

Metal Film Fusing Resistors

Type : ERQA

Type : ERQZ

(0.25 W, 0.5 W, 1 W, 2 W coating type)

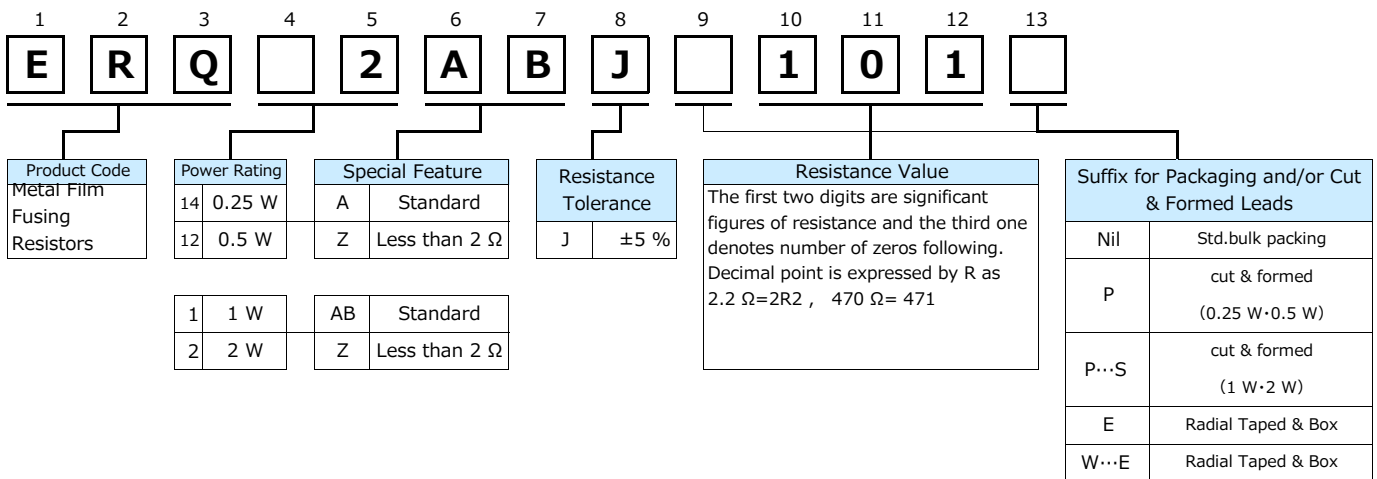


! This series is not a recommended product.
Not recommended for new design.

Features

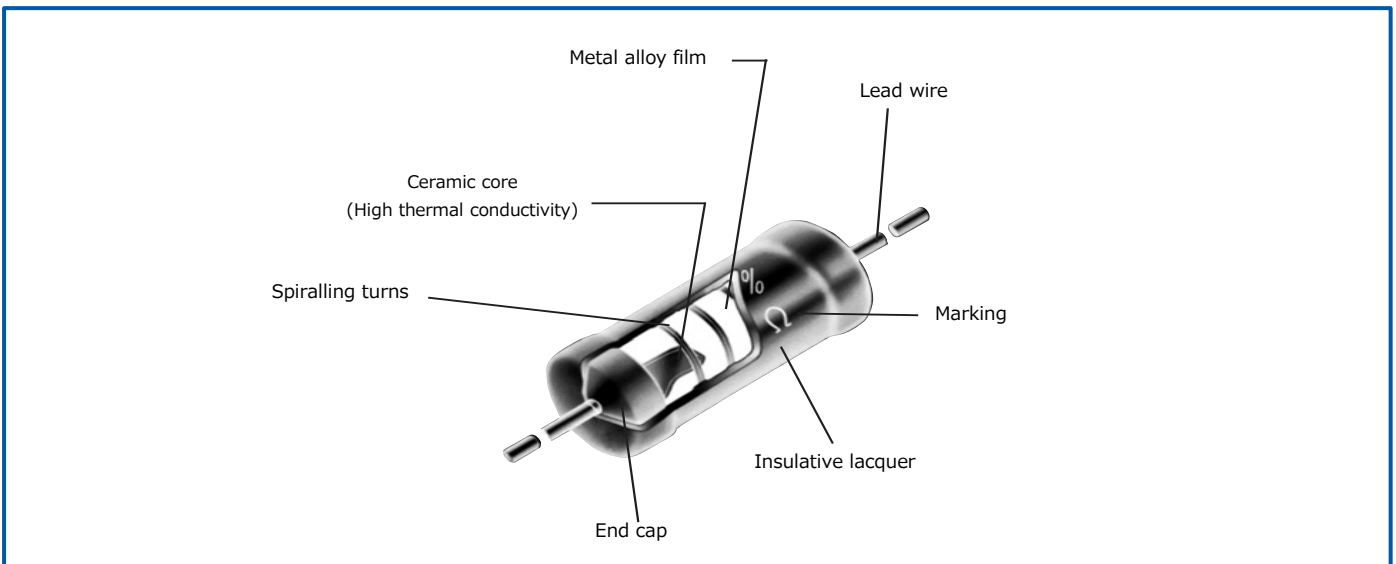
- Accurate fusing
- Small size and lightweight
- Uniform quality, consistent performance and reliability
- Flame retardant, utilizing exclusive silicon insulation material
- Reference Standard.....EIAJ RC-2125
- RoHS compliant

Explanation of Part Numbers



The above example shows a standard Metal Film Fusing Resistors, 2 W power rating, resistance value of 100 Ω, tolerance of ±5 %, and package of standard bulk packing.

