



## Fixed Resistors (Surface Mount Resistors) CONTENTS

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**All products in this catalog comply with the RoHS Directive.**

The RoHS Directive is “the Directive (2011/65/EU) on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment “ and its revisions.

## ⚠ Safety Precautions (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 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  $\text{Cl}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$ ,  $\text{SO}_2$ , or  $\text{NO}_2$
  4. Electric Static Discharge (ESD) Environment  
These components are sensitive to static electricity and can be damaged under static shock (ESD). Please take measures to avoid any of these environments.  
Smaller components are more sensitive to ESD environment.
  5. Electromagnetic Environment  
Avoid any environment where strong electromagnetic waves exist.
  6. In an environment where these products cause dew condensation
  7. 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  $\text{Cl}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$ ,  $\text{SO}_2$ , or  $\text{NO}_2$
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.

## ⚠ Safety Precautions (Common precautions for Surface Mount Resistors)

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

1. Take measures against mechanical stress during and after mounting of Surface Mount Resistors (hereafter called the resistors) so as not to damage their electrodes and protective coatings.  
Be careful not to misplace the resistors on the land patterns. Otherwise, solder bridging may occur.
2. Keep the rated power and ambient temperature within the specified derating curve.  
Some circuit boards, wiring patterns, temperatures of heat generated by adjacent components, or ambient temperatures can become factors in the rise of the temperature of the resistors, regardless of the level of power applied. Therefore, check the conditions before use and optimize them so as not to damage the boards and peripheral components.  
Make sure to contact us before using the resistors under special conditions.
3. If a transient load (heavy load in a short time) like a pulse is expected to be applied, check and evaluate the operations of the resistors when installed in your products before use.  
Never exceed the rated power. Otherwise, the performance and/or reliability of the resistors may be impaired.
4. Before using halogen-based or other high-activity flux, check the possible effects of the flux residues on the performance and reliability of the resistors.
5. When soldering with a soldering iron, never touch the resistors' bodies with the tip of the soldering iron. When using a soldering iron with a high temperature tip, finish soldering as quickly as possible (within three seconds at 350 °C max.).
6. As the amount of applied solder becomes larger, the mechanical stress applied to the resistors increases, causing problems such as cracks and faulty characteristics. Avoid applying an excessive amounts of solder.
7. When the resistors' protective coatings are chipped, flawed, or removed, the characteristics of the resistors may be impaired. Take special care not to apply mechanical shock during automatic mounting or cause damage during handling of the boards with the resistors mounted.
8. Do not apply shock to the resistors or pinch them with a hard tool (e.g. pliers and tweezers). Otherwise, the resistors' protective coatings and bodies may be chipped, affecting their performance.
9. Avoid excessive bending of printed circuit boards in order to protect the resistors from abnormal stress.
10. Do not immerse the resistors in solvent for a long time. Before using solvent, carefully check the effects of immersion.
11. Transient voltage  
If there is a possibility that the transient phenomenon (significantly high voltage applied in a short time) may occur or that a high voltage pulse may be applied, make sure to evaluate and check the characteristics of Fixed Metal (Oxide) Film Resistors mounted on your product rather than only depending on the calculated power limit or steady-state conditions to complete the design or decide to use the resistors.
12. Do not apply excessive tension to the terminals.

## Thick Film Chip Resistors

Type: **ERJ XG, 1G, 2G, 3G, 6G, 8G, 14, 12, 12Z, 1T**



### Features

- Small size and lightweight
- High reliability  
Metal glaze thick film resistive element and three layers of electrodes
- Compatible with placement machines  
Taping packaging available
- Suitable for both reflow and flow soldering
- Reference Standards  
IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 qualified (Exemption ERJXG)
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

- ERJXGN, 1GN, 2GE, 3GE, 6GE, 8GE, 14, 12, 12Z, 1T Series,  $\pm 5\%$

|  |   |   |   |   |   |   |   |   |   |    |    |    |
|--|---|---|---|---|---|---|---|---|---|----|----|----|
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|  | E | R | J | 3 | G | E | Y | J | 1 | 0  | 2  | V  |

