Rated Terminal Part Temperature." For more details refer to the "Introduction of the derating curves based on the terminal part temperature" in the beginning of the catalog

Temperature Rise

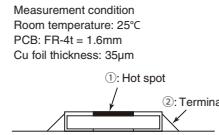
WK73S 2A-2B 1J



WK73S 2H-3A

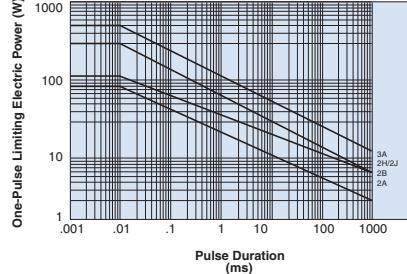


Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



One-Pulse Limiting Electric Power

WK73S 2A-3A



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	WK73S2A (1W), WK73S2B (1W), WK73S3A (2W): Rated voltage x2.0 for 5 seconds. WK73S2B, S2H, S2J, S3A: Rated voltage x2.5 for 3 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes), +155°C (30 minutes), 5 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%: WK73S (±5%) ±1%: all others	±0.5%: WK73S (±5%) ±0.2%: all others	+155°C, 1000 hours

Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/25/19



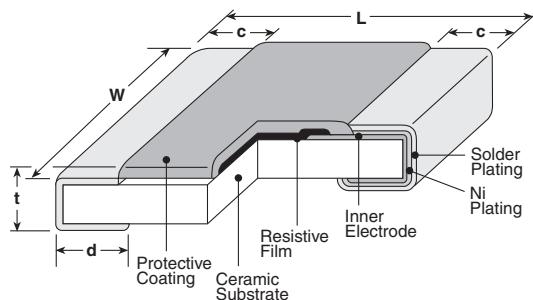
current sense

features

- Wide-side termination (reverse-geometry) type flat chip resistor
- High reliability and performance with T.C.R. $\pm 100 \times 10^{-6}/\text{K}$, resistance tolerance $\pm 1\%$
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

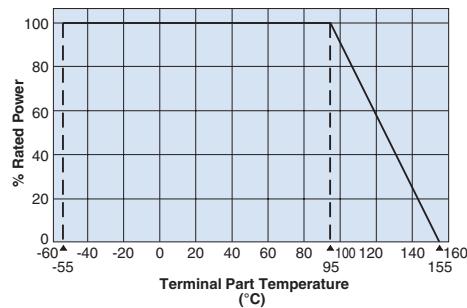


dimensions and construction



Type (Inch Size Code)	L	Dimensions inches (mm)	W	c	d	t
2B15 (0612)	.063±.006 (1.6±0.15)	.126±.008 (3.2±0.2)	.012±.008 (0.3±0.2)	.018±.006 (0.45±0.15)	.030±.006 (0.75±0.15)	.024±.004 (0.6±0.1)
2H2 (1020)	.098±.006 (2.5±0.15)	.197±.006 (5.0±0.15)	.016±.008 (0.4±0.2)			
3A3 (1225)	.122±.006 (3.1±0.15)	.252±.006 (6.3±0.15)	.018±.008 (0.45±0.2)			

Derating Curve



For resistors operated terminal temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve above. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

WK73S	2H2	T	TE	33L0	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
WK73S	2B15: 1.5W 2H2: 2W 3A3: 3W	T: Sn	TD: 0612: 7" 4mm pitch punched paper TE: 1020, 1225: 7" 4mm pitch embossed plastic For further information on packaging, please refer to Appendix A	±0.5%, ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal. Ex: 33mΩ, 1% = 33L0	D: ±0.5% F: ±1% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/25/18

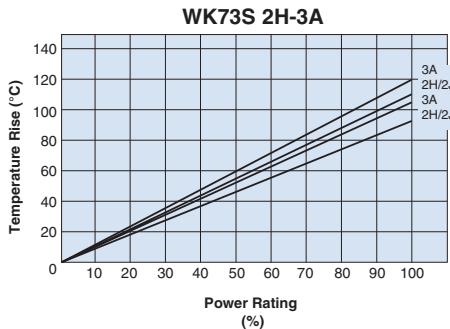
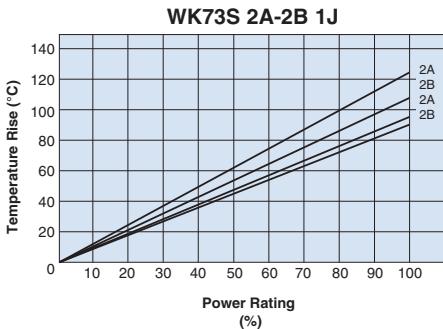
applications and ratings

Part Designation	Power Rating	Rated Terminal Part Temp.	T.C.R. (X 10 ⁻⁶ /K)	Resistance Range (Ω)			Maximum Working Voltage	Maximum Overload Voltage	Operating Temp. Range
WK73S2B15	1.5W	95°C	±100	430m - 9.76	430m - 9.76	430m - 9.1	200V	400V	-55°C to +155°C
			±200	—	30m - 422m	30m - 390m			
			±800	—	—	10m - 27m			
WK73S2H2	2.0W ¹	95°C	±100	—	220m - 9.76	220m - 9.1	200V	400V	-55°C to +155°C
			±200	—	27m - 215m	27m - 200m			
			±800	—	—	10m - 24m			
WK73S3A3	3.0W	95°C	±100	—	360m - 9.76	360m - 9.1	200V	400V	-55°C to +155°C
			±200	—	33m - 357m	33m - 330m			
			±300	—	22m - 32.4m	22m - 30m			
			±800	—	—	10m - 20m			

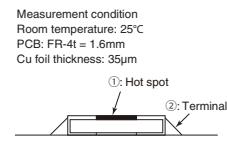
Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower

environmental applications

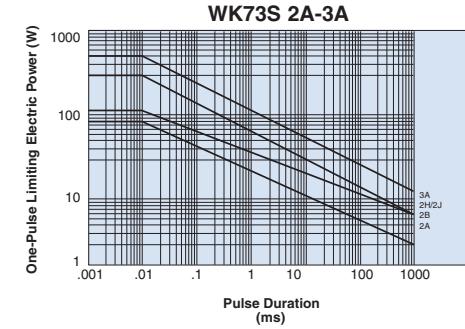
Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated voltage x 2.0 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±0.5%	±0.3%	-55°C (30 minutes)/ +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±0.2%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±2%: J (±5%) ±1%: all others	±0.5%: J (±5%) ±0.2%: all others	+155°C, 1000 hours

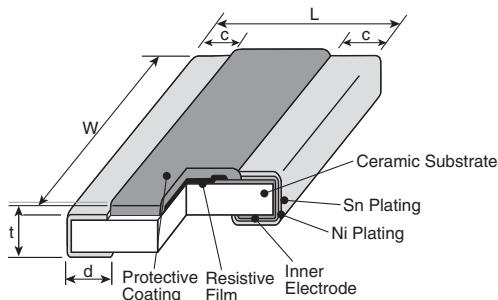
Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

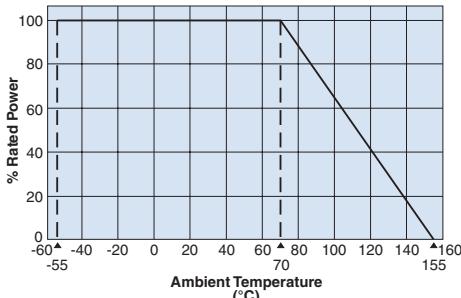
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features

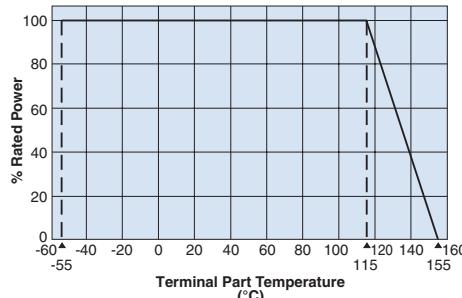
- Wide terminal type flat chip resistor
- High reliability and performance with T.C.R.
 $\pm 75 \times 10^{-6}/\text{K}$, resistance tolerance $\pm 1\%$
- Suitable for flow and reflow solderings
- This product meets EU RoHS requirements.
EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified


dimensions and construction


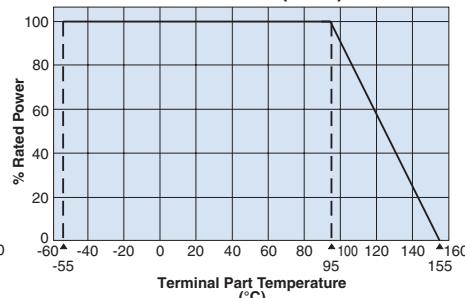
Type (Inch Size Code)	L	Dimensions inches (mm)				
		W	c	d	t	
2B (0612)	.063 \pm .006 (1.6 \pm 0.15)	.126 \pm .012 (3.2 \pm 0.3)	.016 \pm .008 (0.4 \pm 0.2)	.018 \pm .006 (0.45 \pm 0.15)	.024 \pm .004 (0.6 \pm 0.1)	
2B15 (0612)	.063 \pm .006 (1.6 \pm 0.15)	.126 \pm .012 (3.2 \pm 0.3)	.016 \pm .008 (0.4 \pm 0.2)	.018 \pm .006 (0.45 \pm 0.15)	.024 \pm .004 (0.6 \pm 0.1)	

Derating Curve


For resistors operated at an ambient temperature of 70°C or above, the power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, the power rating shall be derated in accordance with the above derating curve.
Please refer to the "Introduction of the derating curves based on terminal part temperature" in the beginning of the catalog.

WU73 2B15 (1.5W)

ordering information

WU73	2B	T	TD	10L0	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
WU73	2B: 1W 2B15: 1.5W	T : Sn	TD: 7" 4mm pitch punched paper For further information on packaging, please refer to Appendix A	4 digits: all values less than 100mΩ are expressed in mΩ with "L" as decimal. Ex: 10mΩ = 10L0	F: $\pm 1\%$

applications and ratings

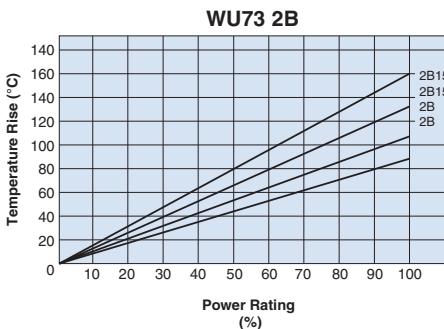
Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temperature	T.C.R. (X 10 ⁻⁶ /K)	Resistance Range (Ω) E-24, 25m, 50m	Resistance Tolerance	Operating Temperature Range
WU732B	1.0W	70°C	115°C	±100	10m~12m	F: ±1%	-55°C to +155°C
				±75	13m~27m		
				±100	30m~100m		
WU732B15	1.5W	—	95°C	±100	10m~12m	F: ±1%	-55°C to +155°C
				±75	13m~27m		
				±100	30m~100m		

Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value}}$

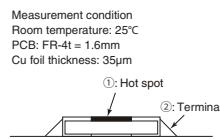
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

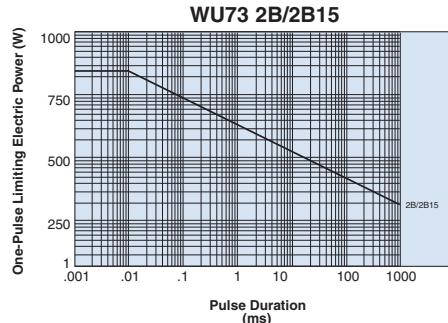
Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.2%	Rated Voltage x 2 for 5 seconds
Resistance to Solder Heat	±1%	±0.2%	260°C ± 5°C, 10 seconds ± 1 second
Bending Test	±1%	±0.1%	Holding point 90mm, Bending 1 time, Bending 5mm
Rapid Change of Temperature	±2%	±0.3%	-55°C (30 minutes), +125°C (30 minutes), 1000 cycles
Moisture Resistance	±2%	±0.1%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±0.2%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.1%	+155°C, 1000 hours

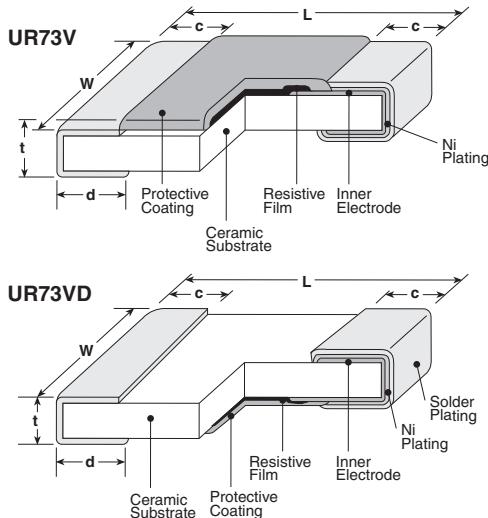
Additional environmental applications can also be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

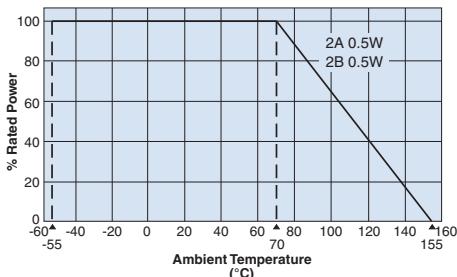
12/17/19


features

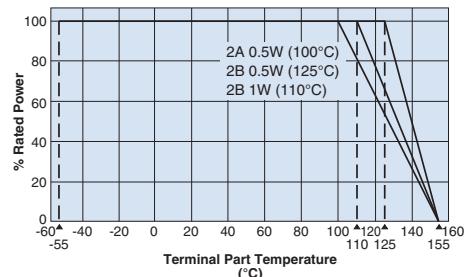
- Current detecting resistors for power supplies, motor circuits, etc.
- Low resistance (100mΩ or under) and high accuracy ($\pm 1\%$) for current detection
- High reliability and performance with T.C.R. $\pm 75 \times 10^{-6}/K$
- Suitable for flow and reflow solderings
- Products will meet EU RoHS requirements
- AEC-Q200 qualified

dimensions and construction


Size Code	Resistance Range (Ω)	Dimensions inches (mm)				
		L	W	c	d	t
UR73V 2A (0805)	10m~16m	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.028±.008 (0.7±0.2)	.024±.004 (0.6±0.1)
	18m~36m				.024±.008 (0.6±0.2)	
UR73V 2A (0805)	39m~100m	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.016±.008 (0.4±0.2)	.024±.004 (0.6±0.1)
	10m~13m				.049±.008 (1.25±0.2)	
	15m~16m	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.016±.012 (0.4±0.3)	.045±.008 (1.15±0.2)	
	18m~20m				.043±.008 (1.1±0.2)	
UR73V 2B (1206)	22m~27m				.039±.008 (1.0±0.2)	
	30m~33m				.039±.012 (1.0±0.3)	.024±.004 (0.6±0.1)
	36m~39m	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.035±.012 (0.9±0.3)	.035±.012 (0.9±0.3)	
	43m~100m				.026±.012 (0.65±0.3)	

Derating Curve


For resistors operated at an ambient temperature of 70°C or above, the power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, the power rating shall be derated in accordance with the above derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog prior use.

ordering information

UR73V	2B	T	TD	30L0	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
UR73V UR73VD: Face-down	2A: 0.5W 2B: 0.5W New 2B: 1W	T: Sn	TD: 4mm pitch punch paper	"R" indicates decimal on values = 100mΩ Ex: R100 = 100mΩ "L" indicates decimal on values <100mΩ Ex: 10L0 = 10mΩ	F: ±1%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/25/19

applications and ratings

Part Designation	Power* Rating	Rated Ambient Temperature	Rated Terminal Temperature	T.C.R. (X10 ⁻⁶ /K)	Resistance Range (Ω) E24 & 25m, 50m	Resistance Tolerance	Operating Temperature Range
UR73V 2A	0.5W	70°C	100°C	±75	39m~100m		
UR73VD 2A	0.5W	70°C	100°C	±75	15m~36m	F: ±1%	-55°C to +155°C
				0~+150	12m~13m		
				0~+250	10m~11m		
				±75	33m~75m		
UR73V 2B	0.5W	70°C	125°C	±100	30m, 82m~100m	F: ±1%	-55°C to +155°C
				±75	33m~75m		
				±100	30m, 82m~100m		
				0~+250	10m~11m		
UR73VD 2B	0.5W	70°C	125°C	±75	12m~27m	F: ±1%	-55°C to +155°C
				0~+250	10m, 11m		
				±75	12m~27m		
				0~+250	10m, 11m		

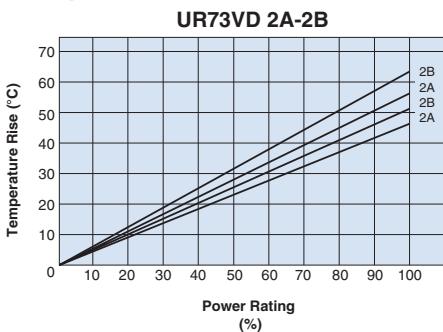
* Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

** Please keep the resistor operating according to the derating curve of the terminal part temperature based on the specified power rating.

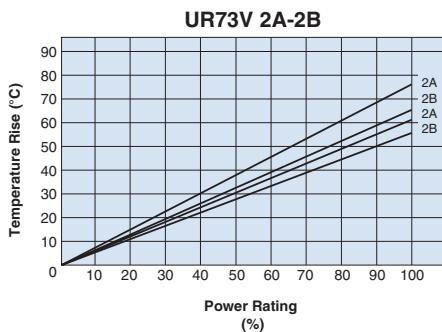
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Temperature Rise



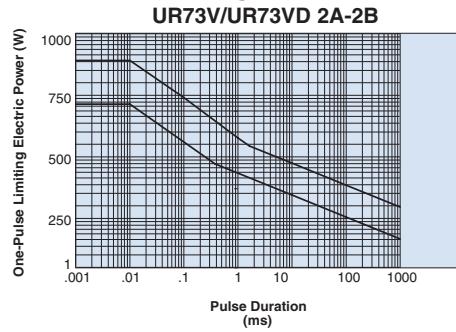
Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



UR73V
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

UR73VD
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

One-Pulse Limiting Electric Power



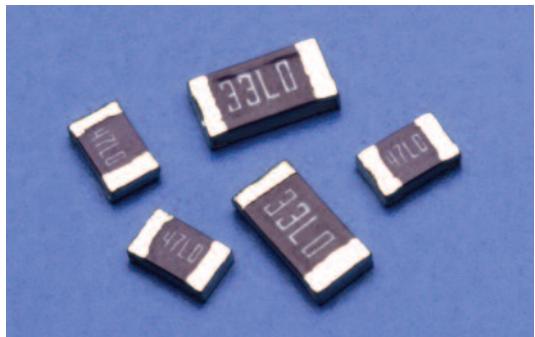
The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.005\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 ± 1 second
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	±2%	±1%	40°C ± 2°C, 90%~95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.3%	+155°C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

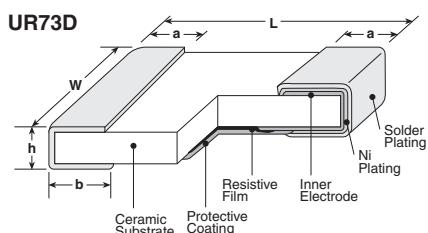
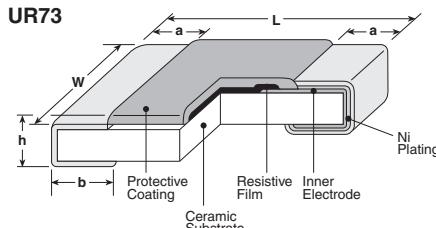
12/17/19



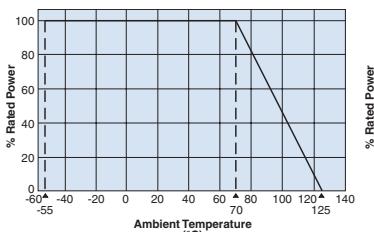
features

- Very low resistance, high precision reliability
- Utilization of thick film
- Low T.C.R. achieved ($\pm 100 \text{ ppm}/^\circ\text{C}$)
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

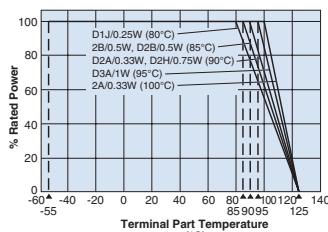
dimensions and construction



Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog prior use.

Size Code	Resistance Range (Ω)	Dimensions inches (mm)				
		L	W	h	a	b
D1E (0402)	24m ~ 100m	.039 ^{+.004} _{-.002} (1.0 ^{+0.1} _{-0.05})	.020 ^{+.004} _{-.002} (0.5 ^{+0.1} _{-0.05})	.016 ^{±.002} (0.4 ^{±0.05})	.010 ^{±.004} (0.25 ^{±0.1})	.012 ^{±.004} (0.3 ^{±0.1})
D1J (0603)	10m ~ 27m 30m ~ 100m	.063 ^{±.008} (1.6 ^{±0.2})	.031 ^{+.005} _{-.004} (0.8 ^{+0.15} _{-0.1})	.02 ^{±.004} (0.5 ^{±0.1})	.014 ^{±.004} (0.35 ^{±0.1})	.022 ^{±.004} (0.55 ^{±0.1}) .014 ^{±.004} (0.35 ^{±0.1})
D2A (0805)	10m ~ 16m 18m ~ 30m	.079 ^{±.008} (2.0 ^{±0.2})	.049 ^{±.008} (1.25 ^{±0.2})	.022 ^{±.004} (0.55 ^{±0.1})	.016 ^{±.008} (0.4 ^{±0.2})	.024 ^{±.008} (0.6 ^{±0.2}) .02 ^{±.008} (0.5 ^{±0.2})
2A (0805)	33m ~ 100m	.079 ^{±.008} (2.0 ^{±0.2})	.049 ^{±.008} (1.25 ^{±0.2})	.02 ^{±.004} (0.55 ^{±0.1})	.016 ^{±.008} (0.4 ^{±0.2})	.012 ^{+.008} _{-.004} (0.3 ^{±0.2})
D2B (1206)	10m ~ 16m 18m ~ 27m	.126 ^{±.008} (3.2 ^{±0.2})	.063 ^{±.008} (1.6 ^{±0.2})	.024 ^{±.004} (0.6 ^{±0.1})	.020 ^{±.008} (0.5 ^{±0.2})	.039 ^{±.008} (1.0 ^{±0.2}) .031 ^{±.008} (0.8 ^{±0.2})
2B (1206)	30m ~ 100m	.126 ^{±.008} (3.2 ^{±0.2})	.063 ^{±.008} (1.6 ^{±0.2})	.024 ^{±.004} (0.6 ^{±0.1})	.020 ^{±.012} (0.5 ^{±0.3})	.016 ^{+.008} _{-.004} (0.4 ^{±0.2})
D2H (2010)	10m ~ 30m 33m ~ 100m	.197 ^{±.008} (5.0 ^{±0.2})	.098 ^{±.008} (2.5 ^{±0.2})	.026 ^{±.004} (0.65 ^{±0.1})	.026 ^{±.012} (0.65 ^{±0.3})	.063 ^{±.012} (1.6 ^{±0.3}) .026 ^{±.012} (0.65 ^{±0.3})
D3A (2512)	10m ~ 30m 33m ~ 100m	.248 ^{±.008} (6.3 ^{±0.2})	.122 ^{±.008} (3.1 ^{±0.2})	.024 ^{±.004} (0.6 ^{±0.1})	.031 ^{±.012} (0.8 ^{±0.3})	.079 ^{±.012} (2.0 ^{±0.3}) .031 ^{±.012} (0.8 ^{±0.3})

ordering information

UR73	2A	T	TD	R100	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
UR73 UR73D	1E: 0.125W 1J: 0.25W 2A: 0.33W 2B: 0.5W 2H: 0.75W 3A: 1W	T: Sn	TP: 2mm pitch punch paper (1E) TD: 7" punched paper tape (1J, 2A, 2B) TE: 7" embossed plastic (2H, 3A)	"R" indicates decimal on values = 100m Ω Ex: R100 = 100m Ω "L" indicates decimal on values <100m Ω Ex: 10L0 = 10m Ω	F: $\pm 1\%$

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

2/08/18

applications and ratings

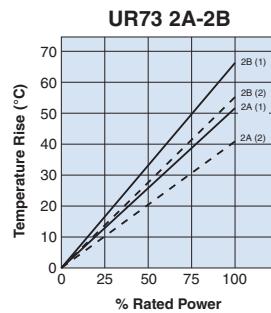
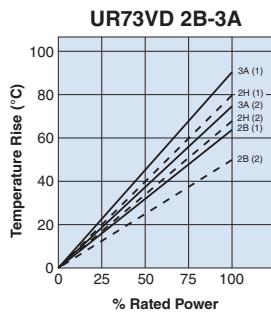
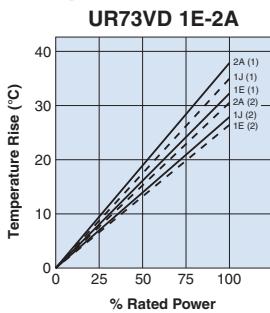
Part Designation	Power Rating	Rated Ambient Temperature	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range		Operating Temperature Range
					F ($\pm 1\%$) E-24, 25mΩ, 50mΩ		
UR73D1E	1/8W (.125W)	70°C	—	±100	30mΩ - 100mΩ	-55°C to +125°C	
				±500	24mΩ - 27mΩ		
UR73D1J	1/4W (.25W)	70°C	80°C	±100	47mΩ - 100mΩ		
				±200	30mΩ - 43mΩ		
UR73D2A	1/3W (.33W)	70°C	90°C	±250	10mΩ - 30mΩ		
UR732A	1/3W (.33W)	70°C	100°C	±100	47mΩ - 100mΩ		
				±250	33mΩ - 43mΩ		
UR73D2B	1/2W (.5W)	70°C	85°C	±200	10mΩ - 27mΩ		
UR732B	1/2W (.5W)	70°C	85°C	±100	47mΩ - 100mΩ		
				±200	30mΩ - 43mΩ		
UR73D2H	3/4W (.75W)	70°C	90°C	±250	10mΩ - 30mΩ		
				±100	33mΩ - 100mΩ		
UR73D3A	1W (1W)	70°C	95°C	±250	10mΩ - 30mΩ		
				±100	33mΩ - 100mΩ		

Rated voltage = $\sqrt{P \cdot R}$

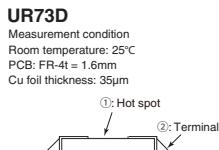
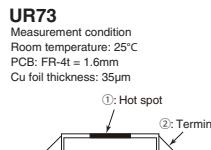
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



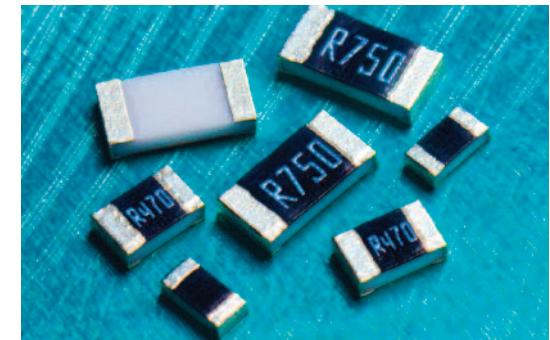
The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement Limit	Δ R (%+0.005Ω)	Typical	Test Method
Resistance	Within specified tolerance	—	25°C	
T.C.R.	Within specified T.C.R.	—	+25°C/+55°C and +25°C/+125°C	
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.5 for 5 seconds	
Resistance to Solder Heat	±1%	±0.3%	260°C ± 5°C, 10 ± 1 second	
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles	
Moisture Resistance	±2%	±1%	40°C ± 2°C, 90%-95%RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
Endurance at 70°C	±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
High Temperature Exposure	±1%	±0.3%	+125°C, 1000 hours	

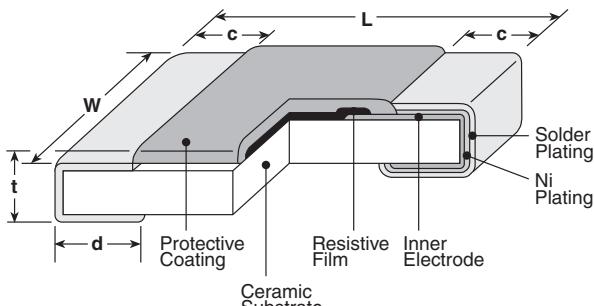
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/25/18


 current
sense

features

- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified: 0402 (1E), 0603 (1J), 0805 (2A), 1206 (2B), 1210 (2E), 2010 (2H/W2H), 2512 (3A/W3A)


dimensions and construction


Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1H (0201)	.024±.001 (.6±.03)	.012±.001 (.3±.03)	.004±.002 (.1±.05)	.006±.002 (.15±.05)	.009±.001 (.23±.03)
1E (0402)	.039 ^{+.004} _{-.002} (1.0 ^{+0.1} _{-0.05})	.02 ^{+.004} _{-.002} (.5 ^{+0.1} _{-0.05})	.01±.004 (.25±.01)	.01±.004 (.25±.01)	.014±.002 (.35±.05)
1J (0603)	.063±.008 (1.6±.02)	.031 ^{+.006} _{-.004} (.8 ^{+0.15} _{-0.1})	.014±.004 (.35±.01)	.014±.004 (.35±.01)	.018±.004 (.45±.01)
2A (0805)	.079±.008 (2.0±.02)	.049±.004 (1.25±.01)	.016±.008 (.4±.02)	.012 ^{+.008} _{-.004} (.3 ^{+0.2} _{-0.1})	.02±.004 (.5±.01)
2B (1206)	.126±.008 (3.2±.02)	.063±.008 (1.6±.02)			
2E (1210)		.102±.008 (2.6±.02)		.016 ^{+.008} _{-.004} (.4 ^{+0.2} _{-0.1})	
2H (2010)	.197±.008 (5.0±.02)	.098±.008 (2.5±.02)			
W2H (2010)			.02±.012 (0.5±.03)	.026±.006 (.65±.015)	.024±.004 (.6±.01)
3A (2512)	.248±.008 (6.3±.02)	.122±.008 (3.1±.02)		.016 ^{+.008} _{-.004} (.4 ^{+0.2} _{-0.1})	
W3A (2512)				.026±.006 (.65±.015)	

ordering information

SR73	2B	T	TD	1R00	F	
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance	
1H 1E 1J 2A 2B 2E W2H W3A 2H 3A	1H 1E 1J 2A 2B 2E W2H W3A 2H 3A	T: Sn L: SnPb (1E, 1J, 2A, 2B, 2E, 2H, 3A) G: Au (1J, 2A, 2B: 0.1Ω - 10Ω - contact factory)	TC: 0201 only: 7" 2mm pitch pressed paper (TC: 10,000 pcs/reel, TCM: 15,000 pcs/reel) TPL: 0402 only: 2mm pitch punch paper TP: 0402, 0603, 0805: 7" 2mm pitch punch paper TD: 0603, 0805, 1206, 1210: 7" 4mm pitch punched paper TE: 0805, 1206, 1210, 2010 & 2512: 7" embossed plastic For further information on packaging, please refer to Appendix A	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal Example: 20mΩ = 20L (3-digit)	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal Example: 20mΩ = 20L (3-digit)	D: ±0.5% F: ±1% G: ±2% J: ±5%

applications and ratings

Part Designation*	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			
					E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)**	E-24 (G±2%)	E-24 (J±5%)
SR731H (0201)	0.1W	70°C	—	0 ~ +400	—	1Ω - 10Ω**	—	0.27Ω - 10Ω
				0 ~ +500		—		0.18Ω - 0.24Ω
SR731E (0402)	1/6W (.166W)	70°C	125°C	±200	—	0.51Ω - 10Ω**	0.51Ω - 10Ω	0.51Ω - 10Ω
				±300	—	0.2Ω - 0.47Ω**	0.2Ω - 0.47Ω	0.2Ω - 0.47Ω
				±500	—	0.1Ω - 0.18Ω**	0.1Ω - 0.18Ω	0.1Ω - 0.18Ω
SR731J (0603)	1/5W (.2W)	70°C	125°C	±200	—	1.02Ω - 10Ω	1.1Ω - 10Ω	1.1Ω - 10Ω
				±200	—	0.1Ω - 1Ω	0.1Ω - 1Ω	0.1Ω - 1Ω

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/01/19

applications and ratings (continued)

Part Designation*	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			
					E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)**	E-24 (G±2%)	E-24 (J±5%)
SR732A (0805)	1/3W (.33W)	70°C	125°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.05Ω - 0.09Ω
	1/2W (.5W [†])	—	105°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.05Ω - 0.09Ω
SR732B (1206)	1/3W (.33W)	70°C	125°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.05Ω - 0.09Ω
	1/2W (.5W [†])	—	110°C	±100	0.15Ω - 10Ω	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.05Ω - 0.09Ω
SR732E (1210)	1/2W (.5W)	70°C	125°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.047Ω - 0.10Ω
				±500	—	—	—	0.036Ω - 0.043Ω
	2/3W (.66W [†])	—	110°C	±100	—	0.1Ω - 10Ω	—	0.024Ω - 0.033Ω
				±200	—	—	0.1Ω - 10Ω	0.047Ω - 0.10Ω
				±500	—	—	—	0.036Ω - 0.043Ω
SR732H/W2H (2010)	3/4W (.75W)	70°C	125°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.033Ω - 0.051Ω
SR733A/W3A (2512)	1W	70°C	125°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.039Ω - 0.051Ω

* Parentheses indicate EIA package size codes.

** 1H, 1E (F: ±1%) E-24 values only.

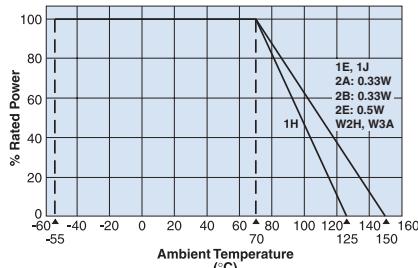
Operating Temp: -55°C to +125°C (SR731H only), -55°C to +150°C

If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

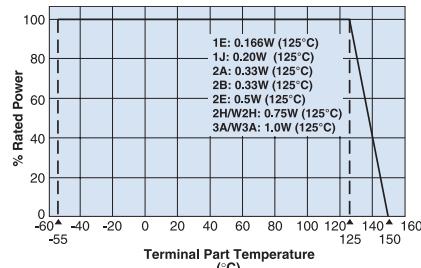
[†]Prior to use, refer to the "Higher Power Ratings" in the beginning of catalog. Rated voltage = $\sqrt{\text{Power rating} \times \text{resistance value or max. working voltage}}$, whichever is lower

environmental applications

Derating Curve

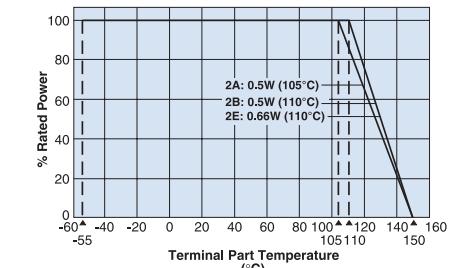


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

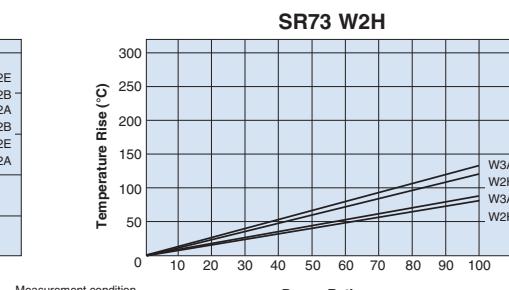
SR73 2A (0.5W), SR73 2B (0.5W), SR73 2E (0.66W)



Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



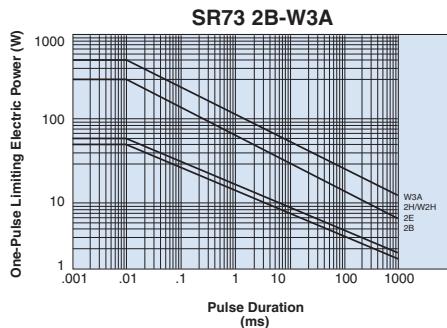
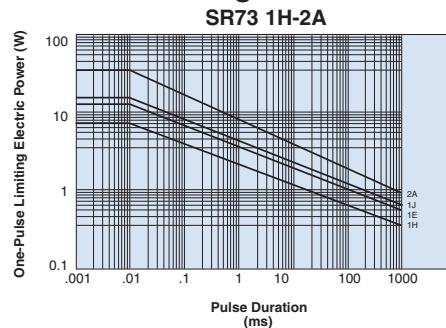
Measurement condition
Room temperature: 25°C
PCB: FR-4t = 1.6mm
Cu foil thickness: 35μm

① Hot spot
② Terminal

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/11/19

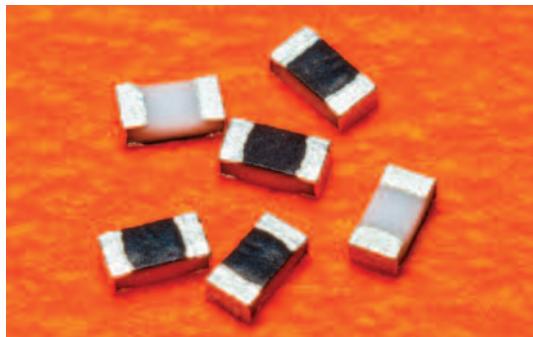
One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement $\Delta R \pm(0.005\%)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Overload (Short time)	$\pm 2\%$	$\pm 0.5\%$	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	1H: $\pm 3\%$, 1E-W3A: $\pm 1\%$	1H: $\pm 0.75\%$ 1E-W3A: $\pm 0.3\%$	260°C $\pm 5^\circ\text{C}$, 10 seconds ± 1 second
Rapid Change of Temperature	$\pm 1\%$	$\pm 0.3\%$	-40°C (30 minutes), +125°C (30 minutes), 100 cycles
Moisture Resistance	1H: $\pm 3\%$ 1E-W3A: $\pm 2\%$	$\pm 1\%$	40°C $\pm 2^\circ\text{C}$, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	1H: $\pm 3\%$ 1E-W3A: $\pm 2\%$	$\pm 1\%$	70°C $\pm 2^\circ\text{C}$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	$\pm 1\%$	$\pm 0.3\%$	1H: +125°C, 1000 hours; 1E, 1J, 2A, 2B, 2E, 2H/W2H, 3A/W3A: +150°C, 1000 hours



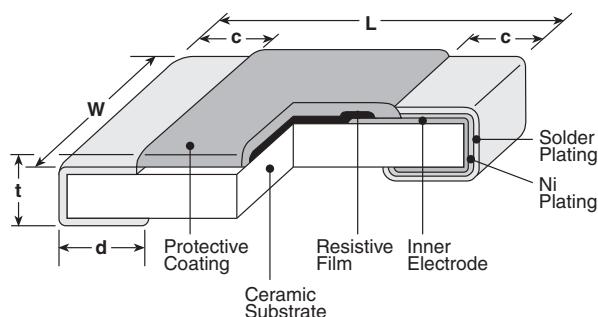
**EU
RoHS
C O M P L I A N T**

current
sense

features

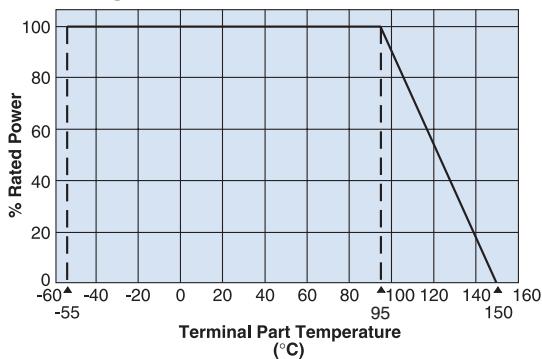
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- AEC-Q200 Qualified

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
3A2 (2512)	.248±.008 (6.3±0.2)	.122±.008 (3.1±0.2)	.02±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)
W3A2 (2512)				.026±.006 (0.65±0.15)	

Derating Curve



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve. Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

ordering information

SR73	3A2	T	TE	1R00	F
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
3A2 W3A2		T: Sn	TE: 7" embossed plastic For further information on packaging, please refer to Appendix A	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal Example: 20mΩ = 20L (3-digit)	F: ±1% G: ±2% J: ±5%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/01/19

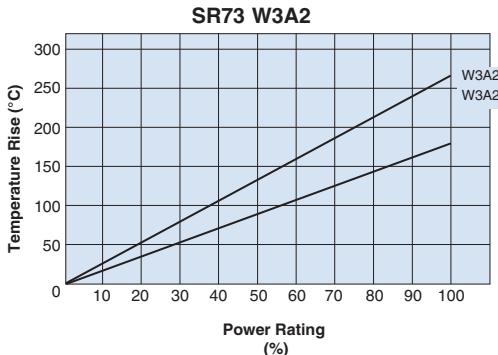
applications and ratings

Part Designation*	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range			
					E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)	E-24 (G±2%)	E-24 (J±5%)
SR733A2/W3A2 (2512)	2W	—	95°C	±100	—	0.1Ω - 10Ω	—	—
				±200	—	—	0.1Ω - 10Ω	0.1Ω - 10Ω
				±500	—	—	—	0.056Ω - 0.091Ω
				±800	—	—	—	0.039Ω - 0.051Ω

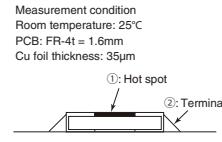
* Parentheses indicate EIA package size codes. Operating Temp: -55°C to +150°C
 Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

environmental applications

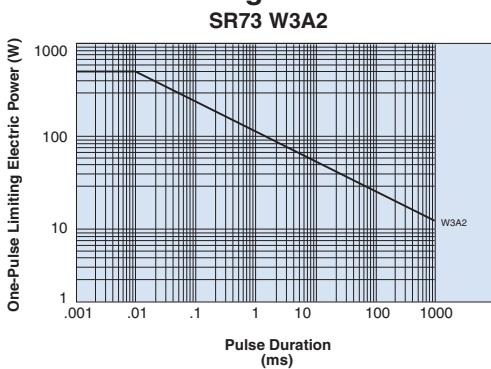
Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions.



One-Pulse Limiting Electric Power



The maximum applicable voltage is equal to the max. overload voltage. Please contact factory for resistance characteristics of continuous applied pulse.

Performance Characteristics

Parameter	Requirement Δ R ±(%+0.005Ω)	Typical	Test Method	
	Limit			
Resistance	Within specified tolerance	—	25°C	
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C	
Overload (Short time)	±2%	±0.5%	Rated voltage x 2.0 for 5 seconds	
Resistance to Solder Heat	1H: ±3%, 1E~W3A2: ±1%	±0.3%	260°C ± 5°C, 10 seconds ± 1 second	
Rapid Change of Temperature	±1%	±0.3%	-40°C (30 minutes), +125°C (30 minutes), 100 cycles	
Moisture Resistance	1H: ±3% 1E~W3A2: ±2%	±1%	40°C ± 2°C, 90%-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
Endurance at 70°C	1H: ±3% 1E~W3A2: ±2%	±1%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
High Temperature Exposure	±1%	±0.3%	+150°C, 1000 hours	

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/01/19

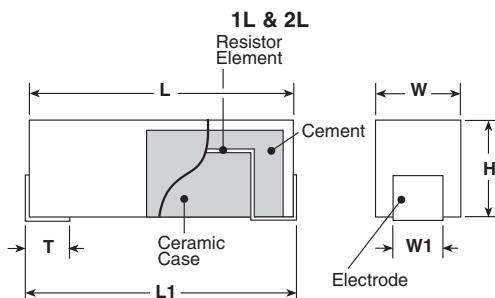


features

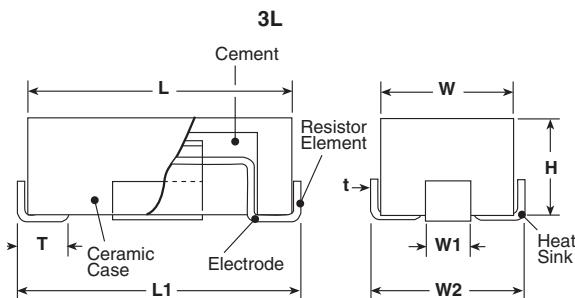
- Suitable to detect large current due to ultra low resistances
- Flame retardant resistor in a ceramic case
- All custom-made products
- Automatic mounting is available
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

current
sense

dimensions and construction



Size Code	Dimensions inches (mm)							
	L	L1	W	W2	H	W1	t	T
1L	.512±.019 (13±0.5)	.551±.039 (14±1.0)	.217±.019 (5.5±0.5)	—	.205±.019 (5.2±0.5)	—	—	.098±.039 (2.5±1.0)
2L	.709±.019 (18±0.5)	.748±.039 (19±1.0)	.248±.019 (6.3±0.5)	—	.236±.006 (6.0±0.5)	.118±.012 (3.0±0.03)	—	.118±.039 (3.0±1.0)
3L	.760±.039 (19.3±1.0)	.323±.019 (8.2±0.5)	.362 (9.2)	—	—	—	.012 (0.3)	—



ordering information

BLR	1L	N	TE	50L	J
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance
1L: 1W 2L: 2W 3L: 15W	1L: 1W 2L: 2W 3L: 15W	N: No surface treatment	TE: 7" embossed plastic 1, 2: 1,000 pieces/reel 3: 750 pieces/reel	3 digits All values less than 0.1Ω (100mΩ) are expressed in mΩ with "L" as decimal Ex: 2mΩ = 2L0	J: ±5% K: ±10%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/26/16

applications and ratings

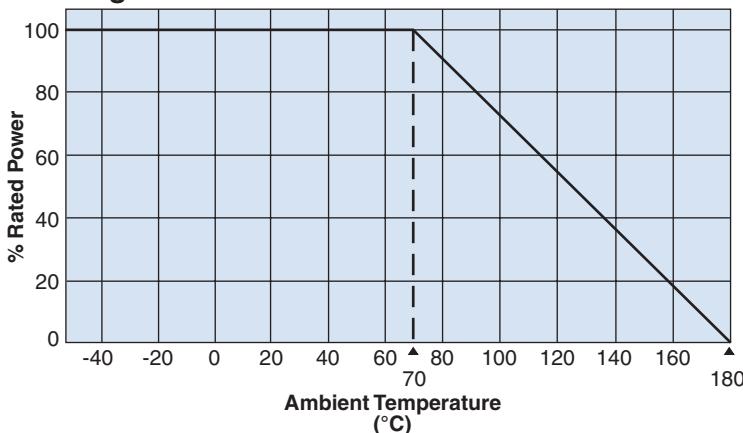
Part Designation	Power Rating	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range*	Resistance Tolerance	Rated Ambient Temperature	Operating Temperature Range
BLR1L	1W	± 100	25m, 50m Ω	J: $\pm 5\%$ K: $\pm 10\%$	$+70^{\circ}\text{C}$	-40°C to $+180^{\circ}\text{C}$
BLR2L	2W		8m, 12m, 13m, 16m, 17.5m, 20m, 22m, 25m Ω			
BLR3L	15W**					

* Please consult with us in advance about resistance value for custom-made products

** It is assumed to be used on aluminum circuit board

environmental applications

Derating Curve



Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm (% + 0.05\Omega)$	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified value	—	$+25^{\circ}\text{C}/+125^{\circ}\text{C}$
Cold Resistance	$\pm 5.0\%$	$\pm 2.0\%$	-55°C , 1000 hours
Heat Resistance	$\pm 5.0\%$	$\pm 2.0\%$	$+125^{\circ}\text{C}$, 1000 hours
Moisture Resistance	$\pm 5.0\%$	$\pm 2.0\%$	$40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, Power rating x 1/10, 90% - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Load Life	$\pm 5.0\%$	$\pm 2.0\%$	$70^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 1000 hours 1.5 hr ON, 0.5 hr OFF cycle



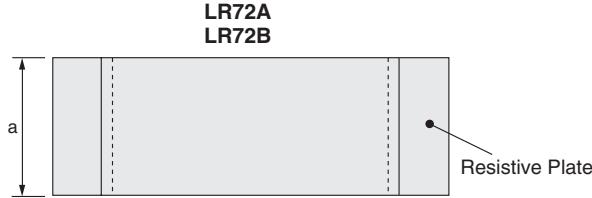
features

- Superior thermal expansion cycling
- Inductance less than 10nH
- Solderable pads (60/40 SnPb plate)
- Lead flexible for thermal expansion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

current
sense

dimensions and construction

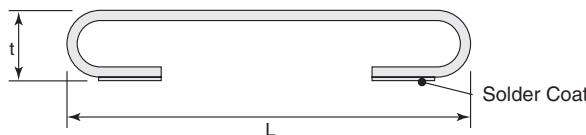
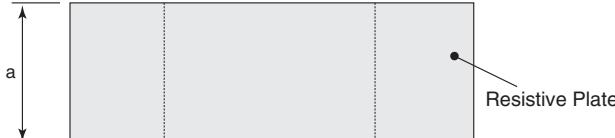
LR72A
LR72B



Size Code	Dimensions inches (mm)			
	L	L2 ^{.01} _{-.02}	W	t
LR72A	.39±.004 (10.0±0.1)	.079 (2.0)	.20±.008 (5.2±0.2)	.079 (2 Max.)
LR72B	.39±.004 (10.0±0.1)	.079 (2.0)	.118±.008 (3.0±0.2)	.079 (2 Max.)
LR72C	.44±.016 (11.2±0.4)	—	.126±.016 (3.2±0.4)	.137±.016 (3.5±0.4)



LR72C



ordering information

LR72	A	D	TED	2L0	J
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance
	A	D: SnAgCu (LR72C only) N: CuNi (non-presolder) (LR72A, B only)	TED: LR72A LR72B TEB: LR72C	2mΩ: 2L0 “L” indicates the decimal in milliohms	J: ±5%
	B				
	C				

For further information on packaging,
please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/11/15

applications and ratings

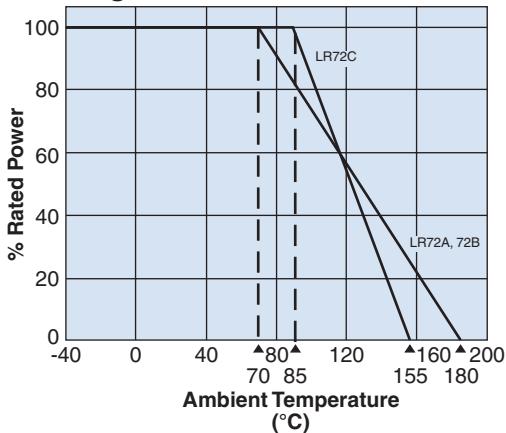
Part Designation	Power Rating*	T.C.R. (ppm/ $^{\circ}$ C) Max.	Standard Resistance**	Resistance Tolerance	Rated Ambient Temperature	Operating Temperature Range
LR72A	1/2W	± 100	2.5m Ω , 5m Ω , 8m Ω	J: $\pm 5\%$	+70 $^{\circ}$ C	-40 $^{\circ}$ C to +180 $^{\circ}$ C
LR72B	1/4W		3m Ω			
LR72C	1W		2m Ω , 3m Ω		+85 $^{\circ}$ C	-40 $^{\circ}$ C to +155 $^{\circ}$ C

* Rated power in case of glass epoxy resin (FR-4) is used for the substrate material

** Please contact factory for custom made resistance values

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70 $^{\circ}$ C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm \%$ Typical	Test Method
Resistance	Within specified tolerance	—	25 $^{\circ}$ C
T.C.R.	Within specified T.C.R.	—	+25 $^{\circ}$ C/+125 $^{\circ}$ C
Resistance to Soldering Heat	$\pm 2.0\%$	$\pm 1.6\%$	350 $^{\circ}$ C $\pm 10^{\circ}$ C, 3 seconds
Moisture Resistance	$\pm 5.0\%$	$\pm 4.5\%$	Power rating x 1/10, 40 $^{\circ}$ C, 90% - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70 $^{\circ}$ C	$\pm 5.0\%$	$\pm 4.5\%$	Rated voltage 70 $^{\circ}$ C, 1000 hours 1.5 hr ON, 0.5 hr OFF cycle



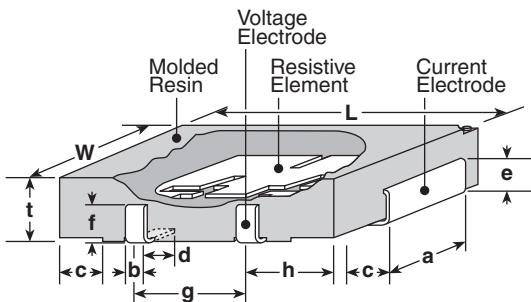
features

- Extremely low resistance and high precision tolerance
- Low T.C.R. achieved ($\pm 50\text{ppm}/^\circ\text{C}$)
- Flameproof UL94V0
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

current
sense

dimensions and construction

Size Code	L	W	t	a	Dimensions inches (mm)							
					b	c	d	e	f	g	h	
CSR1	.425±.02 (10.8±0.5)	.244±.012 (6.2±0.3)	.083±.008 (2.1±0.2)	.118±.012 (3.0±0.3)	.031±.008 (0.8±0.2)	.055±.02 (1.4±0.5)	.047±.02 (1.2±0.5)	.051±.012 (1.3±0.3)	.051±.012 (1.3±0.3)	.197±.004 (5.0±0.1)	.098±.004 (2.5±0.1)	
CSR2	.504±.02 (12.8±0.5)	.323±.012 (8.2±0.3)	.122±.008 (3.1±0.2)	.197±.012 (5.0±0.3)	.039±.008 (1.0±0.2)	.079±.02 (2.0±0.5)	.079±.02 (2.0±0.5)	.087±.012 (2.2±0.3)	.087±.012 (2.2±0.3)	.236±.004 (6.0±0.1)	.118±.004 (3.0±0.1)	



ordering information

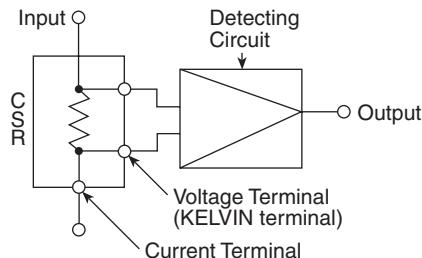
CSR	1	T	TED	10L0	F
Type	Power Rating	Termination Material	Packaging	Nominal Resistance	Tolerance
	1: 1W 2: 2W	T: Sn (Other termination styles may be available, please contact factory for options)	TED: CSR1 TEB: CSR2 (1,000 pieces/reel)	In millionohms: 3 significant figures "L" indicates decimal point	D: ±0.5% F: ±1%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

1/24/14

typical circuit schematic

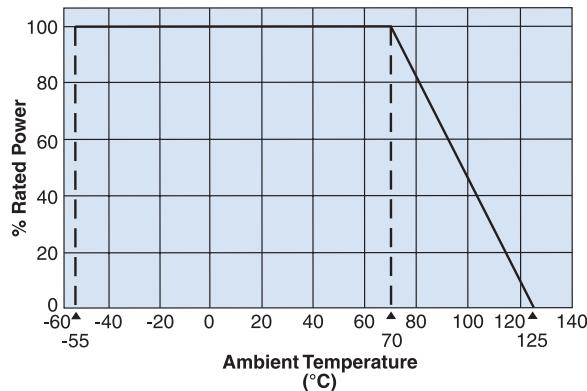


applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range E-12	Resistance Tolerance	Rated Ambient Temperature	Operating Temperature Range
CSR1	1W	±50	5mΩ - 50mΩ	D: ±0.5%, F: ±1%	+70°C	-55°C to +125°C
CSR2	2W			F: ±1%		

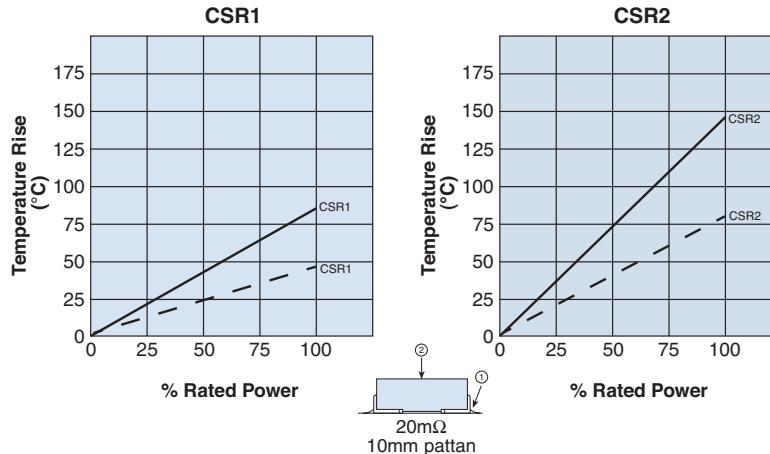
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



Regarding the temperature rise, the value of the temperature varies per conditions and board for use since the temperature is measured under our measuring conditions. Please refer to us before use.

Performance Characteristics

Parameter	Requirement ΔR ±%	Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C	
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C	
Overload (Short Time)	±1.0%	±1.0%	Rated power x 5 for 5 seconds	
Resistance to Solder Heat	±1.0%	±1.0%	260°C ± 5°C, 10 seconds ± 1 second	
Rapid Change of Temperature	±1.0%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 500 cycles	
Moisture Resistance	±2.0%	±0.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
Endurance at 70°C	±1.0%	±0.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle	
Low Temperature Exposure	±0.5%	±0.25%	-55°C, 1 hour	
High Temperature Exposure	±0.5%	±0.25%	+125°C, 100 hours	

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/13/14



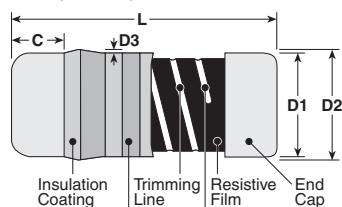
features

- Free direction for mounting due to cylindrical design
- High precision products (Resistance tolerance $\pm 0.1\%$ and T.C.R. $\pm 25 \times 10^{-6}/K$) available (RN41)
- The electrode strength is firm
- The noise characteristics is excellent
- Suitable for reflow, flow and iron solderings
- Products meet EU-RoHS requirements
- AEC-Q200 qualified (RN41 2ES/3AS, CC 12M/25)

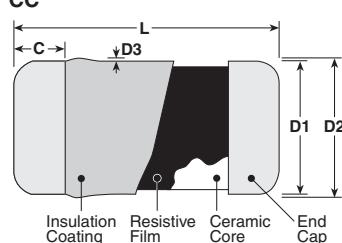
current
sense

dimensions and construction

RN41, RM41, RD41



CC



Type (Inch/DIN Size Code)	Dimensions inches (mm)				
	L	C	D1	D2 (max.)	D3 (max.)
2A (0805/0102)	.079±.004 (2.0±0.1)	.012 (0.3 min.)	.049±.002 (1.25±0.05)	.053 (1.35)	.003 (0.07)
2D (1206/0203)	.126±.008 (3.2±0.2)	.02 (0.5 min.)	.061±.006 (1.55±0.15)	.069 (1.75)	.004 (0.1)
2ES (1406/0204)	.138±.008 (3.5±0.2)	.02 ~ .035 (0.5 ~ 0.9)	.055±.004 (1.4±0.1)	.061 (1.55)	
CC12M (1406/0204)	.138±.008 (3.5±0.2)	.02 ~ .035 (0.5 ~ 0.9)	.055±.004 (1.4±0.1)	.061 (1.55)	.004 (0.1)
2E, 2H, 3AS (2309/0207)	.232±.008 (5.9±0.2)	.02 (0.5 min.)	.087±.004 (2.2±0.1)	.094 (2.4)	.006 (0.15)
CC25 (2309/0207)	.232±.008 (5.9±0.2)	.02 (0.5 min.)	.087±.004 (2.2±0.1)	.094 (2.4)	.006 (0.15)

ordering information

RN41	2ES	T	TE	1001	F	50*
Type	Size	Termination Material	Packaging	Nominal Resistance	Tolerance	T.C.R. (ppm/ $^{\circ}$ C)
RN41 RM41 RD41	2A: 0.125W 2D: 0.2W 2ES: 0.25W, 0.4W 2E: 0.25W 2H: 0.5W 3AS: 1W	T: Sn	TE: 7" embossed plastic (2A, 2ES - 3,000 pieces/reel) (2D - 2,000 pieces/reel) (2E, 2H, 3AS - 1,500 pieces/reel)	$\pm 5\%$: 2 significant figures + 1 multiplier. "R" indicates decimal on values $< 10\Omega$ $\pm 1\%$: 3 significant figures + 1 multiplier. "R" indicates decimal on values $< 100\Omega$	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$	25: ± 25 50: ± 50 100: ± 100 200: ± 200 Nil: RM41 RD41

*T.C.R. noted for RN41 only

CC12M	T	TE
Type	Termination Material	Packaging

CC12M
CC25

T: Sn

TE: 7" embossed plastic

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/26/18

applications and ratings

Part Designation	Power Rating @ 70°C	Rated Ambient Temp.	Rated Terminal Part Temp.	T.C.R. (ppm/°C) Max.	Resistance Range					Max. Working Voltage	Max. Overload Voltage
					E-24, E-96 (B±0.1%)	E-24, E-96 (C±0.25%)	E-24, E-96 (D±0.5%)	E-24, E-96 (F±1%)	E-24 (J±5%)		
RN412A	1/8W (.125W)	70°C	—	±100	—	—	—	100Ω-100kΩ	—	150V	200V
RN412D	1/5W (.2W)	70°C	—	±50	—	—	—	10Ω-604kΩ	—		300V
RN412ES	1/4W (.25W)	70°C	90°C	±25	43Ω-511kΩ	100Ω-100kΩ	100Ω-604kΩ	—	—	200V	400V
		70°C	90°C	±50	—	—	—	1Ω-5.11MΩ	0.22Ω-0.91Ω		—
RN412ES	2/5W (.4W)* ^{1,2}	—	90°C	±50	—	—	—	1Ω-5.11MΩ	0.22Ω-0.91Ω	200V	400V
RN412H	1/2W (.5W)	70°C	—	±200	—	—	—	—	0.22Ω-100kΩ	250V	600V
RN413AS	1W* ²	70°C	—	±50	—	—	—	1Ω-1MΩ	0.22Ω-0.91Ω	400V	600V
RM412D	1/5W (.2W)	70°C	—	±350	—	—	—	—	0.22Ω-8.2Ω (E-12)	—	—
RM412H	1/2W (.5W)	70°C	—	±350	—	—	—	—	—	—	—
RD412ES	1/4W (.25W)	70°C	—	— ³	—	—	—	2.2 - 1.0M	2.2 - 1.0M	200V	400V
RD412E	1/4W (.25W)	70°C	—	— ³	—	—	—	1.0 - 2.2M	1.0 - 2.2M	300V	600V

Part Designation	Current Rating	Rated Ambient Temp.	Maximum Resistance
CC12M	2A	+70°C	20 mΩ or less
CC25	5A		

*¹ A power rating is guaranteed at the terminal part temperature
If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.

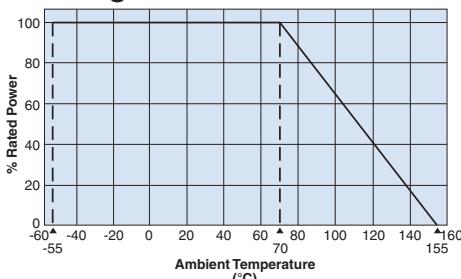
*² A power rating shall be guaranteed with a method shown in the Performance Characteristics. Please contact factory prior to use.

*³ Please contact factory for T.C.R. of RD41

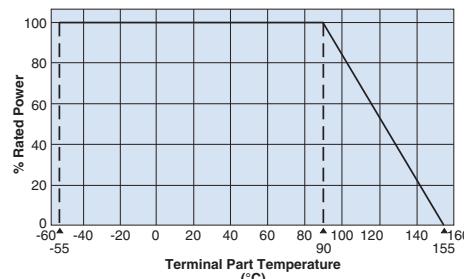
Operating Temperature Range: -55°C to +155°C

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.

Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

Performance Characteristics

Parameter	Type	Requirement $\Delta R \pm(0.05\Omega)$ Limit	Typical	Test Method
Resistance	RN41 RM41 RD41	Within specified tolerance	—	25°C
T.C.R.	RN41 RM41 RD41	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	RN41	±0.5%	±0.3%	Rated voltage x 2.5 for 5 seconds or Max. overload voltage, whichever is lower, for 5 seconds
	RM41	±0.5%	±0.3%	
	RD41	±1%	±0.5%	
Intermittent Overload	RN41 ¹	±1%	—	Rated voltage x 4 (RD41: 2Ax3) or Max. intermittent overload voltage, whichever is lower, 10,000 cycles
	RM41	±0.5%: 2E	—	
	RD41	±1%	—	
Resistance to Soldering Heat	RN41 ²	±2%: 2H (10Ω> ±1%: 2H (10Ω≤ ±0.5%: 2A~2E	±1%: 2H (10Ω> ±0.5%: 2H (10Ω≤ ±0.3%: 2A~2E	260°C ± 5°C, 10 seconds ± 1 second
	RD41	±1%	±0.5%	
	RD41	±0.5%: 2A~2E ±1%: 2H	±0.3%: 2A~2E ±0.7% 2H	
Rapid Change of Temperature	RM41	±1%	±0.75%	-55°C (30 minutes), +125°C (30 minutes), 5 cycles
	RD41	±1%	±0.75%	
	RD41	±1%: 2D, 2E ±3%: 2A; ±5%: 2H	±0.75%: 2D, 2E ±1.5%: 2A; ±3%: 2H	
Moisture Resistance	RM41	±5%	±3%	40°C ± 2°C, 90 ~ 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
	RD41	±5%	±2.5%	
	RD41	±1%: 2D, 2E ±3%: 2A; ±5%: 2H	±0.5%: 2D, 2E ±1.5%: 2A; ±3%: 2H	
Endurance at 70°C	RM41	±5%	±3%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
	RD41	±2%	±1%	
	RD41	±1%	±0.75%	
Low Temperature Exposure	RD41	±1%	±0.75%	-55°C, 1 hour
High Temperature Exposure	RN41 ³	±1%	±0.75%	155°C, 2 hours RN41: 2ES, 3AS: 155°C, 1000 hours
	RD41	±2%	±1%	

¹2ES: Does Not Apply ²2ES: Test Group D ³2ES: Test Group A ⁴2ES: Test Group C

CC

Parameter	Requirement Δ Real R Limit	Typical	Test Method
Resistance	20mΩ Max. after the test	7.5mΩ Max. after the test	25°C
Resistance to Solder Heat			260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature			-55°C (30 minutes), +125°C (30 minutes), 5 cycles
Moisture Resistance			40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C			70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

*Stability Class

Stability Class	Resistance Range	Limit Resistance Changing Attests (Test Group)			
		A	B	C	D
0.25	10-332kΩ	±(0.25 + 0.05Ω)	±(0.50 + 0.05Ω)	±(0.25 + 0.05Ω)	±(0.05 + 0.05Ω)
0.5	1-<10Ω			±(0.50 + 0.05Ω)	±(0.10 + 0.05Ω)
1	0.22-<1Ω	±(0.50 + 0.05Ω)	±(1.00 + 0.05Ω)	±(1.00 + 0.05Ω)	±(0.25 + 0.05Ω)
2	>332kΩ-<5.11MΩ			±(2.00 + 0.05Ω)	±(0.50 + 0.05Ω)

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

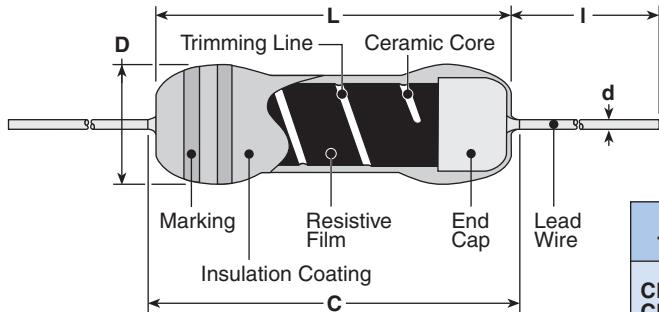
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features

- Flameproof coating is available (specify "CFP")
- Reduced body size (specify "CFS/CFPS")
- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type	L	C (max.)	Dimensions inches (mm)			I** Standard	Long
			D	d (nom.)	I		
CFS1/4 CFPS1/4	.126 ⁺ .008 (3.2±0.2)	.134 (3.4)	.067 ^{+.008} .004 (1.7 ^{+.2} -.1)	.018 (0.45)		.551 Min.* (14.0 Min.)	.787 Min.*** (20.0 Min.)
CF1/4 CFP1/4	.240 ^{+.028} (6.1 ^{+.7} -.5)	.280 (7.1)	.092 ^{+.012} (2.3±0.3)	.024 (0.6)			
CFS1/2 CFPS1/2	.248 ^{+.02} (6.3±0.5)	.280 (7.1)	.112 ^{+.012} .026 (2.85 ^{+.3} -.65)	.024 (0.6)		.787 Min. (20.0 Min.)	—
CFB1/2 CFPB1/2	.354 ^{+.039} (9.0±1.0)	.433 (11.0)	.138 ^{+.02} (3.5±0.5)	.028 (0.7)			

* Forming code S is applied for bulk type.

** Lead length changes depending on taping and forming type.

*** Long type is custom-made

ordering information

CF	1/4	C	T52	R	103	J
Type	Power Rating	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
CF CFP	S1/4: 0.25W 1/4: 0.25W S1/2: 0.5W B1/2: 0.5W	C: SnCu	Axial: T26, T52, L52 Radial: VT, MT, MHT, VTP, VTE U Forming: U, UCL M Forming: M5, M10, M12.5 L Forming: L10, L12.5 S Forming: S	A: Ammo R: Reel	2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	G: ±2% J: ±5%

For further information
on packaging, please refer
to Appendix C.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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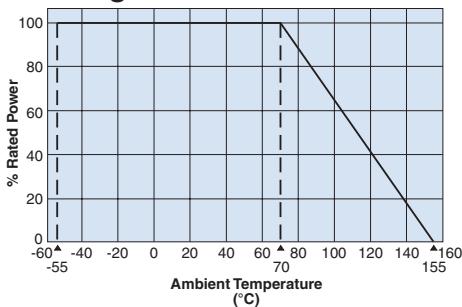
applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C)				Resistance Range E-24 (G±2%)	Resistance Range E-24 (J±5%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage
			+350 to -450	0 to -700	0 to -1000	0 to -1300				
CFS1/4	0.25W	300V	2.2Ω - 47kΩ	51kΩ - 100kΩ	110kΩ - 330kΩ	360kΩ - 1MΩ	10Ω - 330kΩ	2.2Ω - 1MΩ	250V	500V
CFPS1/4			—	—	—	—	10Ω - 100kΩ	2.2Ω - 1MΩ		
CF1/4		500V	2.2Ω - 100kΩ	110kΩ - 330kΩ	360kΩ - 1MΩ	1.1MΩ - 5.1MΩ	—	—	300V	600V
CFP1/4			—	—	—	—	—	—		
CFS1/2	0.50W	700V	1.0Ω - 91kΩ	100kΩ - 1MΩ	1.1MΩ - 2.2MΩ	2.4MΩ - 5.1MΩ	10Ω - 1MΩ	1.0Ω - 5.1MΩ	350V	700V
CFPS1/2			2.2Ω - 91kΩ		—	—	—	2.2Ω - 1MΩ		
CFB1/2		700V	2.2Ω - 100kΩ	110kΩ - 1MΩ	1.1MΩ - 2.2MΩ	2.4MΩ - 5.1MΩ	2.2Ω - 5.1MΩ	400V	800V	—

Operating temperature: -55°C ~ +155°C

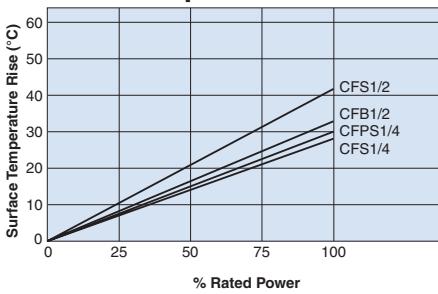
environmental applications

Derating Curve

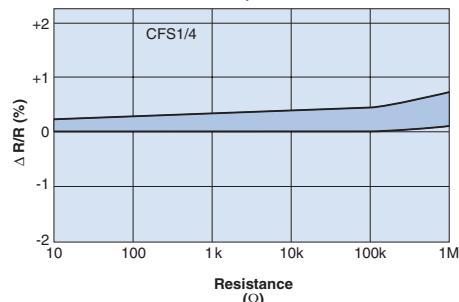


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



Load Life @ 70°C, 1000 Hr



Performance Characteristics

Parameter	Requirement Limit	Typical	Test Method
Resistance	Within specified tolerance	—	Measuring points are at 10mm ±1mm from the end cap.
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±1%	±0.5%	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is lower
Resistance to Solder Heat	±1%	±0.5%	260°C ±5°C, 10 seconds ± 1 second
Terminal Strength	No lead-crimping off and loose terminals	—	Twist 360°C, 5 times
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +125°C (30 minutes), 5 cycles
Moisture Resistance	±5%	±2.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±3%	±1.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent (CFS & CFPS only)	No abnormality in appearance. Marking shall be easily legible.	—	Ultrasonic washing with Isopropyl alcohol for 2 minutes. Power: 0.3W/cm², f: 28kHz, temp: 35°C±5°C
Flame Retardant (CFS & CFPS only)	No evidence of flaming or self-flaming	—	Flame test: The test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: Power (AC) corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed 4 times the maximum operating voltage.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

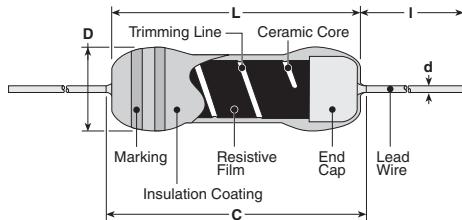
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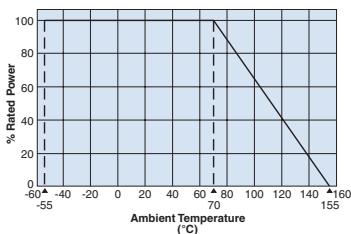
features

- Semi-precision metal film resistors
- Meets requirements of MIL-R-22684
- Suitable for automatic machine insertion
- MFS two times the power rating of the standard body type
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Qualified: MF1/4, MFS1/4, MFS1/2

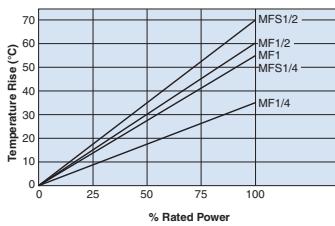
dimensions and construction



Derating Curve



Surface Temperature Rise



Type	Dimensions inches (mm)				
	L (ref.)	C (max.)	D	d (nom.)	I*
MFS1/4	.126 ^{.02} _{.008} (3.2 ^{.05} _{.02})	.133 (3.4)	.066 ^{.016} _{.004} (1.7 ^{.04} _{.1})	.018 (0.45)	
MF1/4	.248±.02 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	1.10±.118 (28.0±3.0)
MFS1/2	.248±.02 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	
MF1/2C MF1/2D	.354±.04 (9.0±1.0)	.437 (11.1)	.138 ^{.016} _{.02} (3.5 ^{.04} _{.05})	.024 (0.6)	1.10 ^{.012} _{.016} (28.0 ^{.03} _{.40})
MF1/2L	.354±.04 (9.0±1.0)	.437 (11.1)	.138±.016 (3.5±0.4)	.024/.031 (0.6)/(0.8)	1.10±.118 (28.0±3.0)
MF1	.610±.02 (15.5±0.5)	.721 (18.3)	.217±.04 (5.5±1.0)	.031 (0.8)	1.50 ^{.012} _{.016} (38.0 ^{.03} _{.50})
RK1/4	.248±.02 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	
RK1/2	.374±.04 (9.5±1.0)	.437 (11.1)	.138±.016 (3.5±0.4)	.024 (0.6)	0.94 min. (24.0 min.)
RK1	.610±.04 (15.5±1.0)	.720 (18.3)	.217±.02 (5.5±0.5)	.031 (0.8)	1.50±.118 (38.0±3.0)

* Lead length changes depending on taping and forming.

ordering information

MF	1/4	L	C	T52	8	R	R20	J
Type	Power Rating	T.C.R.	Termination Material	Taping and Forming	Lead Diameter	Packaging	Nominal Resistance	Tolerance
MF	1/4: 0.25W	E: ±25	C: SnCu	1/4: T26, T52, VT, VTP, VTE, MT, M, U, M10, M12.5	MF1/2L: T52 & Bulk Only: 6: 0.6mm 8: 0.8mm	A: Ammo R: Reel	+2%: 2 significant figures + 1 multiplier	B: ±0.1%
MFS	1/2: 0.50W	C: ±50		1/2: T26, T52, VTP, VTE, M12.5, M15	Blank: All others sizes & packaging		+0.5%, +1%: 3 significant figures + 1 multiplier	C: ±0.25%
RK	1: 1W	D: ±100		1: T521			"R" indicates decimal on value <100Ω	D: ±0.5%
		L: ±200						F: ±1%
		G: ±250						G: ±2%
		B: ±350						J: ±5%

For further information on packaging, please refer to Appendix C.

applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C)	Resistance Range (Ω)						Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range
				(B±0.1%) E-96	(C±0.25%) E-96	(D±0.5%) E-24 E-192	(F±1.0%) E-24 E-96	(G±2.0%) E-24	(J±5.0%) E-24			
MFS1/4C	0.25W	300V	C: ±50	—	—	49.9 - 562k	10 - 1M	—	—	250V	500V	-55°C to +155°C
MFS1/4D			D: ±100									

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings (continued)

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C)	Resistance Range (Ω)						Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range	
MF1/4C	0.25W	500V	C: ±50	—	—	10 - 2.21M	10 - 2.21M	—	—	250V	500V	-55°C to +155°C	
MF1/4D			D: ±100	—	—								
MF1/4L			L: ±200	—	—	—	1.0 - 10	0.51 - 10	—	—	—		
MFS1/2C	0.50W	500V	C: ±50	—	—	10 - 1M	10 - 2.21M	10 - 2.2M	—	350V	700V		
MFS1/2D			D: ±100										
MF1/2C	0.50W	700V	C: ±50	—	—	10 - 5.05M	10 - 4.99M	—	—	350V	700V		
MF1/2D			D: ±100	—	—								
MF1/2L			L: ±200	—	—	—	1.0 - 10	0.51 - 10Ω	—	—	—		
MF1C	1W	700V	C: ±50	5.1 - 2.0M	5.1 - 2.49M	5.1 - 5.11M	1.0 - 6.81M	—	—	350V	700V		
MF1D			D: ±100	—	—								
MF1E			E: ±25	5.1 - 2.0M	5.1 - 2.49M	5.1 - 4.64M	1.0 - 5.11M	—	—	—	—		
RK1/4D	0.25W	500V	D: ±100	—	—	—	3.09M - 25M	—	—	500V	700V		
RK1/4L			L: ±200	—	—	—	—	3.3M - 33M	3.3M - 33M				
RK1/4B			B: ±350	—	—	—	100k - 25M	100k - 33M	100k - 33M				
RK1/2D	0.50W	700V	D: ±100	—	—	—	5.11M - 33M	—	—	700V	1000V		
RK1/2L			L: ±200	—	—	—	—	6.2M - 33M	6.2M - 33M				
RK1/2B			B: ±350	—	—	—	100k - 35M	100k - 51M	100k - 51M				
RK1BC	1W	1000V	B: ±350	—	—	—	100k - 51M	100k - 100M	100k - 100M	1000V	1500V		
RK1/2G*	0.50W	700V	G: ±250	—	—	—	—	—	1M - 12M	350V	700V		

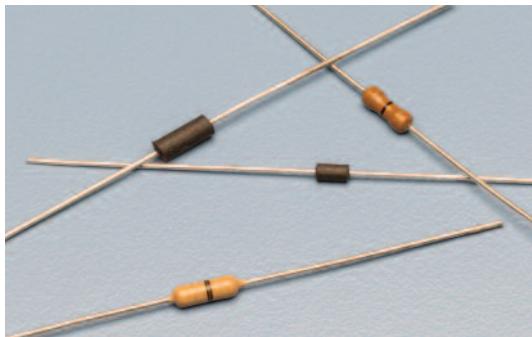
* Discharge path resistor

environmental applications
Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	Room temperature, +100°C, RK: +25°C/+125°C
Overload (Short Time)	RK: ±1%, RK1/2G: ±2.5% MF: ±0.5%	RK: ±0.6%, RK1/2G: ±1% MF: ±0.3%	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is less; MFS1/2: Rated voltage x 2 or max. overload voltage for 5 seconds, whichever is less
Resistance to Solder Heat	RK: ±1%; RK1/2G: ±5%; MF: ±0.75%; MF1/4, MFS1/2, MF1/2: ±0.5%	RK: ±0.5%; RK1/2G: ±1%; MFS1/4: ±0.4%; MF1/4, MFS1/2, MF1/2: ±0.25%	260°C ± 5°C, 10 seconds ± 1 second or 350°C ± 10°C, 3.5 seconds ± 0.5 second
Dielectric Withstanding Voltage	No breakdown	—	1 minute
Insulation Resistance	Not less than 10,000MΩ	—	100V, 1 minute
Rapid Change of Temperature	RK,MF: ±1%; RK1/2G: ±5%	MF: ±0.3%; RK: ±0.5%, RK1/2G: ±1%	-55°C (30 minutes), +155°C (30 minutes), 5 cycles
Moisture Resistance	RK: ±5%; RK1/2G: ±10%; MFS1/4: ±1.5%; MF1/4, MFS1/2, MF1/2: ±1%	RK: ±2%; RK1/2G: ±5%; MFS1/4: ±1%; MF1/4, MFS1/2, MF1/2: ±0.75%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	RK: ±5%; RK1/2G: ±10%; MFS1/4: ±1.5%; MF1/4, MFS1/2, MF1/2: ±1%	RK: ±2%; RK1/2G: ±5%; MFS1/4: ±1%; MF1/4, MFS1/2, MF1/2: ±0.75%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible	—	The resistor shall be immersed for 5 seconds in IPA
Impulse	No such abnormalities as short-circuit, burnout, breakdown, etc.	—	Discharge from 1000pF capacitor 50 pulses. Internal 2.5 seconds. Charge voltage: 1.25kV (RK1/4), 2.5kV (RK1/2) and 6kV (RK1)

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

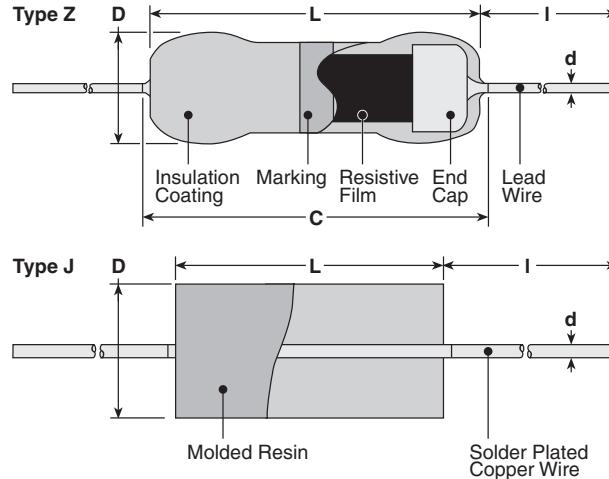
12/19/19


 lead-free
 resistors

features

- Type Z are conformal coated
- Type J are molded
- Suitable for automatic machine insertion
- Size compatible with 1/8, 1/4 and 1/2 watt resistors
- Marking: Type Z are tan color, single black band identifier
Type J are black, no marking
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type	Dimensions inches (mm)					I ¹
	L (ref.) ¹	C (max.)	D	d (nom.)	Standard	
Z16	.126±.008 (3.2±0.2)	.134 (3.4)	.067 ^{+.008} -.004 (1.7 ^{+.2} -.1)	.018 (0.45)	.551 Min. ² (14.0 Min.)	.787 Min. ³ (20.0 Min.)
Z25	.240±.02 (6.1±0.5)		.091±.012 (2.3±0.3)	.280 (7.1)	.024 (0.6)	
Z25Y			.087 ^{+.016} -.008 (2.2 ^{+.4} -.2)		1.18 ^{+.118} -.16 (30.0 ^{+.30} -.40)	
J1/6Z	.134 ^{+.004} -.008 (3.4 ^{+.1} -.2)		.067±.008 (1.7±0.2)	.020 (0.5)	1.18±.118 (30.0±3.0)	
J1/4Z	.256±.02 (6.5±0.5)		.091 ^{+.0} -.012 (2.3 ^{+.0} -.3)	.024 (0.6)		

¹ Lead length changes depending on taping and forming type.

² Forming code S is applied for bulk type.