Construction



Ratings

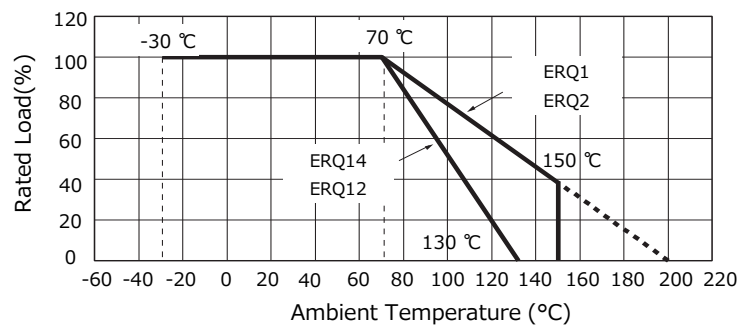
Part No.	Power Rating at 70 °C (W)	Maximum Open Circuit Voltage ⁽¹⁾ (V)	Maximum Overload Voltage	Dielectric Withstanding Voltage (V)	Resistance Tolerance (%)	Resistance Range (Ω)		T.C.R. (×10 ⁻⁶ /K)	Standard Resistance Value	Marking Method on Body	Mass (Weight) (g/ pc)
						min.	max.				
ERQ14Z	0.25	200	3 times of rated voltage ⁽²⁾	AC 350	J (±5)	1.0	1.8	±350	E 24	Color code	0.24
ERQ14A						2.0	470				
ERQ12Z	0.5	250		AC 350	J (±5)	1.0	1.8	±350	E 24	Stamp	0.32
ERQ12A						2.0	560			Color code	
ERQ1Z	1	250		AC 600	J (±5)	1.0	1.8	±350	E 24	Stamp	0.64
ERQ1AB						2.0	560				
ERQ2Z	2	250	AC 1000	J (±5)	1.0	1.8	±350	E 24	Stamp	1.54	
ERQ2AB					2.0	560					

(1) Maximum Open Circuit Voltage: Referring to the maximum value of the voltage applied between terminals of the resistor when the resistor is opened in an electric circuit 1000 times power rating or voltage specified above whichever less is regarded as the maximum open circuit voltage.

(2) Rated Continuous Working Voltage (RCWV) shall be determined from $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$

Power Derating Curve

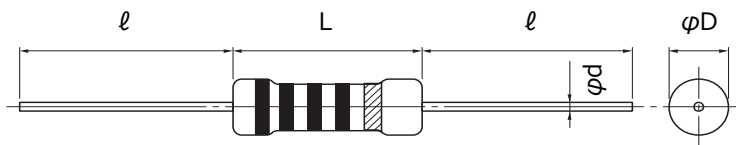
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



Performance Specifications

Characteristics	Specifications			Test Methods
Fusing Characteristics	Rated Power	Res. Value (Ω)	Limit	<p>The test potential shall be preadjusted using a dummy resistor and then be subjected to the test specimens. The potential shall be readjusted within two seconds to reach the exact value of specified current. This test shall be made under the conditions at 20 °C and 65 % RH (or at a temperature of 5 °C to 35 °C and 45 to 85 % RH, only when any doubt may not be caused), and the use of tabilized power source is suggested. Fusing time shall be measured as the duration until the circuit current is decreased to a 1/50 the initial test current or less.</p>
	0.25 W	1 to 1.8	Open within 30 seconds at 30 times the rated power	
	0.5 W			
	1 W			
	2 W			
	0.25 W	2 to 9.1	Open within 30 seconds at 16 times the rated power	
	0.5 W			
	1 W			
	2 W			
	0.25 W	10 to 470	Open within 30 seconds at 12 times the rated power	
0.5 W				
1 W				
2 W				
		10 to 560		

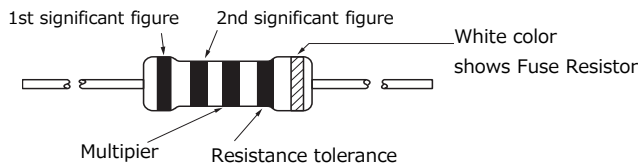
Dimensions in mm (not to scale)



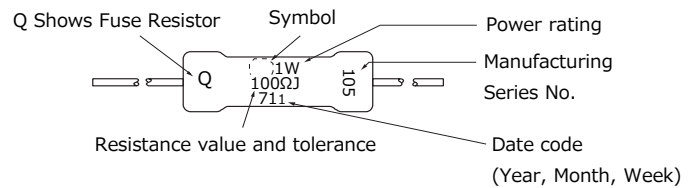
Part No.	Dimensions (mm)			
	L	φD	l	φd
ERQ14	6.3 ^{+1.5} / _{-1.0}	2.3 ±0.5	30.0 ±3.0	0.65 ±0.05
ERQ12	9.0 ^{+1.5} / _{-1.0}	2.8 ±0.5	30.0 ±3.0	0.65 ±0.05
ERQ1	12.0 ^{+1.5} / _{-1.0}	4.0 ±1.0	30.0 ±3.0	0.80 ±0.05
ERQ2	15.0 ±1.5	5.5 ±1.0	38.0 ±3.0	0.80 ±0.05