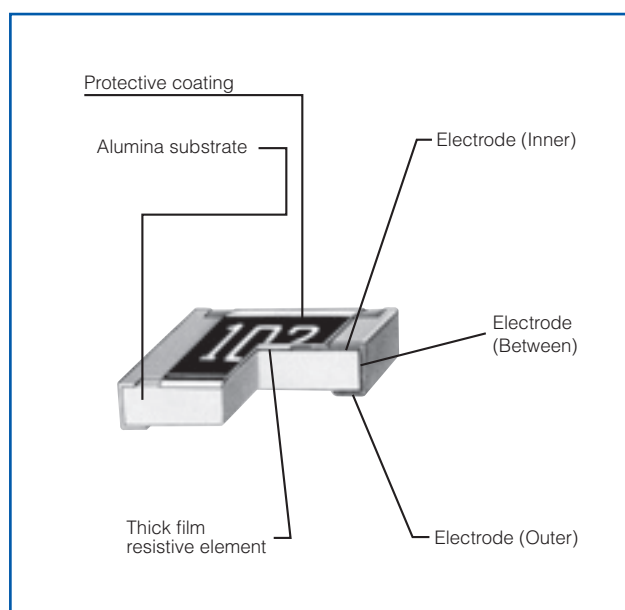
|                           |                    |       |          |         |                                                |                          |                                                |                            |                                          |          |  |  |                                           |
|---------------------------|--------------------|-------|----------|---------|------------------------------------------------|--------------------------|------------------------------------------------|----------------------------|------------------------------------------|----------|--|--|-------------------------------------------|
| Product Code              | Size, Power Rating |       |          | Marking |                                                | Resistance Tolerance     |                                                | Packaging Methods          |                                          |          |  |  |                                           |
| Thick Film Chip Resistors | Code               | Inch  | Power R. | Code    | Marking                                        | Code                     | Tolerance                                      | Code                       | Packaging                                | Part No. |  |  |                                           |
|                           | XGN                | 01005 | 0.031 W  | Y       | Value Marking on black side                    | J                        | ±5 %                                           | Y                          | Pressed Carrier Taping W8P2, 20,000 pcs. | ERJXGN   |  |  |                                           |
|                           | 1GN                | 0201  | 0.05 W   |         |                                                | 0                        | Jumper                                         |                            | U                                        |          |  |  | Embossed Carrier Taping W4P1, 40,000 pcs. |
|                           | 2GE                | 0402  | 0.1 W    |         |                                                | C                        | Pressed Carrier Taping 2 mm pitch, 15,000 pcs. |                            | ERJ1GN                                   |          |  |  |                                           |
|                           | 3GE                | 0603  | 0.1 W    | X       | Punched Carrier Taping 2 mm pitch, 10,000 pcs. | ERJ2GE                   |                                                |                            |                                          |          |  |  |                                           |
|                           | 6GE                | 0805  | 0.125 W  | Y       | Punched Carrier Taping 2 mm pitch, 20,000 pcs. |                          |                                                |                            |                                          |          |  |  |                                           |
|                           | 8GE                | 1206  | 0.25 W   | V       | Punched Carrier Taping 4 mm pitch, 5,000 pcs.  |                          |                                                | ERJ3GE<br>ERJ6GE<br>ERJ8GE |                                          |          |  |  |                                           |
|                           | 14                 | 1210  | 0.5 W    | U       | Embossed Carrier Taping 4 mm pitch, 5,000 pcs. | ERJ14<br>ERJ12<br>ERJ12Z |                                                |                            |                                          |          |  |  |                                           |
|                           | 12                 | 1812  | 0.75 W   |         | Embossed Carrier Taping 4 mm pitch, 4,000 pcs. |                          |                                                |                            |                                          | ERJ1T    |  |  |                                           |
|                           | 12Z                | 2010  | 0.75 W   |         |                                                |                          |                                                |                            |                                          |          |  |  |                                           |
|                           | 1T                 | 2512  | 1 W      |         |                                                |                          |                                                |                            |                                          |          |  |  |                                           |

|                                                                                                                                                                                                 |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Resistance Value                                                                                                                                                                                |  |
| The first two digits are significant figures of resistance and the third one denotes number of zeros following.<br>Decimal Point is expressed by R as 4.7 = 4R7.<br>Jumper is expressed by R00. |  |

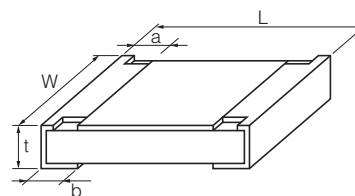
\* Series XGN, 1GN and 2GE do not have value markings on the black side.  
Please omit the letter "Y" from the part number for these series of parts.  
The other part number factors will move up respectively.