³ Long type is custom-made.

ordering information

Z16	C	T52	A
Type	Termination Material	Taping and Forming	Packaging
Z16	C: SnCu	T26, T52	A: Ammo
Z25			R: Reel
Z25Y			
J1/4Z			
J1/6Z			

For further information on packaging,
please refer to Appendix C.

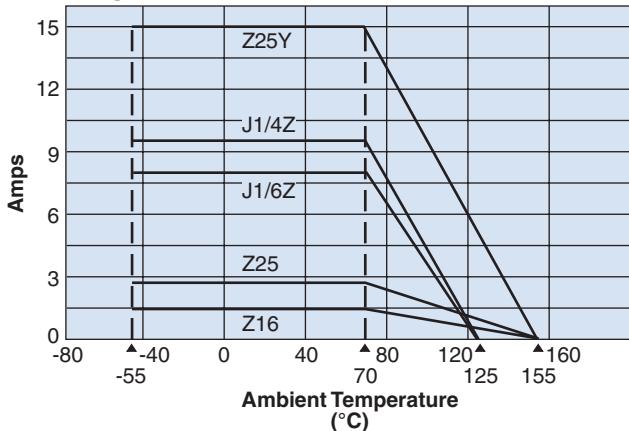
applications and ratings

Part Designation	Maximum Amperage	Minimum Dielectric Withstanding Voltage	Resistance	Rated Ambient Temperature	Operating Temperature Range
Z16	1.5A	300V	20mΩ or less	+70°C	-55°C to +155°C
Z25	2.5A	500V			
Z25Y	15A	500V			

Part Designation	Maximum Allowable Current	Rated Ambient Temperature	Operating Temperature Range
J1/6ZC	8A	+70°C	-55°C to +125°C
J1/4ZC	10A		

environmental applications

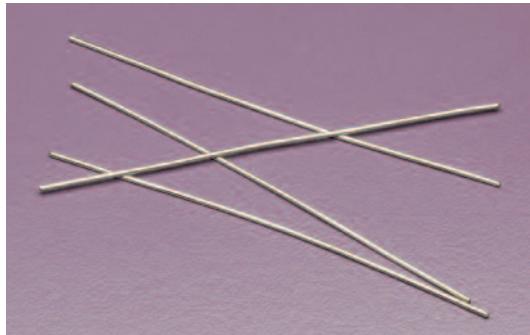
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

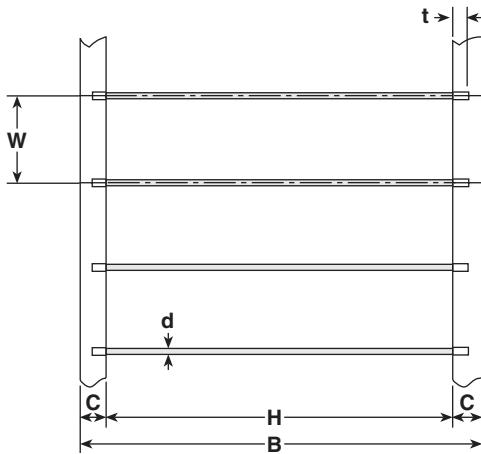
Parameter	Requirement	Test Method JIS C5201-1
Resistance	Less than 20mΩ	Measuring points are 10mm ± 1mm from the end cap
Resistance to Solder Heat		Terminal except 3mm shall be immersed in the solder, 350°C ± 5°C, 3.5 seconds ± 0.5 second
Solderability	90% coverage minimum	235°C ± 5°C, 2 seconds ± 0.5 second
Terminal Strength	No mechanical damages	(Direct Load) Z16: 5N, 30 seconds, Z25: 10N, 30 seconds (Twist Test) 360°, 5 times (Bending Test) 5N, 90°, 2 times (Z16: 2.5N)
Rapid Change of Temperature	Less than 20mΩ	-55°C (30 minutes)/+85°C (30 minutes), 5 cycles
Moisture Resistance		40°C ± 2°C, 90-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 70°C		70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Solvent Resistance	No visible damages to protective coating and marking	Isopropyl alcohol with ultrasonic cleansing for 2 minutes Power: 0.3W/cm², f: 28kHz, Temperature: 35°C ± 5°C



features

- Suitable for automatic machine insertion
- No rating
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



T52 Type	Dimensions inches (mm)					d nominal
	H	B	C	W	t (max.)	
JL5	2.05±.039 (52.0±1.0)	2.56±.039 (65.0±1.0)	.244±.02 (6.2±0.5)	.2±.015 (5.08±0.38)	.098 (2.5)	.02 (0.5)
JL6						.024 (0.6)
JL8						.031 (0.8)

T26 Type	Dimensions inches (mm)					d nominal
	H	B	C	W	t (max.)	
JL5	1.02 ^{.039} .0 (26.0 ⁺¹ -0)	1.54±.039 (39.0±1.0)	.244±.02 (6.2±0.5)	.1972±.02 (5.0±0.5)	.098 (2.5)	.02 (0.5)
JL6						.024 (0.6)
JL8						.031 (0.8)

applications and ratings

Part Designation	Maximum Resistance	Maximum Current Ratings
JL5	10mΩ	8 Amps
JL6		10 Amps
JL8		12 Amps

ordering information

JL	8	C	T52	A
Type	Nominal Diameter	Termination Material	Taping and Forming	Packaging
	5 (24 gauge) 6 (22 gauge) 8 (20 gauge)	C: SnCu (Other termination styles available, contact factory for options)	T26, T52	A: Ammo

For further information on packaging,
please refer to Appendix C.

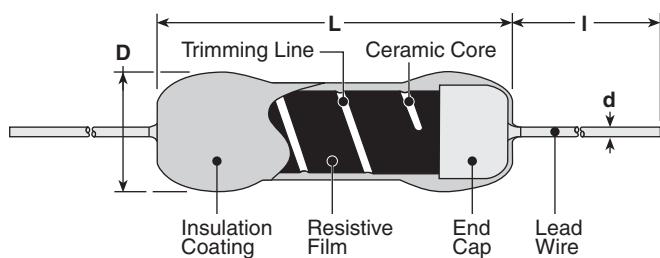


features

- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Qualified: RNS1 only
- Excellent long term stability in resistance values

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resistors

dimensions and construction



Type	Dimensions inches (mm)			
	L (ref.)	D	d	I*
RNS1/8	.250±.04 (6.35±1)	.091±.02 (2.3±0.5)		
RNS1/4	.374±.04 (9.5±1)	.138±.02 (3.5±0.5)		.024 (0.6)
RNS1/2	.531±.04 (13.5±1)	.138±.02 (3.5±0.5)		
RNS1	.610±.04 (15.5±1)	.216±.02 (5.5±0.5)	.031 (0.8)	1.496 (38)

* Lead length changes depending on taping and forming type.

ordering information

RNS	1/8	E	C	T52	R	1001	F
Type	Power Rating	T.C.R.	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
1/8: 0.125W	Y: ±5	Y: ±5	C: SnCu	1/8: T26, T52	A: Ammo	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	B: ±0.1%
1/4: 0.25W	T: ±10	T: ±10		1/4, 1/2: T52	R: Reel		C: ±0.25%
1/2: 0.5W	E: ±25	E: ±25		1: T521			D: ±0.5%
1: 1W	C: ±50						F: ±1.0%

For further information on packaging, please refer to Appendix C.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

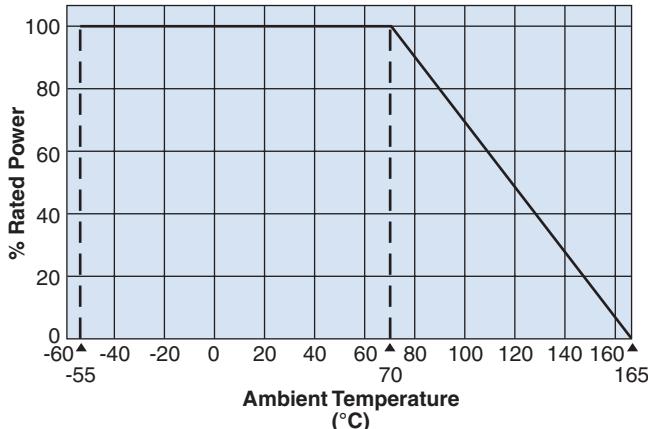
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applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range E-24, E-192 (B \pm 0.1%)	Resistance Range E-24, E-192 (C \pm 0.25%)	Resistance Range E-24, E-192 (D \pm 0.5%)	Resistance Range E-24, E-96 (F \pm 1.0%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Minimum Dielectric Withstanding Voltage	Rated Ambient Temp.	Operating Temp. Range		
RNS1/8	0.125W	Y: \pm 5	100 Ω - 100k Ω	100 Ω - 100k Ω	100 Ω - 100k Ω	100 Ω - 100k Ω	200V	400V	500V	70 $^{\circ}$ C	-25 $^{\circ}$ C to +85 $^{\circ}$ C		
		T: \pm 10	100 Ω - 200k Ω	100 Ω - 200k Ω	100 Ω - 200k Ω	100 Ω - 200k Ω							
		E: \pm 25	5.1 Ω - 750k Ω	5.1 Ω - 1.62M Ω	0.2 Ω - 2M Ω	0.2 Ω - 2M Ω							
		C: \pm 50	5.1 Ω - 750k Ω	5.1 Ω - 1.62M Ω	0.2 Ω - 2M Ω	0.2 Ω - 2M Ω							
RNS1/4	0.25W	E: \pm 25	5.1 Ω - 1M Ω	5.1 Ω - 2M Ω	0.2 Ω - 2M Ω	0.2 Ω - 2M Ω	250V	500V	700V	70 $^{\circ}$ C	-55 $^{\circ}$ C to +165 $^{\circ}$ C		
		C: \pm 50	5.1 Ω - 1.5M Ω	5.1 Ω - 2M Ω	0.2 Ω - 5.1M Ω	0.2 Ω - 5.1M Ω							
RNS1/2	0.50W	E: \pm 25	5.1 Ω - 1.5M Ω	5.1 Ω - 2M Ω	0.2 Ω - 2.4M Ω	0.2 Ω - 4.7M Ω	300V	600V	700V				
		C: \pm 50	5.1 Ω - 2M Ω	5.1 Ω - 2.4M Ω	0.2 Ω - 5.1M Ω	0.2 Ω - 5.1M Ω							
RNS1	1W	E: \pm 25	5.1 Ω - 2M Ω	5.1 Ω - 2.4M Ω	0.2 Ω - 5.1M Ω	0.2 Ω - 5.1M Ω	350V	700V	1000V				
		C: \pm 50	5.1 Ω - 2.4M Ω	5.1 Ω - 2.4M Ω	0.2 Ω - 5.1M Ω	0.2 Ω - 6.8M Ω							

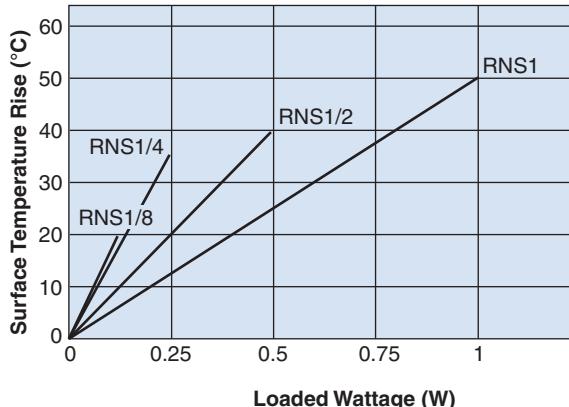
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70 $^{\circ}$ C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm (\% + 0.05\Omega)$	Typical	Test Method
Resistance	Within specified tolerance	—	—	25 $^{\circ}$ C
T.C.R.	Within specified T.C.R.	—	—	Y, T: +25 $^{\circ}$ C/+65 $^{\circ}$ C; E, C: +25 $^{\circ}$ C/+125 $^{\circ}$ C
Overload (Short time)	\pm 0.25%	\pm 0.15%	—	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is lower
Resistance to Solder Heat	\pm 0.2%	\pm 0.075%	—	350 $^{\circ}$ C \pm 10 $^{\circ}$ C, 3.5 seconds \pm 0.5 second
Rapid Change of Temperature	\pm 0.2%	\pm 0.075%	—	-55 $^{\circ}$ C (30 minutes), +85 $^{\circ}$ C (30 minutes), 5 cycles
Moisture Resistance	\pm 0.75%	\pm 0.5%	—	40 $^{\circ}$ C \pm 2 $^{\circ}$ C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70 $^{\circ}$ C	\pm 0.5%	\pm 0.35%	—	70 $^{\circ}$ C \pm 2 $^{\circ}$ C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

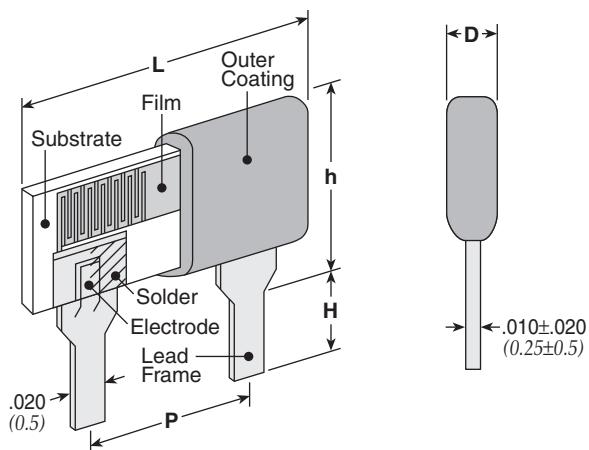


features

- Ultra precision T.C.R. up to ± 2.5 ppm/ $^{\circ}$ C, tolerance to $\pm 0.01\%$
- Wide resistance range from 10Ω to $1M\Omega$
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

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resistors

dimensions and construction



Type	Dimensions inches (mm)				
	L (max.)	D (max.)	P	H	h (max.)
MRS1/8	.220 (5.6)		.100±.008 (2.54±0.2)	.118±.02 (3.0±0.5)	.244 (6.2)
MRS1/4		.098 (2.5)	.200±.008 (5.08±0.2)		
MRS1/3		.295 (7.5)	.150±.008 (3.81±0.2)	.315±.079 (8.0±2.0)	.354 (9.0)

ordering information

Lead Free	MRS	1/3	S	D	1002	T
	Product Code	Size	T.C.R. (ppm)	Terminal Surface Material	Nominal Resistance	Resistance Tolerance
		1/8: 0.125W 1/4: 0.25W 1/3: 0.3W	S: ±2.5 Y: ±5 T: ±10 E: ±25	D: SnAgCu	3 significant figures + 1 multiplier “R” indicates decimal on values <100Ω	T: ±0.01% Q: ±0.02% A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5%

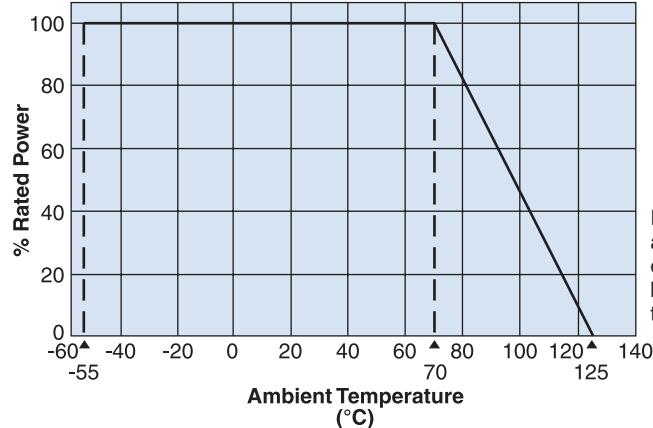
applications and ratings

Type	Power Rating	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range (Ω)						Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
			T: $\pm 0.01\%$ E96	Q: $\pm 0.02\%$ E96	A: $\pm 0.05\%$	B: $\pm 1\%$	C: $\pm 2.5\%$	D: $\pm 5\%$				
			E24/E96 & 25, 50 *10 ⁿ									
MRS1/8	0.125W	Y: ± 5	—	—	100-250k	100-250k	100-250k	100-250k	200V	400	+70 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		T: ± 10	—	—	100-250k	100-510k	30-510k	30-510k				
		E: ± 25	—	—	100-250k	100-510k	10-510k	10-510k				
MRS1/4	0.25W	Y: ± 5	—	—	100-510k	100-510k	100-510k	100-510k	250V	500		
		T: ± 10	—	—	100-510k	100-1M	30-1M	30-1M				
		E: ± 25	—	—	100-510k	100-1M	10-1M	10-1M				
MRS1/3	0.3W	S: ± 2.5	100-100k	30.1-100k	30.1-100k	30.1-100k	—	—	200V			
		Y: ± 5	100-100k	30.1-100k	10-100k	10-100k	—	—				
		T: ± 10	100-100k	30.1-100k	10-100k	10-100k	—	—				

* MRS1/3 is available only in E96 series.

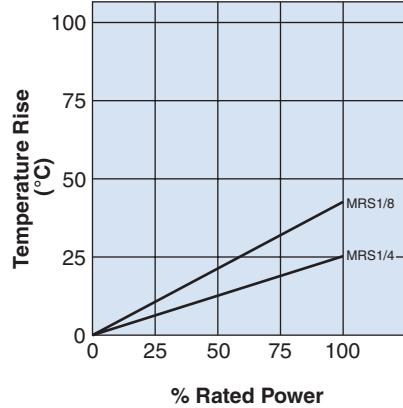
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70 $^{\circ}$ C or above, a power rating shall be derated in accordance with this derating curve.

Surface Temperature Rise

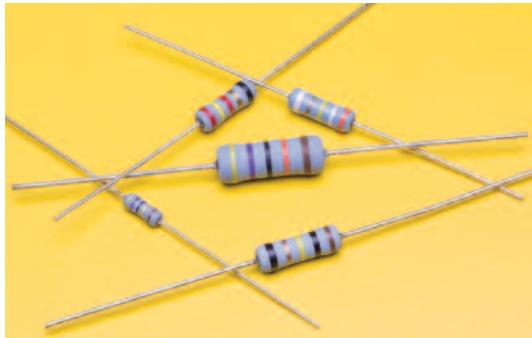


Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\Omega)$	Test Method
Resistance	Within specified tolerance	25 $^{\circ}$ C
T.C.R.	Within specified T.C.R.	+25 $^{\circ}$ C/+65 $^{\circ}$ C
Overload (Short time)	$\pm 0.05\%$	Rated voltage x 2.5 or max. overload voltage whichever is lower, for 5 seconds
Resistance to Soldering Heat	$\pm 0.1\%$: MRS1/8, 1/4 $\pm 0.05\%$: MRS1/3	350 $^{\circ}$ C $\pm 10^{\circ}$ C, 3.5 seconds ± 0.5 second
Rapid Change of Temperature	$\pm 0.1\%$: MRS1/8, 1/4 $\pm 0.05\%$: MRS1/3	MRS1/8, 1/4: -55 +0-5 $^{\circ}$ C (30 minutes), +125 +3-0 $^{\circ}$ C (30 minutes), 5 cycles MRS1/3: -55 +0-5 $^{\circ}$ C (30 minutes), +125 +3-0 $^{\circ}$ C (30 minutes), 50 cycles
Dielectric Withstanding Voltage	$\pm 0.5\%$: MRS1/8, 1/4 $\pm 0.05\%$: MRS1/3	500V (a.c.) for 1 minute between terminals and coatings
Endurance at 70 $^{\circ}$ C	$\pm 0.1\%$: MRS1/8, 1/4 $\pm 0.05\%$: MRS1/3	70 $^{\circ}$ C $\pm 2^{\circ}$ C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Moisture Resistance	$\pm 0.1\%$: MRS1/8, 1/4 $\pm 0.05\%$: MRS1/3	40 $^{\circ}$ C $\pm 2^{\circ}$ C, 90 ~ 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Insulation Resistance	10,000M Ω and more	500V (d.c.) for 1 minute
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	Soaking in 2-propanol of +20 $^{\circ}$ C~25 $^{\circ}$ C for 180 seconds ± 10 seconds

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

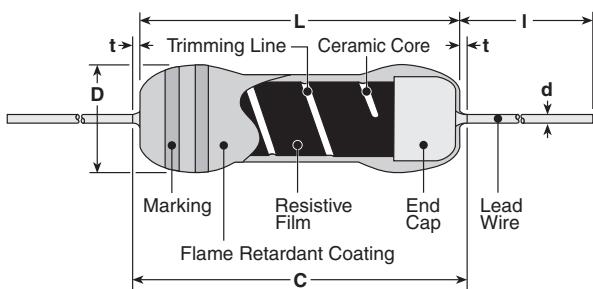
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features

- Excellent anti-surge characteristics
- Stable characteristics of moisture resistance up to high resistance range
- RCR50 +(1MΩ - 12MΩ), RCR50EN (1MΩ - 12MΩ) and RCR60 (1MΩ - 12MΩ) are discharge resistors recognized by UL1676 and c-UL(CSA-C22.2 No.1-M94)
- RCR25EN (100kΩ~33MΩ), RCR50EN (100kΩ - 33MΩ) and RCR60 (100kΩ - 56MΩ) is approved by EN6234-68-1 G.10 safety
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Surface mount style "N" forming is suitable for automatic mounting

dimensions and construction



* Lead length changes depending on taping and forming.

ordering information

RCR	50	EN	C	T52	A	105	J
Type	Power Rating	Safety Appr. Marking	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
RCR	16: 0.25W 25: 0.25W 50: 0.5W 60: 1W 75: 2W 100: 3W	RCR50+: + RCR25EN, RCR50EN: EN Blank: Others	C: SnCu	RCR16: T26, T52 RCR25, RCR25EN: T26, T52 RCR50(+, EN): T52 RCR60: T52 RCR75: T52 RCR100: T521, T631 L, M, N Forming	A: Ammo R: Reel TEB: Plastic embossed: N forming	2 significant figures + 1 multiplier for ±5% 3 significant figures + 1 multiplier for ±1%	F: ±1% J: ±5%

applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	Resistance Range E-24, E-96 (F±1%)	Resistance Range E-24 (J±5%)	Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range
RCR16		300V	100kΩ - 5.1MΩ	100kΩ - 5.1MΩ	500V	1000V	
RCR25 RCR25EN	0.25W		100kΩ - 9.1MΩ	100kΩ - 33MΩ	DC 1600V AC 1150V	DC 2000V AC 1500V	
RCR50			3.3Ω - 910kΩ	3.3Ω - 910kΩ			
RCR50+	0.5W		13MΩ - 33MΩ	13MΩ - 33MΩ			
RCR50EN			1MΩ - 9.1MΩ	1MΩ - 12MΩ			
RCR60	1.0W		100kΩ - 9.1MΩ	100kΩ - 33MΩ			
RCR75	2.0W		100kΩ - 9.1MΩ	100kΩ - 100MΩ			
RCR100	3.0W	1000V	100kΩ - 9.1MΩ	100kΩ - 51MΩ	4000V 5000V	5000V	-55°C to +155°C

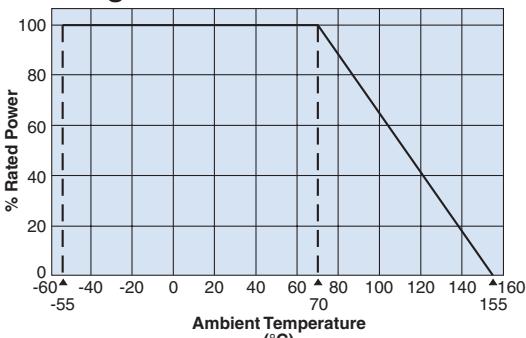
For further information on packaging, please refer to Appendix C.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/29/18

environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Notice of Surge Load

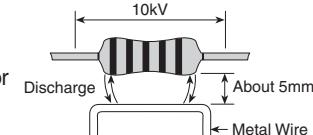
Surge withstanding load voltage for the resistors cannot be guaranteed when the undermentioned 4 items get to a remarkable overload in comparison with the conditions shown by surge withstanding voltage in Anti-surge characteristics. Please contact KOA in advance if such a case is anticipated.

1. Peak voltage to be applied

2. Pulse width

3. Conditions of protecting insulation around the resistor

4. Situation of proximity conductivity object



For example: In the figure, a metal wire is placed less than 5mm away from the resistor body, there is such a case that causes an electric discharge by a surge load 10kV and then destroys the outer coating.

Approvals Awarded

Type	UL1676 & c-UL (CSA-C22.2 No.1-M94)	EN60065 14.1 Test a	EN60065 14.1 Test b	EN62368-1 G.10
RCR25EN	—	—	○	○
RCR50+		—	—	—
RCR50EN	○(1MΩ~12MΩ)	○	○	○
RCR60		○	○	○

Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.05\Omega)$			Typical	Test Method
	Limit				
Resistance	Within regulated tolerance			—	Measuring points are 10mm ± 1mm from the end cap
T.C.R.	Type	T.C.R.	Resistance Range	—	+25°C/+125°C
	RCR16	±200ppm/°C	100kΩ - 5.1MΩ		
	RCR25 (EN)	±350ppm/°C	100kΩ - 33MΩ		
	RCR50 (+)	±500ppm/°C	3.3Ω - 91kΩ		
	RCR50EN	±350ppm/°C	100kΩ - 33MΩ		
	RCR60	±350ppm/°C	100kΩ - 56MΩ		
	RCR75	±350ppm/°C	100kΩ - 100MΩ		
	RCR100	±200ppm/°C	100kΩ - 51MΩ		
Overload	1%			0.5%	Rated voltage x 2.5 or maximum overload voltage for 5 seconds, whichever is less
Resistance to Solder Heat	1%			0.5%	260°C ± 5°C, 10 seconds ± 1 second or 350°C ± 10°C, 3.5 seconds ± 0.5 seconds
Terminal Strength	No mechanical damage			—	Twist 360°, 5 times
Rapid Change of Temperature	1%			0.5%	-55°C (30 minutes)/+155°C (30 minutes), 5 cycles
Moisture Resistance	5%			2.5%	40°C ± 2°C, 90-95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle RCR16, 25, 50 (+), 60: W; RCR75, 100: Wx0.1
Endurance @ 70°C	5%			2.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No visible damage to protective coating and marking			—	Isopropyl alcohol with ultrasonic washing, 2 minutes Power: 0.3W/cm², f: 28kHz, Temperature: 35°C ± 5°C
Surge Withstanding	10%			2.5%	Discharge test: 2kV - 10kV, 0.01μF capacitor discharge pulse, 10 times (1 pulse/5 seconds maximum)
EN60065 Test (RCR50EN, RCR60 only)	20%			—	Discharge test: 10kV, 1000pF capacitor discharge pulse, 50 times (1 pulse/5 seconds maximum)

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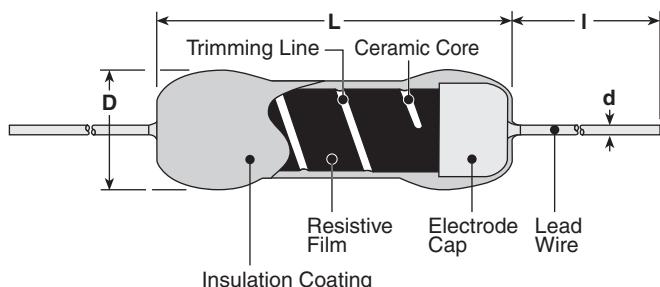
10/29/18



features

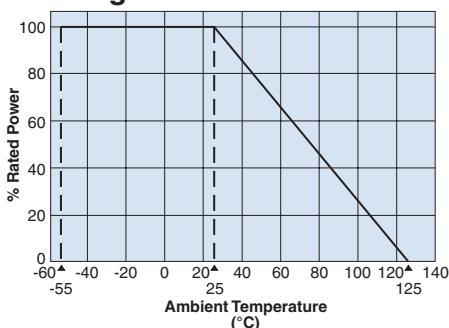
- Miniature construction can endure to high voltage and high power
- Excellent in anti-surge characteristics
- Wide resistance range of $0.5M\Omega$ - $10G\Omega$ and small T.C.R.
- Product meets EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in resistor element and brass cap.

dimensions and construction



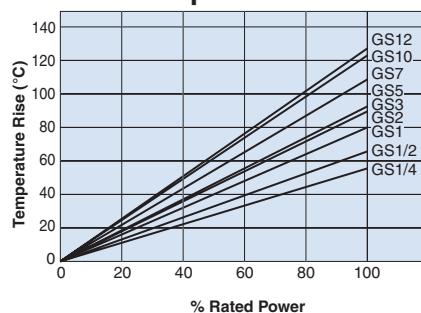
Type	L	D	d (Nominal)	I
GS 1/4	.248±.039 (6.3±1.0)	.091±.020 (2.3±0.5)	.026 (0.65)	
GS 1/2	.374±.039 (9.5±1.0)	.138±.024 (3.5±0.6)	.031 (0.8)	
GS 1	.591±.059 (15.0±1.5)	.177±.039 (4.5±1.0)		
GS 2	.945±.059 (24.0±1.5)			
GS 3	2.05±.079 (52.0±2.0)			
GS 5	2.99±.079 (76.0±2.0)			
GS 7	3.82±.118 (97.0±3.0)	.311±.039 (7.9±1.0)	.039 (1.0)	
GS 10	4.61±.118 (117.0±3.0)			
GS 12	5.39±.118 (137.0±3.0)			

Derating Curve



For resistors operated at an ambient temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

Surface Temperature Rise



ordering information

GS	1/2	L	C	106	J
Type	Power Rating	T.C.R.	Termination Surface Material	Nominal Resistance	Resistance Tolerance
1/4: 0.25W	1/2: 0.5W	D: ±100	C: SnCu	±2%, ±5%, ±10%: 2 significant figures + 1 multiplier	D: ±0.5% F: ±1% G: ±2%
1: 1W	2: 2W	L: ±200		±0.5%, ±1%: 3 significant figures + 1 multiplier	J: ±5% K: ±10%
3: 3W		Packaging Quantity: GS1/4: 1000 pieces GS1/2, GS1: 2000 pieces GS2, GS3, GS5: 500 pieces GS7, GS10, GS12: 250 pieces			
5: 5W					
7: 7W					
10: 10W					
12: 12W					
		Custom forming for all sizes and custom taping for GS1/4 - GS1/2 are available upon request.			

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

4/15/15

applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range (Ω) E-24 & 25, 50×10^n					Max. Working Voltage	Max. Overload Voltage	Impulse Withstand Voltage	Rated Ambient Temperature	Operating Temperature Range
			(D \pm 0.5%)	(F \pm 1%)	(G \pm 2%)	(J \pm 5%)	(K \pm 10%)					
GS1/4*	0.25W	D: \pm 100	500K-20M	500K-100M	500K-100M	500K-100M	500K-100M	0.5kV	1kV	1.25kV	+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-200M	500K-200M	500K-200M	500K-200M	1kV	2kV	2.5kV		
GS1/2*	0.5W	D: \pm 100	500K-100M	500K-500M	500K-500M	500K-500M	500K-500M	3kV	4.5kV	6kV	+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-1G	500K-5G	500K-5G	500K-5G	5kV	7.5kV	10kV		
GS1	1W	D: \pm 100	500K-50M	500K-500M	500K-500M	500K-500M	500K-500M	15kV	20kV	30kV	+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-1G	500K-5G	500K-5G	500K-5G	20kV	30kV	40kV		
GS2	2W	D: \pm 100	500K-50M	500K-500M	500K-500M	500K-500M	500K-500M	30kV	40kV	50kV	+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-1G	500K-10G	500K-10G	500K-10G	35kV	50kV	60kV		
GS3	3W	D: \pm 100	500K-50M	500K-500M	500K-500M	500K-500M	500K-500M	40kV	60kV	70kV	+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-1G	500K-10G	500K-10G	500K-10G					
GS5	5W	D: \pm 100	500K-50M	500K-500M	500K-500M	500K-500M	500K-500M				+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-1G	500K-10G	500K-10G	500K-10G					
GS7	7W	D: \pm 100	1M-50M	1M-100M	1M-500M	1M-500M	1M-500M				+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-50M	500K-100M	500K-1G	500K-10G	500K-10G				
GS10	10W	D: \pm 100	1M-50M	1M-100M	1M-500M	1M-500M	1M-500M				+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-50M	500K-100M	500K-1G	500K-10G	500K-10G				
GS12	12W	D: \pm 100	1M-50M	1M-100M	1M-500M	1M-500M	1M-500M				+25 $^{\circ}$ C	-55 $^{\circ}$ C to +125 $^{\circ}$ C
		L: \pm 200		500K-50M	500K-100M	500K-1G	500K-10G	500K-10G				

* Taping packaging is available for GS1/4 and GS1/2. Please contact factory.

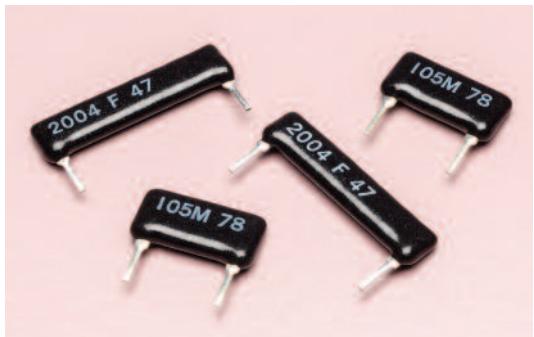
environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R \pm\%$	Test Method
Resistance	Within regulated tolerance	25 $^{\circ}$ C
T.C.R.	Within specified T.C.R.	+25 $^{\circ}$ C/125 $^{\circ}$ C
Overload (Short time)	2%: TCR $200 \times 10^{-6}/K$ 0.5%: TCR $100 \times 10^{-6}/K$	Rated voltage x 2.5 (GS1/4, GS1/2), rated voltage x 2 (GS1-GS12) or Max. overload voltage, whichever is lower for 5 seconds
Resistance to Solder Heat	2%: TCR $200 \times 10^{-6}/K$ 0.5%: TCR $100 \times 10^{-6}/K$	350 $^{\circ}$ C \pm 10 $^{\circ}$ C, 3 seconds \pm 0.5 seconds or 260 $^{\circ}$ C \pm 5 $^{\circ}$ C, 10 seconds \pm 1 second
Rapid Change of Temperature	2%: TCR $200 \times 10^{-6}/K$ 0.5%: TCR $100 \times 10^{-6}/K$	-55 $^{\circ}$ C (30 minutes)/ +125 $^{\circ}$ C (30 minutes), 5 cycles
Moisture Resistance	5%: TCR $200 \times 10^{-6}/K$ 2%: TCR $100 \times 10^{-6}/K$	40 $^{\circ}$ C, 90% - 95%RH, 1000h
Endurance @ 25 $^{\circ}$ C	3%: TCR $200 \times 10^{-6}/K$ 2%: TCR $100 \times 10^{-6}/K$	25 $^{\circ}$ C, 1000 hours 1.5 hr ON/0.5 hr OFF cycle
Voltage Coefficient	$\pm 50 \times 10^{-6}/V$: TCR $200 \times 10^{-6}/K$ $\pm 10 \times 10^{-6}/V$: TCR $100 \times 10^{-6}/K$	GS1/4, 1/2 only, Rated voltage or max. working voltage, whichever is lower and 1/10 of its voltage
Voltage Characteristics	5%: TCR $200 \times 10^{-6}/K$ 3%: TCR $100 \times 10^{-6}/K$	GS1 - 12, Rated voltage or max. working voltage, whichever is lower and 1/10 of its voltage
Resistance to Solvent	No evidence of damage to protective coating and marking	Soaking in IPA for 1 minute and brushing 10 times -3 cycles - liquid temperature 25 $^{\circ}$ C \pm 5 $^{\circ}$ C
Impulse Withstand Voltage	No abnormality in appearance and flash-over	An impulse voltage shall be applied 5 times at an interval of 1 minute

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

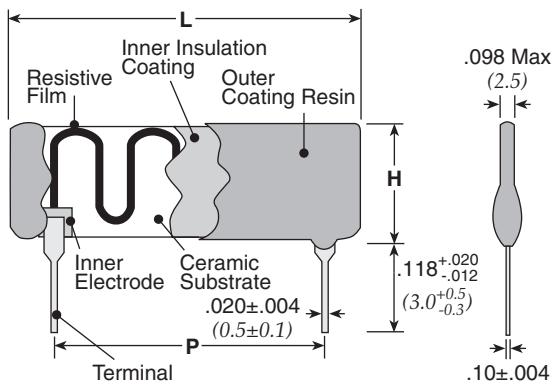
4/15/15



features

- High resistance resistors for high voltage circuits
- Thin SIP shape
- The flame retardant coats corresponding to UL94V-0 are used
- Thick film resistors (RuO_2) ensure high stabilities in life and change in aging
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



Type	Max. Working Voltage Symbol	Dimensions inches (mm)		
		L (Max.)	H (Max.)	P
4L	Nil	.500 (12.7)	.200 (5.08)	.4±.008 (10.16±0.2)
5L	Nil	.602 (15.3)		.5±.008 (12.7±0.2)
6L	Nil	.701 (17.8)		.6±.008 (15.24±0.2)
3C	Nil or 4	.425 (10.8)	.256 (6.5)	.3±.008 (7.62±0.2)
4C	5	.524 (13.3)		.4±.008 (10.16±0.2)
5C	Nil or 6	.622 (15.8)		.5±.008 (12.7±0.2)
6C	7	.724 (18.4)	.394 (10.0)	.6±.008 (15.24±0.2)
7C	Nil or 8	.823 (20.9)		.7±.008 (17.78±0.2)
8C	Nil or 9	.925 (23.5)		.8±.008 (20.32±0.2)
9C	Nil	1.02 (26.0)	.520 (13.2)	.9±.008 (22.86±0.2)
11X	Nil	1.22 (31.0)		1.1±.008 (27.94±0.2)
18X	Nil	1.93 (48.9)		1.8±.008 (45.72±0.2)
18D	Nil	1.93 (48.9)	.520 (13.2)	1.8±.008 (45.72±0.2)

NEW

ordering information

RK92	-	3C	4	D	1004	F	50
Type		Style	Max. Working Voltage Symbol	Termination Surface Material	Nominal Resistance	Resistance Tolerance	T.C.R. (X10 ⁻⁵ /K)
RK92 (Standard)		4L 5L 6L 3C 5C 7C 8C 9C 11X 18X NEW 18D	Nil	D: SnAgCu (L: Sn/Pb)	F: 4 digits G, J, K, M: 3 digits	F: ±1% G: ±2% J: ±5% K: ±10% M: ±20%	Nil
RK92 (Presison)		18D 3C 4C 5C 6C 7C 8C	4 (kV) 5 (kV) 6 (kV) 7 (kV) 8 (kV) 9 (kV)	D: SnAgCu	D, F: 4 digits	D: ±0.5% F: ±1%	100 100 50

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

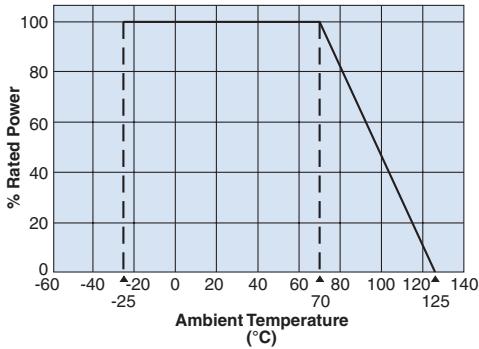
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applications and ratings

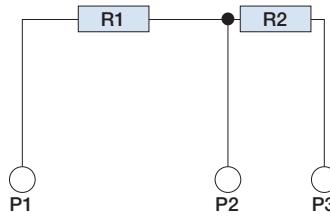
Part Designation	Max. Working Voltage Symbol	Power Rating	Resistance Range (Ω) E-12 • 2×10^n • 3×10^n • 4×10^n • 5×10^n						T.C.R. (ppm/ $^{\circ}$ C) Max.	Maximum Working Voltage	Rated Ambient Temp.	Operating Temp. Range
			D: $\pm 0.5\%$	F: $\pm 1\%$	G: $\pm 2\%$	J: $\pm 5\%$	K: $\pm 10\%$	M: $\pm 20\%$				
4L	Nil	0.5W	—	2M - 10M	2M - 10M	—	—	—	± 300	1kV	$+70^{\circ}\text{C}$	-25°C to $+125^{\circ}\text{C}$
5L	Nil	0.5W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		10kV		
6L	Nil	0.6W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		10kV		
3C	Nil	0.5W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		7kV		
5C	Nil	0.75W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		10kV		
7C	Nil	0.85W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		10kV		
8C	Nil	1.0W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		15kV		
9C	Nil	1.1W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		4kV		
11X	Nil	1.7W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		5kV		
18X	Nil	2.7W	—	1M - 500M	1M - 500M	1M - 1G	1M - 1G	1M - 1G		6kV		
NEW	18D	Nil	4W	1M - 100M	1M - 500M	1M - 500M	1M - 1G	1M - 1G	± 100	7kV		
	3C	4	0.5W	1M - 100M	1M - 100M	—	—	—	± 50	8kV		
	4C	5	0.6W	1M - 100M	1M - 100M	—	—	—		9kV		
	5C	6	0.75W	1M - 150M	1M - 150M	—	—	—		4kV		
	6C	7	0.8W	1M - 150M	1M - 150M	—	—	—		5kV		
	7C	8	0.85W	1M - 200M	1M - 200M	—	—	—		6kV		
	8C	9	1W	1M - 200M	1M - 200M	—	—	—		7kV		

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$ or Max. working voltage, whichever is lower

Please contact factory for other values that are not listed above.

environmental applications
Derating Curve


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

3 Terminal Product
Circuit Schematics

Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified tolerance	—	$+25^{\circ}\text{C}/+125^{\circ}\text{C}$
Resistance to Solder Heat	1%	0.5%	$260^{\circ}\text{C} \pm 5^{\circ}\text{C}$, 10 seconds ± 1 second
Rapid Change of Temperature	1%	0.5%	-25°C (30 minutes)/ $+125^{\circ}\text{C}$ (30 minutes) 5 cycles
Moisture Resistance	5%	3%	$40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 90 - 95% RH, 1000 hours,
Endurance @ 70°C	5%	3%	Room temperature 1000 hours, Rated voltage

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

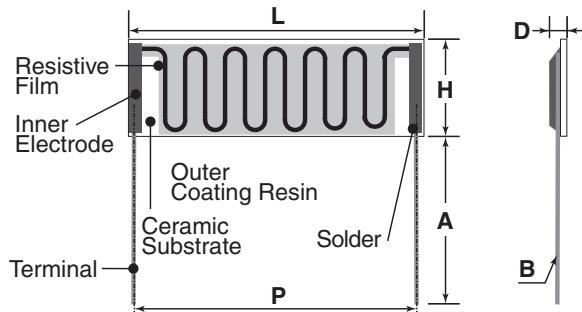
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features

- Resistors excellent in overload capability
- Thin SIP shape
- Thick film resistors (RuO_2) ensure high stabilities in life and change in aging
- Meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



Type	Dimensions inches (mm)					
	L (Max.)	H (Max.)	P	D (Max.)	A	ϕB (Nom.)
18FL	.1.91 (48.5)	.650 (16.5)	1.77±.039 (45.0±1.0)	.098 (2.5)	1.18±.039 (30.0±1.0)	.026 (0.65)

ordering information

RK92	-	18FL	4W	D	305	K
Type		Style	Power Rating	Termination Material	Nominal Resistance	Resistance Tolerance
RK92		18FL	4W	D: SnAgCu	3 Digits	K: ±10%

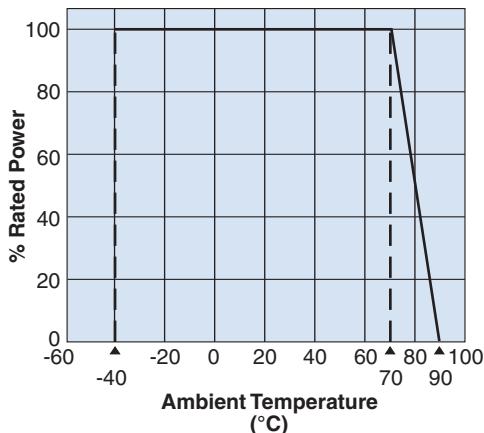
applications and ratings

Part Designation	Power Rating	Resistance Range (Ω) K: $\pm 10\%$	T.C.R. ($\times 10^{-6}/K$)	Rated Ambient Temperature	Operating Temperature Range
18FL	4W	1.2M ~ 16M (1.2M, 3M, 4M, 5M, 8M, 12M, 16M)	± 300	+70°C	-40°C to +90°C

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

environmental applications

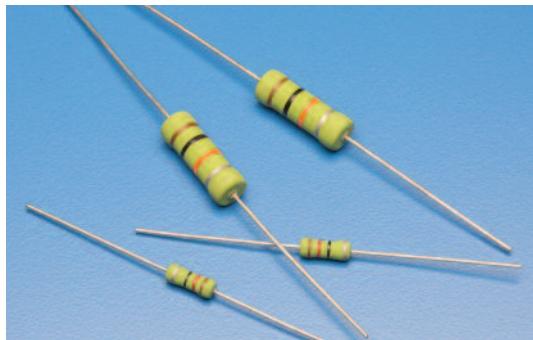
Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

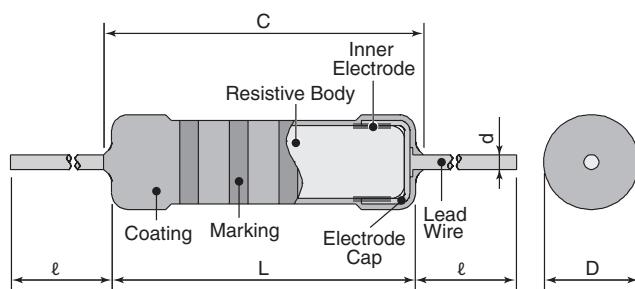
Parameter	Requirement Limit	$\Delta R \pm (% + 0.05\Omega)$ Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Temperature Cycling	2%	1.0%	-40°C (30 minutes)/ +130°C (30 minutes) 10 cycles
Endurance	3%	1.5%	Insulating oil 1000 hours, Rated voltage



features

- KOA original bulk ceramic resistors
- Coated with UL94V0 flameproof material
- Excellent in anti-pulse characteristics
- Non-inductive resistors
- Products with lead-free terminations meet EU RoHS requirements. RoHS regulation is not intended for Pb-glass contained in the electrode.
- Higher reliability against disconnection compared to wirewound resistors and film resistors
- AEC-Q200 Qualified

dimensions and construction



Type	Dimensions inches (mm)				
	L	C (max.)	D	d (nom.)	I*
PCF1/2	.354±.039 (9.0±1.0)	.437 (11.1)	.138±.02 (3.5±0.5)	.028 (0.7)	1.18±.118 (30.0±3.0)
PCF1	0.65±.039 (16.5±1.0)	.748 (19.0)	.217±.039 (5.5±1.0)	.031 (0.8)	1.50±.118 (38.0±3.0)
PCF2	.748±.039 (19.0±1.0)	.886 (22.5)	.276±.039 (7.0±1.0)		

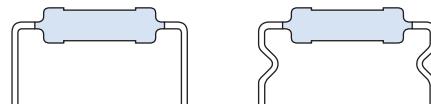
* Lead length changes depending on taping type

ordering information

PCF	1	C	T631	R	103	K
Type	Power Rating	Termination Material	Taping	Packaging	Nominal Resistance	Tolerance
PCF	1/2: 0.5W 1: 1W 2: 2W	C: SnCu	1/2: T52 1: T631 2: T631	R: Reel	2 significant figures + 1 multiplier	K: ±10% M: ±20%

taping

Type	Axial Taping	
PCF1/2	○	—
PCF1	—	○
PCF2	—	○



Contact us for lead forming details.

For further information on packaging, please refer to Appendix C.

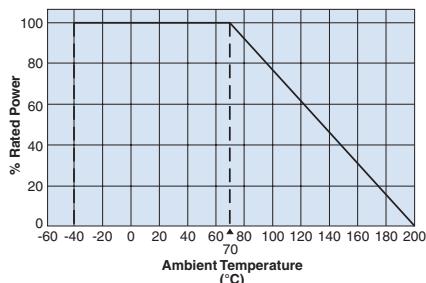
applications and ratings

Part Designation	Power Rating @ 70°C	Resistance Range (Ω)		T.C.R. (x10 ⁻⁶ /K)	Maximum Working Voltage	Maximum Overload Voltage	Dielectric Withstanding Voltage	Rated Ambient Temp.	Operating Temp. Range
		K: ±10% E-12	M: ±20% E-6						
PCF1/2	0.5W	4.7 - 100K	4.7 - 100K	-500 ~ -1300: 3.3Ω≤R<10Ω -600 ~ -1500: 10Ω≤R<100Ω -700 ~ -1800: 100Ω≤R<1kΩ -900 ~ -1900: 1kΩ≤R<100kΩ -900 ~ -2000: 100kΩ≤R<200kΩ -900 ~ -2200: 200kΩ≤R≤390kΩ	200V	400V	500V	+70°C	-40°C to +200°C
PCF1	1.0W	3.3 - 390K	3.3 - 390K	300V	600V				
PCF2	2.0W			400V	800V	700V			

Rated Voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value or Maximum Working Voltage}}$, whichever is lower.

environmental applications

Derating Curve



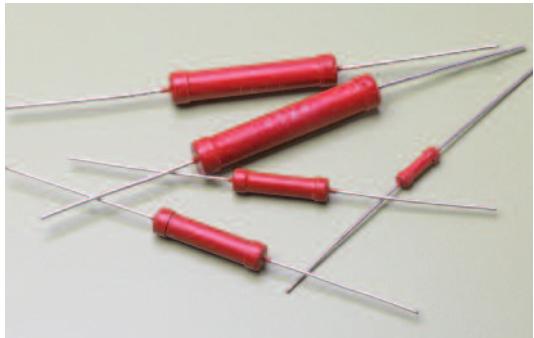
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the derating curve.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.05\Omega)$		Test Method														
	Limit	Typical	Resistance		25°C												
Resistance	Within regulated to tolerance	—	3.3Ω≤R<10Ω	0.3V													
		—	10Ω≤R<100Ω	1.0V													
		—	100Ω≤R≤390kΩ	3.0V													
T.C.R	-500~1300: 3.3Ω≤R<10Ω -600~1500: 10Ω≤R<100Ω -700~1800: 100Ω≤R<1kΩ -900~1900: 1kΩ≤R<100kΩ -900~2000: 100kΩ≤R<200kΩ -900~2200: 200kΩ≤R≤390kΩ	—	+25°C/-40°C, +25°C/+75°C and +25°C/+125°C														
Voltage Coefficient (Apply for over 1kΩ)	0~0.2%/V	—	Rated voltage and rated voltage x 10%														
Overload	2%	0.4%	Rated voltage x 2.5 or maximum overload voltage for 5s, whichever less														
Resistance to pulse	Refer to the table on the right	—	The resistor mounted to the test circuit as below is applied with high voltage impulse 10,000 cycles.														
		—	<table border="1"> <thead> <tr> <th>Type</th> <th>Test Voltage</th> <th>Performance Requirements $\Delta R \pm (% + 0.05\Omega)$</th> </tr> </thead> <tbody> <tr> <td>PCF1/2</td> <td>10kV: 4.7Ω≤R<10kΩ 10kV: 10kΩ≤R<33kΩ 10kV: 33kΩ≤R<100kΩ 4kV: 10kΩ≤R<100kΩ</td> <td>5 10 25 5</td> </tr> <tr> <td>PCF1</td> <td>14kV: 3.3Ω≤R<30kΩ 14kV: 30kΩ≤R<390kΩ 7kV: 30kΩ≤R<390kΩ</td> <td>5 10 5</td> </tr> <tr> <td>PCF2</td> <td>20kV: 3.3Ω≤R<10kΩ 20kV: 10kΩ≤R<390kΩ 11kV: 10kΩ≤R<390kΩ</td> <td>5 10 5</td> </tr> </tbody> </table>			Type	Test Voltage	Performance Requirements $\Delta R \pm (% + 0.05\Omega)$	PCF1/2	10kV: 4.7Ω≤R<10kΩ 10kV: 10kΩ≤R<33kΩ 10kV: 33kΩ≤R<100kΩ 4kV: 10kΩ≤R<100kΩ	5 10 25 5	PCF1	14kV: 3.3Ω≤R<30kΩ 14kV: 30kΩ≤R<390kΩ 7kV: 30kΩ≤R<390kΩ	5 10 5	PCF2	20kV: 3.3Ω≤R<10kΩ 20kV: 10kΩ≤R<390kΩ 11kV: 10kΩ≤R<390kΩ	5 10 5
Type	Test Voltage	Performance Requirements $\Delta R \pm (% + 0.05\Omega)$															
PCF1/2	10kV: 4.7Ω≤R<10kΩ 10kV: 10kΩ≤R<33kΩ 10kV: 33kΩ≤R<100kΩ 4kV: 10kΩ≤R<100kΩ	5 10 25 5															
PCF1	14kV: 3.3Ω≤R<30kΩ 14kV: 30kΩ≤R<390kΩ 7kV: 30kΩ≤R<390kΩ	5 10 5															
PCF2	20kV: 3.3Ω≤R<10kΩ 20kV: 10kΩ≤R<390kΩ 11kV: 10kΩ≤R<390kΩ	5 10 5															
Resistance to soldering heat	2%	0.8%	350°C±10°C, 3.5s±0.5s														
Rapid change of temperature	2%	0.4%	-40°C (30 min.)/+85°C (30 min.), 5 cycles														
Moisture resistance	5%	0.6%	40°C±2°C, 90%~95%RH, 1000 hours, 1.5h ON/0, 5h OFF cycles														
Load life	5%	0.4%	70°C±2°C, 1000h, 1.5h ON/0, 5h OFF cycles														
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	Dipping in IPA or Xylene for 3 minutes and leaving for 10 minutes after removing drops, then brushing 10 times.														

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

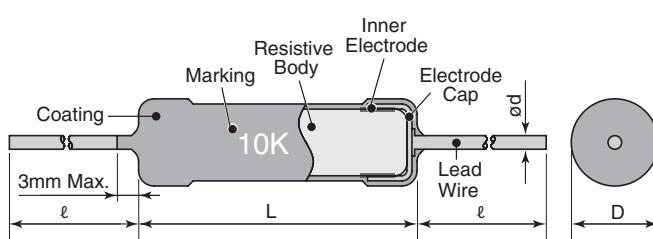
12/19/17



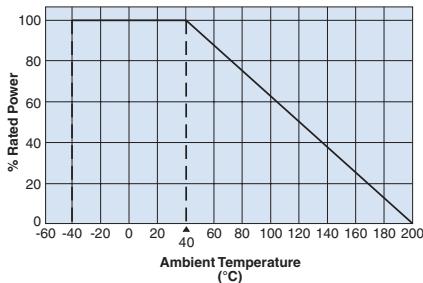
features

- KOA original bulk ceramic resistors
- Excellent in anti-pulse characteristics
- Higher reliability against disconnection compared to wirewound resistors and film resistors
- Products with lead-free terminations meet EU RoHS requirements. RoHS regulation is not intended for Pb-glass contained in the electrode.
- Non-inductive resistors
- AEC-Q200 Qualified

dimensions and construction



Derating Curve



For resistors operated at an ambient temperature of 40°C or above, a power rating shall be derated in accordance with the derating curve.

Type	Dimensions inches (mm)			
	L	D	d (nom.)	I*
HPC1/2	.433±.039 (11.0±2.0)	.138±.039 (3.5±1.0)	.031 (0.8)	1.50±.118 (38.0±3.0)
HPC1	0.630±.039 (16.0±2.0)	.177±.039 (4.5±1.0)		
HPC2	.827±.039 (21.0±2.0)	.197±.039 (5.0±1.0)		
HPC3	1.02±.039 (26.0±2.0)	.236±.039 (6.0±1.0)		
HPC4	1.50±.039 (38.0±2.0)	.276±.039 (7.0±1.0)		
HPC5	1.73±.039 (44.0±2.0)	.295±.039 (7.5±1.0)	.039 (1.0)	

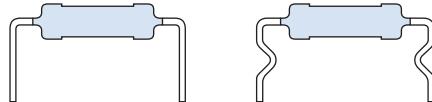
* Lead length changes depending on taping type

ordering information

HPC	1/2	C	T631	R	103	K
Type	Power Rating	Termination Material	Taping	Packaging	Nominal Resistance	Tolerance
HPC	1/2: 0.5W 1: 1W 2: 2W 3: 3W 4: 4W 5: 5W	C: SnCu	1/2: T52 1: T631	A: Ammo R: Reel	2 significant figures + 1 multiplier	K: ±10% M: ±20%

taping

Type	Axial Taping	
HPC1/2	○	—
HPC1	—	○



Contact us for lead forming details.

For further information on packaging, please refer to Appendix C.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

10/29/18

applications and ratings

Part Designation	Power Rating @ 40°C	Resistance Range (Ω)		T.C.R. (x10 ⁻⁶ /K)	Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temp.	Operating Temp. Range
		K: ±10% E-12	M: ±20% E-6					
HPC1/2	0.5W	10 - 390K	3.3 - 330K	-500 ~ -1300: 3.3Ω≤R<10Ω	200V	400V	+40°C	-40°C to +200°C
HPC1	1.0W			-600 ~ -1500: 10Ω≤R<100Ω	300V	600V		
HPC2	2.0W			-700 ~ -1800: 100Ω≤R<1kΩ	400V	800V		
HPC3	3.0W			-900 ~ -1900: 1kΩ≤R<100kΩ	450V	900V		
HPC4	4.0W			-900 ~ -2000: 100kΩ≤R<200kΩ	500V	1000V		
HPC5	5.0W			-900 ~ -2200: 200kΩ≤R≤390kΩ	550V	1100V		

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$ or Max. working voltage, whichever is lower

environmental applications

Performance Characteristics

Parameter	Requirement Δ R ±(% + 0.05Ω)		Test Method																														
	Limit	Typical																															
Resistance	Within regulated to tolerance	—	Resistance																														
			3.3Ω≤R<10Ω																														
			10Ω≤R<100Ω																														
			100Ω≤R≤390kΩ																														
T.C.R	-500~1300: 3.3Ω≤R<10Ω -600~1500: 10Ω≤R<100Ω -700~1800: 100Ω≤R<1kΩ -900~1900: 1kΩ≤R<100kΩ -900~2000: 100kΩ≤R<200kΩ -900~2200: 200kΩ≤R≤390kΩ	—	Resistance measurement voltage 0.3V																														
			1.0V																														
			3.0V																														
			+25°C/-40°C and +25°C/+125°C																														
			Rated voltage and rated voltage x 10%																														
			Rated voltage x 2.5 or maximum overload voltage for 5s, whichever less																														
Resistance to pulse	Refer to the table on the right	—	The resistor mounted to the test circuit as below is applied with high voltage impulse 10,000 cycles.																														
			<table border="1"> <thead> <tr> <th>Type</th> <th>Test Voltage</th> <th>Performance Requirements Δ R ±(% + 0.05Ω)</th> </tr> </thead> <tbody> <tr> <td>HPC1/2</td> <td>8kV: 3.3Ω≤R<30kΩ</td> <td>5</td> </tr> <tr> <td></td> <td>8kV: 30kΩ≤R<390kΩ</td> <td>10</td> </tr> <tr> <td></td> <td>5kV: 30kΩ≤R<390kΩ</td> <td>5</td> </tr> <tr> <td>HPC1</td> <td>15kV: 3.3Ω≤R<30kΩ</td> <td>5</td> </tr> <tr> <td></td> <td>15kV: 30kΩ≤R<390kΩ</td> <td>10</td> </tr> <tr> <td></td> <td>7kV: 30kΩ≤R<390kΩ</td> <td>5</td> </tr> <tr> <td></td> <td>25kV: 3.3Ω≤R<30kΩ</td> <td>5</td> </tr> <tr> <td>HPC2</td> <td>25kV: 30kΩ≤R<390kΩ</td> <td>10</td> </tr> <tr> <td></td> <td>15kV: 30kΩ≤R<390kΩ</td> <td>5</td> </tr> <tr> <td>HPC3 HPC4 HPC5</td> <td>25kV</td> <td>5</td> </tr> </tbody> </table>	Type	Test Voltage	Performance Requirements Δ R ±(% + 0.05Ω)	HPC1/2	8kV: 3.3Ω≤R<30kΩ	5		8kV: 30kΩ≤R<390kΩ	10		5kV: 30kΩ≤R<390kΩ	5	HPC1	15kV: 3.3Ω≤R<30kΩ	5		15kV: 30kΩ≤R<390kΩ	10		7kV: 30kΩ≤R<390kΩ	5		25kV: 3.3Ω≤R<30kΩ	5	HPC2	25kV: 30kΩ≤R<390kΩ	10		15kV: 30kΩ≤R<390kΩ	5
Type	Test Voltage	Performance Requirements Δ R ±(% + 0.05Ω)																															
HPC1/2	8kV: 3.3Ω≤R<30kΩ	5																															
	8kV: 30kΩ≤R<390kΩ	10																															
	5kV: 30kΩ≤R<390kΩ	5																															
HPC1	15kV: 3.3Ω≤R<30kΩ	5																															
	15kV: 30kΩ≤R<390kΩ	10																															
	7kV: 30kΩ≤R<390kΩ	5																															
	25kV: 3.3Ω≤R<30kΩ	5																															
HPC2	25kV: 30kΩ≤R<390kΩ	10																															
	15kV: 30kΩ≤R<390kΩ	5																															
HPC3 HPC4 HPC5	25kV	5																															
350°C±10°C, 3.5s±0.5s																																	
-40°C(30min.)/+85°C(30min.), 5 cycles																																	
40°C±2°C, 90%~95%RH, 1000 hours, 1.5h ON/0, 5h OFF cycles																																	
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Dipping in IPA or Xylene for 3 minutes and leaving for 10 minutes after removing drops, then brushing 10 times.																																	
+200°C, 1000 hours																																	

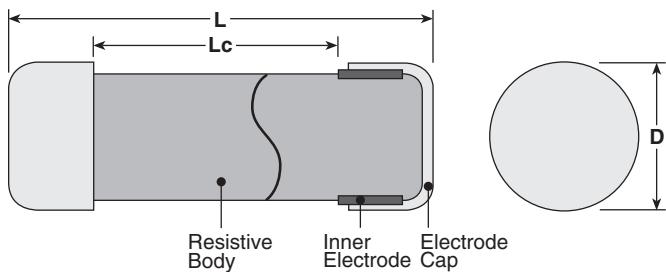


features

- Suitable for noise suppression of engine ignition system
- Reliable in pulse/transient applications
- Products meet EU RoHS requirements. RoHS regulation is not intended for Pb-glass contained in the electrode.

leaded
resistors

dimensions and construction



Size Code	Dimensions inches (mm)			Cap Material
	L	Lc (min.)	D	
CPCN1/2	.421±.02 (10.7±0.5)	.213 (5.4)	.138±.004 (3.5±0.1)	Fe(Ni/Cu plating)
CPCN1	.63±.024 (16.0±0.6)	.378 (9.6)	.187±.012 (4.75±0.3)	
CPCN2N	.720±.024 (18.3±0.6)	.452 (11.5)	.187±.012 (4.75±0.3)	
CPCN2NS	.720±.024 (18.3±0.6)	.452 (11.5)	.187±.012 (4.75±0.3)	SUS304
CPCN3	.720±.024 (18.3±0.6)	.394 (10.0)	.283±.012 (7.2±0.3)	Fe(Sn/Cu plating)

ordering information

CPCN	2N	S	502	M
Type	Power Rating Symbol	Cap Material Symbol	Nominal Resistance	Tolerance
	1/2: 0.5W 1: 1.0W 2N: 1.5W 3: 2.0W	S: SUS304 Nil: Fe (plating)	2 significant figures + 1 multiplier	M: ±20%

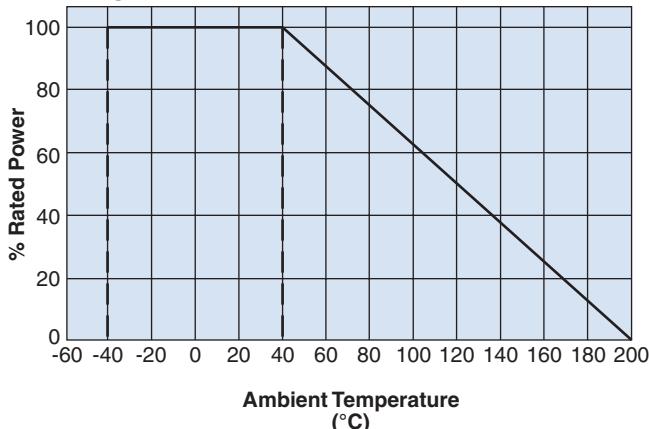
applications and ratings

Type	Power Rating	Nominal Resistance	Resistance Tolerance	T.C.R. (ppm/°C)	Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
CPCN1/2	0.5W	1kΩ, 5kΩ, 10kΩ, 15kΩ	M: ±20%	-1200±300	86V	215V	+40°C	-40°C to +200°C
CPCN1	1.0W				122V	305V		
CPCN2N CPCN2NS	1.5W				150V	375V		
CPCN3	2.0W				173V	432V		

Rated Voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$ or Maximum Working Voltage, whichever is lower.

environmental applications

Derating Curve

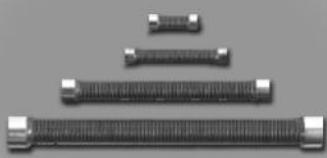


For resistors operated at an ambient temperature of 40°C or higher, the power rating shall be derated in accordance with this derating curve.

Performance Characteristics

Parameter	Requirement Limit	△ R ±(%+0.05Ω)	Test Method								
Resistance	Within regulated tolerance	—	Resistance	Measurement Voltage		25°C					
			1kΩ, 2kΩ, 5kΩ	10V							
			10kΩ, 15kΩ	30V							
T.C.R.	-1200±300ppm/°C	—	+25°C/-40°C and +25°C/+125°C								
Voltage Coefficient	0 ~ -0.2%/V	—	Rated voltage and rated voltage x 10%								
Overload	2	0.3	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is less								
Load Life at High Voltage Pulse	30	—	Continuous 250h high voltage pulse on the test circuit (Refer to JIS D5111) CPCN1/2, CPCN1 in insulation oil								
Resistor Body Strength	No mechanical damages	—	Type	Holding Distance	Time	Force					
			CPCN1/2	5.0 ± 0.2mm	10 seconds	98N (10kgf)					
			CPCN1	9.0 ± 0.3mm							
			CPCN2N/2NS	12.3 ± 0.3mm							
			CPCN3	490N (50kgf)							
Rapid Change of Temperature	5.0	—	-55°C (15 minutes), +155°C (15 minutes), 500 cycles								
Moisture Resistance	5.0	0.9	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle								
Load Life	5.0	0.7	40°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle								
Low Temperature Operation	5.0	0.7	-40°C, 24 hours								
High Temperature Exposure	5.0	2.0	+200°C, 1000 hours								

The resistance measurement before and after the examination should be performed in room temperature with difference $\pm 1^\circ\text{C}$.

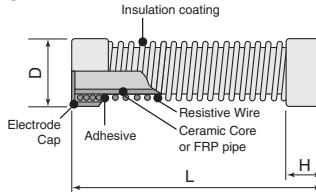


features

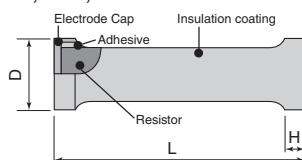
- PSO is made completely moisture preventive to be PSN that can be used under high moisture environment
- PN is a non-inductive type and can be used for high frequency
- PWW resistors, which are non-inductive wirewound resistors for high voltage with resistance wires wound on insulation pipes
- PAP resistors are non-inductive wirewound resistors with inductance less than PWW, can be used for pulse wave measurement, impulse generators, etc. and have the same dimensions as PWW resistors

dimensions and construction

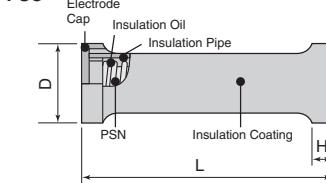
PSN • PV



PN, PWW, PAP



PSO



Size Code	Dimensions (mm)			Weight (g)
	L	D±0.5	H (Nominal)	
PSN-0.5	50±2		17.5	20
PSN-1	100±2		30	
PSN-2	200±2		85	
PSN-3	300±2		250	
PSN-4	400±3		600	
PSN-5	500±3		800	
PSN-6	1000±5		1350	
PV-0.5	80±2		12	
PV-1	150±2		23	
PV-2		9.5	10	45
PV-5	250±2		15	105
PV-8		33	20	220
PSO-0.5	55±5		120	
PSO-1	105±5		150	
PSO-2	205±5		370	

Size Code	Dimensions (mm)			Weight (g)
	L	D±0.5	H (Nominal)	
PSO-3	320±5	46		760
PSO-4	420±5	65		1900
PSO-5	530±5		25	3500
PSO-6	1050±5			6200
PN-0.5	50±2		8	25
PN-1	100±2			55
PN-2	200±2	17	12	80
PN-3	300±2			100
PN-4	400±2			125
PWW-3, PAP-3	300±2	33	20	310 • 250
PWW-4, PAP-4	400±3	45		660 • 510
PWW-5, PAP-5	500±3		25	1330 • 960
PWW-6, PAP-6	1000±5	62		2700 • 1850

ordering information

PSN RoHS

PSN	0.5	CP	F	A	105	J
Product Code	Power Rating	Cap	RoHS	Holder	Nominal Resistance	Resistance Tolerance
	0.5 : 2W 1 : 5W 2 : 10W 3 : 25W 4 : 50W 5 : 125W 6 : 250W	C M MS CP		Nil: No Holder A B	3 digits	J : ±5% K : ±10% M : ±20%

PSO RoHS

PSO	0.5	C	F	105	J
Product Code	Power Rating	Cap	RoHS	Nominal Resistance	Resistance Tolerance
	0.5 : 1.5W 1 : 4W 2 : 8W 3 : 20W 4 : 40W 5 : 100W 6 : 200W	C		3 digits	J : ±5% K : ±10% M : ±20%

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/24/13

ordering information
PV RoHS

PV	0.5	CP	F	A	105	J
Product Code	Power Rating	Cap	RoHS	Holder	Nominal Resistance	Resistance Tolerance
	0.5 : 2W	C		Nil: No Holder	3 digits	J : ±5%
	1 : 4W	M		A		K : ±10%
	2 : 7W	CP		B		M : ±20%
	5 : 12W					
	8 : 20W					

PN RoHS

PN	0.5	CP	F	105	J
Product Code	Power Rating	Cap	RoHS	Nominal Resistance	Resistance Tolerance
	0.5 : 1.5W	C		3 digits	J : ±5%
	1 : 3W	M			K : ±10%
	2 : 6W	CP			M : ±20%
	3 : 9W				
	4 : 12W				

PWW, PAP RoHS

PWW	3	M	F	A	102	J
Product Code	Power Rating	Cap	RoHS	Holder	Nominal Resistance	Resistance Tolerance
	3 : 25W	M		Nil: No Holder	3 digits	J : ±5%
	4 : 50W			A		K : ±10%
	5 : 100W			B		M : ±20%
	6 : 200W					

applications and ratings

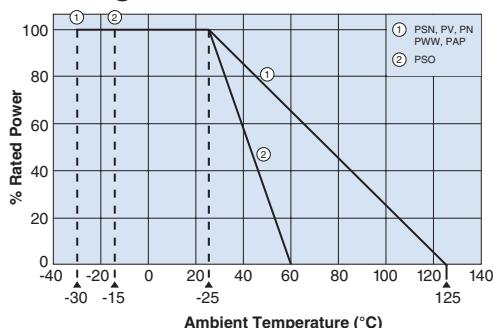
Part Designation	Power Rating (W)	Resistance Range (Ω) J: ±5% K: ±10% M: ±20% (E24)	T.C.R. ($\times 10^{-6}/K$)	Maximum Working Voltage	Impulse Withstand Voltage	Energy Rating 1 time/ 5 min.	Operating Temperature Range	Inductance (μH) Maximum
PSN-0.5	2	500~500M	±1500: +25°C/-15°C ±1000: +25°C/+85°C (R<1G Ω)	15kV	20kV	50J	-30°C~+125°C	
PSN-1	5	1k~1G		30kV	40kV	125J		
PSN-2	10	2k~2G		60kV	80kV	400J		
PSN-3	25	3k~3G		90kV	120kV	1.8kJ		
PSN-4	50	4k~4G		120kV	160kV	4.0kJ		
PSN-5	125	5k~5G		150kV	200kV	9.0kJ		
PSN-6	250	6k~6G		300kV	400kV	20.0kJ		
PV-0.5	2	500~500M		24kV	32kV	45J		
PV-1	4	1k~1G		45kV	60kV	90J		
PV-2	7	1.5k~1.5G		75kV	100kV	270J		
PV-5	12	2.5k~2.5G		15kV	20kV	650J		
PV-8	20	2.5k~2.5G		30kV	40kV	950J		
PSO-0.5	1.5	500~500M	±3000 (R≥1G Ω)	60kV	80kV	40J	-15°C~+60°C	
PSO-1	4	1k~1G		90kV	120kV	100J		
PSO-2	8	2k~2G		120kV	160kV	320J		
PSO-3	20	3k~3G		150kV	200kV	1.5kJ		
PSO-4	40	4k~4G		300kV	400kV	3.2kJ		
PSO-5	100	5k~5G		—	—	7.2kJ		
PSO-6	200	6k~6G		—	—	16.0kJ		
PN-0.5	1.5	50~500k		—	20kV	35J		
PN-1	3	100~1M		—	40kV	70J		
PN-2	6	200~2M		—	80kV	130J		
PN-3	9	300~3M		—	120kV	200J		
PN-4	12	400~4M		—	160kV	270J		
PWW-3	25	10~800	±200	120kV	200kV	2kJ~5kJ	-30°C~+125°C	33
PWW-4	50	15~1.5k		160kV	240kV	4kJ~12kJ		45
PWW-5	100	25~2.5k		200kV	300kV	7kJ~20kJ		62
PWW-6	200	50~5k		400kV	600kV	14kJ~40kJ		62
PAP-3	25	10~400		120kV	180kV	1kJ~2kJ		33
PAP-4	50	10~800		160kV	240kV	1.5kJ~4kJ		45
PAP-5	100	15~1k		200kV	300kV	3.5kJ~10kJ		62
PAP-6	200	25~2k		400kV	600kV	7kJ~25kJ		62

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/21/17

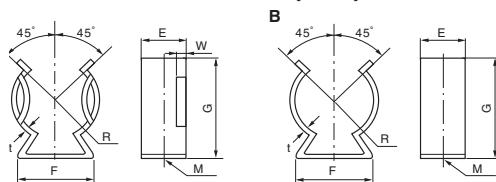
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 25°C or above, a power shall be rated in accordance with the above derating table.

Holder Dimensions (mm)



Type	R	E	F	G	M	t	W
PSN-0.5, PSN-1, PV-2	8.5	11	16	24	ø4.2	0.8	1.5±0.5
PSN-2, PV-5	11.5	15	18	32		1.0	
PSN-3, PV-8, PWW-3, PAP-3	16	18	24	40		1.5±1.0	
PSN-4, PWW-4, PAP-4	22	20	36	59	ø6.5	1.5	2.0±1.0
PSN-5, 6, PWW-5, 6, PAP-5, 6	30	25	46	74		1.5	

Performance Characteristics

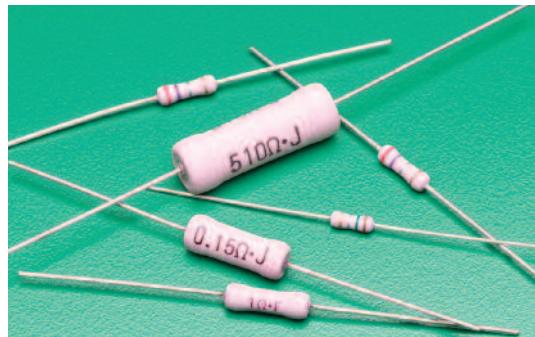
Parameter	Requirements $\Delta R \pm \%$	Test Method
Resistance	Within specified tolerance	25°C
T.C.R.	Within specified T.C.R.	R<1GΩ PSN: ±1500 : +25°C/-15°C
		PSN: ±1000 : +25°C/+85°C
		R≥1GΩ PSN: ±3000 : +25°C/-15°C, +25°C/+85°C
Rapid Change of Temperature	5%	-30°C (30 minutes)/+85°C (30 minutes) 5 cycles Except for PSN
Voltage Characteristics	3%	Rated voltage or max. working voltage, whichever is lower and 1/10 of its voltage
Moisture Resistance	5% : R<100MΩ	40°C, 90%~95%RH, 250 hours
	10% : R≥100MΩ	
Endurance at 25°C	5% : R<100MΩ	25°C, 500 hours
	10% : R≥100MΩ	25°C, 500 hours, Continuous load

Cap Dimensions (mm)

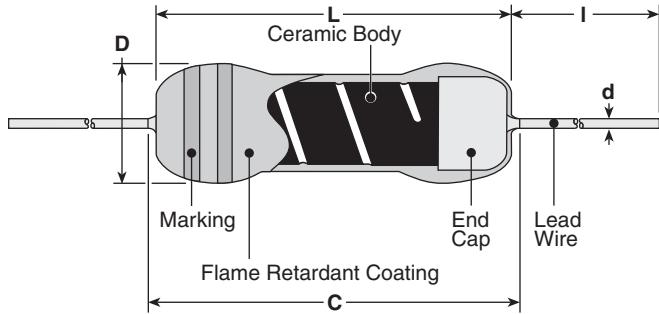
Cap Shape	C	M	MS	CP	C											
	D	d	D	M	K	A	D	M	K	A	d	l	D	M	l ₁	l ₂
PSN-05;PSN-1;PV-2	17.5	7	17.5	3	2	7	—	—	—	—	1.0	90	—	—	—	—
PSN-2;PV-5	24	12	24	4	2	10	—	—	—	—	1.2	120	—	—	—	—
PSN-3;PV-8;PWW-3;PAP-3	33	14	33	5	4	14	—	—	—	—	—	—	—	—	—	—
PSN-4;PWW-4;PAP-4	—	—	45	6	4	16	45	8	4	16	—	—	—	—	—	—
PSN-5,6;PWW-5,6;PAP-5,6	—	—	62	8	7	26	62	10	7	37	—	—	—	—	—	—
PV-0.5;PV-1	9.5	Without hole	—	—	—	—	—	—	—	—	0.9	90	—	—	—	—
PN-0.5	17	Without hole	—	—	—	—	—	—	—	—	1.0	90	—	—	—	—
PN-1	—	—	17	4	—	—	—	—	—	—	1.0	90	—	—	—	—
PN-2~PN-4	—	—	17	4	—	—	—	—	—	—	1.2	120	—	—	—	—
PSO-05,1	—	—	—	—	—	—	—	—	—	—	—	—	28	4	8	—
PSO-2	—	—	—	—	—	—	—	—	—	—	—	—	38	6	10	—
PSO-3	—	—	—	—	—	—	—	—	—	—	—	—	46	8	—	15
PSO-4	—	—	—	—	—	—	—	—	—	—	—	—	65	10	—	20
PSO-5,6	—	—	—	—	—	—	—	—	—	—	—	—	80	12	—	25

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/24/13


features

- Small size power type resistor
- Coated with UL94V0 equivalent flameproof material
- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- Surface mount style "N" forming is suitable for automatic mounting


dimensions and construction


Type	Dimensions inches (mm)				
	L	C (max.)	D	d (nom.) ¹	I*
MOS1/2 MOSX1/2	.244±.02 (6.2±0.5)	.280 (7.1)	.098±.02 (2.5±0.5)	.024 (0.6)	.945 Min. (24.0 Min.)
MOS1 MOSX1	.354±.039 (9.0±1.0)	.437 (11.1)	.118±.02 (3.0±0.5)	.024/.031 (0.6)/(0.8)	
MOS2 MOSX2	.472±.039 (12.0±1.0)	.591 (15.0)	.157±.02 (4.0±0.5)		
MOS3 MOSX3	.610±.039 (15.5±1.0)	.709 (18.0)	.236±.039 (6.0±1.0)		.031 (0.8) 1.18±.118 (30.0±3.0)
MOS5 MOSX5	.965±.039 (24.5±1.0)	1.10 (28.0)	.354±.039 (9.0±1.0)		
					1.50±.118 (38.0±3.0)

* Lead length changes depending on taping and forming type.

¹ Ex. MOS1C, 1CT52, 1CT526 = 0.6MM
MOS1C8, 1CT528 = 0.8MM

ordering information

MOS	1	C	T52	8	A	103	J
Type	Power Rating	Termination Material	Taping and Forming	Lead Diameter	Packaging	Nominal Resistance	Tolerance
MOS MOSX	1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W	C: SnCu	Axial: T26, T52, T521, T631 Stand-off Axial: L52, L521, L631 Radial: VTP, VTE, GT, GT4, VTF L, U, M, N Forming	MOS(X)1: T52 & Bulk Only: 6: 0.6mm 8: 0.8mm Blank: All others sizes & packaging	A: Ammo R: Reel TEB, TEG: Plastic embossed (N forming)	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	F: ±1% G: ±2% J: ±5%

For further information on packaging, please refer to Appendix C.