Explanation of Marking

Type ERQ14, ERQ12 (0.25 W, 0.5 W)

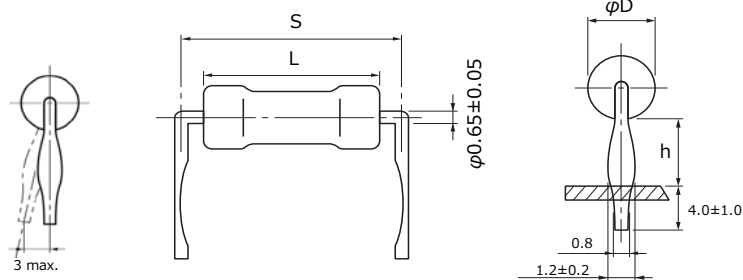


Type ERQ1, ERQ2 (1W, 2W)



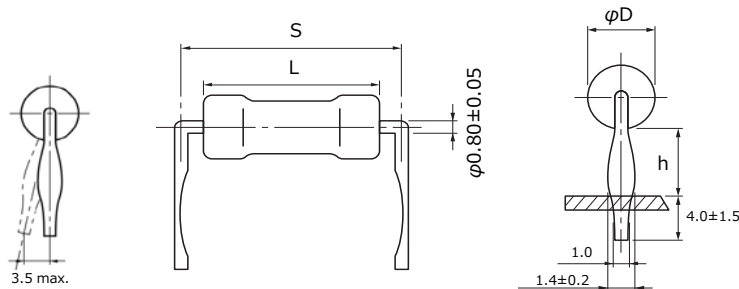
Cut & Formed Type

ERQ□□AJ□□□P
ERQ□□ZJ□□□P



Part No.	Power Rating at 70 °C (W)	Standard Q'ty/Packing (pcs)	Dimensions (mm)			
			L	φD	S	h
ERQ14□J□□□P	0.25	2,000	6.3 ^{+1.5} / _{-1.0}	2.3 ±0.5	10.0 ±1.5	4.0 ±1.5
ERQ12□J□□□P	0.5	2,000	9.0 ^{+1.5} / _{-1.0}	2.8 ±0.5	12.5 ±1.5	4.0 ±1.5

ERQ□ABJP□□□S
ERQ□ZJP□□□S



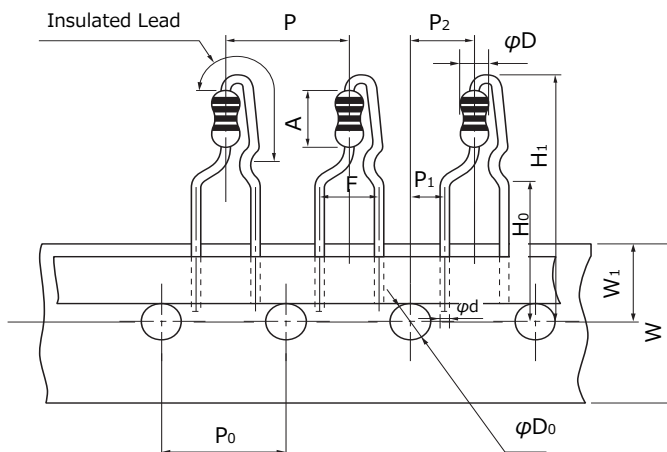
Part No.	Power Rating at 70 °C (W)	Standard Q'ty/Packing (pcs)	Dimensions (mm)			
			L	φD	S	h
ERQ1□□JP□□□S	1	1,000	12.0 ^{+1.5} / _{-1.0}	4.0 ±1.0	15.0 ±1.5	6.0 ±1.5
ERQ2□□JP□□□S	2	1,000	15.0 ±1.5	5.5 ±1.0	20.0 ±2.0	6.5 ±1.5

For Panasert Automatic Insertion Machine Radial Taped & Box

ERQ□□AJ□□□E

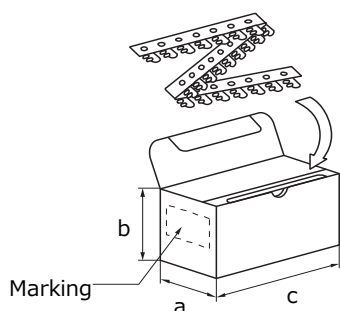
ERQ□□ZJ□□□E

(14A/14Z, 12A/12Z, 1AB/1Z)



