

## Metal Film Fusing Resistors

Type: **ERQA**

**ERQZ**

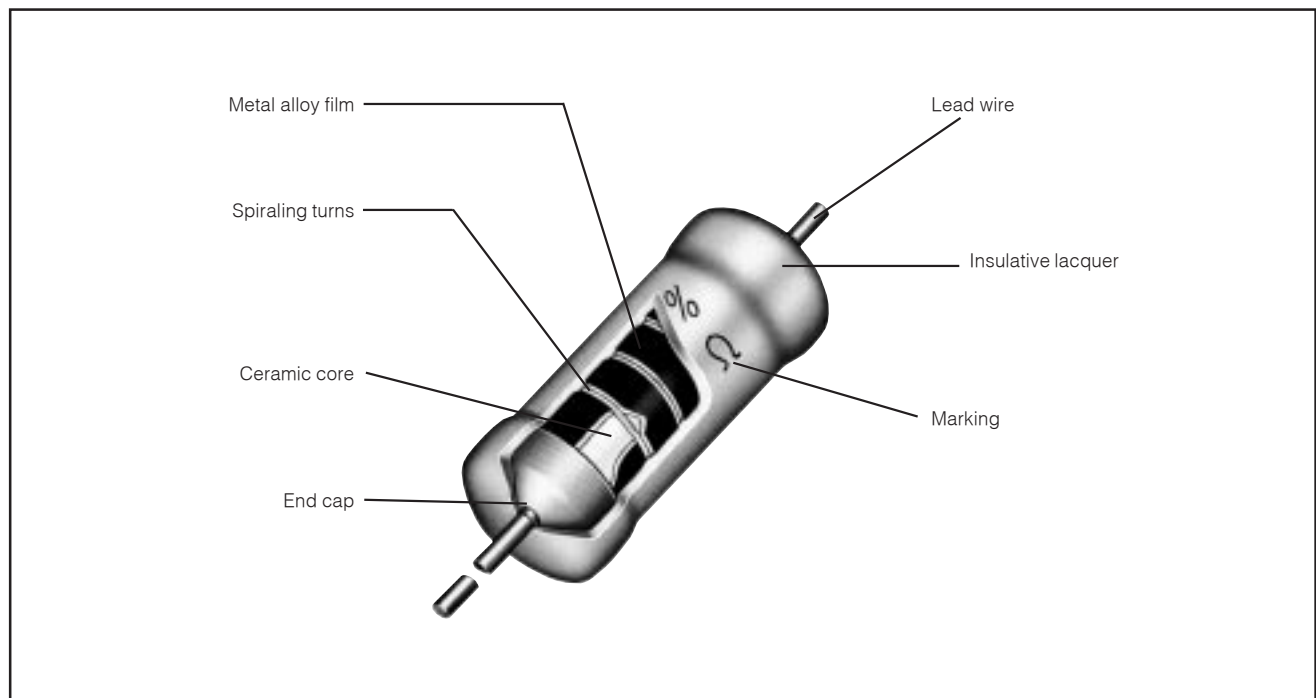
(0.25 W, 0.5 W, 1 W, 2 W coating type)