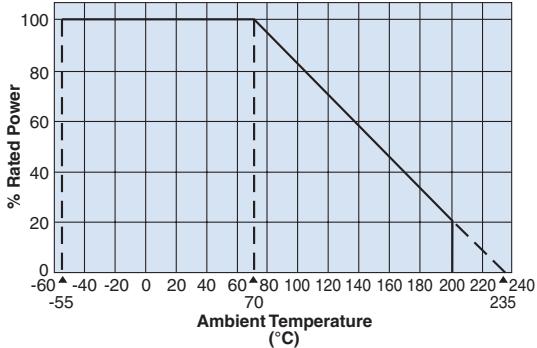
applications and ratings

Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C) Max.	Resistance Range			Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage	Operating Temperature Range					
MOS1/2	0.5W	400V	±300	10Ω - 47kΩ	10Ω - 47kΩ	10Ω - 47kΩ	$E = \sqrt{P \times R}$	600V	-55°C to +200°C					
MOS1	1.0W	500V		10Ω - 68kΩ	10Ω - 68kΩ	10Ω - 100kΩ								
MOS2	2.0W			10Ω - 100kΩ	10Ω - 100kΩ		350V	700V						
MOS3	3.0W	700V		—										
MOS5	5.0W	800V		0.22Ω - 9.1Ω	0.1Ω - 9.1Ω	$E = \sqrt{P \times R}$	500V	1000V						
MOSX1/2	0.5W	400V												
MOSX1	1.0W	500V		1Ω - 9.1Ω	0.22Ω - 9.1Ω	0.1Ω - 9.1Ω	$E \times 2.5$	E × 2.5						
MOSX2	2.0W			—										
MOSX3	3.0W	700V												
MOSX5	5.0W	800V												

* Please consult when there is a demand of the resistance besides the 1% and 2% range.

environmental applications

Derating Curve

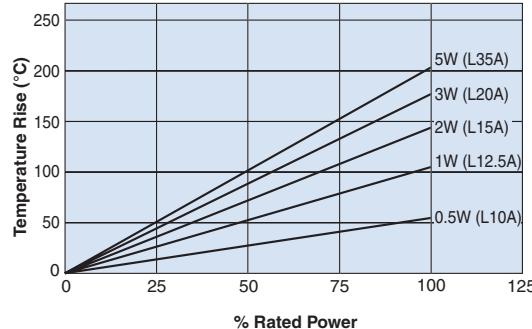


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement Limit	△ R ±(% + 0.05Ω)	Test Method
Resistance	Within specified tolerance	—	Measuring points are at 10mm ±1mm from the end cap.
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±(2% + 0.1Ω)	±1%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	±1%	±0.5%	260°C ±5°C, 10 seconds ± 1 second
Terminal Strength	No lead-breaking off and loose terminals	—	Twist 360°C, 5 times
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +155°C (30 minutes), 5 cycles
Moisture Resistance	±(5%+0.1Ω)	±2.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±(5%+0.1Ω)	±2.5%	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible	—	Ultrasonic washing with isopropyl alcohol for 2 minutes. Power: 0.3W/cm³, f: 28kHz, Temp: 35°C ±5°C
Flame Retardant	No evidence of flaming or self-flaming	—	Flame test: the test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: power (AC) corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed the value of 4 times of the maximum operating voltage

Surface Temperature Rise

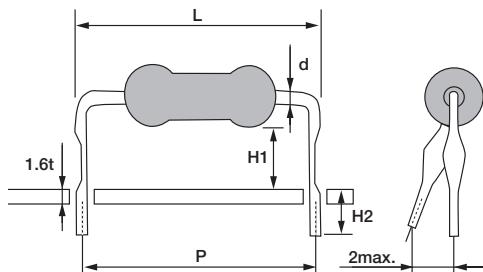


Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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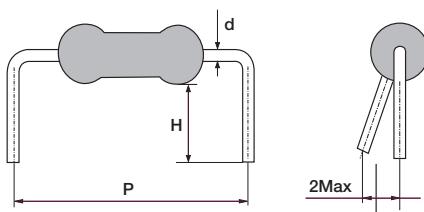
secondary processed products

L Forming



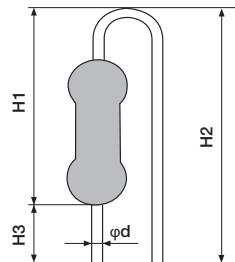
Type	Dimensions millimeters				
	P	H1	H2	d (Nom.)	L max.
1/2CL10A	10.0±1.0	5.3±1.0		0.6	
1CL12.5A	12.5±1.0	7.0±1.0			
1CL15A		6.5±1.0			
2CL15A	15.0±1.0	7.0±1.0			
2CL15F		4.5±1.0			
2CL20A		9.0±1.0			
2CL20D		4.8±1.0			
3CL20A	20.0±1.0	8.0±1.0		0.8	
3CL20C		10.0±1.0			
3CL20T		4.0±1.0			
3CL25A	25.0±1.0	7.0±1.0			
3CL30A	30.0±1.0	7.0±1.0			
5CL30A		8.5±1.0			
5CL35A	35.0±1.0	5.5±1.0			

M Forming



Type	Dimensions millimeters			Substrate Hole Dia.
	P	H	d (Nom.)	
1/2CM10C	10.0±1.0	3.5±1.0	0.6	
1/2CM10F	10.0±1.0	5.0±1.0	0.6	
1CM12.5C	12.5±1.0	3.5±1.0	0.8	
1CM12.5D	12.5±1.0	4.0±1.0	0.8	
1CM15F	15.0±1.0	5.0±1.0	0.8	
1CM15J	15.0±1.0	6.3±1.0	0.8	
1CM15S	15.0±1.0	11.0±1.0	0.8	
2CM15C	15.0±1.0	3.5±1.0	0.8	
2CM15E	15.0±1.0	4.5±1.0	0.8	
2CM16D	16.0±1.0	4.0±1.0	0.8	
2CM20D	20.0±1.0	4.0±1.0	0.8	
2CM20U	20.0±1.0	13.5±1.0	0.8	
3CM20E	20.0±1.0	4.6±1.0	0.8	
3CM26E	26.0±1.0	4.7±1.0	0.8	
5CM30U	30.0±1.0	13.0±1.0	0.8	

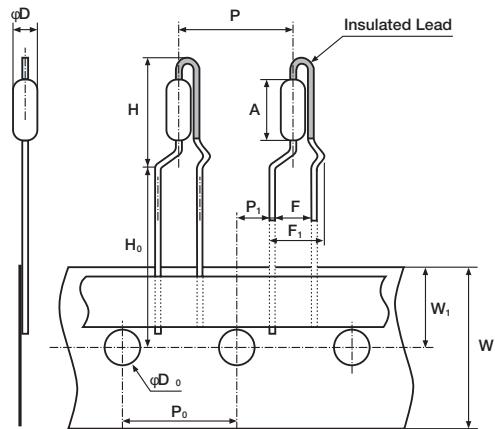
UCL Forming



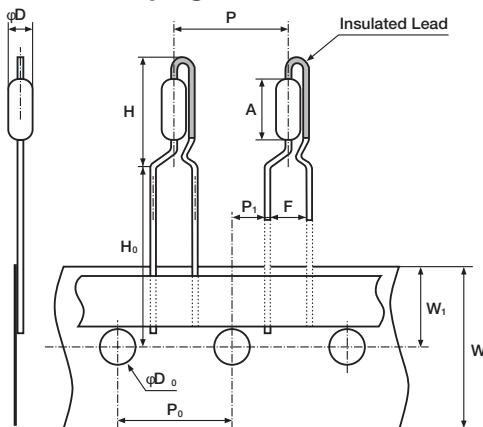
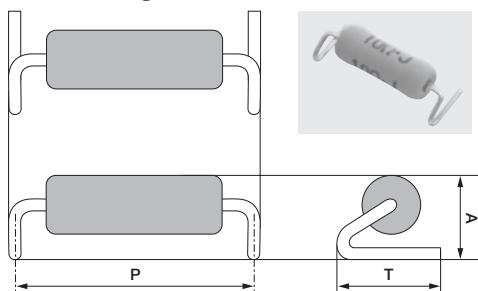
Type	Dimensions millimeters				Insertion Pitch	Substrate Hole Dia.
	H1	H2	H3	d (Nom.)		
1CUCL	13.0±1.0	17.0 max.	3.5±1.0			
2CUCL	14.5±1.0	18.5 max.	3.5±1.0			
3CUCL	20.0 max.	22.0±1.0	4.0±1.0			

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

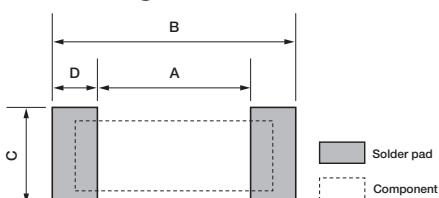
11/21/17

secondary processed products (continued)
VTF Radial Taping


Type	1/2C	1C	2C	2C
	VTP	VTP	VTP	VTF
A	6.2±0.5	9.0±1.0	12.0±1.0	12.0±1.0
øD	2.5±0.5	3.0±0.5	4.0±0.5	4.0±0.5
d (Nom.)	0.6	0.6	0.65	0.8
F	5.0±0.5	5.0±0.5	5.0±0.5	5.0±0.5
F1	—	—	—	7.3 max.
H	13 max.	16 max.	22.5 max.	22.5 max.
H0	16.0+1.0/-0	16.0+1.0/-0	16.0+1.0/-0	16.0+1.0/-0
P	12.7±1.0	12.7±1.0	12.7±1.0	12.7±1.0
P0	12.7±0.3	12.7±0.3	12.7±0.3	12.7±0.3
P1	3.85±0.7	3.85±0.7	3.85±0.7	3.85±0.7
W	18.0±0.5	18.0±0.5	18.0±0.5	18.0±0.5
W1	9.0±0.5	9.0±0.5	9.0±0.5	9.0±0.5
øD0	4.0±0.2	4.0±0.2	4.0±0.2	4.0±0.2
Substrate Hole Dia.	ø0.8	ø0.8	ø0.8	ø1.0

VTP Radial Taping

N Forming


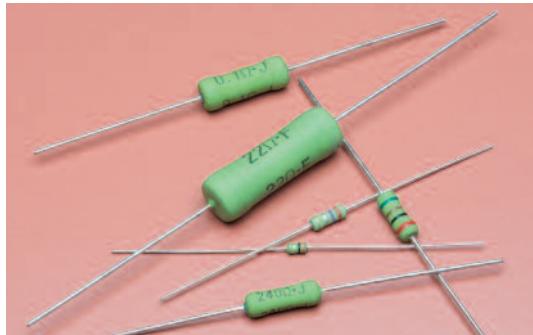
Type	1C	2C	3C
	N14.5TEB	N17TEB	N20TEG
P±1	14.5	17.0	20.0
T±0.5	5.0	6.0	7.5±1.0
A±0.5	4.8	5.8	6.5
d (Nom.)	0.8	0.8	0.8

UCL Forming


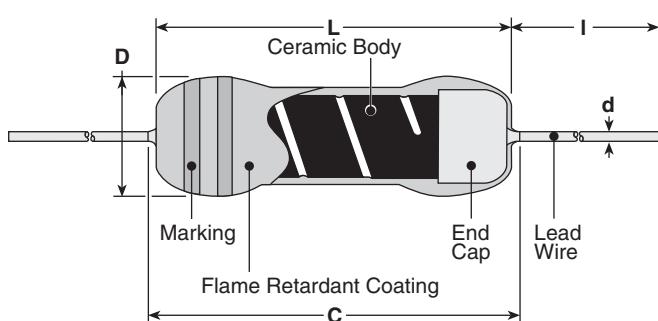
Type	1C	2C	3C
	N14.5TEB	N17TEB	N20TEG
A	12.5	14.6	17.6
B	16.5	19.4	22.4
C	7.0	8.0	9.5
D	2.0	2.4	2.4

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/09/15


features

- Fixed metal film resistor available (specify "SPRX")
- Flameproof silicone coating equivalent to (UL94V0)
- High reliability performance
- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- Surface mount style "N" forming is suitable for automatic mounting

dimensions and construction


Type	Dimensions inches (mm)				
	L	C (max.)	D	d nominal	I*
SPR1/4 SPRX1/4	.13±.012 (3.3±0.3)	.138 (3.5)	.067±.012 (1.7±0.3)	.018 (0.45)	.787 Min. (20.0 Min.)
SPR1/2 SPRX1/2	.244±.02 (6.2±0.5)	.280 (7.1)	.098±.02 (2.5±0.5)	.024 (0.6)	
SPR1 SPRX1	.354±.039 (9.0±1.0)	.437 (11.1)	.138±.02 (3.5±0.5)		.945 Min. (24.0 Min.)
SPR2 SPRX2	.472±.039 (12.0±1.0)	.591 (15.0)	.165±.031 (4.2±0.8)		.031 (0.8)
SPR3 SPRX3	.610±.039 (15.5±1.0)	.709 (18.0)	.236±.039 (6.0±1.0)		1.18±.118 (30.0±3.0)
SPR5 SPRX5	.965±.039 (24.5±1.0)	1.10 (28.0)	.354±.039 (9.0±1.0)		1.50±.118 (38.0±3.0)

* Lead length changes depending on taping and forming type.

ordering information

SPR	1/2	C	T52	R	103	J
Type	Power Rating	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
SPR SPRX	1/4: 0.25W 1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W	C: SnCu	Axial: T26, T52, T521, T631 Stand-off Axial: L52, L521, L631 Radial: VT, VTP, VTE, GT, VTF L, U, M, N Forming	A: Ammo R: Reel TEB: Embossed plastic (N forming)	±2%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	F: ±1% G: ±2% J: ±5%

For further information on packaging, please refer to Appendix C.

applications and ratings

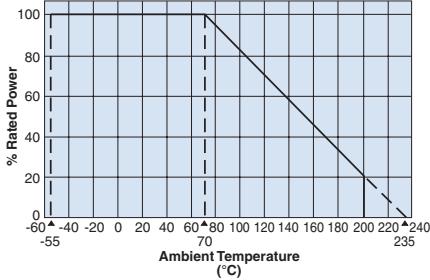
Part Designation	Power Rating @ 70°C	Minimum Dielectric Withstanding Voltage	T.C.R. (ppm/°C)	Resistance Range			Absolute Maximum Working Voltage	Absolute Maximum Overload Voltage
				E-24* (F±1%, G±2%)	E-24* (G±2%)	E-24 (J±5%)		
SPR1/4	0.25W	300V	±350	—	—	2.2Ω - 10KΩ	$E = \sqrt{P \times R}$	500V
SPR1/2	0.5W	500V		10Ω - 91KΩ	10Ω - 91KΩ	2.2Ω - 91KΩ		800V
SPR1	1W	500V		10Ω - 100KΩ	10Ω - 100KΩ	2.2Ω - 110KΩ		1000V
SPR2	2W	700V		—	—	0.1Ω - 2.0Ω	500V	1200V
SPR3	3W	700V		1.0Ω - 2.0Ω	0.22Ω - 2.0Ω		$E = \sqrt{P \times R}$	E x 2.5
SPR5	5W	800V		—	—			
SPRX1/4	0.25W	300V		—	—			
SPRX1/2	0.5W	500V		—	—			
SPRX1	1W	500V		—	—			
SPRX2	2W	700V		—	—			
SPRX3	3W	700V		—	—			
SPRX5	5W	800V		—	—			

* Please consult when there is a demand of the resistance besides the 1% and 2% range.

Rated Ambient Temperature: +70°C Operating Temperature Range: -55°C to +200°C

environmental applications

Derating Curve

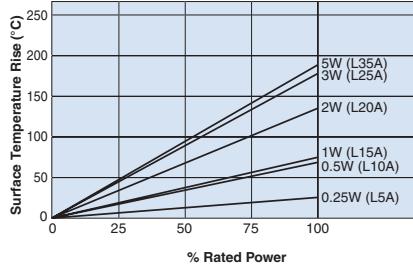


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

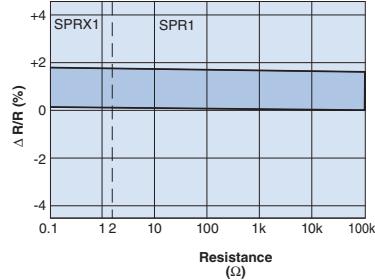
Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm(\% + 0.05\Omega)$ Typical	Test Method
Resistance	Within specified tolerance	—	Measuring points are at 10mm ±1mm from the end cap.
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short time)	±(1%+0.1Ω)	±0.5%	Rated voltage x 2.5 or max. overload voltage for 5 seconds, whichever is lower
Resistance to Solder Heat	±1%	±0.5%	260°C ±5°C, 10 seconds ± 1 second
Terminal Strength	No lead-crimping off and loose terminals	—	Twist 360°C, 5 times
Rapid Change of Temperature	±1%	±0.5%	-55°C (30 minutes), +155°C (30 minutes), 5 cycles
Moisture Resistance	±(3%+0.1Ω):1/4W-2W ±(5%+0.1Ω):3W,5W	1.5: 1/4W-2W 2.5: 3W, 5W	40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±(3%+0.1Ω):1/4W-2W ±(5%+0.1Ω):3W,5W	1.5: 1/4W-2W 2.5: 3W, 5W	70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible	—	Ultrasonic washing with isopropyl alcohol for 2 minutes. Power: 0.3W/cm³, f: 28kHz, Temp: 35°C ±5°C
Flame Retardant	No evidence of flaming or self-flaming	—	Flame test: the test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: power (AC) corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed the value of 4 times of the maximum operating voltage

Surface Temperature Rise

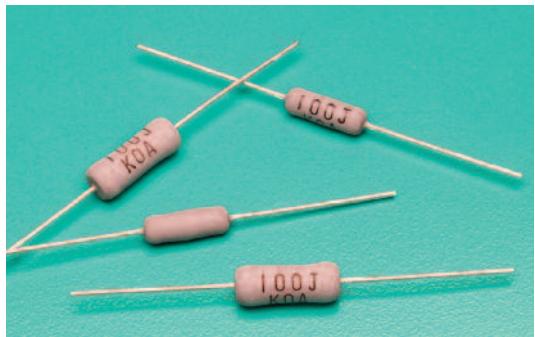


Load Life @ 70°C, 1000 Hr

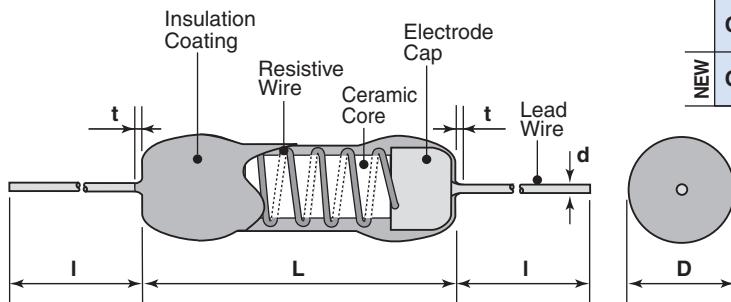


Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/01/19


features

- Flameproof retardant coating (equivalent to UL94-V-0)
- Fail-safe mains fusing at AC 250V (CWFS23: 4.7Ω~9.1Ω; AC200V)
- Products with lead-free terminations meet EU RoHS

dimensions and construction


Type	Dimensions inches (mm)				
	L	D	I	d (nom.)	t (max.)
CWFS23	.472±.039 (12.0±1.0)	.157±.039 (4.0±1.0)	1.18±.118 (30.0±3.0)	.031 (0.8)	.118 (3.0)
NEW CWFS35	.591±.039 (15.0±1.0)	.236±.039 (6.0±1.0)	1.18±.118 (30.0±3.0)	.031 (0.8)	.118 (3.0)

ordering information

CWF	S	23	C	T52	A	100	J
Product Code	Type	Power Rating	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
	S: Safety Fusing	23: 3W NEW 35: 5W	C: SnCu	23: T52 35: T521	A: Ammo	J: 3 digits	J: ±5%

Contact KOA when you have control request for environmental hazardous material other than the substance specified by EU RoHS.

For further information on packaging, please refer to Appendix C.

Lead length changes depending on taping and forming type.

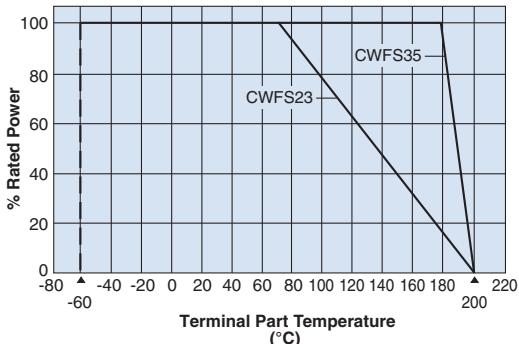
applications and ratings

Part Designation	Power Rating	Rated Terminal Part Temperature	Resistance Range E-24 (J±5%)	Fusing Characteristics		T.C.R. (x10 ⁻⁶ /K)	Operating Temperature Range
				Fusing Power	Fusing Time		
CWFS23	3	+120°C	4.7Ω - 100Ω	90W	30 Sec Max.	±100	
NEW CWFS35	5	+180°C	4.7Ω - 100Ω	150W	30 Sec Max.	±100	-55°C to +200°C

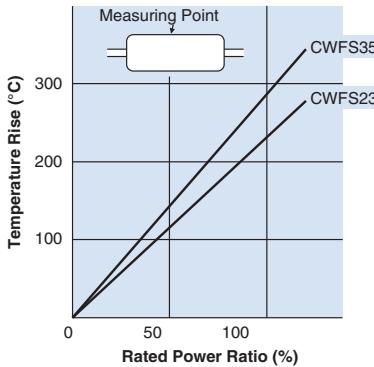
Rated voltage= $\sqrt{\text{Power Rating} \times \text{Resistance value}}$

environmental applications

Derating Curve



Temperature Rise (Ref.)



Fixing Board t=1.2 Material: Glass Epoxy Board

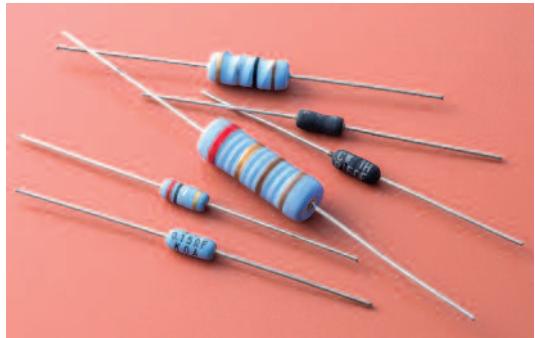
leaded
resistors

Performance Characteristics

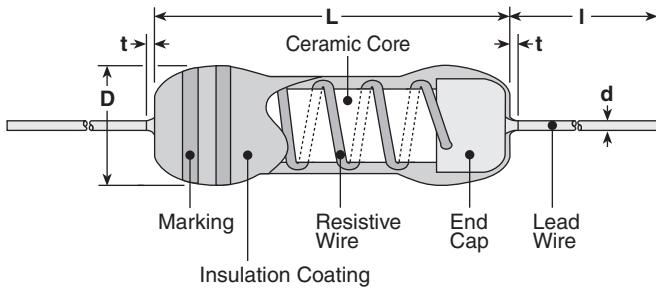
Parameter	Requirement $\Delta R \pm(\% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	$\pm 100 \times 10^{-6}/K$	—	+25°C/-55°C and +25°C/+125°C
Melt Time	30 seconds	4 seconds	Power rating x 30
Overload (Short Time)	5%	2%	Rated rating x 10, 5 seconds
Resistance to Solder Heat	1%	0.8%	350°C ± 10°C for 3.5 seconds or 260°C ± 5°C for 10 seconds
Moisture Resistance	5%	4%	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance of Rated Terminal Part Temperature	5%	3%	CWFS23: 120°C ± 2°C; CWFS35: 180°C ± 2°C 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No abnormality in appearance such as disappearance of making, etc.	—	On immersing the sample in IPA for 3 min., the resistor surface should be lightly wiped with a dry cloth (velvet or gauze)

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

8/16/18



dimensions and construction



features

- Flameproof silicone coating equivalent (UL94V0)
- CWH resistors meet MIL-PRF-26 (U characteristics)
- CWH high precision resistors with T.C.R. less than $\pm 50 \times 10^{-6}/\text{K}$
- Suitable for automatic machine insertion
- Various types of formings are available
- Excellent in pulse characteristic
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- CW1SS has UL1412 approval (File No. E320246)
- Surface mount style "N" forming is suitable for automatic mounting CW, CWP



Type	L	Dimensions inches (mm)	t (max.)	D	d (nom.)	I*
CW1/4	.13±.012 (3.3±0.3)	.02 (0.5)	.075±.012 (1.9±0.3)	.018 (0.45)		
CW1/2	.256±.039 (6.5±1.0)	.039 (1.0)	.098±.039 (2.5±1.0)	.024 (0.6)		
CW1			.138±.039 (3.5±1.0)			
CW1X	.354±.039 (9.0±1.0)		.138 ^{+.006} _{-.0} (3.5 ^{+.5} _{-.0})			
CW1P			.138±.039 (3.5±1.0)			
CW2			.157±.039 (4.0±1.0)			
CW2X	.472±.039 (12.0±1.0)	.118 (3.0)	.157 ^{+.006} _{-.0} (4.0 ^{+.5} _{-.0})		.031 (0.8)	
CW2P			.157±.039 (4.0±1.0)			
CW3			.236±.039 (6.0±1.0)			
CW3X	.591±.039 (15.0±1.0)		.236 ^{+.006} _{-.0} (6.0 ^{+.5} _{-.0})			
CW3P			.236±.039 (6.0±1.0)			
CW5	.945±.006 (24.0±1.5)		.354±.006 (9.0±1.5)			1.50±.118 (38.0±3.0)
CW1S	.256±.039 (6.5±1.0)	.039 (1.0)	.098±.039 (2.5±1.0)	.024 (0.6)	1.18±.118 (30.0±3.0)	
CW1SS						
CW1H	.354±.039 (9.0±1.0)		.138±.039 (3.5±1.0)			
CW2H	.472±.039 (12.0±1.0)	.118 (3.0)	.157±.039 (4.0±1.0)		.031 (0.8)	1.18±.118 (30.0±3.0)
CW3H	.591±.039 (15.0±1.0)		.236±.039 (6.0±1.0)			

* Lead length changes depending on taping and forming type.

ordering information

CW	1/2	P	C	T52	A	103	F
Type	Power Rating	Style	Termination Material	Taping and Forming	Packaging	Nominal Resistance	Tolerance
1/4: 0.25W		H: Stability	C: SnCu	Axial: T26, T52, T521, T631	A: Ammo	$\pm 2\%$, $\pm 5\%$: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω	$\pm 0.25\%$
1/2: 0.5W		Nil: Power		Stand-off Axial: L52A, L52B	R: Reel	$\pm 1\%$:	$\pm 0.5\%$
1: 1W		P: Precision		Radial: VTP*, GT	TEB: TEG: Embossed plastic (N forming)	3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	$\pm 1\%$
2: 2W		S: Small		L forming: L12.5A, L15A, L20A, L25A			$\pm 2\%$
3: 3W		X: Power		N forming: N17, N20			$\pm 5\%$
5: 5W		SS: Small type, UL Approved					$\pm 10\%$

For further information on packaging, please refer to Appendix C.

* VTP: Applicable to 0.47Ω or over for CW1, CW1P only

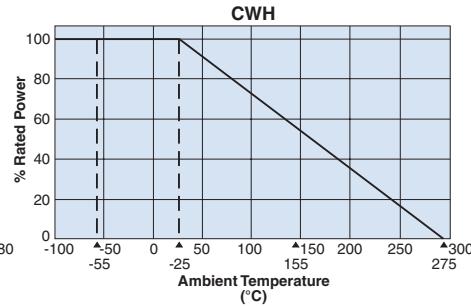
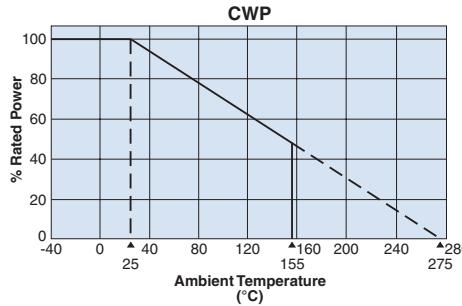
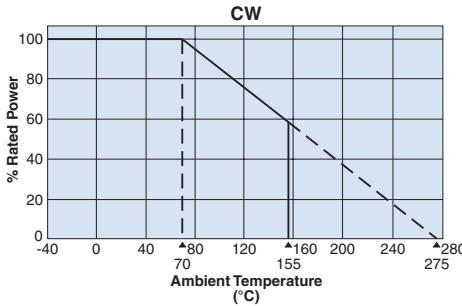
applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)						Rated Ambient Temperature	Operating Temperature Range		
			E-24, E-96 (C $\pm 0.25\%$)	E-24, E-96 (D $\pm 0.5\%$)	E-24, E-96 (F $\pm 1\%$)	E-24 (G $\pm 2\%$)	E-24 (J $\pm 5\%$)	E-24 (K $\pm 10\%$)				
CW1/4	0.25W	± 250	—	—	—	—	0.47 - 15	0.47 - 15	$+70^\circ\text{C}$	-40°C to $+155^\circ\text{C}$		
CW1/2	0.5W											
CW1	1.0W						0.1 - 390	0.1 - 390				
CW2	2.0W						0.1 - 390	0.1 - 390				
CW3	3.0W						0.1 - 390	0.1 - 390				
CW5	5.0W						0.1 - 390	0.1 - 390				
CW1X	1.0W	± 500	—	—	—	—	0.01 - 0.091	0.01 - 0.091	$+25^\circ\text{C}$	-55°C to $+275^\circ\text{C}$		
CW2X	2.0W						0.01 - 0.091	0.01 - 0.091				
CW3X	3.0W						0.01 - 0.091	0.01 - 0.091				
CW1S	1.0W	± 250	—	—	—	—	0.1 - 100	0.1 - 100	$+25^\circ\text{C}$	-55°C to $+275^\circ\text{C}$		
CW1SS	1.0W	± 100	—	—	—	—	10	—				
CW1P	1.0W	$\pm 90: R \geq 10\Omega$ $\pm 50: R < 10\Omega$	1 - 100	0.47 - 220	0.1 - 430	—	—	—				
CW2P	2.0W		1 - 390	0.47 - 390	0.1 - 390							
CW3P	3.0W		1 - 390	0.47 - 390	0.1 - 390							
CW1H	1.0W	$\pm 20: R \geq 10\Omega$ $\pm 50: R < 10\Omega$	—	0.47 - 220	0.1 - 430	—	—	—	$+25^\circ\text{C}$	-55°C to $+275^\circ\text{C}$		
CW2H	2.0W			0.47 - 750	0.1 - 2k							
CW3H	3.0W			0.47 - 1k	0.1 - 3k							

CW_H: Max. Working Voltage: $E = \sqrt{(PxR)}$ CW_H: Max. Overload Voltage: $E = \sqrt{(PxRx5)}$

environmental applications

Derating Curve



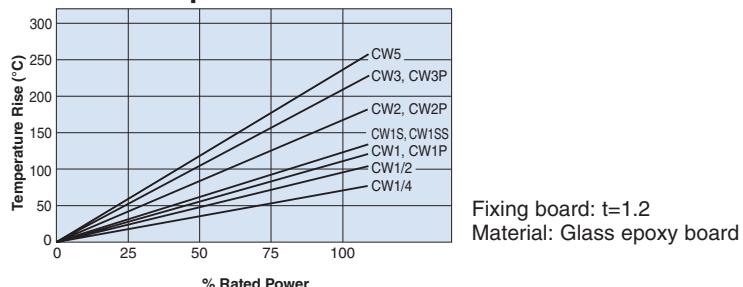
For resistors operated at an ambient temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/01/19

environmental applications

Surface Temperature Rise



Performance Characteristics

Parameter	Requirement $\Delta R \pm (% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	CW: +25°C/+125°C CWP: +25°C/-40°C and +25°C/+155°C CWH: +25°C/-55°C and +25°C/+125°C
Overload (Short Time)	1%: CW, CWX 0.5%: CWP 2%: CW1S, CW1SS 0.2%: CWP($R<10\Omega$)*, CWH	0.8%: CW, CWX 0.4%: CWP 1.8%: CW1S, CW1SS 0.18%: CWP($R<10\Omega$) 0.15%: CWH	CW,CWX,CW1S,CW1SS: Power rating x 10 for 5 seconds CWP: Power rating x 6.25 for 5 seconds CWP ($R<10\Omega$), CWH: Power rating x 5 for 5 seconds
Resistance to Solder Heat	1%: CW,CW1S,CW1SS,CWX 0.5%: CWP 0.2%: CWP ($R<10\Omega$)*, CWH	0.8%: CW,CW1S,CW1SS,CWX 0.4%: CWP 0.18%: CWP ($R<10\Omega$) 0.15%: CWH	350°C ± 10°C for 3.5 seconds or 260°C ± 5°C for 10 seconds
Moisture Resistance	5%: CW, CW1S, CWX 2%: CWP 0.5%: CWP ($R<10\Omega$)*	4%: CW, CW1S, CWX 1.6%: CWP 0.45%: CWP ($R<10\Omega$)	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 70°C	5%: CW,CW1S,CW1SS,CWX 2%: CWP 0.5%: CWP ($R<10\Omega$)*	4%: CW,CW1S,CW1SS,CWX 1.6%: CWP 0.45%: CWP ($R<10\Omega$)	70°C, 1000 hours (CW, CWX, CW1S, CW1SS), 25°C, 1000 hours (CWP) 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvent	No evidence of damage to protective coating and marking	—	After immersing the sample in IPA for 3 min., the resistor surface should be wiped with a dry cloth (velvet or gauze)
Low Temperature	0.2%: CWH	0.15%: CWH	-65°C, 24 hours
High Temperature	0.5%: CWH	0.45%: CWH	+275°C, 250 hours
Thunder Surge	3%: CW1SS	—	Combination wave, +1.5kV 20 seconds 3 cycles
Load Life	0.5%: CWH	0.45%: CWH	-25°C, power rating, 1.5 hr ON, 0.5 hr OFF 2000 hours

* Refer to MIL-PRF-26G standard

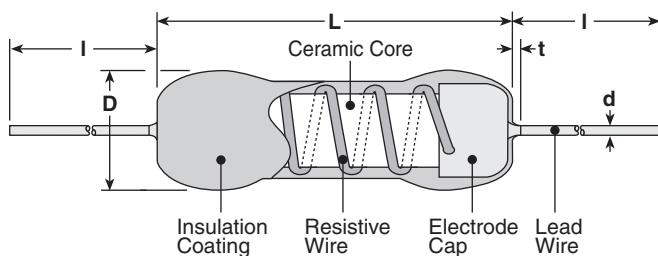


features

- Resistors meeting MIL-R-26E (U and V characteristics) and surface temperature (hot spot) 350°C max.
- Resistors with a wide range of 0.1Ω ~ 62kΩ, covering applications from precision to power
- RW□N type resistors are non-inductive wound and can be used in high frequency applications.
- Products with lead-free terminations meet EU RoHS and China RoHS requirements



dimensions and construction



Type	Dimensions inches (mm)			
	L	D	d (nom.)	I
RW1/2, RW1/2N	.315±.039 (8.0±1.0)	.138 ^{+.039} _{-.0} (1.6 ^{+.10} _{-.0})		.020 (0.5)
RW1, RW1N	.413±.039 (10.5±1.0)	.106±.039 (2.7±1.0)		
RW2, RW2N	.512±.039 (13.0±1.0)	.205±.039 (5.2±1.0)		.031 (0.8)
RW3, RW3N	.650±.039 (16.5±1.0)	.252±.039 (6.4±1.0)		
RW5, RW5N	.866±.039 (22±1.0)		.307±.059 (7.8±1.5)	.039 (1.0)
RW7, RW7N	1.24±.039 (31.5±1.0)			
RW10, RW10N	1.81±.059 (46.0±1.5)		.366±.089 (9.3±1.5)	

1.50±.118
(38.0±3.0)

ordering information

Pb Free
Type

RW	1/2	N	T	103	J
Type	Power Rating	Winding Method	Termination Material	Nominal Resistance	Tolerance
	1/2: 0.5W 1: 1W 2: 2W 3: 3W 5: 5W 7: 7W 10: 10W	Nil: Standard winding N: Non-inductive winding	T: Sn	±3%, ±5%: 2 significant figures + 1 multiplier "R" indicates decimal on value <10Ω ±0.5%, ±1%: 3 significant figures + 1 multiplier "R" indicates decimal on value <100Ω	D: ±0.5% F: ±1% H: ±3% J: ±5%
				Packaging quantity: RW1/2 ~ RW1: 1,000 pieces RW2 ~ RW7: 500 pieces RW10: 300 pieces	

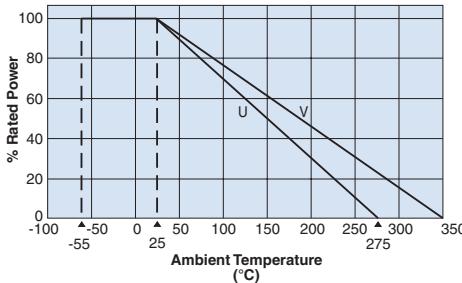
applications and ratings

Part Designation	Power Rating		Resistance Range (Ω)				T.C.R. (ppm/ $^{\circ}$ C)	Max. Working Voltage	Max. Overload Voltage
	U	V	D \pm 0.5% (E24 • E96 25x10 $^{\circ}$ •50x10 $^{\circ}$)	F \pm 1% (E24 • E96 25x10 $^{\circ}$ •50x10 $^{\circ}$)	H \pm 3% (E24 & 25x10 $^{\circ}$ •50x10 $^{\circ}$)	J \pm 5% (E24 & 25x10 $^{\circ}$ •50x10 $^{\circ}$)			
RW1/2	0.5W	—	10 - 2.61k	10 - 2.61k	0.47 - 2.7k	0.47 - 2.7k	+20/-50: $R \geq 10\Omega$	80V	150V
RW1/2N			—	10 - 2.37k	10 - 2.4k	10 - 2.4k			
RW1	1.0W	—	1 - 5.11k	1 - 5.11k	0.1 - 5.1k	0.1 - 5.1k	+50/-70: $1\Omega \leq R < 10\Omega$	130V	300V
RW1N			—	10 - 3.74k	10 - 3.6k	10 - 3.6k			
RW2	2.0W	3.0W	1 - 10k	1 - 10k	0.1 - 10k	0.1 - 10k	+400/-90: $R < 1\Omega$	140V	500V
RW2N			—	15 - 10k	10 - 10k	10 - 10k			
RW3	3.0W	5.0W	1 - 15k	1 - 15k	0.1 - 15k	0.1 - 15k	+200V	600V	1000V
RW3N			—	15 - 15k	15 - 15k	15 - 15k			
RW5	5.0W	7.0W	1 - 30.1k	1 - 30.1k	0.1 - 30k	0.1 - 30k	+600V	800V	1500V
RW5N			—	20 - 29.4k	20 - 30k	20 - 30k			
RW7	7.0W	10W	1 - 45.3k	1 - 45.3k	0.1 - 47k	0.1 - 47k	+1000V	1200V	2000V
RW7N			—	36 - 44.2k	36 - 43k	36 - 43k			
RW10	10W	14W	1 - 60.4k	1 - 60.4k	0.1 - 62k	0.1 - 62k	+2000V	1800V	3000V
RW10N			—	62 - 49.9k	62 - 51k	62 - 51k			

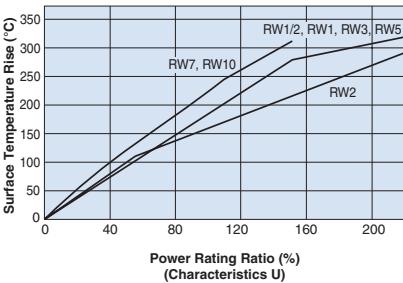
Operating Temperature Range: Characteristic U: -55°C ~ +275°C, V: -55°C ~ +350°C

environmental applications

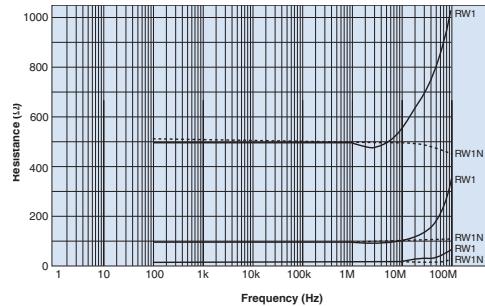
Derating Curve



Surface Temperature Rise



Frequency Characteristics



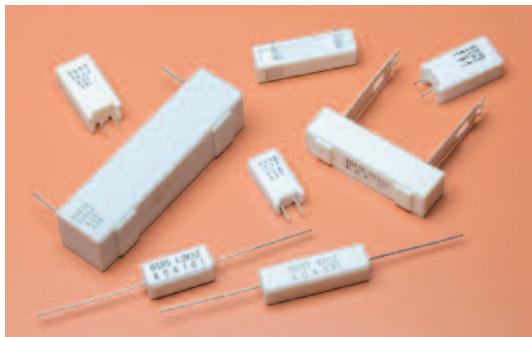
Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\Omega)$	Test Method
Resistance	Within regulated tolerance	25°C
T.C.R.	Within specified T.C.R.	+25°C/-55°C, +25°C/+125°C
Overload (Short time)	0.2%: U	Rated power x 5 or Max. overload voltage, whichever is lower for 5 seconds
	2%: V	Rated power x 10 or Max. overload voltage, whichever is lower for 5 seconds
Resistance to Solder Heat	0.1%	350°C ± 10°C, 3 seconds ± 0.5 seconds or 260°C ± 5°C, 10 seconds ± 1 second
Moisture Resistance	0.2%: U 2%: V	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON/0.5 hr OFF cycle
Endurance @ 25°C	0.5%: U 3%: V	25°C, 2000 hours 1.5 hr ON/0.5 hr OFF cycle
High Temperature Exposure	0.2%: U	275 ⁺⁵ ₋₀ °C, 250 hours
	2%: V	350 ⁺⁵ ₋₀ °C, 250 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/05/18

rectangular type wirewound resistors with glass core
 rectangular type wirewound resistors with ceramic core
 rectangular type metal oxide film resistors



features

- High power resistors
- Uses flame-retardant insulated ceramic case
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.
- Excellent in anti-pulse and in rush current



applications and ratings

Type	Power Rating	Resistance Range (Ω) E24				Style & Weight (g/1 piece)													
		F \pm 1%	G \pm 2%	J \pm 5%	K \pm 10%	S	N	E	P	X	Y	YS	Z	H	Q	HA	HB	QA	QB
BWR1	1W	1~56	0.22~75	0.1~75	—	1.3	—	—	—	—	—	—	—	—	—	—	—	—	
BWR2	2W	1~160	0.22~200	0.1~200	—	2.1	3.9	—	—	—	—	—	—	—	—	—	—	—	
BWR3	3W	1~300	0.22~390	0.1~390	—	3.9	5.9	—	—	—	—	—	—	—	—	—	—	—	
BWR5	5W	1~300	0.22~390	0.1~390	—	5.1	7.2	5.7	5.6	—	—	—	—	—	—	—	—	—	
BWR7	7W	1~360	0.22~390	0.1~390	—	7.5	10.8	—	—	—	—	—	—	—	—	—	—	—	
BWR10	10W	1~390	0.22~390	0.1~390	—	10.2	15.0	—	—	—	—	—	—	—	—	—	—	—	
BWR15	15W	1~390	0.22~390	0.1~390	—	18.8	—	—	—	—	—	—	—	—	—	—	—	—	
BWR20	20W	1~390	0.22~390	0.1~390	—	23.3	—	—	—	—	—	—	—	—	—	—	—	—	
BGR5	5W	—	—	10~390	0.39~9.1	—	—	—	—	6.1	7.6	6.6	7.6	—	6.2	—	—	—	
BGR7	7W	—	—	10~390	0.39~9.1	—	—	—	—	8.2	9.1	7.8	9.1	—	7.8	—	—	—	
BGR10	10W	—	—	10~390	0.39~9.1	—	—	—	—	11.0	12.4	10.4	11.4	9.9	10.7	13.6	—	14.5	
BGR15	15W	—	—	10~390	0.51~9.1	—	—	—	—	18.8	—	20.5	18.4	18.6	24.4	27.5	24.6	27.7	
BGR20	20W	—	—	10~390	0.51~9.1	—	—	—	—	22.3	—	24.0	21.9	22.1	27.9	31.0	28.1	31.3	
BGR30	30W	—	—	10~390	2.2~9.1	—	—	—	—	—	—	—	—	59.3	59.6	73.9	73.5	74.2	73.8
BGR40	40W	—	—	10~390	2.2~9.1	—	—	—	—	—	—	—	—	70.4	70.6	85.0	84.6	85.2	84.8
BSR2	2W	—	—	430~13k	—	2.1	3.8	—	—	—	—	—	—	—	—	—	—	—	
BSR3	3W	—	—	430~27k	—	3.9	5.9	—	—	—	—	—	—	—	—	—	—	—	
BSR5	5W	—	—	430~51k	—	5.1	7.2	5.7	—	6.1	7.6	6.6	7.6	—	6.2	—	—	—	
BSR7	7W	—	—	430~56k	—	7.4	10.8	—	—	8.2	9.1	7.8	9.1	—	7.8	—	—	—	
BSR10	10W	—	—	430~75k	—	10.2	15.0	—	—	11.0	12.4	10.4	11.4	10.9	10.7	13.7	—	14.5	
BSR15	15W	—	—	430~56k	—	18.8	—	—	—	18.5	—	20.5	18.4	18.6	24.4	27.5	24.6	27.7	
BSR20	20W	—	—	430~56k	—	23.3	—	—	—	22.0	—	24.0	21.9	22.1	27.9	31.0	28.1	31.3	

Type	Power Rating	Max. Working Voltage (V) BSR	Max. Working Voltage (V) BGR, BWR	Max. Overload Voltage (V) BSR	Max. Overload Voltage (V) BGR, BWR	BWR	BSR	BGR	Rated Ambient Temperature	Operating Temperature Range
BWR1	1W	—	$E = \sqrt{P \cdot R}$	—	$E = \sqrt{P \cdot R \cdot 10}$	± 100	± 300	± 250	$+70^\circ\text{C}$	-40°C to $+155^\circ\text{C}$
B□ R2	2W	250		500						
B□ R3	3W	300		600						
B□ R5	5W	350		700						
B□ R7	7W	500		1000						
B□ R10	10W	700		1400						
B□ R15	15W	700		1400						
B□ R20	20W	750		1500						
BGR30	30W	—		—						
BGR40	40W	—		—						

Rated voltage= $\sqrt{\text{Power Rating} \times \text{Resistance value or Max. working voltage}}$, whichever is lower.

□ Represents the space to designate product type via character G, W, or S.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/16/19

rectangular type wirewound resistors with glass core
 rectangular type wirewound resistors with ceramic core
 rectangular type metal oxide film resistors

ordering information

BWR	3	C	N	100	J
Type	Power Rating	Termination ¹ Material	Style	Nominal Resistance	Tolerance
BGR: Wirewound (glass core) BWR: Wirewound (ceramic core) BSR: Metal oxide film	See table	C: SnCu	Blank: S style ² N: N style E: E style P: P style	+1%: 3 significant figures + 1 multiplier "R" indicates decimal on values <100Ω +2%, +5%, +10%: 2 significant figures + 1 multiplier "R" indicates decimal on values <10Ω	F: ±1% G: ±2% J: ±5% K: ±10%
		T: Sn	X: X style Y: Y style YS: YS style Z: Z style H: H style Q: Q style HA: HA style HB: HB style QA: QA style QB: QB style		

¹ Lead-Free plated terminal symbols.

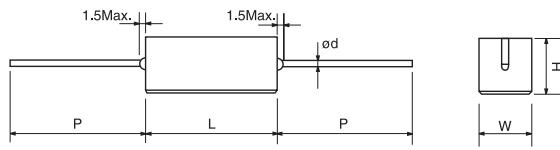
C (SnCu) N, E, S and P styles

T (Sn) X, Y, YS, Z, H and Q styles

² No indication on style means S style.

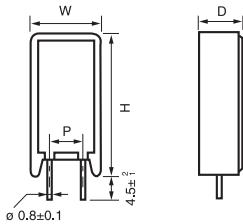
dimensions and construction

S Style

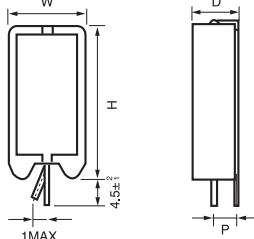


Type	Dimensions millimeters				
	L	W	H	P	D
BWR1	13.0±1.0	5.5±1.0	5.5±1.0	30.0±3.0	0.6±0.1
BWR2, BSR2	18.0±1.5	6.3±1.0	6.3±1.0		
BWR3, BSR3	22.0±1.5	8.0±1.0	8.0±1.0		
BWR5, BSR5					
BWR7, BSR7	35.0±1.5	9.5±1.0	9.5±1.0	35.0±3.0	0.8±0.1
BWR10, BSR10	48.0±1.5				
BWR15, BSR15		12.5±1.2	12.5±1.2		
BWR20, BSR20	63.5±1.5	12.5±1.5	12.5±1.5		

N Style



E Style



Type	Dimensions millimeters			
	W±1	D±1	H±1.5	P ^{*2}
BWR2N, BSR2N	11	7	20.5	
BWR3N, BSR3N	12	8	25	
BWR5N, BSR5N	13	9	25.5	5
BWR7N, BSR7N			38.5	
BWR10N, BSR10N	16	12	35	7.5
BWR5E, BSR5E	9.5	9.5	23.5	5

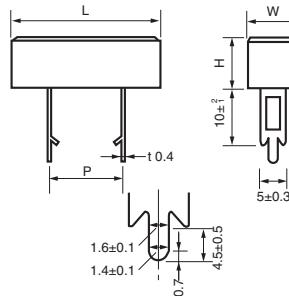


BGR, BWR, BSR

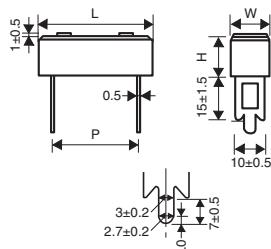
**rectangular type wirewound resistors with glass core
rectangular type wirewound resistors with ceramic core
rectangular type metal oxide film resistors**

dimensions and construction (continued)

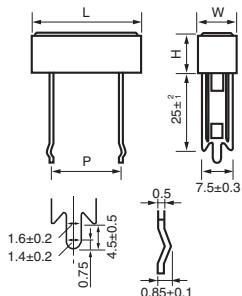
X Style (5W, 10W)



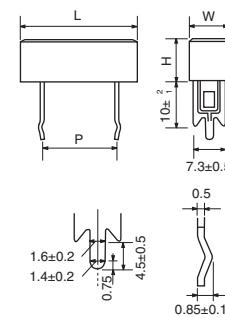
(15W, 20W)



Y Style

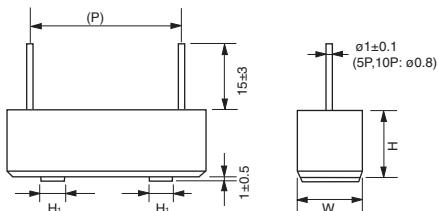


YS Style



Type	L±1.5	Dimensions millimeters		
		W±1.0	H±1.0	P±1.5
BGR5X, BSR5X, BGR5Y, BSR5Y, BGR5YS, BSR5YS	27	9.5	9.5	15
BGR7X, BSR7X, BGR7Y, BSR7Y, BGR7YS, BSR7YS	35			22.5
BGR10X, BSR10X, BGR10Y, BSR10Y, BGR10YS, BSR10YS	48			35
BGR15X, BSR15X	12.5	12.5	32.5	
BGR20X, BSR20X			63.5	47.5

P Style



Type	Dimensions millimeters				
	L	W	H	H ₁	(P)
BWR5P	23.0±1.5	9.5±1.5	9.5±1.5	—	20

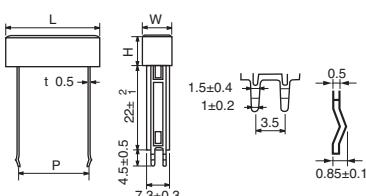
Parenthesized dimensions are for reference.

Please refrain from using these parts as a board-insertion type.

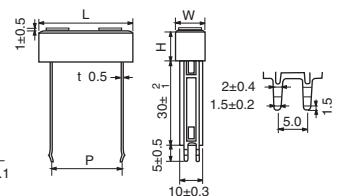
* Soldering only does not allow enough joint strength.

Additional fixation is recommended.

Z Style (5W, 10W)



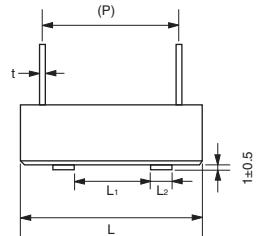
(15W, 20W)



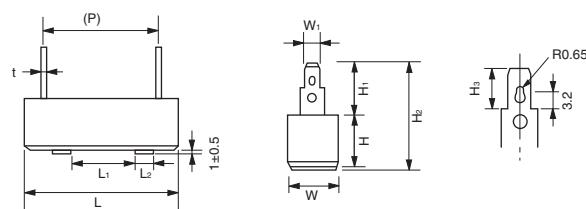
Type	Dimensions millimeters			
	L±1.5	W±1.0	H±1.0	P
BGR5Z, BSR5Z	27			15 ⁺⁶ ₋₂
BGR7Z, BSR7Z	35	9.5	9.5	22.5 ⁺⁶ ₋₂
BGR10Z, BSR10Z	48			35 ⁺⁶ ₋₂
BGR15Z, BSR15Z		12.5	12.5	32.5 ⁺⁴ ₋₀
BGR20Z, BSR20Z	63.5			47.5 ⁺⁴ ₋₀

dimensions and construction (continued)

H Style



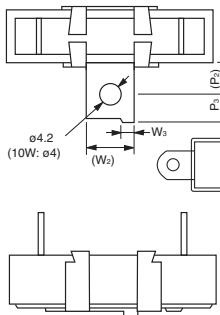
Q Style



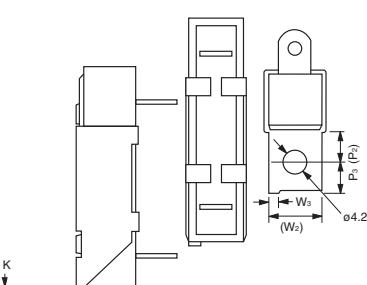
Type	Dimensions millimeters											
	L	L ₁	L ₁	W	W ₁	H	H ₁	H ₂	(H ₃)	(P)	t	(øh ₁)
BGR10H, BSR10H	48.0±1.5	25.0±1.0	4.5	9.5±1.0	5	9.5±1.0	7.0±1.0	—	—	35	0.4	2.0
BGR15H, BSR15H			7.0	12.5±1.2	6	12.5±1.5	8.5±1.0			34.5	0.5	2.5
BGR20H, BSR20H			63.5±2.0							49.5		
BGR30H	75.0±2.5	40.0±1.2	10.0	19.0±1.5	7.5	19.0±1.5	11.0±1.0	—	—	56	0.5	3.0
BGR40H	90.0±2.5									71		
BGR5Q, BSR5Q	27.0±1.5	—	—	9.5±1.0	4.75	9.5±1.0	10.5±1.0	6.5	3.3	15.0	0.5	2.2
BGR7Q, BSR7Q	35.0±1.5									22.5		
BGR10Q, BSR10Q	48.0±1.5									35.0		
BGR15Q, BSR15Q	25.0±1.0	4.5	12.5±1.2	4.75	12.5±1.5	13.0±1.0	6.35	—	34.5	0.5	—	
BGR20Q, BSR20Q		7.0							49.5			
BGR30Q	75±2.5	40.0±1.2	10.0	19.0±1.5	6.3	19.0±1.5	12.0±1.0	8.0	4.1	56	0.8	1.7
BGR40Q	90±2.5									71		

Parenthesized dimensions are for reference.

HA, QA Style



HB, QB Style

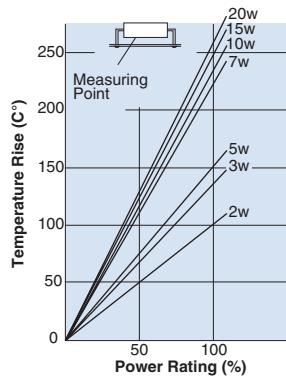


Parenthesized dimensions are for reference.

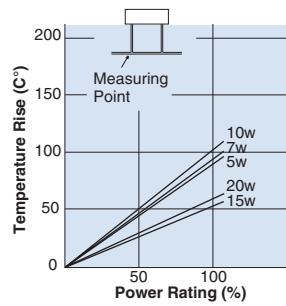
rectangular type wirewound resistors with glass core
 rectangular type wirewound resistors with ceramic core
 rectangular type metal oxide film resistors

Derating Curve

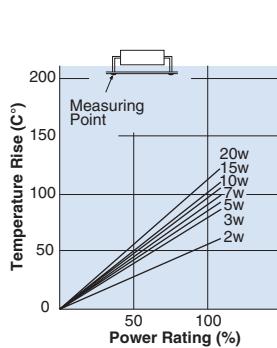
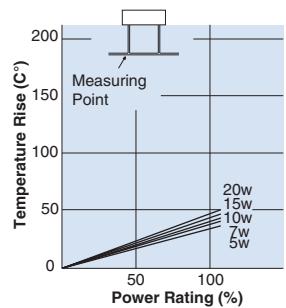
S Style



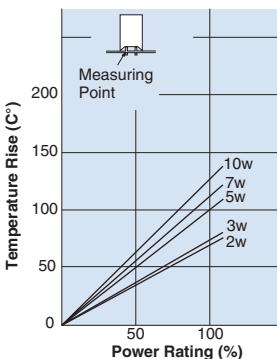
X Style



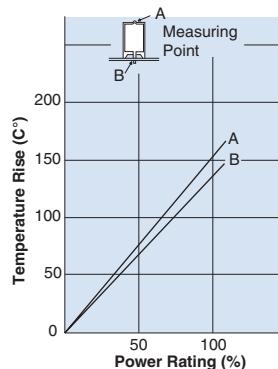
Z Style



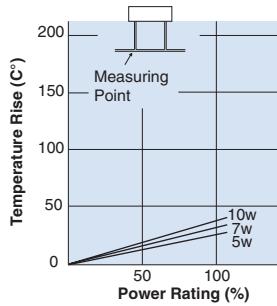
N Style



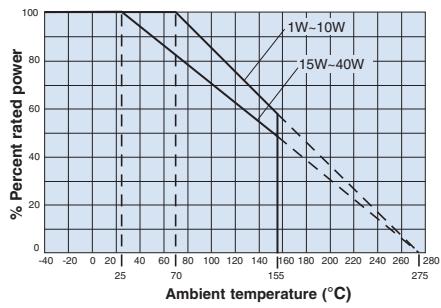
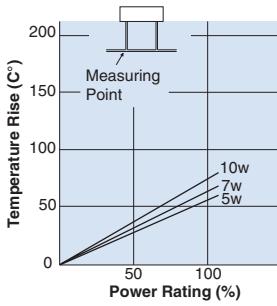
E Style



Y Style



YS Style



environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R \pm \%$ Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Resistance to Solder Heat	1%: BWR, BSR 2%: BGR	0.8%: BWR 1.7%: BGR 0.9%: BSR	350°C ± 10°C for 3.5 seconds
Moisture Resistance	3%: BWR, BGR 5%: BSR	2.4%: BWR 2.55%: BGR 4.5%: BSR	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 70°C	3%: BWR 5%: BGR, BSR	2.4%: BWR 4.25%: BGR 4.5%: BSR	Rated voltage, 70°C, 1000 hours, 1.5 hours ON/ 0.5 hours OFF cycle

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

2/11/15



features



- High power resistors
- Uses flame-retardant insulated ceramic case
- Excellent in anti-pulse and in rush current
- Suitable for high reliable applications like automotives
- AEC-Q200 qualified.
- Products meet EU RoHS requirements

applications and ratings

Type	Power Rating	Pulse Energy Capacity (J)**	Resistance Range (Ω) E24		Style & Weight (g/1pcs)					
			J±5%	K±10%	S***	N***	G	QA	QC	QD
BWRV3	3W	11	1~390	—	3.9	5.9	—	—	—	—
BWRV5	5W	17	1~390	—	5.1	7.2	—	—	—	—
BWRV7	7W	52	1~390	—	7.5	10.8	—	—	—	—
BWRV10	10W	100	1~390	—	10.2	15.0	—	—	—	—
BWRV15	15W	100	1~390	—	18.8	—	—	—	—	—
BWRV20	20W	180	1~390	—	23.3	—	—	—	—	—
BWRV40*	40W	549	5.1~100	—	—	—	93.5	—	—	—
NEW BGRV5	5W	16	10~390	5.1~9.1	—	—	6.2	—	—	—
BGRV7	7W	31	10~390	5.1~9.1	—	—	7.9	—	—	—
BGRV10	10W	60	10~390	5.1~9.1	—	—	10.7	14.5	—	—
BGRV15	15W	95	10~390	5.1~9.1	—	—	18.6	24.6	—	—
BGRV20	20W	161	10~390	5.1~9.1	—	—	22.1	28.1	—	—
BGRV30	30W	161	10~390	5.1~9.1	—	—	59.6	72.4	84.6	73.9
NEW BGRV30TQW	30W	226	10~390	5.1~9.1	—	—	59.6	72.4	84.6	73.9
BGRV40	40W	226	10~390	5.1~9.1	—	—	70.6	85.2	95.6	84.9
NEW BGRV40TQW	40W	—	10~100	5.1~9.1	—	—	70.6	85.2	95.6	84.9
BSRV3	3W	—	430~27k	—	3.9	5.9	—	—	—	—
BSRV5	5W	—	430~51k	—	5.1	7.2	6.2	—	—	—
BSRV7	7W	—	430~56k	—	7.5	10.8	7.9	—	—	—
BSRV10	10W	—	430~75k	—	10.2	15.0	10.7	14.5	—	—
BSRV15	15W	—	430~56k	—	18.8	—	18.6	24.6	—	—
BSRV20	20W	—	430~56k	—	23.3	—	22.1	28.1	—	—

* Under development

** Average value between $10\Omega \sim 100\Omega$

*** S Style and N Style lead terminal products are not compatible with the AEC-Q200 vibration test only by soldered PCB mounting.

When using the product, please take into account vibration measures such as fixing the product with silicone resin.

Type	Power Rating	Rated Ambient Temperature	Max. Working Voltage (V)			Max. Overload Voltage (V)			T.C.R. ($\times 10^{-6}/K$)			Operating Temperature Range
			BGRV	BWRV	BSRV	BGRV	BWRV	BSRV	BGRV	BWRV	BSRV	
NEW BSRV3	3W	+70°C $E=\sqrt{P \cdot R}$	—	E=√P·R	300	—	E=√P·R·10	600	—	±250	±300	-40°C to +155°C
BSRV5	5W		—		350	—		700	—			
B□RV7	7W		—		500	—		1000	—			
B□RV10	10W		—		700	—		1400	—			
B□RV15	15W		—		700	—		1400	—			
B□RV20	20W		—	E=√P·R	750	—		1500	—			
BGRV30	30W		—		—	—		—	—			
BGRV40	40W		—		—	—		—	—			
BWRV40*	40W		—		—	—		—	—			

* Under development

Rated voltage= $\sqrt{\text{Power Rating} \times \text{Resistance value}}$ or Max. working voltage, whichever is lower.

Please consult with us in advance about custom-made products.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/17/19

ordering information

BGRV	30	T	Q	A	300	J	
Type	Power Rating	Termination ¹ Surface Material	Style ²	Dimentional Accuracy ³	Mounting Bracket	Nominal Resistance	Resistance Tolerance
BGRV: Wirewound (glass core) BWRV: Wirewound (ceramic core) BSRV: Metal oxide film	See table	C: SbCu T: Sn	Nil: S style N: N style Q: Q style	Nil: Standard W: Dimensional accuracy improvement product	Nil: None A: A style C: S style D: D style	3 digits	J: ±5% K: ±10%

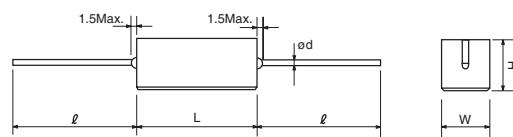
¹ Lead-Free plated terminal symbols. C (SnCu): S, N styles T(Sn): Q styles

² No indication on style means S style.

Contact us when you have control request for environmental hazardous material other than the substance specified by EU-RoHS.

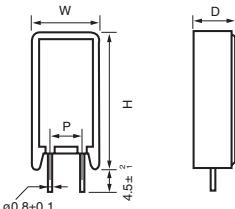
dimensions and construction

S Style



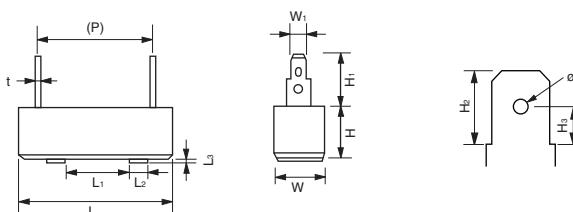
Type	Dimensions millimeters				
	L	W	H	L ₁	D
BWRV3C, BSRV3C	22±1.5	8±1.0	8±1.0		
BWRV5C, BSRV5C		9.5±1.0	9.5±1.0		
BWRV7C, BSRV7C	35±1.5			35±3	0.8±0.1
BWRV10C, BSRV10C	48±1.5				
BWRV15C, BSRV15C		12.5±1.2	12.5±1.2		
BWRV20C, BSRV20C	63.5±1.5				

N Style



Type	Dimensions millimeters			
	W	D	H	P
BWRV3CN, BSRV3CN	12±1.0	8±1.0	25±1.5	
BWRV5CN, BSRV5CN	13±1.0	9±1.0	25±1.5	5 ⁺² ₋₁
BWRV7CN, BSRV7CN			38.5±1.5	
BWRV10CN, BSRV10CN	16±1.0	12±1.0	35±1.5	7.5 ⁺² ₋₁

Q Style



Type	L	L ₁	L ₂	L ₃	W	Dimensions millimeters							
						W ₁	H	H ₁	H ₂	(H ₃)	(P)	t	(øf)
BGRV5Q, BSRV5Q	27±1.5	—	—	—	9.5±1.0	9.5±1.0	10.5±1.0	6.5±0.2	3.3	15.0			
BGRV7Q, BSRV7Q	35±1.5	—	—	—	4.75±0.1	9.5±1.0	10.5±1.0	6.5±0.2	3.3	22.5	0.5±0.05	2.2	
BGRV10Q, BSRV10Q	48±1.5	—	—	—	12.5±1.2	12.5±1.5	13.0±1.0	6.35±0.2	3.15	35.0			
BGRV15Q, BSRV15G	48±1.5	—	—	—	19.0±1.0	19.0±1.0	19.0±0.5	6.3±0.1	4.1	34.5			
BGRV20Q, BSRV20Q	63.5±2	—	—	—	19.0±0.5	19.0±0.5	19.0±0.5	6.3±0.1	4.1	49.5			
BGRV30Q	75±1.0	40±1.0	—	—	20.0±0.5	20.0±0.5	20.0±0.5	6.3±0.1	4.1	56.0			
BGRV30QW*	75±0.5	40±0.5	—	—	—	—	—	—	—	56±0.5	0.8±0.08	1.7	
BGRV40Q	90±1.0	40±1.0	—	—	—	—	—	—	—	71.0			
BGRV40QW*	90±0.5	40±0.5	—	—	—	—	—	—	—	71±0.5			
BWRV40Q**	91±1.0	—	—	—	—	—	—	—	—	—	—	—	—

* Dimensional accuracy improvement product

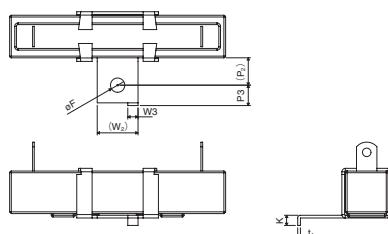
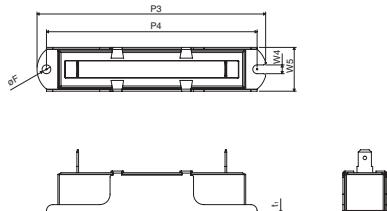
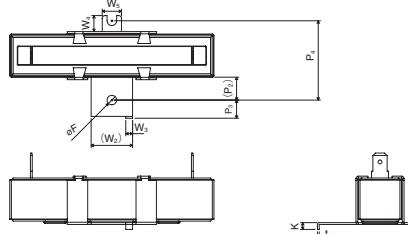
** Under development

Parenthesized dimensions are for reference.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/03/19

dimensions and construction (continued)

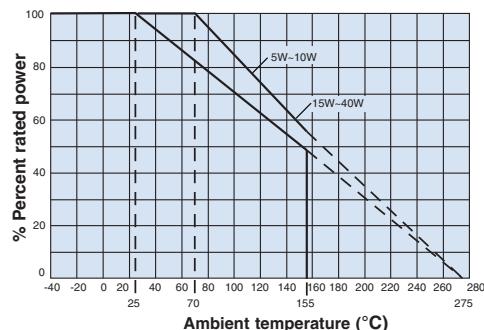
QA Style

QC Style

QD Style


Type	Dimensions millimeters									
	(P ₂)	P ₃	P ₄	(W ₂)	W ₃	(W ₄)	(W ₅)	K	t ₁	ØF
BGRV10QA, BSRV10QA	8.0	6.0±1.0	—	12.0	3.0±0.3	—	21.0	2.8±0.3	0.6	4.0
BGRV15QA, BSRV15QA								3.0±0.3		
BGRV20QA, BSRV20QA	—	110±1.0	101±1.0	—	—	4.2	21.0	—	0.8	4.2
BGRV30QC, BGRV30QWC*										
BGRV40QC, BGRV40QWC*										
BGRV30QD, BGRV30QWD	10.0	8.0±1.0	35.0±1.0	18.0	3.0±0.3	7.0	8.5	3.0±0.3		
BGRV30QD, BGRV30QWD										

* Under development

Parenthesized dimensions are for reference.

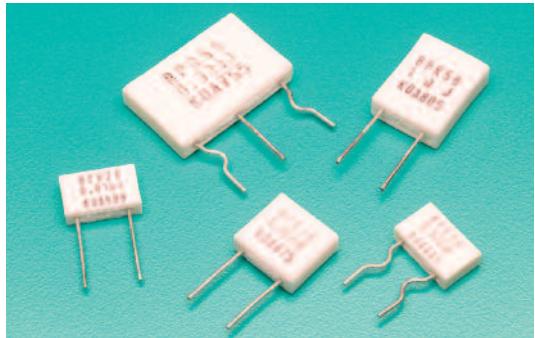
Derating Curve



environmental applications

Performance Characteristics

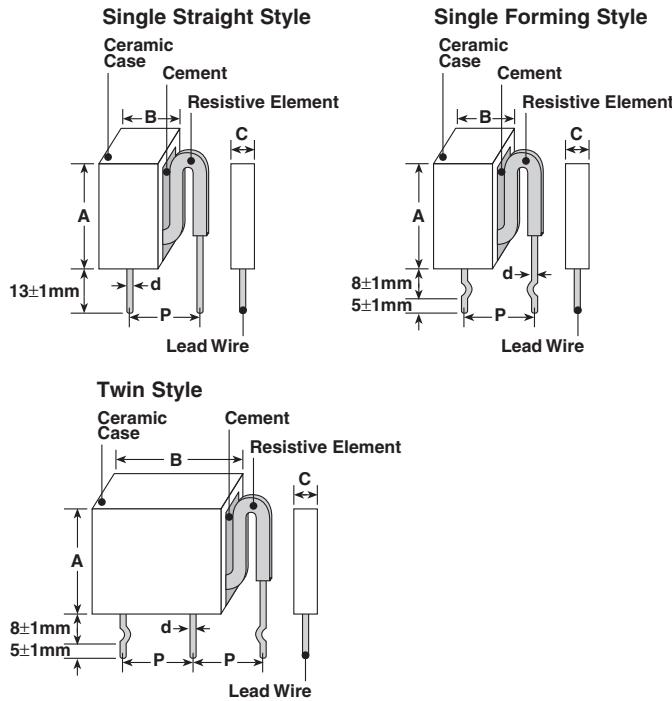
Parameter	Requirement $\Delta R \pm\%$		Test Method
	Limit	Typical	
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C and +25°C/+125°C
Resistance to Solder Heat	1%: BWRV, BSRV 2%: BGRV	0.5%: BWRV, BSRV 1.0%: BGRV	350°C ± 10°C for 3.5 seconds
Moisture Resistance	3%: BWRV, BGRV 5%: BSRV	2.0%: BWRV, BGRV 2.5%: BSRV	Power rating x 1/10, 40°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance @ 25°C and 70°C	3%: BWRV 5%: BGRV, BSRV	2.0%: BWRV 2.5%: BGRV, BSRV	25°C and 70°C, rated voltage, 1000 hours, 1.5 hours ON/0.5 hours OFF cycle



features

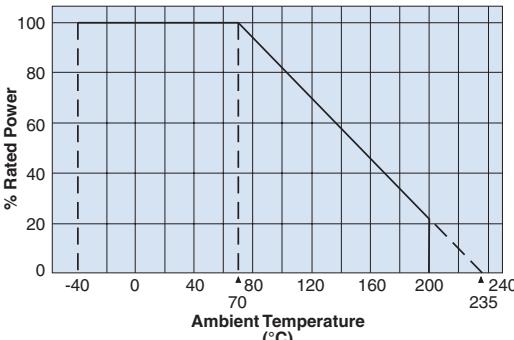
- Power type current detecting resistors
- Flame retardant resistors in ceramic case
- Automatic insertion for a 5mm pitch between terminals is applicable (26 type, 58 type)
- Low inductance
- Space saving
- Marking: Alpha/numeric marking
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm)				
	A	B	C	d	P
BPR26	.335±.04 (8.5±1.0)	.512±.04 (13.0±1.0)	.157±.04 (4.0±1.0)	.024±.04 (0.6±1.0)	.354±.04 (9.0±1.0)
BPR28	.335±.04 (8.5±1.0)	.512±.04 (13.0±1.0)	.157±.04 (4.0±1.0)	.031±.04 (0.8±1.0)	.354±.04 (9.0±1.0)
BPR38	.512±.04 (13.0±1.0)	.551±.04 (14.0±1.0)		.031±.04 (0.8±1.0)	.354±.04 (9.0±1.0)
BPR58	.709±.04 (18.0±1.0)	.551±.04 (14.0±1.0)		.031±.04 (0.8±1.0)	.354±.04 (9.0±1.0)
BPR108	.669±.06 (17.0±1.5)	1.02±.06 (26.0±1.5)		.197±.04 (5.0±1.0)	.787±.04 (20.0±1.0)
BPR55	.669±.06 (17.0±1.5)	1.02±.06 (26.0±1.5)		.031±.04 (0.8±1.0)	.394±.04 (10.0±1.0)
BPR77	.787±.07 (20.0±1.8)	1.02±.06 (26.0±1.5)		.031±.04 (0.8±1.0)	.394±.04 (10.0±1.0)

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

ordering information

BPR	5	8	C	F	R10	J
Type	Power Rating	Lead Wire Diameter	Termination Material	Packaging	Nominal Resistance	Tolerance
2: 2W	6: ø0.6mm	C: SnCu	Blank: Straight lead (9.0mm pitch)	2 significant figures +1 multiplier. "R" indicates decimal on value <10Ω.	J: ±5%	
3: 3W	8: ø0.8mm		F: Forming (9.0mm pitch)	All values less than 0.1Ω are expressed in mΩ with "L" as decimal.	K: ±10%	
5: 5W			FT: Radial taping (BPR26FT, BPR58FT only, 5.0mm pitch)	Ex: 20mΩ - 20L		
10: 10W	8: ø0.8mm					
55: 5W+5W	Blank					
77: 7W+7W						

For further information on packaging, please refer to Appendix C.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings

Part Designation	Power Rating	T.C.R. (ppm/ $^{\circ}$ C) Max.	Resistance Range		Rated Ambient Temperature	Operating Temperature Range
			J: $\pm 5\%$ (E12)	K: $\pm 10\%$ (E12)		
BPR26	2W	$\pm 350^*$	0.01 Ω 0.1 Ω - 0.68 Ω	0.01 Ω - 0.68 Ω	+70 $^{\circ}$ C	-40 $^{\circ}$ C to +200 $^{\circ}$ C
BPR28	2W		0.01 Ω , 0.1 Ω - 1.0 Ω	0.01 Ω - 1.0 Ω		
BPR38	3W		—	0.05 Ω , 0.1 Ω - 1.0 Ω		
BPR58	5W		0.05 Ω , 0.1 Ω 0.22 Ω - 0.47 Ω	0.03 Ω - 0.47 Ω		
BPR108	10W		—	—		
BPR55	5W+5W		—	—		
BPR77	7W+7W		—	—		

* Application range: The straight style of 0.018 Ω or over

standard resistance

Resistance	26, 28		38		58		108		55		77	
	J: $\pm 5\%$	K: $\pm 10\%$										
0.01	○	○	○	○	○	○	—	—	—	—	—	—
0.012	○	○	○	○	○	○	—	—	—	—	—	—
0.015	○	○	○	○	○	○	—	—	—	—	—	—
0.018	○	○	○	○	○	○	—	—	—	—	—	—
0.02*	○	○	○	○	○	○	—	—	—	—	—	—
0.022	○	○	○	○	○	○	—	—	—	—	—	—
0.027	○	○	○	○	○	○	—	—	—	—	—	—
0.03*	○	○	○	○	○	○	—	—	—	○	—	—
0.033	○	○	○	○	○	○	—	—	—	—	—	—
0.039	○	○	○	○	○	○	—	—	—	—	—	—
0.04*	○	○	○	○	○	○	—	—	—	—	—	—
0.047	○	○	○	○	○	○	—	—	—	—	—	—
0.05*	○	○	○	○	○	○	○	○	○	○	○	○
0.068	○	○	○	○	○	○	—	—	—	—	—	—
0.082	○	○	○	○	○	○	—	—	—	—	—	—
0.1	○	○	○	○	○	○	○	○	○	○	○	○
0.12	○	○	○	○	○	○	—	—	—	○	—	—
0.15	○	○	○	○	○	○	○	—	—	○	—	—
0.18	○	○	○	○	○	○	○	—	—	○	—	—
0.22	○	○	○	○	○	○	—	—	○	○	○	○
0.27	○	○	○	○	○	○	—	—	○	○	○	○
0.33	○	○	○	○	○	○	—	—	○	○	○	○
0.39	○	○	○	○	○	○	—	—	○	○	○	○
0.47	○	○	○	○	○	○	—	—	○	○	—	—
0.56	○	○	○	○	○	○	—	—	—	—	—	—
0.68	○	○	○	○	○	○	—	—	—	—	—	—
0.82	—	—	—	—	—	—	—	—	—	—	—	—
1.00	—	—	—	—	—	—	—	—	—	—	—	—

○ : Available

Blank : Please consult

— : Not available

* Non standard E-12 Decade Value

environmental applications

Performance Characteristics

Parameter	Requirement $\Delta R\%$ Limit	Typical	Test Method
Resistance	Within regulated tolerance	—	25 $^{\circ}$ C (Measurement position: 10mm under from the case)
T.C.R.	Within specified T.C.R.	—	+25 $^{\circ}$ C/-55 $^{\circ}$ C and +25 $^{\circ}$ C/+125 $^{\circ}$ C (Application range: the straight style of 0.018 Ω over)
Overload (Short time)	$\pm 2.0\%$	$\pm 1.0\%$	Rated power x 2.5 for 5 seconds (Application range: 0.05 Ω & over)
Resistance to Solder Heat	$\pm 2.0\%$	$\pm 1.0\%$	260 $^{\circ}$ C $\pm 5\%$, 10 seconds ± 1 second
Moisture Resistance	$\pm 5.0\%$	$\pm 3.0\%$	40 $^{\circ}$ C $\pm 2\%$, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70 $^{\circ}$ C	$\pm 5.0\%$	$\pm 3.0\%$	70 $^{\circ}$ C $\pm 2\%$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	$\pm 3.0\%$	$\pm 2.0\%$	+125 $^{\circ}$ C, 100 hours
Resistance to Solvent	No evidence of damage to protective coating and marking	—	After immersing the sample in I.P.A for 60 seconds ± 10 seconds, the resistor surface should be rubbed with absorbent cotton 10 times

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

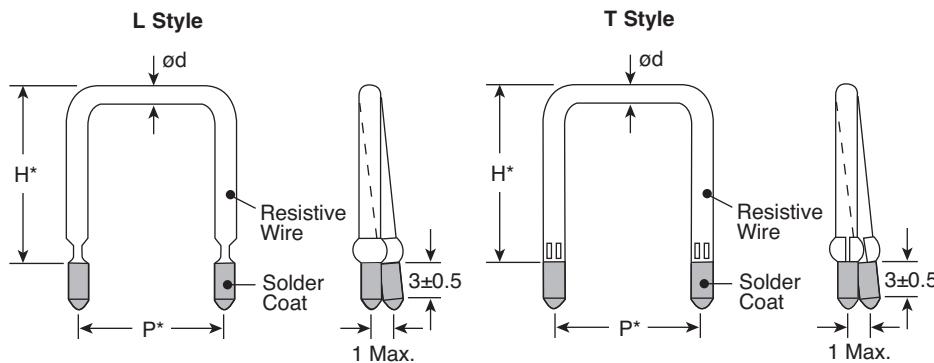
12/12/19



features

- The super low resistance ($3m\Omega \sim$) is suitable for high power current detection
- Pitches and heights adjustable according to mounting conditions
- All custom-made products
- Easy soldering
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



* Please consult with factory about dimensions "P" and "H"
T style is applied for the diameter of \varnothing 2.3 or above

ordering information

LR	09	D	L	10	20L	J
Type	Symbol	Termination Material	Style	Insertion Pitch	Nominal Resistance	Resistance Tolerance
	06~20: L-Style 23~29: T-Style	D: SnAgCu N: No surface treatment	L (06~20) T (23~29)	Insertion Pitch	3 digits	H: ±3% J: ±5%

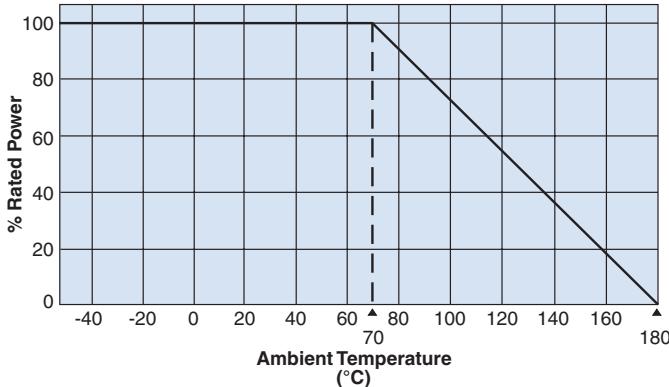
applications and ratings

Part Designation	Symbol	Ød Diameter (mm)	Maximum Current Rating (A)	Resistance Range	Resistance Tolerance	T.C.R. (ppm/°C) Max.	Rated Ambient Temperature	Operating Temperature Range
LR06D	06	0.6	3.0	50mΩ - 100mΩ				
LR07D	07	0.7	4.0	30mΩ - 70mΩ				
LR08D	08	0.8	4.5	28mΩ - 50mΩ				
LR09D	09	0.9	5.0	20mΩ - 40mΩ				
LR10D	10	1.0	5.5	15mΩ - 30mΩ				
LR11D	11	1.1	6.0	15mΩ - 20mΩ				
LR12D	12	1.2	7.0	10mΩ - 20mΩ				
LR13D	13	1.3	7.5	10mΩ - 20mΩ				
LR14D	14	1.4	8.0	10mΩ - 20mΩ				
LR15D	15	1.5	9.0	10mΩ - 20mΩ				
LR16D	16	1.6	9.5	10mΩ - 15mΩ				
LR18D	18	1.8	11	5mΩ - 10mΩ				
LR20D	20	2.0	12	5mΩ - 10mΩ				
LR23D	23	2.3	14	3mΩ - 10mΩ				
LR26D	26	2.6	18	3mΩ - 5mΩ				
LR29D	29	2.9	21	3mΩ - 5mΩ				

* Other diameters and resistances are also available on request

environmental applications

Derating Curve



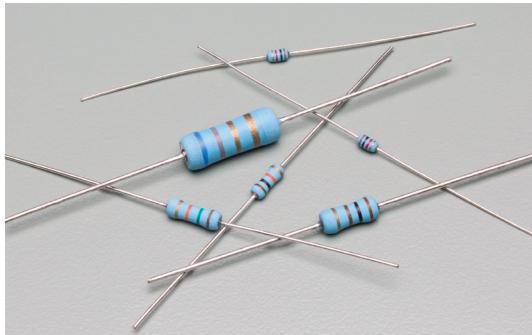
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement Δ R ±% Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Resistance to Soldering Heat	±2.0%	±1.6%	350°C ± 10°C, 3 seconds
Moisture Resistance	±3.0%	±2.7%	Power rating x 1/10, 40°C, 90% - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±5.0%	±3.0%	Rated voltage, 70°C, 1000 hours 1.5 hr ON, 0.5 hr OFF cycle

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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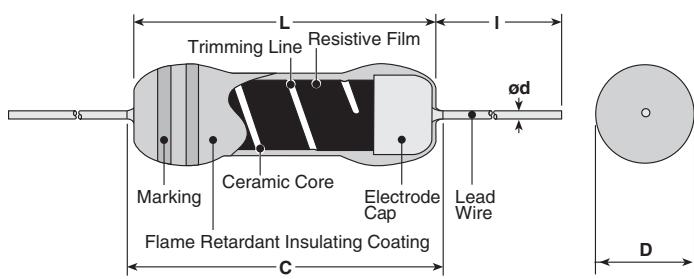


features

- Functions as a resistor in normal condition
- Quick fusing protects circuit from excessive overload at an abnormal time
- Flame-retardant coating equivalent to UL94 V-0
- Products meet EU RoHS requirements



dimensions and construction



Type	Dimensions inches (mm)				
	L	C Max.	D	d(Nominal)	I*
RF16	.125±.008 (3.2±0.2)	.134 (3.4)	.461 ^{+.010} (1.7 ^{+.25})	.018 (0.45)	1.18±.118 (30±3)
RF25	.248±.020 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)		
RF50	.335±.020 (8.5±0.5)	.374 (9.5)	.118±.012 (3.0±0.3)		
RF1	.354±.039 (9.0±1.0)	.437 (11.1)	.138±.020 (3.5±0.5)		
RF2	.610±.039 (15.5±1.0)	.709 (18.0)	.236±.039 (6.0±1.0)		

* Lead length changes depending on taping and forming type.

ordering information

RF	25	C	T52	A	100	J
Product Code	Power Rating 16: 0.17W 25: 0.25W 50: 0.5W 1: 1W 2: 2W	Terminal Surface Material C: SnCu	Taping & Forming T26, T52, T521, T631, MHT, VTP, VTE, VT, GT L, M Forming	Packaging A: Ammo R: Reel	Nominal Resistance 3 digits	Resistance Tolerance J: ±5%

ratings

Type	Power Rating	Resistance Range E24 J: ±5%	Fusing Characteristics						T.C.R. ×10 ⁻⁶ /K	Dielectric Withstanding Voltage	
			Fusing Power				Fusing Time				
RF16C	0.17W	1.0 - 1k	—	—	—	3W 1Ω - 4.7Ω	2.5W 5.1Ω - 1kΩ	—	60 sec Max.	±1000: R≤4.7Ω	250V
RF25C	0.25W	0.1 - 10k	10W 0.1 - 0.18Ω	7.5W 0.2 - 0.43Ω	6.25W 0.47 - 0.91Ω	—	3.75W 1Ω - 4.7Ω 2.4kΩ - 10kΩ	3W 5.1Ω - 2.2kΩ	300V		
RF50C	0.5W	0.1 - 15k	—	—	12.5W 0.1 - 0.43Ω	—	7.5W 0.47Ω - 2Ω 1.1kΩ - 15kΩ	6W 2.2Ω - 1kΩ	350V		
RF1C	1W	0.1 - 10k	—	30W 0.1 - 0.18Ω	25W 0.2 - 0.43Ω	—	15W 0.47Ω - 2Ω 1.1kΩ - 10kΩ	12W 2.2Ω - 1kΩ	600V		
RF2C	2W	1.0 - 3k	—	—	—	36W 1Ω - 3.6Ω	30W 1.1kΩ - 3kΩ	24W 3.9Ω - 1kΩ			

Rated Ambient Temperature: +70°C

Operating Temperature Range: -40 – +155°C

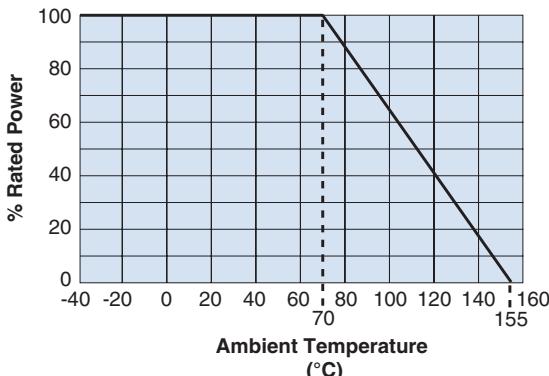
Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance value}}$

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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environmental applications

Derating Curve

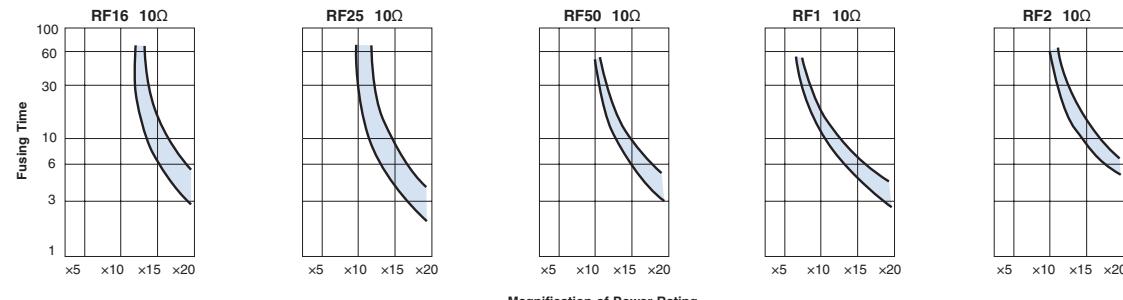


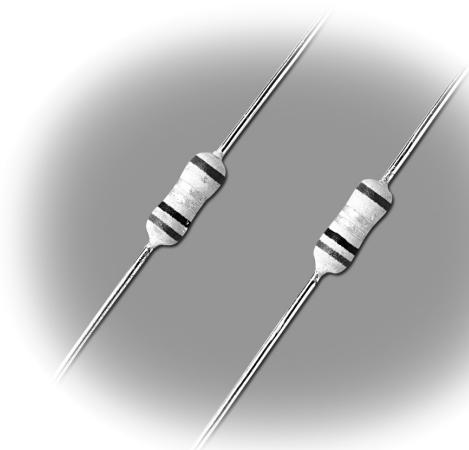
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with derating curve on the left.