Dimensions (mm)		Dimensions (mm)		Dimensions (mm)		Dimensions (mm)		Dimensions (mm)				
P	12.7±1.0	W	18.0±0.5	H ₁	14A/14Z	12 max.	A	14A/14Z	6.35 ^{+0.65} _{-0.35}	phi D	14A/14Z	2.3±0.5
P ₀	12.7±0.3	W ₁	9.0±0.5		12A/12Z	15.5 max.		12A/12Z	9.0 ^{+1.5} _{-1.0}		12A/12Z	2.8±0.5
P ₁	3.85±0.70				1AB/1Z	19 max.		1AB/1Z	12.0 ^{+1.5} _{-1.0}		1AB/1Z	4.0±1.0
P ₂	6.35±1.00			H ₀	16.0±0.5		phi d	0.65±0.05				
F	5.0±0.8			phi D ₀	4.0±0.2							

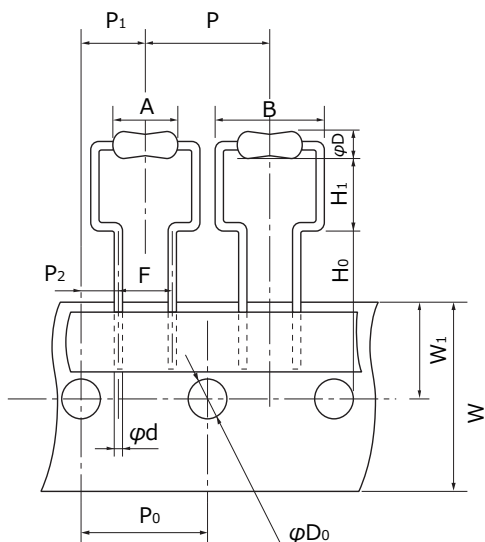
● Radial Tape Packaging Methods



Part No.	Standard Quantity (pcs/box)	Dimensions (mm)		
		a	b	c
ERQ14AJ□□□E	2,000	46	130	335
ERQ14ZJ□□□E				
ERQ12AJ□□□E				
ERQ12ZJ□□□E	2,000	46	130	335
ERQ1ABJ□□□E				
ERQ1ZJ□□□E				
	1,000	49	100	335

For Panasert Automatic Insertion Machine Radial Taped & Box

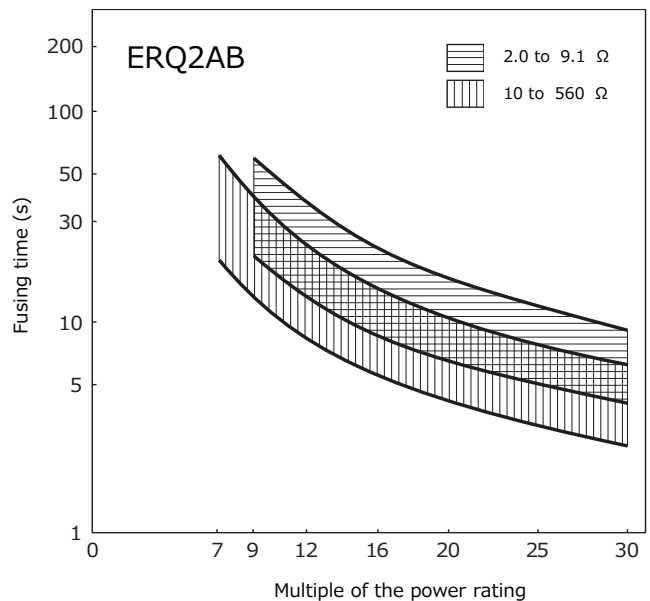
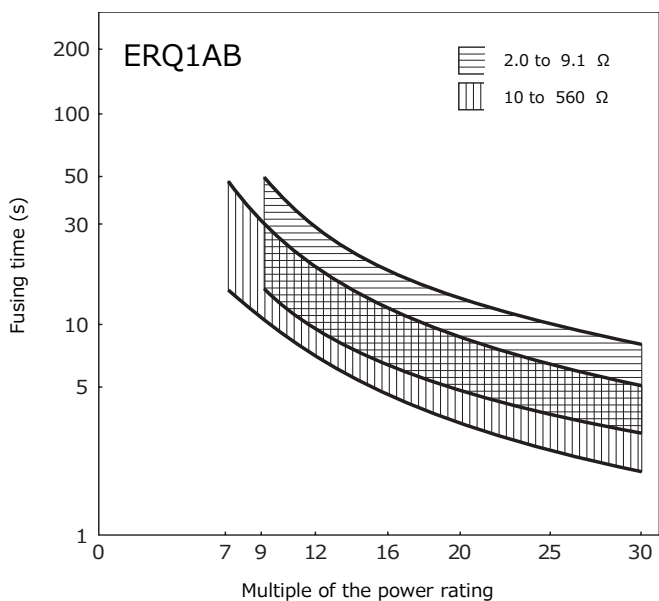
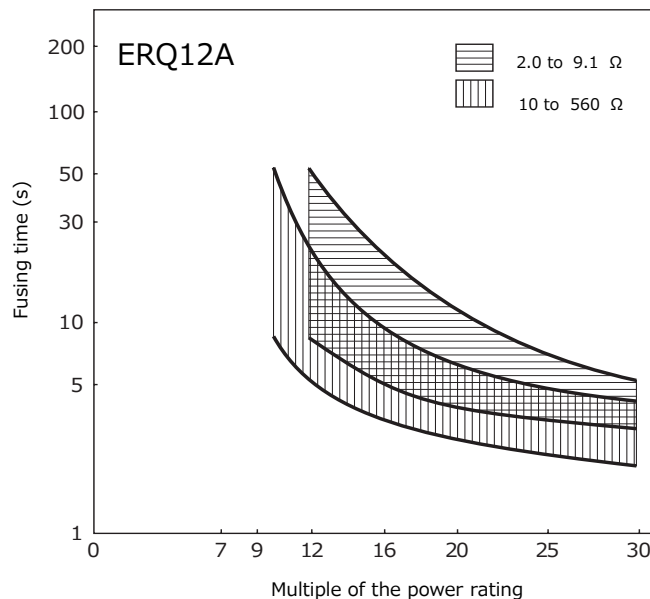
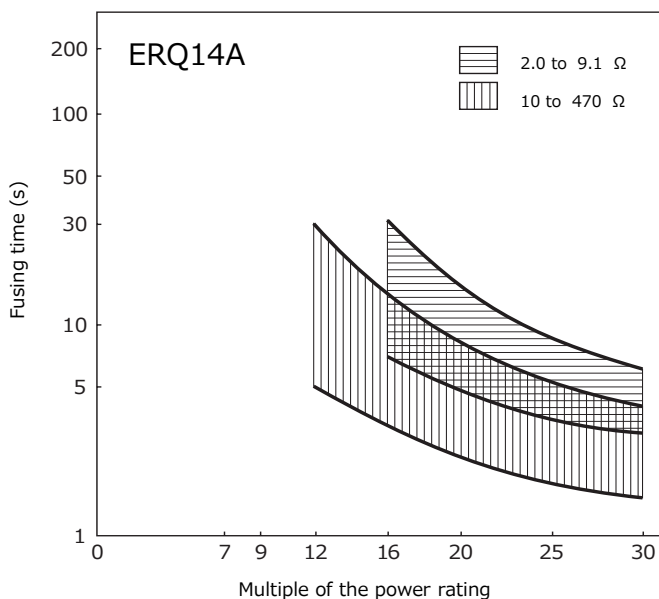
ERQ□□A/ZJW□□□E (14A/14Z, 12A/12Z, 1AB/1Z)