\* Series XGN, 1GN and 2GE do not have value markings on the black side.  
Please omit the letter "Y" from the part number for these series of parts.  
The other part number factors will move up respectively.

## Construction



## Dimensions in mm (not to scale)



| Part No. | Dimensions (mm) |                 |                 |                 |                 | Mass (Weight)<br>(g/1000 pcs.) |
|----------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------------------|
|          | L               | W               | a               | b               | t               |                                |
| ERJXG    | 0.40 $\pm$ 0.02 | 0.20 $\pm$ 0.02 | 0.10 $\pm$ 0.03 | 0.10 $\pm$ 0.03 | 0.13 $\pm$ 0.02 | 0.04                           |
| ERJ1G    | 0.60 $\pm$ 0.03 | 0.30 $\pm$ 0.03 | 0.10 $\pm$ 0.05 | 0.15 $\pm$ 0.05 | 0.23 $\pm$ 0.03 | 0.15                           |
| ERJ2G    | 1.00 $\pm$ 0.05 | 0.50 $\pm$ 0.05 | 0.20 $\pm$ 0.10 | 0.25 $\pm$ 0.05 | 0.35 $\pm$ 0.05 | 0.8                            |
| ERJ3G    | 1.60 $\pm$ 0.15 | 0.80 $\pm$ 0.15 | 0.30 $\pm$ 0.20 | 0.30 $\pm$ 0.15 | 0.45 $\pm$ 0.10 | 2                              |
| ERJ6G    | 2.00 $\pm$ 0.20 | 1.25 $\pm$ 0.10 | 0.40 $\pm$ 0.20 | 0.40 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 4                              |
| ERJ8G    | 3.20 $\pm$ 0.20 | 1.60 $\pm$ 0.15 | 0.50 $\pm$ 0.20 | 0.50 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 10                             |
| ERJ14    | 3.20 $\pm$ 0.20 | 2.50 $\pm$ 0.20 | 0.50 $\pm$ 0.20 | 0.50 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 16                             |
| ERJ12    | 4.50 $\pm$ 0.20 | 3.20 $\pm$ 0.20 | 0.50 $\pm$ 0.20 | 0.50 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 27                             |
| ERJ12Z   | 5.00 $\pm$ 0.20 | 2.50 $\pm$ 0.20 | 0.60 $\pm$ 0.20 | 0.60 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 27                             |
| ERJ1T    | 6.40 $\pm$ 0.20 | 3.20 $\pm$ 0.20 | 0.65 $\pm$ 0.20 | 0.60 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 45                             |

## Ratings

### [For Resistor]

| Part No.<br>(inch size) | Power Rating <sup>(3)</sup><br>at 70 °C<br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>( $\Omega$ ) | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ )                                                                         | Category<br>Temperature Range<br>( $^{\circ}\text{C}$ ) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------|
| ERJXG<br>(01005)        | 0.031                                          | 15                                                | 30                                                | $\pm 5$                        | 1 to 1 M (E24)                      | <10 $\Omega$ : -100 to +600<br>10 $\Omega$ to 100 $\Omega$ : $\pm 300$<br>100 $\Omega$ $\leq$ : $\pm 200$               | -55 to +125                                             | —                 |
| ERJ1G<br>(0201)         | 0.05                                           | 25                                                | 50                                                | $\pm 5$                        | 1 to 10 M (E24)                     | <10 $\Omega$ :<br>-100 to +600<br><br>10 $\Omega$ to 1 M $\Omega$ :<br>$\pm 200$<br><br>1 M $\Omega$ <:<br>-400 to +150 | -55 to +125                                             | Grade 1           |
| ERJ2G<br>(0402)         | 0.1                                            | 50                                                | 100                                               | $\pm 5$                        | 1 to 10 M (E24)                     |                                                                                                                         | -55 to +155                                             | Grade 0           |
| ERJ3G<br>(0603)         | 0.1                                            | 75                                                | 150                                               | $\pm 5$                        | 1 to 10 M (E24)                     |                                                                                                                         | -55 to +155                                             | Grade 0           |
| ERJ6G<br>(0805)         | 0.125                                          | 150                                               | 200                                               | $\pm 5$                        | 1 to 10 M (E24)                     |                                                                                                                         | -55 to +155                                             | Grade 0           |
| ERJ8G<br>(1206)         | 0.25                                           | 200                                               | 400                                               | $\pm 5$                        | 1 to 10 M (E24)                     |                                                                                                                         | -55 to +155                                             | Grade 0           |
| ERJ14<br>(1210)         | 0.5                                            | 200                                               | 400                                               | $\pm 5$                        | 1 to 10 M (E24)                     |                                                                                                                         | -55 to +155                                             | Grade 0           |
| ERJ12<br>(1812)         | 0.75                                           | 200                                               | 500                                               | $\pm 5$                        | 1 to 10 M (E24)                     |                                                                                                                         | -55 to +155                                             | Grade 0           |
| ERJ12Z<br>(2010)        | 0.75                                           | 200                                               | 500                                               | $\pm 5$                        | 1 to 10 M (E24)                     |                                                                                                                         | -55 to +155                                             | Grade 0           |
| ERJ1T<br>(2512)         | 1                                              | 200                                               | 500                                               | $\pm 5$                        | 1 to 1 M (E24)                      |                                                                                                                         | -55 to +155                                             | Grade 0           |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$  or Maximum Overload Voltage listed above, whichever less.  
(3) Use it on the condition that the case temperature is below the upper category temperature.