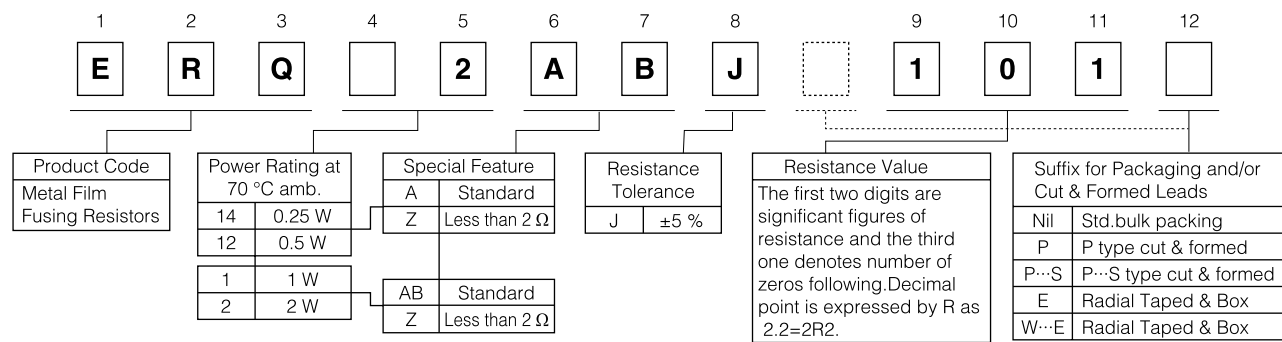
### ■ Features

- **Accurate fusibility**  
The accurate fusibility is applicable to safety circuits in a wide range of electronic sets
- **Small in Size, light in weight**  
Small in size and light in weight can easily realize to save a PWB space of sets
- **Uniform Quality**  
An exclusive automated process developed, built and used only by Matsushita and severe quality control system results in uniform quality and consistent performance in reliability
- **Flame retardant**  
The exclusively formulated silicon insulative material ensure highly evaluated flame-retardant performance
- **Reference Standard**  
EIAJ RC-2125

### ■ Construction and Materials



■ 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.

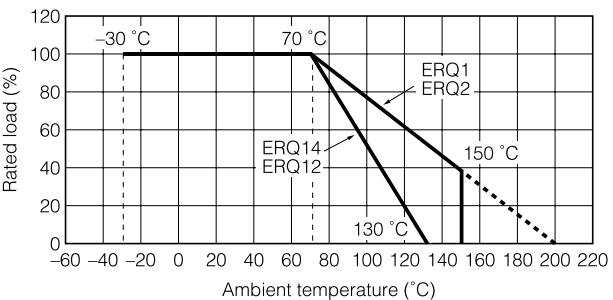
■ Ratings

| Type   | Power Rating at 70 °C (W) | Maximum Open Circuit Voltage <sup>(1)</sup> (V) | Maximum Overload Voltage                | Dielectric With-standing Voltage (V) | Resistance Tolerance (%) | Resistance Range (Ω) |      | T.C.R. [x10 <sup>-6</sup> /°C (ppm/°C)] | Standard Resistance Values | Marking Method on Body | Mass (Weight) [g/pc.] |
|--------|---------------------------|---|---|--------------------------------------|--------------------------|----------------------|------|---|----------------------------|------------------------|-----------------------|
|        |                           |   |   |                                      |                          | min.                 | max. |   |                            |                        |                       |
| ERQ14Z | 0.25                      | 200   | 3 times of rated voltage <sup>(2)</sup> | AC 350                               | J (±5)                   | 1.0                  | 1.8  | ±350                                    | E24                        | Color code             | 0.24 (0.53 lbs.)      |
| ERQ14A |                           |   |   |                                      |                          | 2.0                  | 470  |   |                            |                        |                       |
| ERQ12Z | 0.5                       | 250   |   | AC 350                               | J (±5)                   | 1.0                  | 1.8  | ±350                                    | E24                        | Color code             | 0.32 (0.71 lbs.)      |
| ERQ12A |                           |   |   |                                      |                          | 2.0                  | 560  |   |                            |                        |                       |
| ERQ1Z  | 1                         | 250   |   | AC 600                               | J (±5)                   | 1.0                  | 1.8  | ±350                                    | E24                        | Stamp                  | 0.64 (1.41 lbs.)      |
| ERQ1AB |                           |   |   |                                      |                          | 2.0                  | 560  |   |                            |                        |                       |
| ERQ2Z  | 2                         | 250   |   | AC 1000                              | J (±5)                   | 1.0                  | 1.8  | ±350                                    | E24                        | Stamp                  | 1.52 (3.35 lbs.)      |
| ERQ2AB |                           |   |   |                                      |                          | 2.0                  | 560  |   |                            |                        |                       |

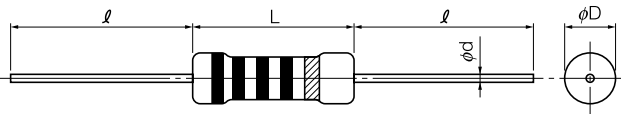
- (1) Maximum Open Circuit Voltage: Referring to the maximum value of the voltage applied between terminals of the resistor when the resistor is opened in an electric circuit 1000 times power rating or voltage specified above whichever less is regarded as the maximum open circuit voltage.
- (2) Rated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