Performance Characteristics

Test Items	Performance Requirements $\Delta R \pm (\% + 0.05\Omega)$		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+125°C
Overload (Short Time)	1%	0.5%	Rated voltage \times 2.5 for 5 seconds
Resistance to Soldering Heat	1%	0.5%	350°C \pm 10°C, 3.5s \pm 0.5s or 260°C \pm 5°C, 10s \pm 1s
Rapid Change of Temperature	1%	0.5%	-40°C (30 min.)/ +85°C (30 min.) 5 cycles
Moisture Resistance	5%	2.5%	40°C \pm 2°C, 90% - 95% RH, 1000 hours 1.5h ON/0.5h OFF cycle
Endurance at 70°C	5%	2.5%	70°C \pm 2°C, 1000 hours 1.5h ON/0.5h OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	The resistor shall be immersed in IPA for 30 sec.
Flame retardant	No evidence of flaming or self-flaming.	—	Flame test : The test flame shall be applied and removed for each 15 sec respectively to repeat the cycle 5 times. Overload flame retardant: Power corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1min. until disconnection occurs.

Fusing Characteristics

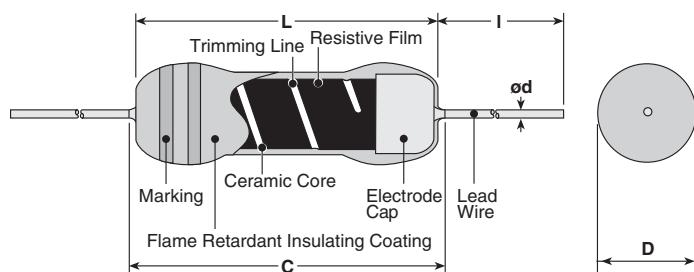




features

- Fuse within 60 seconds in case of over-current
- Constant current fusing type
- Fuse at low magnification at 5 times or 10 times of power rating
- Flame-retardant coating equivalent to UL94 V-0
- Products meet EU RoHS requirements

dimensions and construction



Type	Dimensions inches (mm)				
	L	C Max.	D	d (Nominal)	I*
RF25CC	.248±.020 (6.3±0.5)	.280 (7.1)	.091±.012 (2.3±0.3)	.024 (0.6)	1.18±.118 (30±3)

* Lead length changes depending on taping and forming type.

ordering information

RF	25	C	C	T52	A	R68	K
Product Code	Power Rating	Terminal Surface Material	Constant Current Fusing Type	Taping & Forming	Packaging	Nominal Resistance	Resistance Tolerance
	25: 0.25W	C:SnCu		T26, T52, VTP, VTE, L10A, M10X	A: Ammo R: Reel	3 digits	K:±10%

applications and ratings

Power Rating	Resistance Range(Ω) (E-24)	Resistance Tolerance	Fusing Characteristics			Dielectric Withstanding Voltage	Taping & Q'ty/AMMO (pcs)	
			Fusing Power		Fusing Time		T26A	T52A
0.25W	0.1 - 0.91	K: ±10%	2.5W 0.1 Ω	1.25W 0.11 Ω - 0.91 Ω	60 sec Max.	250V	2,000	2,000

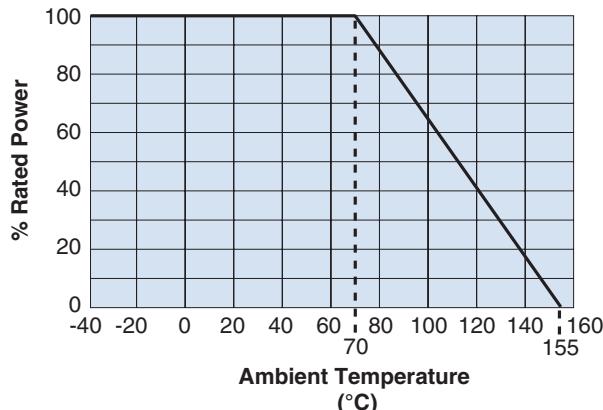
Rated Ambient Temperature: +70°C

Operating Temperature Range: -40°C - +155°C

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance value}}$

environmental applications

Derating Curve

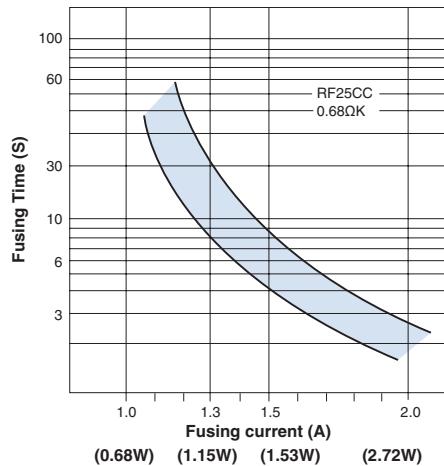


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with derating curve on the left.

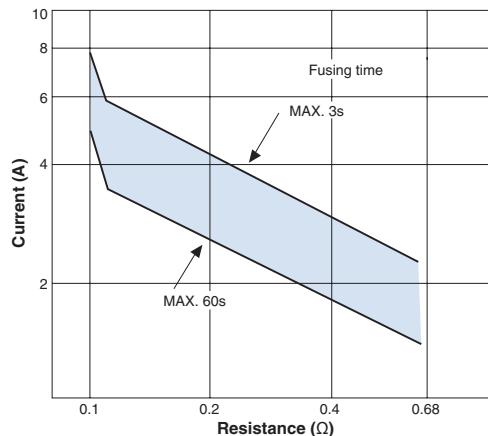
Performance Characteristics

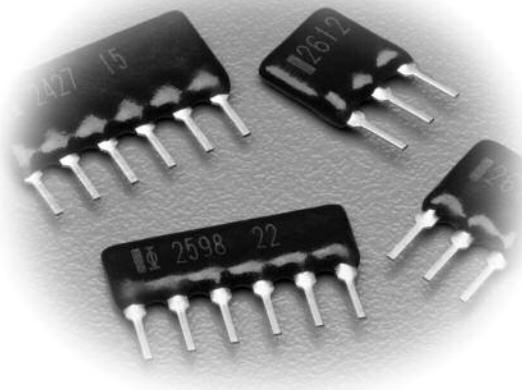
Test Items	Performance Requirements $\Delta R \pm (\% + 0.05\Omega)$		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
Resistance to Soldering Heat	5%	2.5%	350°C ± 10°C, 3.5s ± 0.5s or 260°C ± 5°C, 10s ± 1s
Humidity	5%	2.5%	40°C ± 2°C, 90% - 95%RH, 1000h No Load
Endurance at 70°C	5%	2.5%	70°C ± 2°C, 1000h 1.5h ON/0.5h OFF cycle
Resistance to Solvent	No abnormality in appearance. Marking shall be easily legible.	—	The resistor shall be immersed in IPA for 30 sec.
Flame retardant	No evidence of flaming or self-flaming.	—	Flame test: The test flame shall be applied and removed for each 15 sec respectively to repeat the cycle 5 times. Overload flame retardant: Power corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1min. until dis-connection occurs.

Fusing Characteristics



I-R Characteristics

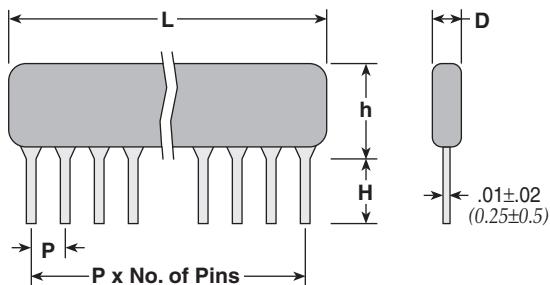




features

- Custom design network
- Ultra-precision performance for precision analog circuits
- Tolerance to $\pm 0.1\%$, matching to 0.05%
- T.C.R. to $\pm 25\text{ppm}/^\circ\text{C}$, tracking to $2\text{ppm}/^\circ\text{C}$
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



Type	Dimensions inches (mm)				
	L (max.)	D (max.)	P	H	h (max.)
MRPL03	.335 (8.5)	.098 (2.5)	.100±.008 (2.54±0.2)	.118±.02 (3.0±0.5)	.256 (6.5)
MRPA03					.335 (8.5)

ordering information

MRP	L03	E	A	D	103/103	B	A
Type	Size	T.C.R. (ppm/°C)	T.C.R. Tracking	Termination Material	Resistance Value	Tolerance	Tolerance Ratio
	L03 A03	E: ±25 C: ±50	A: 2 Y: 5 T: 10	D: SnAgCu	3 significant figures/ 3 significant figures	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1.0%	E: 0.025% A: 0.05% B: 0.1% C: 0.25% D: 0.5%

custom circuit ordering information

MRP	KxxxxD
Type	Custom Code
	Factory will assign

applications and ratings

Ratings

Type	Power Rating (mW)		Absolute T.C.R.	T.C.R. Tracking	Resistance Range*	Resistance Tolerance	Maximum Working Voltage	Maximum Overload Voltage	Rated Ambient Temperature	Operating Temperature Range
	Element	Package								
MRPL03	100	200	E: ±25	A: 2 (R2/R1≤10) Y: 5 T: 10	50-100kΩ	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	100V	200V	+70°C	-55°C to +125°C
MRPA03			C: ±50							

* Resistance combination for R1, R2 is standardized to 200/20k, 1k/1k, 1k/2k, 1k/4k, 1k/9k, 1k/10k, 1k/20k, 10k/10k, 10k/100k, 50k/50k, 100k/100k
 Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

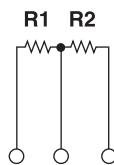
11/15/17

applications and ratings (continued)

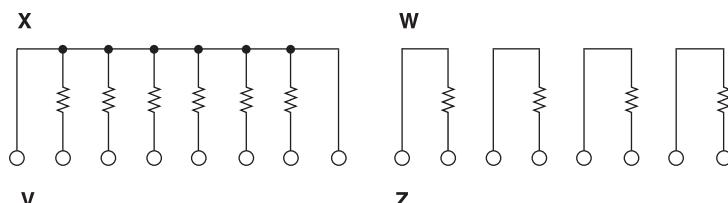
Resistance Range

		Resistance Ratio Tolerance				
		E: 0.025%	A: 0.05%	B: 0.1%	C: 0.25%	D: 0.5%
Absolute Resistance Tolerance	B: $\pm 0.1\%$	50 Ω - 100k Ω	50 Ω - 100k Ω	50 Ω - 100k Ω	—	—
	C: $\pm 0.25\%$	50 Ω - 100k Ω	—			
	D: $\pm 0.5\%$	50 Ω - 100k Ω				
	F: $\pm 1\%$	50 Ω - 100k Ω				
R1/R2 Relative Resistance Ratio		100 max.	100 max.	150 max.	150 max.	150 max.

standard circuit schematic

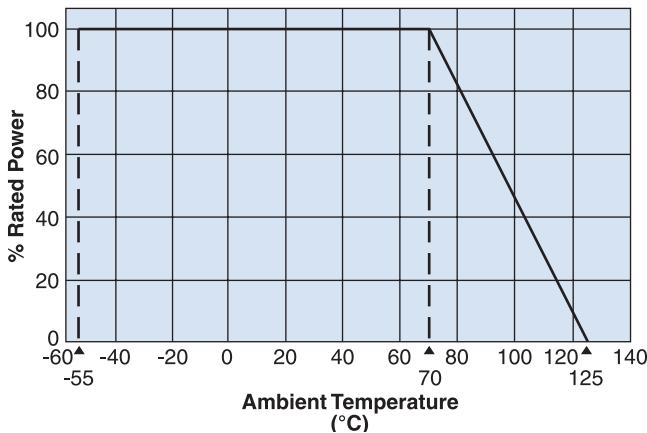


custom circuit schematics



environmental applications

Derating Curve



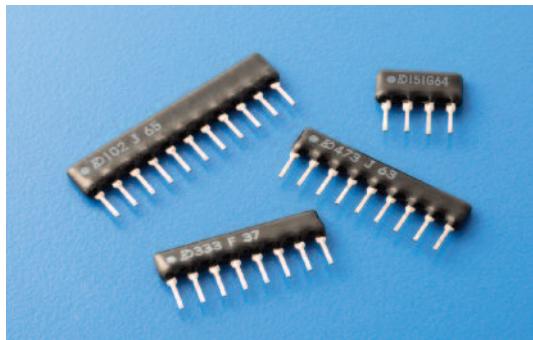
(Examples only. Contact factory for other custom layout requests.)

Performance Characteristics

Parameter	Requirement	Test Method
Resistance	Within specified tolerance	25°C
T.C.R.	Within specified T.C.R.	+25°C/+65°C
Overload (Short Time)	$\pm 0.05\%$	Rated voltage x 2.5 or max. overload voltage, whichever is lower, 5 seconds
Resistance to Soldering Heat	$\pm 0.1\%$	+350°C $\pm 10\%$, 3.5 \pm 0.5 seconds
Rapid Change of Temperature	$\pm 0.1\%$	-55 +0/-5°C (30 min.), +125 +3/-0°C (30 min.) 5 cycles
Moisture Resistance	$\pm 0.1\%$	40°C $\pm 2\%$, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	$\pm 0.1\%$	70°C $\pm 2\%$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Resistance to Solvents	No abnormality in outer coating and markings	Soaking in 2-propanol of +20°C ~ +25°C for 180 seconds \pm 10 seconds
Insulation Resistance	10,000M Ω or above	500V (d.c.) for 1 minute between terminals and coatings
Withstanding Voltage	$\pm 0.5\%$	500V (a.c.) for 1 minute between terminals and coatings

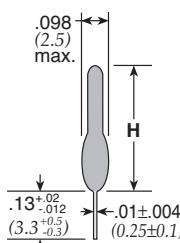
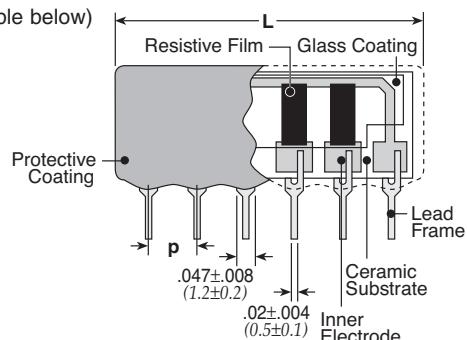
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/29/16



dimensions and construction

(See table below)



Size Code		Number of Pins														Dimen. in. (mm)	
	L	3	4	5	6	7	8	9	10	11	12	13	14	15	16	H max.	p
RKL	L	8.20	10.16	12.70	15.24	17.78	20.32	22.86	25.40	27.94	30.48	—	—	—	—	.200 (5.08) .100±.008 (2.54±0.2)	
	B,A,R circuit	250	375	500	625	750	875	1000	1050	1150	1250	—	—	—	—		
	C,T,E circuit	—	—	500	—	750	—	1000	—	1150	—	—	—	—	—		
	D circuit	—	—	375	500	625	750	875	1000	1125	1250	—	—	—	—		
	S Circuit	—	400	—	600	—	800	—	1000	—	1200	—	—	—	—		
RKC (2.54 pitch)	L	8.20	10.8	13.2	15.8	18.3	20.9	23.4	25.9	28.5	31.0	33.6	36.1	38.7	41.3	.256 (6.5) .100±.008 (2.54±0.2)	
	B,A,R circuit	250	375	500	625	750	875	1000	1050	1150	1250	1350	1450	1500	1550		
	C,T,E circuit	—	—	500	—	750	—	1000	—	1150	—	1350	—	—	—		
	D circuit	—	—	375	500	625	750	875	1000	1125	1250	1350	1450	—	—		
	S Circuit	—	500	—	750	—	1000	—	1050	—	1250	—	1450	—	—		
RKH	L	—	10.8	13.3	15.8	18.3	20.9	23.4	25.9	28.5	31.0	33.6	36.1	38.7	41.3	.421 (10.7) .100±.008 (2.54±0.2)	
	B,A,R circuit	—	525	700	875	1050	1250	1400	1500	1600	1700	1800	—	—	—		
	C,T,E circuit	—	—	700	—	1050	—	1400	—	1600	—	1800	—	—	—		
	D circuit	—	—	700	875	1050	1250	1400	1500	1600	1700	—	—	—	—		
	S Circuit	—	500	—	1050	—	1400	—	1500	—	1700	—	—	—	—		
RKC (1.8 pitch)	L	—	10.2	10.8	12.7	15.5	15.8	17.8	20.4	20.9	23.5	25.4	28.5	—	—	.256 (6.5) .071±.006 (1.8±0.15)	
	W	—	300	400	500	580	650	720	760	820	850	880	900	—	—		

L= L dimension (mm) max. W= Wattage/Package (mW) max.

ordering information

RKC	8	B	S ¹	D	STP	103	F
Type	Number of Resistors	Circuit Symbol	1.8mm Symbol	Termination Material	Packaging	Nominal Resistance	Tolerance
RKC	3 - 16	B, S, C, D, A, T, E, R	RKC only	D: SnAgCu (Other termination styles available, contact factory for options)	STP, STB TPA: (4-9 pins) or TUA (10 pins) taping (3 leads) TBA: (4-10 pins) taping (all leads)	2 significant figures + 1 multiplier for ±2% & ±5% 3 significant figures + 1 multiplier for ±1% R1/R2 3 digits/3 digits	F: ±1% G: ±2% J: ±5% R circuit: ±2%, ±5% only
RKH							
RKL							

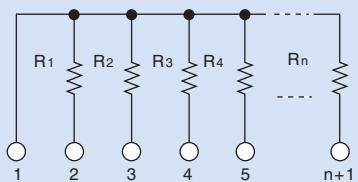
For further information on packaging, please refer to Appendix C.

¹ The symbol "S" showing 1.8 pitch is added to the type designation after the circuit symbol.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/05/17

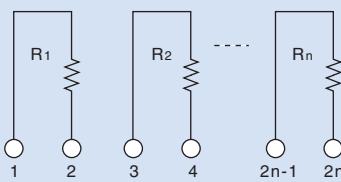
circuit schematics

B circuit


R1=R2=R3=R4=.....=Rn

n: number of elements

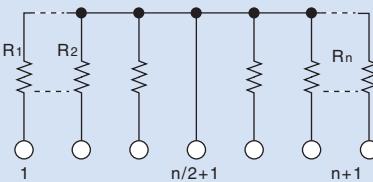
 Example: RKC8B 103 J
 RKL8B 472 J
 RKH8B 332 J

S circuit


R1=R2=.....=Rn

n: number of elements

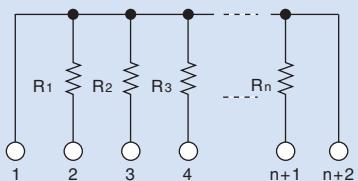
 Example: RKC4S 103 J
 RKL4S 472 J
 RKH4S 332 J

C circuit


R1=R2=R3=R4=.....=Rn

n: number of elements

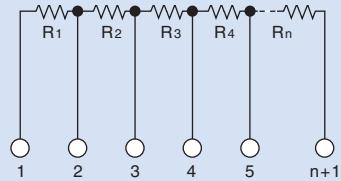
 Example: RKC8C 103 J
 RKL8C 472 J
 RKH8C 332 J

D circuit


R1=R2=R3=.....=Rn

n: number of elements

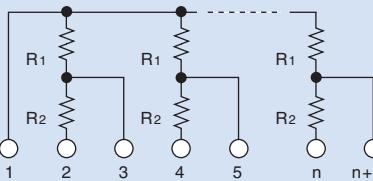
 Example: RKC8D 103 J
 RKL8D 472 J
 RKH8D 332 J

A circuit


R1=R2=R3=R4=.....=Rn

n: number of elements

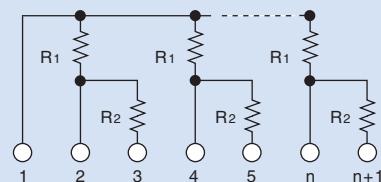
 Example: RKC8A 103 J
 RKL8A 472 J
 RKH8A 332 J

T circuit


R1=R2 or R1≠R2

n: number of elements

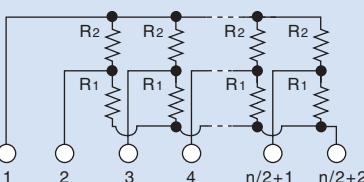
 Example: RKC8T 103/103 J
 RKL8T 103/103 J
 RKH8T 103/103 J

E circuit


R1=R2 or R1≠R2

n: number of elements

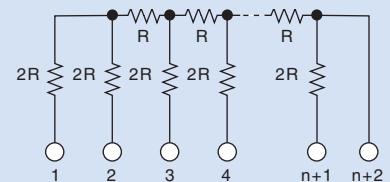
 Example: RKC8E 103/103 J
 RKL8E 103/103 J
 RKH8E 103/103 J

R circuit


R1=R2 or R1≠R2

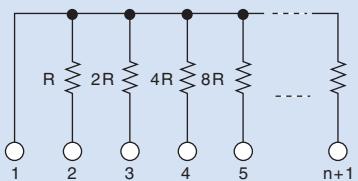
n: number of elements

 Example: RKC16R 331/471 J
 RKL16R 331/471 J
 RKH16R 331/471 J

L circuit


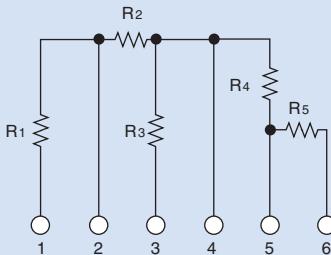
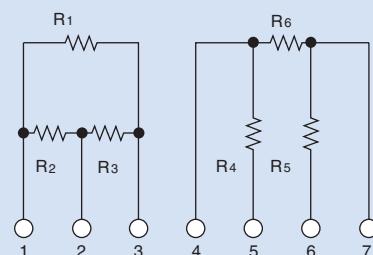
n: number of elements

Example: RKC5L 253

K circuit


n: number of elements

Example: RKC4K 102

Example of custom circuit

Example of custom circuit


applications and ratings

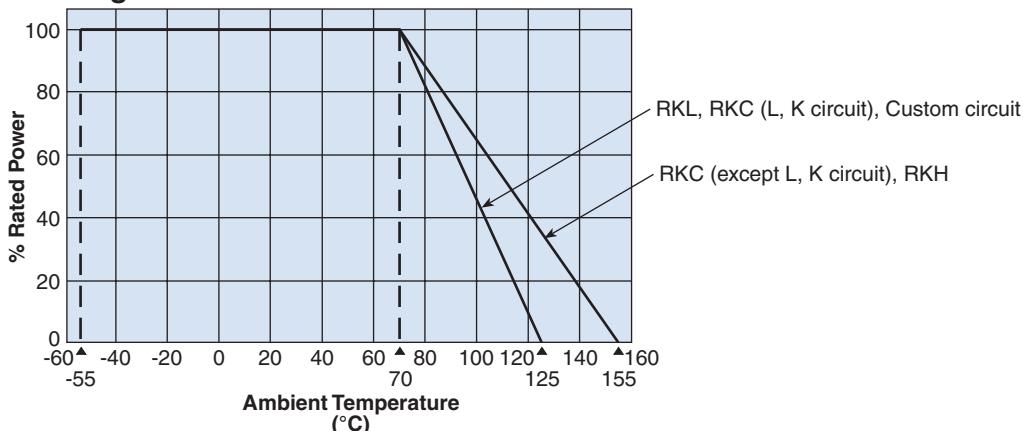
Part Designation	Circuit Symbol	Number of Pins	Power Rating/Element	T.C.R. (ppm/°C) Max.	Resistance Range (Ω)	Resistance Tolerance	Maximum Working Voltage	Rated Ambient Temperature	Operating Temperature Range			
RKC	B	3-16	125mW	±200	22-2.2M (E24)	F: ±1% G: ±2% J: ±5%	200V	+70°C	-55°C to +155°C			
	C	5-13										
	D	5-14										
	A	4-14										
	T	5-13										
	E	5-13			100-100k (E24)	G: ±2% J: ±5%						
	S	4-14	250mW									
	R	4-16	125mW									
	L	6-10	20mW	±200	R=2.5k, 5k 10k, 25k 50k, 100k R1(MSB):100 Min Rn LSB:1M Max	±1/2LSB (Bit Error) ±1/2LSB (Bit Error)	20V	+70°C	-55°C to +125°C			
	K	5-9	40mW									
RKL	B	3-12	125mW	±200	22-1M (E24)	F: ±1% G: ±2% J: ±5%	100V	+70°C	-55°C to +125°C			
	C	5-11										
	D	5-12										
	A	3-12										
	T	5-11										
	E	5-11			100-100k (E24)	G: ±2% J: ±5%						
	S	4-12	200mW									
	R	4-11	125mW									
RKH	B	4-13	250mW	±200	56-2.2M (E24)	F: ±1% G: ±2% J: ±5%	250V	+70°C	-55°C to +155°C			
	C	5-13										
	D	5-12										
	A	4-12										
	T	5-13			500mW	G: ±2% J: ±5%						
	E	5-13										
	S	4-12			250mW	G: ±2% J: ±5%						
	R	5-11										
M-	RKL	3-12	0.1W 0.125W 0.25W 0.5W 1W	±100 ±150 ±200	10-10M	±0.5% ±1% ±2% ±5%	100V	+70°C	-55°C to +125°C			
	RKC (1.8 pitch)	4-14					50V					
	RKC (2.54 pitch)	3-16					200V					
	RKH	4-13					250V					

Rated voltage = $\sqrt{\text{power rating} \times \text{resistance value}}$ or max. working voltage, whichever is lower.

weight (g/1000 pcs)

	Number of Pins						
	3	4	5	6	7	8	9
RKL	147	185	228	271	314	357	400
RKC	160	217	273	330	387	444	501
RKH	—	416	511	606	701	796	891

	Number of Pins						
	10	11	12	13	14	15	16
RKL	443	486	529	—	—	—	—
RKC	558	615	672	728	785	842	893
RKH	986	1081	1176	1271	—	—	—

environmental applications
Derating Curve


For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/-55°C, +25°C/+125°C (RKL) +25°C/-55°C, +25°C/+155°C (RKC, RKH)
Overload (Short time)	$\pm 0.5\%$	$\pm 0.25\%$	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	$\pm 0.5\%$	$\pm 0.25\%$	260°C $\pm 5^\circ\text{C}$, 10 seconds ± 1 second
Temperature Cycling	$\pm 0.5\%$	$\pm 0.25\%$	-40°C (30 minutes), +85°C (30 minutes), 5 cycles
Moisture Resistance	$\pm 2.0\%$	$\pm 1.0\%$	40°C $\pm 2^\circ\text{C}$, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	$\pm 2.0\%$	$\pm 1.0\%$	70°C $\pm 2^\circ\text{C}$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

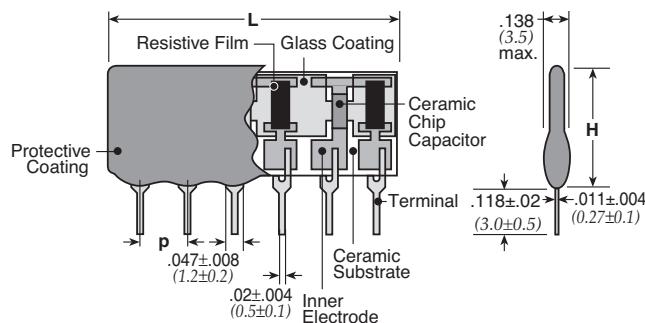


features

- Metal glaze resistors (RuO₂) provide lifetime stability
- Free from short circuit, unexpected solder melting and terminal disconnection due to the high temperature solder used to connect terminals
- Capable of reducing the numbers of parts and part insertions
- Custom orders are available
- Products with lead-free termination meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass



dimensions and construction



Type	Dimensions inches (mm)			
	Number of Pins	L	H	p
CRA □	5 - 90	.100xP+.024 (2.54xP+0.6)	.256 (6.5)	.100 (2.54)
CRB □	5 - 10			
CRC □	5 - 13			
CRD □	5 - 13			
CRE □	6 - 14			
CRF □	5 - 13			

□ = Number of pins

ordering information

CR	E	6	01	D
Product Code	Circuit Symbol	Number of Cells	KOA Reference Number	Terminal Surface Material
	A B C D E F M	4 - 8 (CRA) 3 - 8 (CRB) 2 - 6 (CRC, CRD CRE, CRF) Nil (CRM)		D: SnAgCu Nil: Sn/Pb

ratings

Parameter	Resistor	Capacitor
Max. Operating Voltage	50V	
Constant Range	10Ω - 1MΩ	10pF - 0.1μF
T.C.	±200×10 ⁻⁶ /K	CH, B, R*
Tolerance	±5% (J) ±10% (K) ±20% (M) -20% - +80% (Z)	±5% (J) ±10% (K) ±20% (M) -20% - +80% (Z)
Operating Temp. Range	-25°C - +85°C	
Storage Temp. Range	-55°C - +125°C	

* Refer to T.C. chart to the right

T.C. Type	T.C.			
	Reference Temp.	Temp. Range	Capacitance Change or Temp. Coefficient	Operating Temp.
CH	20°C	20~125°C	0±60ppm/°C	-55~125°C
B	20°C	-25~85°C	±10%	-25~85°C
R	20°C	-55~125°C	±15%	-55~125°C

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/15/17

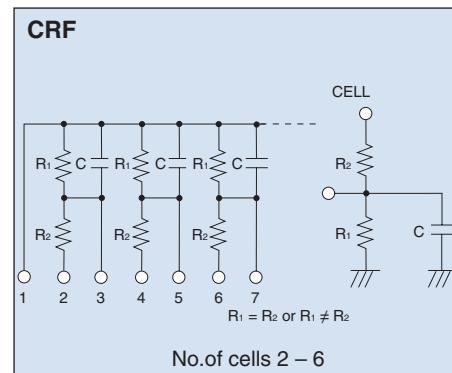
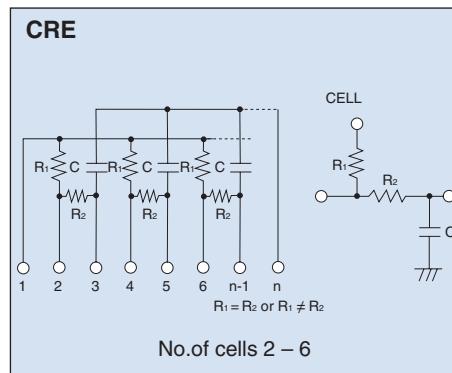
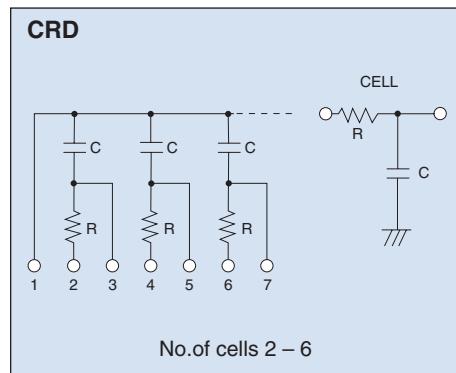
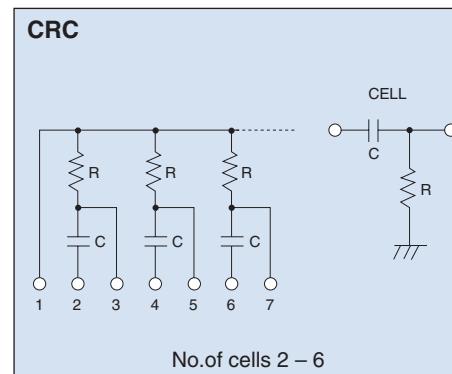
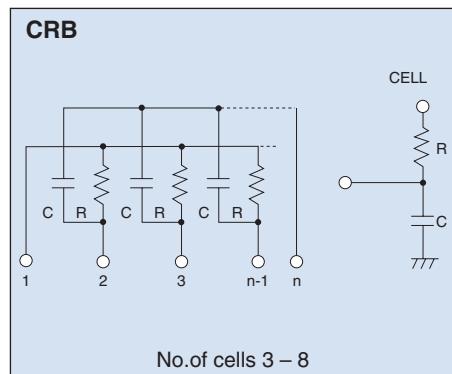
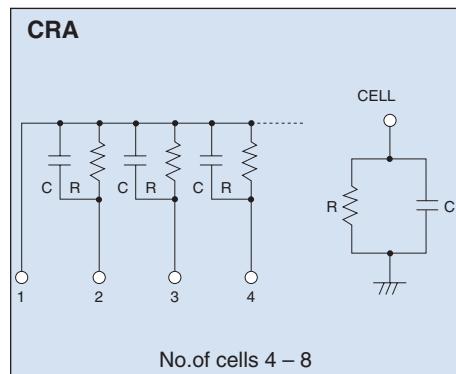
maximum wattage/package

	Number of Pins				
	5	6	7	8	9
mW/Package	500	625	750	875	1000

	Number of Pins				
	10	11	12	13	14
mW/Package	1050	1150	1250	1350	1450

 leaded
resistors

circuit schematics



When ordering the CR series, please indicate the following items shown below:

For circuit code A – F, please indicate the following items:

Resistance
Capacitance
Operating voltage
Capacitance tolerance
T.C.

For circuit code M, please add the following items:

Circuit schematics
Pin layout
Dimensions
Conditions for use
Resistor (Power rating, Tolerance, T.C.R.)

Precautions for the Thermal Sensors

Refer to the precautions of common matters for all products in the beginning of this catalog.

Particulars Common to Thermal Sensors

- Excessive voltage such as ESD, could damage thermal sensors.
- Water drops from condensation or impure substances that adheres between the electrode wires may cause insulation deficiency and lower the resistance value of the thermal sensors. Be aware when using this product.
- Avoid applying thermal shocks with large temperature difference in order to maintain the accuracy of the thermistor.
- Some of the thermal sensors use special temperature sensing films. Contact us if the sensors are constantly operated under high temperature environment.

Platinum Thin-Film Thermal Sensors

- Welding is recommended to connect the lead wires of SDT101B, SDT310P, SDT310MTM, SDT310AP, SDT310HCTP and SDT310VASP since they are heat resistant lead wires. Select the flux for stainless-steel when soldering. Wash the flux with hot water after the soldering to remove the residue completely.
- The 3-wire or 4-wire method is recommended for implementing high precision temperature measuring for both SDT101 and SDT310 series.
- When molded or placed in a metal tube filled with resin, the resistance value may change depending on the kind of resins used.

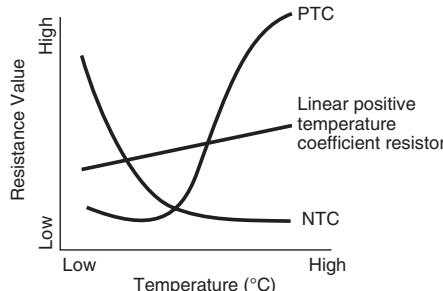
Terms and Definitions

Thermistor

- Thermally sensitive resistors, constructed from temperature sensitive semi-conductive materials, with predictable, large variation in resistance due to change in temperature. There are two kinds of thermistors characterized by resistance change.
- PTC (Positive Temperature Coefficient): Resistance increases with a rise in temperature.
- NTC (Negative Temperature Coefficient): Resistance decreases with a rise in temperature.

Linear Positive Temperature Coefficient Resistor

- The resistance value of the element will change according to the temperature similar to the thermistors.
- The resistance value change range is narrow compared to the thermistors but the linearity is high.



Rated Power

- The maximum wattage which can be continuously applied to a resistor at the rated ambient temperature.

Critical Resistance Value

- The maximum nominal resistance value at which the rated power can be applied without exceeding the maximum working voltage.
- The rated voltage is equal to the maximum working voltage at the critical resistance value.

Maximum Working Voltage

- Maximum D.C. or A.C. voltage that can be continuously applied to a resistor or a thermosensor. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

Overload Voltage

- Allowable voltage which is applied for 5 sec. according to the short time overload test. Overload voltage shall be 2.5 times of rated voltage or max. overload voltage, whichever is lower.

Curie Temperature (PTC)

- The temperature at which the resistance value starts to increase rapidly. It is also called the switching temperature.

Resistance-Temperature Characteristic of a Thermistor (NTC)

- The relationship between a zero load resistance and a temperature or a temperature range. It can be expressed using the following formula:

$$R = R_0 \exp \{B(1/T - 1/T_0)\}$$

R : Resistance Value at Temperature T (K)
 R₀ : Resistance Value at Temperature T₀ (K)
 B : B Constants T (K)=t (°C)+273.15

B Constant of a Thermistor (NTC)

- Size of change in the resistance between any two temperatures within a specified range is calculated using the following formula:

$$B(K) = \frac{\ln R - \ln R_1}{1/T - 1/T_1} \quad \begin{aligned} R &: \text{Resistance Value in } T \text{ (K)} \\ R_1 &: \text{Resistance Value in } T_1 \text{ (K)} \\ T &: \text{Standard Temperature (K)} \\ T_1 &: \text{Regulated Temperature (K)} \end{aligned}$$

Thermal Dissipation Constant

- The necessary power which is needed to increase the temperature of the element 1°C by self heating and is expressed with the following formula:

$$\delta(W/°C) = W/(T_1 - T) \quad \begin{aligned} W &: \text{Electrical input power (W)} \\ T &: \text{Standard Temperature (°C)} \\ T_1 &: \text{Self heating temperature generated by applied power (°C)} \end{aligned}$$

Temperature Coefficient of Resistance (T.C.R.)

- Relative variation of resistance between two given temperatures when temperature is changed by 1K, which is calculated by the following formula.

$$\text{T.C.R. (ppm/°C)} = \frac{R - R_0}{R_0} \times \frac{1}{T - T_0} \times 10^6$$

R : Resistance value (Ω) at T
 R₀ : Resistance value (Ω) at T₀
 T : Measured test temperature (°C)
 T₀ : Measured base temperature (°C)

Rated Temperature

- Maximum ambient temperature at which the power rating may be applied continuously. The rated ambient temperature refers to the temperature around the resistor mounted inside the equipment, not to the air temperature outside the equipment.

Derating Curve

- Plot that expresses the relation between ambient temperature and the maximum allowable power, which is generally expressed in percentage.

Thermal Time Constant

- Time needed for a sensor's temperature to change 63.2% when the ambient temperature of a sensor is rapidly changed by a condition in which self heat generation can be ignored.

External Conductor

- A conductor connected to a temperature sensor that is located outside of the protective body.

Internal Conductor

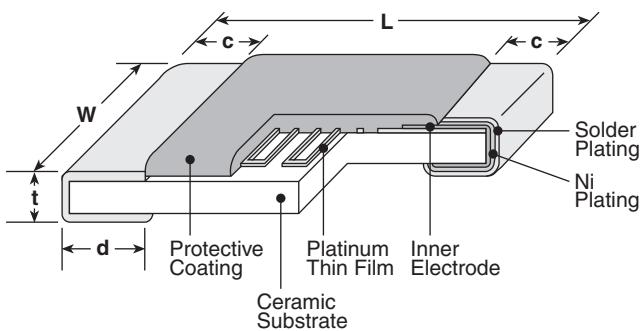
- A conductor connected to a temperature sensor that is located inside of the protective body.



features

- SMD platinum thin film thermal sensors
- T.C.R. is in accordance to JIS-DIN standards IEC
- Suitable for temperature control in various industrial equipment
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.02±.012 (0.5±0.3)	.02±.006 (0.5±0.15)

ordering information

SDT73H	2B	T	TE	100	F	385
Type	Size Code	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (x 10 ⁻³ K)
SDT73H 2B SDT73S 2B	2B: 3.2x1.6mm	T: Sn	TEK: 4mm pitch plastic embossed (1,000 pieces/reel) TE: 4mm pitch plastic embossed (5,000 pieces/reel)	100: 100Ω 500: 500Ω SDT73S: 100Ω	C: ±0.2% F: ±1% SDT73S: F: ±1%	385: +3850

applications and ratings

Part Designation	Resistance @ 0°C	Resistor Tolerance*	Thermal Time Constant**	Thermal Dissipation Constant**	T.C.R. (ppm/°C)	T.C.R. Tolerance (ppm/°C)	Specified Current	Operating Temperature Range
SDT73H 2B	100Ω 500Ω	C: ±0.2% F: ±1%	6.5 seconds	2.4mW/°C	3850	±50	1mA Max.: 100Ω 0.1mA Max.: 500Ω	-55°C to +155°C
SDT73S 2B	100Ω	F: ±1%						-55°C to +250°C***

* Please consult with us about the products equivalent to class B of JIS.

** Thermal time constant and thermal dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods. Thermal dissipation constant is approx. 4mW/°C under the surface mounting condition.

*** When always using a SDT73S, 200°C or less is recommended.

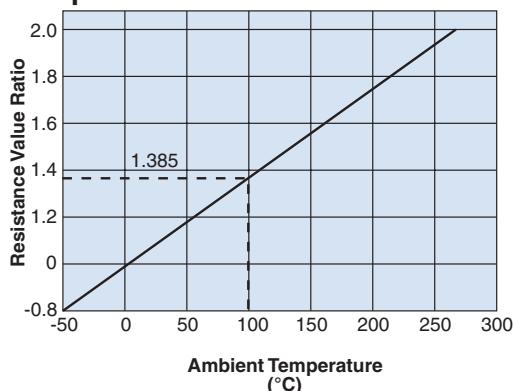
For further information on packaging,
please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

3/09/15

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

$$-55^{\circ}\text{C} \sim 0^{\circ}\text{C} : R_T = R_0 \{1 + C_1 T + C_2 T^2 + C_3 (T - 100)\}$$

$$0^{\circ}\text{C} \sim +250^{\circ}\text{C} : R_T = R_0 (1 + C_1 T + C_2 T^2)$$

R_T : Resistance value at $T^{\circ}\text{C}$

R_0 : Resistance value at 0°C

T : Ambient temperature ($^{\circ}\text{C}$)

Constants C_1 , C_2 , C_3 :

$$C_1 = 3.9083 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$$

$$C_2 = 5.775 \times 10^{-7} \text{ }^{\circ}\text{C}^{-2}$$

$$C_3 = -4.183 \times 10^{-12} \text{ }^{\circ}\text{C}^4$$

Pt100 Resistance - Temperature Characteristics (JIS C 1604¹⁹⁹⁷)

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	80.31	79.91	79.51	79.11	78.72	78.32	—	—	—	—
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
	0	1	2	3	4	5	6	7	8	9
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82
220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47
230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11
240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74
250	194.10	—	—	—	—	—	—	—	—	—

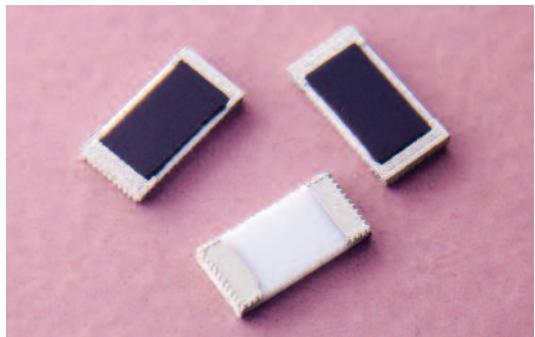
Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5.

Performance Characteristics

Parameter	Requirement	△ R ±(%+0.05Ω)	Test Method
	Limit	Typical	
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	3850±10ppm/°C	0°C/ +100°C
Insulation Resistance	100MΩ or more	—	d.c. 100V
Dielectric Withstanding Voltage	±0.5%	-0.019%	a.c. 100V, 60 seconds - 70 seconds
Resistance to Solder Heat	±0.5%	-0.004%	260°C for 10 seconds
Rapid Change of Temperature	±0.5%	-0.033% (SDT73H) -0.048% (SDT73S)	-55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +155°C (30 minutes)/ +25°C (2 - 3 minutes), 10 cycles
Moisture Resistance	±0.5%	-0.016%	40°C, 90 - 95% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
Normal Temperature Load Life	±0.5%	-0.010%	20°C ± 10°C, 1000 hours, 1mA continuous turning on electricity
High Temperature Load Life	±0.5%	-0.017% (SDT73H) -0.020% (SDT73S)	+155°C, 1000 hours (SDT73H), +250°C, 1000 hours (SDT73S) 1mA continuous turning on electricity
High Temperature Exposure	±0.5%	-0.022% (SDT73H) -0.023% (SDT73S)	+155°C, 1000 hours (SDT73H), +250°C, 1000 hours (SDT73S)
Low Temperature Exposure	±0.5%	-0.029%	-55°C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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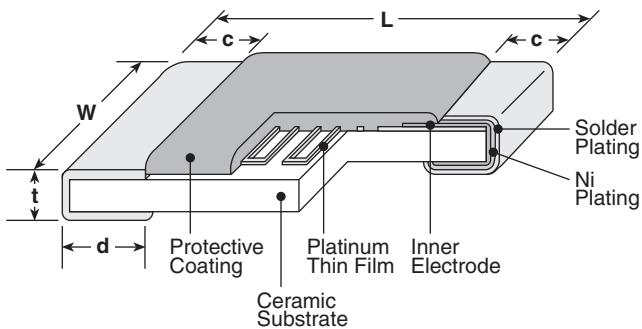


features

- SMD platinum thin film thermal sensors
- T.C.R. is in accordance to JIS-DIN IEC standards
- The evaluation based on AEC-Q200 has been examined
- Suitable for both flow and reflow solderings
- Products with lead-free terminations meet EU RoHS
- AEC-Q200 Qualified



dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.02±.012 (0.5±0.3)	.02±.006 (0.5±0.15)

ordering information

SDT73V	2B	T	TE	100	F	385
Type	Size Code	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (x 10 ⁻³ /K)
	2B: 3.2x1.6mm	T: Sn	TEK: 4mm pitch plastic embossed (1,000 pieces/reel) TE: 4mm pitch plastic embossed (5,000 pieces/reel)	100: 100Ω 500: 500Ω	C: ±0.2% F: ±1%	

applications and ratings

Part Designation	Resistance @ 0°C	Resistor Tolerance*	Thermal Time Constant**	Thermal Dissipation Constant**	T.C.R. (ppm/°C)	T.C.R. Tolerance (ppm/°C)	Specified Current	Operating Temperature Range
SDT73V 2B	100Ω 500Ω	C: ±0.2% F: ±1%	6.5 seconds	2.4mW/°C	3850	±50	1mA Max.: 100Ω 0.1mA Max.: 500Ω	-55°C to +155°C

* Please consult with us about the products equivalent to class B of JIS.

** Thermal time constant and thermal dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods. Thermal dissipation constant is approx. 4mW/°C under the surface mounting condition.

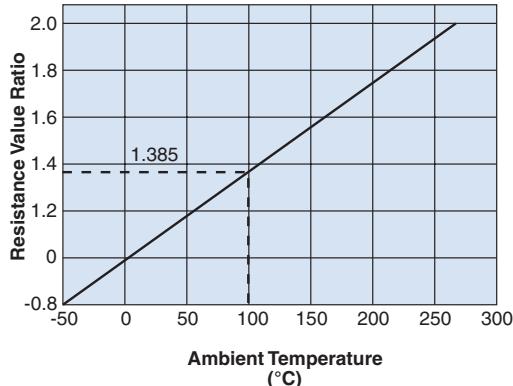
For further information on packaging,
please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/07/16

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

$$\begin{aligned} -55^{\circ}\text{C} \sim 0^{\circ}\text{C} &: R_T = R_0 \{1 + C_1 T + C_2 T^2 + C_3 (T-100)^3\} \\ 0^{\circ}\text{C} \sim +155^{\circ}\text{C} &: R_T = R_0 \{1 + C_1 T + C_2 T^2\} \end{aligned}$$

R_T : Resistance value at $T^{\circ}\text{C}$

R_0 : Resistance value at 0°C

T : Ambient temperature ($^{\circ}\text{C}$)

Constants C_1, C_2, C_3 :

$$C_1 = 3.9083 \times 10^{-3} \text{ } ^{\circ}\text{C}^{-1}$$

$$C_2 = -5.775 \times 10^{-7} \text{ } ^{\circ}\text{C}^{-2}$$

$$C_3 = -4.183 \times 10^{-12} \text{ } ^{\circ}\text{C}^{-3}$$

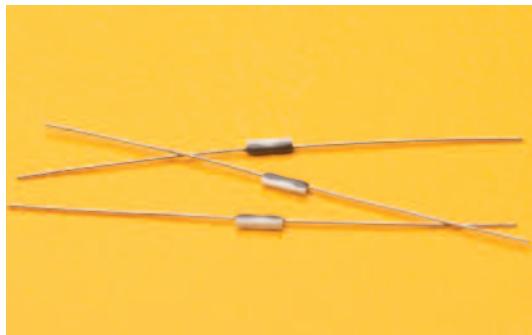
Pt100 Resistance - Temperature Characteristic (JIS C 1604¹⁹⁹⁷)

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
0	1	2	3	4	5	6	7	8	9	
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	—	—	—	—

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5.

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\Omega)$		Test Method
	Limit	Typical	
High Temperature Exposure	±0.5%	-0.022%	+155°C, 1000 hours
Rapid Change of Temperature	±0.5%	-0.058%	-55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +155°C (30 minutes)/ +25°C (2 - 3 minutes), 1000 cycles
Moisture Resistance	±0.5%	-0.041%	25°C, -65°C (90 - 100% RH), t= 24 hours/cycle. Unpowered. It is carried out 10 times.
Moisture Resistance	±0.5%	-0.016%	85°C, 85% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Load Life	±0.5%	-0.017%	155°C, 1000 hours, 1mA continuous turning on electricity
Mechanical Shock	±0.5%	-0.001%	100gs Maximum, 6Dms (Standard), 12.3 feet/second
Vibration	±0.5%	-0.009%	Test from 10-2000Hz, 5g's for 20 minutes, 12 cycles each of 3 orientations
Resistance to Solder Heat	±0.5%	-0.004%	260°C for 10 seconds
Thermal Shock	±0.5%	-0.032%	-55°C (15 minutes)/ +155°C (15 minutes), 300 cycles
Solderability	95% Coverage Min.	—	235°C ± 5°C, 3 seconds ± 0.5 seconds
Terminal Strength	±0.5%	-0.011%	1.8kg force is kept on the samples for 60 seconds

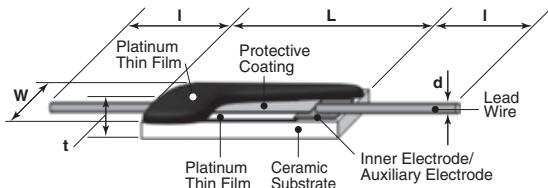


features

- Small as quarter volume of conventional type. 3.2 second thermal time constant.
- Excellent heat-resistance
- Applies axial lead type suitable to use as heater element
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Qualified



dimensions and construction



Type	Dimensions inches (mm)				
	W	L	t	d (Nom.)	I
SDT310VASP	.016 ^{+.006} (0.4 ^{+.015})	.079±.004 (2.0±0.10)	.026 max. (0.65 max.)	.006±.002 (Ø0.15±0.05)	.394±.079 (10±2.0)

ordering information

SDT310V	AS	P	K	20	F	25
Type	Style	Terminal Surface Material	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. (x 10 ⁻⁶ /K)
		P: Pt clad	K: Chip Tray	20: 20Ω	F: ±1	25: ±25 x 10 ⁻⁶ /K

applications and ratings

Part Designation	Nominal R. Value at 0°C	R. Value Tolerance (%) at 0°C	T.C.R. x 10 ⁻⁶ /K*	Thermal Time Constant**	Maximum Current	Power Rating	Operating Temperature Range
SDT310VASP	20Ω	±1%	3850±25	3.2 seconds in stationary air	90mA Max.	0.5W	-55°C to +600°C

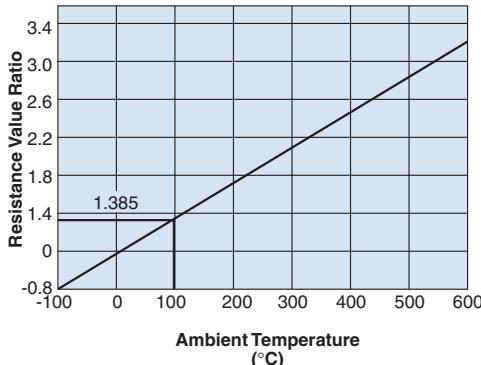
* T.C.R. measuring temperature: 0°C/+100°C.

** Thermal time constant is value measured in stationary air and is typical value ,which are values of elements and vary with connecting or fixing methods.

*** Temperature of the device including a self-heating.

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

$$\begin{aligned} -55^{\circ}\text{C} \sim 0^{\circ}\text{C} &: R_T = R_0 \{1 + C_1 T + C_2 T^2 + C_3 (T-100)^3\} \\ 0^{\circ}\text{C} \sim +400^{\circ}\text{C} &: R_T = R_0 (1 + C_1 T + C_2 T^2) \end{aligned}$$

R_T : Resistance value at $T^{\circ}\text{C}$

R_0 : Resistance value at 0°C

T : Ambient temperature($^{\circ}\text{C}$)

Constants C_1, C_2, C_3 :

$$C_1 = 3.9083 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$$

$$C_2 = -5.775 \times 10^{-7} \text{ }^{\circ}\text{C}^2$$

$$C_3 = -4.183 \times 10^{-12} \text{ }^{\circ}\text{C}^3$$

Pt100 Resistance - Temperature Characteristic 20 at 0°C

Temperature ($^{\circ}\text{C}$)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
0	20.00	19.92	19.84	19.77	19.69	19.61	19.53	19.45	19.37	19.30
1	20.00	20.08	20.16	20.23	20.31	20.39	20.47	20.55	20.62	20.70
2	20.78	20.86	20.94	21.01	21.09	21.17	21.25	21.33	21.40	21.48
3	21.56	21.64	21.71	21.79	21.87	21.95	22.02	22.10	22.18	22.26
4	22.33	22.41	22.49	22.57	22.64	22.72	22.80	22.88	22.95	23.03
5	23.11	23.19	23.26	23.34	23.42	23.49	23.57	23.65	23.73	23.80
6	23.88	23.96	24.03	24.11	24.19	24.26	24.34	24.42	24.49	24.57
7	24.65	24.73	24.80	24.88	24.96	25.03	25.11	25.19	25.26	25.34
8	25.42	25.49	25.57	25.64	25.72	25.80	25.87	25.95	26.03	26.10
9	26.18	26.26	26.33	26.41	26.48	26.56	26.64	26.71	26.79	26.87
10	26.94	27.02	27.09	27.17	27.25	27.32	27.40	27.47	27.55	27.63
11	27.70	27.78	27.85	27.93	28.00	28.08	28.16	28.23	28.31	28.38
12	28.46	28.53	28.61	28.69	28.76	28.84	28.91	28.99	29.06	29.14
13	29.21	29.29	29.36	29.44	29.51	29.59	29.67	29.74	29.82	29.89
14	29.97	30.04	30.12	30.19	30.27	30.34	30.42	30.49	30.57	30.64
15	30.72	30.79	30.87	30.94	31.02	31.09	31.17	31.24	31.32	31.39
16	31.47	31.54	31.61	31.69	31.76	31.84	31.91	31.99	32.06	32.14
17	32.21	32.29	32.36	32.43	32.51	32.58	32.66	32.73	32.81	32.88
18	32.95	33.03	33.10	33.18	33.25	33.33	33.40	33.47	33.55	33.62
19	33.70	33.77	33.84	33.92	33.99	34.07	34.14	34.21	34.29	34.36
20	34.43	34.51	34.58	34.66	34.73	34.80	34.88	34.95	35.02	35.10
21	35.17	35.24	35.32	35.39	35.47	35.54	35.61	35.69	35.76	35.83
22	35.91	35.98	36.05	36.13	36.20	36.27	36.34	36.42	36.49	36.56
23	36.64	36.71	36.78	36.86	36.93	37.00	37.08	37.15	37.22	37.29
24	37.37	37.44	37.51	37.59	37.66	37.73	37.80	37.88	37.95	38.02
25	38.19	38.17	38.24	38.31	38.38	38.46	38.53	38.60	38.67	38.75
26	38.82	38.89	38.96	39.04	39.11	39.18	39.25	39.33	39.40	39.47
27	39.54	39.61	39.69	39.76	39.83	39.90	39.97	40.05	40.12	40.19
28	40.26	40.33	40.41	40.48	40.55	40.62	40.69	40.77	40.84	40.91
29	40.98	41.05	41.12	41.20	41.27	41.34	41.41	41.48	41.55	41.63
30	41.70	41.77	41.84	41.91	41.98	42.05	42.13	42.20	42.27	42.34
31	42.41	42.48	42.55	42.62	42.70	42.77	42.84	42.91	42.98	43.05
32	43.12	43.19	43.26	43.33	43.41	43.48	43.55	43.62	43.69	43.76
33	43.83	43.90	43.97	44.04	44.11	44.18	44.25	44.33	44.40	44.47
34	44.54	44.61	44.68	44.75	44.82	44.89	44.96	45.03	45.10	45.17
35	45.24	45.31	45.38	45.45	45.52	45.59	45.66	45.73	45.80	45.87
36	45.94	46.01	46.08	46.15	46.22	46.29	46.36	46.43	46.50	46.57
37	46.64	46.71	46.78	46.85	46.92	46.99	47.06	47.13	47.20	47.27
38	47.34	47.41	47.48	47.55	47.62	47.69	47.76	47.83	47.90	47.97
39	48.04	48.10	48.17	48.24	48.31	48.38	48.45	48.52	48.59	48.66
40	48.73	48.80	48.87	48.94	49.00	49.07	49.14	49.21	49.28	49.35
41	49.42	49.49	49.56	49.63	49.69	49.76	49.83	49.90	49.97	50.04
42	50.11	50.18	50.24	50.31	50.38	50.45	50.52	50.59	50.66	50.72
43	50.79	50.86	50.93	51.00	51.07	51.13	51.20	51.27	51.34	51.41
44	51.48	51.54	51.61	51.68	51.75	51.82	51.88	51.95	52.02	52.09
45	52.16	52.22	52.29	52.36	52.43	52.50	52.56	52.63	52.70	52.77

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C , read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 28.08Ω .

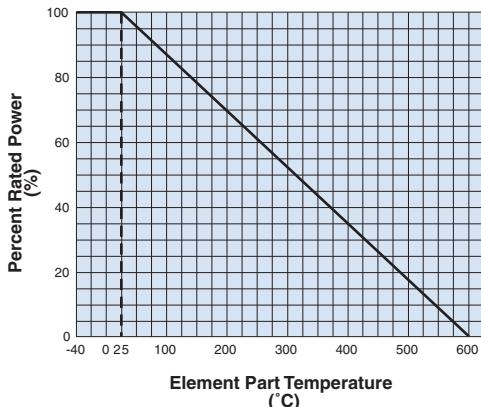
environmental applications (continued)

Pt100 Resistance - Temperature Characteristic 20 at 0°C

Temperature (°C)	0	1	2	3	4	5	6	7	8	9
450	52.84	52.90	52.97	53.04	53.11	53.17	53.24	53.31	53.38	53.44
460	53.51	53.58	53.65	53.71	53.78	53.85	53.92	53.98	54.05	54.12
470	54.19	54.25	54.32	54.39	54.46	54.52	54.59	54.66	54.72	54.79
480	54.86	54.93	54.99	55.06	55.13	55.19	55.26	55.33	55.39	55.46
490	55.53	55.60	55.66	55.73	55.80	55.86	55.93	56.00	56.06	56.13
500	56.20	56.26	56.33	56.40	56.46	56.53	56.59	56.66	56.73	56.79
510	56.86	56.93	56.99	57.06	57.13	57.19	57.26	57.32	57.39	57.46
520	57.52	57.59	57.66	57.72	57.79	57.85	57.92	57.99	58.05	58.12
530	58.18	58.25	58.32	58.38	58.45	58.51	58.58	58.64	58.71	58.78
540	58.84	58.91	58.97	59.04	59.10	59.17	59.24	59.30	59.37	59.43
550	59.50	59.56	59.63	59.69	59.76	59.82	59.89	59.96	60.02	60.09
560	60.15	60.22	60.28	60.35	60.41	60.48	60.54	60.61	60.67	60.74
570	60.80	60.87	60.93	61.00	61.06	61.13	61.19	61.26	61.32	61.39
580	61.45	61.52	61.58	61.65	61.71	61.77	61.84	61.90	61.97	62.03
590	62.10	62.16	62.23	62.29	62.36	62.42	62.48	62.55	62.61	62.68
600	62.74	-	-	-	-	-	-	-	-	-

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 28.08Ω.

Derating Curve



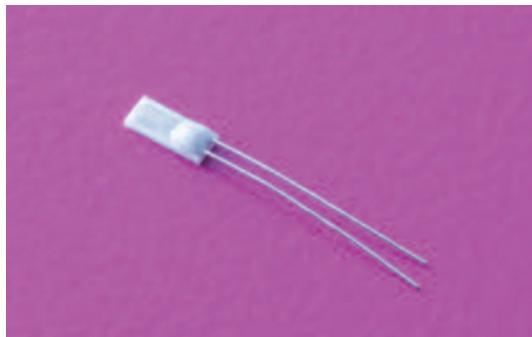
For sensors operated at an element part temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

Performance Characteristics

Parameter	Requirement ΔR (%+0.05Ω)	Test Method
Resistance	Within specified tolerance	0°C
T.C.R.	Within specified T.C.R.	0°C/ +100°C
Rapid Change of Temperature	±0.5%	-55°C (30 minutes)/ +200°C (30 minutes) 1000 cycles
Moisture Resistance	±0.5%	85°C ± 2°C, 85% RH, 1000 hours, 10mA, 1.5 hr ON, 0.5 hr OFF cycle
Normal Temperature Load Life	±0.5%	25°C ± 10°C, 1000 hours, 90mA, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Load Life	±0.5%	125°C, 1000 hours, 85mA continuous turning on electricity
Mechanical Shock	±0.5%	100g's maximum, 6Dms (standard), 12.3ft/s
Vibration	±0.5%	Test from 10-2000hz 20g's for 20 minutes, 12 cycles each of 3 orientations
Component Strength	600g and more	Pull test

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

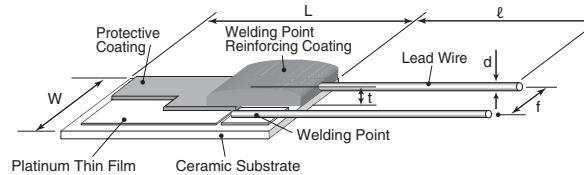
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features

- Characteristics are equivalent with IEC 60751⁻²⁰⁰⁸, JISC 1604⁻²⁰¹³
- Small package of 1.2mm x 3mm with 1kΩ resistance
- Products meet RoHS requirements. RoHS regulation is not intended for Pb-glass contained in glass.

dimensions and construction



Type	Dimensions inches (mm)					
	W	L	t	f (Nom.)	d	I
SDT310HCTP	.047±.004 (1.2±0.10)	.118±.004 (3.0±0.10)	.043 max. (1.1 max.)	.002 (0.5)	.006±.002 (ø0.15±0.05)	.315 ^{+.079} (8 ^{+.1})

ordering information

SDT310	H	CT	P	100	A	3850
Type	Size Code	Operating Temperature	Terminal Surface Material	Nominal Resistance	Class	T.C.R. (x 10 ⁻⁶ /K)
	H: W=1.2mm	CT: -55°C~400°C	P: Pt clad wire	100: 100Ω	A: F0.15 B: F0.3	

applications and ratings

Part Designation	Nominal R. Value (Ω)	Tolerance		Tolerance	R. Value Tolerance (%)	T.C.R. (x10 ⁻⁶ /K)**	Thermal Time Constant***	Self-heating Coefficient (°C/mW)****	Specified Current*****	Temperature Range (C°)
SDT310HCTP	100	F0.15	Class A	±(0.15+0.002 [t])*	±0.059	3850	2.8 seconds in stationary air	0.09	1mA Max.	-55 ~ +300
		F0.3	Class B	±(0.3+0.005 [t])*	±0.12					-55 ~ +400

* [t] is a measuring temperature indicated at °C that is not related to marking - -.

** T.C.R. Measuring Temperature : 0°C/+100°C.

*** Thermal time constant is value measured in stationary air and is typical value, which is value of element and vary with connecting or fixing methods.

**** Self-heating coefficient expressed in °C/mW is values measured at temperature : 0°C in flowing oil with a velocity >0.2m/s, which is value of elements and vary with connecting or fixing methods.

***** Specified current is a current value that is used at reliability test under the condition of self heat-generation that can be disregarded. Recommended measuring currents 1mA for 100Ω.

environmental applications

Performance Characteristics

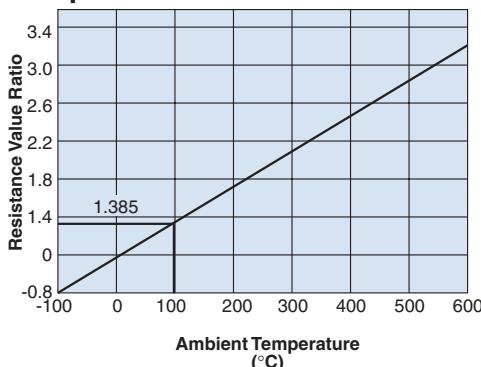
Parameter	Requirement Δ R ±(%) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	—	0°C/ +100°C
Insulation Resistance	100MΩ or more	—	d.c. 100V
Dielectric Withstanding Voltage	±0.06%	-0.003%	a.c. 100V, 60 seconds - 70 seconds
Rapid Change of Temperature	±0.06 (F0.15 at 300°C) ±0.12 (F0.3 at 400°C)	-0.002% +0.013%	-55°C (30 minutes)/ +25°C (2 - 3 minutes)/ +300°C or +400°C (30 minutes)/ +25°C (2 - 3 minutes), 10 cycles
Moisture Resistance	±0.06%	-0.002%	60°C ± 2°C, 90 - 95% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Load Life	±0.06 (F0.15 at 300°C) ±0.12 (F0.3 at 400°C)	-0.016% -0.022%	300°C or 400°C, 1000 hours, 1mA continuous turning on electricity
High Temperature Exposure	±0.06 (F0.15 at 300°C) ±0.12 (F0.3 at 400°C)	+0.004% +0.014%	+300°C or +400°C, 1000 hours
Low Temperature Exposure	±0.06%	+0.010%	-55°C, 1000 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/20/18

environmental applications (continued)

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

$$\begin{aligned} -55^{\circ}\text{C} \sim 0^{\circ}\text{C} &: R_T = R_0 \{1 + C_1 T + C_2 T^2 + C_3 (T-100)^3\} \\ 0^{\circ}\text{C} \sim +400^{\circ}\text{C} &: R_T = R_0 (1 + C_1 T + C_2 T^2) \end{aligned}$$

R_T : Resistance value at $T^{\circ}\text{C}$

R_0 : Resistance value at 0°C

T : Ambient temperature($^{\circ}\text{C}$)

Constants C_1 , C_2 , C_3 :

$$C_1 = 3.908 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$$

$$C_2 = -5.775 \times 10^{-7} \text{ }^{\circ}\text{C}^2$$

$$C_3 = -4.183 \times 10^{-12} \text{ }^{\circ}\text{C}^3$$

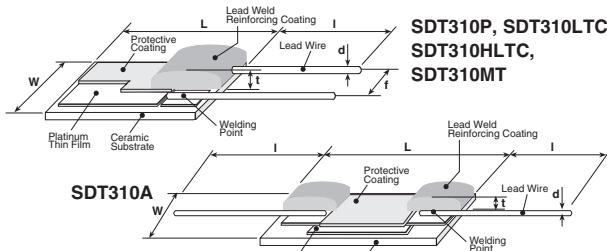
Pt100 Resistance - Temperature Characteristic (JISC 1604²⁰¹³) 100 at 0°C

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82
220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47
230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11
240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74
250	194.10	194.46	194.82	195.18	195.55	195.91	196.27	196.63	196.99	197.35
260	197.71	198.07	198.43	198.79	199.15	199.51	199.87	200.23	200.59	200.95
270	201.31	201.67	202.03	202.39	202.75	203.11	203.47	203.83	204.19	204.55
280	204.90	205.26	205.62	205.98	206.34	206.70	207.05	207.41	207.77	208.13
290	208.48	208.84	209.20	209.56	209.91	210.27	210.63	210.98	211.34	211.70
300	212.05	212.41	212.76	213.12	213.48	213.83	214.19	214.54	214.90	215.25
310	215.61	215.96	216.32	216.67	217.03	217.38	217.74	218.09	218.44	218.80
320	219.15	219.51	219.86	220.21	220.57	220.92	221.27	221.63	221.98	222.33
330	222.68	223.04	223.39	223.74	224.09	224.45	224.80	225.15	225.50	225.85
340	226.21	226.56	226.91	227.26	227.61	227.96	228.31	228.66	229.02	229.37
350	229.72	230.07	230.42	230.77	231.12	231.47	231.82	232.17	232.52	232.87
360	233.21	233.56	233.91	234.26	234.61	234.96	235.31	235.66	236.00	236.35
370	236.70	237.05	237.40	237.74	238.09	238.44	238.79	239.13	239.48	239.83
380	240.18	240.52	240.87	241.22	241.56	241.91	242.26	242.60	242.95	243.29
390	243.64	243.99	244.33	244.68	245.02	245.37	245.71	246.06	246.40	246.75
400	247.09	247.44	247.78	248.13	248.47	248.81	249.16	249.50	249.85	250.19

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes.
When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω.



dimensions and construction



ordering information

SDT310	2B	LT	C	100	B	3850
Type	Size Code	Temperature Range	Terminal Surface Temperature	Nominal Resistance	Class	T.C.R. (x 10 ⁻⁶ /K)
	Nil: Standard A H	LT: -55°C~+155°C Nil: -55°C~+400°C MT: -55°C~+650°C	C: SnCu (SDT310LT, SDT310HLT) P: Pt clad wire (SDT310, SDT310A) M: PtIr (SDT310MT)	100: 100Ω 500: 500Ω 1K: 1kΩ 10: 10Ω (SDT310AP)	A: ±(0.15+0.002[t]) B: ±(0.3+0.005[t]) C: ±(1.0+0.01[t]) K: ±10% (SDT310A)	

applications and ratings

Part Designation	Resistance Range @ 0°C	Tolerance Class (°C)	Resistance Tolerance	Thermal Time Constant**	Thermal Dissipation Constant**	T.C.R. (ppm/°C)*	Specified Current***	Operating Temperature Range
SDT310LTC	100Ω, 500Ω, 1kΩ	A:±(0.15+0.002 [t])	±0.059%	7 seconds in stationary air	0.9mW/°C	3850	10Ω, 100Ω 1mA Max. 500Ω, 1KΩ 0.1mA Max.	-55°C to +155°C
		B:±(0.3+0.005 [t])	±0.12%					-55°C to +400°C
		C:±(1.0+0.01 [t])	±0.39%					-55°C to +650°C
SDT310P	100Ω, 500Ω, 1kΩ	A:±(0.15+0.002 [t])	±0.059%	2.8 seconds in stationary air	1.0mW/°C	3850±2%	-55°C to +155°C	-55°C to +400°C
		B:±(0.3+0.005 [t])	±0.12%					-55°C to +650°C
		C:±(1.0+0.01 [t])	±0.39%					-55°C to +400°C
SDT310MTM	100Ω	B:±(0.3+0.005 [t])	±0.12%	6 seconds in stationary air	1.0mW/°C	3850±2%	-55°C to +400°C	-55°C to +650°C
SDT310HLTC	1kΩ	A:±(0.15+0.002 [t])	±0.059%					-55°C to +400°C
		B:±(0.3+0.005 [t])	±0.12%					-55°C to +650°C
		C:±(1.0+0.01 [t])	±0.39%					-55°C to +400°C
SDT310AP	10Ω	—	±10%	6 seconds in stationary air	1.0mW/°C	3850±2%	-55°C to +400°C	-55°C to +400°C

* T.C.R. measuring temperature: 0°C/+100°C.

** Thermal time constant and thermal dissipation constant are values measured in stationary air and are typical values, which are values of elements and vary with connecting or fixing methods.

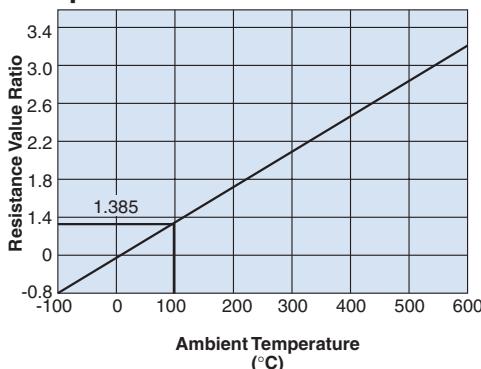
*** The electricity which it is charged with in the element is moved to the range that rise in temperature due to a self-heat generation can be ignored. Recommended measuring currents are 1mA for 100Ω and 0.1mA for 500Ω or 1kΩ. SDT310AP can be used as hot-film sensor. Maximum specified current is 100mA when using under self-heating condition.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/20/18

environmental applications

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

$$\begin{aligned} -55^{\circ}\text{C} \sim 0^{\circ}\text{C} &: R_T = R_0 \{1 + C_1 T + C_2 T^2 + C_3 (T-100)^3\} \\ 0^{\circ}\text{C} \sim +650^{\circ}\text{C} &: R_T = R_0 \{1 + C_1 T + C_2 T^2\} \end{aligned}$$

R_T : Resistance value at $T^{\circ}\text{C}$

R_0 : Resistance value at 0°C

T : Ambient temperature($^{\circ}\text{C}$)

Constants C_1, C_2, C_3 :

$$C_1 = 3.9083 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$$

$$C_2 = -5.775 \times 10^{-7} \text{ }^{\circ}\text{C}^2$$

$$C_3 = -4.183 \times 10^{-12} \text{ }^{\circ}\text{C}^3$$

Pt100 Resistance - Temperature Characteristic (JIS C1604⁻¹⁹⁹⁷) 100 at 0°C

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
-10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
-20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
-30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
-40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
-50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
-60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
-70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
-80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
-90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
-100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
-110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
-120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
-130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
-140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
-150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
-160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
-170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
-180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80
-190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
-200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
-210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82
-220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47
-230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11
-240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74
-250	194.10	194.46	194.82	195.18	195.55	195.91	196.27	196.63	196.99	197.35
-260	197.71	198.07	198.43	198.79	199.15	199.51	199.87	200.23	200.59	200.95
-270	201.31	201.67	202.03	202.39	202.75	203.11	203.47	203.83	204.19	204.55
-280	204.90	205.26	205.62	205.98	206.34	206.70	207.05	207.41	207.77	208.13
-290	208.48	208.84	209.20	209.56	209.91	210.27	210.63	210.98	211.34	211.70
-300	212.05	212.41	212.76	213.12	213.48	213.83	214.19	214.54	214.90	215.25
-310	215.61	215.96	216.32	216.67	217.03	217.38	217.74	218.09	218.44	218.80
-320	219.15	219.51	219.86	220.21	220.57	220.92	221.27	221.63	221.98	222.33
-330	222.68	223.04	223.39	223.74	224.09	224.45	224.80	225.15	225.50	225.85
-340	226.21	226.56	226.91	227.26	227.61	227.96	228.31	228.66	229.02	229.37
-350	229.72	230.07	230.42	230.77	231.12	231.47	231.82	232.17	232.52	232.87
-360	233.21	233.56	233.91	234.26	234.61	234.96	235.31	235.66	236.00	236.35
-370	236.70	237.05	237.40	237.74	238.09	238.44	238.79	239.13	239.48	239.83
-380	240.18	240.52	240.87	241.22	241.56	241.91	242.26	242.60	242.95	243.29
-390	243.64	243.99	244.33	244.68	245.02	245.37	245.71	246.06	246.40	246.75
-400	247.09	247.44	247.78	248.13	248.47	248.81	249.16	249.50	249.85	250.19
-410	250.53	250.88	251.22	251.56	251.91	252.25	252.59	252.93	253.28	253.62
-420	253.96	254.30	254.65	254.99	255.33	255.67	256.01	256.35	256.70	257.04
-430	257.38	257.72	258.06	258.40	258.74	259.08	259.42	259.76	260.10	260.44
-440	260.78	261.12	261.46	261.80	262.14	262.48	262.82	263.16	263.50	263.84

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5. Similarly, the value for 1KΩ at 0°C will be the value obtained by multiplying the resistance value by 10.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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environmental applications (continued)

Pt100 Resistance - Temperature Characteristic (JIS C1604⁻¹⁹⁹⁷) 100 at 0°C

Temperature (°C)	0	1	2	3	4	5	6	7	8	9
450	264.18	264.52	264.86	265.20	265.53	265.87	266.21	266.55	266.89	267.22
460	267.56	267.90	268.24	268.57	268.91	269.25	269.59	269.92	270.26	270.60
470	270.93	271.27	271.61	271.94	272.28	272.61	272.95	273.29	273.62	273.96
480	274.29	274.63	274.96	275.30	275.63	275.97	276.30	276.64	276.97	277.31
490	277.64	277.98	278.31	278.64	278.98	279.31	279.64	279.98	280.31	280.64
500	280.98	281.31	281.64	281.98	282.31	282.64	282.97	283.31	283.64	283.97
510	284.30	284.63	284.97	285.30	285.63	285.96	286.29	286.62	286.95	287.29
520	287.62	287.95	288.28	288.61	288.94	289.27	289.60	289.93	290.26	290.59
530	290.92	291.25	291.58	291.91	292.24	292.56	292.89	293.22	293.55	293.88
540	294.21	294.54	294.86	295.19	295.52	295.85	296.18	296.50	296.83	297.16
550	297.49	297.81	298.14	298.47	298.80	299.12	299.45	299.78	300.10	300.43
560	300.75	301.08	301.41	301.73	302.06	302.38	302.71	303.03	303.36	303.69
570	304.01	304.34	304.66	304.98	305.31	305.63	305.96	306.28	306.61	306.93
580	307.25	307.58	307.90	308.23	308.55	308.87	309.20	309.52	309.84	310.16
590	310.49	310.81	311.13	311.45	311.78	312.10	312.42	312.74	313.06	313.39
600	313.71	314.03	314.35	314.67	314.99	315.31	315.64	315.96	316.28	316.60
610	316.92	317.24	317.56	317.88	318.20	318.52	318.84	319.16	319.48	319.80
620	320.12	320.43	320.75	321.07	321.39	321.71	322.03	322.35	322.67	322.98
630	323.30	323.62	323.94	324.26	324.57	324.89	325.21	325.53	325.84	326.16
640	326.48	326.79	327.11	327.43	327.74	328.06	328.38	328.69	329.01	329.32

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 140.40Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5. Similarly, the value for 1KΩ at 0°C will be the value obtained by multiplying the resistance value by 10.

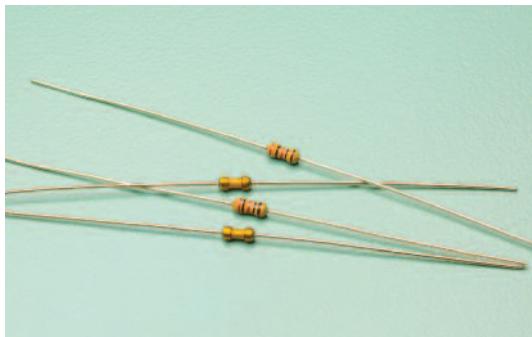
thermal
sensors

Performance Characteristics

Parameter	Requirement ΔR (%+0.05Ω) Limit	Typical	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	—	0°C / +100°C
Insulation Resistance	100MΩ or more	—	d.c. 100V
Dielectric Withstanding Voltage	±0.12%	±0.010%	a.c. 100V, 60 seconds - 70 seconds
Resistance to Solder Heat	±0.5%	±0.014%	350°C for 3.5 seconds
Rapid Change of Temperature	±0.12%	-0.026%	-55°C (30 minutes) / +25°C (2 - 3 minutes) / +155°C (30 minutes) / +25°C (2 - 3 minutes), 10 cycles (SDT310LTC, SDT310HLTC); -55°C (30 minutes) / +25°C (2 - 3 minutes) / +400°C (30 minutes) / +25°C (2 - 3 minutes), 10 cycles (SDT310P, SDT310A); +25°C (30 minutes) / +650°C (30 minutes) 10 cycles (SDT310MTM)
Moisture Resistance	±0.5%	-0.004%	60°C ± 2°C, 90 - 95% RH, 1000 hours, 1mA, 1.5 hr ON, 0.5 hr OFF cycle
Normal Temperature Load Life	±0.5%	-0.017%	20°C ± 10°C, 1000 hours, 1mA continuous turning on electricity
High Temperature Load Life	±0.5%	-0.022%	155°C ± 2°C (SDT310LTC, SDT310HLTC), 400°C ± 8°C (SDT310P, SDT310AP), 1000 hours, 650°C ± 13°C (SDT310MTM), 250 hours, 1mA continuous turning on electricity
High Temperature Exposure	±0.12%, ±0.5% (SDT310MTM)	-0.027%, -0.060% (SDT310MTM)	+155°C (SDT310LTC, SDT310HLTC), +400°C (SDT310P, SDT310AP), +650°C (SDT310MTM), 250 hours
Low Temperature Exposure	±0.12%	-0.036%	-55°C, 250 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

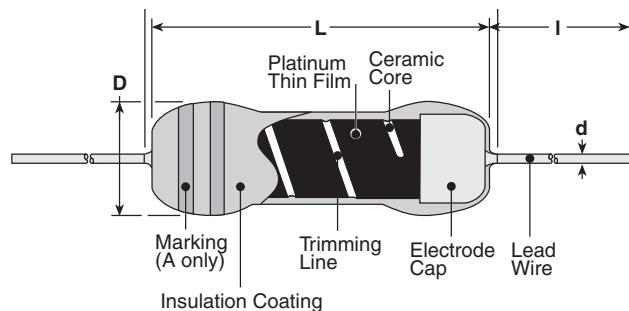
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features

- SDT101SA is ultra-compact sensor element and offers $1\text{k}\Omega$
- Simple structure for lead forming
- STD101A and SDT101SA can be easily soldered
- Ideal for low directivity heat flow sensor elements
- Stable characteristics even in use for a long time with an excellent environment resistance
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Qualified (SDT101B 500Ω only)

dimensions and construction



Type	Dimensions inches (mm)				
	L	C	D	d (Nom.)	I
SDT101A	.157±.031 (4.0±0.8)	—	.063±.008 (1.6±0.2)	.016±.003 (0.4±0.08)	1.18±.118 (30±3)
SDT101SA	—	.157±.031 (4.0±0.8)	.063±.008 (1.6±0.2)	.016±.003 (0.4±0.08)	1.18±.118 (30±3)
SDT101B	.157±.031 (4.0±0.8)	—	.059±.008 (1.5±0.2)	.016±.003 (0.4±0.08)	1.18±.118 (30±3)

ordering information

SDT101	A	X	C	T26	A	100	D	F
Type	Temperature Range	Reference Temperature*	Terminal Surface Material	Taping	Packaging	Nominal Resistance	Resistance Tolerance	T.C.R. Tolerance
SDT101	A: -55°C~+150°C	X: 0°C	C: SnCu (A, SA only)	Nil: Bulk	Nil: Bulk	10: 10Ω	D: ±0.5%	F: ±1%
SDT101S	B: -55°C~+300°C		N: Ni (B only)	T26: 26mm taping (A only)	A: AMMO (A only)	100: 100Ω	F: ±1%	G: ±2%
				T52: 52mm taping	R: Reel (B only)	500: 500Ω	G: ±2%	
						1K: 1000Ω (SA only)		

* There is also a product that has a standard temperature of 25°C (symbol: Y) for custom support.