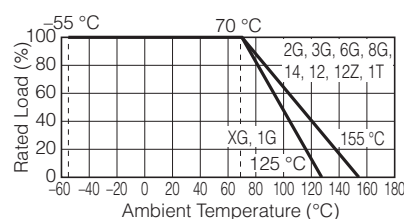
### [For Jumper]

| Part No.<br>(inch size) | Rated Current<br>(A) | Maximum Overload Current <sup>(1)</sup><br>(A) |
|-------------------------|----------------------|------------------------------------------------|
| ERJXG (01005)           | 0.5                  | 1                                              |
| ERJ1G (0201)            |                      |                                                |
| ERJ2G (0402)            |                      |                                                |
| ERJ3G (0603)            | 1                    | 2                                              |
| ERJ6G (0805)            |                      |                                                |
| ERJ8G (1206)            |                      |                                                |
| ERJ14 (1210)            | 2                    | 4                                              |
| ERJ12 (1812)            |                      |                                                |
| ERJ12Z (2010)           |                      |                                                |
| ERJ1T (2512)            |                      |                                                |

(1) Overload test current

### Power Derating Curve

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



## Performance

| Test Item                    | Performance Requirements   |               | Test Conditions                                                                                     |
|------------------------------|----------------------------|---------------|-----------------------------------------------------------------------------------------------------|
|                              | Resistor type              | Jumper type   |                                                                                                     |
| Resistance                   | Within Specified Tolerance | 50 mΩ or less | 20 °C                                                                                               |
| T. C. R.                     | Within Specified T. C. R.  | 50 mΩ or less | +25 °C/+155 °C (ERJXG, ERJ1G : +25 °C/+125 °C)                                                      |
| Overload                     | ±2 %                       | 50 mΩ or less | Rated Voltage × 2.5, 5 s<br>Jumper type : Max. Overload Current, 5 s                                |
| Resistance to Soldering Heat | ±1 %                       | 50 mΩ or less | 270 °C, 10 s                                                                                        |
| Rapid Change of Temperature  | ±1 %                       | 50 mΩ or less | −55 °C (30min.) / +155 °C (ERJXG, ERJ1G : +125 °C) (30min.), 100 cycles                             |
| High Temperature Exposure    | ±1 %                       | 50 mΩ or less | +155 °C (ERJXG, ERJ1G : +125 °C) , 1000 h                                                           |
| Damp Heat, Steady State      | ±1 %                       | 50 mΩ or less | 60 °C, 90 % to 95 %RH, 1000 h                                                                       |
| Load Life in Humidity        | ±3 %                       | 50 mΩ or less | 60 °C, 90 % to 95 %RH, Rated Voltage (Jumper type: Rated Current), 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3 %                       | 50 mΩ or less | 70 °C, Rated Voltage(Jumper type: Rated Current), 1.5 h ON/0.5 h OFF cycle, 1000 h                  |