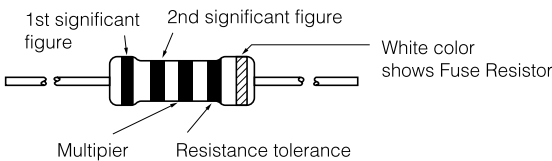
■ Dimensions in mm (not to scale)



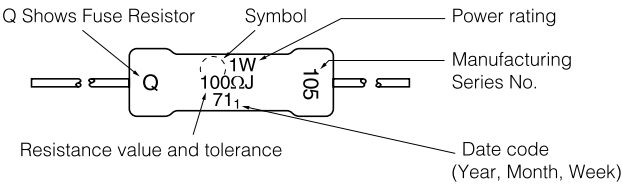
| Type  | Dimensions (mm)                      |         |          |           |
|-------|--------------------------------------|---------|----------|-----------|
|       | L                                    | φD      | ℓ        | φd        |
| ERQ14 | 6.3 <sup>+1.5</sup> <sub>-1.0</sub>  | 2.3±0.5 | 30.0±3.0 | 0.65±0.05 |
| ERQ12 | 9.0 <sup>+1.5</sup> <sub>-1.0</sub>  | 2.8±0.5 | 30.0±3.0 | 0.65±0.05 |
| ERQ1  | 12.0 <sup>+1.5</sup> <sub>-1.0</sub> | 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 14, 12

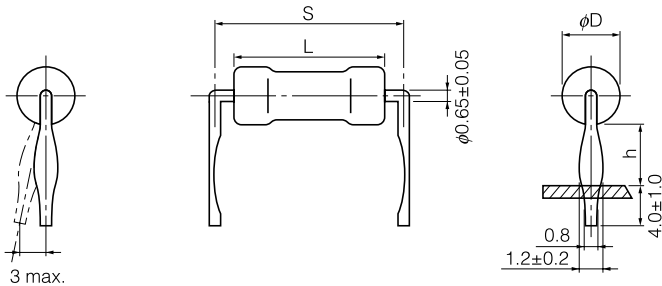


Type 1, 2



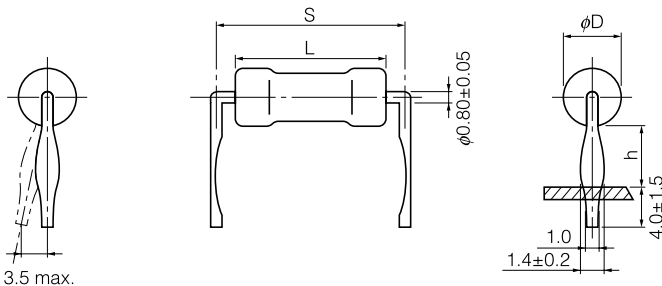
■ Cut & Formed Type

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                      | 2000                         | 6.3 <sup>+1.5</sup> <sub>-1.0</sub> | 2.3±0.5 | 10.0±1.5 | 4.0±1.5 |
| ERQ12□J□□□P | 0.5                       | 2000                         | 9.0 <sup>+1.5</sup> <sub>-1.0</sub> | 2.8±0.5 | 12.5±1.5 | 4.0±1.5 |