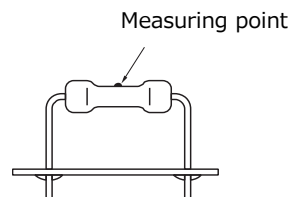
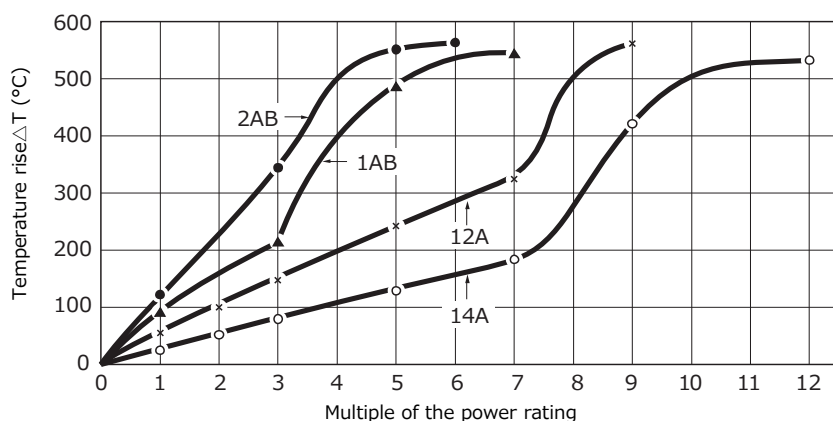
Dimensions (mm)		Dimensions (mm)			
P	14A/14Z	12.7±1.0	H ₁		
	12A/12Z, 1AB/1Z	30.0±1.0			
P ₀	14A/14Z	12.7±0.3		phi D ₀	
	12A/12Z, 1AB/1Z	15.0±0.3	4.0±0.2		
P ₁	14A/14Z	6.35±1.00	A		
	12A/12Z, 1AB/1Z	7.5±1.0			
P ₂	14A/14Z	3.85±0.70		B	
	12A/12Z, 1AB/1Z	3.75±0.50			
F	14A/14Z	5.0 ^{+0.6} _{-0.2}	14A/14Z		11.2 max.
	12A/12Z, 1AB/1Z	7.5 ^{+0.6} _{-0.2}		12A/12Z	14.0 max.
W	18.0±0.5		phi D	1AB/1Z	17.0 max.
W ₁	9.0±0.5			14A/14Z	2.3 ^{+0.5} _{-0.3}
H ₀	14A/14Z	16.0±0.5	phi d	12A/12Z	2.8±0.5
	12A/12Z	18.0±1.0		14A/14Z	4.0±1.0
	1AB/1Z	18.0±1.0		12A/12Z, 1AB/1Z	phi 0.65±0.05
				12A/12Z, 1AB/1Z	phi 0.80±0.05

Fusing Characteristics (Constant Voltage Circuit)

This data is for reference only, specifications should be verified in written form with the engineering division.



Hot Spot Temperature (for reference)



⚠ Safety Precautions

The following are precautions for individual products. Please also refer to the common precautions for Fixed Resistors in this catalog.