(However, the temperature coefficient of resistance is measured at 0°C/100°C.) Please contact us.

Contact us when you have control request for environmental hazardous material other than the substance specified by EU-RoHS. For further information on taping, please refer to APPENDIX C on the back pages.

applications and ratings

Part Designation	Power Rating @ 70°C*	Thermal Time Constant*	Thermal Dissipation Constant*	Resistance Range	Resistance Tolerance	T.C.R. (ppm/°C)	T.C.R. Tolerance (ppm/°C)	Rated Ambient Temperature	Operating Temperature Range
SDT101A	0.125W	6 seconds	2.8mW/°C	10Ω, 100Ω, 500Ω	D: ±0.5% F: ±1%	3500	F: ±1% G: ±2%	+70°C	-55°C to +150°C
SDT101SA				1000Ω	G: ±2%		G: ±2%		
SDT101B		9 seconds	1.8mW/°C	10Ω, 100Ω, 500Ω	D: ±0.5% F: ±1%		F: ±1% G: ±2%	+200°C	-55°C to +300°C

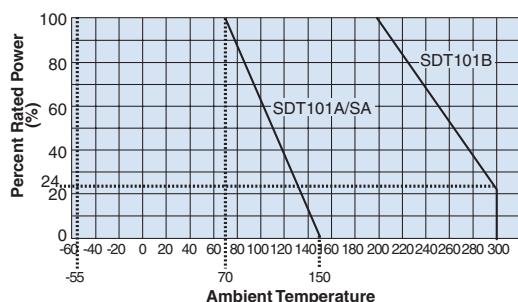
* Thermal time constant and thermal dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods. T.C.R. measuring temperature: 0°C/+100°C

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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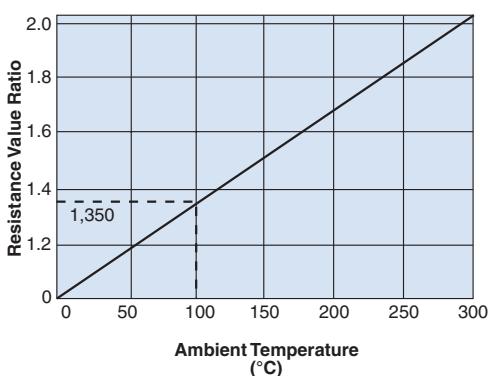
environmental applications

Derating Curve



For sensors operated at an ambient temperature or above, a power rating shall be derated in accordance with the above derating curve.

Example of Temperature Characteristics of Resistance



Approximate Expression for Resistance-Temperature Characteristics

R_T : Resistance value at $T^{\circ}\text{C}$

R_0 : Resistance value at 0°C

T : Ambient temperature ($^{\circ}\text{C}$)

Constants C_1, C_2 :

$$C_1 = 0.356297 \times 10^{-2} \quad C_2 = 0.617945 \times 10^{-6}$$

Resistance - Temperature Characteristic (Typical Value)

Temperature (°C)	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	82.04	81.67	81.31	80.94	80.58	80.22	—	—	—	—
-40	85.66	85.29	84.93	84.57	84.21	83.85	83.49	83.12	82.76	82.40
-30	89.26	88.90	88.54	88.18	87.82	87.46	87.10	86.74	86.38	86.02
-20	92.85	92.49	92.13	91.78	91.42	91.06	90.70	90.34	89.98	89.62
-10	96.43	96.07	95.72	95.36	95.00	94.64	94.29	93.93	93.57	93.21
0	100.00	99.64	99.29	98.93	98.57	98.22	97.86	97.50	97.15	96.79
0	1	2	3	4	5	6	7	8	9	
0	100.00	100.36	100.71	101.07	101.42	101.78	102.13	102.49	102.85	103.20
10	103.56	103.91	104.26	104.62	104.97	105.33	105.68	106.04	106.39	106.74
20	107.10	107.45	107.81	108.16	108.51	108.87	109.22	109.57	109.92	110.28
30	110.63	110.98	111.33	111.69	112.04	112.39	112.74	113.09	113.44	113.80
40	114.15	114.50	114.85	115.20	115.55	115.90	116.25	116.60	116.95	117.30
50	117.65	118.00	118.35	118.70	119.05	119.40	119.75	120.10	120.45	120.80
60	121.15	121.50	121.84	122.19	122.54	122.89	123.24	123.59	123.93	124.28
70	124.63	124.98	125.32	125.67	126.02	126.37	126.71	127.06	127.41	127.75
80	128.10	128.44	128.79	129.14	129.48	129.83	130.17	130.52	130.86	131.21
90	131.56	131.90	132.25	132.59	132.93	133.28	133.62	133.97	134.31	134.66
100	135.00	135.34	135.69	136.03	136.37	136.72	137.06	137.40	137.75	138.09
110	138.43	138.77	139.12	139.46	139.80	140.14	140.49	140.83	141.17	141.51
120	141.85	142.19	142.53	142.88	143.22	143.56	143.90	144.24	144.58	144.92
130	145.26	145.60	145.94	146.28	146.62	146.96	147.30	147.64	147.98	148.32
140	148.65	148.99	149.33	149.67	150.01	150.35	150.69	151.02	151.36	151.70
150	152.04	152.38	152.71	153.05	153.39	153.72	154.06	154.40	154.74	155.07
160	155.41	155.74	156.08	156.42	156.75	157.09	157.43	157.76	158.10	158.43
170	158.77	159.10	159.44	159.77	160.11	160.44	160.78	161.11	161.44	161.78
180	162.11	162.45	162.78	163.11	163.45	163.78	164.11	164.45	164.78	165.11
190	165.45	165.78	166.11	166.44	166.78	167.11	167.44	167.77	168.10	168.44
200	168.77	169.10	169.43	169.76	170.09	170.42	170.76	171.09	171.42	171.75
210	172.08	172.41	172.74	173.07	173.40	173.73	174.06	174.39	174.72	175.04
220	175.37	175.70	176.03	176.36	176.69	177.02	177.35	177.67	178.00	178.33
230	178.99	179.99	179.31	179.64	179.97	180.30	180.62	180.95	181.28	181.60
240	181.93	182.26	182.58	182.91	183.24	183.56	183.89	184.21	184.54	184.87
250	185.19	185.52	185.84	186.17	186.49	186.82	187.14	187.47	187.79	188.11
260	188.44	188.76	189.09	189.41	189.73	190.06	190.38	190.70	191.03	191.35
270	191.67	192.00	192.32	192.64	192.96	193.29	193.61	193.93	194.25	194.57
280	194.90	195.22	195.54	195.86	196.18	196.50	196.82	197.14	197.47	197.79
290	198.11	198.43	198.75	199.07	199.39	199.71	200.03	200.35	200.67	200.99
300	201.31	—	—	—	—	—	—	—	—	—

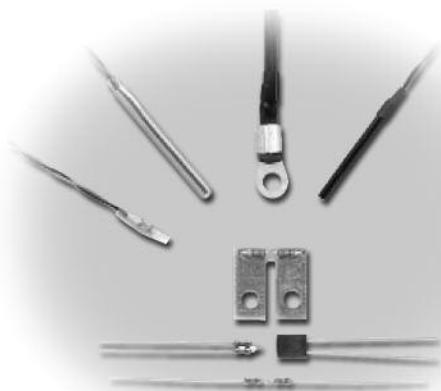
Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 136.72Ω. The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5. Similarly, the value for 10Ω at 0°C will be the value obtained by dividing the resistance value by 10.

Performance Characteristics

Parameter	Requirement	△ R ±(%+0.05Ω)	Test Method
Resistance	Within specified tolerance	—	0°C
T.C.R.	Within specified T.C.R.	—	0°C/ +100°C
Overload (Short Time)	±0.5%	±0.2%	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat (SDT101A)	±0.3%	±0.1%	350°C, 1 second (SDT101A/SA)
Rapid Change of Temperature	±0.5%	±0.2%	-55°C (30 minutes)/ +25°C (10 minutes)/ +150°C (30 minutes)/ +25°C (10 minutes), 5 cycles
Moisture Resistance	±1%	±0.3%	80°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	±1%	±0.2%	70°C ± 3°C (SDT101A/SA), 200°C ± 3°C (SDT101B), 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
High Temperature Exposure	±1%	±0.7%	+150°C (SDT101A/SA), +300°C (SDT101B), 1000 hours
Shelf Life	±0.3%	±0.1%	Left for 1 year on shelf in natural condition

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/04/19



features

- All ST-series thermal sensors are custom-made products. ST-series thermal sensors are designed in various shapes in accordance with your application using a platinum thin-film thermal sensor (SDT101, SDT310 series) as an element. Shapes of sensor parts can be designed flexibly to meet your shapes and dimensional needs, from simple resin mold parts to sensor parts sealed in metal protective tubes made of SUS316.

ordering information

ST3000 Series

ST	31050201	F	A	X	1K	B	D
Type	Type Number	Pb Free Symbol	Element Type	Reference Temperature	Nominal Resistance**	Resistance Tolerance**	T.C.R. Tolerance
			A: SDT101	X: 0°C	100: 100Ω 500: 500Ω 1K: 1kΩ	B: ±0.1% C: ±0.2% D: ±0.5% F: ±1%	D: ±0.5% F: ±1% G: ±2%

* ST3000 series products with a reference temperature of 25°C (T.C.R. will be calculated between 0°C/100°C.) are also available. Contact us.

**These are specified for inner element only

ST8100 Series

ST	8102201	F	B	X	1K	B
Type	Type Number	Pb Free Symbol	Element Type	Reference Temperature	Nominal Resistance	Class
			B: SDT310LTC C: SDT310P	X: 0°C	100: 100Ω 500: 500Ω 1K: 1kΩ	B: ±(0.3+0.005 [t]) C: ±(1.0+0.01 [t])

applications and ratings

Part Designation	Element	Resistance Value at 0°C	Class: Tolerance to Measuring Temperature	Resistance Tolerance	T.C.R. (x 10 ³ /K)	T.C.R. Tolerance (ppm/°C)
ST3000	SDT101A SDT101B	100Ω 500Ω 1kΩ	—	B: ±0.1% C: ±0.2% D: ±0.5% F: ±1%	3500	D: ±0.5% F: ±1% G: ±2%
ST8100	SDT310LTC SDT310P	100Ω 500Ω 1kΩ	B: ±(0.3+0.005[t]) C: ±(1.0+0.01[t])	—	3850	—

* ST3000 Series, 1kΩ, resistance tolerance B • C are produced in pair of SDT101Series. The combination of ST3000 series, resistance tolerance B-T.C.R. and tolerance D is equivalent to class B of SDT310 tolerance to the measuring temperature.

In the above table specification there are restrictions on manufacturing range depending on part number. Please refer to the Performance list.

environmental applications

Example of	Material	Example of	Material	Example of	Form
Processing Protective Tubes	PPS Epoxy resin coating Fluorine resin shrinkage tube Polyimide SUS304 SUS316 Cu	Processing External Conductors	Polyurethane coated wire Parallel heat-resistant vinyl chloride wire Fluorine resin coated wire	Form	Processing of connecting terminals Mounting on printed circuit board
				2-wire system 3-wire, 4-wire system Shielded wire	

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/05/18

environmental applications

Performance Characteristics - ST3000 series (A part extract)

Shape	Unit: mm	Product Number	L (mm)	ℓ (m)	Measurement Temp. Range
	Welded Nickel SDT101B Welded 0.15 ø0.4 30±3 13max. 30±3	31011 Lead wire without solder plating	—	—	-50°C ~ +300°C
		31012 Lead wire with solder plating	—	—	-40°C ~ +120°C
	Welded Nickel SDT101B Welded 4max. 7max. 30±3	31021 Lead wire without solder plating	—	—	-50°C ~ +300°C
		31022 Lead wire with solder plating	—	—	-40°C ~ +120°C
	Epoxy Resin Coating (Black) 0.3-square Parallel Heat-Resistant Vinyl Chloride Wire (Black) 5.5max. L ℓ (10)	31030201	30 max.	0.1	-40°C ~ +100°C
		31030205		0.5	
		31030210		1.0	
		31030230		3.0	
	SUS304 (14) 0.3-square Heat-Resistant Vinyl Chloride Wire (Black) Heat Shrinkage Tube L ℓ (10)	31040301	35	0.1	-40°C ~ +100°C
		31040305		0.5	
		31040310		1.0	
		31040330		3.0	
	Fluorine Resin Heat Shrinkage Tube. 0.08-square parallel fluorine resin wire (Red, Black) 3 max. L ℓ (10)	31050201	23 max.	0.1	-40°C ~ +220°C
		31050205		0.5	
		31050210		1.0	
		31050230		3.0	
	SUS304 Caulking 0.08-square parallel fluorine resin wire (Red, Black) 6.3 4max. (*) L ℓ (10)	31060301	30	0.1	-40°C ~ +220°C
		31060305		0.5	
		31060310		1.0	
		31060330		3.0	
		31060501	50	0.1	
		31060505		0.5	
		31060510		1.0	
		31060530		3.0	
	PPS ø0.4 Tin plated copper wire 5.0 t=2.7 30	3201	—	—	-20°C ~ +120°C
		3202	—	—	-40°C ~ +140°C

* For product of resistance 1kΩ or product of resistance tolerance B, C, L=50mm is only available.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/21/18

environmental applications (continued)
Performance Characteristics - ST3000 series (A part extract)

Shape	Unit: mm	Product Number	L (mm)	ℓ (m)	Measurement Temp. Range
	0.3-square parallel heat-resistant vinyl chloride wire (Black)	32050001	—	0.1	-20°C ~ +80°C
		32050005		0.5	
		32050010		1.0	
		32050030		3.0	
	Polyimide (Brown) Heat shrinkage tube 0.08-square fluorine resin covered wire (Red, Black)	32090201	24	0.1	-40°C ~ +120°C
		32090205		0.5	
		32090210		1.0	
		32090230		3.0	
	SUS304 Pt100 Resin Nickel Wire	32120907	90	0.7	-40°C ~ +300°C Only top of protective tubes
		32121207	120	0.7	
		32121707	175	0.7	
		32121202	120	0.2	
	Coated Polyurethane Coated Wire (Brown)	33010004	(8)	0.4	-20°C ~ +80°C
Products with resistance value 1K or resistance tolerance B, C are not manufactured					
	SUS304 Vinyl Cabtyre Cable (Gray) M3 Solderless Terminal	33040305	35	0.5	-40°C ~ +160°C
		33040310		1.0	
		33040330		3.0	
	0.08-Square Fluorine Resin Wire	33060001	—	0.1	-20°C ~ +120°C
		33060005		0.5	
		33060010		1.0	
		33060030		3.0	
	Welded SUS304 PT 1/8 0.08-square Fluorine Resin Wire (Red, Black)	33110305	30	0.5	-40°C ~ +220°C
		33110310		1.0	
		33110330		3.0	

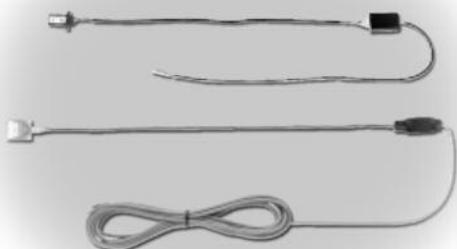
environmental applications (continued)
Performance Characteristics - ST8100 series

Shape	Unit: mm	Product Number	Lead Wire Number	ℓ (m)	Measurement Temp. Range
<p>2 wire: Red Black 3 wire: Red Black Black</p>	<p>2 wire: Red Black 3 wire: Red Black Black</p>	8102201	2	0.1	SDT310LTC: -40°C ~ +105°C SDT310P: -40°C ~ +200°C
		8102205		0.5	
		8102210		1.0	
		8102301	3	0.1	
		8102305		0.5	
		8102310		1.0	
<p>2 wire: Red Black 3 wire: Red Black Black</p>	<p>2 wire: Red Black 3 wire: Red Black Black</p>	8103201	2	0.1	SDT310LTC: -40°C ~ +105°C SDT310P: -40°C ~ +200°C
		8103205		0.5	
		8103210		1.0	
		8103301	3	0.1	
		8103305		0.5	
		8103310		1.0	
<p>2 wire: Red Black 3 wire: Red Black Black</p>	<p>2 wire: Red Black 3 wire: Red Black Black</p>	8104201	2	0.1	SDT310LTC Only: -40°C ~ +105°C
		8104205		0.5	
		8104210		1.0	
		8104301	3	0.1	
		8104305		0.5	
		8104310		1.0	
<p>SDT310LTC</p>	<p>SDT310LTC</p>	8106201	2	0.1	SDT310LTC Only: -40°C ~ +125°C
		8106205		0.5	
		8106210		1.0	
<p>SDT310LTC</p>	<p>SDT310LTC</p>	8107301	3	0.1	SDT310LTC Only: -40°C ~ +150°C
		8107305		0.5	
		8107310		1.0	

guarantee of product

The guaranteed term of the product is one year after delivery. However, when trouble occurs during the guaranteed term because of our responsibility, the product is exchanged or is repaired. We guarantee the product itself, any damages caused by this product shall be excused.

features



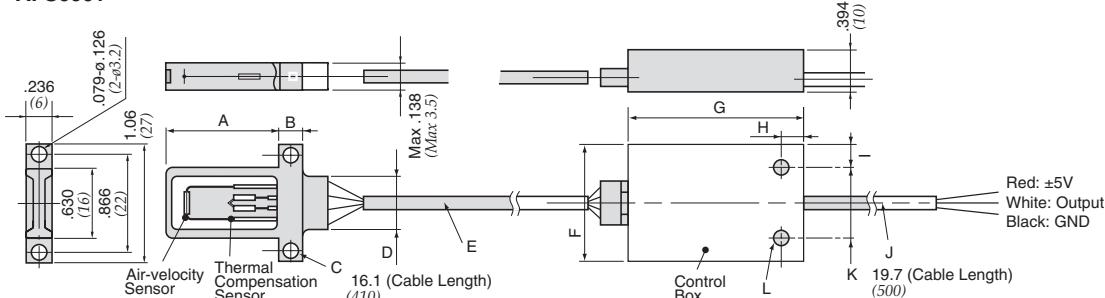
- The platinum thin-film thermal sensor realizes high and long-term stability
- The small platinum thin-film thermal sensor and an even temperature differential operating circuit ensure a quick response
- The built-in temperature compensation circuit assures correct values regardless of air temperature. The air velocity sensor and air velocity temperature compensation sensor are sensors with the same characteristics to enable correct temperature compensation
- Products have no rotating mechanism and are resistant to vibrations
- Products are compact and light, and are easy to be installed in equipment

dimensions and construction

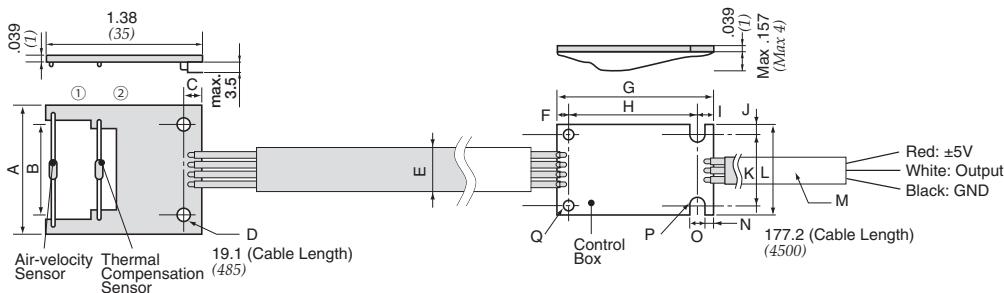
Size	Dimensions inches (mm)												
	A	B	C	D	E	F	G	H	I	J	K	L	
AFS0001	.984 (25)	.197 (5)	2- \varnothing .126 (2- \varnothing 3.2)	.512 (13)	\varnothing .118 (\varnothing 3)	.984 (25)	1.57 (40)	.217 (5.5)	.177 (4.5)	\varnothing .118 (\varnothing 3)	.630 (16)	2- \varnothing .126 (2- \varnothing 3.2)	

Size	Dimensions inches (mm)																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
AFS0002	1.10 (28)	.787 (20)	.157 (4)	2- \varnothing .126 (2- \varnothing 3.2)	.394 (10)	.118 (3)	1.38 (35)	1.12 (28.5)	.138 (3.5)	.079 (2)	.630 (16)	.787 (20)	.197 (\varnothing 5)	.069 (1.76)	\varnothing .126 (3.2)	R.126 (R3.2)	2- \varnothing .079 (2- \varnothing 2.0)

AFS0001



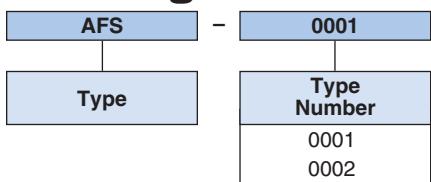
AFS0002



Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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ordering information

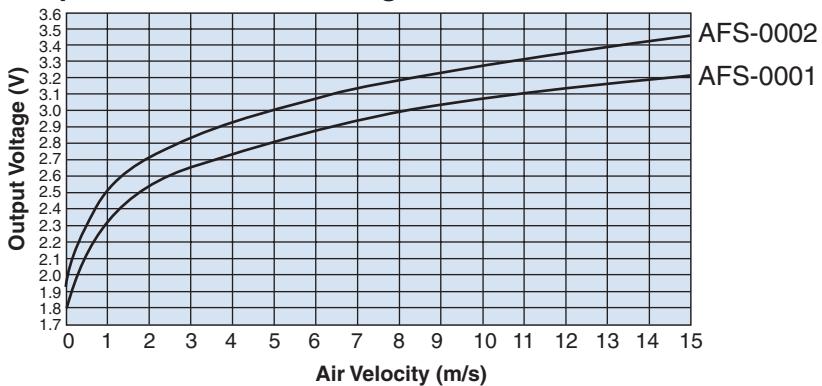


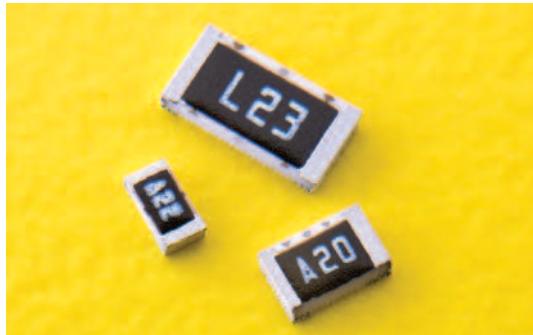
applications and ratings

Test Items	AFS-0001	AFS-0002	Remarks
Detection Object		Clean air, ordinary pressure	
Detection Range (m/s)	0 - 15		
Detection Accuracy (m/s)	±0.3%	±0.5%	0.5 - 1.0 (less than 1.0) m/s
	±0.5%	±0.7%	1.0 - 4.0 (less than 4.0) m/s
	—	±2.0%	4.0 - 12 (less than 12) m/s
	—	±3.0%	12 - 15 m/s
	±1.5%	—	4.0 - 15 m/s
Power Supply Voltage (V)	5.0 ± 0.25		
Current Consumption (A)	0.2 maximum		Start-up time is excluded
Output Voltage (V)	1.8 - 3.2	1.9 - 3.5	Non-linear analog (see Output Characteristics Diagram)
Output Impedance (Ω)	100 typical		
Start-up Time (S)	15 typical		
Operating Temperature Range (°C)	0 - +60		
Operating Humidity Range (%RH)	30 - 85		Dew condensation not allowed
Storage Temperature Range (°C)	-10 - +70		
Storage Humidity Range (%RH)	30 - 85		Dew condensation not allowed
Temperature Compensation Range (°C)	0 - +60		

environmental applications

Output Characteristics Diagram

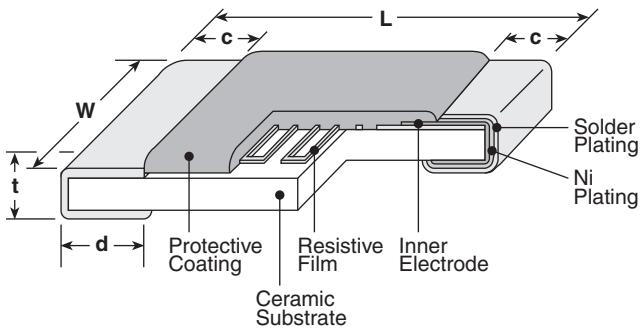




features

- Thin film thermal sensors of SMD type
- Resistance tolerance $\pm 1\%$, a wide range of TCRs $+3000 \times 10^{-6}/K \sim +5000 \times 10^{-6}/K$ with the standard products
- Suitable for control of temperatures in various industrial equipment
- Suitable for both flow and reflow soldering
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.008 (0.8±0.2)	.012±.008 (0.3±0.2)	.012±.008 (0.3±0.2)	.02±.004 (0.5±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.016±.008 (0.4±0.2)	.02±.006 (0.5±0.15)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.012 (0.5±0.3)	.02±.012 (0.5±0.3)	.02±.006 (0.5±0.15)

ordering information

LP73	2B	T	TE	103	J	3600
Product Code	Size Code	Termination Material	Packaging	Resistance Value	Tolerance	T.C.R.
1J: 0603 2A: 0805 2B: 1206	1J: 0603 2A: 0805 2B: 1206	T: Sn	TE: 4mm embossed pitch plastic (5,000 pieces/reel)	2 significant figures + 1 multiplier 3 digits	F: ±1% G: ±2% J: ±5%	

applications and ratings

Part Designation	Power Rating	Thermal Time Constant (sec.)*	Thermal Dissipation Constant (mW°C)*	Rated Ambient Temp.	Operating Temp. Range
LP731J	0.016W	2	1.2		
LP732A	0.031W	4	1.8	+70°C	-55°C to +125°C
LP732B	0.063W	6.5	2.4		

* Thermal Time Constant and Dissipation Constant are reference values, which are values of elements and vary with connecting or fixing methods.

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

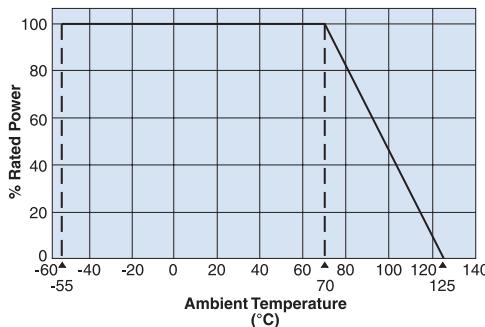
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applications and ratings (continued)

T.C.R. (ppm/ $^{\circ}$ C) Max.	T.C.R. Tolerance	Resistance Range E-24			Resistance Tolerance
		1J	2A	2B	
3000	$\pm 5\%$	100 Ω -1k Ω	100 Ω - 2k Ω	100 Ω - 10k Ω	F: $\pm 1\%$, G: $\pm 2\%$
3300		100 Ω -300 Ω			J: $\pm 5\%$
3600		330 Ω -1k Ω			G: $\pm 2\%$, J: $\pm 5\%$
4000		100 Ω - 1k Ω			F: $\pm 1\%$
4500					G: $\pm 2\%$
5000					J: $\pm 5\%$

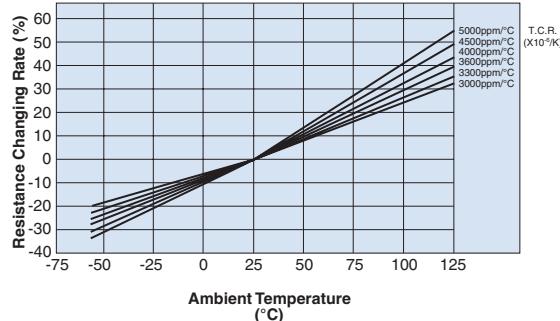
environmental applications

Derating Curve



For sensors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Temperature Characteristics



Approximate Expression for Resistance-Temperature Characteristics

T.C.R. ($\times 10^{-6}/K$)	C_0	C_1	C_2
3000	0.931258	0.00265213	3.90112×10^{-6}
3300	0.924355	0.00292569	4.00516×10^{-6}
3600	0.916356	0.00323714	4.34428×10^{-6}
4000	0.907039	0.00361006	4.33457×10^{-6}
4500	0.897412	0.00395222	6.05201×10^{-6}
5000	0.886014	0.00437224	7.48809×10^{-6}

(Values are not guaranteed but typical)
 $R_T = R_{25} (C_0 + C_1 T + C_2 T^2)$

R_T : Resistance value at T °C

R_{25} : Resistance value at 25°C

T: Ambient temperature (°C)

C_0 , C_1 , C_2 : Constants

Performance Characteristics

Parameter	Requirement Limit	$\Delta R \pm (\% + 0.05\Omega)$ Typical	Test Method
Resistance	Within regulated tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+65°C
Overload	$\pm 0.5\%$	$\pm 0.3\%$	Rated voltage x 2.5 for 5 seconds
Resistance to Solder Heat	$\pm 0.5\%$	$\pm 0.3\%$	260°C $\pm 5\%$ C, 10 seconds + 1 second/- 0 second
Rapid Change of Temperature	$\pm 0.5\%$	$\pm 0.3\%$	-55°C (30 minutes), +25°C (2-3 minutes), +125°C (30 minutes), +25°C (2-3 minutes), 5 cycles
Moisture Resistance	$\pm 2.0\%$	$\pm 1.5\%$	40°C $\pm 2\%$ C, 90 - 95% RH, 1000 hours, 1.5 hours ON, 0.5 hours OFF cycle
Endurance at 70°C	$\pm 2.0\%$	$\pm 1.5\%$	70°C $\pm 2\%$ C, 1000 hours, 1.5 hours ON, 0.5 hours OFF cycle

Confirming resistance drift is recommended since this product has a tendency to have bigger resistance change than general flat chip over 70°C.
Please pay attention not to be applied ESD, it may cause of resistance change.

Actual Value (Out of Guarantee)

Test Items	Reference	Test Method
High Temperature Exposure	$\pm 8.0\%$	125°C, 1000 hours
ESD	500V	Human model, 100 pF 1.5 k Ω

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

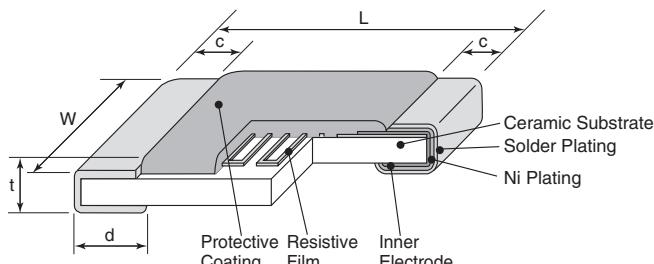
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features

- SMD thin film resistors with thermo-perceptivity
- Various TCRs $+150 - +4500 \times 10^{-6}/\text{K}$ are available
- Operating temperature range -155°C
Rated ambient temperature: 85°C
- Products meet EU RoHS requirements
- AEC-Q200 Qualified

dimensions and construction



Type	Dimensions inches (mm)				
	L	W	c	d	t
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+.02} _{-.01})	.020±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.020±.012 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{-.01})	.024±.004 (0.6±0.1)

ordering information

LT73V	2B	T	TD	102	J	0900
Type	Power Rating	Termination Material	Taping	Nominal Resistance	Resistance Tolerance	T.C.R. ($\times 10^{-6}/\text{K}$)
	2A:0.1W 2B:0.125W	T:Sn	TD:4mm pitch paper TE:4mm pitch plastic embossed	3 digits	G:±2% J:±5%	4 digits

For further information on packaging, please refer to Appendix A.

applications and ratings

Type	Power Rating	Max. Working Voltage	Max. Overload Voltage	Thermal Time Constant*	Thermal Dissipation Constant*	Rated Ambient Temperature	Operating Temperature Range	Taping & Q'ty/Reel (pcs)	
								TD	TE
2A	0.1W	50V	100V	1.0s	1.37mW/ $^\circ\text{C}$	+85 $^\circ\text{C}$	-55 $^\circ\text{C} - +155^\circ\text{C}$	5,000	4,000
2B	0.125W	75V	150V	1.5s	1.47mW/ $^\circ\text{C}$			5,000	4,000

* Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

T.C.R. ($\times 10^{-6}/\text{K}$)	T.C.R. Tolerance	(Ω) Resistance Range (E24)		Resistance Tolerance
		2A	2B	
150, 250, 350, 450, 500	±100 $\times 10^{-6}/\text{K}$	2k - 15k	2k - 22k	G: ±2%
600, 700, 800, 900	±150 $\times 10^{-6}/\text{K}$	1k - 8.2k	1k - 15k	
1000, 1200, 1400		1k - 6.8k	1k - 8.2k	
1600, 1800		510 - 4.7k	1k - 6.8k	
2000, 2200, 2400		510 - 4.7k	510 - 6.8k	
2600, 2800, 3000		510 - 3k	510 - 6.2k	
3300, 3600, 3900		100 - 1k	100 - 2k	
4200		51 - 510	51 - 510	
4500				

T.C.R. Measuring Temperature: $+25^\circ\text{C} - +75^\circ\text{C}$

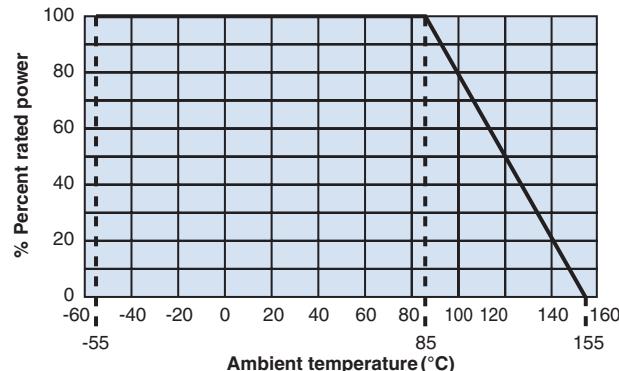
Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance value or Max. working voltage}}$, whichever is lower.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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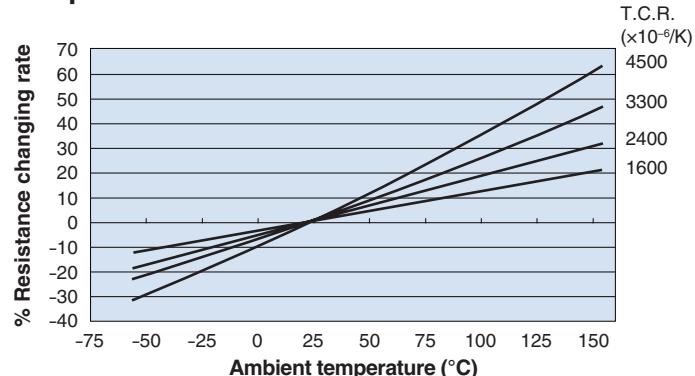
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 85°C or above, a power rating shall be derated in accordance with the above derating curve.

Temperature Characteristics of Resistance



Approximate Expression for Resistance- Temperature Characteristics

Values are not guaranteed but typical.

$$R_T = R_{25} (C_0 + C_1 T + C_2 T^2)$$

R₂₅: 25°C

T: (°C)

C₀, C₁, C₂:

R_T: Resistance value at T°C

R₂₅: Resistance value at 25°C

T: Ambient temperature (°C)

C₀, C₁, C₂: Constants

T.C.R. (x10 ⁻⁶ /K)	C ₀	C ₁	C ₂
3000	0.9288	0.0028	1.9983×10 ⁻⁶
3300	0.9232	0.0030	2.9980×10 ⁻⁶
3600	0.9175	0.0032	4.0000×10 ⁻⁶
3900	0.9099	0.0035	4.0064×10 ⁻⁶
4200	0.9026	0.0038	3.9964×10 ⁻⁶
4500	0.8948	0.0041	4.0064×10 ⁻⁶

Performance Characteristics

Parameters	Performance Requirements $\Delta R \pm (\% + 0.05\Omega)$		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	–	25°C
T.C.R.	Within specified T.C.R.	–	+25°C/+75°C
Overload (Short Time)	1%	0.02%	Rated voltage × 2.5 or Max. overload Vol., whichever is lower, for 5 seconds
Resistance to Soldering Heat	1%	0.10%	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	2% : TCR≤+3300 5% : TCR≥+3600	0.53% 2.59%	-55°C (30min.)/+155°C (30min.), 1000 cycles
Moisture Resistance	3%	0.15%	85°C ± 2°C, 85% ± 5% RH, 1/10 rated power, 1.5h ON/0.5h OFF cycle. 1000 hours
Endurance at 85°C	2% : TCR≤+3300 5% : TCR≥+3600	0.30% 0.76%	85°C ± 2°C, 1000 hours 1.5h ON/0.5h OFF cycle.
High Temperature Load Life	2% : TCR≤+3300 5% : TCR≥+3600	0.40% 2.17%	125°C, Rated voltage, 1000 hours
High temperature Exposure	2% : TCR≤+3300 5% : TCR≥+3600	0.81% 3.20%	155°C, 1000h
Low Temperature Exposure	2%	-0.10%	-55°C, 1000h

Please pay attention not to be applied ESD, it may cause of resistance change.

Actual Value (Out of guarantee)

Test Items	Reference	Test Methods
ESD	500V	Human Body Model, 100pF, 1.5kΩ

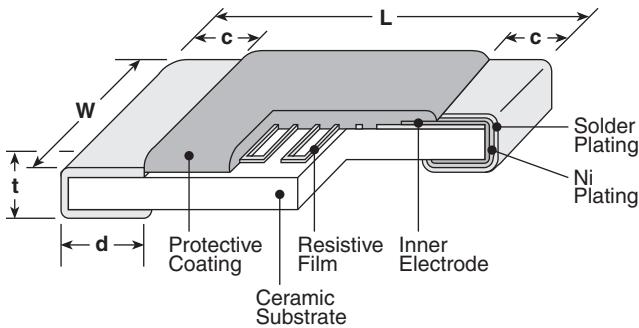
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 11/20/14



features

- Anti-leaching nickel barrier terminations
- Twenty-five specifiable temperature characteristics
- SMD thin film resistor with thermo-perceptivity
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+.02} _{.01})	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.008 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.02} _{.01})	.024±.004 (0.6±0.1)

ordering information

LT73	2B	T	TD	101	J	1000
Type	Size Code	Termination Material	Packaging	Resistance Value	Tolerance	T.C.R.
2A: 0805 2B: 1206		T: Sn (Other termination styles available, contact factory for options)	TD: 7" paper taping (5,000 pieces/reel) TE: 7" embossed plastic (4,000 pieces/reel)	2 significant figures + 1 multiplier	G: ±2% J: ±5%	

applications and ratings

Part Designation	Power Rating	Maximum Working Voltage	Maximum Overload Voltage	Thermal Time Constant	Thermal Dissipation Constant	Rated Ambient Temperature	Operating Temperature Range
LT732A	0.1W	50V	100V	1.0s	1.37mW/°C	+70°C	-40°C to +125°C
LT322B	0.125W	75V	150V	1.5s	1.47mW/°C		

Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings

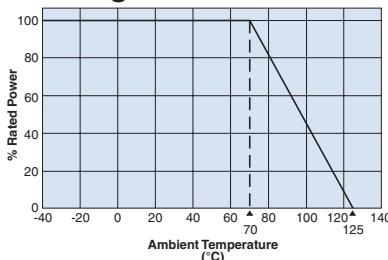
T.C.R. ($\times 10^{-6}/\text{K}$)	T.C.R. Tolerance	Resistance Range E-24		Resistance Tolerance
		LT732A	LT732B	
150, 250, 350, 450, 500	$\pm 100 \times 10^{-6}/\text{K}$	2k Ω - 24k Ω	2k Ω - 51k Ω	G: $\pm 2\%$
600, 700, 800, 900		1k Ω - 20k Ω	1k Ω - 43k Ω	
1000, 1200, 1400		1k Ω - 13k Ω	1k Ω - 27k Ω	
1600, 1800		510 Ω - 4.7k Ω	1k Ω - 10k Ω	
2000, 2200, 2400		510 Ω - 4.7k Ω	510 Ω - 9.1k Ω	
2600, 2800, 3000		510 Ω - 3.0k Ω	510 Ω - 6.2k Ω	
3300, 3600, 3900		510 Ω - 3.0k Ω	510 Ω - 6.2k Ω	
4200		100 Ω - 1k Ω	100 Ω - 2k Ω	
4500		51 Ω - 510 Ω	51 Ω - 510 Ω	
				J: $\pm 5\%$

T.C.R. Measuring Temperature: +25°C ~ +75°C

Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance value}}$ or Max. working voltage, whichever is lower.

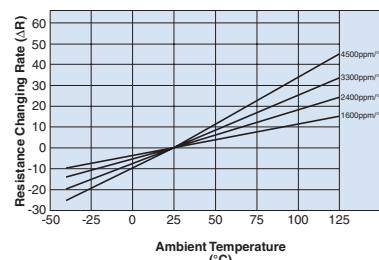
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

Examples of Temperature Characteristics of Resistance



Approximate Expression for Resistance-Temperature Characteristics

Values are not guaranteed but typical.

$R_T = R_{25} (C_0 + C_1 T + C_2 T^2)$ R_T : T°C R_T : Resistance value at T°C
 R_{25} : 25°C R_{25} : Resistance value at 25°C
 T : (°C) T: Ambient temperature (°C)
 C_0, C_1, C_2 : C_0, C_1, C_2 : Constants

T.C.R. ($\times 10^{-6}/\text{K}$)	C_0	C_1	C_2
3000	0.9288	0.0028	1.9983×10^{-6}
3300	0.9232	0.0030	2.9980×10^{-6}
3600	0.9175	0.0032	4.0000×10^{-6}
3900	0.9099	0.0035	4.0064×10^{-6}
4200	0.9026	0.0038	3.9964×10^{-6}
4500	0.8948	0.0041	4.0064×10^{-6}

Performance Characteristics

Parameter	Requirement $\Delta R \pm (\% + 0.05\Omega)$ Limit	Typical	Test Method
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+75°C
Overload (Short time)	$\pm 1.0\%$	$\pm 0.23\%$	Rated voltage x 2.5 or maximum overload volume for 5 seconds, whichever is lower
Resistance to Solder Heat	$\pm 1.0\%$	$\pm 0.1\%$	260°C $\pm 5^\circ\text{C}$, 10 seconds ± 1 second
Rapid Change of Temperature	$\pm 1.0\%$	$\pm 0.1\%$	-40°C (30 minutes)/ +125°C (30 minutes), 5 cycles
Moisture Resistance	$\pm 3.0\%$	$\pm 0.54\%$	40°C $\pm 2^\circ\text{C}$, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle
Endurance at 70°C	$\pm 3.0\%$	$\pm 0.62\%$	70°C $\pm 2^\circ\text{C}$, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle

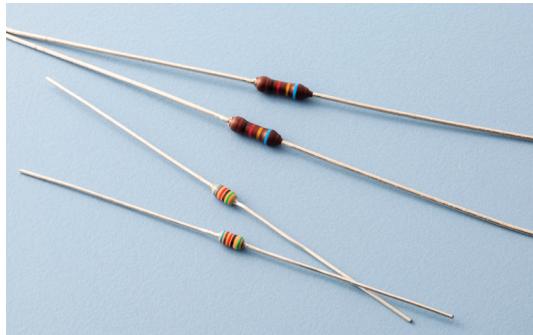
Confirming resistance drift is recommended since this product has a tendency to have bigger resistance change than general flat chip over 70°C.
Please pay attention not to be applied ESD, it may cause of resistance change.

Actual Value (Out of Guarantee)

Test Items	Reference	Test Method
Low Temperature Exposure	$\pm 0.05\%$	-40°C, 45 minutes
High Temperature Exposure	$\pm 0.6\%$	125°C, 1000 hours
ESD	500V	Human Body Model, 100 pF 1.5 k Ω

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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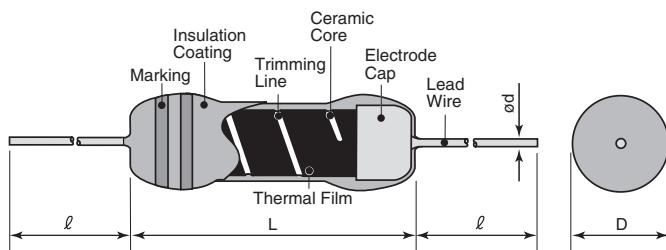


features

- LP series is thin-film thermal sensors and accommodates resistance tolerance $\pm 1\%$ and high T.C.R. $+5000 \times 10^{-6}/K$ with the standard products
- Suitable for control of temperatures for various industrial equipment
- Products meet EU RoHS requirements



dimensions and construction



Type	Dimensions inches (mm)			
	L	D	d (Nom.)	I
LP 1/16	.138 ^{.008} _{.016} (3.5 ^{.02} _{.04})	.067±.008 (1.7±0.2)	.020±.002 (0.5±0.05)	1.18±.118 (30±3)
LP 1/8	.25±.031 (6.35±0.8)	.090±.008 (2.3±0.2)	.026±.002 (0.65±0.05)	1.50±.118 (38±3)

ordering information

LP	1/8	C	T26	A	103	J	362
Product Code	Power Rating	Termination Surface Material	Taping	Packaging	Nominal Resistance	Resistance Tolerance	Symbol of T.C.R.
1/16: 0.063W 1/8: 0.125W	C: SnCu	Nil: Bulk T26: 26mm Taping T52: 52mm Taping	Nil: Bulk A: AMMO	3 digits	F: ±1% G: ±2% J: ±5%	3 digits 151: 150 362: 3600	

applications and ratings

Type	Power Rating	Thermal Time Constant	Thermal Dissipation Constant*	Rated Ambient Temperature	Operating Temperature Range
LP1/16C	0.063W	8s	2.5mW/°C	+70°C	-55°C–150°C
LP1/8C	0.125W	14s	4.5mW/°C		

* Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

T.C.R. ($\times 10^{-6}/K$)	T.C.R. Tolerance	(Ω) Resistance Range (E24 & 2.5, 5.0×10^6)						
		LP1/16			LP1/8			
		F:±1%	G:±2%	J:±5%	F:±1%	G:±2%	J:±5%	
150, 250, 350	$\pm 50 \times 10^{-6}/K$	-	150–10k	150–10k	-	150–51k0	150–51k0	
450			150–30k	150–30k		150–100k	150–100k	
550, 650, 750, 850	$\pm 10\%$	100–30k	10–30k	1–30k	100–100k	10–100k	1–100k	
950, 1000, 1200			100–10k	10–10k		100–51k	10–51k	
1400, 1600, 1800			1–10k	1–10k		100–20k	10–20k	
2000, 2200, 2400						1–51k	1–20k	
2500	$\pm 5\%$	100–20k	100–30k	10–30k	100–100k	10–100k	1–100k	
3000			100–10k	10–10k		100–51k	10–51k	
3300			1–10k	1–10k		100–20k	10–20k	
3600						1–51k	1–20k	
4000, 4500, 5000						1–20k	1–20k	

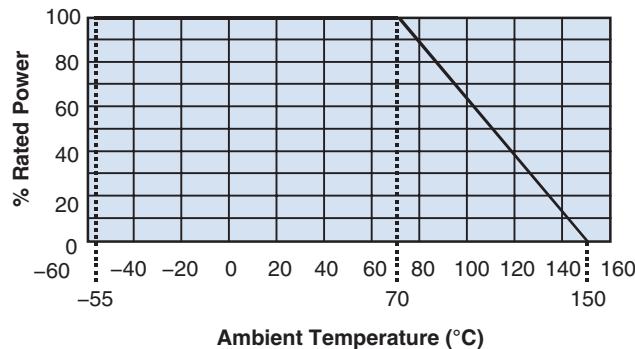
T.C.R. Measuring Temperature: +25°C/+65°C. T.C.R. is guaranteed by random inspections.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

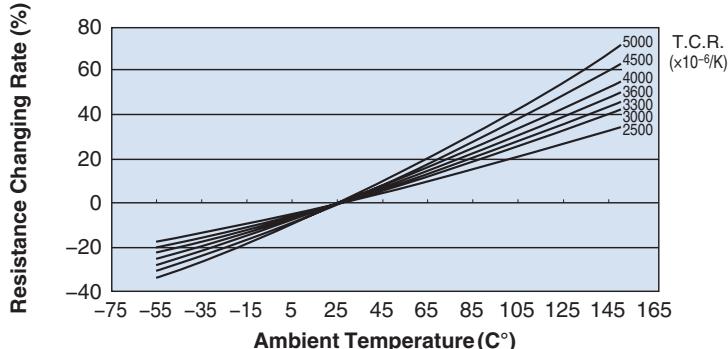
11/30/17

environmental applications

Derating Curve



Examples of Temp. Characteristics of Resistance



Approximate Expression for Resistance- Temperature Characteristics

Values are not guaranteed but typical.

$R_T = R_{25} (C_0 + C_1 T + C_2 T^2)$ R_T : T°C

R_{25} : 25°C

T: (°C)

C_0, C_1, C_2 :

R_T : Resistance value at T°C

R_{25} : Resistance value at 25°C

T: Ambient temperature (°C)

C_0, C_1, C_2 : Constants

T.C.R. ($\times 10^{-6}/K$)	C_0	C_1	C_2
3000	0.931258	0.00265213	3.90112×10^{-6}
3300	0.924355	0.00292569	4.00516×10^{-6}
3600	0.916356	0.00323714	4.34428×10^{-6}
4000	0.907039	0.00361006	4.33457×10^{-6}
4500	0.897412	0.00395222	6.05201×10^{-6}
5000	0.886014	0.00437224	7.48809×10^{-6}

Performance Characteristics

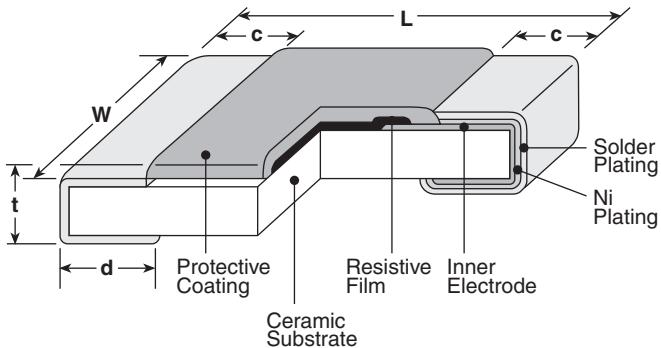
Test Items	Performance Requirements $\Delta R \pm$ (% $\pm 0.05\Omega$)		Test Methods
	Limit	Typical	
Resistance	Within specified tolerance	—	25°C
T.C.R.	Within specified T.C.R.	—	+25°C/+65°C
Overload (Short time)	0.5%	0.2%	Rated voltage $\times 2.5$ for 5 seconds
Resistance to Soldering Heat	0.5%	0.2%	350°C $\pm 10^\circ\text{C}$, 1 second
Rapid Change of Temperature	0.5%	0.2%	-55°C (30min.) /+25°C (10min.)/ +150°C (30min.)/+25°C (10min.) 5 cycles
Moisture Resistance	2%	0.3%	40°C $\pm 2^\circ\text{C}$, 90%–95%RH, 1000h 1.5h ON/0.5h OFF cycle
Endurance at 70°C	2%	0.5%	70°C $\pm 3^\circ\text{C}$, 1000h 1.5h ON/0.5h OFF cycle



features

- Twelve standard resistance values
- Products with lead-free terminations meet EU RoHS requirements. EU RoHS regulation is not intended for Pb-glass contained in electrode, resistor element and glass.

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.02±.004 (0.5±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.004 (1.25±0.1)	.016±.008 (0.4±0.2)	.012 ^{+.008} _{-.004} (0.3 ^{+.2} _{.1})	.02 ^{+.008} _{-.004} (0.5 ^{+.2} _{.1})
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.008 (0.5±0.3)	.016 ^{+.008} _{-.004} (0.4 ^{+.2} _{.1})	.024±.004 (0.6±0.1)

ordering information

NT73	2A	T	TD	103	K	3800	J
Type	Size Code	Termination Material	Packaging	Nominal Resistance	Resistance Tolerance	B Constant Nominal	B Constant Tolerance
	1J: 0603 2A: 0805 2B: 1206	T: Sn (Other termination styles may be available, please contact factory for options)	TD: 7" paper tape (5,000 pieces/reel)	2 significant figures + 1 multiplier	J: ±5% K: ±10% L: ±15%	3200 3500 3700 3800 3950 4100	H: ±3% J: ±5% K: ±10%

applications and ratings

Part Designation	Resistance @ 25°C	Resistance Tolerance	B Constant @ 25°C/75°C	B Constant Tolerance	Power Rating (mW)	Operating Temperature Range		
NT731J	6.8kΩ	J: ±5% K: ±10%	3500K 3800K 3700K	±10%	5	-55°C to +125°C		
	10kΩ			±5%				
	15kΩ			±3%				
	10kΩ		3800K	±5%				
	20kΩ							
	22kΩ							
	30kΩ							
	33kΩ							
	47kΩ							
	68kΩ							
NT732A	100kΩ	J: ±5%; K: ±10% L: ±15%	4100K 3200K	±3%	5			
	47kΩ							
	1kΩ							
	2kΩ		3500K	±10%				
	2.2kΩ							
	2.4kΩ							
	3.3kΩ							
	4.7kΩ							
	5kΩ							

For further information on packaging, please refer to Appendix A.

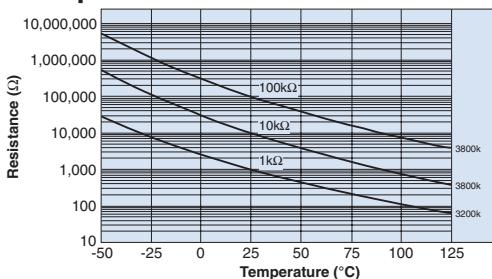
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings (continued)

Part Designation	Resistance @ 25°C	Resistance Tolerance	B Constant @ 25°C/75°C	B Constant Tolerance	Power Rating (mW)	Operating Temperature Range
NT732A	6.8kΩ	K: ±10%; L: ±15%	3800K	±10%	5	-55°C to +125°C
	10kΩ		3500K			
	15kΩ					
	10kΩ					
	20kΩ					
	22kΩ					
	30kΩ					
	33kΩ					
	47kΩ					
	68kΩ					
	100kΩ					
	150kΩ					
	50kΩ	J: ±5% K: ±10% L: ±15%	3800K	±5%		
	10kΩ		3950K			
	15kΩ					
	20kΩ					
	22kΩ					
	30kΩ					
	33kΩ					
	47kΩ					
	68kΩ					
	100kΩ					
	150kΩ					
NT732B	1kΩ	K: ±10% L: ±15%	3200K	±10%	5	-55°C to +125°C
	2.2kΩ		3500K			
	3.3kΩ					
	4.7kΩ					
	6.8kΩ					
	10kΩ	J: ±5% K: ±10% L: ±15%	3800K	±5%		
	22kΩ					
	33kΩ					
	47kΩ					
	68kΩ					
	100kΩ					

Thermal dissipation constant - in the atmosphere - (reference) 1J: 2.0mW/°C, 2A: 2.8mW/°C, 2B: 3.0mW/°C

environmental applications
Temperature Characteristics

Performance Characteristics

Parameter	Requirement	Δ R ±(%+0.05Ω)	Test Method
Resistance	Within specified tolerance	—	25°C
B Constant	Within specified tolerance	—	+25°C/+75°C
Resistance to Solder Heat	Other: ±1%, ±2%:1kΩ	Other: ±0.5%, ±1%:1kΩ	260°C ± 5°C, 10 seconds ± 1 second
Rapid Change of Temperature	±3.0%	±1.3%	-55°C (30 minutes), +125°C (30 minutes), 50 cycles
Moisture Resistance	±3.0%	±1.1%	40°C ± 2°C, 90 - 95% RH, 1000 hours
Load Life	±3.0%	±2.5%	80°C ± 2°C, DC5mW, 1000 hours
High Temperature Exposure	±3.0%	±1.6%	80°C, 1000 hours

Confirming resistance drift is recommended since this product has a tendency to have bigger resistance change than general flat chip over 80°C.
Please pay attention not to be applied ESD, it may cause of resistance change.

Actual Value (Out of Guarantee)

Test Items	Reference	Test Method
High Temperature Exposure	±7.0%	125°C, 1000 hours
ESD	500V	Human model, 100 pF 1.5 kΩ

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

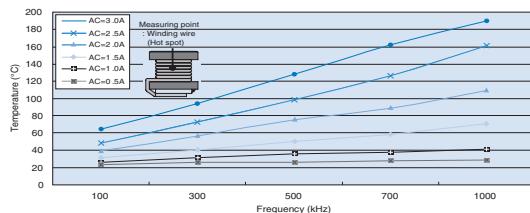
12/12/19

Precautions for the Inductors

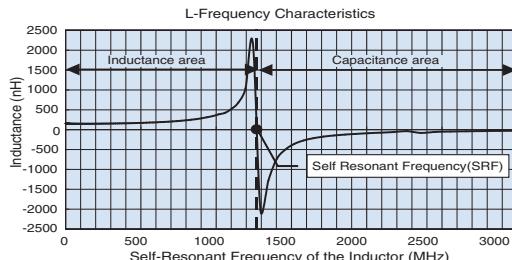
Refer to the precautions of common matters for all products in the beginning of this catalog.

Inductors in General

- Characteristics such as the inductance, Q value etc. are frequency dependent.
- The stress from resin coating and molding can result in change of inductance.
- Since the inductors use ceramic materials, chipping and crack can occur. Please be careful when handling. Excessive vibration and impact could destroy the parts.
- Keep magnetic tweezers and other magnets away from the inductors to avoid change of inductance caused by magnetization. Do not press the wire wound part of the chip inductor with sharp objects.
- The inductance could decrease according to magnetic saturation when the inductor is used exceeding the allowable current. There is also a possibility of disconnection and short-circuit or emitting smoke and ignition caused by the heat generation of the inductor.
- There is a risk of disconnection when excessive current (inrush current) is applied. Change of the characteristics may occur by the magnetization of the core when excessive current is applied to a DC circuit.
- When the parts are used at high-frequency, the heat generation will be larger and the part temperature will be higher compared with DC or low-frequency. This is caused by increasing iron loss and copper loss. Please be careful not to exceed the operating temperature rise by high frequency. Ex. LPC4045



- The electrical characteristics change from the variation of frequency of the parts. When the part is used above the frequency band of the SRF (self-resonant frequency), it will function as a capacitor. Please do not use the parts above the SRF.



Mounting

- Some inductors have magnetic polarities.
- The inductance and Q values of a non-magnetically-shielded inductor could change from magnetic coupling affected by other components, chassis, patterns, etc. When mounting in high density, check the characteristic in advance with the actual equipment. Additionally, take care of the positioning of the components since closely mounted inductors may cause magnetic coupling. Do not place large magnetic materials like audio speakers, etc. near the inductors.
- Do not expose the inductors to the heat radiation from other high temperature parts.

Reference

- For basic precautions, please refer to the Technical report of JEITA RCR-2501C Safety application guide for inductors for use in electronic equipment.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/11/19

Terms and Definitions

Nominal Inductance

- Inductance that the inductor is designed to have and generally indicated on the body.

Q Value (Quality factor)

- A coefficient that shows the quality of the inductors. It is calculated from the following formula shown below.

$$Q = \frac{wL}{R}$$

w = Angular Frequency ($w=2\pi f$)
L = Inductance
R = Resistance

Self-Resonant Frequency

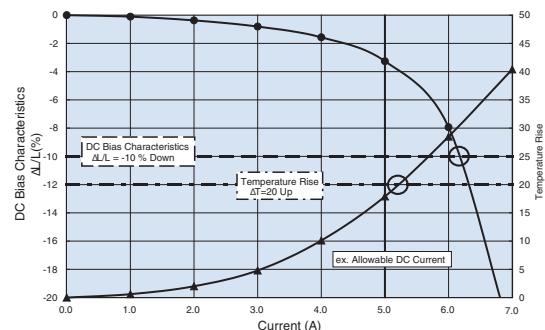
- Frequency that resonance occurs by the distribution capacity and inductance of the inductor.

DC Resistance Value

- Resistance value at DC.

Allowable DC Current

- Upper limit of the current which is set to assure the safe use of the inductor.
- It is defined as the smaller DC current value of either the DC superposition or the surface temperature rise characteristics.
- DC superposition characteristic is a phenomenon which occurs when the inductors, made with magnetic materials such as ferrite, have a large DC current applied. When this occurs, the inductance drops because of the magnetic saturation.
- The plot below shows the relationship between the DC superposition and the surface temperature rise..



Iron Loss

- Electrical energy that is lost when the wire wound magnetic material is magnetized by the applied AC. It is calculated by the sum of hysteretic loss and eddy-current loss.

Copper Loss

- Energy that is transformed into Joule heat by the resistance of the wound wire. The Copper loss increases in the high frequency band from the skin effect.

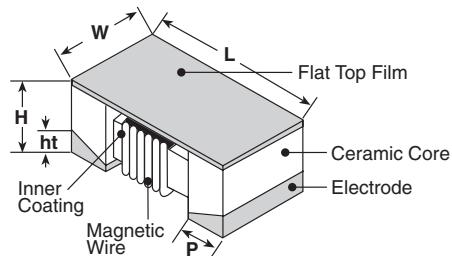


features

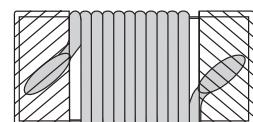
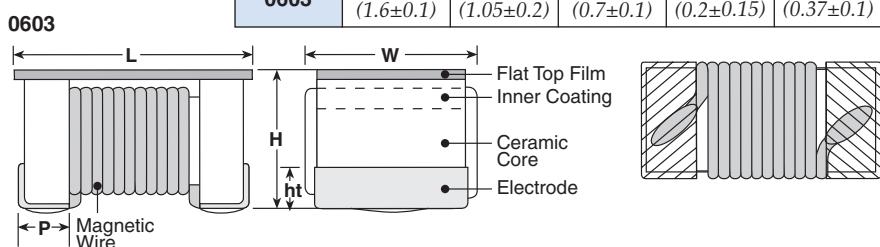
- Low DC resistance and high allowable DC current
- Low profile style 0.027 inches (0.7mm) typical
- Suitable for reflow soldering
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction

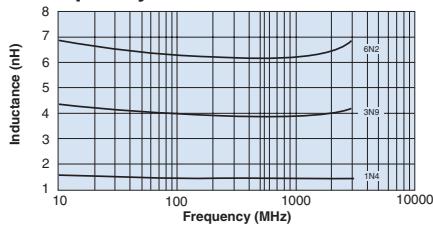
0402, 0603



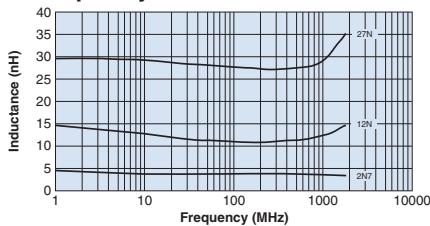
Size Code	Dimensions inches (mm)				
	L	W	H	Ht	P
0402	.039±.004 (1.0±0.1)	.020±.004 (0.5±0.1)	.022±.004 (0.55±0.1)	.006±.004 (0.15±0.1)	.008±.004 (0.2±0.1)
0603	.063±.004 (1.6±0.1)	.041±.008 (1.05±0.2)	.028±.004 (0.7±0.1)	.008±.006 (0.2±0.15)	.015±.004 (0.37±0.1)



L-Frequency Characteristics - 0402



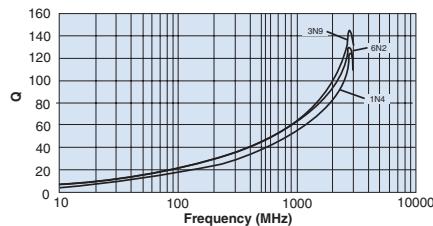
L-Frequency Characteristics - 0603



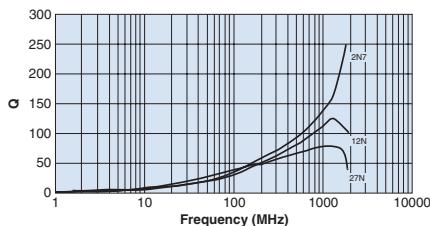
Test equipment:

Agilent 4991 A Impedance analyzer (KQC0402)
Agilent 4291 A Impedance analyzer (KQC0603)

Q-Frequency Characteristics - 0402



Q-Frequency Characteristics - 0603



ordering information

KQC	0603	T	TE	12N	J
Type	Size Code	Termination Material	Packaging	Nominal Inductance	Tolerance
	0402 0603	T: Sn	TP: 2mm pitch paper (0402: 10,000 pieces/reel) TE: 4mm pitch embossed plastic (0603: 2,000 pieces/reel) TD: 4mm pitch paper (0402: 2,000 pieces/reel)	3 digits 10N: 10nH 1N2: 1.2nH	B: ±0.1nH C: ±0.2nH G: ±2% J: ±5%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings

Part Designation	Nominal Inductance (nH)	L Measuring Frequency	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (GHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (A)		
KQC0402T**1N4*	1.4	250	B: $\pm 0.1\text{nH}$	25	250	11.0	0.019	1.40		
KQC0402T**1N5*	1.5					10.0				
KQC0402T**1N6*	1.6					9.6				
KQC0402T**1N7*	1.7					8.5				
KQC0402T**2N5*	2.5					8.0				
KQC0402T**2N7*	2.7		C: $\pm 0.2\text{nH}$	29		7.2	0.028	1.20		
KQC0402T**3N0*	3.0					6.6				
KQC0402T**3N3*	3.3					7.3				
KQC0402T**3N9*	3.9					7.0	0.036	1.00		
KQC0402T**4N3*	4.3					6.6				
KQC0402T**4N7*	4.7	250	J: $\pm 5\%$	35	250	5.6	0.045	0.90		
KQC0402T**6N2*	6.2					18				
KQC0603TTE1N2*	1.2					6.0				
KQC0603TTE2N7*	2.7					5.5				
KQC0603TTE4N7*	4.7					4.0				
KQC0603TTE5N6*	5.6		G: $\pm 2\%$ J: $\pm 5\%$			3.0	0.065	1.25		
KQC0603TTE7N5*	7.5					2.5				
KQC0603TTE8N2*	8.2					0.055				
KQC0603TTE10N*	10					0.065				
KQC0603TTE12N*	12					0.090				
KQC0603TTE15N*	15					0.100				
KQC0603TTE18N*	18					0.120				
KQC0603TTE22N*	22									
KQC0603TTE27N*	27									

* Add tolerance character (B, C, J, G)

** Add packaging character (TD, TP)

Operating Temperature Range: $-40^\circ\text{C} \sim +125^\circ\text{C}$

The operating temperature range of the coil (ambient temperature + self heating) must remain at $+125^\circ\text{C}$ or less

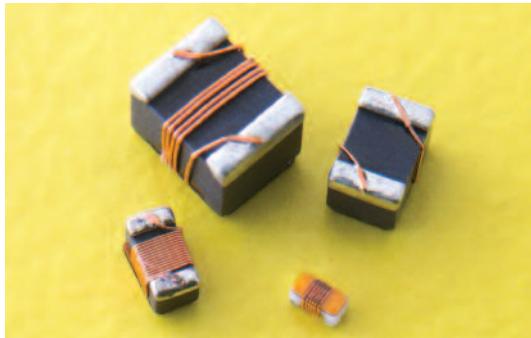
environmental applications

Performance Characteristics

Parameter	Requirements Maximum Limit	$\Delta L/L$	$\Delta Q/Q$	Test Method
Resistance to Soldering Heat	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 1.2\%$ $\Delta Q/Q: \pm 2.7\%$		$260^\circ\text{C} \pm 5^\circ\text{C}$, 10s ± 1 s
Rapid Change of Temperature	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 1.9\%$ $\Delta Q/Q: \pm 3.9\%$		-40°C (30min.) / $+125^\circ\text{C}$ (30min.) 100 cycles
Low Temperature Exposure	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 2.0\%$ $\Delta Q/Q: \pm 4.1\%$		$-40^\circ\text{C} \pm 2^\circ\text{C}$, 1000h
High Temperature Exposure	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 1.8\%$ $\Delta Q/Q: \pm 3.3\%$		$125^\circ\text{C} \pm 2^\circ\text{C}$, 1000h
Moisture Exposure	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 1.7\%$ $\Delta Q/Q: \pm 3.3\%$		$40^\circ\text{C} \pm 2^\circ\text{C}$, 90%~95%RH, 1000h
Resistance to Solvent	No damage and marking shall remain legible	—		Accordance with MIL-STD 202F Method 215

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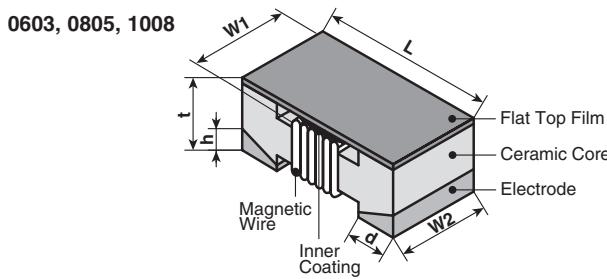
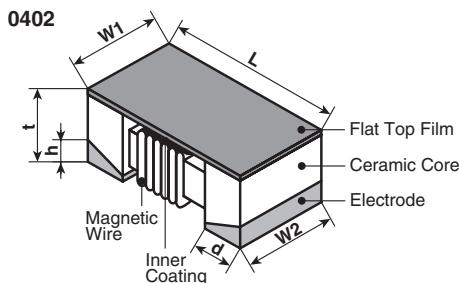
11/30/17



features

- Surface mount
- Operating temperature: -40°C ~ +125°C
- Flat top suitable for high speed pick-and-place components
- Excellent high frequency applications
- High Q factors and self-resonant frequency values
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Qualified

dimensions and construction



Size Code	Dimensions inches (mm)					
	L	W1	W2	t	h	d
KQT0402	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.02±.004 (0.5±0.1)	.022±.004 (0.55±0.1)	.006±.004 (0.15±0.1)	.01±.004 (0.25±0.1)
KQ0603	.063±.004 (1.6±0.1)	.039±.004 (1.0±0.1)	.033±.004 (0.85±0.1)	.035±.004 (0.9±0.1)	.01±.006 (0.25±0.15)	.014±.004 (0.35±0.1)
KQ0805	.079±.008 (2.0±0.2)	.059±.008 (1.5±0.2) (3.3nH-390nH)	.063±.008 (1.6±0.2) (470nH-820nH)	.053±.004 (1.35±0.1)	.051±.008 (1.3±0.2)	.016±.006 (0.40±0.15)
KQ1008	.098±.008 (2.5±0.2)	.087±.008 (2.2±0.2)	.079±.004 (2.0±0.1)	.071 ^{.008} _{.0} (1.8 ^{+0.2} ₋₀)	.018±.006 (0.45±0.15)	.018±.004 (0.45±0.1)

ordering information

KQ	1008	T	TE	10N	J
Type	Size Code	Termination Material	Packaging	Nominal Inductance	Tolerance
KQ KQT	0402 0603 0805 1008	T: Sn	TP: 2mm pitch paper (0402: 10,000 pieces/reel) TD: 7" paper tape (0402: 2,000 pieces/reel) TE: 7" embossed plastic (0603, 0805, 1008: 2,000 pieces/reel)	3 digits: 10N: 10nH R10: 0.1µH 1R0: 1.0µH	B: ±0.1nH C: ±0.2nH G: ±2% H: ±3% J: ±5% K: ±10% M: ±20%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)
KQT0402T**1N0*		1.0			16		11000	0.045	1360
KQT0402T**1N9*		1.9				9600	0.070		1040
KQT0402T**2N0*		2.0		B: ±0.1nH C: ±0.2nH	19				960
KQT0402T**2N2*		2.2			18			0.068	
KQT0402T**2N4*		2.4			17		8000	0.120	700
KQT0402T**2N7*		2.7							
KQT0402T**3N3*		3.3				7200	0.066		840
KQT0402T**3N6*		3.6			19				
KQT0402T**3N9*		3.9			18		6000	0.091	
KQT0402T**4N3*		4.3							800
KQT0402T**4N7*		4.7				5800	0.083		760
KQT0402T**5N1*		5.1				4800	0.086		
KQT0402T**5N6*		5.6				5800	0.104		680
KQT0402T**6N2*		6.2				4400			
KQT0402T**6N8*		6.8				4200	0.150	650	
KQT0402T**7N5*		7.5				4160	0.104	680	
KQT0402T**8N2*		8.2				4000	0.150	650	
KQT0402T**8N7*		8.7				3900	0.195	480	
KQT0402T**9N0*		9.0				3680	0.120		640
KQT0402T**9N5*		9.5				3600			
KQT0402T**10N*		10				3450	0.180		
KQT0402T**11N*		11				3280	0.172		560
KQT0402T**12N*		12				3100	0.200		
KQT0402T**13N*		13		H: ±3% J: ±5% K: ±10%	24		0.230		500
KQT0402T**15N*		15				3040	0.202	480	
KQT0402T**16N*		16				3000	0.250	450	
KQT0402T**18N*		18				2800	0.323		
KQT0402T**19N*		19				2720	0.214		
KQT0402T**20N*		20				2700	0.322		
KQT0402T**22N*		22				2480	0.298		400
KQT0402T**23N*		23					0.354		
KQT0402T**24N*		24				2400	0.393		
KQT0402T**27N*		27					0.550	340	
KQT0402T**30N*		30					2320	0.560	320
KQT0402T**33N*		33					2300	0.550	300
KQT0402T**34N*		34			24		2240	0.620	320
KQT0402T**36N*		36					2200	0.810	300
KQT0402T**39N*		39						0.830	150
KQT0402T**40N*		40					2100	0.835	240
KQT0402T**43N*		43						2800	1.170
KQT0402T**47N*		47						2000	1.120
KQT0402T**51N*		51						1800	1.810
KQT0402T**56N*		56						1600	2.090
KQT0402T**68N*		68						1500	2.320
KQT0402T**82N*		82							120
KQT0402T**R10*		100							
KQT0402T**R12*		120							

* Add tolerance character (B, C, G, H, J, K, M)

** Add packaging code

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applications and ratings (continued)

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	
KQ0603TTE1N6*	C	1.6	250	J: ±5% K: ±10%	24	250	12500	0.03	700	
KQ0603TTE1N8*	0	1.8			16		6900	0.045		
KQ0603TTE3N3*	X	3.3			22		5900	0.055		
KQ0603TTE3N6*	E	3.6			20		5800	0.063		
KQ0603TTE3N9*	1	3.9			27		4800	0.08		
KQ0603TTE4N3*	F	4.3			28		4600	0.116		
KQ0603TTE4N7*	G	4.7			31		4800	0.115		
KQ0603TTE5N1*	Y	5.1			33		4000	0.11		
KQ0603TTE6N8*	2	6.8			35		3300	0.106		
KQ0603TTE7N5*	H	7.5			37		3100	0.12		
KQ0603TTE8N2*	A	8.2			34		3000	0.109		
KQ0603TTE8N7*	J	8.7			35		2700	0.125		
KQ0603TTE9N5*	B	9.5			38		2650	0.13		
KQ0603TTE10N*	3	10			37		2800	0.086		
KQ0603TTE11N*	K	11			40		2250	0.13		
KQ0603TTE12N*	4	12			37		2300	0.17		
KQ0603TTE15N*	5	15			40		2080	0.22		
KQ0603TTE16N*	L	16			38		2200	0.19		
KQ0603TTE18N*	6	18			40		2000	0.135		
KQ0603TTE22N*	7	22			39		1900	0.25		
KQ0603TTE23N*	S	23			38		1700	0.28		
KQ0603TTE24N*	M	24			37		1900	0.30		
KQ0603TTE27N*	8	27			37		1400	0.31		
KQ0603TTE30N*	N	30			34		1350	0.49	400	
KQ0603TTE33N*	9	33			32		1300	0.54		
KQ0603TTE36N*	P	36			32		1400	0.58		
KQ0603TTE39N*	0	39			32		1350	0.61		
KQ0603TTE43N*	Q	43			25	100	1300	0.65	300	
KQ0603TTE47N*	1	47			24		1200	1.4		
KQ0603TTE51N*	T	51			24		1000	2.2		
KQ0603TTE56N*	2	56			24		900	2.3		
KQ0603TTE68N*	3	68			24		840	2.5		
KQ0603TTE72N*	4	72			24		800	2.4		
KQ0603TTE82N*	5	82			24		700	3.0		
KQ0603TTER10*	6	100	150	G: ±2% J: ±5% K: ±10%	34	100	1300	2.3	140	
KQ0603TTER11*	7	110			32		1200	2.17		
KQ0603TTER12*	8	120			32		1000	2.09		
KQ0603TTER15*	9	150			25		900	2.04		
KQ0603TTER18*	0	180			25		840	1.99		
KQ0603TTER20*	U	200			24		800	1.95		
KQ0603TTER21*	V	210			24		700	1.91		
KQ0603TTER22*	1	220	50		30	50	640	1.87	130	
KQ0603TTER25*	W	250			30		610	1.83		
KQ0603TTER27*	2	270			30		560	1.79		
KQ0603TTER30*	X	300			30		590	1.75		
KQ0603TTER33*	3	330			30		590	1.71		
KQ0603TTER39*	4	390			30		590	1.67		
KQ0603TTER47*	5	470			30		590	1.63		
KQ0603TTER51*	V	510			30		590	1.59		
KQ0603TTER56*	6	560			30		590	1.55		
KQ0603TTER62*	W	620			30		590	1.51		

* Add tolerance character (B, C, G, H, J, K, M)

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applications and ratings (continued)

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)
KQ0603TTER68*	7	680	50	J: ±5% K: ±10%	30	50	540	1.97	140
KQ0603TTER72*	C	720					530	2.04	130
KQ0603TTER75*	X	750					490	3.09	110
KQ0603TTER82*	8	820					480	2.95	120
KQ0603TTER91*	Y	910					440	5.13	90
KQ0603TTE1R0*	9	1000					400	5.45	80
KQ0603TTE1R2*	0	1200							
KQ0805TTE3N3*	0	3.3	250	J: ±5% K: ±10%	50	1500	6000	0.08	600
KQ0805TTE6N8*	1	6.8					5500	0.11	
KQ0805TTE8N2*	2	8.2					4700	0.12	
KQ0805TTE12N*	3	12					4000	0.15	
KQ0805TTE15N*	4	15					3400	0.17	
KQ0805TTE18N*	5	18					3300	0.20	
KQ0805TTE20N*	Y	20					2600	0.22	
KQ0805TTE22N*	6	22	200	G: ±2% J: ±5% K: ±10%	55	1000	2500	0.25	500
KQ0805TTE27N*	7	27					2050	0.27	
KQ0805TTE33N*	8	33					2000	0.29	
KQ0805TTE39N*	9	39					1650	0.34	
KQ0805TTE43N*	4	43					1550	0.31	
KQ0805TTE47N*	0	47					1450	0.34	
KQ0805TTE56N*	1	56					1300	0.38	
KQ0805TTE68N*	2	68	150	G: ±2% J: ±5% K: ±10%	60	500	1200	0.42	400
KQ0805TTE82N*	3	82					1100	0.46	
KQ0805TTER10*	4	100					920	0.51	
KQ0805TTER12*	5	120					870	0.56	
KQ0805TTER15*	6	150					850	0.64	
KQ0805TTER16*	H	160					650	1.0	350
KQ0805TTER17*	J	170					600	1.4	310
KQ0805TTER18*	7	180	100	J: ±5% K: ±10%	48	250	560	1.5	290
KQ0805TTER19*	D	190					600	1.4	310
KQ0805TTER20*	E	200					560	1.5	290
KQ0805TTER21*	F	210					600	1.4	310
KQ0805TTER22*	8	220					560	1.5	290
KQ0805TTER23*	K	230					600	1.4	310
KQ0805TTER24*	L	240					560	1.5	290
KQ0805TTER25*	G	250	50	J: ±5% K: ±10%	33	100	4100	0.08	1000
KQ0805TTER27*	9	270					3300	0.09	
KQ0805TTER33*	0	330					3000	0.10	
KQ0805TTER39*	1	390					2500	0.11	
KQ0805TTER47*	2	470					2400	0.12	
KQ0805TTER56*	3	560		25	23	50	1600	0.13	
KQ0805TTER68*	4	680					1600	0.14	
KQ0805TTER72*	A	720							
KQ0805TTER82*	5	820							
KQ1008TTE10N*	10N	10	50	J: ±5% K: ±10% M: ±20%	50	500	4100	0.08	1000
KQ1008TTE12N*	12N	12					3300	0.09	
KQ1008TTE15N*	15N	15					3000	0.10	
KQ1008TTE18N*	18N	18					2500	0.11	
KQ1008TTE22N*	22N	22					2400	0.12	
KQ1008TTE27N*	27N	27		350	55	350	1600	0.13	
KQ1008TTE33N*	33N	33					1600	0.14	

* Add tolerance character (C, G, H, J, K, M)

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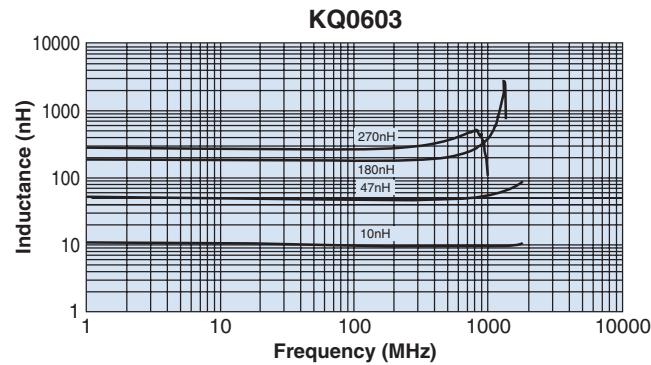
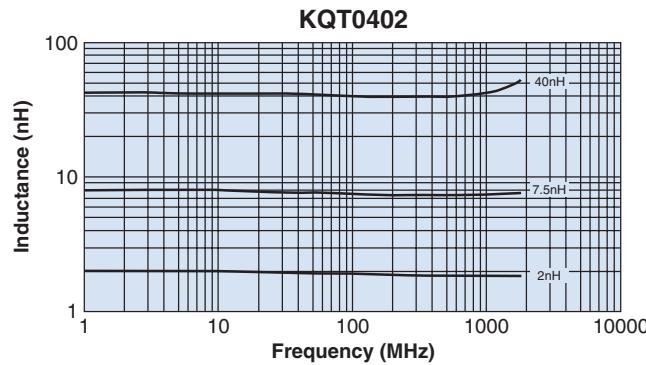
applications and ratings (continued)

Part Designation	Marking	Nominal Inductance (nH)	L Measuring Frequency (MHz)	Inductance Tolerance	Q Quality Factor Minimum	Q Measuring Frequency (MHz)	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)
KQ1008TTE39N*	39N	39	50	J: ±5%, K: ±10% M: ±20%	60	350	1500	0.15	1000
KQ1008TTE47N*	47N	47			65		1300	0.16	
KQ1008TTE56N*	56N	56			60		1000	0.18	
KQ1008TTE68N*	68N	68			60		950	0.20	
KQ1008TTE82N*	82N	82			60		850	0.22	
KQ1008TTER10*	R10	100			60		750	0.56	650
KQ1008TTER12*	R12	120			60		700	0.63	
KQ1008TTER15*	R15	150			60		600	0.70	580
KQ1008TTER18*	R18	180			60		570	0.77	620
KQ1008TTER22*	R22	220			60		500	0.84	500
KQ1008TTER27*	R27	270	25	G: ±2% J: ±5% K: ±10%	45	100	450	0.91	500
KQ1008TTER33*	R33	330			45		415	1.05	450
KQ1008TTER39*	R39	390			45		375	1.12	470
KQ1008TTER47*	R47	470			45		360	1.19	400
KQ1008TTER56*	R56	560			45		350	1.33	300
KQ1008TTER62*	R62	620			45		320	1.40	400
KQ1008TTER68*	R68	680			45		300	1.47	270
KQ1008TTER75*	R75	750			45		280	1.54	360
KQ1008TTER82*	R82	820			45		250	1.61	400
KQ1008TTER91*	R91	910			35	50	220	1.68	380
KQ1008TTE1R0*	1R0	1000			35		200	1.75	370
KQ1008TTE1R2*	1R2	1200			35		180	1.6	310
KQ1008TTE1R5*	1R5	1500			35		160	1.7	300
KQ1008TTE1R8*	1R8	1800			28		140	1.9	270
KQ1008TTE2R2*	2R2	2200			28		120	2.2	250
KQ1008TTE2R7*	2R7	2700			22	25	110	2.3	230
KQ1008TTE3R3*	3R3	3300			22		100	2.7	210
KQ1008TTE3R9*	3R9	3900			22		90	2.8	200
KQ1008TTE4R7*	4R7	4700			20		80	3.1	170
KQ1008TTE5R6*	5R6	5600			20		70	3.0	150
KQ1008TTE6R8*	6R8	6800			15	7.9	65	3.4	150
KQ1008TTE8R2*	8R2	8200			15		60	2.5	240
KQ1008TTE100*	100	10000			15		50	2.8	200
					15		40	3.0	170