ERQ□ABJP□□□S  
ERQ□ZJP□□□S

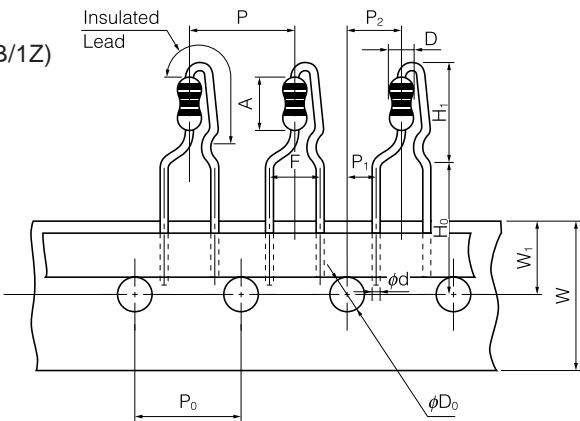


| Part No.     | Power Rating at 70 °C (W) | Standard Q'ty/Packing (pcs.) | Dimensions (mm)                      |         |          |         |
|--------------|---------------------------|------------------------------|--------------------------------------|---------|----------|---------|
|              |                           |                              | L                                    | φD      | S        | h       |
| ERQ1□□JP□□□S | 1                         | 1000                         | 12.0 <sup>+1.5</sup> <sub>-1.0</sub> | 4.0±1.0 | 15.0±1.5 | 6.0±1.5 |
| ERQ2□□JP□□□S | 2                         | 1000                         | 15.0±1.5                             | 5.5±1.0 | 20.0±2.0 | 6.5±1.5 |

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

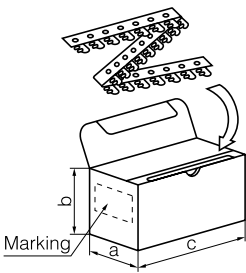
■ For Panasert Automatic Insertion Machine Radial Tape & Box

Type 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 <sub>1</sub>  | 14A/14Z  | 12 max.         | A  | 14A/14Z   | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> | D | 14A/14Z | 2.3±0.5 |
| P <sub>0</sub>  | 12.7±0.3  | W <sub>1</sub>  | 9.0±0.5  |                 | 12A/12Z  | 15.5 max.       |    | 12A/12Z   | 9.0 <sup>+1.5</sup> <sub>-1.0</sub>    |   | 12A/12Z | 2.8±0.5 |
| P <sub>1</sub>  | 3.85±0.70 |                 |          |                 | 1AB/1Z   | 19 max.         |    | 1AB/1Z    | 12.0 <sup>+1.5</sup> <sub>-1.0</sub>   |   | 1AB/1Z  | 4.0±1.0 |
| P <sub>2</sub>  | 6.35±1.00 |                 |          | H <sub>0</sub>  | 16.0±0.5 |                 | φd | 0.65±0.05 |  |   |         |         |
| F               | 5.0±0.8   |                 |          | φD <sub>0</sub> | 4.0±0.2  |                 |    |           |  |   |         |         |

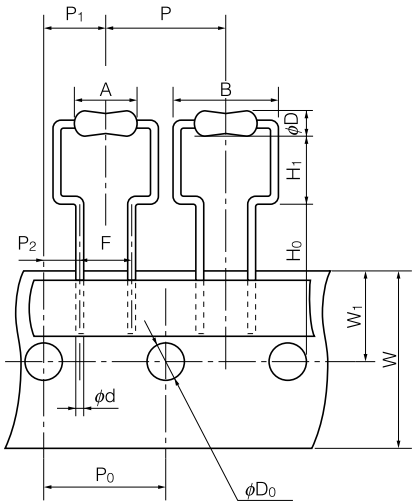
● Radial Tape Package Specifications



| Part Number                | Dimensions (mm) |     |     | Standard Quantity<br>(pcs./box) |
|----------------------------|-----------------|-----|-----|---------------------------------|
|                            | a               | b   | c   |                                 |
| ERQ14AJ□□□E<br>ERQ14ZJ□□□E | 46              | 130 | 335 | 2000                            |
| ERQ12AJ□□□E<br>ERQ12ZJ□□□E | 46              | 130 | 335 | 2000                            |
| ERQ1ABJ□□□E<br>ERQ1ZJ□□□E  | 49              | 100 | 335 | 1000                            |