## Precision Thick Film Chip Resistors

Type: **ERJ XG, 1G**  
**ERJ 1R, 2R, 3R, 6R**  
**ERJ 3E, 6E, 8E, 14, 12, 1T**



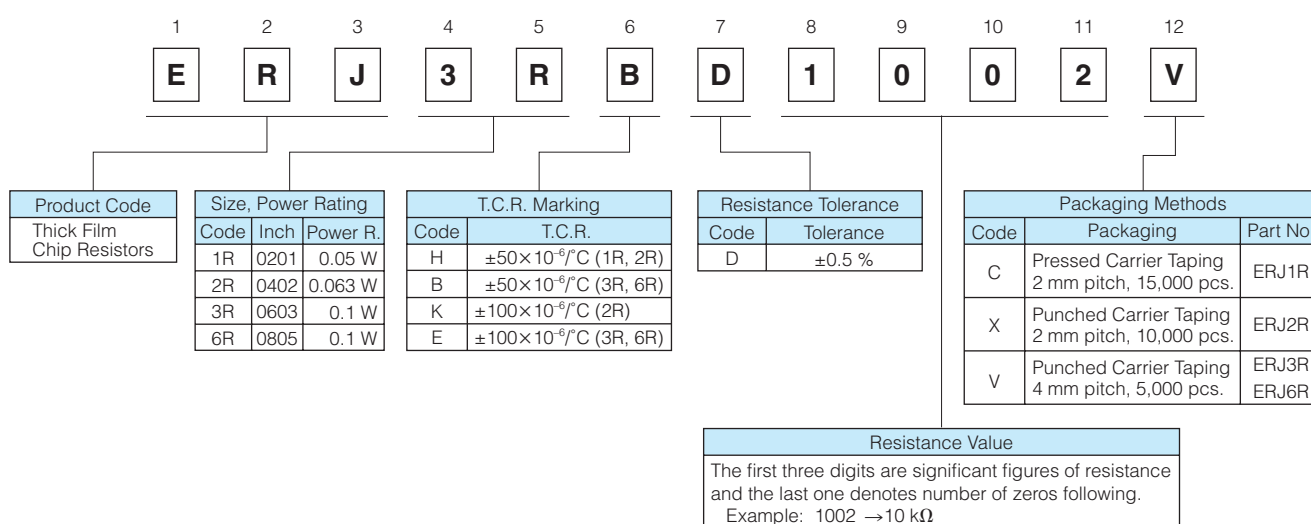
### Features

- Small size and lightweight
- High reliability  
Metal glaze thick film resistive element and three layers of electrodes
- Compatible with placement machines  
Taping packaging available
- Suitable for both reflow and flow soldering
- Low Resistance Tolerance  
ERJXG, 1G, 2R, 3E, 6E, 8E, 14, 12, 1T Series :  $\pm 1\%$   
ERJ1R, 2R, 3R, 6R Series :  $\pm 0.5\%$
- Reference Standards  
IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 qualified (Exemption ERJXG, ERJ1R)
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

- ERJ1R, 2R, 3R, 6R Series,  $\pm 0.5\%$



- ERJXGN, 1GN, 2RC, 2RK, 3EK, 6EN, 8EN, 14N, 12N, 12S, 1TN Series,  $\pm 1\%$

1

2

3

4

5

6

7

8

9

10

11

12

E

R

J

8

E

N

F

1

0

0

2

V

Product Code

Thick Film Chip Resistors

Size, Power Rating

| Code | Inch  | Power R. |
|------|-------|----------|
| XGN  | 01005 | 0.031 W  |
| 1GN  | 0201  | 0.05 W   |
| 2RC  | 0402  | 0.1 W    |
| 2RK  | 0402  | 0.1 W    |
| 3EK  | 0603  | 0.1 W    |
| 6EN  | 0805  | 0.125 W  |
| 8EN  | 1206  | 0.25 W   |
| 14N  | 1210  | 0.5 W    |
| 12N  | 1812  | 0.75 W   |
| 12S  | 2010  | 0.75 W   |
| 1TN  | 2512  | 1 W      |

Resistance Tolerance

| Code | Tolerance |
|------|-----------|
| F    | ±1 %      |

Resistance Value

The first three digits are significant figures of resistance and the last one denotes number of zeros following.