1. Checking the fusing conditions

- 1) Fusing characteristics differ depending on the type, shape, and resistance. Check the fusing conditions before selecting the type of Metal Film Fusing Resistors (hereafter called the fusing resistor) to be used.
- 2) Use the fusing resistors under the maximum open circuit voltage. Otherwise, arcing may occur when a voltage much higher than the rated one is applied in the event of an abnormality in the circuit, or when a high voltage is applied after fusing.
- 3) Under abnormal conditions of a constant voltage circuit, a current of about 2 or 3 times the initial abnormal current passes through, accelerating the speed at which the fusing resistors blows. When using a constant current circuit, carefully check the conditions because the fusing resistors may not blow in a constant current circuit.

2. Checking for pulse voltage, impact voltage, and transient voltage

Make sure to evaluate and check the fusing resistors mounted on your product if they are to be mounted on a circuit that generates an impact voltage, or if there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a pulse voltage with a high peak voltage may be applied.

Make sure to consult our sales staff before using the fusing resistors under special conditions.

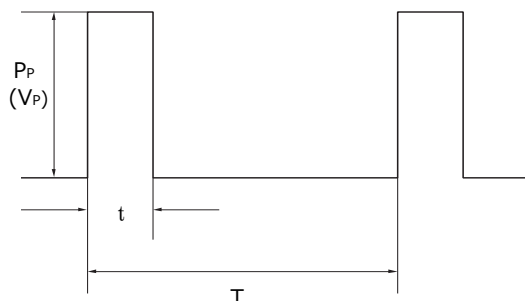
3. Conditions of use in a steady state

Make sure that the load conditions have a sufficient allowance for the power derating curve. The characteristics of the fusing resistors are set by using a constant voltage circuit.

4. The solvent resistance of the fusing resistors is not assured. If you use a solvent for cleaning after soldering or other processes, make sure to consult our sales staff before use and perform a prior test and evaluation to ensure that the solvent will not affect the reliability of the fusing resistors.

[Data for Reference]

Pulse Characteristics (Usual)



P_p	: Pulse limit power (W)
V_p	: Pulse limit voltage (V)
t	: Pulse continuous time (s)
T	: Period (s)
V_R	: Rated voltage (V)
P	: Rated power (W)
R	: Resistance value (Ω)
$V_{p\max.}$: Max. pulse limit voltage (V)

Withstand pulse limit power is calculated by the next method.

$$P_p = K \cdot P \cdot T/t$$

$$V_p = \sqrt{K \cdot P \cdot R \cdot T/t}$$

Reference to the right about a fixed number of $V_{p\max.}$

Part No.	K	$V_{p\max.}$ (V)
ERQ14A	0.6	200
ERQ12A	0.6	250
ERQ1AB	0.6	250
ERQ2AB	0.4	250

- $T > 1(s) \rightarrow T = 1(s)$
- $T/t > 100 \rightarrow T/t = 100$
- $P_p < P \rightarrow P$ stands for P_p
($V_p < V_R \rightarrow V_R$ stands for V_p)

- Added voltage $\leq V_{p\max.}$

- P_p or V_p is referent value

Conditions: Pulse added time=1000 h

Resistance change = $\pm 5\%$

Room temperature

Safety and Legal Matters to Be Observed

Product specifications and applications

- Please be advised that this product and product specifications are subject to change without notice for improvement purposes. Therefore, please request and confirm the latest delivery specifications that explain the specifications in detail before the final design, or purchase or use of the product, regardless of the application. In addition, do not use this product in any way that deviates from the contents of the company's delivery specifications.
- Unless otherwise specified in this catalog or the delivery specifications, this product is intended for use in general electronic equipment (AV products, home appliances, commercial equipment, office equipment, information and communication equipment, etc.).
When this product is used for the following special cases, please separately discuss the delivery specifications suited to each application with the company. These include applications requiring special quality and reliability, wherein their failures or malfunctions may directly threaten human life or cause harm to the human body (e.g.: space/aircraft equipment, transportation/traffic equipment, combustion equipment, medical equipment, disaster prevention/crime prevention equipment, safety equipment, etc.).

Safety design and product evaluation

- Please ensure safety through protection circuits, redundant circuits, etc., in the customer's system design so that a defect in our company's product will not endanger human life or cause other serious damage.
- This catalog shows the quality and performance of individual parts. The durability of parts varies depending on the usage environment and conditions. Therefore, please ensure to evaluate and confirm the state of each part after it has been mounted in your product in the actual operating environment before use.
If you have any doubts about the safety of this product, then please notify us immediately, and be sure to conduct a technical review including the above protection circuits and redundant circuits at your company.