■ For Panasert Automatic Insertion Machine Radial Taped & Box

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



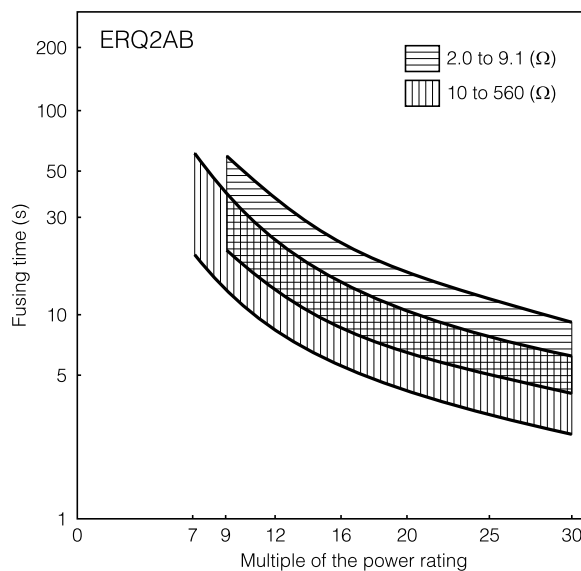
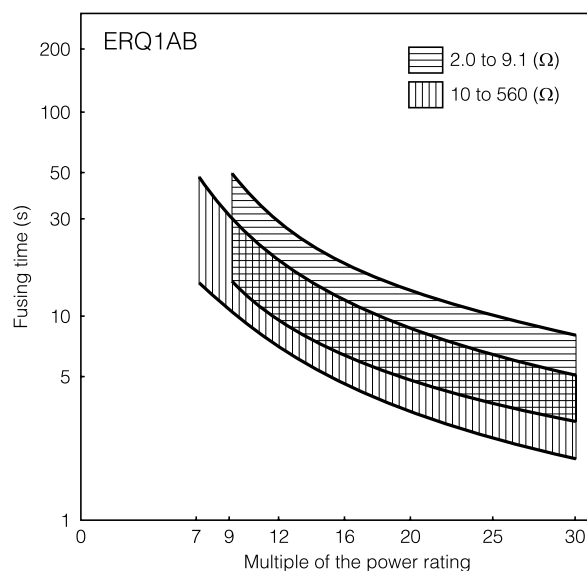
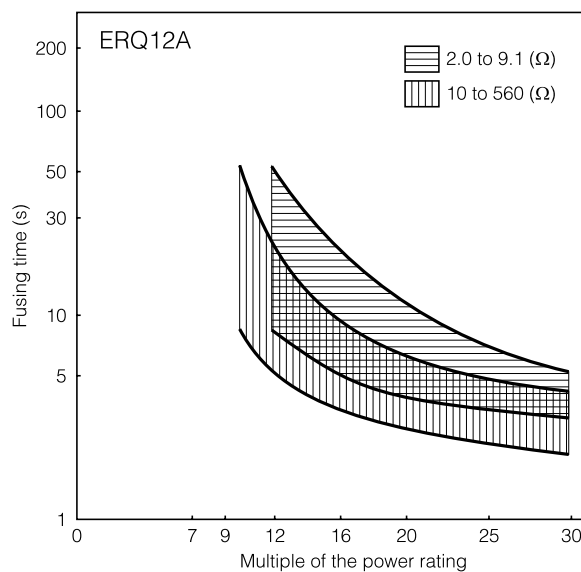
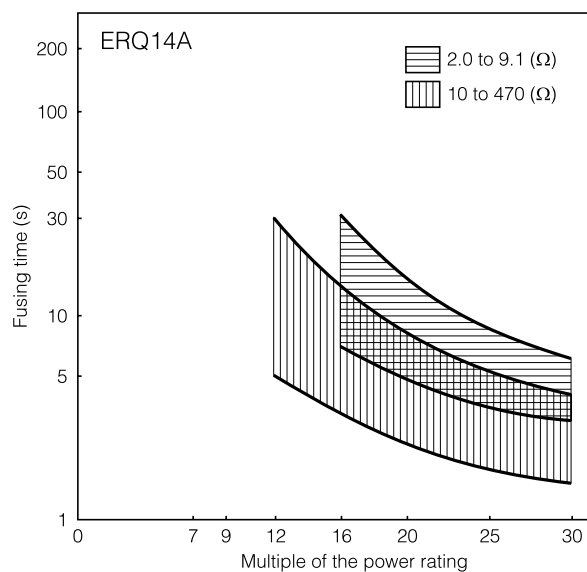
| Dimensions (mm) |                 |                                     | Dimensions (mm) |                 |  |
|-----------------|-----------------|-------------------------------------|-----------------|-----------------|--|
| P               | 14A/14Z         | 12.7±1.0                            | H <sub>1</sub>  | 14A/14Z         | 6.5 <sup>+0.6</sup> <sub>-0.3</sub>    |
|                 | 12A/12Z, 1AB/1Z | 30.0±1.0                            |                 | 12A/12Z         | 6.5 <sup>+1.0</sup> <sub>-0.0</sub>    |
| P <sub>0</sub>  | 14A/14Z         | 12.7±0.3                            |                 | 1AB/1Z          | 6.5 <sup>+1.0</sup> <sub>-0.0</sub>    |
|                 | 12A/12Z, 1AB/1Z | 15.0±0.3                            | φD <sub>0</sub> | 4.0±0.2         |  |
| P <sub>1</sub>  | 14A/14Z         | 6.35±1.00                           | A               | 14A/14Z         | 6.35 <sup>+0.65</sup> <sub>-0.35</sub> |
|                 | 12A/12Z, 1AB/1Z | 7.5±1.0                             |                 | 12A/12Z         | 9.0 <sup>+1.5</sup> <sub>-1.0</sub>    |
| P <sub>2</sub>  | 14A/14Z         | 3.85±0.70                           |                 | 1AB/1Z          | 12.0 <sup>+1.5</sup> <sub>-1.0</sub>   |
|                 | 12A/12Z, 1AB/1Z | 3.75±0.50                           | B               | 14A/14Z         | 11.2 max.                              |
| F               | 14A/14Z         | 5.0 <sup>+0.6</sup> <sub>-0.2</sub> |                 | 12A/12Z         | 14 max.                                |
|                 | 12A/12Z, 1AB/1Z | 7.5 <sup>+0.6</sup> <sub>-0.2</sub> |                 | 1AB/1Z          | 17 max.                                |
| W               | 18.0±0.5        |                                     | φD              | 14A/14Z         | 2.3 <sup>+0.5</sup> <sub>-0.3</sub>    |
| W <sub>1</sub>  | 9.0±0.5         |                                     |                 | 12A/12Z         | 2.8±0.5                                |
| H <sub>0</sub>  | 14A/14Z         | 16.0±0.5                            |                 | 1AB/1Z          | 4.0±1.0                                |
|                 | 12A/12Z         | 18.0±1.0                            | φd              | 14A/14Z         | 0.65±0.05                              |
|                 | 1AB/1Z          | 18.0±1.0                            |                 | 12A/12Z, 1AB/1Z | 0.80±0.05                              |