* Add tolerance character (C, G, H, J, K, M)

Operating Temperature Range: -40°C ~ +125°C

The operating temperature range of the coil (ambient temperature + self heating) must remain at +125°C or less

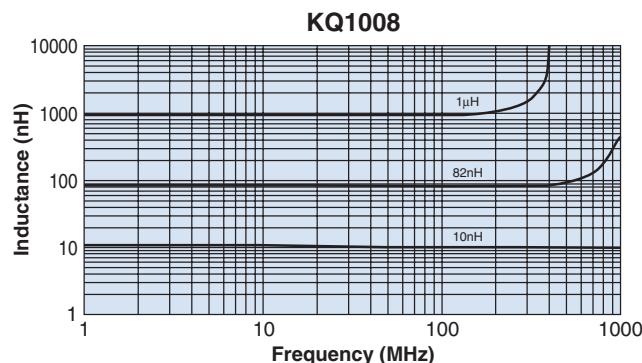
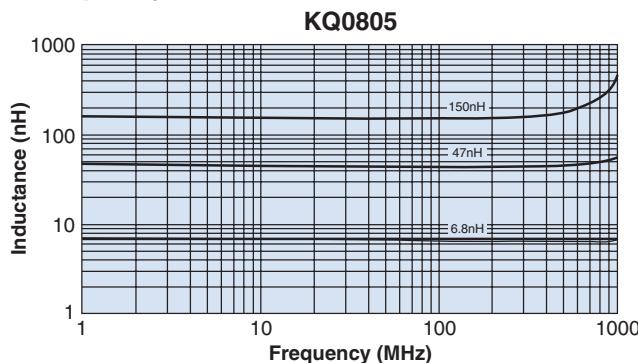
environmental applications
L-Frequency Characteristics


Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

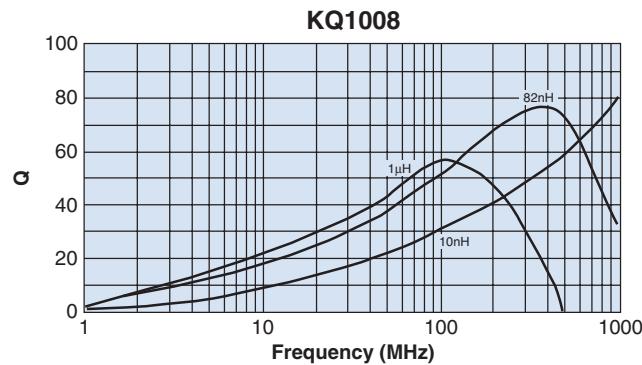
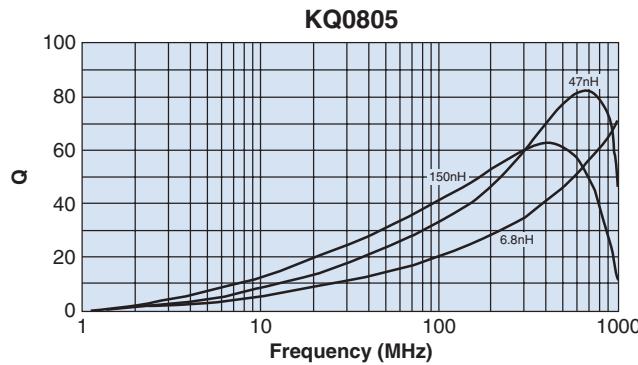
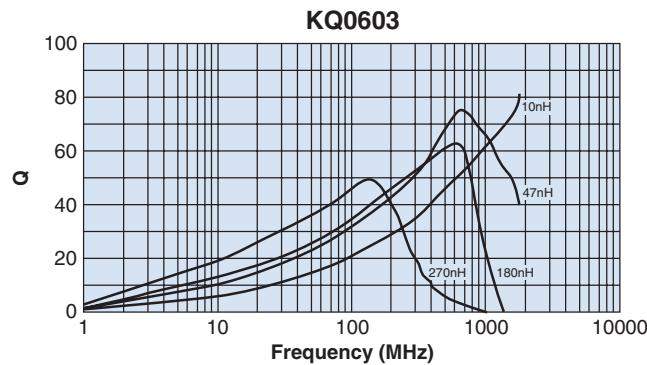
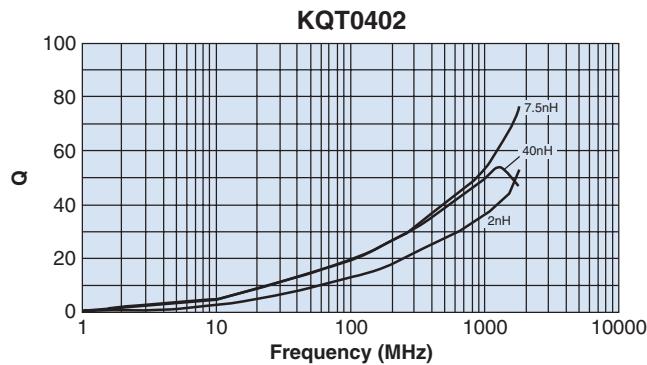
12/19/17

environmental applications (continued)

L-Frequency Characteristics



Q-Frequency Characteristics



Test equipment: HP4291A impedance analyzer

Performance Characteristics

Parameter	Requirements Maximum Limit	$\Delta L/L$	$\Delta Q/Q$	Test Method
		Typical		
Resistance to Soldering Heat	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 2.7\%$ $\Delta Q/Q: \pm 6.6\%$		$260^\circ C \pm 5^\circ C$, 10s ± 1 s
Rapid Change of Temperature	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 2.1\%$ $\Delta Q/Q: \pm 5.3\%$		$-40^\circ C$ (30min.) / $+125^\circ C$ (30min.) 100 cycles
Low Temperature Exposure	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 1.8\%$ $\Delta Q/Q: \pm 2.8\%$		$-40^\circ C \pm 2^\circ C$, 1000h
High Temperature Exposure	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 1.8\%$ $\Delta Q/Q: \pm 5.3\%$		$125^\circ C \pm 2^\circ C$, 1000h
Moisture Exposure	No significant abnormality in appearance $\Delta L/L: \pm 5\%$, $\Delta Q/Q: \pm 10\%$	$\Delta L/L: \pm 0.9\%$ $\Delta Q/Q: \pm 6.9\%$		$40^\circ C \pm 2^\circ C$, 90%~95%RH, 1000h
Resistance to Solvent	No damage and marking shall remain legible	—		Accordance with MIL-STD 202F Method 215

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/30/17

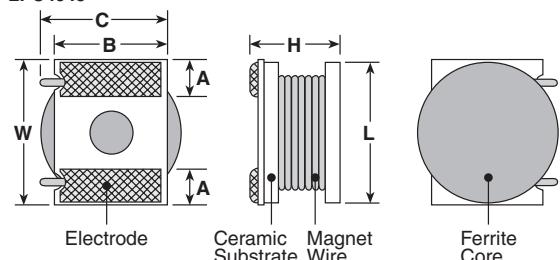


features

- Low DC resistance and high allowable current are realized by the original construction and wiring technology
- Automatic surface mounting is applicable
- Excellent solderability and endurance environment
- Suitable for reflow soldering
- Products meet EU RoHS requirements
- AEC-Q200 Qualified

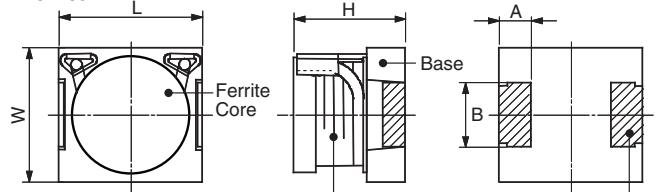
dimensions and construction

LPC4045

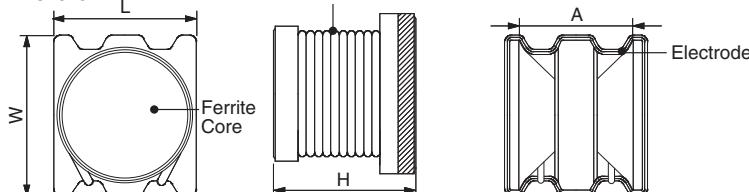


Size	Dimensions inches (mm)					
	L	W	H Max.	A	B	C
4045	.157±.008 (4.0±0.2)	.177±.008 (4.5±0.2)	.169±.009 (4.3±0.2)	.039±.112 (1.0±0.3)	.118±.008 (3.0±0.2)	.138 (3.5)
4235	.177±.008 (4.5±0.2)	.165±.008 (4.2±0.2)	.138 Max. (3.5 Max.)	.039±.008 (1.0±0.2)	.079±.008 (2.0±0.2)	—
4545	.161±.012 (4.1±0.3)	.181±.016 (4.6±0.4)	.181 Max. (4.6 Max.)	.126±.012 (3.2±0.3)	—	—

LPC4235



LPC4545



inductors

ordering information

LPC	4235	T	TM	221	K
Type	Size	Termination Material	Packaging	Nominal Inductance	Tolerance
		A: SnAg (4045 only) T: Sn (4235 only) C: Sn/Cu (4545 only)	TM: taping (4235) TE: taping (4545) TED: taping (4045)	3 digits 221: 220µH	K: ±10% M: ±20%
4045	4235				
4235					
4545					

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/20/18

applications and ratings

Part Designation	Nominal Inductance (μH)	Inductance Tolerance	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (Amps)
LPC4045ATED1R0M	1.0	M: $\pm 20\%$	90.0	0.015	3.10
LPC4045ATED1R5M	1.5		70.0	0.020	2.80
LPC4045ATED2R2M	2.2		55.0	0.023	2.50
LPC4045ATED3R3M	3.3		45.0	0.044	1.80
LPC4045ATED4R7M	4.7		35.0	0.062	1.45
LPC4045ATED6R8M	6.8		25.0	0.075	1.30
LPC4045ATED100K	10		23.5	0.10	1.02
LPC4045ATED150K	15		18.5	0.15	0.84
LPC4045ATED220K	22		14.0	0.21	0.70
LPC4045ATED330K	33		12.0	0.41	0.52
LPC4045ATED470K	47		10.5	0.52	0.46
LPC4045ATED680K	68		8.0	0.67	0.40
LPC4045ATED101K	100	K: $\pm 10\%$	6.3	0.92	0.28
LPC4045ATED151K	150		5.2	1.80	0.25
LPC4045ATED221K	220		3.9	2.25	0.18
LPC4045ATED331K	330		3.0	4.27	0.15
LPC4045ATED471K	470		2.7	5.23	0.14
LPC4045ATED681K	680		2.2	6.67	0.12
LPC4235TTM R82M	0.82	M: $\pm 20\%$	146.6	0.017	3.34
LPC4235TTM 1R0M	1.0		125.1	0.020	3.27
LPC4235TTM 1R2M	1.2		114.7	0.023	3.10
LPC4235TTM 1R5M	1.5		101.4	0.031	2.53
LPC4235TTM 2R2M	2.2		78.8	0.039	2.28
LPC4235TTM 3R3M	3.3		66.7	0.070	1.63
LPC4235TTM 4R7M	4.7		52.0	0.090	1.44
LPC4235TTM 6R8M	6.8		43.5	0.109	1.29
LPC4235TTM 100K	10		33.5	0.190	0.91
LPC4235TTM 150K	15		29.1	0.230	0.87
LPC4235TTM 220K	22		21.7	0.366	0.69
LPC4235TTM 330K	33		13.9	0.542	0.52
LPC4235TTM 470K	47	K: $\pm 10\%$	12.0	0.688	0.47
LPC4235TTM 680K	68		12.7	1.30	0.34
LPC4235TTM 101K	100		10.4	1.66	0.31
LPC4235TTM 151K	150		7.5	2.96	0.22
LPC4235TTM 221K	220		6.7	3.77	0.20
LPC4545CTE 1R0M	1.0	M: $\pm 20\%$	90.0	0.015	3.66
LPC4545CTE 1R5M	1.5		65.0	0.02	3.21
LPC4545CTE 2R2M	2.2		50.0	0.023	2.96
LPC4545CTE 3R3M	3.3		40.0	0.044	2.19
LPC4545CTE 4R7M	4.7		35.0	0.062	1.81
LPC4545CTE 6R8M	6.8		25.0	0.075	1.60
LPC4545CTE 100K	10		23.0	0.1	1.43
LPC4545CTE 150K	15		15.0	0.15	1.04
LPC4545CTE 220K	22		13.0	0.21	0.88
LPC4545CTE 330K	33		10.0	0.41	0.60
LPC4545CTE 470K	47	K: $\pm 10\%$	9.0	0.52	0.53
LPC4545CTE 680K	68		7.5	0.67	0.49
LPC4545CTE 101K	100		5.5	0.92	0.41
LPC4545CTE 151K	150		5.0	1.8	0.29
LPC4545CTE 221K	220		4.0	2.25	0.26
LPC4545CTE 331K	330		2.5	4.27	0.19
LPC4545CTE 471K	470		2.0	5.23	0.17
LPC4545CTE 681K	680		1.8	6.67	0.15
LPC4545CTE 152K	1500		1.3	17.04	0.10
LPC4545CTE 222K	2200		0.9	35.0	0.07

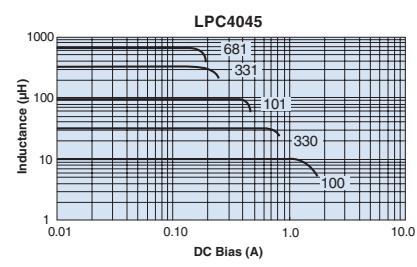
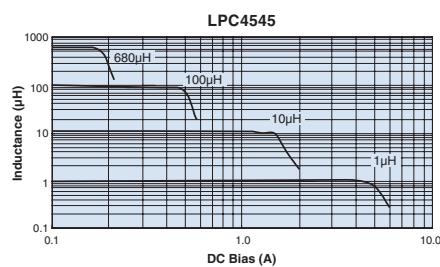
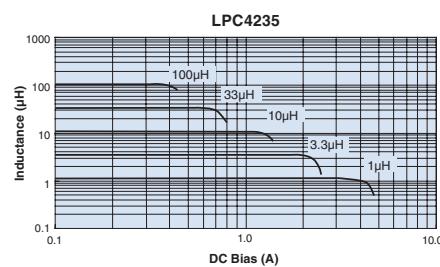
Allowable current is a DC Current which causes initial inductance to decrease by 10%. Or coil temperature to rise by 40°C, whichever is smaller

Operating Temperature Range: -40°C ~ +125°C LPC4235: Test Report +155°C is available

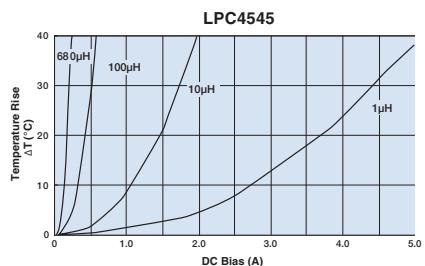
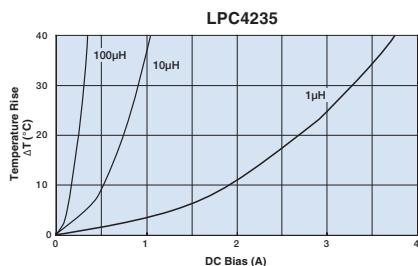
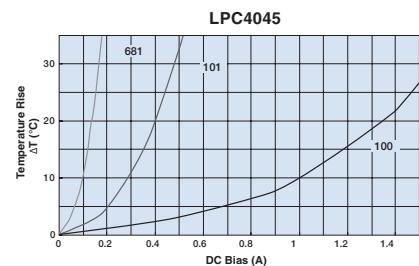
The operating temperature range of the coil (ambient temperature + self heating) must remain at +125°C or less

environmental applications

DC Bias Characteristics



Surface Temperature Rise



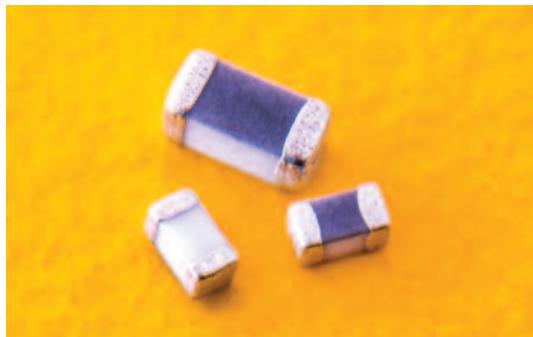
Performance Characteristics

Parameter	Performance Requirements $\Delta L/L$		Test Method		
	Limit	Typical	LPC4045	LPC4235	LPC4545
Rapid Change of Temperature	$\pm 5\%$	$\pm 1.3\%$	-40°C (30 minutes)/ +85°C (30 minutes), 100 cycles	-40°C (30 minutes)/ +125°C (30 minutes), 100 cycles	-40°C (30 minutes)/ +125°C (30 minutes), 100 cycles
Low Temperature Exposure	$\pm 5\%$	$\pm 1.3\%$	-40°C, 500 hours	-40°C $\pm 2^{\circ}\text{C}$, 500 hours	-40°C, 1000 hours
High Temperature Exposure	$\pm 5\%$	$\pm 1.3\%$	+85°C, 500 hours	+125°C $\pm 2^{\circ}\text{C}$, 500 hours	+125°C $\pm 2^{\circ}\text{C}$, 1000 hours
Moisture Exposure	$\pm 5\%$	$\pm 1.6\%$	+40°C $\pm 2^{\circ}\text{C}$, 90 - 95% RH, 500 hours	+40°C $\pm 2^{\circ}\text{C}$, 90 - 95% RH, 500 hours	+85°C, 8 5% RH, 1000 hours

Surface Temperature Rise graphs and additional environmental applications can be found at www.koaspeer.com

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

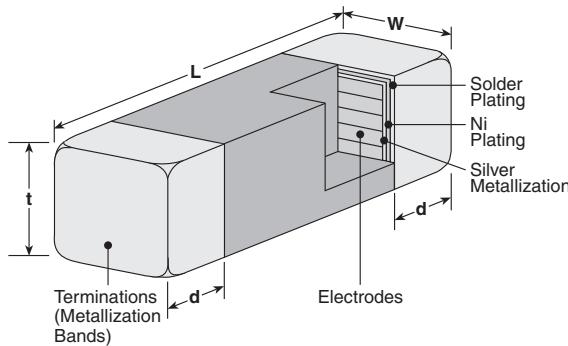
12/12/19



features

- Monolithic structure provides high reliability in a wide temperature and humidity range
- High quality ceramic material and unique manufacturing process provides high Q at high frequency
- Nickel barrier with solder overcoat for excellent solderability
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm)			
	L	W	t	d
1E (0402)	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.02±.004 (0.5±0.1)	.01±.004 (0.25±0.1)
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.012±.008 (0.3±0.20)

ordering information

MHL	1E	C	T	TP	3N9	S
Type	Size Code	Material	Termination Material	Packaging	Nominal Inductance	Tolerance
	1E 1J		T: Sn	TP: 7" paper tape 2 mm pitch (1E only - 10,000 pieces/reel) TD: 7" paper tape (1J - 4,000 pieces/reel)	3N9 = 3.9nH R10 = 100nH	S: ±0.3nH J: ±5%
		Permeability Code: C				

For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Inductance L (nH)	Inductance Tolerance	Q Minimum (100MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range**
MHL1ECTTP1N0*	1.0	S: ±0.3nH	8	10000	0.12	300	-55°C to +125°C
MHL1ECTTP1N2*	1.2			6000	0.16		
MHL1ECTTP2N2*	2.2				0.19		
MHL1ECTTP3N3*	3.3				0.22		
MHL1ECTTP3N9*	3.9				0.24		
MHL1ECTTP4N7*	4.7				0.27		
MHL1ECTTP5N6*	5.6						

applications and ratings (continued)

Part Designation	Inductance L (nH)	Inductance Tolerance	Q Minimum (100MHz)	Self Resonant Frequency Typical (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range**			
MHL1ECTTP6N8*	6.8	J: ±5%	8	3900	0.32	300	-55°C to +125°C			
MHL1ECTTP8N2*	8.2			3500	0.37					
MHL1ECTTP10N*	10			3200	0.42					
MHL1ECTTP12N*	12			2600	0.50					
MHL1ECTTP15N*	15			2300	0.55					
MHL1ECTTP18N*	18			2000	0.65					
MHL1ECTTP22N*	22			1600	0.8	200				
MHL1ECTTP27N*	27			1400	0.9					
MHL1ECTTP39N*	39			1100	1.2					
MHL1ECTTP47N*	47			900	1.3					
MHL1ECTTP56N*	56			750	1.4					
MHL1ECTTP82N*	82			600	1.6	100				
MHL1ECTTPR10*	100				2.0					
MHL1JCTTD1N5*	1.5	S: ±0.3nH	8	6000	0.10	600	-55°C to +125°C			
MHL1JCTTD1N8*	1.8									
MHL1JCTTD2N2*	2.2									
MHL1JCTTD2N7*	2.7									
MHL1JCTTD3N3*	3.3		10	4000	0.13	600				
MHL1JCTTD3N9*	3.9									
MHL1JCTTD4N7*	4.7									
MHL1JCTTD5N6*	5.6									
MHL1JCTTD6N8*	6.8		12	3500	0.20	600				
MHL1JCTTD8N2*	8.2									
MHL1JCTTD10N*	10			3200	0.23					
MHL1JCTTD12N*	12									
MHL1JCTTD15N*	15									
MHL1JCTTD18N*	18			2600	0.25	500				
MHL1JCTTD22N*	22									
MHL1JCTTD27N*	27			2300	0.30					
MHL1JCTTD33N*	33									
MHL1JCTTD39N*	39									
MHL1JCTTD47N*	47	J: ±5%	8***	2000	0.35	400	-55°C to +125°C			
MHL1JCTTD68N*	68									
MHL1JCTTD82N*	82									
MHL1JCTTDR12*	120									
MHL1JCTTDR15*	150			500	600	300				
MHL1JCTTDR22*	220									

*Add tolerance character (S, J)

** The operating temperature range of the coil (ambient temperature + self heating) must remain at +125°C or less

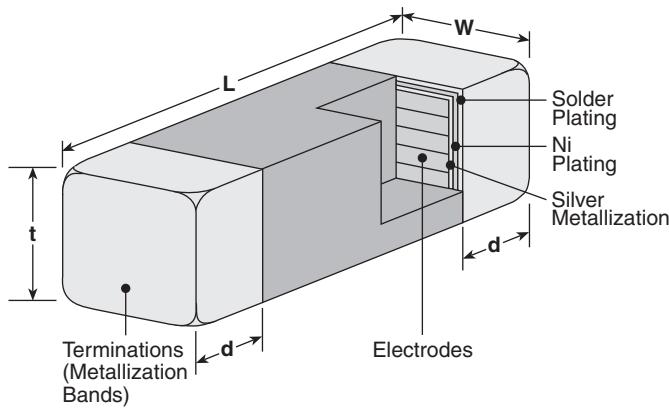
*** 50MHz



features

- Designed to reduce noise at high frequencies
- Standard EIA packages: 1E, 1J, 2A, 2B
- Nickel barrier with solder overcoat for excellent solderability
- Magnetically shielded
- Marking: Black body color with no marking
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	d
1E (0402)	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.02±.004 (0.5±0.1)	.01±.004 (0.25±0.1)
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.014±.006 (0.36±0.15)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.035±.008 (0.9±0.2)	.020±.012 (0.51±0.30)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.043±.008 (1.1±0.2)	.020±.012 (0.51±0.30)

ordering information

CZB	1E	G	T	TP	100	P
Type	Size	Permeability Code	Termination Material	Packaging	Impedance	Tolerance
	1E	F	T: Sn	TP: 7" paper tape (1E only - 10,000 pieces/reel) TD: 7" paper tape (1J, 2A - 4,000 pieces/reel) TE: 7" embossed plastic (2B - 3,000 pieces/reel)	2 significant figures + 1 multiplier	P: ±25%
	1J	G				
	2A	S				
	2B					

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

6/29/17

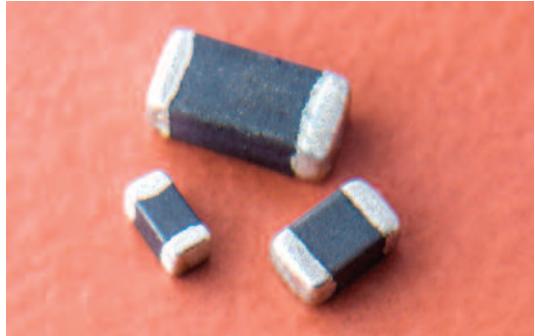
applications and ratings

Part Designation	Impedance @ 100MHz [†] (Ω)	DC Resistance Maximum ^{††} (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range
CZB1EGTTP100P	10	0.05	600	-55°C to +125°C
CZB1EGTTP700P	70	0.40	350	
CZB1EGTTP121P	120	0.50	300	
CZB1EGTTP221P	220	0.70	200	
CZB1EGTTP301P	300	0.80	150	
CZB1EGTTP601P	600	1.00	150	
CZB1EGTTP102P	1000	1.50	100	
CZB1JGTTD300P	30	0.10	600	-55°C to +125°C
CZB1JGTTD600P	60	0.20		
CZB1JGTTD800P	80	0.25		
CZB1JGTTD101P	100	0.30		
CZB1JGTTD121P	120	0.35		
CZB1JGTTD141P	140	0.40		
CZB1JGTTD221P	220	0.45		
CZB1JGTTD301P	300	0.50	300	-55°C to +125°C
CZB1JGTTD451P	450	0.60		
CZB1JGTTD601P	600	0.70		
CZB1JGTTD102P	1000	0.80		
CZB1JGTTD152P	1500	0.90		
CZB1JGTTD202P	2000	1.20		
CZB2AGTTD500P	50	0.10		
CZB2AGTTD101P	100	0.15	800	-55°C to +125°C
CZB2AGTTD121P	120	0.25		
CZB2AGTTD301P	300	0.30		
CZB2AGTTD601P	600	0.35		
CZB2AGTTD601PV	600	0.25		
CZB2AGTTD102P	1000	0.40		
CZB2BFTTE190P	19	0.05		
CZB2BFTTE300P	30	0.10	600	-55°C to +125°C
CZB2BFTTE600P	60	0.20		
CZB2BFTTE800P	80	0.20		
CZB2BFTTE101P	100	0.20		
CZB2BFTTE121P	120	0.15		
CZB2BFTTE201P	200	0.20		
CZB2BFTTE301P	300	0.30		
CZB2BFTTE601P	600	0.40	500	-55°C to +125°C

[†] Impedance test method: HP4291A

^{††} DCR test method: Keithley 580

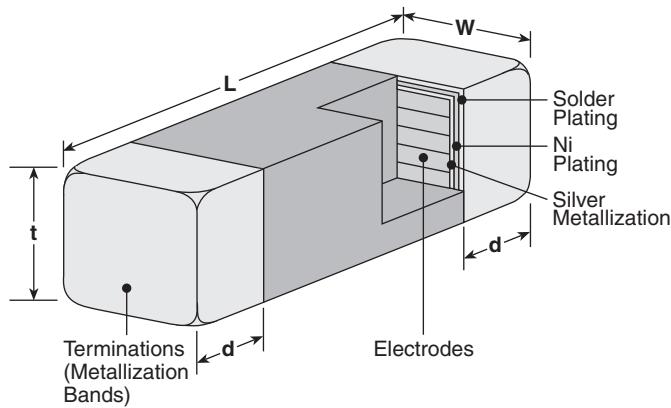
For complete environmental specifications, please refer to www.koaspeer.com



features

- Designed to reduce noise at high frequencies
- Standard EIA packages: 1J, 2A, 2B
- Nickel barrier with solder overcoat for excellent solderability
- Magnetically shielded
- Marking: Black body color with no marking
- Products with lead-free terminations meet EU RoHS requirements

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	d
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.031±.006 (0.8±0.15)	.014±.006 (0.36±0.15)
2A (0805)	.079±.008 (2.0±0.2)	.047±.008 (1.20±0.2)	.035±.008 (0.9±0.2)	.02±.012 (0.51±0.30)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.043±.008 (1.1±0.2)	.02±.012 (0.51±0.30)

ordering information

CZP	2A	F	T	TD	300	P
Type	Size	Permeability Code	Termination Material	Packaging	Impedance	Tolerance
	1J 2A 2B	F P	T: Sn	TD: 7" paper tape (1J, 2A - 4,000 pieces/reel) TE: 7" embossed plastic (2B - 3,000 pieces/reel)	2 significant figures + 1 multiplier	P: ±25%

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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applications and ratings

Part Designation	Impedance @ 100MHz (Ω)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Operating Temperature Range	
CZP1JFTTD300P	30	0.03	3000	-55°C to +125°C	
CZP1JFTTD600P	60	0.04			
CZP1JFTTD121P	120	0.10			
CZP1JFTTD181P	180	2000			
CZP1JFTTD221P	220				0.20
CZP1JFTTD301P	300	1000			
CZP1JFTTD601P	600				
CZP2AFTTD300P	30	0.015	4000	-55°C to +125°C	
CZP2AFTTD600P	60	0.04	3000		
CZP2AFTTD800P	80				
CZP2AFTTD221P	220	0.05	2000		
CZP2AFTTD301P	300	0.15			
CZP2AFTTD601P	600	0.20	1000		
CZP2AFTTD102P	1000				
CZP2BFTTE190P	19	0.02	4000	-55°C to +125°C	
CZP2BFTTE300P	30				
CZP2BFTTE500P	50	0.025			
CZP2BFTTE800P	80	0.03	3000		
CZP2BFTTE101P	100	0.08	2500		
CZP2BFTTE121P	120		1000		
CZP2BFTTE601P	600	0.20			
CZP2BPTTE600P	60	0.02	6000		
CZP2BPTTE101P	100	0.03	3000		
CZP2BPTTE121P	120	0.04			
CZP2BPTTE601P	600	0.10	1500		

For complete environmental specifications, please refer to www.koaspeer.com

Precautions for the Fusing Components

Refer to the precautions of common matters for all products in the beginning of this catalog.

Safety Standards

- KOA's fuse components comply with the following safety standards:
- | | |
|---------------|---|
| U.S.A. | UL (Underwriters Laboratories Inc.)
UL248 |
| CANADA | CSA (Canadian Standards Association)
C22.2 No.248
c-UL (Underwriters Laboratories Inc.)
UL248 |
| INTERNATIONAL | *c-UL is equivalent to CSA in recognition
IEC (International Electrotechnical Commission)
60127-1, -4 |
| JAPAN | Electrical Appliances and Materials Safety Act
(PSE) Class-B |

Rated Current

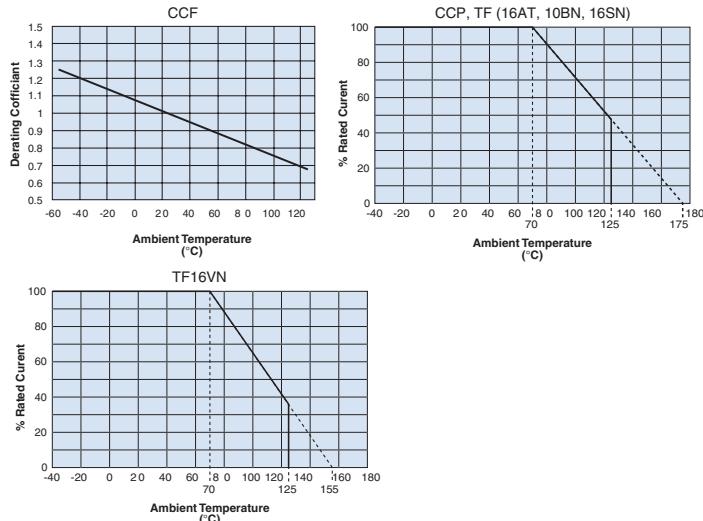
- Specified amperage that conforms to safety standards, such as fusing time. This is not to be confused with the steady-state (stationary) current, which is calculated using the following equation:
Stationary Current \leq Rated Current \times Stationary Derating Coefficient \times Ambient Temperature Derating

The table below indicates deratings for each type of products.

Type	Stationary Derating Coefficient
CCF1N, CCF1F	0.7
TF16AT	0.75
TF10BN, TF16SN, TF16VN	1.0
CCP2B, CCP2E	1.0

Deratings for Ambient Temperatures

The following Deratings for Ambient Temperatures are required:



- Ambient Temperature Derating values are found on product datasheets.
- If the current waveform is a repeated pulse or AC waveform, the peak current shall be both the rated current and stationary current. Do not use the effective value of the current waveform.

Rated Voltage

- A rated voltage indicates the voltage that does not run through electrodes after the fuse blows. In case of exceeding the rated voltage, the circuit voltage should be applied at voltage not higher than the rated voltage because the current may run again or may break the elements.

Interrupting Capacity

- Maximum current and voltage that can be interrupted when an abnormal situation arises. Make sure beforehand that voltage and current at the time of abnormality occurring in the circuit are within the interrupting capacity.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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Type	Fusing Current	Fusing Time
CCF1N (0.4~10)	Rated Current x 2 or Over	1 second
CCP2B	Rated Current x 2 or Over	1 second
CCP2E	Rated Current x 2.5 or Over	1 second
CCP2E_H	Rated Current x 2 or Over	1 second
TF16SN	Rated Current x 2 or Over	1 second
TF10BN	Rated Current x 2 or Over	5 seconds
TF16AT	Rated Current x 2 or Over	5 seconds
TF16VN	Rated Current x 2.5 or Over	5 seconds
CCF1N (12, 15)	Rated Current x 2 or Over	60s second
CCF1F	Rated Current x 2 or Over	120 seconds

Fusing Current

- Minimum current needed to break fusing element. Refer to the following list to quickly interrupt if an abnormal current occurred in the circuit:
If fusing time is within 1 second or greater, the variance in the fusing time is largely affected by the surroundings (temperature, mounting pad dimensions, substrate material, etc.). Verification should be made with an actual circuit.

Anti-Surge Characteristics

There are limits to applications of transient overcurrents (inrush current, reversible current at motor-lock, etc.) that occur in circuits. It is necessary to select proper products that withstand such overcurrents without fusing. Select proper fusing components considering the following conditions:

- The transient phenomenon varies with the ambient temperature, charging/discharging conditions of capacitors, etc. Check the current waveform under such conditions that the stationary current also becomes the peak current. If the circuit has components highly dependent on temperature, such as thermistors, etc., please do a check under these conditions.
- For a peak current observation, shorten the sampling time of an oscilloscope to verify the maximum value of the wave-form of the surge current.
- We recommend the current measurement using current probe. If current measuring is performed by measuring voltages of shunt resistors, etc., use the lowest possible resistances.

Operation Check

- Before you decide which fuse product you use, please mount the selected fuse on actual device and confirm that rush current and surge current have enough margin and that the product has performance that enables it to interrupt the abnormal current quickly.

Soldering

- This product is suitable both for reflow-soldering and for flowsoldering, but excessive heat may cause an open-circuit and change its characteristics.
- The part shall be soldered at the maximum temperature of 260°C or less.
- If a soldering iron is used, it shall be at 350°C or less and should be soldered in a short time. Further, pay attention that the products are not touched directly by the top of the iron. It may cause disconnection or characteristic change.

Placement

- If resin coating, potting or encapsulation molding is used, please confirm reliability. Small contractile stress at resin stiffening time can cause cracks, fuse shear line, or resistance change. Also, the generated heat may not be able to dissipate properly, causing a change in fusing characteristics.
- The fusing characteristics may change when there are components that generate heat around the fuses. Keep fuses away from those parts.

Storage

- Avoid storing components under the condition of high temperature/high humidity (40°C/70%RH or more) which may deteriorate solderability.
- Also avoid direct sun light which may deteriorate solderability and induce changes in taping strength.

Parts Selection

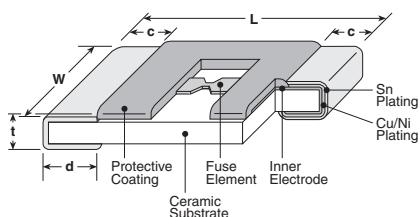
- If you have any questions about fuse selection, please do not hesitate contacting us.

Reference

- For basic precautions, refer to JEITA technical report "JEITA RCR-4800 Safety application guide on fuse for use in electronic and electrical equipment".



dimensions and construction



ordering information

TF	16S	N	1.25	T	TE
Type	Size	Fusing Characteristic	Rated Current	Termination Material	Packaging
	10B: 1.0x0.5mm 16A: 1.6x0.8mm 16S: 1.6x0.8mm	N: Normal blow T: Anti pulse (16A only)	Reference rating chart	T: Sn	TB: 2mm pitch punched paper (TF10BN only, 10,000 pieces/reel) TD: 4mm pitch punched paper (TF16 only, 5,000 pieces/reel)

applications and ratings

Part Designation	Marking	Rated Current	Fusing Time	Internal R. Maximum (mΩ)	Rated Voltage	Rated Ambient Temperature	Operating Temperature Range
TF10BN0.20	A	0.20A	Open within 5 sec. at 200% rated current (Refer to Fusing Characteristics graph)	1990	DC 32V	+70°C	-55°C to +125°C
TF10BN0.25	C	0.25A		1270			
TF10BN0.315	D	0.315A		850			
TF10BN0.50	F	0.50A		320			
TF10BN0.63	I	0.63A		200			
TF10BN0.80	K	0.80A		135			
TF10BN1.00	L	1.00A		115			
TF10BN1.25	M	1.25A		90			
TF10BN1.60	N	1.60A		58			
TF10BN2.00	S	2.00A		42			
TF10BN2.50	T	2.50A		35			
TF10BN3.00	V	3.00A		30			
TF10BN3.50	R	3.50A		27			
TF10BN4.00	X	4.00A		23			
TF10BN5.00	Y	5.00A		19			
TF16AT0.25	C	0.25A	Open within 5 sec. at 200% rated current (Refer to Fusing Characteristics graph)	498	DC 32V	+70°C	-55°C to +125°C
TF16AT0.315	D	0.315A		384			
TF16AT0.50	F	0.50A		198			
TF16AT0.63	I	0.63A		143			
TF16AT0.80	K	0.80A		120			
TF16AT1.00	L	1.00A		94			
TF16AT1.25	M	1.25A		73			
TF16AT1.60	N	1.60A		59			
TF16AT2.00	S	2.00A		42			
TF16AT2.50	T	2.50A		32			

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

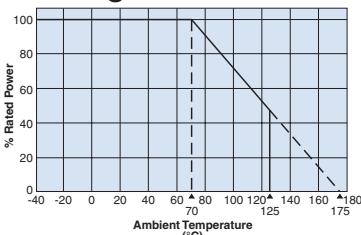
7/11/19

applications and ratings (continued)

Part Designation	Marking	Rated Current	Fusing Time	Internal R. Maximum (mΩ)	Rated Voltage	Rated Ambient Temperature	Operating Temperature Range
TF16AT3.15	U	3.15A	Open within 5 sec. at 200% rated current (Refer to Fusing Characteristics graph)	24	32V	+70°C	-55°C to +125°C
TF16AT4.00	X	4.00A		17			
TF16AT5.00	Y	5.00A		14			
TF16SN0.20	A	0.20A	Open within 1 sec. at 200% rated current (Refer to Fusing Characteristics graph)	1500	32V	+70°C	-40°C to +125°C
TF16SN0.25	C	0.25A		960			
TF16SN0.315	D	0.315A		600			
TF16SN0.40	H	0.40A		440			
TF16SN0.50	F	0.50A		300			
TF16SN0.63	I	0.63A		190			
TF16SN0.70	J	0.70A		170			
TF16SN0.80	K	0.80A		135			
TF16SN1.00	L	1.00A		103			
TF16SN1.25	M	1.25A		78			
TF16SN1.60	N	1.60A		58			
TF16SN2.00	S	2.00A		47			
TF16SN2.50	T	2.50A		38			
TF16SN3.15	U	3.15A		28			

environmental applications

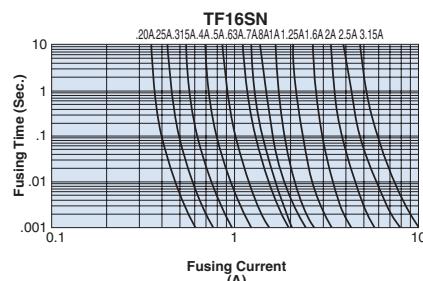
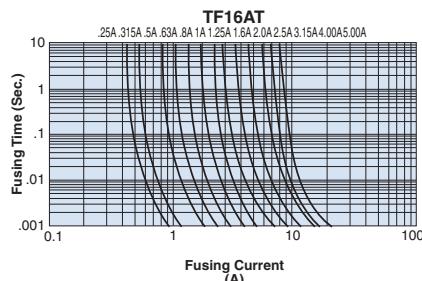
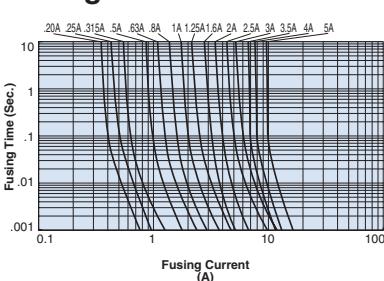
Derating Curve



Stationary Current: Regard the peak of stationary current waveform as stationary current value when the stationary current is repeated pulse.

Temperature Derating: Rated current needs to be derated if used at an ambient temperature 70°C or above. Refer to the derating coefficient on the left figure.

Fusing Characteristics



Performance Characteristics

Parameter	Requirement	Test Method
Fusing Characteristics	Within 1 second (16SN) Within 5 seconds (10BN, 16AT)	— 200% of rated voltage shall be carried (@25°C)
Bending Test	No mechanical damages	— Distance between holding points: 90mm, Bending: 3mm, 1 time (BN, AT), 2mm, 1 time (SN)
Resistance to Solder Heat	±10%	±4.5% (16SN) ±5% (10BN, 16AT) 260°C ± 5°C, 10 seconds ± 0.5 ^a second
Solderability	95% coverage minimum	— 245°C ± 3°C, 3 seconds ± 0.5 second
Load Life	±10%	±4.5%(16SN) ±5% (10BN, 16AT) 70°C ± 2°C, 1000 hours, rated current x 100%, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	±10%	±3% (10BN) ±4.5% (16SN), 5% (16AT) 40°C ± 2°C, 90 - 95% RH, 1000 hours, rated current x 100% (10BN, 16SN), x 75% (16AT), 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	±10%	±4% (16SN) ±5% (10BN, 16AT) 16SN: -40°C ± 2°C (30 minutes), 10BN, 16AT: -55°C ± 2°C, +125°C (30 minutes), 10 cycles
Resistance to Solvent	No evidence of damages to protective coating and marking	— Conforming to MIL-STD-202F
Residual Resistance	10kΩ and more	— Measure DC resistance after fusing

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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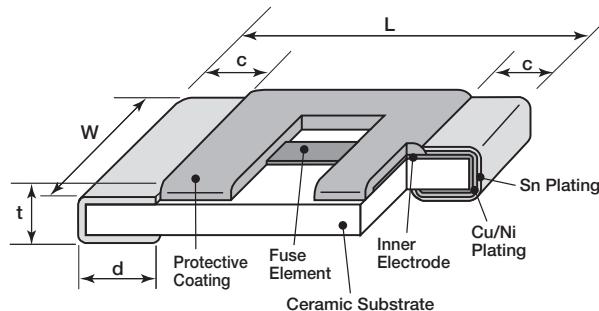


features

- Small and light chip current fuses for the secondary circuit
- Temperature cycle (-55°C ~ 125°C), 1000 cycle
- Original construction and manufacturing method stabilize fusing characteristics
- Suitable for overcurrent protection of circuit block in small electronic devices
- Suitable for reflow solderings
- Products meet EU RoHS requirements
- AEC-Q200 Qualified



dimensions and construction



Type	Dimensions inches (mm)				
	L	W	c	d	t
TF16VN (0603)	.063±.004 (1.6±0.1)	.031±.004 (0.8±0.1)	.014±.004 (0.35±0.1)	.012±.004 (0.3±0.1)	.018±.004 (0.45±0.1)

ordering information

TF	16V	N	2.50	D	T	TD
Product Code	Size	Fusing Characteristics	Rated Current	Rated Voltage	Terminal Surface Material	Taping
	16V: 1.6 x 0.8mm	N: Normal blow		Nil: DC 32V D: DC 125V DC 70V DC 50V	T: Sn	TD: 4mm pitch punch paper

For further information on packaging, please refer to Appendix A.

ratings

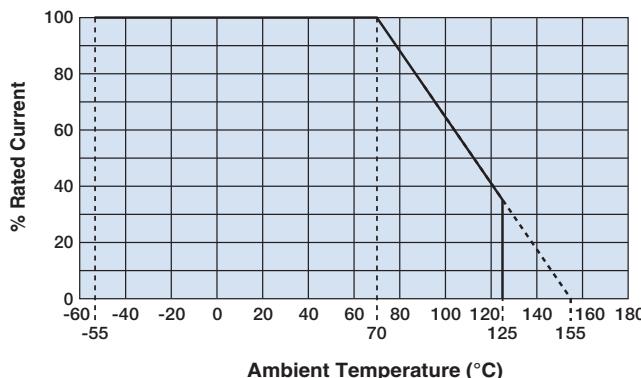
Type	Marking	Rated Current	Fusing Time	Internal R. (mΩ)Max.	Rated Voltage	Rated Ambient Temp.	Operating Temperature Range
TF16VN0.40	H	0.40A	Open within 5 sec. at 250% rated current. Refer to the graph of fusing characteristics.	760	DC 32V (DC125V)	+70°C	-55°C ~ 125°C
TF16VN0.50	F	0.50A		520			
TF16VN0.63	I	0.63A		370			
TF16VN0.80	K	0.80A		200			
TF16VN1.00	L	1.00A		160			
TF16VN1.25	M	1.25A		130			
TF16VN1.60	N	1.60A		100			
TF16VN2.00	S	2.00A		80			
TF16VN2.50	T	2.50A		60			
TF16VN3.15	U	3.15A		40	DC 32V (DC50V)		

High rated voltage products (DC 125V: 0.4A to 0.5A, DC 70V: 0.63A to 2.5A, DC 50V: 3.15A) are available. Please ask KOA sales.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 8/13/19

environmental applications

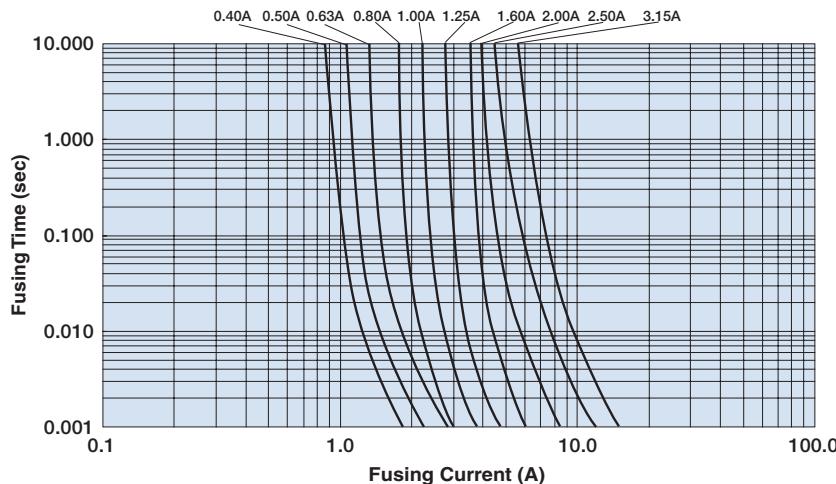
Derating Curve



Stationary current: Regard the peak of stationary current waveform as stationary current value when the stationary current is repeated pulse.

Temperature Derating: Rated Current needs to be derated if used at an ambient temperature of 70°C or more. Refer to the derating coefficient on the left figure.

Fusing Characteristics (Average Fusing Time)



Performance Characteristics

Test Items	Performance Requirements $\Delta R \pm \%$		Test Methods
	Limit	Typical	
Fusing Characteristics	Within 5 seconds	—	250% of rated current shall be carried (@25°C)
Bending Test	No mechanical damages	—	Distance between holding points 90mm, bending width 2mm, 1 time.
Resistance to Soldering Heat (Reflow Soldering)	10	5	Preheating: 150+30°C, 90 ± 30 seconds Heating: 230°C or more, 30 ± 10 seconds, max. 260°C
Solderability	95% coverage min.	—	245°C±3°C, 3 seconds ± 0.5 seconds
Load Life	10	5	70°C±2°C, 1000h, Rated current × 100%, 1.5h ON/0.5h OFF cycle
Load Life Moisture	10	5	85°C±2°C, 85%±5%RH, 1000h, Rated current × 10%, 1.5h ON/0.5h OFF cycle
Rapid Change of Temperature	10	5	-55°C (30min.)/+125°C (30min.) 1000 cycles
Resistance to Solvent	No evidence of damages to protective coating and marking.	—	Conforming to MIL-STD-202F
Residual Resistance	10kΩ or more	—	Measure DC resistance after fusing

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

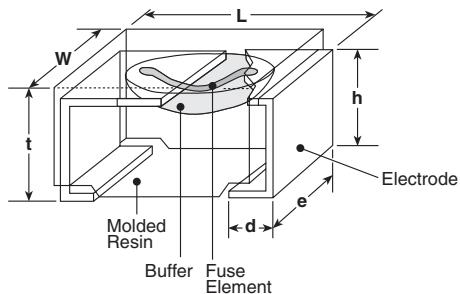
10/17/18



features

- Immediate cut-off of excessive heat
- No generation of heat
- UL94V0 epoxy case
- Suitable for flow and reflow soldering
- UL248.14, file #131375
- One-time fuse device
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Size Code	Dimensions inches (mm)					
	L	W	t	h	e	d
2B	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.047±.008 (1.2±0.2)	.031±.004 (0.8±0.1)	.047±.004 (1.2±0.1)	.024±.004 (0.6±0.1)
2E		.098±.008 (2.5±0.2)	.087±.008 (2.2±0.2)	.075±.004 (1.9±0.1)	.067±.004 (1.7±0.1)	.02±.004 (0.5±0.1)

ordering information

CCP	2B	20		T	TE
Type	Size Code	Rating	Fusing Magnification	Termination Material	Packaging
	2B: 1206 2E: 1210	Reference rating chart	Blank: 200% (2B) 250% (2E) H: 200% (2E)	T: Sn	TE: 7" embossed plastic (2B - 3,000 pieces/reel) (2E - 2,000 pieces/reel)

applications and ratings

Part Designation	Current Rating	Fusing Current	Fusing Time	Internal R. Maximum (mΩ)	Maximum Open Circuit Voltage*	Rated Ambient Temperature	Operating Temperature Range
CCP2B15	0.75A	1.5A		150			
CCP2B20	1.00A	2.0A		100			
CCP2B25	1.25A	2.5A		75			
CCP2B30	1.50A	3.0A		60			
CCP2B35	1.75A	3.5A		50			
CCP2B40	2.00A	4.0A		45			
CCP2B50	2.50A	5.0A		35			
CCP2B63	3.15A	6.3A		23			
CCP2B80	4.00A	8.0A		19			
CCP2B100	5.00A	10.0A		15			
CCP2E10H	0.50A	1.0A	1 second max. @ fusing current	200	24V (40V/76V)*	+70°C	-40°C to +125°C
CCP2E13H	0.65A	1.3A		170			
CCP2E15H	0.75A	1.5A		150			
CCP2E20H	1.00A	2.0A		100			
CCP2E25H	1.25A	2.5A		75			
CCP2E30H	1.50A	3.0A		60			
CCP2E35H	1.75A	3.5A		50			
CCP2E38H	1.90A	3.8A		48			

* Note: High rated voltage (76V: 0.75A ~ 3.15A; 40V: 4A ~ 5A) also available, please contact KOA.

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

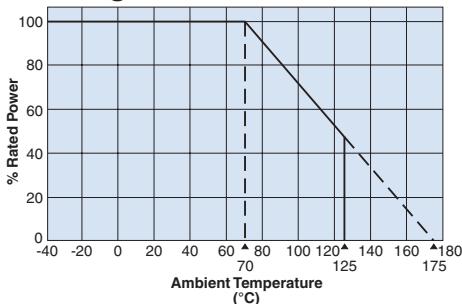
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applications and ratings (continued)

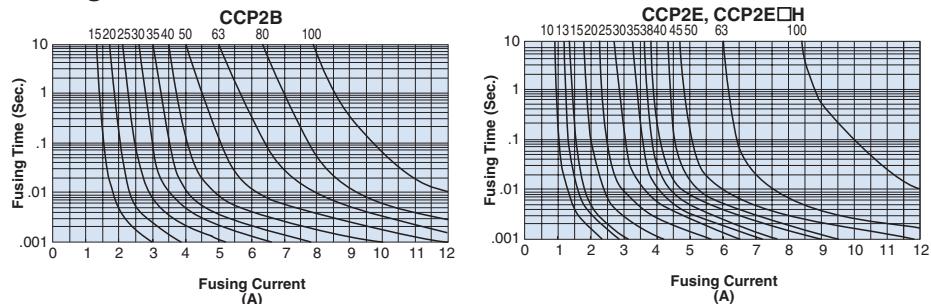
Part Designation	Current Rating	Fusing Current	Fusing Time	Internal R. Maximum (mΩ)	Maximum Open Circuit Voltage	Rated Ambient Temperature	Operating Temperature Range
CCP2E40H	2.00A	4.0A		45			
CCP2E45H	2.25A	4.5A		40			
CCP2E50H	2.50A	5.0A		35			
CCP2E63H	3.15A	6.3A		23			
CCP2E100	4.00A	10.0A		15			
CCP2E10	0.4A	1.0A		200			
CCP2E13	0.52A	1.3A		170			
CCP2E15	0.6A	1.5A		150			
CCP2E20	0.8A	2.0A		100			
CCP2E25	1.0A	2.5A		75			
CCP2E30	1.2A	3.0A		60			
CCP2E35	1.4A	3.5A		50			
CCP2E38	1.5A	3.8A		48			
CCP2E40	1.6A	4.0A		45			
CCP2E45	1.8A	4.5A		40			
CCP2E50	2.0A	5.0A		35			
CCP2E63	2.5A	6.25A		23			

environmental applications

Derating Curve



Fusing Characteristics



Performance Characteristics

Parameter	Requirement Δ R±% Limit	Typical	Test Method
Fusing Characteristics	Within 1 second	—	CCP2B: 200% of rated current shall be carried CCP2E: 250% of rated current shall be carried CCP2E□H: 200% of rated current shall be carried
Open Circuit Voltage	No fusing, flaming, explosion	—	Apply DC voltage between the termination after fusing. CCP2B: 24V; CCP2E, CCP2E□H: 72V
Residual Resistance	10kΩ or more	—	Measure DC resistance after fusing
Bending Test	No mechanical damages	—	Distance between holding points 90mm, bending width 10mm, 1 time
Resistance to Soldering Heat	±10%	±2.5%	260°C ±5°C, 10 seconds ± 0.5 seconds, 2 cycles
Solderability	±95% coverage min.	—	230°C ±5°C, 3 seconds ± 0.5 seconds
Load Life	±10%	±3%	70°C ± 3°C, 1000 hours, rated current, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	±10%	±1.5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, rated current, 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	±10%	±4.0%	-40°C (30 minutes), +125°C (30 minutes), 10 cycles
Resistance to Solvent	No evidence of damages to protective coating and marking	—	Conforming to MIL-STD-202F

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

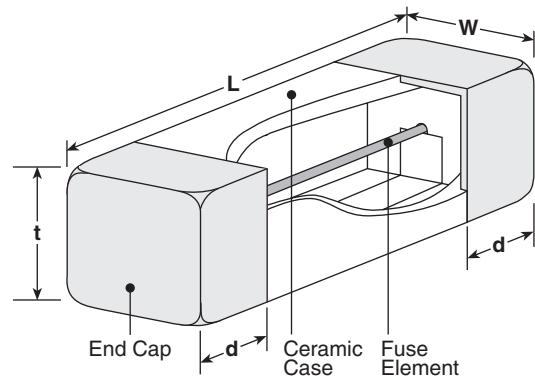
12/12/19



features

- Surface mount fuse suitable for primary and secondary circuits
- Ceramic case provides excellent mechanical strength
- Suitable for flow and reflow soldering
- Products with lead-free terminations meet EU RoHS and China RoHS requirements

dimensions and construction



Type	Dimensions inches (mm)			
	L	W	t	d
CCF	.236±.008 (6.0±0.2)	.098±.008 (2.5±0.2)	.098±.008 (2.5±0.2)	.055±.008 (1.4±0.2)

ordering information

CCF	1	N	1	Rated Voltage (UL)	T	TE
Type	Style	Characteristic	Rated Current	Nil: 125V _{a.c.} /60V _{d.c.} or 65V _{a.c.} /65V _{d.c.} D: 125V _{a.c.} /160V _{d.c.}	Termination Material	Packaging

N: Normal blow

Reference rating chart

T: Sn

TE: 4mm pitch embossed plastic (1,000 pieces/reel)

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/12/17

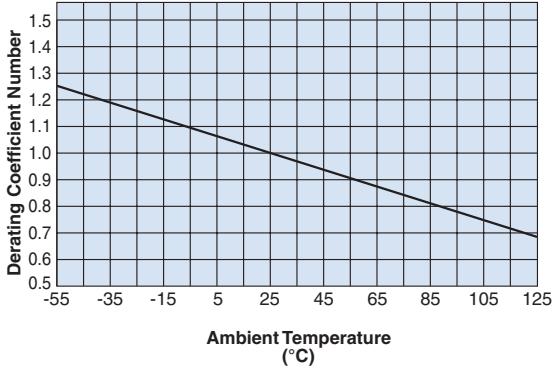
applications and ratings

Part Designation	Current Rating	Voltage Rating	Operating Temperature Range	Interrupting Capacity	Fusing Characteristics		Internal R. (mΩ) Max.	Normal Melting I _t t (A ² , seconds)
					Rated Current	Fusing Time		
CCF1N0.4	400mA	UL (c-UL) AC 125V DC 60V (DC 160V)	-55°C to +125°C	UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	650	0.024
CCF1N0.5	500mA			PSE AC 100V	PSE 130% 160% 200%		510	0.030
CCF1N0.63	630mA			UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%		390	0.052
CCF1N0.8	800mA			(DC 160V)	(DC 160V)		250	0.125
CCF1N1	1A			UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	90.4	0.156
CCF1N1.25	1.25A			(DC 160V)	(DC 160V)	4 hour min. 1 hour max. 1 second max.	75.9	0.220
CCF1N1.6	1.6A			UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	59.3	0.513
CCF1N2	2A			(DC 160V)	(DC 160V)	4 hour min. 1 second max.	42.9	0.814
CCF1N2.5	2.5A			UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	36.6	1.31
CCF1N3.15	3.15A			(DC 160V)	(DC 160V)	4 hour min. 1 second max.	26	2.37
CCF1N4	4A	UL (c-UL) AC 125V DC 60V (DC 160V)	-55°C to +125°C	UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	20.1	3.85
CCF1N5	5A			(DC 160V)	(DC 160V)	4 hour min. 1 second max.	15.3	6.5
CCF1N6.3	6.3A			UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	11.4	10.6
CCF1N7	7A			(DC 160V)	(DC 160V)	4 hour min. 1 second max.	10.6	12.8
CCF1N8	8A			UL (c-UL) AC 125V 50A DC 60V 50A (DC 160V)	UL (c-UL) 100% 200%	4 hour min. 1 second max.	9.5	17.0
CCF1N10	10A			(DC 160V)	(DC 160V)	4 hour min. 1 second max.	7.5	27.7
CCF1N12	12A	UL (c-UL) AC 65V DC 65V	-55°C to +125°C	UL (c-UL) AC 65V 50A DC 65V 50A	UL (c-UL) 100% 200%	4 hour min. 60 seconds max.	4.5	73.5
CCF1N15	15A			(DC 160V)	(DC 160V)	4 hour min. 60 seconds max.	3.5	125.5

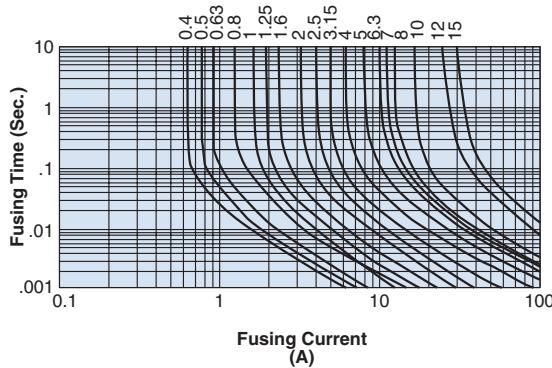
High rated voltage products (DC 160V: 400mA to 10A) are available. Please contact KOA Speer.

environmental applications

Derating Curve



Fusing Characteristics



Performance Characteristics

Parameter	Requirement Δ R±% Limit	Typical	Test Method
Fusing Characteristics	Within specified time. No restrike	—	Fusing time measured under rated current x 160% and 200%
Surface Temperature Rise	Max. Temp. Rise 140°C	—	Surface temperature should be measured by rated current x 115%
	Max. Temp. Rise 75°C	—	Surface temperature should be measured by rated current x 100%
Bending Test	No mechanical damages	—	Distance between holding points 90mm, bent by 3mm at rate of 1mm/s
Resistance to Soldering Heat	±10%	±3%	260°C ±5°C, 10 seconds ± 0.5 seconds
Solderability	±95% coverage min.	—	235°C ±5°C, 3 seconds ± 0.5 seconds
Load Life	±10%	±5%	70°C ± 2°C, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	±10%	±5%	40°C ± 2°C, 90 - 95% RH, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	±10%	±5%	-55°C (30 minutes), +125°C (30 minutes), 100 cycles

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

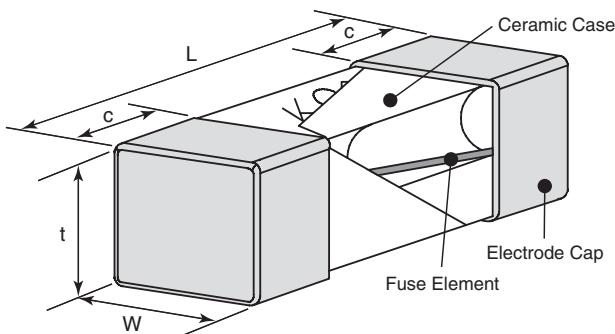
11/06/18



features

- Meets IEC60127-4 specifications (7A or less)
- Stable fusing characteristics due to original technology
- Suitable for reflow and flow soldering
- Products meet EU RoHS requirements
- Excellent anti-sulfuration characteristics due to using high sulfuration-proof material

dimensions and construction



Type	Dimensions inches (mm)			
	L	W	t	c
CCF1F (2410)	.236±.008 (6.0±0.2)	.098±.008 (2.5±0.2)	.098±.008 (2.5±0.2)	.055±.008 (1.4±0.2)

ordering information

CCF	1	F	1	T	TE
Type	Style	Fusing Characteristic	Rated Current	Termination Surface Material	Packaging
		F: Fast-acting		T: Sn	TE: 4mm pitch plastic embossed BK: Bulk

applications and ratings

Part Designation	Current Rating	Voltage Rating	Interrupting Capacity	Fusing Characteristics	Internal R. (mΩ) Max.	Normal Melting I _t (A, sec.)	Operating Temperature Range
Rated Current				Rated Current			
CCF1F0.4	0.4A				650	0.024	
CCF1F0.5	0.5A				510	0.030	
CCF1F0.63	0.63A				390	0.052	
CCF1F0.8	0.8A				250	0.125	
CCF1F1	1A				90.4	0.156	
CCF1F1.25	1.25A				75.9	0.220	
CCF1F1.6	1.6A				59.3	0.513	
CCF1F2	2A				42.9	0.814	
CCF1F2.5	2.5A				36.6	1.31	
							-55°C to +125°C

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

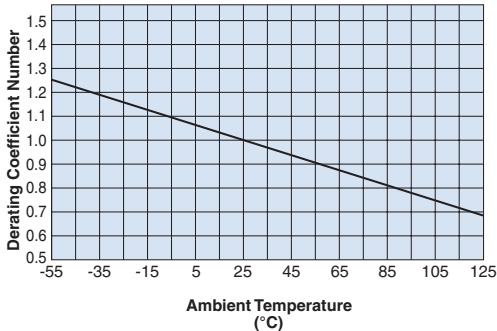
12/12/17

applications and ratings (continued)

Part Designation	Current Rating	Voltage Rating	Interrupting Capacity	Fusing Characteristics	Internal R. (mΩ) Max.	Normal Melting I ^t (A ² , sec.)	Operating Temperature Range	
				Rated Current	Fusing Time			
CCF1F3.15	3.15A	UL(c-UL) AC 125V DC 125V	UL(c-UL) AC125V 50A DC125V 50A	UL(c-UL) 100% 200%	4 hour min. 60 sec. max.	26.0	2.37	-55°C to +125°C
CCF1F4	4A					20.1	3.85	
CCF1F5	5A					15.3	6.5	
CCF1F6.3	6.3A					11.4	10.6	
CCF1F7	7A					10.6	12.8	
CCF1F8	8A					9.5	17.0	
CCF1F10	10A					7.5	27.7	
CCF1F12	12A					4.5	73.5	
CCF1F15	15A					3.5	125.5	

environmental applications

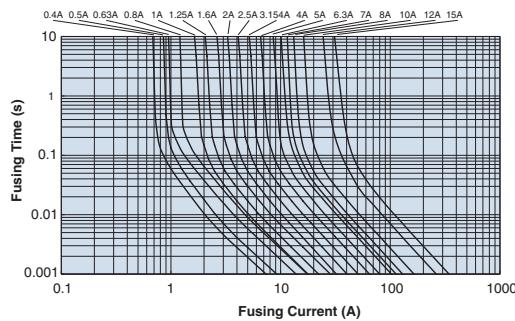
Derating Curve



Stationary Current: Regard the peak of stationary current waveform as stationary current value when the stationary current is repeated pulse. Normal derating of this product should be 0.7max. as standards.

Deratings by ambient temperatures. When using the products at the temperatures other than normal temperature ($25^{\circ}\text{C} \pm 5^{\circ}$), temperature adjustment will be required. Please refer the derating coefficient as shown in the figure.

Fusing Characteristics



Performance Characteristics

Parameter	Requirements	Limit	Typical	Test Method
Fusing Characteristics	Within specified time. Insulation resistance shall not be less than $0.1\text{M}\Omega$	—	—	Fusing time measured under rated current x 200% (at 25°C)
Surface Temperature Rise	Maximum temperature rise 75°C and not fusing (all the rating)	—	—	Surface temperature should be measured by 1.00/N
Bending Test	No mechanical damage	—	—	Distance between holding points 90mm, bent by 3mm at rate of 1mm/second
Resistance to Soldering Heat	$\Delta R \pm 10\%$	$\pm 3\%$	—	$260^{\circ}\text{C} \pm 5^{\circ}\text{C}$, 10 seconds ± 0.5 seconds
Solderability	95% coverage minimum	—	—	$235^{\circ}\text{C} \pm 5^{\circ}\text{C}$, 3 seconds ± 0.5 seconds
Load Life	$\Delta R \pm 10\%$	$\pm 5\%$	—	$70^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Load Life Moisture	$\Delta R \pm 10\%$	$\pm 5\%$	—	$40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 90 - 95% RH, 1000 hours, rated current x 70%, 1.5 hr ON, 0.5 hr OFF cycle
Rapid Change of Temperature	$\Delta R \pm 10\%$	$\pm 5\%$	—	-55°C (30 minutes), $+125^{\circ}\text{C}$ (30 minutes), 100 cycles
Sulfuration Test	$\Delta R \pm 5\%$	—	—	Soaked in industrial oil with 3.5% sulfur concentration, $105^{\circ}\text{C} \pm 3^{\circ}\text{C}$, 500 hours

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/12/17

Precautions for the Varistors

The reliability of the metal oxide varistors are dependant on the ways of their use and could lead to accidents so please be aware.

Selection and Protection

- It is recommended that the steady-state circuit voltage which remains at 80% or less of the max. allowable circuit voltage. Exceeding the specification will cause deterioration, short-circuits, etc.
- Select proper parts according to the surge energy and the number of the impressions if the varistors are used to absorb the surge for an inductive loading.
- The rated surge endurance is defined in terms of shock wave current waveform (starting up 8μs/wave-tail length 20μs). The waveform in a practical use may be different from the test conditions, in which case, select the proper parts from the Voltage-Current Curves in the varistor catalog.
- Insert fuses or thermal fuses in series with varistors if the size of the surge power cannot be estimated, in order to prevent varistors from bursting due to an excessive surge over the rating.
- Give consideration on the layout to combustible materials and to take measurements on the circuits (fuses or thermal fuses) since there may be smoking or flaming if the varistor short-circuits due to an excessive surge over the rating.
- Upon mold sealing, fully confirm the reliability and use the resin which has small contractile stress at stiffening since the protection coat may peel off, cracks may occur at the solder connection, and the characteristics of the varistor may change.
- Perform the withstand voltage test and the insulation resistance test with the varistors removed from the circuit since the test voltage may exceed the varistor voltage.

Failure Mode

- The varistors will deteriorate and have a possibility of short-circuiting if they are exposed to an excessive surge over the specification. A short-circuit occurs when the load factor rises against the circuit voltage due to the deterioration of a varistor voltage. Then the Joule heat is generated by the leakage current and a thermal runaway occurs. The varistors may burst and become open if a commercial power supply of 200V r.m.s. is connected to a varistor for 100V r.m.s. (270V/1mA).

Chip Varistors for Surface Mount

- Please perform damp-proofing on the surface of the varistors prior to the use when installing in a high-humidity and high-temperature environment.

Reference

- For basic precautions, please refer to the technical report of JEITA EMAJ-R039 Safety

Terms and Definitions

Maximum Allowable Circuit Voltage

- The maximum commercial frequency sinusoidal voltage effective value or maximum DC voltage which can be applied continuously.

Maximum Energy (E)

- The maximum energy within the varistor voltage change rate of ±10% when a single impulse of 2ms is applied. (NV73 2E, 2J, 2L are applied 100 times.)

Maximum Peak Current (Ip)

- The maximum peak current within the varistor voltage change rate of ±10%, when a single standard impulse of 8/20μs is applied in two times with an interval of 5 min. (NV73 2E, 2J, 2L are 100 times.)

Operating Temperature (Top)

- The allowable ambient temperature range while the device is operating.

Storage Temperature (Tstg)

- The temperature range in which the elements do not deteriorate.

Varistor Voltage (Vc)

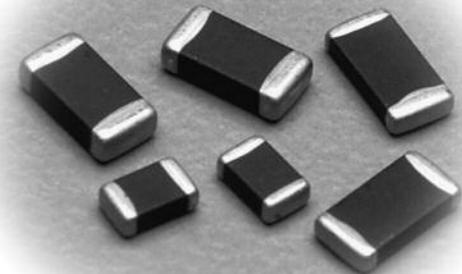
- The terminal voltages on both ends of the varistor when the specified current is applied.

Clamping Voltage (Vp)

- The peak value of the voltage between two terminals of the varistor when the specified standard waveform impulse current (8/20μs) is applied.

Recommended value of varistor voltage for the power supply voltage

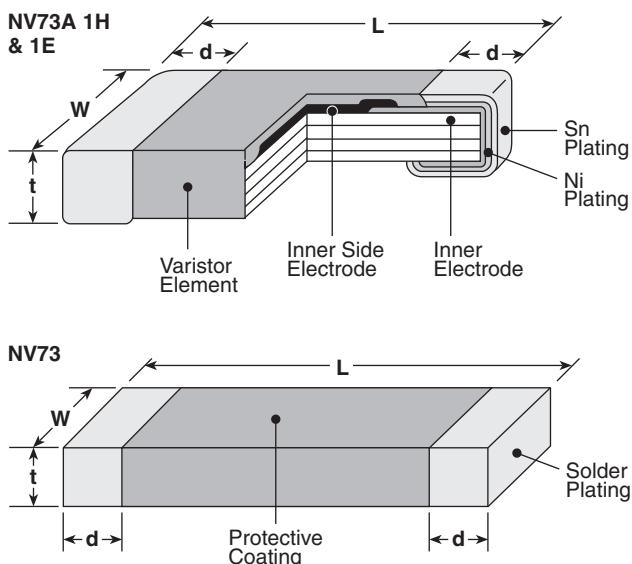
Voltage of Power Line	Varistor Voltage
3.3V d.c.	8.2V
5V d.c.	8.2V, 12V
12V d.c.	24V, 27V
24V d.c.	47V, 56V
48V d.c.	82V, 100V, 120V



features

- Multilayer structure
- High surge current
- Protector against static electricity, switching and incoming surges
- Suitable for both flow and reflow soldering
- Products with lead-free terminations meet EU RoHS requirements. Pb located in glass material, electrode and varistor element is exempt per Annex 1, exemption 5 of EU directive 2005/95/EC

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	d
1H (0201)	.024±.001 (.6±.03)	.012±.001 (.3±.03)	.012±.001 (.3±.03)	.004 min. (.1 min.)
1E (0402)	.023±.004 (1.0±.01)	.02±.004 (.5±.01)	.023 max. (.6 max.)	.01±.006 (.25±.015)
1J (0603)	.063±.006 (1.6±.015)	.031±.006 (.8±.015)	.031±.006 (.8±.015)	.016 ^{+.006} _{-.008} (.4 ^{+.015} _{-.2})
2A (0805)	.079±.008 (2.0±.02)	.049±.008 (1.25±.02)	.051 max. (1.3 max.)	.02±.010 (.5±.025)
2B (1206)	.126±.008 (3.2±.02)	.063±.008 (1.6±.02)	.065 max. (1.65 max.)	.02 ^{+.014} _{-.010} (.5 ^{+.35} _{-.25})
2E (1210)	.126±.008 (3.2±.02)	.098±.008 (2.5±.02)	.059 max. (1.5 max.)	.020±.008 (.5±.02)
2J (1812)	.177±.008 (4.5±.02)	.126±.008 (3.2±.02)	.079 max. (2.0 max.)	.020 ^{+.012} _{-.004} (.5 ^{+.3} _{.1})
2L (2220)	.224±.008 (5.7±.02)	.197±.008 (5.0±.02)	.098 max. (2.5 max.)	.020 ^{+.001} _{-.004} (.5 ^{+.3} _{.1})
C2L (2220)	.232±.008 (5.9±.02)	.201±.008 (5.1±.02)	.106 max. (2.7 max.)	.028 ^{+.016} _{-.012} (.7 ^{+.4} _{.3})

ordering information

NV73	A	L	1J	T	TE	8.2
Type	Energy Code	Capacitance Type	Size	Termination Material	Packaging	Varistor Voltage
A	B	Blank: Standard L: Low Capacitance (1E only)	1H: 0201 1E: 0402 1J: 0603 2A: 0805 2B: 1206 2E: 1210 2J: 1812 2L: 2220	T: Sn	TBM: 2mm press paper (1H: 15,000 pieces/reel) TP: 2mm pitch paper (1E: 10,000 pieces/reel) TE: 7" embossed plastic (1J, 2A, 2B: 2,500 pieces/reel; 2J, 2L: 1,000 pieces/reel; 2E: 2,000 pieces/reel)	8.2V 8.2 18V 18

For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Varistor Voltage V _{1mA} (V)	Varistor Voltage Tolerance (V)	Maximum Allowable Voltage d.c. (V)	Clamping Voltage I _c =1A (V) 8/20μs	Maximum Energy (J) 10/1000μs	Maximum Peak Current (A) 2 times 8/20μs	Capacitance (Typ) 1kHz (pF)	Operating Temp. (°C)	Storage Temp. (°C)
NV73A1HTTBM12	12	10 - 15.6	6.5	35	0.05	1	33	-40°C to +85°C	-40°C to +125°C
NV73A1ETTP8	8	6.4 - 9.6	5.5	20		20	480		
NV73A1ETTP18	18	16.2 - 19.8	14.0	35			160		
NV73AL1ETTP12	12	10 - 14	5.5	30	0.03	5	50		
NV73AL1ETTP21	21	18 - 24	14.0	50			50		
NV73AL1ETTP28	28	24 - 32	18.0	65			2		
NV73AL1ETTP120	120	90 - 150		350 (1C=0.5A)	0.005		0.5		

Part Designation	Varistor Voltage V _c	Maximum Allowable Voltage		Clamping Voltage		Maximum Energy E (J)	Maximum Peak Current I _p (A) (2 times)	Operating Temp. T _{opt} (°C)	Storage Temp. T _{stg} (°C)
	I _c = 1mA (V)	a.c rms (V)	d.c (V)	V _{1A}	V _{2A}				
NV73A1JTTE8.2	6.8 - 9.8	4.2	6.0	—	21	0.1	30	-40°C to +85°C	-40°C to +125°C
NV73A1JTTE12	10 - 14.4	6.1	8.6	—	29				
NV73A1JTTE15	12.5 - 18	7.6	10.8	—	35				
NV73A1JTTE18	16 - 20	9.1	12.8	—	37				
NV73A1JTTE20	18 - 22	10.6	15.0	—	40				
NV73A1JTTE22	19 - 24	12.0	16.5	—	42				
NV73A1JTTE24	21.8 - 26.5	14.0	18.0	—	46	0.04	20	-40°C to +85°C	-40°C to +125°C
NV73A1JTTE27	25 - 32	17.0	22.0	—	49				
NV73A2ATTE8.2	6.8 - 9.8	4.2	6.0	18	—				
NV73A2ATTE12	10 - 14.4	6.1	8.6	24	—				
NV73A2ATTE15	12.5 - 18	7.6	10.8	29	—				
NV73A2ATTE18	16 - 20	9.1	12.8	29	—				
NV73A2ATTE20	18 - 22	10.6	15.0	33	—	0.05	20	-40°C to +85°C	-40°C to +125°C
NV73A2ATTE22	19 - 24	12.0	16.5	39	—				
NV73A2ATTE24	21.8 - 26.5	14.0	18.0	42	—				
NV73A2ATTE27	25 - 32	17.0	22.0	50	—				
NV73A2ATTE33	30 - 39	20.0	26.0	60	—				
NV73A2ATTE39	37 - 47	25.0	31.0	72	—				
NV73A2ATTE47	45 - 54	30.0	38.0	86	—	0.14	25	-40°C to +85°C	-40°C to +125°C
NV73B2ATTE8.2	6.8 - 9.8	4.2	6.0	—	18				
NV73B2ATTE12	10 - 14.4	6.1	8.6	—	24				
NV73B2ATTE15	12.5 - 18	7.6	10.8	—	30				
NV73B2ATTE18	16 - 20	9.1	12.8	—	32				
NV73B2ATTE20	18 - 22	10.6	15.0	—	36				
NV73B2ATTE22	19 - 24	12.0	16.5	—	40	0.09	35	-40°C to +85°C	-40°C to +125°C
NV73B2ATTE24	21.8 - 26.5	14.0	18.0	—	42				
NV73B2ATTE27	25 - 32	17.0	22.0	—	58				
NV73B2ATTE33	30 - 39	20.0	26.0	—	66				
NV73C2ATTE8.2	6.8 - 9.8	4.2	6.0	—	18				
NV73C2ATTE12	10 - 14.4	6.1	8.6	—	24				
NV73C2ATTE15	12.5 - 18	7.6	10.8	—	29	0.11	50	-40°C to +85°C	-40°C to +125°C
NV73C2ATTE18	16 - 20	9.1	12.8	—	32				
NV73C2ATTE20	18 - 22	10.6	15.0	—	35				
NV73C2ATTE22	19 - 24	12.0	16.5	—	40				
NV73C2ATTE24	21.8 - 26.5	14.0	18.0	—	42				
NV73C2ATTE27	25 - 32	17.0	22.0	—	55				
NV73A2BTTE33	30 - 39	20.0	26.0	—	60	0.15	40	-40°C to +85°C	-40°C to +125°C
NV73A2BTTE39	37 - 47	25.0	31.0	—	72				
NV73A2BTTE47	45 - 54	30.0	38.0	—	85				
NV73A2BTTE56	52 - 62	35.0	45.0	—	100				

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/24/14

applications and ratings (continued)

Part Designation	Varistor Voltage Vc	Maximum Allowable Voltage		Clamping Voltage		Maximum Energy E (J)	Maximum Peak Current Ip (A) (2 times)	Operating Temp. T _{opt} (°C)	Storage Temp. T _{stg} (°C)
		I _c = 1mA (V)	a.c rms (V)	d.c (V)	V _{1A}				
NV73B2BTTE8.2	6.8 - 9.8	4.2	6.0	—	18	0.03	30	-40°C to +85°C	-40°C to +125°C
NV73B2BTTE12	10 - 14.4	6.1	8.6	—	24	0.07			
NV73B2BTTE15	12.5 - 18	7.6	10.8	—	29	0.09			
NV73B2BTTE18	16 - 20	9.1	12.8	—	32	0.1			
NV73B2BTTE20	18 - 22	10.6	15.0	—	35	0.11			
NV73B2BTTE22	19 - 24	12.0	16.5	—	40	0.12			
NV73B2BTTE24	21.8 - 26.5	14.0	18.0	—	42	0.14			
NV73B2BTTE27	25 - 32	17.0	22.0	—	52	0.16			
NV73C2BTTE8.2	6.8 - 9.8	4.2	6.0	—	18	0.06	40		
NV73C2BTTE12	10 - 14.4	6.1	8.6	—	24	0.1			
NV73C2BTTE15	12.5 - 18	7.6	10.8	—	29	0.13			
NV73C2BTTE18	16 - 20	9.1	12.8	—	29	0.15			
NV73C2BTTE20	18 - 22	10.6	15.0	—	31	0.17			
NV73C2BTTE22	19 - 24	12.0	16.5	—	35	0.19			
NV73C2BTTE24	21.8 - 26.5	14.0	18.0	—	38	0.2			
NV73C2BTTE27	25 - 32	17.0	22.0	—	48	0.24			

Part Designation	Varistor Voltage Vc	Maximum Allowable Voltage		Clamping Voltage			Maximum Energy E (J)	Maximum Peak Current Ip (A) (2 times)	Operating Temp. T _{opt} (°C)	Storage Temp. T _{stg} (°C)
		I _c = 1mA (V)	a.c rms (V)	d.c (V)	V _{2.5A}	V _{5A}				
NV73A2ETTE15	12.8 - 17.3	8.0	11.0	30	—	—	1.0	400	-50°C to +125°C	-50°C to +150°C
NV73A2ETTE18	15.3 - 20.7	11.0	14.0	34	—	—	1.2			
NV73A2ETTE22	19.8 - 24.2	12.0	16.5	39	—	—	1.4			
NV73A2ETTE24	21.6 - 26.4	14.0	18.0	39	—	—	1.4			
NV73A2ETTE27	24.3 - 29.7	17.0	22.0	44	—	—	1.7			
NV73A2ETTE33	29.7 - 36.3	20.0	26.0	54	—	—	1.9			
NV73A2ETTE39	35.1 - 42.9	25.0	30.0	65	—	—	1.7			
NV73A2ETTE47	42.3 - 51.7	30.0	38.0	77	—	—	2.0			
NV73A2ETTE56	50.4 - 61.6	35.0	45.0	90	—	—	2.0			
NV73A2ETTE82	73.8 - 90.2	50.0	65.0	135	—	—	1.2			
NV73A2ETTE100	90.0 - 110.0	60.0	85.0	165	—	—	1.4	200	-50°C to +125°C	-50°C to +150°C
NV73A2ETTE110	99.0 - 121.0	70.0	90.0	180	—	—	1.4			
NV73A2JETTE12	10.2 - 13.8	6.0	9.0	—	27	—	0.9			
NV73A2JETTE15	12.8 - 17.3	8.0	11.0	—	32	—	1.2			
NV73A2JETTE18	16.2 - 19.8	11.0	14.0	—	35	—	1.4			
NV73A2JETTE22	19.8 - 24.2	12.0	16.5	—	41	—	1.6			
NV73A2JETTE24	21.6 - 26.4	14.0	18.0	—	44	—	1.7			
NV73A2JETTE27	24.3 - 29.7	17.0	22.0	—	49	—	2.0			
NV73A2JETTE33	29.7 - 36.3	20.0	26.0	—	54	—	2.5			
NV73A2JETTE39	35.1 - 42.9	25.0	30.0	—	65	—	2.9			
NV73A2JETTE47	42.3 - 51.7	30.0	38.0	—	77	—	3.5			
NV73A2JETTE56	50.4 - 61.6	35.0	45.0	—	90	—	4.2	400	-50°C to +125°C	-50°C to +150°C
NV73A2JETTE68	61.2 - 74.8	40.0	56.0	—	110	—	4.8			
NV73A2JETTE82	73.8 - 90.2	50.0	65.0	—	135	—	4.5			
NV73A2JETTE100	90 - 110	60.0	85.0	—	165	—	5.8			
NV73A2JETTE110	99 - 121	70.0	90.0	—	180	—	5.8			
NV73A2JETTE150	135 - 165	95.0	127.0	—	248	—	5.8			
NV73B2JETTE15	12.8 - 17.3	8.0	11.0	—	32	—	1.8	300	-50°C to +125°C	-50°C to +150°C
NV73B2JETTE18	15.3 - 20.7	11.0	14.0	—	35	—	1.9			
NV73B2JETTE22	19.8 - 24.2	12.0	16.5	—	41	—	2.3			
NV73B2JETTE24	21.6 - 26.4	14.0	18.0	—	44	—	2.3			
NV73B2JETTE27	24.3 - 29.7	17.0	22.0	—	49	—	2.7			
NV73B2JETTE33	29.7 - 36.3	20.0	26.0	—	54	—	3.0			

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/24/14

applications and ratings (continued)

Part Designation	Varistor Voltage Vc	Maximum Allowable Voltage		Clamping Voltage			Maximum Energy E (J)	Maximum Peak Current Ip (A) (2 times)	Operating Temp. T _{opt} (°C)	Storage Temp. T _{stg} (°C)
	I _c = 1mA (V)	a.c rms (V)	d.c (V)	V _{2.5A}	V _{5A}	V _{10A}				
NV73B2JTTE39	35.1 - 42.9	25.0	30.0	—	65	—	3.7	800	-50°C to +125°C	-50°C to +150°C
NV73B2JTTE47	42.3 - 51.7	30.0	38.0	—	77	—	4.2			
NV73B2JTTE56	50.4 - 61.6	35.0	45.0	—	90	—	4.2			
NV73A2LTTE12	10.2 - 13.8	6.0	9.0	—	—	28	1.9			
NV73A2LTTE15	12.8 - 17.3	8.0	11.0	—	—	33	2.3			
NV73A2LTTE18	16.2 - 19.8	11.0	14.0	—	—	36	2.7			
NV73A2LTTE22	19.8 - 24.2	12.0	16.5	—	—	41	2.9			
NV73A2LTTE24	21.6 - 26.4	14.0	18.0	—	—	45	3.1			
NV73A2LTTE27	24.3 - 29.7	17.0	22.0	—	—	48	3.8			
NV73A2LTTE33	29.7 - 36.3	20.0	26.0	—	—	57	4.3			
NV73A2LTTE39	35.1 - 42.9	25.0	30.0	—	—	65	5.5	1000	-50°C to +125°C	-50°C to +150°C
NV73A2LTTE47	42.3 - 51.7	30.0	38.0	—	—	77	6.3			
NV73A2LTTE56	50.4 - 61.6	35.0	45.0	—	—	90	7.7			
NV73A2LTTE68	61.2 - 74.8	40.0	56.0	—	—	110	8.8			
NV73A2LTTE100	90 - 110	60.0	85.0	—	—	165	6.8			
NV73A2LTTE110	99 - 121	70.0	90.0	—	—	180	6.8			
NV73B2LTTE15	12.8 - 17.3	8.0	11.0	—	—	33	4.2			
NV73B2LTTE18	15.3 - 20.7	11.0	14.0	—	—	36	5.4			
NV73B2LTTE22	19.8 - 24.2	12.0	16.5	—	—	41	5.8			
NV73B2LTTE24	21.6 - 26.4	14.0	18.0	—	—	45	5.8			
NV73B2LTTE27	24.3 - 29.7	17.0	22.0	—	—	48	7.2	1200	-40°C to +125°C	-40°C to +150°C
NV73B2LTTE33	29.7 - 36.3	20.0	26.0	—	—	57	7.8			
NV73B2LTTE39	35.1 - 42.9	25.0	30.0	—	—	65	9.6			
NV73B2LTTE47	42.3 - 51.7	30.0	38.0	—	—	77	12.0			
NV73B2LTTE56	50.4 - 61.6	35.0	45.0	—	—	90	7.7			
NV73B2LTTE82	73.8 - 90.2	50.0	65.0	—	—	135	5.6			
NV73C2LTTE39	35.1 - 42.9	25.0	30.0	—	—	65	5.6 (1 time)			
NV73C2LTTE82	73.8 - 90.2	50.0	65.0	—	—	135	14 (1 time)			

Maximum allowable voltage - the maximum sinusoidal RMS voltage or maximum DC voltage which can be applied continuously

E: Maximum energy - the maximum energy within the varistor voltage change of ±10% when a single impulse of 2m sec. is applied

Ip: Maximum peak current - the maximum peak current within the varistor voltage change of ±10% when a single standard impulse of 8/20μ sec. is applied two times with an interval of 5 min.