Laws / Regulations / Intellectual property

- The transportation of dangerous goods as designated by UN numbers, UN classifications, etc., does not apply to this product. In addition, when exporting products, product specifications, and technical information described in this catalog, please comply with the laws and regulations of the countries to which the products are exported, especially those concerning security export control.
- Each model of this product complies with the RoHS Directive (Restriction of the use of hazardous substances in electrical and electronic equipment) (2011/65/EU and (EU) 2015/863). The date of compliance with the RoHS Directive and REACH Regulation varies depending on the product model.
Further, if you are using product models in stock and are not sure whether or not they comply with the RoHS Directive or REACH Regulation, please contact us by selecting "Sales Inquiry" from the inquiry form.
- During the manufacturing process of this product and any of its components and materials to be used, Panasonic does not intentionally use ozone-depleting substances stipulated in the Montreal Protocol and specific bromine-based flame retardants such as PBBs (Poly-Brominated Biphenyls) / PBDEs (Poly-Brominated Diphenyl Ethers). In addition, the materials used in this product are all listed as existing chemical substances based on the Act on the Regulation of Manufacture and Evaluation of Chemical Substances.
- With regard to the disposal of this product, please confirm the disposal method in each country and region where it is incorporated into your company's product and used.
- The technical information contained in this catalog is intended to show only typical operation and application circuit examples of this product. This catalog does not guarantee that such information does not infringe upon the intellectual property rights of Panasonic or any third party, nor imply that the license of such rights has been granted.

Panasonic Industry will assume no liability whatsoever if the use of our company's products deviates from the contents of this catalog or does not comply with the precautions. Please be advised of these restrictions.

Matters to Be Observed When Using This Product (Rectangular chip fuse)

Use environments and cleaning conditions

- This product (fixed resistor) is not designed for use in specific environments. Using the resistor in the following specific environments or service conditions may affect the performance/reliability of the resistor. Avoid using it in such specific environments. If you intend to use the resistor in such environments, checking the performance, reliability, etc., of the product sufficiently is your own responsibility.
 - (1) Used in liquid, such as water, oil, chemicals, and organic solvents.
 - (2) Used in a place exposed to direct sunlight, an outdoor place with no shielding, or a dusty place.
 - (3) Used in a place where the product is heavily exposed to sea breeze or a corrosive gas, such as Cl₂, H₂S, NH₃, SO₂, or NO_x.
 - (4) Used in an environment where static electricity and electromagnetic waves are strong.
 - (5) Located close to a heating component or a flammable material, such as a vinyl cable placed near the product.
 - (6) Sealed or coated with a resin.
 - (7) Solder flux of the resistor soldered with no-clean type solder, etc., is cleansed with a solvent, water, or a water-soluble cleaner, etc. (Water-soluble flux residues have a particularly large influence on a resistor.)
 - (8) Used in a place where dew concentrates on the product.
 - (9) Used in a contaminated state.
(Example: Touching the resistor mounted on a printed board leaving sebum on the resistor (improper handling))
- Sealing the resistor with a resin in a resin potting process, damp-proofing process, etc., applies excessive stress to the resistor, which may cause the internal electrodes a connection problem. In such cases, the proper operation of the resistor is not guaranteed. If you intend to use the resistor in such environments, checking the performance, reliability, etc., of the product sufficiently is your own responsibility.
- Do not leave the resistor immersed in a solvent for a long time. When using the resistor immersed in a solvent, confirm the operation of the product mounted on the board.
- When a cleaning solution or cleaning condition for cleaning the printed board or a drying condition for drying the printed board after soldering the resistor is improper, it may have a negative effect on the performance/reliability of the resistor. Confirming these conditions sufficiently is your own responsibility. Also examine the effects of soiled cleaning agent, cleaning residues, and post-cleaning contaminations, and control for these effects properly.

Response to anomalies and handling conditions

- When the resistor is heating abnormally or emitting a smell, stop using the resistor immediately, for example, turn off the main power supply of the device.
Also, keep your face and hands away from the product as it may become hot and cause burns.
- The resistor is so thin that it may break easily when subjected to impact. Before putting the resistor in use, confirm that the resistor has not been broken by impact that applied thereto when mounted on the printed board. Applying impact to the resistor or pinching the resistor with a hard tool (pliers, tweezers, etc.) may chip the resistor or its protective film, which affects its performance. Be careful to avoid such cases.
- Do not reuse a resistor having been used on a printed board and removed therefrom. Do not touch the resistor with your bare hands.
- Be careful not to drop the resistor on the floor, etc. The resistor is likely to suffer mechanical or electrical damage when dropped on the floor. Avoid using said resistor.
- The resistor may have its resistance value changed due to electrostatic discharge (ESD). Take ESD prevention measures when handling the resistor. ESD prevention measures include an environment where static electricity is not likely to be generated (recommended RH: 40% to 60%), by wearing an earth band, conductive gloves, etc., grounding the device in which the resistor is incorporated, and placing a conductive mat, etc., on a work platform.
- Select a rated current for the chip fuse so that a current flowing through the chip fuse, in a normal condition, is 70% or less of the rated current. Do not let a current larger than the rated current flow continuously through the chip fuse.