■ Performance Specifications

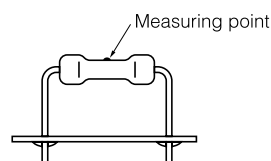
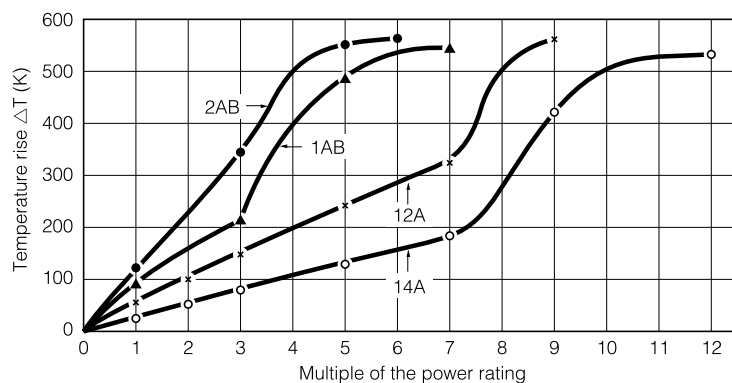
| Characteristics        | Specifications                |                |  | Test Methods   |
|------------------------|-------------------------------|----------------|--|--|
| Fusing Characteristics | Rated Power                   | Res. Value (Ω) | Limit  | The test potential shall be preadjusted 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 stabilized 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. |
|                        | 0.25 W<br>0.5 W               | 1 to 1.8       | Open within 30 seconds at 30 times the rated power |  |
|                        | 1 W<br>2 W                    |                | Open within 30 seconds at 25 times the rated power |  |
|                        | 0.25 W<br>0.5 W<br>1 W<br>2 W | 2 to 9.1       | Open within 30 seconds at 16 times the rated power |  |
|                        | 0.25 W                        | 10 to 470      | Open within 30 seconds at 12 times the rated power |  |
|                        | 0.5 W<br>1 W<br>2 W           | 10 to 560      |  |  |
|                        |                               |                |  |  |

### ■ Fusing Characteristics (Constant Voltage Circuit)

These data are for reference, only specifications are subject to written form of engineering.