T_{opt}: Operating temperature - Ambient temperature range when the device is operating

T_{stg}: Storage temperature - Temperature range without causing the device any failure

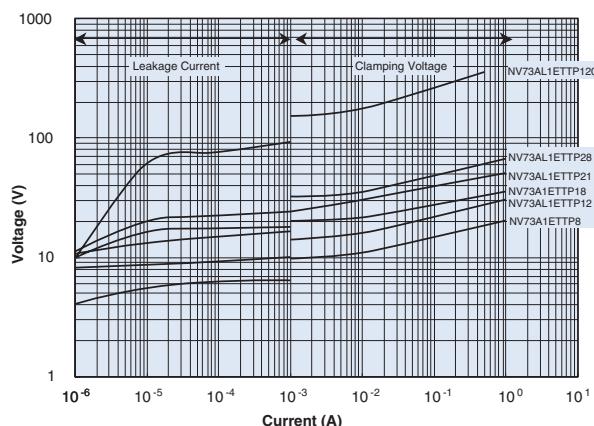
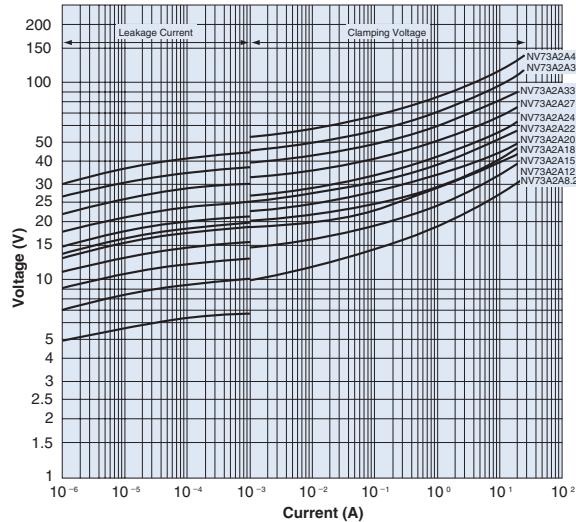
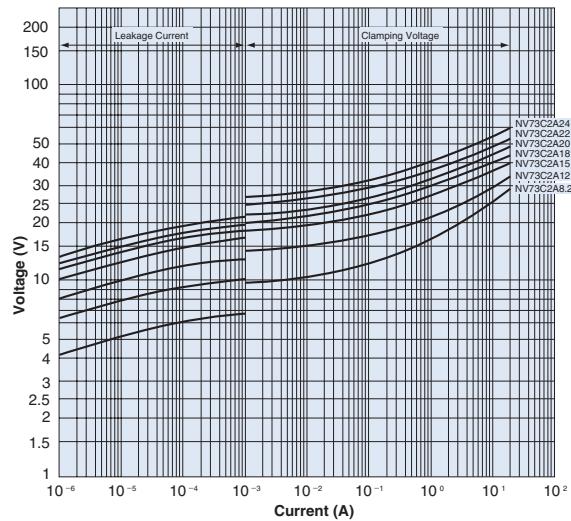
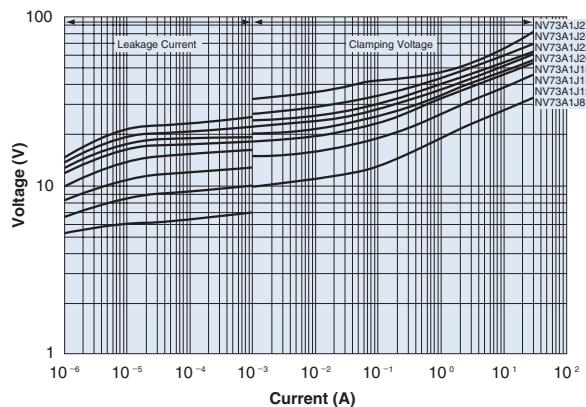
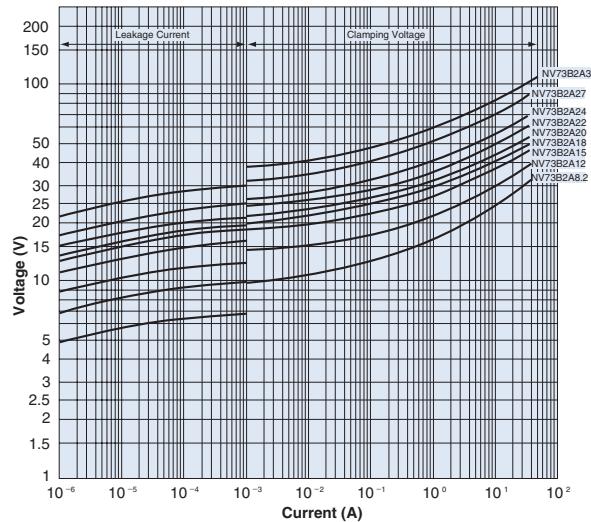
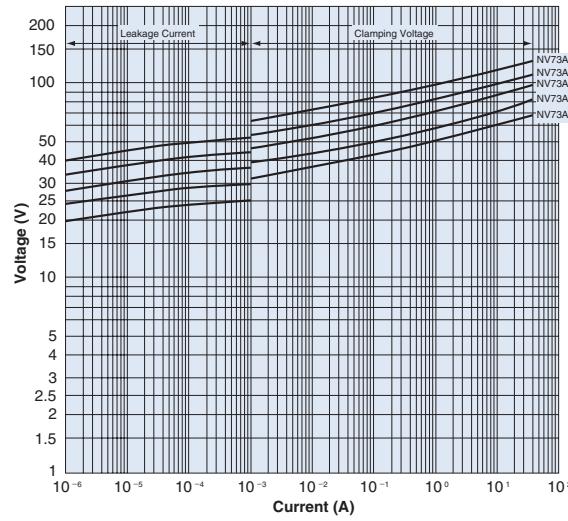
environmental applications
Performance Characteristics

Parameter	Requirement Δ V±%	Test Method
Varistor Voltage	Within specified tolerance	Voltage between terminals when 1mA is flowed
Solderability	95% coverage minimum	230°C ± 5°C, 4 seconds ± 1 second; 235°C ± 5°C, 4 seconds ± 1 second***
Resistance to Solder Heat	±10%	260°C ± 5°C, 10 seconds ± 0.5 second*, 270°C ± 5°C, 3 seconds ± 0.5 second**, 260°C ± 5°C, 4 seconds ± 1 second***
Rapid Change of Temperature	±10%	-40°C (30 minutes), +125°C (30 minutes), 30 cycles; 5 cycles***
Maximum Peak Current	±10%	A single standard impulse of 8/20μ seconds, positive/negative applied once each; A single standard impulse of 8/20μ seconds, 100 pulse, 30 second interval***
Maximum Energy	±10%	A single standard impulse of 10/1000μs, once*; A single standard impulse of 2ms, once**; A single standard impulse of 10/1000μs, 100pulse, 90 second interval***
High Temperature Life with d.c. Bias	±10%	85°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.); 125°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.)***
Low Temperature Life with d.c. Bias***	±10%	-50°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (d.c.)
High Temperature Life with a.c. Bias**	±10%	85°C ± 5°C, 1000h, Load: Maximum allowable circuit voltage (Va.c.r.m.s.)
High Temperature & High Humidity Life with d.c. Bias	±10%	40°C ± 5°C, 95% RH, 500h, Load: Maximum allowable voltage (d.c.)
Capacitance*	Typical	1kHz: Others, 1MHz: Varistor voltage 120V
High Temperature Storage Life	±10%	125°C ± 5°C, 1000h; 150°C ± 5°C, 1000h***
Low Temperature Storage Life	±10%	-40°C ± 5°C, 1000h; -50°C ± 5°C, 1000h***

* 1H, 1E ** 1J, 2A, 2B *** 2E, 2J, 2L

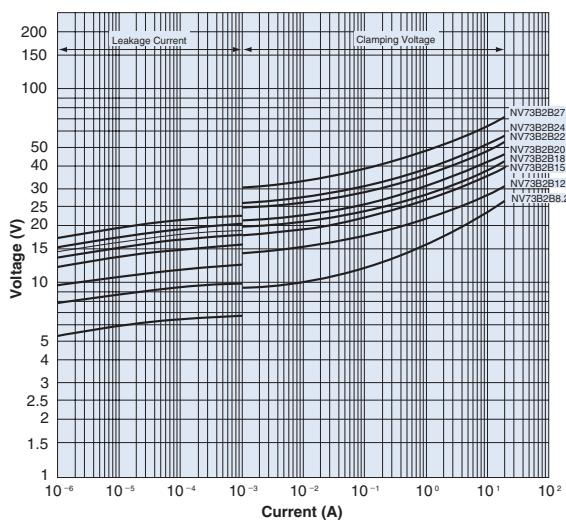
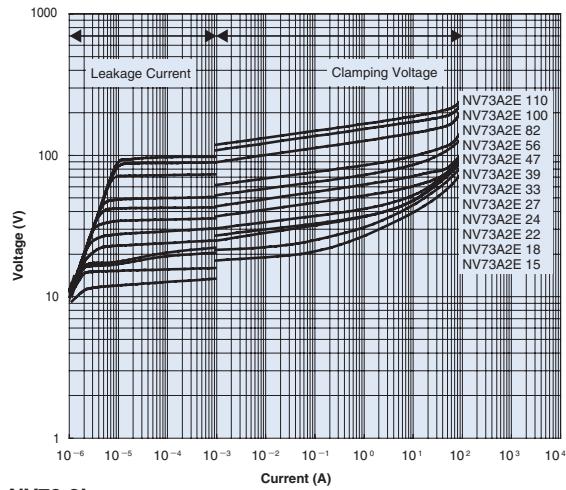
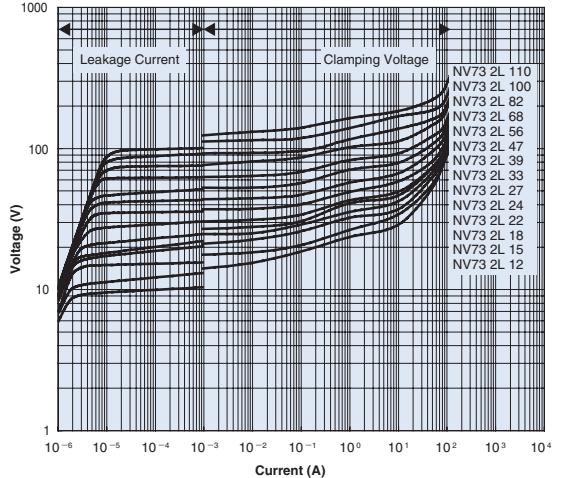
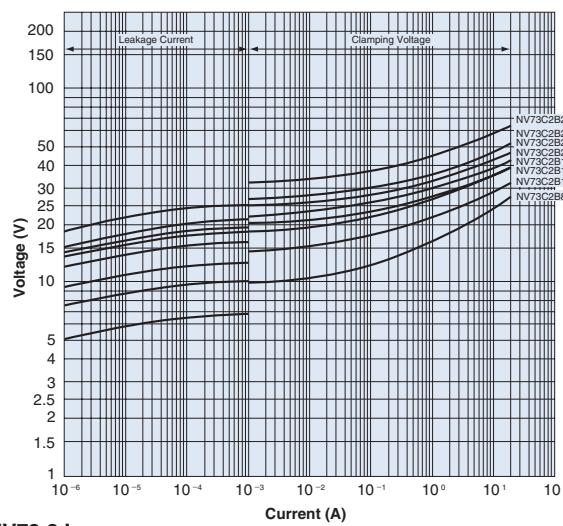
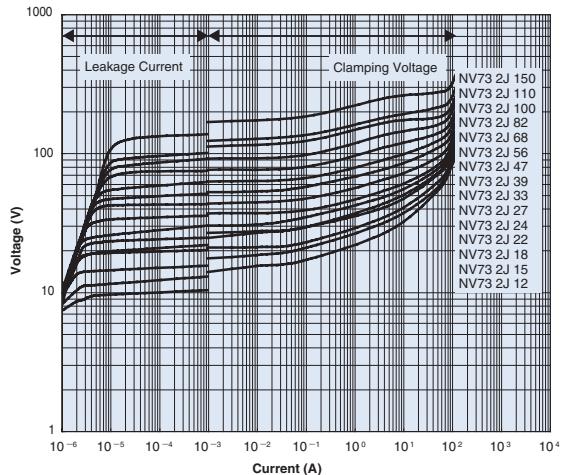
For Voltage Current Curves Graphs see Environmental Applications. Additional environmental applications can also be found at www.koaspeer.com. Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/06/18

environmental applications (continued)
Voltage-Current Curves ($T_a = 25^\circ\text{C}$)
NV73A 1E

NV73A 2A

NV73C 2A

NV73A 1J

NV73B 2A

NV73A 2B


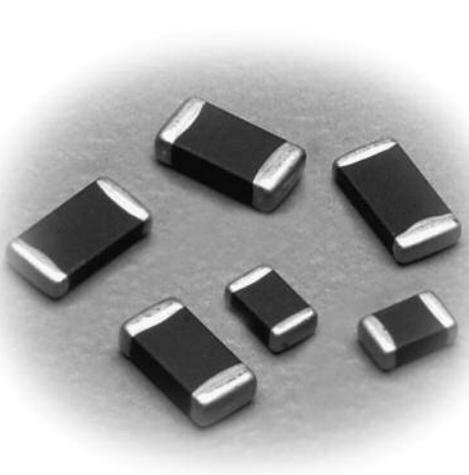
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/08/16

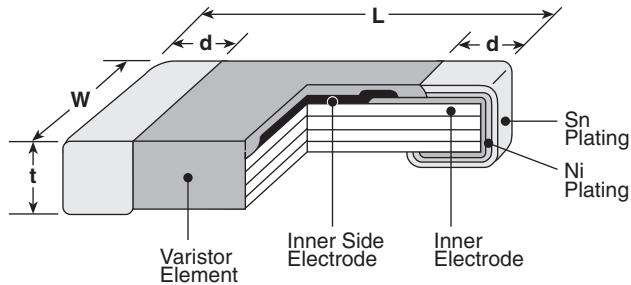
environmental applications (continued)
Voltage-Current Curves ($T_a = 25^\circ\text{C}$)
NV73B 2B

NV73 2E

NV73 2L

NV73C 2B

NV73 2J


Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/08/16



dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	d
1J (0603)	.063±.006 (1.6±0.15)	.031±.006 (0.8±0.15)	.039 max. (1.0 max.)	.016±.006 (0.4±0.15)
2A (0805)	.079±.010 (2.0±0.25)	.049±.008 (1.25±0.2)	.051 max. (1.30 max.)	.020±.010 (0.5±0.25)
2B (1206)	.126±.012 (3.2±0.3)	.063±.012 (1.6±0.3)	.057 max. (1.45 max.)	.022±.012 (0.55±0.3)

ordering information

NV73	DL	2A	T	TE	27
Type	Energy Code	Size	Termination Material	Packaging	Varistor Voltage
		1J: 1.6 x 0.08 2A: 2.0 x 1.2 2B: 3.2 x 1.6	T: Sn	TE: 7" embossed plastic	

applications and ratings

Part Designation	Varistor Voltage (V)	Maximum Allowable Voltage		Maximum Clamping Voltage (V)		Maximum Energy (J)	Maximum Peak Current 8/20µs (A) 1 time	Short-Time Applied Voltage (5 min) (V _{DC})	Capacitance (Typ) 1kHz (pF)
	V _{1mA}	A.C. (V _{r.m.s.})	D.C. (V)	V _{1A}	V _{2A}				
NV73DL1JTTE12	10~14.4	6.1	8.6	24	—	0.1	80	10	630
NV73DL1JTTE22	22~27	14	16	42	—	0.2	100	24.5	390
NV73DL1JTTE27	24~32	17	22	50	—	0.2	100	24.5	320
NV73DL1JTTE33	33~39	20	26	60	—	0.3	100	24.5	200
NV73DL1JTTE47	40~54	30	34	81	—	0.3	100	42	130
NV73DL2ATTE12	10~14.4	6.1	8.6	24	—	0.1	120	10	1070
NV73DL2ATTE22	22~27	14	16	42	—	0.3	160	24.5	610
NV73DL2ATTE27	24~32	17	22	50	—	0.3	160	24.5	580
NV73DL2ATTE33	33~39	20	26	60	—	0.3	160	24.5	380
NV73DL2ATTE47	40~54	30	34	81	—	0.3	160	42	260
NV73DL2ATTE68	62~72	45	56	108	—	0.3	160	64	190
NV73DL2ATTE82	74~90	50	65	135	—	0.3	160	75	105

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/19/17

applications and ratings (continued)

Part Designation	Varistor Voltage (V)	Maximum Allowable Voltage		Maximum Clamping Voltage (V)		Maximum Energy (J)	Maximum Peak Current 8/20μs (A) 1 time	Short-Time Applied Voltage (5 min) (V _{DC})	Capacitance (Typ) 1kHz (pF)
		V _{1mA}	A.C.(V _{r.m.s.})	D.C.(V)	V _{1A}				
NV73DL2BTTE22	22~27	14	16	—	42	1	300	24.5	1600
NV73DL2BTTE27	24~32	17	22	—	50	1	300	24.5	1360
NV73DL2BTTE33	33~39	20	26	—	60	1	300	24.5	870
NV73DL2BTTE68	62~72	45	56	—	108	1.5	300	64	380
NV73DL2BTTE82	74~90	50	65	—	135	1.5	300	75	250

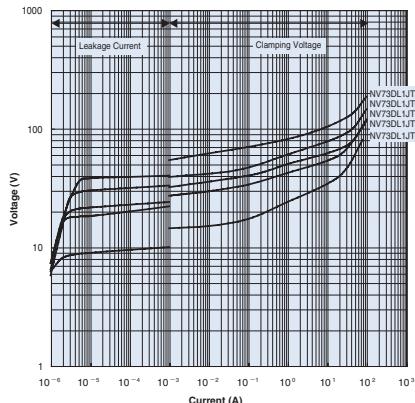
Operating temperature range: -40°C to +125°C

Storage temperature range: -40°C to +150°C

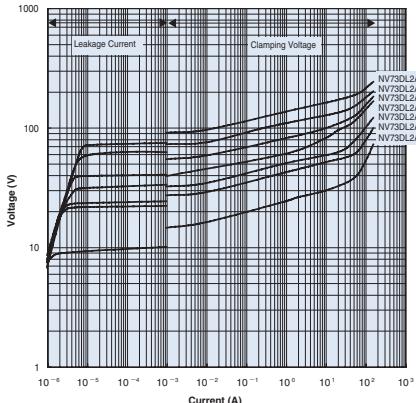
environmental applications

Voltage Current Curves (Ta = +25°C)

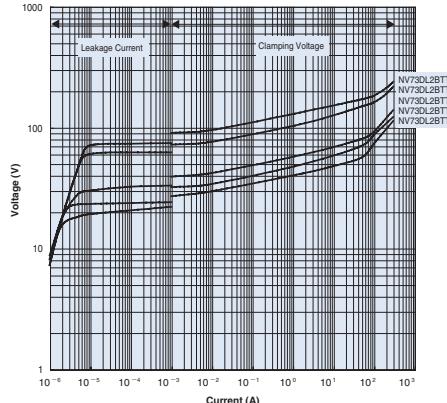
NV73DL1J



NV73DL2A



NV73DL2B



Performance Characteristics

Parameter	Requirement Δ V1mA±%	Test Method
Varistor Voltage	Within specified tolerance	Voltage between terminals when 1mA and 10mA are flowed
Solderability	95% coverage minimum (Ag-Pd: 75% coverage min.)	230°C ± 5°C, 5 seconds ± 0.5 second
Resistance to Solder Heat	±10%	260°C ± 5°C, 10 seconds ± 0.5 second
Rapid Change of Temperature	±10%	-40°C (30 minutes)/ +125°C (30 minutes), 1000 cycles
Short-Time Applied Voltage	±10%	Maximum value of D.C. voltage that can be applied for a short period of time (5 min.) (NV73D2A 12: 1 min.)
Maximum Peak Current	±10%	A single standard impulse current of 8/20μ seconds is applied
Maximum Energy	±10%	A single standard impulse of 2m second, once
Electrostatic Discharge	±10%	25kV (Non contact) (NV73DL1J12, NV73DL2A12: 15kV (Non contact))
Vibration Resistance	No visible damage. No remarkable mechanical damage	Vibration frequency: 10Hz~2000Hz; Full amplitude: 1.5mm, 10Hz~2000Hz-10Hz 20 min. XYZ direction 4 hrs for each total 12 hrs
High Temperature Life with d.c. Bias	±10%	125°C ± 2°C, 1000h, Applied voltage: Varistor voltage (V1 _{ma}) x 0.85
High Temperature & High Humidity Life with Bias	±10%	85°C ± 2°C, 85% RH, 1000h, Applied voltage: Varistor voltage (V1 _{ma}) x 0.85
Thermal Shock	±10%	-55°C (15 min.)/ +125°C (15 min.) 300 cycles
Shock	±10%	Half sine wave, Applied time: 1m second, Applied cycle: 500m/s ² , 5 cycles
High Temperature Storage	±10%	150°C, 1000h
Low Temperature Storage	±10%	-40°C, 1000h

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

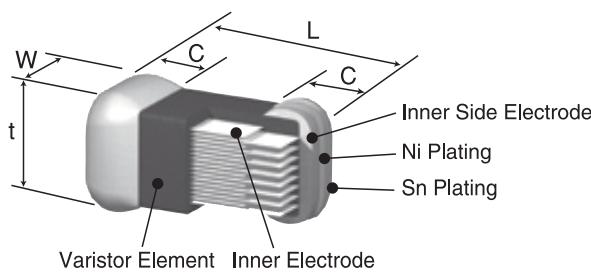
12/12/17



features

- Symmetrical non-linearity V-I characteristics absorb positive and negative surge
- Suitable for protection of automotive applications from load dump surge on electronic components
- Meets JASO load dump surge test requirements
- Operating temperatures up to 125°C
- High resistance to cyclic temperature stress
- Suitable for both flow and reflow solderings
- Products meet EU RoHS requirements
- AEC-Q200 Qualified

dimensions and construction



Type (Inch Size Code)	Dimensions inches (mm)			
	L	W	t	C
NV73DS 2L (2420)	.240±.014 (6.1±0.35)	.201±.014 (5.1±0.35)	.146 max. (3.7 max.)	.041±.008 (1.05±0.2)

ordering information

NV73	DS	2L	T	TE	27
Type	Energy Code	Size	Termination Material	Packaging	Varistor Voltage
A B		2L: 6.1 x 5.1mm	T: Sn	TE: 7" embossed plastic	

applications and ratings

Part Designation	Varistor Voltage (Range) (V)	Maximum Allowable Voltage		Clamping Voltage (V)	Maximum Load Dump Surge Energy	Maximum Peak Current	Short-Time Applied Voltage (5 min)
	V_{1mA}	A.C.(V _{r.m.s.})	D.C.(V)	V_{20A}	J	8/20μs (A) 1 time	(V _{DC})
NV73DSA2LTTE27	20~25	14	16	40	70	200	24.5
NV73DSB2LTTE27	20~25	14	16	40	63	200	24.5
NV73DSB2LTTE47	40~45	30	34	60	65	200	38

Operating temperature range: -40°C to +125°C

Storage temperature range: -40°C to +150°C

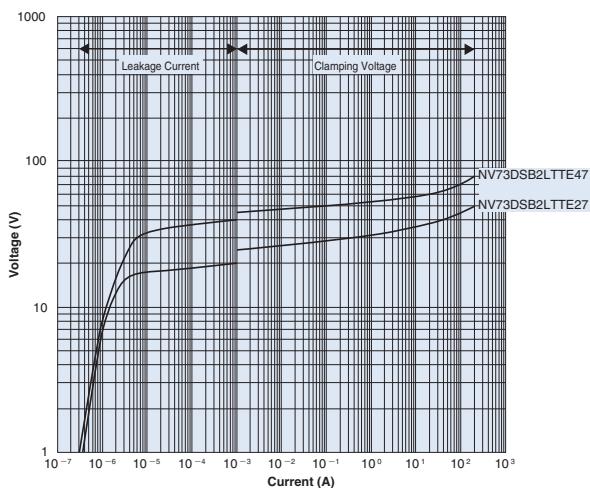
For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/19/17

environmental applications

Voltage Current Curves ($T_a = +25^\circ\text{C}$)

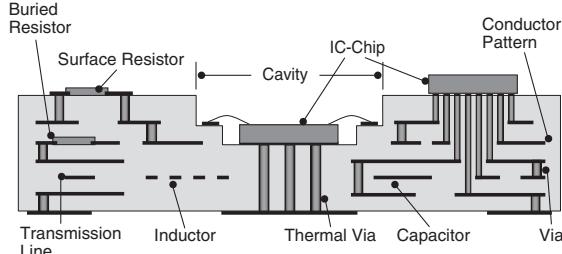


Performance Characteristics

Parameter	Requirement ΔV_{1mA}	Test Method
Varistor Voltage	Within specified tolerance	Voltage between terminals when 1mA is flowed
Resistance to Solder Heat	$\pm 10\%$	$260^\circ\text{C} \pm 5^\circ\text{C}$, 10 seconds ± 0.5 second
Solderability	95% coverage minimum	$230^\circ\text{C} \pm 5^\circ\text{C}$, 5 seconds ± 0.5 second
Rapid Change of Temperature	$\pm 10\%$	-40°C (30 minutes)/ +125°C (30 minutes), 1000 cycles
Short-Time Applied Voltage	$\pm 10\%$	Maximum value of D.C. voltage that can be applied for a short period of time (5 min.)
Maximum Peak Current	$\pm 10\%$	A single standard impulse current of 8/20 μ seconds is applied
Maximum Energy	$\pm 10\%$	A single standard impulse of 2m second, once
Electrostatic Discharge	$\pm 10\%$	25kV (Non contact)
Vibration Resistance	No visible damage. No remarkable mechanical damage	Vibration frequency: 10Hz~2000Hz; Full amplitude: 1.5mm, 10Hz~2000Hz~10Hz 20 min. XYZ direction 4 hrs for each total 12 hrs
High Temperature & High Humidity Life with Bias	$\pm 10\%$	$85^\circ\text{C} \pm 2^\circ\text{C}$, 85% RH, 1000h, Applied voltage: Varistor voltage (V_{1ma}) $\times 0.85$
High Temperature Life with d.c. Bias	$\pm 10\%$	$125^\circ\text{C} \pm 2^\circ\text{C}$, 1000h, Applied voltage: Varistor voltage (V_{1ma}) $\times 0.85$
Thermal Shock	$\pm 10\%$	-55°C (15 min.)/ +125°C (15 min.) 300 cycles
Shock	$\pm 10\%$	Half sine wave, Applied time: 1m second, Applied cycle: 500m/s ² , 5 cycles
High Temperature Storage	$\pm 10\%$	150°C, 1000h
Low Temperature Storage	$\pm 10\%$	-40°C, 1000h



construction



ordering information

New Part #	KLC	AB1
Type	KOA	Ref. Number

features

- KOA's substrates are suitable for bare chip mounting, as the thermal expansion coefficient is close to silicon's one and outstanding dimensional accuracy and flatness.
- Thanks to our low dielectric ceramics and low resistive conductors, the substrates excel in the high frequency characteristics
- Miniaturization and high integration are possible because of multilayer wiring, multi-cavity structure and the surface/buried printing resistors possibilities
- Special shapes of substrate and cavity such as circle shape, polygonal shape and concave or convex shape are available
- Thermal vias under bare chips can be implemented to improve the thermal conductivity of the substrate
- The substrates are outstanding in heat resistance and humidity resistance. There will be no outgas occurrence from the ceramics.
- Products meet EU RoHS requirements

what is LTCC ?

LTCC stands for Low Temperature Co-fired Ceramics. KOA's LTCC are multilayer ceramic substrates. This technology permits to use low resistive material as conductor patterns due to the lower temperature needed during firing process compared to general ceramic firing process. This is achieved by adding glass to alumina. KOA uses Silver based paste (Ag) to create the electrical structures in and on the ceramics layers. To be noted, that top and bottom layers patterns can be plated using various processes. Thanks to these materials, low loss electrical performance can be achieved as well as high dimensional accuracy.

KOA's LTCC provides clear advantages for system downsizing by forming surface resistors, inner resistors, and transmission lines on/ in the substrate. In addition, our thermal expansion coefficient is close to silicon's one, enhancing the reliability of mounted bare chip.

Furthermore, cavity structures can be formed, making possible the creation of low profile packages.

environmental applications

Characteristics of Substrate Material

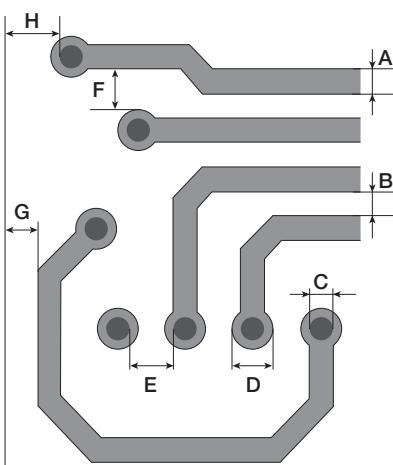
Parameter	Characteristics
Bending Strength (MPa)	250
Thermal Expansion Coefficient ($\times 10^{-6}/K$)	5.5
Thermal Conductivity (W/m • K)	3
Insulation Resistance ($\Omega \cdot cm$)	$>10^{13}$
Dielectric Constant at 1GHz	6.6
Dielectric Loss at 1GHz	<0.004
Density (g/cm ³)	2.8
Surface Roughness Ra (μm)	<0.4
Withstanding Voltage (kV/mm)	>15
Substrate Thickness (mm)	0.4~2.0 Standard
Layer Thickness ($\mu m/Layer$)	80, 100, 125 Standard

Symbol	Parameter	Design Value
A	Line Width	0.06mm Min.
B	Line to Line Spacing	0.06mm Min.
C	Via Diameter	0.1mm, 0.15mm, 0.2mm
D	Via Pad Diameter	Via diameter +0.05mm Min.
E	Via to Via Spacing	0.2mm Min.
F	Via pad to Line Spacing	0.125mm Min.
G	Part Edge to Conductor Spacing	0.2mm Min.
H	Part Edge to Via Spacing	0.3mm Min.
J1, J2	Cavity Width	0.6mm Min.
K1, K2	Cavity Depth	0.1mm Min.
L	Wall Width of Cavity	0.5mm Min.
M	Shelf Width in the Cavity	0.5mm Min.

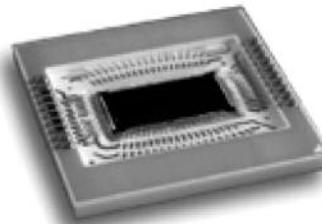
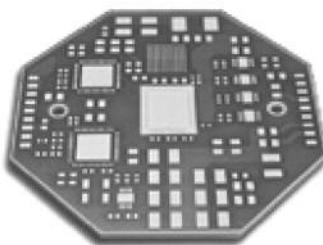
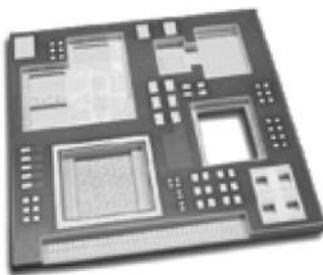
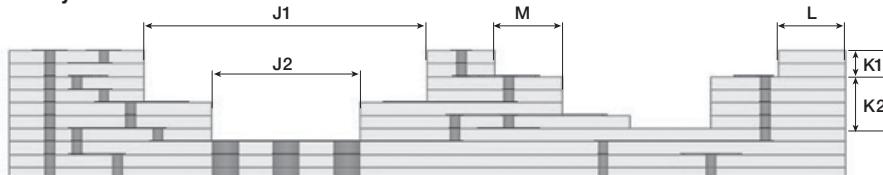
Conductor

Parameter	Characteristics
Material of Conductor	Ag
Resistivity of Conductor ($\mu\Omega \cdot cm$)	2.5
Surface Plating	Ni-Au, Ni-Pd-Au

Surface layer - Inner layer



Cavity



Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

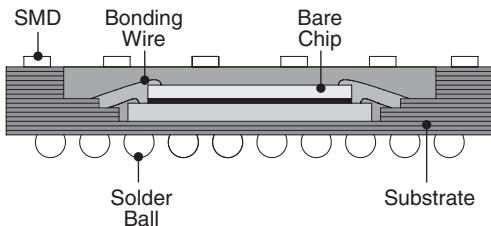
12/05/19



features

- Plural semiconductors in one package offers downsized system with high performance and standardization
- Wiring space saving by multilayer fine patterns on build-up substrate. No signal delay by shortened wiring distance
- Less mounting problem because of the decreasing number of the terminals

construction

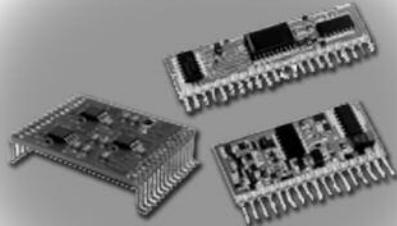


Package Specifications

Item	Content
Terminal Pitch	0.8mm~
Mountable Device	<ul style="list-style-type: none"> • SMD • Bare Chip • Printed Resistor
Package	<ul style="list-style-type: none"> • SON • BGA • LGA
Substrate for Package	• LTCC

Mounting Specifications

Item	Unit	Min.	Std.	Max.	Note
Substrate Dimension	mm	—	—	100 x 100	
Substrate Thickness	mm	0.4	—	2.0	
Bare Chip Pad Pitch	μm	100	—	—	
Bare Chip Pad Dimension	μm	70	—	—	
Bare Chip Thickness	mm	0.1	0.2	—	
Molding Height	mm	0.3	1.0	1.2	Height from chip surface
Wire Length	mm	0.3	—	3.0	
Wire Loop Height	μm	100	200	—	
Wire Diameter Au	Au	20	25	40	
Plating	Nonelectrical Au Plating				
Substrate	• LTCC				



features

- Adjustment processes are decreased by function and ratio trimmings
- High density mounting by bonding (COB)
- Various types of package are available
- High reliability achieved by KOAs original thick film technology
- Thick film printed circuit substrate applies the non-noble metal paste (conductive paste and resistive paste) and receives the many total inquires including material selecting, pattern designing and mass production

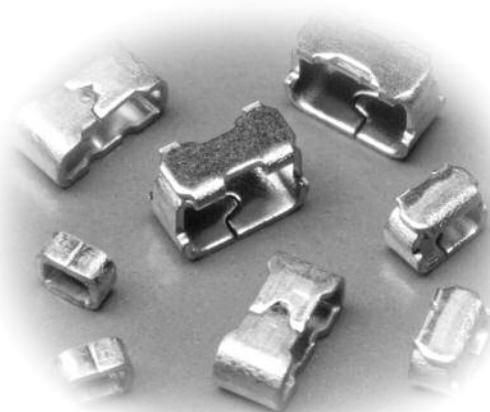
ordering information

KA	7777	D
Product Code	KOA Ref. Number	Terminal Surface Material
KA: Hybrid IC		D: SnAgCu T: Sn

Component - KA Series

Substrate Materials	Item	Printing	Mounting	Bonding
	Al ₂ O ₃ Alumina	o	o	o
	Glass epoxy	x	o	o
Conductors, Resistors	Item	Ag-Pd	Ag-Pt	
	Conductor resistance	18mΩ/□/15μm	5mΩ/□/10μm	
	Heat shock	-55°C~+125°C 300 Cycles	-55°C~+125°C 500 Cycles	
	RuO ₂	5Ω~10MΩ ±100x10 ⁶ /K		
Mounting	Item	Specifications		
	COB	Au Wire, Al Wire		
	BGA	0.5mm Pitch~		
	QFP	0.4mm Pitch~		
	Chip	0.4mm x 0.2mm		
Package, Outside Terminals	Package	Lead Pitch		
	SIP	1.8mm, 2.0mm, 2.5mm, 2.54mm		
	DIP, SOP	1.27mm, 1.8mm, 2.54mm		
	ZIP	2.54mm		
	BGA, LGA	1.0mm~		
Over Coating, Plating	Over Coating	Color	UL Standard	
	Epoxy metamorphic phenol	Black	94 V0 Approved	
	Epoxy	Black	94 V1 Approved	

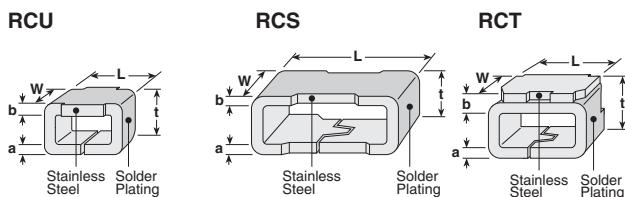
o= Available x= Not available



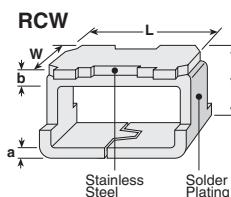
features

- Surface-mountable chip type test terminal
- Automatic machine insertable
- Suitable for reflow and wave soldering
- Available in three standard sizes: 0603, 0805 or 1206
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- AEC-Q200 Qualified (RCU only)

dimensions and construction



Note: Top surfaces of RCT and RCW are not solderable.



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	t	a	b
RCU (0603)	.063 (1.6)	.031 (0.8)	.045 (1.15)	.009 (0.23)	.009 (0.23)
RCT (0805)	.079 (2.0)	.049 (1.25)	.057 (1.45)	.009 (0.23)	.018 (0.45)
RCS (1206)	.126 (3.2)	.063 (1.6)	.049 (1.25)	.009 (0.23)	.009 (0.23)
RCW (1206)				.079 (2.0)	.009 (0.23) .018 (0.45)

ordering information

RCU	C	TE
Type	Termination Material	Packaging
RCU	C: SnCu	TE: 7" embossed plastic (2,000 pieces/reel) TED: 10" embossed plastic (5,000 pieces/reel) RCW not available in TED
RCT		
RCS		
RCW		

For further information on packaging, please refer to Appendix A.

applications and ratings

Part Designation	Rated Current	Standard Resistance	Rated Ambient Temperature	Operating Temperature Range
RCU	2 Amps	50mΩ or less	+70°C	-55°C to +125°C
RCT				
RCS				
RCW				

environmental applications

Performance Characteristics

Parameter	Requirement	Real R Limit	Typical	Test Method
Resistance	50mΩ Max. after the test	10mΩ Max. after the test	25°C	
Resistance to Solder Heat			260°C ± 5°C, 10 seconds ± 1 second	
Rapid Change of Temperature			-55°C (30 minutes), +125°C (30 minutes), 100 cycles	
High Temperature Exposure			+125°C, 240 hours	

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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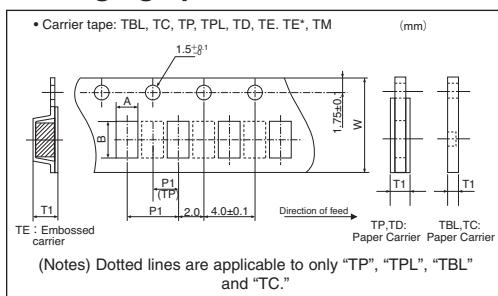
For Product Specific packaging, please refer to the individual product data sheets.

Type		Component Size (mm)			Carrier Tape	Quantity/Reel (Pieces)	Taping (mm)					Reel Size øa (mm)
		L	W	T			A	B	W	P1	T1	
HRK73 HV73 HV73-RT HV73V HV73-RT LT73 LT73V RN73 RK73-RT RK73B RK73G RK73G-RT RK73H RK73Z RN73H RN73R RS73 RS73-RT SG73 SG73-RT SG73G SG73P SG73S SR73 SR73-RT UR73V	1F	0.4	0.2	0.12	TX	40000	0.25±0.04	0.45±0.04	4.0±0.2	1.0±0.05	0.40±0.1	180
							0.25±0.04	0.45±0.04	8.0±0.2	2±0.05	0.31±0.2/-0	
	1H	0.6	0.3	0.23	TC/TCM	10000/15000	0.37±0.05	0.67±0.05	8.0±0.2	2±0.05	0.42±0.1	178
							0.65±0.1	1.15±0.1	8.0±0.2	2±0.05	0.42±0.2/-0	
	1E	1	0.5	0.35	TPL*	20000	0.65±0.1	1.15±0.1	8.0±0.2	2±0.05	0.42±0.2/-0	178
							0.65±0.1	1.15±0.1	8.0±0.2	2±0.05	0.42±0.2/-0	
	1J	1.6	0.8	0.45	TP	10000	1.1±0.1	1.9±0.1	8.0±0.2	2±0.05	0.6±0.2/-0	178
							1.1±0.1	1.9±0.1	8.0±0.2	4.0±0.1	0.6±0.2/-0	
	2A	2	1.25	0.5	TD	5000	1.65±0.2	2.4±0.2	8.0±0.2	2±0.05	0.75±0.2/-0	178
							1.65±0.2	2.4±0.2	8.0±0.2	4.0±0.1	0.75±0.2/-0	
	2B	3.2	1.6	0.6	TE	4000	1.6±0.2	2.4±0.2	8.0±0.2	4.0±0.1	0.9±0.1	178
							1.9±0.2	3.5±0.2	8.0±0.2	4.0±0.1	1.0±0.1	
	2E	3.2	2.6	0.6	TD	5000	2.85±0.2	3.5±0.2	8.0±0.2	4.0±0.1	0.75±0.2/-0	178
							2.85±0.2	3.5±0.2	8.0±0.2	4.0±0.1	1.0±0.15	
	2H/W2H	5	2.5	0.6	TE	4000	2.9±0.2	5.35±0.2	12.0±0.3/-0.1	4.0±0.1	1.0±0.15	178
	3A/W3A/ 3A2/W3A2	6.3	3.1	0.6	TE	4000	3.44±0.2	6.65±0.2	12.0±0.3/-0.1	4.0±0.1	1.0±0.15	178
XR73B XR73H XR73Z	1H	0.6	0.3	0.13	TWA	40000	0.37±0.05	0.67±0.05	8.0	1.0	0.50±0.1	180
							0.37±0.05	0.67±0.05	8.0	2.0	0.50±0.1	
	1E	1.0	0.5	0.14	TWL	20000	0.6±0.05	1.12±0.05	8.0	2.0	0.50±0.1	180
							0.65±0.10	1.15±0.10	8.0	2.0	0.42±0.02/-0	
WK73 WK73-RT WU73 WG73	1E	0.5	1.0	0.35	TP	10000	1.1±0.1	1.9±0.1	8.0	4	0.6±0.2/-0	180
							1.1±0.1	1.9±0.1	8.0	4	0.75±0.2/-0	
	1J	0.8	1.6	0.45	TD	5000	2.0±0.2	3.5±0.2	8.0±0.2	4.0±0.1	0.75±0.2/-0	178
							2.0±0.2	3.5±0.2	8.0±0.2	4.0±0.1	1±0.15	
	2A	1.25	2.0	0.5	TE	5000	3.35±0.2	4.85±0.2	12.0±0.3	4.0±0.1	1±0.15	178
							3.35±0.2	4.85±0.2	12.0±0.3	4.0±0.1	1±0.15	
	2B/2B15	1.6	3.2	0.6	TD	5000	3.44±0.2	6.65±0.2	12.0±0.3	4.0±0.1	1±0.15	178
							3.44±0.2	6.65±0.2	12.0±0.3	4.0±0.1	1±0.15	
	2H/2H2	2.5	5.0	0.4	TE	4000	12.2±0.1	17.7±0.1	24	12±0.2	3.1±0.1	255
							12.2±0.1	17.7±0.1	24	12±0.2	3.1±0.1	
	3A/3A3	3.1	6.4	0.45	TE	4000	12.2±0.1	17.7±0.1	24	12±0.2	3.1±0.1	255
							12.2±0.1	17.7±0.1	24	12±0.2	3.1±0.1	
SL SLW	0.7, W07	5.0	0.5	1.7	TE	2000	5.5±0.1	3.1±0.1	12	4	2.25±0.10	180
							6.8±0.1	3.6±0.1	12.0±0.1	8.0±0.2	2.35±0.1	
	1, W1	6.3	3.1	1.9	TE	1000	12.2±0.1	17.7±0.1	24	12±0.1	3.1±0.1	255
SLN	2/3	11.5	7	2.5	TED	1000	12.2±0.1	17.7±0.1	24	12±0.2	3.1±0.1	255
							12.2±0.1	17.7±0.1	24	12±0.2	3.1±0.1	
TLRH	2A	2.0	1.25	0.25	TD	5000	2.4±0.1	1.65±0.1	8	4	0.42±0.03	178
							6.75±0.20	3.55±0.20	12	8	1.0±0.1	
TLR	2A	2.0	1.25	0.25	TD	5000	1.65±0.1	2.4±0.1	8	4	0.42±0.02/-0	178
							2.0±0.1	3.5±0.1	8	4	0.75±0.05	
	2H, 2HW	5.0	2.5	0.6	TE	4000	2.9±0.1	5.35±0.1	12	4	0.77±0.1	180
							3.55±0.1	6.75±0.1	12	8	1.0±0.1	
	3AW, 3AP, 3APS	6.4	3.2	0.6	TE	2000	0.65±0.05	1.15±0.05	8	2	0.6±0.04	180
							1.10±0.1	1.9±0.1	8	4	0.6±0.05	
TLRZ	1E	1.0	0.5	0.4	TB	10000	2.4±0.1	1.65±0.1	8	2	0.6±0.04	180
							3.55±0.1	6.75±0.1	12	8	1.0±0.1	
	1J	1.6	0.8	0.5	TD	5000	2.0±0.1	3.5±0.1	8	4	0.75±0.05	180
SLP	2H, 2HW	5.1	2.5	0.635	TE	4000	2.9±0.1	5.35±0.1	12	4	0.77±0.1	180
							3.55±0.1	6.75±0.1	12	8	1.0±0.1	

* TPL not available for RN73 and RN73H

**WK73 only

Packaging specifications



(Notes) Dotted lines are applicable to only "TP", "TPL", "TBL" and "TC."

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/05/19

For Product Specific packaging, please refer to the individual product data sheets.

Type	Component Size (mm)			Carrier Tape	Quantity/Reel (Pieces)	Taping (mm)					Reel Size øa (mm)	
	L	W	T			A	B	W	P1	T1		
PS	L (0.2mΩ)	6.3	3.15	1.40	TEB	5000	3.45±0.1	6.60±0.1	12	8	1.6±0.1	330
	L (0.3mΩ)	6.3	3.15	1.32	TEB	5000	3.45±0.1	6.60±0.1	12	8	1.6±0.1	330
	L (0.5mΩ)	6.3	3.15	1.12	TEB	5000	3.45±0.1	6.60±0.1	12	8	1.6±0.1	330
	J (0.2mΩ)	10.0	5.2	1.98	TEB	3000	5.6±0.1	10.45±0.1	16	8	2.3±0.1	330
	J (0.5mΩ)	10.0	5.2	1.27	TEB	3000	5.6±0.1	10.45±0.1	16	8	2.3±0.1	330
	J (1mΩ)	10.0	5.2	0.89	TEB	3000	5.6±0.1	10.45±0.1	16	8	2.3±0.1	330
	J (2mΩ)	10.0	5.2	1.17	TEB	3000	5.6±0.1	10.45±0.1	16	8	2.3±0.1	330
	J (3mΩ)	10.0	5.2	0.95	TEB	3000	5.6±0.1	10.45±0.1	16	8	2.3±0.1	330
	J (4mΩ)	10.0	5.2	0.84	TEB	3000	5.6±0.1	10.45±0.1	16	8	2.3±0.1	330
	F (0.5mΩ)	3.0	3.8	1.8	TEB	3000	3.25±0.1	4.25±0.1	12	8	2.2±0.1	330
	F (1mΩ)	3.0	3.8	1.8	TEB	3000	3.25±0.1	4.25±0.1	12	8	2.2±0.1	330
	G (0.5mΩ)	6.9	6.6	3.05	TEB	1500	7.2±0.1	7.3±0.1	16	12	3.4±0.1	330
	G (1mΩ)	6.9	6.6	2.8	TEB	1500	7.2±0.1	7.3±0.1	16	12	3.4±0.1	330
TSL	1	6.3	3.1	1	TE	3000	3.4±0.1	6.6±0.1	12.0±0.1	4.0±0.1	1.3±0.1	180
CSR	1	10.8	6.2	2.1	TED	1000	6.7±0.1	11.1±0.14	24	12.0±0.1	2.6±0.1	255
	2	12.8±0.5	8.2±0.3	3.1±0.2	TEB	1000	9.0±0.15	13.0±0.1	24	12.0±0.1	4.35±0.1	330
LR72	A	10±0.2	5.2	2	TED	2000	1.45±0.2	5.7±0.2	24±0.2	8.0±0.10	2.3±0.2	255
	B	10±0.2	3	2	TED	2000	1.45±0.2	3.4±0.2	24±0.2	8.0±0.10	2.5±0.2	255
	C	11.2±0.4	3.2±0.4	3.5±0.4	TEB	1500	1.17±0.1	4.3±0.1	24±0.2	8.0±0.1	4.4±0.15	330
BLR	1	13±0.5	5.5±0.5	2.5±1.0	TE	1000	6.2±0.1	15.0±0.1	24.0±0.2	12.0±0.1	6.7±0.1	330
	2	18±0.5	6.3±0.5	3.0±0.1	TE	1000	7.0±0.1	20.5±0.1	32.0±0.2	12.0±0.1	7.5±0.1	330
	3	18±0.5	8.2±0.5	3.0±0.1	TE	750	10.0±0.1	20.5±0.1	32.0±0.2	16.0±0.1	7.0±0.1	380
CNN	2A2	2.54	2	0.5	TE	4000	2.9±0.2	2.4±0.2	8.0±0.2	4.0±0.1	1±0.15	180
RD41	2A	2	1.25	-	TE	3000	1.5±0.2	2.3±0.2	8	4	1.5 max.	178
RN41	2ES, 12M	3.5	1.4	-	TE	3000	1.7±0.1	3.7±0.1	8	4	2.0 max.	178
RM41	2D	3.2	1.55	-	TE	2000	1.9±0.1	3.5±0.1	8	4	2.0 max.	178
CC	2E, 2H, 25	5.9	2.2	-	TE	1500	2.4±0.1	6.2±0.1	12	4	2.9 max.	178
NT73	1E	1	0.5	0.35	TP	10000	1.15±0.1	0.65±0.1	8.0±0.2	2.0±0.05	0.45+0.1/-0	178
	1J	1.6	0.8	0.45	TD	5000	1.9±0.1	1.1±0.1	8.0±0.2	4.0±0.1	0.6+0.2/-0	178
	2A	2	1.25	0.5	TD	5000	2.4±0.2	1.65±0.2	8.0±0.2	4.0±0.1	0.75+0.2/-0	178
	2B	3.2	1.6	0.6	TD	5000	3.5±0.2	2±0.2	8.0±0.2	4.0±0.1	0.75+0.2/-0	178
SDT73H/S/V	2B	3.2	1.6	0.5	TEK/TE	1000/5000	3.6±0.1	2.0±0.1	8.0±0.2	4.0±0.1	0.85+0.05/-0.1	180
LP73	1J	1.6	0.8	0.5	TE	5000	1.9±0.1	1.1±0.1	8.0±0.2	4.0±0.1	0.6±0.1	180
	2A	2.0	1.25	0.5	TE	5000	2.4±0.1	1.6±0.1	8.0±0.2	4.0±0.1	0.85±0.1	180
	2B	3.2	1.6	0.5	TE	5000	3.6±0.1	2.0±0.2	8.0±0.2	4.0±0.1	0.85±0.1	180
RCU		1.60	0.8	1.15	TE/TED	2000/5000	1.85±0.16	1.05±0.15	8.0±0.2	4.0±0.1	1.25±0.1	178/260
RCT		2.00	1.25	1.45	TE/TED	2000/5000	2.45±0.15	1.65±0.1/-0.2	8.0±0.2	4.0±0.1	1.70±0.1	178/260
RCS		3.20	1.6	1.25	TE/TED	2000/5000	3.6±0.2	2.0±0.2	8.0±0.2	4.0±0.1	1.45±0.15	178/260
RCW		3.2	1.6	2	TE	2000	3.4±0.1/-0.05	1.95±0.1/-0.05	8.0±0.2	4.0±0.1	2.2±.01	178
KQC	0603	1.6	1.05	0.7	TE	2000	1.77±0.05	1.20±0.05	8	4	0.86±0.05	178
KQT	0402	1.0	0.5	0.55	TD	2000	1.20±0.05	0.65±0.05	8	4	0.68±0.1	178
KQC					TP	10000	1.20±0.05	0.65±0.05	8	2	0.68±0.1	178
KQ	0603	1.60	1.0	0.9	TE	2000	1.86±0.05	1.15±0.05	8	4	1.05±0.1	178
	0805	2.00	1.5	1.3	TE	2000	2.22±0.1	1.60±0.1	8	4	1.5±0.1	178
	1008	2.50	2.2	1.8	TE	2000	2.7±0.1	2.35±0.1	8	4	2.1±0.1	178
LPC	4545	4.6	4.1	4.6	TE	2500	4.5±0.2	5.0±0.2	12	8	5.0±0.2	380
	4045	4.50	4	4.5	TED	2500	4.15±0.2	4.8±0.2	12.0±0.1	8.0±0.2	5±0.2	380
	4235	4.5	4.2	3.5	TM	2000	4.8±0.2	4.5±0.2	12.0±0.1	8.0±0.1	4.0±0.2	330
CZB	1E	1.0±0.1	0.5±0.1	0.5±0.1	TP	10000	0.65±0.1	1.17±0.1	8.0±0.22	2.0±0.23	0.63±0.1	178
	1J	1.6±0.15	0.8±0.15	0.8±0.15	TD	4000	1.1±0.1	1.8±0.1	8.1±0.1	4.0±0.1	1.1±0.1	178
	2A	2.0±0.2	1.25±0.2	0.9±0.2	TD	2000/4000*	1.6±0.1	2.4±0.1	8.1±0.1	4.0±0.1	1.2±0.1	178
	2B	3.2±0.2	1.6±0.2	0.51±0.25	TE	3000	1.8±0.1	3.5±0.1	8.1±0.1	4.0±0.1	1.8±0.1	178
MHL	1E	1.0±0.1	0.5±0.1	0.5±0.1	TP	10000	0.67±0.1	1.17±0.1	8.0±0.22	2.0±0.23	0.63±0.1	178
	1J	1.6±0.15	0.8±0.15	0.8±0.15	TD	4000	1.15±0.1	1.85±0.1	8.0±0.1	4.0±0.1	1.1±0.1	178

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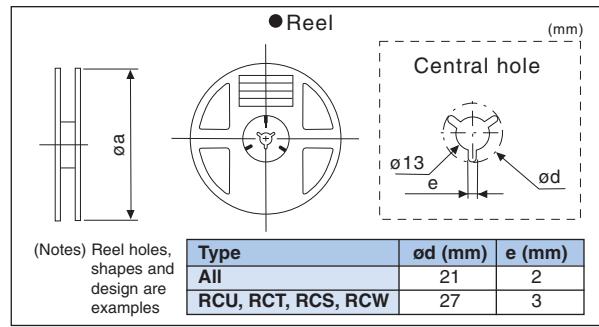
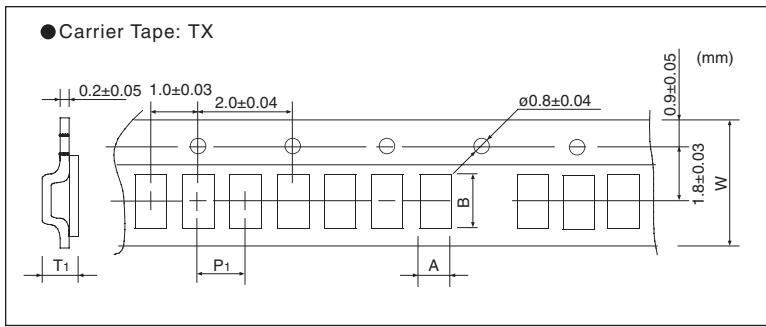
12/05/19

For Product Specific packaging, please refer to the individual product data sheets.

Type	Component Size (mm)			Carrier Tape	Quantity/ Reel (Pieces)	Taping (mm)					Reel Size øa (mm)
	L	W	T			A	B	W	P1	T1	
NV73 NV73DL	1H	0.6	0.3	0.3	TBM	15000	0.38±0.02	0.68±0.02	8.0±0.2	2.0±0.1	0.42+0.02/-0
	1E	1.0±0.1	0.5±0.1	0.25±0.15	TP	10000	0.65±0.1	1.15±0.1	8.0±0.2	2.0±0.1	0.6±0.2
	1J	1.6±0.15	0.8±0.15	0.8±0.15	TE	2500	1.2±0.1	1.9±0.1	8.0±0.2	4.0±0.1	1.75 max.
	2A	2.0±0.2	1.25±0.2	1.3 max.	TE	2500	1.6±0.1	2.4±0.1	8.0±0.2	4.0±0.1	1.75 max.
	2B	3.2±0.2	1.6±0.2	1.65 max.	TE	2500	2.0±0.1	3.6±0.1	8.0±0.2	4.0±0.1	1.75 max.
	2E	3.2	2.5	1.5 max.	TE	2000	2.85±0.1	3.5±0.1	8.0±0.2	4.0±0.2	1.55 max.
	2J	4.5	3.2	2.0 max.	TE	1000	3.6±0.1	4.9±0.1	12.0±0.2	8.0±0.2	2.05 max.
NV73DS	2L	5.7	5.0	2.5 max.	TE	1000	5.4±0.1	6.0±0.1	12.0±0.2	8.0±0.2	2.60 max.
	2L	6.1	5.1	3.0 max.	TE	500	5.3±0.1	6.6±0.1	12	8	3.00 max.
TF	10	1.00	0.5	0.45	TB	10000	0.65±0.05	1.15±0.05	8.0±0.2	2.0±0.1	0.6+0.2/-0
	16	1.60	0.8	0.6	TD	5000	1.1±0.1	1.9±0.1	8.0±0.3	4.0±0.1	0.6±0.1
CCP	2B	3.20	1.6	1.2	TE	3000	1.9±0.1	3.5±0.1	8.0±0.3	4.0±0.1	1.5±0.1
	2E	2.5	2.2	TE	2000	2.8±0.1	3.5±0.1	8.0±0.3	4.0±0.1	2.4±0.1	178
CCF	1N,1F	6.0	2.5	2.5	TE	1000	2.7±0.2	6.4±0.2	12.0±0.3	4.0±0.1	2.9±0.2
AC(X)	Q16	4.9	5.99	1.6	TEB	2500	6.5±0.1	5.3±0.1	12	8	2.5±0.2
DNA	Q20	8.66	5.99	1.6	TEB	2500	6.5±0.1	9.0±0.1	16	8	2.5±0.2
DN(X)	Q24	8.66	5.99	1.6	TEB	2500	6.5±0.1	9.0±0.1	16	8	2.5±0.2
HVD	Q28	10.0	5.99	1.6	TEB	2500	6.5±0.1	10.3±0.1	16	8	2.5±0.2
RD(X)	N08	4.83	5.99	1.6	TEB	2500	6.5±0.1	5.3±0.1	12	8	2.5±0.2
R(X)A	N14	8.66	5.99	1.6	TEB	2500	6.5±0.1	9.0±0.1	16	8	2.5±0.2
RT(X)	N16	9.91	5.99	1.6	TEB	2500	6.5±0.1	10.3±0.1	16	8	2.5±0.2
TF(X)	S03	2.92	2.30	0.95	TE	3000	3.15±0.1	2.77±0.1	8	4	1.3±0.2
HVD		8.66	5.99	1.6	TE	2500	6.5±0.1	9.0±0.1	16	8	2.1±0.1

* CZB2A: <2200Ω=TD:4,000; 2200Ω=TD: 2,000 pcs/reel

Packaging specifications



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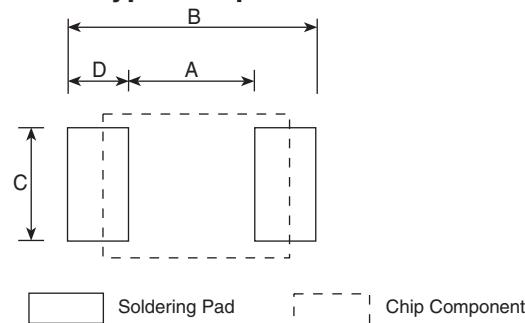
12/05/19

standard soldering pad dimensions

The optimum soldering pad dimensions may differ depending on soldering conditions, however, the following land dimensions are generally recommended.

Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
WG73	1E	0.5 X 1.0	0.2	1.1	1.0	0.45
	1J	0.8 X 1.6	0.4	1.7	1.6	0.65
	2A	1.25 X 2.0	0.55	2.35	2.0	0.9
WK73	2B/2B15	1.6 X 3.2	0.7	2.3	3.2	0.8
	2H/2H2	2.5 X 5.0	1.0	35	5.0	1.25
WU73	2J	3.1 X 4.6	1.6	3.9	4.75	1.15
	3A/3A3	3.1 X 6.4	1.6	3.9	6.4	1.15
RK73 RS73 SG73 RN73R RN73H SR73 LT73 NT73 RF73 HV73 LP73 SDT73	1F	0.4 X 0.2	0.12	0.48	0.18	0.18
	1H	0.6 X 0.3	0.25	0.7	0.3	0.225
	1E	1.0 X 0.5	0.5	1.3	0.3	0.4
	1J	1.6 X 0.8	1.0	2.0	0.6	0.5
	2A	2.0 X 1.25	1.3	2.5	1.05	0.6
	2B	3.2 X 1.6	2.2	4.0	1.4	0.9
	2E	3.2 X 2.5	2.2	4.0	2.3	0.9
	2H	5.0 X 2.5	3.3	6.1	2.3	1.4
	3A/W3W/W3A2	6.4 X 3.2	4.6	8.0	3.0	1.7
	07, W07	5.0 X 2.5	2.3	7.0	2.6	2.35
	1, W1	6.3 X 3.1	3.4	8.0	3.0	2.3
	2-3	11.5 X 7.0	5.4	15.0	5.0	4.8
SLP	2H, 2HW	5.1 X 2.5	3.3	6.1	3.0	1.4
	3A, 3AW	6.35 X 3.2	4.1	7.55	3.7	1.725
SLN	2, 3, 5	11.5 X 7.0	5.0	15.0	6.0	5.0
CCP	2E	3.2 X 2.5	2.2	5.0	2.0	1.4
	2B	3.2 X 1.6	2.2	5.0	1.4	1.4
CCF	1N, 1F	6.0 X 2.5	3.0	7.2	2.8	2.1
LPC	4045	4.5 X 4.0	1.5	5.1	3.5	1.8
	4235	4.5 X 4.2	1.9	5.5	2.6	1.8
	4545	4.1 X 4.6	2.9	5.3	4.7	1.2
KQT	0402	1.0 X 0.5	0.46	1.18	0.66	0.36
KQ KQC	0603	1.6 X 1.0	0.64	1.92	1.02	0.64
	0805	2.0 X 1.5	0.76	2.8	1.78	1.02
	1008	2.5 X 2.2	1.27	3.31	2.54	1.02
CZB CZP MHL	1E	0.50 X 0.10	0.4	1.6	0.6	—
	1J	0.80 X 1.6	0.55	2.6	0.94	—
	2A	1.25 X 2.0	0.66	3.0	1.45	—
	2B	1.6 X 3.2	1.5	4.4	1.8	—
TF	10	1.0 X 0.5	0.5	1.3	0.3	0.4
	16	1.6 X 0.8	1.0	2.0	0.6	0.5

Flat Type Components



Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
TLR	1E	1.0 X 0.5	0.2	1.3	0.6	0.55
	2A	2.0 X 1.25	0.5	2.5	1.3	1.0
	2BW/2BP (0.5mΩ)	3.2 X 1.6	0.6	4.0	1.8	1.7
	2BN/2B/2BW/2BP (1mΩ, 1.5mΩ)	3.2 X 1.6	0.8	4.0	1.8	1.6
	2BN/2B/2BW/2BP (2mΩ-20mΩ)	3.2 X 1.6	1.4	4.0	1.8	1.3
	2H, 2HW (0.5mΩ, 1mΩ)	5.0 X 2.5	1.0	6.1	3.0	2.55
	2H, 2HW (2mΩ-6mΩ)	5.0 X 2.5	1.3	6.1	3.0	2.4
	2H, 2HW (7mΩ-10mΩ)	5.0 X 2.5	3.3	6.1	3.0	1.4
	3AW (0.5-0.82mΩ)	6.35 X 3.18	0.8	7.55	3.83	3.375
	3AW (1mΩ-4mΩ)	6.35 X 3.18	1.45	7.55	3.83	3.05
	3AW (5mΩ-8mΩ)	6.35 X 3.18	3.45	7.55	3.83	2.05
	3AW (9mΩ, 10mΩ)	6.35 X 3.18	4.40	7.55	3.83	1.575
TLRH	3AP (0.5-0.82mΩ)	6.35 X 3.18	0.80	7.55	3.83	3.375
	3AP (1mΩ)	6.35 X 3.18	1.45	7.55	3.83	3.05
	3AP (2mΩ)	6.35 X 3.18	1.05	7.55	3.83	3.25
	3AP (3mΩ-4mΩ)	6.35 X 3.18	1.45	7.55	3.83	3.05
	3AP (5mΩ-8mΩ)	6.35 X 3.18	3.45	7.55	3.83	2.05
	3AP (9mΩ-10mΩ)	6.35 X 3.18	4.40	7.55	3.83	1.575
2A	6.35 X 3.18	3.45	7.55	3.83	2.05	
	6.3 X 3.2	2.0	2.5	1.3	1.0	
	6.3 X 3.2	4.4	7.5	3.7	1.55	
3AP	6.3 X 3.2	2.15	7.55	3.83	2.7	

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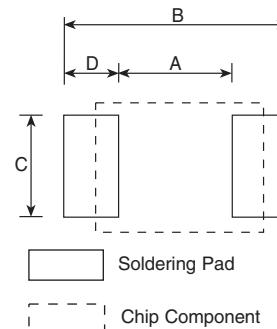
12/05/19

standard soldering pad dimensions (continued)

The optimum soldering pad dimensions may differ depending on soldering conditions, however, the following land dimensions are generally recommended.

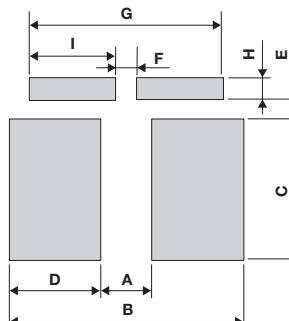
Type	Style	Dimensions millimeters			
		Component Size	A	B	C
TLRZ	1E	1.0 X 0.5	0.5	1.3	0.6
	1J	1.6 X 0.8	0.5	2.0	0.9
	2A	2.0 X 1.25	0.5	2.5	1.45
	2B	3.2 X 1.6	2.2	3.8	1.8
UR73	2A	2.0 X 1.25	1.3	2.6	1.1
	2B	3.2 X 1.6	2.2	4.2	1.6
UR73D	1E	1.0 X 0.5	0.4	1.7	0.5
	1J	1.6 X 0.8	0.5	2.5	0.9
	2A	2.0 X 1.25	0.8	3.4	1.3
	2B	3.2 X 1.6	1.2	4.6	1.8
	2H (10mΩ-30mΩ)	5.0 X 2.5	1.8	6.1	2.6
	2H (33mΩ-100mΩ)	5.0 X 2.5	3.3	6.1	2.5
	3A (10mΩ-30mΩ)	6.3 X 3.1	2.3	8.0	3.3
	3A (33mΩ-100mΩ)	6.3 X 3.1	4.6	8.0	3.2
	2A	2.0 X 1.25	1.2	3.4	1.3
UR73V	2B	3.2 X 1.6	2.2	4.2	1.6
	2A (10m-18m)	2.0 X 3.1	0.6	3.4	1.3
UR73VD	2A (20m-36m)	2.0 X 3.1	0.8	3.4	1.3
	2B (10m-13m)	3.2 X 1.6	0.7	4.4	1.6
	2B (15m-16m)	3.2 X 1.6	0.9	4.4	1.6
	2B (18m-20m)	3.2 X 1.6	1.0	4.4	1.6
	2B (22m-27m)	3.2 X 1.6	1.2	4.4	1.6
	1H	0.6 X 0.3	0.25-0.35	0.65-0.95	0.25-0.35
NV73 NV73DL	1E	1.0 X 0.5	0.51	1.73	0.51
	1J	1.6 X 0.8	1.0	3.0	1.2
	2A	2.0 X 1.25	1.2	4.0	1.0
	2B	3.2 X 1.6	2.2	5.0	1.3
	2E	3.2 X 2.5	2.2	5.0	2.2
	2J	4.5 X 3.2	3.0	5.8	2.9
	2L	5.7 X 5.0	4.5	7.5	4.7
NV73DS	2L	6.1 X 5.1	4.5	7.5	4.7
PS	L	6.3 X 3.15	3.4	7	3.4
	J	10.0 X 5.2	5.6	11	6.2
					1.8

Flat Type Components



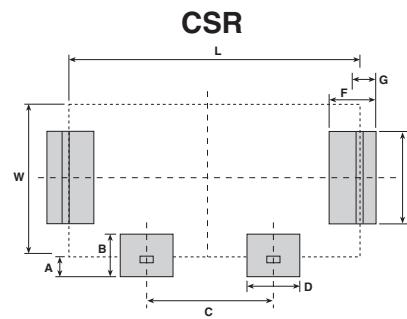
current sense resistor—PSG/PSF

Dimensions inches (mm)									
Type	A	B	C	D	E	F	G	H	I
PSG4 (2725)	.078 (2.0)	.370 (9.4)	.220 (5.6)	.146 (3.7)	.031 (0.8)	.031 (0.8)	.307 (7.8)	.035 (0.9)	.138 (3.5)
PSF4 (1216)	.024 (0.6)	.142 (3.6)	.116 (2.95)	.059 (1.5)	.020 (0.5)	.024 (0.6)	.142 (3.6)	.028 (0.7)	.059 (1.5)



current sense resistor—CSR

Dimensions inches (mm)									
Type	L	W	A	B	C	D	E	F	G
CSR1	.393 (10.0)	.236 (6.0)	.039 (1.0)	.078 (2.0)	.196 (5.0)	.062 (1.6)	.118 (3.0)	.078 (2.0)	.039 (1.0)
CSR2	.472 (12.0)	.314 (8.0)	.062 (1.6)	.125 (3.2)	.236 (6.0)	.086 (2.2)	.208 (5.3)	.090 (2.3)	.045 (1.15)

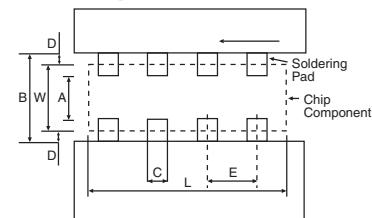


resistor arrays-CN

Type	Style	Dimensions						
		Component Size	A	B	C	D	E	F
L*	W							
CNN	2A	2.54	2.0	1.2	2.8	0.6	0.4	1.27
							—	—

* n = number of resistors

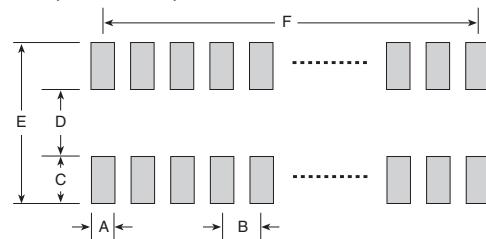
Chip Networks



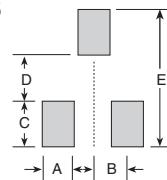
integrated passive devices-SOIC, TSSOP, QSOP & SOT23

Chip Size	Dimensions inches (mm)					
	A	B	C	D	E	F
N08	.028 (0.7)	.050 (1.27)	.094 (2.4)	.098 (2.5)	.287 (7.3)	.150 (3.81)
N14	.028 (0.7)	.050 (1.27)	.094 (2.4)	.098 (2.5)	.287 (7.3)	.300 (7.62)
N16	.028 (0.7)	.050 (1.27)	.094 (2.4)	.098 (2.5)	.287 (7.3)	.350 (8.89)
Q16	.012 (0.3)	.025 (0.63)	.050 (1.27)	.180 (4.56)	.280 (7.1)	.175 (4.45)
Q20	.012 (0.3)	.025 (0.63)	.050 (1.27)	.180 (4.56)	.280 (7.1)	.225 (5.72)
Q24	.012 (0.3)	.025 (0.63)	.050 (1.27)	.180 (4.56)	.280 (7.1)	.275 (6.99)
SOT23	.035 (0.9)	.037 (0.95)	.055 (1.4)	.031 (0.8)	.141 (3.6)	—

SOIC, TSSOP, QSOP

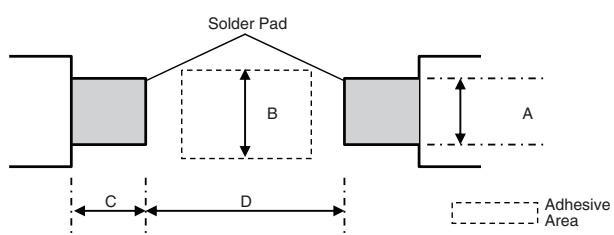


SOT23



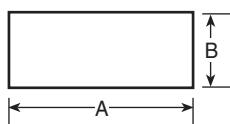
Surface mount components-RD41, RN41, RM41, MLT, CC

Type	Style	Dimensions millimeters				
		Component Size	A	B	C	D
RD41	2A	2.0 X 1.25	1.3	1.3	2.0	1.3
	2ES 12M	3.5 X 1.40	1.5	2.2	1.5	2.0
	2D	3.2 X 1.55	1.5	2.2	1.5	2.0
	2E 25	5.9 X 2.2	2.0	3.0	3.0	4.0
	2H	5.9 X 2.2	2.0	3.0	3.0	4.0



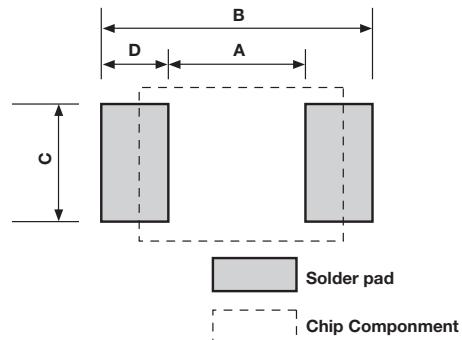
other chips—RCS, RCT, RCU, RCW

Type	Dimensions millimeters	
	A	B
RCS	4.1-4.3	1.4-1.6
RCT	2.9-3.1	1.05-1.25
RCU	2.5-2.7	0.6-0.8
RCW	4.1-4.3	1.4-1.6



power chip inductor—LPC

Type	Dimensions inches (mm)			
	A	B	C	D
LPC4045	.059 (1.5)	.201 (5.1)	.138 (3.5)	.071 (1.8)
LPC4235	.075 (1.9)	.217 (5.5)	.102 (2.6)	.071 (1.8)
LPC4545	.114 (2.9)	.209 (5.3)	.185 (4.7)	.047 (1.2)

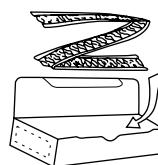


axial tapings

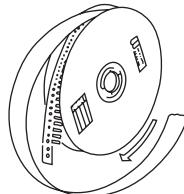
Straight Type Name	Taping Type Name	Lead ød (mm)	Packaging Style	Packaging & Q'ty (pcs)		Weight (g)		
				AMMO	Reel	AMMO	Reel	Net 1000pcs
MOS1/2 ²	MOS1/2CT26	0.6	T26	2000	—	350	—	140
MOS1/2	MOS1/2CT52	0.6	T52	2000	5000	590	1400	250
MOS1	MOS1CT52	0.6	T52	2000	4000	810	1550	350
MOS1	MOS1CT526	0.6	T52	2000	4000	810	1550	350
MOS1C8	MOS1CT528	0.8	T52	2000	4000	810	1550	350
MOS1	MOS1CL52	0.8	L52	2000	4000	810	1550	350
MOS2	MOS2CT52	0.8	T52	1000	2000	910	1750	800
MOS2	MOS2CT521	0.8	T521	1000	—	910	—	800
MOS2	MOS2CL521	0.8	L521	1000	1000	910	950	800
MOS3	MOS3CL521	0.8	L521	500	—	775	—	1350
MOS3	MOS3CT521	0.8	T521	500	1000	775	1500	1350
MOS3	MOS3CT631	0.8	T631	1000	1000	1580	1600	1400
MOS3	MOS3CL631	0.8	L631	1000	1000	1580	1600	1400
SPR1/4 ³	SPR1/4CT26	0.45	T26	2000	—	250	—	90
SPR1/4	SPR1/4CT52	0.45	T52	2000	5000	340	850	140
SPR1/2	SPR1/2CT26	0.6	T26	2000	—	350	—	140
SPR1/2	SPR1/2CT52	0.6	T52	2000	5000	590	1400	250
SPR1/2	SPR1/2CL52	0.65	L52	2000	5000	590	1400	250
SPR1	SPR1CT52	0.8	T52	2000	4000	1140	2150	500
SPR1	SPR1CL52	0.8	L52	2000	4000	1140	2150	500
SPR2	SPR2CT52	0.8	T52	1000	2000	910	1750	800
SPR2	SPR2CT521	0.8	T521	1000	—	910	—	800
SPR2	SPR2CL521	0.8	L521	1000	1000	910	950	800
SPR3	SPR3CT521	0.8	T521	500	1000	765	1500	1350
SPR3	SPR3CL521	0.8	T521	500	—	775	—	1350
SPR3	SPR3CT631	0.8	T631	1000	1000	1580	1600	1400
SPR3	SPR3CL631	0.8	L631	1000	1000	1580	1600	1400
RF16	RF16CT26	0.45	T26	2000	—	220	—	90
RF16	RF16CT52	0.45	T52	2000	5000	340	800	150
RF25	RF25CT26	0.6	T26	2000	—	330	—	140
RF25	RF25CT52	0.6	T52	2000	5000	500	1300	230
RF50	RF50CT52	0.6	T52	2000	4000	660	1320	310
RF1	RF1CT52	0.8	T52	2000	4000	1080	2050	500
RF2	RF2CT521	0.8	T521	500	1000	700	1420	1300
RF2	RF2CT631	0.8	T631	1000	—	1410	—	1350
Z16	Z16CT26	0.45	T26	5000	—	615	—	110
Z16	Z16CT52	0.45	T52	3000	5000	530	920	150
Z25	Z25CT26	0.6	T26	2000	—	410	—	180
Z25	Z25CT52	0.6	T52	2000	5000	530	1400	240
J1/6Z	J1/6ZCT26	0.5	T26	2000	—	230	—	90
J1/6Z	J1/6ZCT52	0.5	T52	2000	5000	320	950	130
J1/4Z	J1/4ZCT26	0.6	T26	2000	—	320	—	130
J1/4Z	J1/4ZCT52	0.6	T52	2000	5000	460	1310	190
JL5	JL5CT26	0.5	T26	5000	—	420	—	75
JL5	JL5CT52	0.5	T52	5000	—	680	—	120
JL6	JL6CT26	0.6	T26	5000	—	515	—	100
JL6	JL6CT52	0.6	T52	5000	1000	815	—	160
JL8	JL8CT52	0.8	T52	—	10000	—	3054	305
LP1/8	LP1/8CT26	0.65	T26	2000	—	410	—	170
LP1/8	LP1/8CT52	0.65	T52	2000	—	580	—	260
LP1/16	LP1/16CT26	0.5	T26	4000	—	450	—	100
LP1/16	LP1/16CT52	0.5	T52	4000	—	630	—	150
CFS1/4	CFS1/4 CT26	0.45	T26	5000	—	615	—	110
CFS1/4	CFS1/4 CT52	0.45	T52	3000	5000	530	920	150
CF1/4	CF1/4 CT26	0.6	T26	2000	—	410	—	180
CF1/4	CF1/4 CT52	0.6	T52	2000	5000	530	1400	240
CFB1/2	CFB1/2 CT52	0.7	T52	2000	4000	1110	2280	520
CFS1/2	CFS1/2 CT26	0.6	T26	2000	—	525	—	230
SDT101A	SDT101AXCT26	0.4	T26	2000	—	350	—	75
SDT101A	SDT101AXCT52	0.4	T52	2000	—	470	—	150
SDT101B	SDT101BXNT52	0.4	T52	—	2000	—	410	150

Packaging

(1) AMMO Pack
(Symbol: A) Standard



(2) Reel (Symbol: R)



*1: The same taping applicable also to MOX.