- Be careful when a pulse current larger than the rated current, such as an inrush current or surge current at the moment of turning on the power supply, briefly flows through the chip fuse. It may cause the chip fuse to fuse off, which is undesirable. Calculate the I^2t value of the pulse current, and from the I^2t -t characteristics curve, determine the tolerance of the chip fuse to the number of pulses applied. Based on these I^2t value and tolerance, make a decision on whether or not to use the chip fuse. Determining the tolerance involves technicalities. Consult our sales staff in advance.
- The product fuses off when carrying a current two times or more of the rated current. Select a product so that the abnormal current generated in the event of a circuit failure of your product is at least twice the rated current of the product. Make sure that the abnormal current does not exceed the maximum cutoff current of the product.
- The chip fuse is intended for use on the secondary side of the power supply. Do not use the fuse on the primary side of the power supply. Keep source voltage applied to the chip fuse equal to or lower than the rated voltage of the chip fuse.
- The load characteristics and fuse characteristics of the chip fuse are affected by the ambient temperature. Before actually using the chip fuse, evaluate and confirm the operation of the chip fuse incorporated in your product while sufficiently taking into consideration the category temperature range.

Circuit design and circuit board design

- To prevent a case where a transient load (e.g., a pulse for a short period) too large for the product to handle is applied, make sure to evaluate and confirm the operation of the product incorporated in your product. Applying power or voltage (current) larger than the rated power or rated voltage (current) to the resistor may impair its performance and reliability. Make sure to use the resistor with power or voltage (current) equal to or lower than the rated power or rated voltage (current). The product warranty does not cover usage where an excessively large load, such as a pulse current, is applied to the product.
- The resistor may have a high temperature even when used with power equal to or lower than the rated power. Be careful in such cases. Another factor to be considered are effects on the board, peripheral components, etc., and the effects of peripheral components on the resistor. Make sure to confirm first that the temperature of the resistor incorporated in your product is equal to or lower than the specified temperature, and then use the resistor.
- Continuously using the chip fuse in a fused state is not allowed.
When the chip fuse fuses off, immediately turn off the power supply to cut off the current flow.
- When a resistor is used in a high-frequency circuit, the resistor may fail to offer the required characteristics. Check whether the resistor offers the required characteristics in the actual circuit in which the resistors are incorporated.
- Be careful that unusual stress caused by an excessive bend of the printed board is not applied to the resistor. Design the circuit structure such that the resistor is not close to a perforated line for board splitting or on a line with sizable holes bored on the board.
- When a different component is mounted on the board where the resistor has been soldered, be careful that the board does not bend excessively. If necessary, provide the board with backup pins (support pins) to keep it straight.
- Avoid manual board splitting. Use a jig, etc., to break the board so that it does not bend excessively when split apart.

Mounting conditions

- When the product is used under mounting conditions departing from mounting conditions specified in our specification sheet, the product may be exposed to unexpected stress to fail. Be careful to avoid such a case. When mounting the resistor on a printed board, set the resistor's front and back surfaces in the direction indicated by the tape. Make sure to evaluate and confirm the operation of the resistor incorporated in your product and determine whether the resistor is usable as a component of the product.
- Set soldering conditions for the resistor within the recommended soldering conditions specified by our company. Any time, soldering condition departing from the specified soldering condition, such as a high peak temperature or a long heating may impair the performance/reliability of the resistor. Note that the specified soldering conditions indicate conditions under which degradation of the resistor characteristics does not occur but do not indicate conditions under which stable soldering can be performed. Check and set individual conditions under which stable soldering can be performed.
- Heat the resistor in advance so that a difference between the soldering temperature and the temperature of the resistor surface is reduced to 100 °C or lower. When dipping the soldered resistor in a solvent, etc., to cool the resistor rapidly, ensure that the temperature difference between the resistor and the solvent is 100 °C or lower during the dipping.

- When soldering the resistor using a soldering iron, apply hot air, etc., to the resistor to heat it sufficiently in advance and then solder the resistor without bringing the soldering iron tip into contact with the product. If the temperature of the soldering iron tip is high, finish the soldering work quickly (within 3 seconds when the temperature of the soldering iron tip is 350 °C or lower). In the case of a fixed resistor with low resistance, the resistor may fail to offer the exactly intended resistance value because of the variation in the solder volume, etc. Make sure to confirm the resistance value of the resistor in the actual circuit configuration.
- Soldering the resistor with too much solder or too little solder results in the poor reliability of the solder connection of the resistor. Use the proper volume of solder in the soldering process. Sufficiently check for the volume of solder used.
- Soldering with high bond strength or special property solder may affect the quality of the resistor. Do not use such solder.
- Use rosin-based solder flux. When using highly active solder flux made mainly of halogen (chlorine, bromine, etc.), flux residues may affect the performance and reliability of the resistor. Check the effects of flux residues before using the solder flux. Do not use highly acidic flux, water-soluble flux, or flux containing fluoride ions. When solder flux sticks to the resistor after the soldering process, the activation energy of the flux may corrode the resistor and cause it to fail. Prevent solder flux from sticking to the resistor.

Storage conditions

Keeping the product in the following environments or conditions may lead to degradation of its performance, solderability, etc. Do not keep the product in the following environments.

- (1) Stored in a place where the product is heavily exposed to sea breeze or a corrosive gas, such as Cl₂, H₂S, NH₃, SO₂, or NO_x.
- (2) Stored in a place where the product is exposed to direct sunlight.
- (3) Stored in a place where a temperature condition of 5 °C to 35 °C and a relative humidity condition of 45% to 85% cannot be maintained.
- (4) Kept in storage for more than one year from the delivery date.