### ■ Hot Spot Temperature (for reference)



## ⚠ Cautions for Safety

The following are precautions for individual products. Please also refer to the precautions common to Fixed Resistors shown on page ER3 of 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.

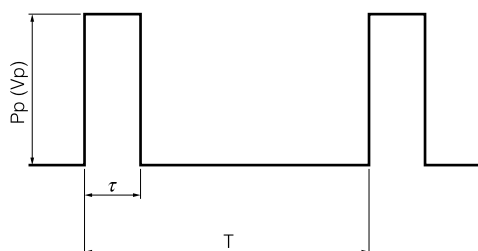
### 3. Conditions of use in a steady state

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)
- $\tau$  : Pulse continuous time (s)
- $T$  : Period (s)
- $V_R$  : Rated voltage (V)
- $P$  : Rated power (W)
- $R$  : Resistance value ( $\Omega$ )
- $V_{P\max.}$  : Max. pulse limit voltage (V)

Withstand pulse limit power is calculated by the next method.

$$P_P = K \cdot P \cdot T/\tau$$

$$V_P = \sqrt{K \cdot P \cdot R \cdot T/\tau}$$

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

| Type   | K   | $V_{P\max.}$ (V) |
|--------|-----|------------------|
| ERQ14A | 0.6 | 200              |
| ERQ12A | 0.6 | 250              |
| ERQ1AB | 0.6 | 250              |
| ERQ2AB | 0.4 | 250              |

●  $T > 1(s) \rightarrow T = 1(s)$

●  $T/\tau > 100 \rightarrow T/\tau = 100$

●  $P_P < P \rightarrow P$  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 reference value

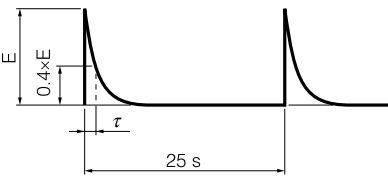
Conditions : Pulse added time=1000 h, Resistance change=±5 %, Room temperature

■ Pulse Characteristics (Inrush)

(Test Methods)

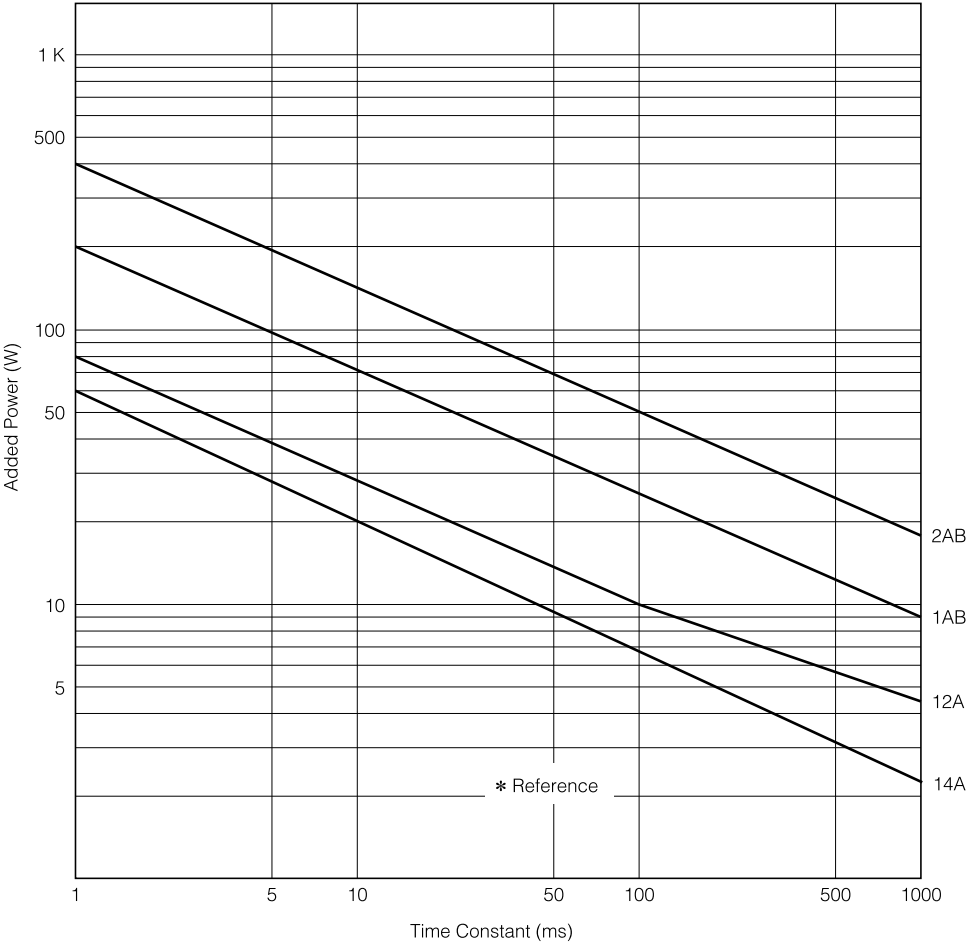
Resistance change $\leq\pm 5\%$  with pulse 10000 cycles as like the figure.