*2: The same taping applicable also to MOSX.

*3: The same taping applicable also to SPRX.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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axial tapings

Straight Type Name	Taping Type Name	Lead ød (mm)	Packaging Style	Packaging & Q'ty (pcs)		Weight (g)		
				AMMO	Reel	AMMO	Reel	Net 1000pcs
CFS1/2	CFS1/2 CT52	0.6	T52	2000	4000	640	1500	290
CFPS1/4	CFPS1/4 CT26	0.45	T26	5000	—	615	—	100
CFPS1/4	CFPS1/4 CT52	0.45	T52	3000	—	530	—	150
CFP1/4	CFP1/4 CT26	0.6	T26	2000	—	410	—	180
CFP1/4	CFP1/4 CT52	0.6	T52	2000	5000	530	1400	240
CFP1/4	CFP1/4 CL52	0.65	L52	2000	—	530	—	240
CFPS1/2	CFPS1/2 CT26	0.6	T26	2000	—	525	—	230
CFPS1/2	CFPS1/2 CT52	0.6	T52	2000	4000	640	1500	290
MFS1/4**	MFS1/4 CT26	0.45	T26	3000	—	350	—	90
MFS1/4	MFS1/4 CT52	0.45	T52	3000	—	500	—	120
MFS1/2	MFS1/2 CT26	0.6	T26	2000	—	360	—	160
MFS1/2	MFS1/2 CT52	0.6	T52	2000	5000	500	1300	215
MF1/4	MF1/4 CT26	0.6	T26	2000	—	360	—	160
MF1/4	MF1/4 CT52	0.6	T52	2000	5000	500	1300	215
MF1/2	MF1/2 CT52	0.6	T52	2000	4000	900	2000	360
MFP1/4	MFP1/4 CT26	0.6	T26	2000	—	450	—	250
MFP1/4	MFP1/4 CT52	0.6	T52	2000	5000	470	1400	250
MFP1/2	MFP1/2 CT52	0.6	T52	2000	4000	950	2010	430
RNS1/4	RNS1/4 CT52	0.6	T52	2000	4000	600	1550	440
RNS1/8	RNS1/8 CT26	0.6	T26	2000	—	400	—	180
RNS1/8	RNS1/8 CT52	0.6	T52	2000	5000	600	1550	220
RNS1/2	RNS1/2 CT52	0.6	T52	2000	4000	1100	2150	500
RNS1	RNS1 CT521	0.8	T521	500	1000	750	2100	1500
RCR16	RCR16 CT26	0.45	T26	5000	—	500	—	100
RCR16	RCR16 CT52	0.45	T52	3000	—	450	—	150
RCR25	RCR25 CT26	0.6	T26	2000	—	390	—	180
RCR25	RCR25 CT52	0.6	T52	2000	—	520	—	240
RCR25EN	RCR25EN CT26	0.6	T26	2000	—	390	—	180
RCR25RN	RCR25RN CT52	0.6	T52	2000	—	520	—	240
RCR50 (+)	RCR50(+) CT52	0.7	T52	2000	3000	1050	1630	520
RCR50EN	RCR50ENCT52	0.7	T52	2000	3000	1050	1630	520
RCR60	RCR60 CT52	0.7	T52	2000	3000	1050	1630	520
RCR75	RCR75 CT52	0.8	T52	1000	—	830	—	800
RCR100	RCR100 CT521	0.8	T521	500	—	750	—	1400
RCR100	RCR100 CT631	0.8	T631	1000	—	1450	—	1400
RK1/4	RK1/4 CT26	0.6	T26	2000	—	360	—	250
RK1/4	RK1/4 CT52	0.6	T52	2000	5000	500	1300	250
RK1/2	RK1/2 CT52	0.6	T52	2000	4000	900	—	380
RK1	RK1 CT521	0.8	T521	500	—	700	—	1340
PCF1/2	PCF1/2 CT52	0.7	T52	—	2000	—	1140	450
PCF1	PCF1 CT631	0.8	T631	—	1000	—	1530	1270
PCF2	PCF2 CT631	0.8	T631	—	500	—	1340	2160
HPC1/2	HPC1/2 CT52	0.8	T52	1000	2000	800	1440	600
HPC1	HPC1 CT631	0.8	T631	—	1000	—	1440	1170
CW1/4	CW1/4 CT26	0.45	T26	2000	—	460	—	150
CW1/4	CW1/4 CT52	0.45	T52	3000	—	690	—	150
CW1/2	CW1/2 CT52	0.6	T52	2000	—	570	—	250
CW1/4	CW1 CT52	0.8	T52	1000	—	580	—	650
CW2/4	CW2 CT52	0.8	T52	1000	—	780	—	950
CW2/4	CW2 CT521	0.8	T521	1000	—	790	—	950
CW3/4	CW3 CT521	0.8	T521	500	—	740	—	1780
CW3/4	CW3 CT631	0.8	T631	500	—	750	—	1780
CW1S	CW1S CT52	0.6	T52	2000	—	570	—	250
CWFS23	CWFS23 CT52	0.8	T52	1000	—	780	—	950
CWFS35	CWFS35 CT521	0.8	T521	500	—	740	—	1780

□ T.C.R. * 4 The same taping applicable also to CW-P, CW-X and CW-H

** ±0.1% and ±0.25% not available in reel packaging

T-Type

Packaging Style	Dimensions (mm)				
	W	P	A	I ₁ -I ₂	Accumulated Tolerance
T26 ⁶	26 ^{+0.2} ₋₀	5.00±0.3	39±1.0	0.2Max. ⁵	250.0±3mm/P×50
	26 ⁺¹ ₋₀	5.00±0.3	39±1.0	1.0Max.	100.0±2mm/P×20
T52 ⁶	52±1	5.08±0.38	65±1.0	1.0Max.	101.6±2mm/P×20
T521	52±1	10.16±0.80	65±1.0	1.0Max.	203.2±3mm/P×20
T631	63±1	10.16±0.80	—	1.0Max.	203.2±3mm/P×20

*5 Applied to CFS1/4 (CFPS1/4) T26 Only

*6 Contact us for LP and SDT series

L-Type

Type	Dimensions (mm)			
	H ₁	W	d	h ₁ , h ₂
MOS ²	1 □L52	25.5	—	0.8
	2 □L521	36.0	—	0.8
	3 □L631	42.5	—	0.8
SPR ³	1/2 □L52	26.0	1.17~1.40	0.65
	1 □L52	25.5	—	0.8
	2 □L521	36.0	1.20~1.45	0.8
CFP	1/4 □L52	H ₁ : 24.5±1	1.17~1.4	0.65
	1/2 □L52	26.0	1.05~1.35	0.6
	1 □L52	27.5	1.20~1.40	0.8

radial tapings

										(mm)					
VT					VT					VTE					
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	
MFS1/2 CVT	0.6	2000	2500	750	MFS1/4 CVT	0.45	3000	3000	620	MFS1/2 CVTE	0.6	2000	2500	750	
MF1/4 CVT	0.6	2000	2500	750		CFS1/4 CVT	0.45	3000	3000	720	MF1/4 CVT	0.6	2000	2500	750
RNS1/8 CVT	0.6	2000	2500	750		SPR1/4 CVT*	0.45	3000	3000	720	RNS1/8 CVTE	0.6	2000	2500	750
J1/4Z CVT*	0.6	2000	2500	670						MOS1/2 CVTE	0.6	2500	2500	930	
CF1/4 CVT	0.6	2000	2500	720						SPR1/2 CVTE	0.6	2500	2500	930	
CFS1/2 CVT	0.6	2000	2500	800						CF1/4 CVTE	0.6	2500	2500	900	
CFP1/4 CVT*	0.6	2000	2500	720						CFS1/2 CVTE	0.6	2500	2500	1000	
CFPS1/2 CVT*	0.6	2000	2500	800						RF25 CVTE	0.6	2000	2500	750	
RF25 CVT*	0.6	2000	2500	750											
VTP					VTF										
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	
CW1/2 CVTP*	0.6	2000	—	750	CW1 CVTP*	0.8	1000	—	740	CW2 CVTP*	0.8	1000	—	1080	
CW1 CVTP*	0.8	1000	—	—	J1/4Z CVTP*	0.6	2000	2500	670	MF1/4 CVTP	0.6	2000	2500	750	
MOS1/2 CVTP	0.6	2000	2500	740	MF1/4 CVTP	0.6	2000	2500	750	RNS1/8 CVTP	0.6	2000	2500	750	
MOS1 CVTP	0.6	1500	—	1110	CF1/4 CVTP	0.6	2000	2500	740	CF1/4 CVTP	0.6	2000	2500	740	
MOS2 CVTP	0.65	1000	—	1080	CFS1/2 CVTP	0.6	2000	2500	800	CFS1/2 CVTP	0.6	2000	2500	800	
SPR1/2 CVTP	0.6	2000	2500	740	CFP1/4 CVTP	0.6	2000	2500	740	CFP1/4 CVTP	0.6	2000	2500	740	
SPR1 CVTP	0.6	1000	—	740	CFPS1/2 CVTP	0.6	2000	2500	800	CFPS1/2 CVTP	0.6	2000	2500	800	
SPR2 CVTP	0.65	1000	—	1080	RF25 CVTP	0.6	2000	2500	750	RF25 CVTP	0.6	2000	2500	750	
MFS1/2 CVTP	0.6	2000	2500	750											
MT					MHT					FT					
Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	Radial Type Name	Radial Lead ød	AMMO (pcs)	Reel (pcs)	Weight g/AMMO	
MFS1/4 CMT	0.45	3000	—	620	CFS1/4 CMHT	0.45	3000	—	720	BPR26 CFT	0.6	500	—	790	
CFS1/4 CMT	0.45	3000	3000	720	CFPS1/4 CMHT	0.6	3000	—	720	BPR58 CFT	0.8	500	—	1940	
CFPS1/4 CMT	0.45	3000	3000	720	RF16 CMHT	0.45	3000	—	240						
J1/6Z CMT	0.5	2000	—	450											

□ T.C.R. * The insulated coating on the lead wire is not available.

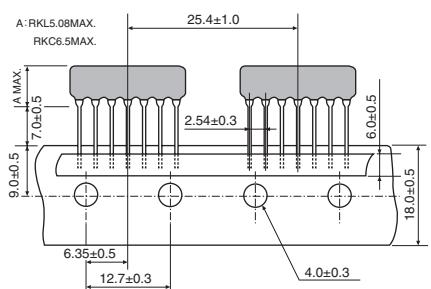
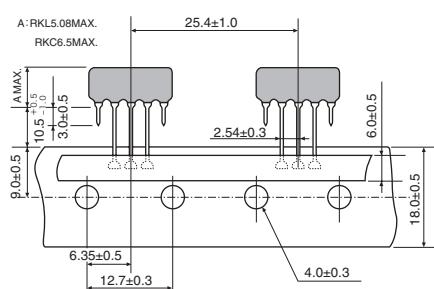
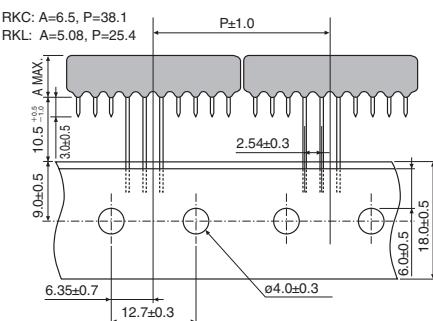
Also for MOSX, SPRX types, radial taping in the same shape as MOS, SPR types is applicable.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

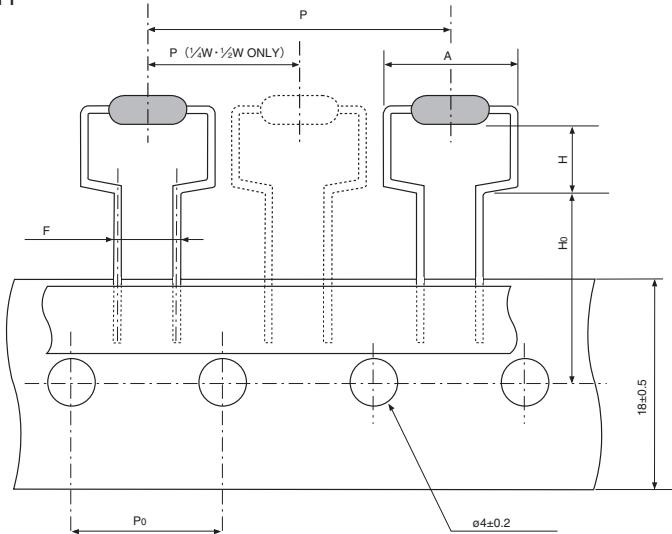
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radial tapings

(mm)

TBA (4pin-10pin)

TPA (4pin-9pin)

TUA (10pin)


Radial Type Name	AMMO (pcs)	Weight g/AMMO	Radial Type Name	AMMO (pcs)	Weight g/AMMO	Radial Type Name	AMMO (pcs)	Weight g/AMMO
RKC TBA	1000	850(9Pin)	RKC TPA	1000	800(9Pin)	RKC TUA	1000	850(9Pin)
RKL TBA	1000	850(9Pin)	RKL TPA	1000	800(9Pin)	RKL TUA	1000	850(9Pin)

GT


Radial Type Name	Radial Lead ød	AMMO (pcs)	Weight g/AMMO	F	P	P0	H	H0	AMax.
MOS1/2CGT	0.6	2000	740	5±0.5	12.7±1.0	12.7±0.3	6.5 ^{+0.6} _{-0.5}	16±0.5	12
MOSTCGT	0.8	1000	730				6.5 ^{+0.6} _{-0.5}		
MOS1CGT4	0.8	1000	700				4.0 ^{+1.0} _{-0.5}		14.5
MOS2CGT	0.8	500	580	7.5 ^{+0.8} _{-0.2}	30±1.0	15±0.3	7.5 ^{+1.0} _{-0.5}	19±0.7	
MOS2CGT4	0.8	500	560				4.0 ^{+1.0} _{-0.5}		17.5
MOS3CGT	0.8	500	910				8.5 ^{+1.0} _{-0.5}		
MOS3CGTS ¹	0.8	500	910	7.5±0.5			5.5±1.0	19±1.0	21
SPR1/2CGT	0.6	2000	740	5±0.5	12.7±1.0	12.7±0.3	6.5 ^{+0.6} _{-0.5}	16±0.5	12
SPR1CGT	0.8	1000	770				6.5 ^{+0.6} _{-0.5}		
SPR2CGT	0.8	500	540	7.5 ^{+0.8} _{-0.2}	30±1.0	15±0.3	7.5 ^{+1.0} _{-0.5}	19±0.7	14.5
SPR3CGT	0.8	500	910				8.5 ^{+1.0} _{-0.5}		17.5
CFP1/4CGT	0.65	2000	720	5±0.5	12.7±1.0	12.7±0.3	6.5 ^{+0.6} _{-0.5}	16±0.5	12
CFPS1/2CGT	0.8	1500	600	5±0.5	12.7±1.0	12.7±0.3	6.5 ^{+0.6} _{-0.5}	16±0.5	12
CW1HCGT	0.8	1000	920						
RF50CGT	0.8	1000	730				6.5 ^{+1.0} _{-0.5}		14.5
RF1CGT	0.8	1000	770				8.5 ^{+1.0} _{-0.5}		
RF2CGT	0.8	500	1820	7.5 ^{+0.8} _{-0.2}	30±1.0	15±0.3	7.5 ^{+1.0} _{-0.5}	19±0.7	21
CW2CGT	0.8	500	1080				8.5 ^{+1.0} _{-0.5}		
CW3CGT	0.8	500	1820				8.5 ^{+1.0} _{-0.5}		17.5

□ T.C.R.

 Also for MOSX, SPRX types, radial taping in the same shape as MOS, SPR types is applicable. ¹Sprocket hole position is different from above image. Please contact KOA.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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forming (not available taping)

Forming Style	Forming Type Name	Forming Dimension (mm)				Weight g/100pcs	Basic Unit (pcs)	Straight Type Name	
		P±1	H3±1orH5	H4±1orH6	d				
L Forming	CW1/2CL10A (CW1SCL10A)	10.0	5.3	4.5	0.6	24	2000	CW1/2 (CW1S)	
	CW1CL12.5A (CW1PCL12.5A) (CW1HCL12.5A)	12.5	6.5	4.0	0.8	56	2000	CW1 (CW1P) (CW1H)	
	CW1CL15A (CW1PCL15A) (CW1HCL15A)	15.0	5.3	4.5	0.8	56	2000	CW1 (CW1P) (CW1H)	
	CW2CL15A (CW2PCL15A) (CW2HCL15A)	15.0	7.0	4.5	0.8	84	2000	CW2 (CW2P) (CW2H)	
	CW2CL20A (CW2PCL20A) (CW2HCL20A)	20.0	8.0	4.5	0.8	84	2000	CW2 (CW2P) (CW2H)	
	CW3CL20A (CW3PCL20A) (CW3HCL20A)	20.0	8.0	4.0	0.8	160	1000	CW3 (CW3P) (CW3H)	
	CW3CL25A (CW3PCL25A) (CW3HCL25A)	25.0	7.0	4.5	0.8	160	1000	CW3 (CW3P) (CW3H)	
	CW5CL30A (CW5PCL30A)	30.0	8.5	4.5	0.8	524	500	CW5	
	CW5CL35A (CW5PCL35A)	35.0	5.5	4.5	0.8	524	500	CW5	
	MOS1/2CL10A (MOSX1/2CL10A)	10.0	5.3	4.0	0.6	23	2000	MOS1/2 (MOSX1/2)	
L Forming	MOS1CL12.5A (MOSX1CL12.5A)	12.5	7.0	4.0	0.8	31	2000	MOS1 (MOSX1)	
	MOS1CL15A (MOSX1CL15A)	15.0	6.5	4.0	0.8	31	2000	MOS1 (MOSX1)	
	MOS2CL15A (MOSX2CL15A)	15.0	7.0	4.0	0.8	71	2000	MOS2 (MOSX2)	
	MOS2CL20A (MOSX2CL20A)	20.0	9.0	4.0	0.8	71	2000	MOS2 (MOSX2)	
	MOS3CL20A (MOSX3CL20A)	20.0	8.0	4.0	0.8	146	1000	MOS3 (MOSX3)	
	MOS3CL25A (MOSX3CL25A)	25.0	7.0	4.0	0.8	146	1000	MOS3 (MOSX3)	
	MOS5CL30A (MOSX5CL30A)	30.0	8.5	4.0	0.8	524	500	MOS5 (MOSX5)	
	MOS5CL35A (MOSX5CL35A)	35.0	5.5	4.0	0.8	524	500	MOS5 (MOSX5)	
	SPR1/2CL10A (SPRX1/2CL10A)	10.0	5.3	4.0	0.6	23	2000	SPR1/2 (SPRX1/2)	
	SPR1CL12.5A (SPRX1CL12.5A)	12.5	6.5	4.0	0.8	54	2000	SPR1 (SPRX1)	
L Forming	SPR1CL15A (SPRX1CL15A)	15.0	5.3	4.0	0.8	54	2000	SPR1 (SPRX1)	
	SPR2CL15A (SPRX2CL15A)	15.0	7.0	4.0	0.8	71	2000	SPR2 (SPRX2)	
	SPR2CL20A (SPRX2CL20A)	20.0	9.0	4.0	0.8	71	2000	SPR2 (SPRX2)	
	SPR3CL20A (SPRX3CL20A)	20.0	8.0	4.0	0.8	141	1000	SPR3 (SPRX3)	
	SPR3CL25A (SPRX3CL25A)	25.0	7.0	4.0	0.8	141	1000	SPR3 (SPRX3)	
	SPR5CL30A (SPRX5CL30A)	30.0	8.5	4.0	0.8	456	500	SPR5 (SPRX5)	
	SPR5CL35A (SPRX5CL35A)	35.0	5.5	4.0	0.8	456	500	SPR5 (SPRX5)	
	RCR50(+)-CL15A	15.0	5.3	4.5	0.7	34	2000	RCR50 (+)	
	RCR50ENCL15A	15.0	5.3	4.5	0.7	34	2000	RCR50EN	
	RCR60CL15A	15.0	5.3	4.5	0.7	34	2000	RCR60	
U Forming	RCR75CL15A	15.0	7.0	4.5	0.8	69	2000	RCR75	
	RCR100CL25A	25.0	7.0	4.0	0.8	142	1000	RCR100	
	RK1/4□CL10A	10.0	5.3	4.5	0.6	23	1000	RK1/4	
	RK1DCL20A	20.0	8.8	4.5	0.8	146	1000	RK1	
	CFP1/4CL10A	10.0	6.5	4.5	0.65	23	1000	CFP1/4	
	CFPB1/2CL12.5A	12.5	6.5	4.5	0.65	44	1000	CFPB1/2	
	RF25CL10A	10.0	5.35	5.0	0.6	23	2000	RF25	
	RF50CL12.5A	12.5	6.0	5.2	0.6	29	2000	RF50	
	RF50CL15A	15.0	6.0	5.3	0.6	29	2000	RF50	
	RF1CL12.5A	12.5	6.5	4.8	0.8	46	2000	RF1	
U Forming	RF1CL15A	15.0	5.3	4.5	0.8	46	2000	RF1	
	RF1CL20A	20.0	5.3	4.5	0.8	46	2000	RF1	
	RF2CL20A	20.0	8.0	5.0	0.8	141	1000	RF2	
	RF2CL25A	25.0	7.0	4.5	0.8	141	1000	RF2	
	MFS1/4□CU	-	5.5Max.	15.0±1.0	0.45	14	2000	MFS1/4	
U Forming	CFS1/4CU	-	5.5Max.	15.0±1.0	0.45	12	2000	CFS1/4	
	MF1/4□CU	-	9.5Max.	28.0±3.0	0.6	23	2000	MF1/4	
	MFP1/4□CU	-	9.5Max.	28.0±3.0	0.6	23	2000	MFP1/4	
	RK1/4□CU	-	9.5Max.	30.0±3.0	0.6	23	1000	RK1/4	
	CF1/4CUCL	-	10.0Max.	10.0±1.0	0.6	23	1000	CF1/4	
U Forming	CFS1/2CU	-	9.5Max.	30.0±3.0	0.6	44	1000	CFS1/2	
	MOS1CU	(MOSX1CU)	-	19.5±3.0	15.0Min.	0.8	23	1000	MOS1 (MOSX1)
	MOS2CU	(MOSX2CU)	-	22.0±3.0	15.0Min.	0.8	71	1000	MOS2 (MOSX2)
	MOS3CU	(MOSX3CU)	-	25.0±3.0	15.0Min.	0.8	146	1000	MOS3 (MOSX3)
	SPR1CU	(SPRX1CU)	-	19.5±3.0	15.0Min.	0.8	54	1000	SPR1 (SPRX1)
UCL Forming	SPR2CU	(SPRX2CU)	-	22.0±3.0	15.0Min.	0.8	93	1000	SPR2 (SPRX2)
	SPR3CU	(SPRX3CU)	-	25.0±3.0	15.0Min.	0.8	141	1000	SPR3 (SPRX3)
	MOS1CUCL	(MOSX1CUCL)	-	13.0±1.0	3.5±1.0	0.8	23	1000	MOS (X)1
UCL Forming	MOS2CUCL	(MOSX2CUCL)	-	14.5±1.0	3.5±1.0	0.8	71	1000	MOS (X)2
	MOS3CUCL	(MOSX3CUCL)	-	20.0Max.	4.0±1.0	0.8	146	1000	MOS (X)3

□ T.C.R.

forming (not available taping)

Forming Style	Forming Type Name	Forming Dimension (mm)					Weight g/100pcs	Basic Unit (pcs)	Straight Type Name	
		P±1	H1	H2	e Max.	d				
M Forming	MFS1/4□CM5F	5.0	—	5.0±1.0	2.0	0.45	14	2000	MFS1/4	
	MFS1/4□CM5R	5.0	10.0±1.0	—	2.0	0.45	14	2000	MFS1/4	
	MFS1/4□CM5W	5.0	—	15.0	2.0	0.45	14	2000	MFS1/4	
	MFS1/2□CM10R	10.0	—	5.0±1.0	2.0	0.6	23	2000	MFS1/2	
	MF1/4□CM10F	10.0	—	5.0±1.0	2.0	0.6	23	2000	MF1/4	
	MF1/4□CM12.5R	12.5	10.0±1.0	—	2.0	0.6	23	2000	MF1/4	
	MF1/2□CM12.5R	12.5	10.0±1.0	—	2.0	0.6	41	2000	MF1/2	
	MF1/2□CM15R	15.0	10.0±1.0	—	2.0	0.6	41	2000	MF1/2	
	MFP1/4□CM10F	10.0	—	5.0±1.0	1.7	0.6	24	2000	MFP1/4	
	MFP1/4□CM12.5R	12.5	10.0±1.0	—	1.7	0.6	24	2000	MFP1/4	
	MFP1/2□CM12.5R	12.5	10.0±1.0	—	2.0	0.6	41	2000	MFP1/2	
	MFP1/2□CM15R	15.0	10.0±1.0	—	2.0	0.6	41	2000	MFP1/2	
	RCR16CM5F	5.0	—	5.0±1.0	2.0	0.45	14	2000	RCR16	
	RCR25CM10F	10.0	—	5.0±1.0	2.0	0.6	23	2000	RCR25	
	RCR25ENCM10F	10.0	—	5.0±1.0	2.0	0.6	23	2000	RCR25EN	
RK Forming	RCR50(+CM15F	15.0	—	5.0±1.0	2.0	0.7	40	2000	RCR50	
	RCR50CM15F	15.0	—	5.0±1.0	2.0	0.7	40	2000	RCR50+	
	RCR60CM15F	15.0	—	5.0±1.0	2.0	0.7	40	2000	RCR60	
	RCR100CM20E	20.0	—	4.6±1.0	2.0	0.8	120	1000	RCR100	
	RK1/4□CM10F	10.0	—	5.0±1.0	1.7	0.6	21	1000	RK1/4	
	RK1/4□CM10R	10.0	—	10.0±1.0	1.7	0.6	21	1000	RK1/4	
	RK1/4□CM12.5R	12.5	—	10.0±1.0	1.7	0.6	23	1000	RK1/4	
	RK1/2□CM15F	15.0	—	5.0±1.0	2.0	0.6	40	1000	RK1/4	
	RK1/2□CM12.5F	12.5	—	5.0±1.0	2.0	0.6	37	1000	RK1/2	
	RK1/2□CM15R	15.0	—	10.0±1.0	2.0	0.6	37	1000	RK1/2	
CFS Forming	CFS1/4CM5F	5.0	5.9±1.0	5.0±1.0	1.5	0.45	12	2000	CFS1/4	
	CF1/4CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	23	1000	CF1/4	
	CF1/4CM12.5H	12.5	6.0±1.0	4.8±1.0	1.7	0.6	23	1000	CF1/4	
	CFB1/2CM12.5K	12.5	7.0±1.0	5.0±1.0	1.7	0.7	44	1000	CFB1/2	
	CFS1/2CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	26	1000	CFS1/2	
	CFPS1/4CM5F	5.0	5.9±1.0	5.0±1.0	1.5	0.45	12	2000	CFPS1/4	
	CFP1/4CM10H	10.0	6.0±1.0	4.8±1.0	1.7	0.6	23	1000	CFP1/4	
	CFPB1/2CM12.5K	12.5	7.0±1.0	5.0±1.0	2.0	0.7	44	1000	CFPB1/2	
	J1/6ZCM7.5H	7.5	—	5.0 ^{+2.0} _{-0.0}	1.5	0.5	5	1000	J1/6Z	
	J1/4ZCM10H	10.0	—	5.0 ^{+2.0} _{-0.0}	1.5	0.6	9	1000	J1/4Z	
RF Forming	RF16CM5F	5.0	—	5.0±1.0	2.0	0.45	12	2000	RF16	
	RF25CM10X	10.0	16.0±1.0	14.8±1.0	1.5	0.6	23	2000	RF25	
	RF50CM12.5E	12.5	—	4.5±1.0	1.5	0.6	29	2000	RF50	
	RF1CM15F	15.0	—	5.0±1.0	1.5	0.8	46	2000	RF1	
	MO1/2CM15F	(MOX1/2CM15F)	15.0	—	5.0±1.0	2.0	0.7	40	2000	MO1/2 (MOX1/2)
MOS Forming	MO1CM15S	(MOX1CM15S)	15.0	—	11.5±1.5	2.0	0.8	75	2000	MO1 (MOX1)
	MO2CM20E	(MOX2CM20E)	20.0	—	4.6±1.0	2.0	0.8	120	1000	MO2 (MO2)
	MO2CM25C	(MOX2CM25C)	25.0	—	3.5±1.0	2.0	0.8	120	1000	MO2 (MOX2)
	MOS1/2CM10C	(MOSX1/2CM10C)	10.0	—	3.5±1.0	2.0	0.6	23	2000	MOS (X) 1/2
	MOS1/2CM10F	(MOSX1/2CM10F)	10.0	—	5.0±1.0	2.0	0.6	23	2000	MOS (X) 1/2
	MOS1CM12.5C	(MOSX1CM12.5C)	12.5	—	3.5±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM12.5D	(MOSX1CM12.5D)	12.5	—	4.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15F	(MOSX1CM15F)	15.0	—	5.0±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15J	(MOSX1CM15J)	15.0	—	6.3±1.0	2.0	0.8	31	2000	MOS (X) 1
	MOS1CM15S	(MOSX1CM15S)	15.0	—	11.0±1.0	2.0	0.8	31	2000	MOS (X) 1
SPR Forming	MOS2CM15C	(MOSX2CM15C)	15.0	—	3.5±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM15E	(MOSX2CM15E)	15.0	—	4.5±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM16D	(MOSX2CM16D)	16.0	—	4.0±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM20D	(MOSX2CM20D)	20.0	—	4.0±1.0	2.0	0.8	71	2000	MOS (X) 2
	MOS2CM20U	(MOSX2CM20U)	20.0	—	13.5±1.5	2.0	0.8	71	2000	MOS (X) 2
	MOS3CM20E	(MOSX3CM20E)	20.0	—	4.6±1.0	2.0	0.8	120	1000	MOS (X) 3
	MOS3CM26E	(MOSX3CM26E)	26.0	—	4.7±1.0	2.0	0.8	120	1000	MOS (X) 3
	MOS5CM30U	(MOSX5CM30U)	30.0	—	13.0±1.0	2.0	0.8	456	500	MOS (X) 5
	SPR1/2CM10F		10.0	—	5.0±1.0	2.0	0.6	23	2000	SPR1/2
	SPR1CM12.5D		12.5	—	4.0±1.0	2.0	0.8	44	2000	SPR1
SPRX Forming	SPR1CM15F		15.0	—	5.0±1.0	2.0	0.8	44	2000	SPR1
	SPR2CM15E		15.0	—	4.5±1.0	2.0	0.8	71	2000	SPR2
	SPR3CM20E		20.0	—	4.6±1.0	2.0	0.8	120	1000	SPR3
	SPRX1/2CM10F		10.0	—	5.0±1.0	2.0	0.6	23	2000	SPRX1/2
	SPRX1CM12.5D		12.5	—	4.0±1.0	2.0	0.8	44	2000	SPRX1
SPRX Forming	SPRX1CM15F		15.0	—	5.0±1.0	2.0	0.8	44	2000	SPRX1
	SPRX2CM15E		15.0	—	4.5±1.0	2.0	0.8	71	2000	SPRX2
	SPRX3CM20E		20.0	—	4.6±1.0	2.0	0.8	120	1000	SPRX3

□ T.C.R.

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minimum ordered quantity

Chip Components

Type	Basic Unit/Bag	Quantity /Box	Taping
RK73B, RK73H	1F~W3A2	1,000	— O
RK73G	1H~2B	1,000	— O
RK73Z	1F~W3A	1,000	— O
RN73R, RN73H	1E~2E	200	— O
WK73, WU73 WG73	1E~3A3	1,000	— O
XR73	1H, 1E	1,000	— O
SR73	1H~W3A2	1,000	— O
UR73, UR73D, UR73V, UR73VD	1E~3A	1,000	— O
HV73	1J~3A	1,000	— O
SG73, SG73P, SG73S, SG73G	1E~W3A	1,000	— O
PSF, PSJ, PSG, PSL		100	— O
TLR, TLRH	1J, 2A, 2BP, 2B, 2H, 3AW, 2BW, 2HW, 3AP, 3APS	100	— O
SL, SLN, SLP	07, 1, 2, W07, W1, 3, 5	100	— O
TSL	1	100	— O
CSR	1, 2	100	— O
BLR	1	100	100 O
LR72	A, B, C	100	100 O
RD41	2ES	2,000	40,000 O
	2E	2,000	10,000 O
RN41	2A	5,000	50,000 O
	2ES	2,000	40,000 O
	2D	2,000	36,000 O
	2E, 2H	2,000	10,000 O
RM41	2D	2,000	36,000 O
	2H	2,000	10,000 O
CC	12M	2,000	40,000 O
	25	2,000	10,000 O
CPCN	1/2	1,000	10,000 —
	1, 2N, 2NS	1,000	5,000 —
	3	500	2,000 —
RF73	1J~3A	200	— O
NT73	1J~2B	200	— O
LT73, LT73V	2A, 2B	200	— O
LP73	1J	1,000	— O
	2A, 2B	500	— O
SDT73H/V/S	2B	100	— O
CNN	2A	100	— O
KQC	0402, 0603	200	— O
HS		81	384 O
KQT	0402	200	— O
KQ	0603, 0805, 1008	200	— O
LPC	4545, 4235	100	— O
	4045	100	— O
TF	10B, 16S, 16A, 16VN	100	— O
CCP	2B, 2E	100	— O
CCF	1N, 1F	100	— O
NV73	1H • 1E	—	— O

Type	Basic Unit/Bag	Quantity /Box	Taping
NV73, NV73DL	1J~2L	1,000	— O
NV73DS	2L	500	— O
RCU		100	— O
RCT		100	— O
RCS		100	— O
RCW		100	— O

Please refer to product pages for taping quantities.

Discrete Components

Type	Basic Unit/Bag	Taping
CF (CFP)	S1/4	2,000
	1/4, B1/2, S1/2	1,000
MF (MFP)	S1/4	2,000
	S1/2, 1/4, 1/2	1,000
RNS	1/8~1	1,000
	1/4~1	1,000
RK	16, 25	2,000
	50, 50+, 60, 75	2,000
	100	1,000
HPC	1/2	3,000
	1	1,000
	2, 3	1,000
	4, 5	500
PCF	1/2	2,000
	1	1,000
	2	500
RF	16~1	2,000
	2	1,000
RF25CC		2,000
MOS (MOSX)	1/2~2	2,000
	3, 1U, 2U	1,000
	5	500
SPR (SPRX)	1/4	2,000
	1/2~2	2,000
	3, 1U, 2U	1,000
	5	500
CW	1/2~3	1,000
	5	500

Discrete Components (continued)

Type		Basic Unit/Bag	Taping
BPR	26, 28	1,000	O
	38	1,000	—
	58	1,000	O
	108, 55, 77	400	—
LR	6-29	1,000	—
BGR, BWR, BSR	5N	(1500)	—
	7N	(700)	—
	10N	(600)	—
	1	500 (700)	—
BGR,BWR,BSR (Straight type)	2, 3	(1000)	—
	5	(700)	—
	7, 10	(500)	—
	15	(320)	—
	20	(300)	—
	5-7, 10X, 10YS (Lug terminal)	200	—
Z	10Y, 10Z, 10H, 15~20	100	—
	16	2,000	O
J1/6Z, J1/4Z	25	1,000	O
		1,000	O
JLT		—	O
RK92		1,000	—
RKL, RKC	3pin	1,000	—
	4~5pin	1,000	O
	6~9pin	1,000	O
	10pin	1,000	—
	11~17pin	1,000	—
	4~8pin	1,000	—
RKH	9pin	1,000	—
	10~13pin	1,000	—

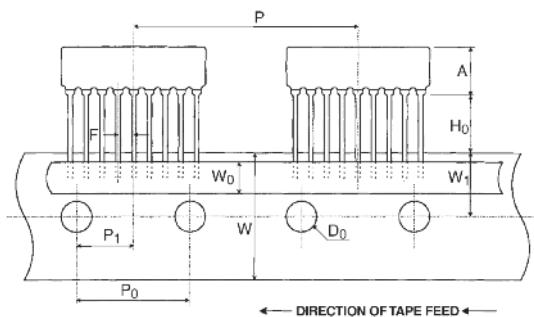
* () is flat container

Type		Basic Unit/Bag	Quantity /Box	Taping
MRS	1/8~1/3	100	5000	—
	1/4	—	1000	—
	1/2	—	2000	—
	1	—	2000	—
	2	—	500	—
	3	—	500	—
	5	—	500	—
	7	—	250	—
	10	—	250	—
GS	12	—	250	—
LF	1/8, 1/4, 1/2	100	2000	O
LP	1/16	100	2000	O
SDT101	1/8	100	1000	O
	A	100	2500	O
SDT101S	B	100	2500	—
SDT310		100	—	—
PSN•PV•PSO•PN•PWW•PAP		1	—	—
AFS		1	—	—
RW	1/2	20	1000	—
	1	20	1000	—
	2~7	20	500	—
	10	20	300	—
CR		100	1000	—
MRP	3 pin	100	3000	—

Please refer to product pages for taping quantities.

SIP resistor network taping—TBA style

For KOA type RKL & RKC networks with 4 to 9 pins

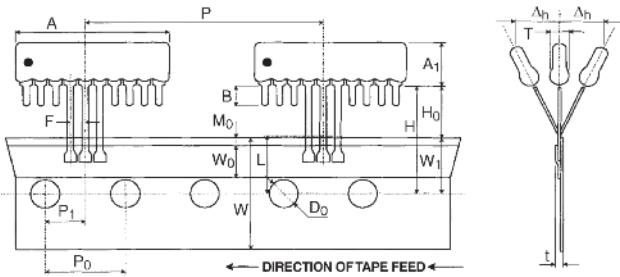


Leaded Resistors (TBA Style)

Type	Dimensions (mm)
A	RKL: 5.0 max.-RKC: 6.5 max.
P	25.4 ± 1.0
P ₀	12.7 ± 0.3
P ₁	6.35 ± 0.5
F	2.54 ± 0.3
W	18.0 ± 0.5
W ₀	6.0 ± 0.5
W ₁	9.0 ± 0.5
H ₀	7.0 ± 0.5
D ₀	4.0 ± 0.3

SIP resistor network taping—TUA style

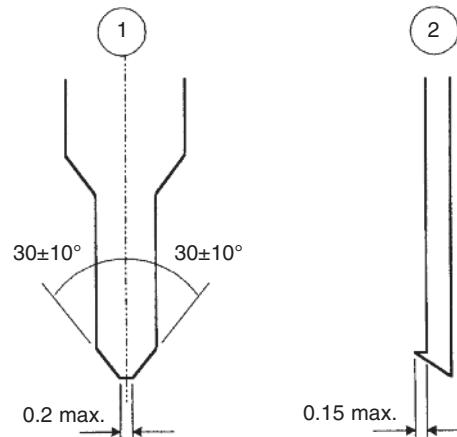
For KOA type RKL & RKC 10-pin networks



Leaded Resistors (TUA Style)

Type	Dimensions (mm)
A	25.40 max.
T	2.5 max.
A ₁	5.0 max.
B	3 ± 0.5
P	RKL: 25.4, RKC: 38.1±1.0
P ₀	12.7 ± 0.3
P ₁	6.35 ± 0.7
Δh	0 ± 2.0
W	18 ± 0.5
W ₀	6 ± 0.5
W ₁	9 ± 0.5
H	19.5 ± 0.5
H ₀	10.5 ± 0.5
D ₀	4 ± 0.3
t	0.7 ± 0.2
L	11 max.
M ₀	1.0 ± 1.0

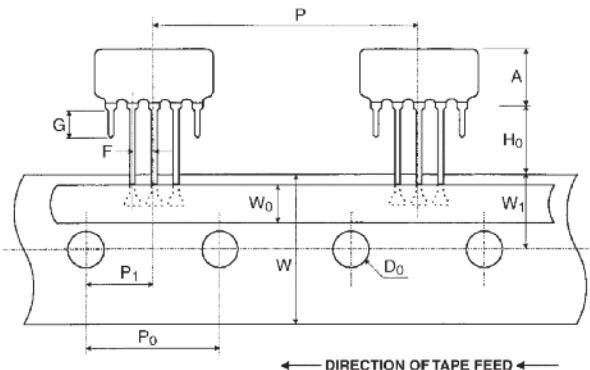
Application: Universal radial lead component insertion machine



*21 Holes Length = 254 ± 1mm

SIP resistor network taping—TPA style

For KOA type RKL & RKC networks with 4 to 9 pins

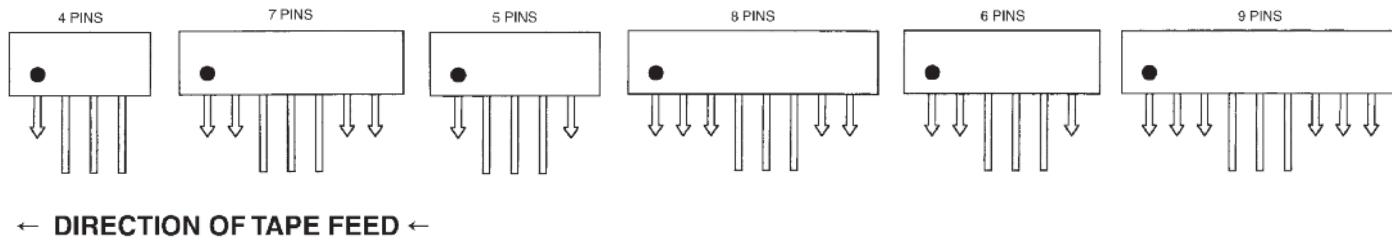


Leaded Resistors (TPA style)

Type	Dimensions (mm)
A	RKL: 5.0 max.-RKC: 6.5 max.
P	25.4 ± 1.0
P ₀	12.7 ± 0.3
P ₁	6.35 ± 0.5
F	2.54 ± 0.3
W	18.0 ± 0.5
W ₀	6.0 ± 0.5
W ₁	9.0 ± 0.5
H ₀	10.5 ± 0.5/1.0
D ₀	4.0 ± 0.3
G	3.0 ± 0.5

SIP resistor network taping—TPA style

For KOA TPA style taping

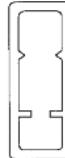
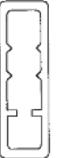


SIP resistor network packaging—STP & STB style packaging for stick (magazine) case

Stick Packaging

Type	Basic Unit/Stick	Stick/Box
RKC	(STB)	(STP)
4 Pin	54	46
5 Pin	42	37
6 Pin	34	31
7 Pin	30	27
8 Pin	26	23
9 Pin	23	21
10 Pin	21	19
11 Pin	19	17
12 Pin	18	15
13 Pin	16	14
14 Pin	15	13
RKC	(STB)	(STP)
4 Pin	55	48
5 Pin	44	38
6 Pin	37	32
7 Pin	31	27
8 Pin	27	24
9 Pin	24	21
10 Pin	22	19
11 Pin	20	17
12 Pin	18	16

Stick (Magazine) Case

Type	Resistor Networks	
	RKL	RKC
Magazine Symbol	STP	STB
Sectional View		
W x H x L (mm)	5.0 x $\frac{11.0}{12.5}$ x 508	3.8 x 13.4 x 580
Quantity (pcs)	13~46	15~54
Weight (g)	30	30

resistor networks

Resistor Color Code Chart

Color	Significant Figure	Multiplier	Tolerance
Silver	—	10^{-2}	+10%
Gold	—	10^{-1}	+5%
Black	0	1	—
Brown	1	10	+1%
Red	2	10^2	+2%
Orange	3	10^3	—
Yellow	4	10^4	—
Green	5	10^5	+0.5%
Blue	6	10^6	+0.25%
Violet	7	10^7	+0.10%
Gray	8	10^8	+0.05%
White	9	10^{3*}	—

* The 10^{3*} Multiplier is not an "Industry Standard" Multiplier



Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

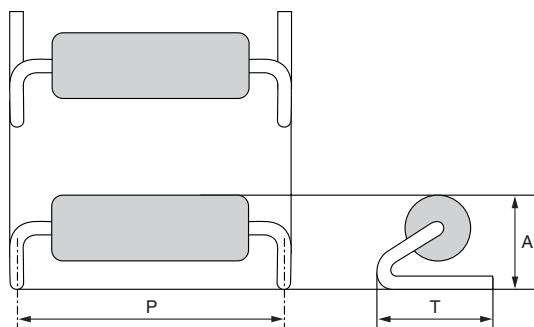
12/06/19

surface mounted device style lead forming

Ratings

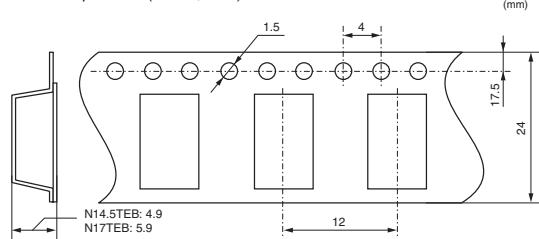
Type	Forming Type Name	Carrier Type	Forming Dimensions (mm)				Quantity/Reel (pcs)	Weight (g)	
			P	T	A	d		Reel	NET/1000pcs
MOS (X) 1C	N14.5	TEB	14.5 ± 1	5.0 ± 0.5	4.8 ± 0.5	0.8	1000	700	350
MOS (X) 2C SPR(X) 2C RCR75C CW2C	N17	TEB	17.0 ± 1	6.0 ± 0.5	5.8 ± 0.5	0.8	1000	900	600
MOS (X) 3 SPR(X) 3 RCR100 CW3C	N20	TEG	20.0 ± 1	7.5 ± 1	6.5 ± 0.5	0.8	900	1,800	1,400

Forming Style

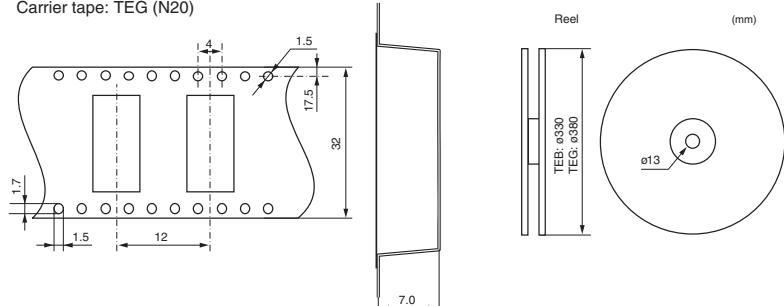


Packaging Specifications

Carrier tape: TEB (N14.5, N17)

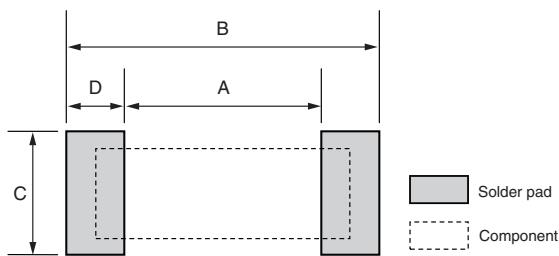


Carrier tape: TEG (N20)



Recommended Pad Dimensions

Type	Forming Type Name	Forming Dimensions (mm)			
		A	B	C	D
MOS (X) 1C	N14.5TEB	12.5	16.5	7.0	2.0
MOS (X) 2C SPR(X) 2C RCR75C CW2C	N17TEB	14.6	19.4	8.0	2.4
MOS (X) 3 SPR(X) 3 RCR100 CW3C	N20TEG	17.6	22.4	9.5	2.4



• Need a dedicated nozzle for automatic mounting.
Please ask us before use.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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marking

KSE Part Designation		Color		Marking Type
		Body	Marking	
RS73	1J, 2A, 2B	Black	None	None
	1H (0201)	Black	None	None
	1E (0402)	Black	None	None
	1J (0603)	Black	White	3 Digits
RK73B	2A (0805)	Black	White	3 Digits
RK73B-RT	2B (1206)	Black	White	3 Digits
XR73	2E (1210)	Black	White	3 Digits
	2H, W2H (2010)	Black	White	3 Digits
	3A, W3A, W3A2, (2512)	Black	White	3 Digits
	1H (0201), 1E (0402)	Green	None	None
RK73Z	1F (01005)	Black	None	None
RK73Z-RT	1J (0603)	Black	White	0
	2A (0805)	Black	White	000
	2B (1206)	Black	White	000
	2E (1210)	Black	White	000
	2H (2010)	Black	White	000
	3A (2512)	Black	White	000
	1F,1H	Black	None	None
RK73H	1E (0402)	Blue	None	None
RK73H-RT	1J (0603)	Blue	Black	E-24 3 Digits, E-96 None
	2A (0805)	Blue	Black	4 Digits
	2B (1206)	Blue	Black	4 Digits
	2E (1210)	Blue	Black	4 Digits
	2H, W2H (2010)	Blue	Black	4 Digits
	3A, W3A, W3A2, (2512)	Blue	Black	4 Digits
RK73G	1H (0201)	Black	None	None
RK73G-RT	1E (0402)	Black	None	None
	1J (0603)	Dark Blue	Black	E-24 3 Digits E-96 None
	2A (0805)	Dark Blue	Black	4 Digits
	2B (1206)	Dark Blue	Black	4 Digits
RN73R	1E (0402)	Black	None	None
	1E	Black	—	None
RN73H	1J	Black	—	E-24 3 Digits E-96 4 Digits
	2A, 2B, 2E	Black	—	4 Digits
HV73(V)	1J	Black	None	None
HV73(V)-RT	2A-3A	Black	White	3 Digits
WK73	—	Black	White	3 Digits
WK73-RT	—	Black	White	3 Digits
WK731J	—	Black	None	None
WG73	—	Red	White	3 Digits
WU73	—	Black	None	None
	(D) 1E	Indigo	None	None
UR73	1J	Indigo	White	None
	(D) 3A	Indigo	White	4 Digits
	(D) 2A	Indigo	White	4 Digits
	(D) 2B	Indigo	White	4 Digits
	(D) 2H	Indigo	White	4 Digits
UR73V (D)	2A/2B	Black	None	None

KSE Part Designation		Color		Marking Type
		Body	Marking	
SG73	—	Red Wine	White	3 Digits
SG73P/S	1J-2E	Green	Black	3 Digits, E-24 Only
SG73P/S	1E	Black	None	None
SG73-RT	—	Red Wine	White	3 Digits
SG73P-RT	1E	Black	None	3 Digits
SG73S-RT	1E	Black	None	3 Digits
SG73P-RT	1J-2E	Green	Black	3 Digits, E-24 Only
SG73S-RT	1J-2E	Green	White	3 Digits, E-24 Only
CNN	—	Green	White	2 Digits
	1H	Black	None	None
	1E	Indigo	None	None
SR73	1J	Indigo	—	1%: None 2%, 5%: 3 Digits
	2A ~ 3A2	Indigo	—	.5%, 1%: 4 Digits 2%, 5%: 3 Digits
	1E	Black	None	None
SR73-RT	1J	Black	White	1%: None 2%, 5% = 3 Digits
	2A/2B/2E	Black	White	4 Digits
SL	—	Black	White or Laser	4 Digits + tolerance
TSL	—	Black	White	4 Digits designator
	2A/3APS (2m)	Black	None	None
	2BW/2HW	Silver	None	None
TLR	2B/3AW/3AP	Silver	Black	4 Digits
	3AW/3AP (0.5m-1.5m)	Black	Black	4 Digits
	2BP	Black	None	None
TLRZ	1E/1J/2A/2B	Black	None	None
TLRH	2A/3AW/3AP	Black	Silver	4 Digits, 2A-no marking
LR72	—	Silver	None	3 Digits
CSR	—	Black	White	Distinctive
RD41	—	Ivory	3 color band	None
RN41	—	Blue	3 color band	None
RM41	—	Green	3 color band	None
CPCN	—	Gray	None	None
RKC, RKH RKL	—	Black	White	1% = 4 Digits 2%, 5% = 3 Digits
MRP	—	Black	White	Alphanumeric
MRS	—	Black	White	Alphanumeric
LT73(V)	—	Bronze	Black	3 Digits
	1J	Pink	—	—
NT	2A, 2B	Pink	Black	3 Digit
RF73	—	Brown	Black	3 Digits
CCP	—	Black	White	2 Digits
CCF	—	White	Black	Alphanumeric
TF16	SN, BN, VN	Black	White	Letter Designation
	AT	Black	Blue	Letter Designation
NV73	—	Black	None	None
NV73A	—	Black	None	None
NV73D	—	Black	None	None
MHL	1E	Brown	None	None
	1J	White	Black Stripe	None

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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marking (continued)

KSE Part Designation	Color		Marking Type	
	Body	Marking		
KQ	0603	Black	White	3 Digits
	0805	Black	White	3 Digits
	1008	Black	White	3 Digits
KQ(T)	0402	White	None	None
KQC	0402	White	None	None
	0603	Black	None	None
LP73	—	Black	White	Alphanumeric
LPC	—	Black	None	None
CZB/CZP	—	Black	None	None
CF	1/4	Tan	—	Color Bands
CFP	1/4, 1/2	Green	—	Color Bands
CFS	1/4	Ivory	—	Color Bands
MF	1/4,1/2,1	Blue Gray	—	Color Bands
LF	1/8,1/4,1/2	Blue	—	Color Dot
RCR	16	Gray	—	Color Bands
	50+, 50EN	Green	—	Color Bands
	60	White	—	Color Bands
	75,100	Black	—	Color Bands
PCF	—	Light Green	—	Color Bands
HPC	—	Redish Brown	White	Alphanumeric
RK92	—	Black	White	Alphanumeric
RK92-L	—	Green	White	Alphanumeric
MOS(x)	—	Pink	Color Bands	or Alphanumeric
SPR	1/4,1/2,1	Light Green	Color Bands	Color Bands
SPR	2,3,5	Light Green	Black	Alphanumeric
CWFS	—	Gray	Black	Alphanumeric
CW	1/4	Green	—	Alphanumeric
CW,CW_X	—	Blue	—	Color Bands
CW_P	—	Blue	—	Alphanumeric
CW1S	—	Black	—	Alphanumeric
CW1SS	—	Black	—	2 Silver bands
CWH	—	Black	—	Alphanumeric
RW	—	Black	—	Alphanumeric
BPR	—	White	Black	Alphanumeric
RF	—	Blue	—	Color Bands
RF25CC	—	Blue	—	Color Bands
MRS	—	Black	—	No Marking
RNS	—	Light Gray	—	Alphanumeric
CR	—	Black	—	Alphanumeric

significant figures of nominal resistance

E-12 Decade Values					
10	12	15	18	22	27
33	39	47	56	68	82
E-24 Decade Values					
10	11	12	13	15	16
18	20	22	24	27	30
33	36	39	43	47	51
56	62	68	75	82	91
E-96 Decade Values					
100	102	105	107	110	113
115	118	121	124	127	130
133	137	140	143	147	150
154	158	162	165	169	174
178	182	187	191	196	200
205	210	215	221	226	232
237	243	249	255	261	267
274	280	287	294	301	309
316	324	332	340	348	357
365	374	383	392	402	412
422	432	442	453	464	475
487	499	511	523	536	549
562	576	590	604	619	634
649	665	681	698	715	732
750	768	787	806	825	845
866	887	909	931	953	976
E-192 Decade Values					
100	101	102	104	105	106
107	109	110	111	113	114
115	117	118	120	121	123
124	126	127	129	130	132
133	135	137	138	140	142
143	145	147	149	150	152
154	156	158	160	162	164
165	167	169	172	174	176
178	180	182	184	187	189
191	193	196	198	200	203
205	208	210	213	215	218
221	223	226	229	232	234
237	240	243	246	249	252
255	258	261	264	267	271
274	277	280	284	287	291
294	298	301	305	309	312
316	320	324	328	332	336
340	344	348	352	357	361
365	370	374	379	383	388
392	397	402	407	412	417
422	427	432	437	442	448
453	459	464	470	475	481
487	493	499	505	511	517
523	530	536	542	549	556
562	569	576	583	590	597
604	612	619	626	634	642
649	657	665	673	681	690
698	706	715	723	732	741
750	759	768	777	787	796
806	816	825	835	845	856
866	876	887	898	909	920
931	942	953	965	976	988

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Rated Power:

The maximum value of power which can be continuously loaded to a resistor at a rated ambient temperature.

Rated Voltage:

The maximum value of D.C. voltage or A.C. voltage (rms) capable of being applied continuously to a resistor at the rated ambient temperature. Rated voltage shall be calculated from the following formula:

Rated Voltage(V) =

$$\sqrt{\text{Rated Power(W)} \times \text{Nominal Resistance Value (ohm)}}$$

However, it shall not exceed the maximum working voltage.

Critical Resistance Value:

The maximum nominal resistance value at which the rated power can be loaded without exceeding the maximum working voltage. The rated voltage is equal to the maximum working voltage in the critical resistance value.

Maximum Working Value:

The maximum value of D.C. voltage or A.C. voltage (rms) capable of being applied continuously to a resistor or a resistor element. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

Maximum Overload Voltage:

The maximum value of voltage capable of being applied to a resistor for five seconds in the short-time overload test. Typically the applied voltage in the short-time overload test shall be 2.5 times larger than the rated voltage. However, it shall not exceed the maximum overload voltage.

Dielectric Withstanding Voltage:

A.C. voltage (rms) that can be applied to a designated spot between the electrode and the outer coating for one minute in the dielectric withstanding voltage test.

Rated Ambient Temperature:

The maximum ambient temperature at which a resistor is capable of being used continuously with the prescribed rated power. The rated ambient temperature refers to the temperature around the resistor inside the equipment, not to the air temperature outside the equipment.

Derating Curve:

The curve that expresses the relation between ambient temperature and the maximum value of continuously loadable power at its temperature, which is generally expressed in percentage.

Temperature Coefficient of Resistance (T.C.R.):

The rate of change in resistance value per 1°C in the prescribed temperature within the range of resistor operating temperature shall be expressed in the following formula:

$$\text{T.C.R. (ppm/}^{\circ}\text{C}) = \frac{R-R_0}{R_0} \times \frac{1}{T-T_0} \times 10^6$$

Where: R: Measured Resistance at T°C

R₀: Measured Resistance at T₀°C

T: Measured Test Temperature (°C)

T₀: Measured Base Temperature (°C)



surface mount inductors

Open Core Wirewound Chip Inductors

KQT0402TK001Kit

Lead-free, 47 values 10 pcs each

KQ0603TK001Kit

Lead-free, 52 values 10 pcs each

KQ0805TK001Kit

Lead-free, 36 values 10 pcs each

KQ1008TK001Kit

Lead-free, 40 values 10 pcs each

KQC0402TK001Kit

Lead-free, 12 values 20 pcs each

KQC0603TK001Kit

Lead-free, 12 values 20 pcs each

NOTE: Reference product data pages for available values.

surface mount resistors

NEW Anti-Sulfur Precision Flat Chip Resistors

RK73H1ERT-Kit1 (0402 chip size)

122 values, 100 pcs each

RK73H1JRT-Kit1 (0603 chip size)

122 values, 100 pcs each

Precision Flat Chip Resistors

RK73H1FTK001Kit (01005 chip size)

38 values, Lead-free, 25 pcs each ($10R_0 \sim 620K = \pm 1\%$)

RK73H1HTK001Kit (0201 chip size)

217 values, Lead-free, 50 pcs each ($0, 10R_0 \sim 1M00 = \pm 1\%$)

RK73H1ETK001Kit (0402 chip size)

122 values, Lead-free, 100 pcs each ($0, 10R_0 \sim 1M00 = \pm 1\%$) E-24

RK73H1JTK001Kit (0603 chip size)

122 values, Lead-free, 100 pcs each ($0, 10R_0 \sim 1M00 = \pm 1\%$) E-24

RK73H2ATK001Kit (0805 chip size)

122 values, Lead-free, 100 pcs each ($0, 10R_0 \sim 1M00 = \pm 1\%$)

RK73H2BTK001Kit (1206 chip size)

122 values, Lead-free, 100 pcs each ($0, 10R_0 \sim 1M00 = \pm 1\%$)

General Purpose Flat Chip Resistors

RK73B1FTK001Kit (01005 chip size)

51 values, Lead-free, 25 pcs each ($0, 10 \sim 1M = \pm 5\%$)

RK73B1HTK001Kit (0201 chip size)

139 values, Lead-free, 50 pcs each ($0, 2R2 \sim 2M2 = \pm 5\%$)

High Current Chip Inductors

LPC4045AK001kit

Lead-free, 19 values 25 pcs each

LPC4235AK001kit

Lead-free, 17 values 25 pcs each

surface mount resistors (continued)

High Voltage Flat Chip Resistors

HV73TK001Kit (0603, 0805, 1206, 2010 chip sizes)

156 values, Lead-free, 25 pcs each ($10k \sim 10M = +1\%$)

Varistors

NV73TK001Kit (0201, 0402, 0603, 0805, 1206, 1210, 1812, 2220 chip sizes)

Lead-free, 122 values, 10 pcs each size

NV73DLTK001Kit (0603, 0805, 1206 chip sizes)

17 values, Lead-free, 10 pcs each size

Surge Current Flat Chip Resistors

SG73TK001Kit (0603, 0805, 1206, 1210, 2010, 2512 chip sizes)

204 values, $\pm 10\%$, Lead-free, 25 pcs each

SG73STK001Kit (0603, 0805, 1206, 1210 chip sizes)

101 values, $\pm 1\%$, Lead-free, 25 pcs each

SG73PTK001Kit (0603, 0805, 1206, 1210 chip sizes)

97 values, $\pm 1\%$, Lead-free, 25 pcs each

Wide Terminal Flat Chip Resistors

WK73TK001Kit (0612, 1020, 1218 & 1225 chip sizes)

79 values, Lead-free, 25 pcs each ($\pm 1\%, \pm 5\%$)

WU73TK001Kit (0612 chip sizes)

17 values, 20 pcs each ($\pm 1\%$)

NOTE: Reference product data pages for available values.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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surface mount resistors (continued)

Circuit Protection - Thermal Sensors

NT73TK001Kit (0603, 0805, 1206 chip sizes)
Lead-free, 53 values (1J, 2A, 2B), 10 pcs each size

Circuit Protection - Fuses

CCFTK001Kit (2410 chip size)

18 values, Lead-free, 20 pcs each

CCPTK001Kit (1206, 1210 chip sizes)

35 values, Lead-free, 20 pcs each

FuseKit-TF10BN (0402 chip size)

12 values, Lead-free, 100 pcs each

FuseKit-TF16SN (0603 chip size)

14 values, Lead-free, 100 pcs each

FuseKit-TF16AT (0603 chip size)

13 values, Lead-free, 100 pcs each

NOTE: Reference product data pages for available values.

current sense resistors

Surface Mount Molded

SLW07TK001Kit (2010, 1W size)
27 values, 20 pcs each ($\pm 1\%$).

SLW1TK001Kit (2512, 1.5W size)
25 values, 20 pcs each ($\pm 0.5\%$).

SL1TK001Kit (2512, 1W size)
58 values, 20 pcs each ($\pm 1\%$).

SL2TK001Kit (4528, 2W size)
45 values, 20 pcs each ($\pm 1\%$).

SL3TK001Kit (4528, 3W size)
33 values, 20 pcs each ($\pm 1\%$).

SLN3TK001Kit (4528, 3W size)
32 values, 20 pcs each ($\pm 0.5\%$).

SLN5TK001Kit (4528, 5W size)
21 values, 10 pcs each ($\pm 0.5\%$).

TSL1TK001Kit (2512, 1W size)
33 values, Lead-free, 20 pcs each ($\pm 1\%$).

Metal Plate

TLR2ATK001Kit (0805 chip size)
9 values, complete range, 20 pcs each ($\pm 1\%$).

TLR2BWD-Kit (1206 chip size)
18 values, 15 pcs each ($\pm 1\%$).

TLR2HWD-Kit (2010 chip size)
10 values, 15 pcs each ($\pm 1\%$).

TLR3APD-Kit (2512 chip size)
10 values, 20 pcs each ($\pm 1\%$).

TLRDK001Kit (1206, 1210, 2512 chip sizes)
43 values, Lead-free, complete range, 20 pcs each ($\pm 1\%$).

Ultra Precision Flat Chip Resistor

RN73H1ET-Kit (0402 chip size)

49 values, Lead-free, 50 pcs each ($\pm 0.1\%$, 25ppm°C)

RN73H1JT-Kit (0603 chip size)

67 values, Lead-free, 50 pcs each ($\pm 0.1\%$, 25ppm°C)

RN73H2AT-Kit (0805 chip size)

73 values, Lead-free, 50 pcs each ($\pm 0.1\%$, 25ppm°C)

Chip Resistors

UR73TK001Kit (0402, 0603, 0805, 1206, 2512 chip sizes)
144 values, Lead-free, 20 pcs each ($\pm 1\%$).

UR73VTK001Kit (1206 chip sizes)

8 values, 20 pcs each ($\pm 1\%$).

Thick Film

SR731HTK001Kit (0201 chip size)
29 values, Lead-free, 50 pcs each (R47 ~ 10R0, $\pm 1\%$, $\pm 5\%$)

SR731ETK001Kit (0402 chip size)

25 values, Lead-free, 50 pcs each (R100 ~ 1R00, $\pm 1\%$)

SR731JTK001Kit (0603 chip size)

49 values, Lead-free, 50 pcs each (R100 ~ 10R0, $\pm 1\%$)

SR732ATK001Kit (0805 chip size)

49 values, Lead-free, 50 pcs each (R100 ~ 10R0, $\pm 1\%$)

SR732BTK001Kit (1206 chip size)

49 values, Lead-free, 50 pcs each (R100 ~ 10R0, $\pm 1\%$)

SR732ETK001Kit (1210 chip size)

49 values, Lead-free, 50 pcs each (R100 ~ 10R0, $\pm 1\%$)

SR732HTK001Kit (2010 chip size)

49 values, Lead-free, 50 pcs each (R100 ~ 10R0, $\pm 1\%$)

SR733ATK001Kit (2512 chip size)

49 values, Lead-free, 50 pcs each (R100 ~ 10R0, $\pm 1\%$)

NOTE: Reference product data pages for available values.



Sales Representatives

APM Naltron
8710 W. Hillsborough Ave
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L6H 5V5
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Mesa, AZ 85204
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PH: 214-995-1034

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Metz-Jade Associates, Inc.
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43 Leopard Rd
Paoli, PA 19301
PH: 484-318-7779
FX: 484-318-7842

Northeast Representatives
PO Box 447
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Marshfield, MA 02051
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FX: 781-837-9342

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303 Williams Ave (Suite 621)
Huntsville, AL 35801
PH: 256-539-7371

Rep One Associates, Inc.
3235 Satellite Blvd (Bldg. 400,
Suite 300)
Duluth, GA 30096
PH: 770-209-9242

Spectrum Sales
6800 W. 107th St (Suite 200)
Overland Park, KS 66212
PH: 913-648-6811

Straube Associates
7970 Sheridan Blvd (Suite C)
Westminster, CO 80003
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FX: 303-426-0896

Straube Associates (SAI)
333 W. Maude Ave. (Suite 205)
Sunnyvale, CA 94085
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Tradecomp
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Sao Paulo - SP
Brazil - 04571-090
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Tri-Tech Electronics, Inc.
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(Suite 100)
Rochester, NY 14626
PH: 585-385-6500

Victory Sales America, Inc.
4600 W. 77th St. (Suite 205)
Edina, MN 55435
PH: 612-615-9777
FX: 651-994-6978

Westrep CA
400 N. Tustin Ave (Suite 130)
Santa Ana, CA 92705
PH: 714-527-2822
FX: 714-527-3868

corporate Information

Name	Branch Location	Street	City/Zip	State	Phone
Arrow Electronics	See Below	9201 East Dry Creek Road	Centennial	CO	303-824-4000
Brevan Electronics, Inc.	Corporate	6 Continental Boulevard	Merrimack	NH	603-429-1900
Carlton-Bates	Corporate	3600 W. 69th Street	Little Rock	AR	844-284-3700
Digi - Key	Corporate	701 Brooks Avenue South	Thief River Falls	MN	800-344-4539
GW Electronics	Corporate	1833 Executive Drive	Oconomowoc	WI	262-567-9445
Justin Electronics	Corporate	400 Oser Avenue, Suite #800	Hauppauge	NY	631-951-4900
M3 Technology	Corporate	58 Sawgrass Drive	Bellport	NY	631-205-0005
Midstate Electronics	Corporate	71 South Turnpike Road	Wallingford	CT	203-265-9900
Mouser	Corporate	1000 N Main St	Mansfield	TX	817-804-3800
REM Electronics	See Below	525 S. Park Avenue	Warren	OH	330-373-1300
SMD, Inc.	See Below	1 Oldfield	Irvine	CA	949-470-7700
Tonar Industries, Inc.	Corporate	419 Franklin Avenue	Rockaway	NJ	973-586-9000
TTI	See Below	2441 Northeast Parkway	Fort Worth	TX	817-740-9000
Verical	Corporate	9201 East Dry Creek Road	Centennial	CO	303-824-4000

branch locations

State	City/Zip	Name	Street	Phone
AL	Huntsville	Arrow Electronics	4930 Corporate Drive (Ste F)	256-864-3300
	Huntsville	TTI, Inc.	4725 Whitesburg Drive (Ste 201)	256-721-1597
AR	Little Rock	Carlton-Bates	3600 W. 69th Street	501-562-9100
AZ	Phoenix	Arrow Electronics	1955 East Sky Harbor Circle N	602-256-2290
	Tempe	TTI, Inc.	2151 East Broadway Road (Ste 211)	480-638-1590
CA	Foothill Ranch	Arrow Electronics	26632 Towne Centre Drive (Ste 100)	949-380-4700
	San Diego	Arrow Electronics	10089 Willow Creek Road (Ste 225)	858-536-7600
	San Jose	Arrow Electronics	1732 N. 1st St (Ste 300)	669-342-3800
	Woodland Hills	Arrow Electronics	20935 Warner Center Lane	818-932-1000
	Irvine	SMD, Inc.	1 Oldfield	949-470-7700
	Chatsworth	TTI, Inc.	9121 Oakdale Avenue (Ste 200)	818-407-8000
	Fremont	TTI, Inc.	48371 Fremont Blvd. (Ste 107)	510-668-0830
	Poway	TTI, Inc.	13475 Danielson Street (Ste 210)	858-748-2025
	Tustin	TTI, Inc.	14511 Myford Road (Ste 210)	714-505-4857
CO	Centennial	Arrow Electronics	9201 East Dry Creek Road	303-824-4000
	Westminster	TTI, Inc.	9035 Wadsworth Pkwy (Ste 1600)	303-427-0241
CT	Wallingford	Arrow Electronics	2 Barnes Industrial Rd South	203-265-7741
	Wallingford	Midstate Electronics	71 South Turnpike Road	203-265-9900
	Wallingford	TTI, Inc.	8 Fairfield Blvd.	203-949-6262
FL	Lake Mary	Arrow Electronics	200 Colonial Center Pkwy (Ste 250)	321-233-8800
	Plantation	Arrow Electronics	8211 W. Broward Blvd (Ste 430)	954-429-8200
	Orlando	TTI, Inc.	5810 Hoffner Ave. (Ste 801)	407-273-6977
GA	Duluth	Arrow Electronics	2915 Premiere Parkway (Ste 150)	770-495-5200
IL	Itasca	Arrow Electronics	1162 Springlake Drive	630-250-0500
	Schaumburg	TTI, Inc.	915 National Parkway (Ste 30 Entrance D)	847-884-6500
IN	Indianapolis	Arrow Electronics	3077 E. 98th Street (Ste 160)	317-810-6250
KS	Overland Park	Arrow Electronics	10740 Nail Ave. (Ste 390)	913-469-3691
	Overland Park	TTI, Inc.	6405 Metcalf Ave (Ste 105)	913-789-6427
MA	Peabody	Arrow Electronics	4 Technology Drive	978-538-8500
	Tewksbury	TTI, Inc.	Three Highwood Drive	978-851-2000

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

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branch locations (continued)

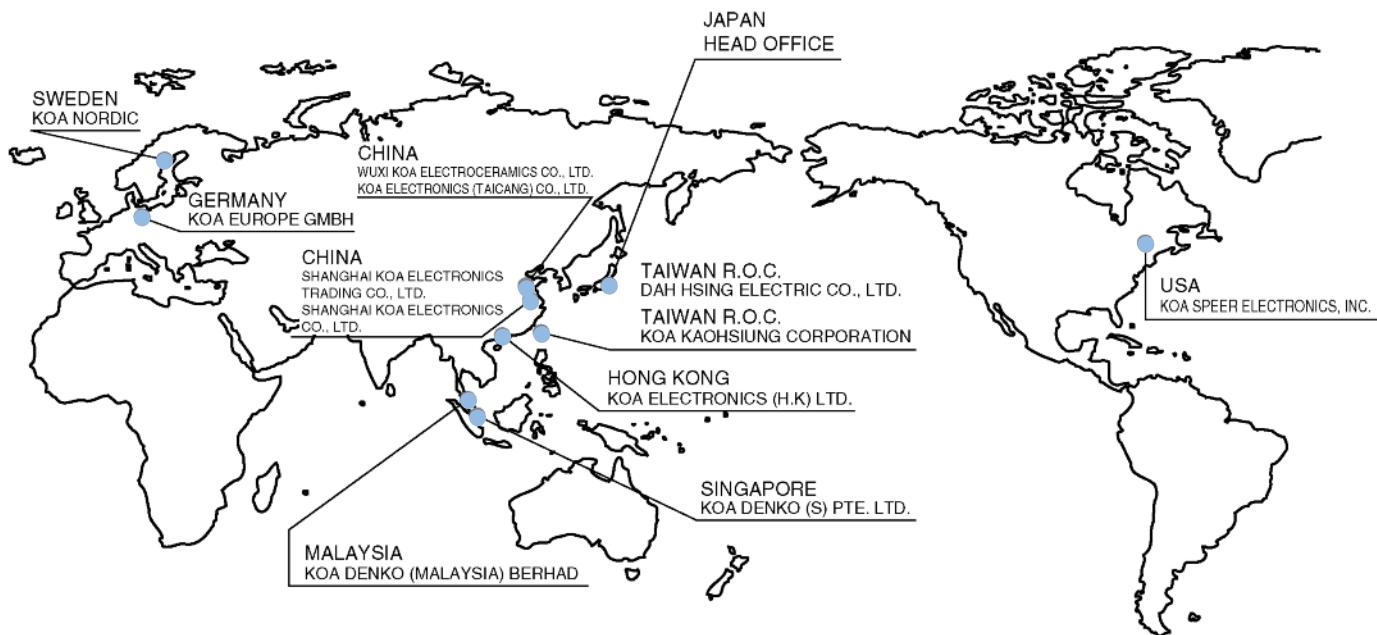
State	City/Zip	Name	Street	Phone
MD	Columbia	Arrow Electronics	7067 Columbia Gateway Drive	410-312-4600
	Columbia	TTI, Inc.	6304 Woodside Court (Ste 115)	410-995-6627
MI	Plymouth	Arrow Electronics	44720 Helm Street	734-335-9260
MN	Bloomington	Arrow Electronics	10900 Hampshire Ave. S	952-828-5350
	Thief River Falls	Digi - Key	701 Brooks Avenue South	800-344-4539
MO	Minneapolis	TTI, Inc.	7825 Washington Avenue South (Ste 800)	952-829-7200
	Earth City	Arrow Electronics	514 Earth City Expressway (Ste 321)	314-725-4164
NC	Durham	Arrow Electronics	2530 Meridian Parkway (Ste 300)	919-768-6806
	Raleigh	TTI, Inc.	220 Horizon Drive (Ste 203)	919-876-8922
NH	Merrimack	Brevan Electronics, Inc.	6 Continental Blvd.	603-429-1900
	Salem	SMD, Inc.	7B Raymond Avenue	603-681-0320
NJ	Parsippany	Arrow Electronics	90 E. Halsey Road (Ste 114)	973-560-3820
	Rockaway	Tonar Industries, Inc.	419 Franklin Avenue	973-586-9000
NY	Mount Laurel	TTI, Inc.	307 Fellowship Road (Ste 100)	856-234-6400
	Islandia	Arrow Electronics	3001 Express Drive North (Ste 100)	631-851-2300
NY	Pittsford	Arrow Electronics	1000 Pittsford-Victor Rd (2nd Floor)	585-427-0300
	Hauppauge	Justin Electronics	400 Oser Avenue (Ste 800)	631-951-4900
NY	Bellport	M3 Technology	58 Sawgrass Drive	631-205-0005
	Ronkonkoma	TTI, Inc.	3281 Veterans Highway (Ste E-3)	631-737-2000
NY	Victor	TTI, Inc	7640 Omnitech PI (Ste 5-C)	203-949-6262
	Beavercreek	Arrow Electronics	70 Birch Alley	937-648-3801
OH	Solon	Arrow Electronics	6675 Parkland Blvd.	440-248-9996
	Warren	REM Electronics	525 S. Park Avenue	330-373-1300
OH	Dayton (Centerville)	TTI, Inc.	10564 Success Lane (Ste B)	937-885-6270
	Independence	TTI, Inc.	Corporate Plaza 2 6480 Rockside Woods Blvd. (Ste 110)	216-524-2810
OK	Tulsa	Arrow Electronics	7633 E. 63rd Place (Ste 300)	918-986-1581
OR	Beaverton	Arrow Electronics	6600 SW 105th Avenue (Ste 100)	503-629-1400
	Beaverton	TTI, Inc.	8700 SW Nimbus Avenue (Ste B)	503-644-4560
PA	Horsham	Arrow Electronics	200 Gibraltar Road	215-956-4800
	Pittsburgh	Arrow Electronics	201 Penn Center Blvd. (Ste 400)	724-387-7000
PA	Erie	REM Electronics Inc.	2043 W. 12th Street	814-453-5626
	Austin	Arrow Electronics	1908 Kramer Lane, Braker B (Ste 200)	737-703-3500
TX	El Paso	Arrow Electronics	4150 Rio Bravo (Ste 150)	915-834-6100
	Plano	Arrow Electronics	1820 Preston Park Blvd.	972-985-6600
TX	El Paso	SMD, Inc.	11 Founders Blvd. (Ste 600)	949-470-7700
	Houston	TTI, Inc.	7102 N Sam Houston Pkwy (Ste 130)	713-339-2700
TX	Irving	TTI, Inc.	4600 Fuller Drive (Ste 100)	972-594-5900
	Fort Worth	TTI, Inc. (Mexico & Latin America)	5050 Mark IV Parkway	817-624-6380
TX	Fort Worth	TTI, Inc. (Telemarketing)	5050 Mark IV Parkway	817-624-6380
	Fort Worth	TTI, Inc. (Teleservices & BDG)	5050 Mark IV Parkway	817-624-6380
TX	Mansfield	Mouser Electronics, Inc.	1000 N. Main Street	817-804-3800
	Salt Lake City	Arrow Electronics	448 E 6400 S (Ste 400)	801-313-7300
WA	Bellevue	Arrow Electronics	3380 146th PI SE	425-643-9992
	Redmond	TTI, Inc.	11121 Willows Road NE (Ste 130)	425-882-0291

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branch locations (continued)

State	City/Zip	Name	Street	Phone
WI	Brookfield	Arrow Electronics	400 N. Executive Drive (Ste 112)	262-879-0434
	Oconomowoc	GW Electronics	1833 Executive Drive	262-567-9445
	Brookfield	TTI, Inc.	250 North Patrick Blvd (Ste 160)	262-797-9233
Canada				
AB	Calgary	Arrow Electronics	160 Quarry Park Blvd, SE	403-735-2800
BC	Burnaby	Arrow Electronics	4946 Canada Way (Unit 125)	604-630-4300
Ontario	Mississauga	Arrow Electronics	171 Superior Boulevard (Unit 2)	905-670-7769
	Ottawa	Arrow Electronics	343 Preston Street (Unit 1163)	343-291-1112
	Woodbridge	TTI, Inc.	111A Zenway Blvd. 13	905-850-3003
Quebec	Dorval	Arrow Electronics	1425 Trans Canada Highway (Ste 140)	514-421-4360
	Pointe-Claire	TTI, Inc.	52 Hymus Boulevard (Ste 102)	514-426-1212



KOA Overseas Sales Offices and Plants

Area	Country	Sales Office	Street	Phone	FAX
Japan	Japan	Global Sales Center	2-17-2 Midori-Cho, Fuchu-Shi, Tokyo 183-0006, Japan	(+81) 42-336-5755	(+81) 42-336-5353
North and South America	USA	KOA Speer Electronics, Inc.	Bolivar Drive, P.O. Box 547 Bradford, PA 16701, USA	(+1) 814-362-5536	(+1) 814-362-8883
Europe	Germany	KOA Europe GMBH	Kaddenbusch 6, D-25578 Dägeling Itzehoe, Germany	(+49) 4821-8989-0	(+49) 4821-8989-89
	Sweden	KOA Nordic	c/o EG Components Sweden AB, Box 39 SE-162 11, Vällingby, Sweden	(+46) 8 759 35 20	(+46) 8 739 28 58
Asia	Singapore	KOA Denko (S) PTE., Ltd.	72 Bendemeer Road, #06-02 Hiap Huat House, Singapore 339941	(+65) 63395151	(+65) 63398556
	Malaysia	KOA Denko (Malaysia) Berhad	Lots 7, 8 & 9, Batu Berendam FTZ 75350, Malacca, Malaysia	(+60) 6-2328031-3	(+60) 6-2328030
	Hong Kong	KOA Electronics (H.K.) Ltd.	Unit 1803, Miramar Tower, 132 Nathan Road T.S.T., Kowloon, Hong Kong	(+852) 2492-6918	(+852) 2492-7398
China	Shanghai KOA Electronics Trading Co., Ltd.	Xin Yin Building Room No. 1702 Yi Shan Road 888 Shanghai, China 200233	(+86) 21-64320101	(+86) 21-64320083	
China	Shanghai KOA Electronics Co., Ltd.	No. 581 Guiping Road, Cao He Jing, Shanghai, China	(+86) 21-64850723	(+86) 21-64852960	
China	Wuxi KOA Electroceramics Co., Ltd.	Heqiao, Yixing City, Jiangsu Province, China	(+86) 510-7871645	(+86) 510-7871626	
China	KOA Electronics (Taicang) Co., Ltd.	No. 111 Luoyang Road, Taicang Economy Development Area, Taicang, Jiangsu Province, China	(+86) 512-53561111	(+86) 512-53561600	
Taiwan R.O.C.	Dah Hsing Electric Co., Ltd.	11th Floor Ping-An Mansion, No. 34 Sec.1, Nan-King East Road, Taipei, Taiwan, R.O.C.	(+886) 2-2521-4166	(+886) 2-2564-1859	
Taiwan R.O.C.	KOA Kaohsiung Corporation	17-2 Kai-Fa Road, N.E.P.Z. Kaohsiung, Taiwan, R.O.C.	(+886) 7-363-4157-8	(+886) 7-363-4543	
Japan	Head Office	3672 Ina, Ina-Shi, Nagano 396-8585, Japan	(+81) 265-78-2121		

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11/25/15

world class quality

Successful companies recognize the value in selecting suppliers committed to total quality. KOA Speer has long embraced the principals of continuous improvement to attain new performance levels in every aspect of customer support. Our manufacturing programs redefine industry standards with defect levels measured in parts per billion. This organization-wide focus on quality resulted in our receiving ISO 9001:2015 certification. In addition, our quality program has received the more stringent IATF16949:2016 certification required to be a tier one supplier in the automotive industry.

customer programs

KOA Speer can play a vital role in helping your operation achieve maximum efficiency. Our sales/customer service representatives will meet with your design, production and purchasing teams to create a program that makes sense for your organization. Among the areas we regularly address are data entry and access through customized EDI, and inventory management through dock-to-stock and JIT programs. Our willingness to not only develop these programs but to execute them as promised, makes KOA Speer a dependable partner worth integrating into your operation.



responsive service

Providing products and answers when you need them is a fundamental policy at KOA Speer. Our 185,000 square foot warehouse features an automated material handling system based upon bar coding and radio frequency data communication (RFDC) to maintain an inventory of billions of components, while shipping millions of components per day. Standard product availability, the industry's most extensive electronic data interchange (EDI) program and a willingness to inventory to customer requirements, make KOA Speer JIT delivery an integral part of our customer's efforts at improving efficiency.

KOA
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