- 1) Added power and added voltage are within the lower territory of this graph
- 2) Added in normal temperature and humidity



$P=E^2/R$   
 $E$  : Voltage (V)  
 $R$  : Resistance ( $\Omega$ )

| Max. Added Pulse Voltage |       |
|--------------------------|-------|
| 14A                      | 200 V |
| 12A                      | 250 V |
| 1AB                      | 250 V |
| 2AB                      | 300 V |





## Caution for Safety (Common precautions for Fixed Resistors)

- When using our products, no matter what sort of equipment they might be used for, be sure to make a written agreement on the specifications with us in advance. The design and specifications in this catalog are subject to change without prior notice.
- Do not use the products beyond the specifications described in this catalog.
- This catalog explains the quality and performance of the products as individual components. Before use, check and evaluate their operations when installed in your products.
- Install the following systems for a failsafe design to ensure safety if these products are to be used in equipment where a defect in these products may cause the loss of human life or other significant damage, such as damage to vehicles (automobile, train, vessel), traffic lights, medical equipment, aerospace equipment, electric heating appliances, combustion/gas equipment, rotating equipment, and disaster/crime prevention equipment.
  - \* Systems equipped with a protection circuit and a protection device
  - \* Systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault

### (1) Precautions for use

- These products are designed and manufactured for general purpose and standard use in general electronic equipment (e.g. AV equipment, home electric appliances, office equipment, information and communication equipment)
- These products are not intended for use in the following special conditions. Before using the products, carefully check the effects on their quality and performance, and determine whether or not they can be used.
  1. In liquid, such as water, oil, chemicals, or organic solvent
  2. In direct sunlight, outdoors, or in dust
  3. In salty air or air with a high concentration of corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>2</sub>
  4. In an environment where strong static electricity or electromagnetic waves exist
  5. In an environment where these products cause dew condensation
  6. Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin or other materials
- These products generate Joule heat when energized. Carefully position these products so that their heat will not affect the other components.
- Carefully position these products so that their temperatures will not exceed the category temperature range due to the effects of neighboring heat-generating components. Do not mount or place heat-generating components or inflammables, such as vinyl-coated wires, near these products.
- Note that non-cleaning solder, halogen-based highly active flux, or water-soluble flux may deteriorate the performance or reliability of the products.
- Carefully select a flux cleaning agent for use after soldering. An unsuitable agent may deteriorate the performance or reliability. In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues. Otherwise, the insulation performance may be deteriorated.

### (2) Precautions for storage

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 5 °C to 35 °C and a relative humidity of 45 % to 85 %.

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>2</sub>
2. In direct sunlight

### <Package markings>

Package markings include the product number, quantity, and country of origin.  
In principle, the country of origin should be indicated in English.