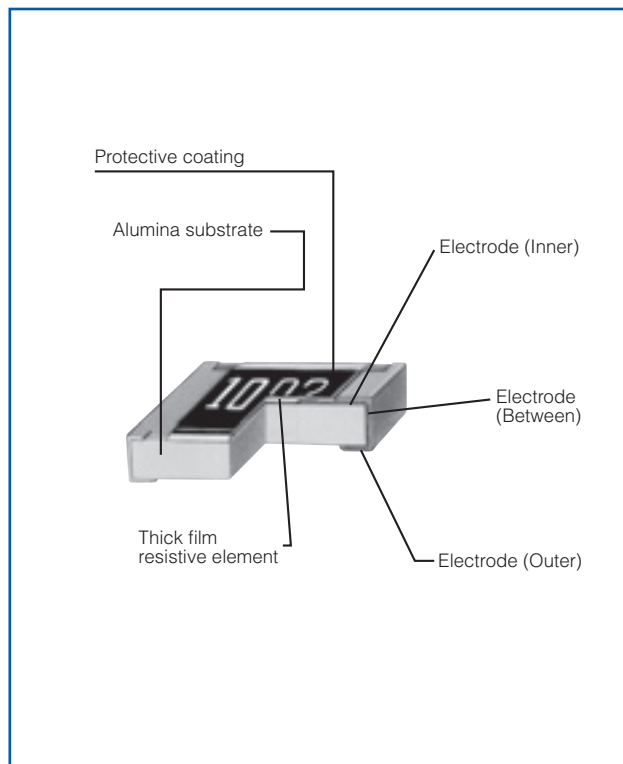
Decimal point is expressed by "R".

Example : 1002 → 10 kΩ

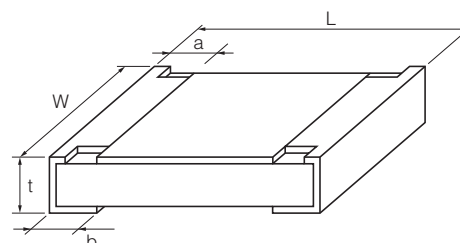
Packaging Methods

| Code | Packaging                                      | Part No.                   |
|------|------------------------------------------------|----------------------------|
| Y    | Pressed Carrier Taping W8P2, 20,000 pcs.       | ERJXGN                     |
| U    | Embossed Carrier Taping W4P1, 40,000 pcs.      |                            |
| C    | Pressed Carrier Taping 2 mm pitch, 15,000 pcs. | ERJ1GN                     |
| X    | Punched Carrier Taping 2 mm pitch, 10,000 pcs. | ERJ2RC<br>ERJ2RK           |
| V    | Punched Carrier Taping 4 mm pitch, 5,000 pcs.  | ERJ3EK<br>ERJ6EN<br>ERJ8EN |
| U    | Embossed Carrier Taping 4 mm pitch, 5,000 pcs. | ERJ14N<br>ERJ12N<br>ERJ12S |
|      | Embossed Carrier Taping 4 mm pitch, 4,000 pcs. | ERJ1TN                     |

## Construction



## Dimensions in mm (not to scale)



| Part No.         | Dimensions (mm)         |                         |                         |                         |                         | Mass (Weight)<br>[g/1000 pcs.] |
|------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------------|
|                  | L                       | W                       | a                       | b                       | t                       |                                |
| ERJXG            | 0.40 $^{+0.02}_{-0.02}$ | 0.20 $^{+0.02}_{-0.02}$ | 0.10 $^{+0.03}_{-0.03}$ | 0.10 $^{+0.03}_{-0.03}$ | 0.13 $^{+0.02}_{-0.02}$ | 0.04                           |
| ERJ1G, 1R        | 0.60 $^{+0.03}_{-0.03}$ | 0.30 $^{+0.03}_{-0.03}$ | 0.10 $^{+0.05}_{-0.05}$ | 0.15 $^{+0.05}_{-0.05}$ | 0.23 $^{+0.03}_{-0.03}$ | 0.15                           |
| ERJ2R□           | 1.00 $^{+0.05}_{-0.05}$ | 0.50 $^{+0.05}_{-0.05}$ | 0.20 $^{+0.10}_{-0.10}$ | 0.25 $^{+0.05}_{-0.05}$ | 0.35 $^{+0.05}_{-0.05}$ | 0.8                            |
| ERJ3R□<br>ERJ3EK | 1.60 $^{+0.15}_{-0.15}$ | 0.80 $^{+0.15}_{-0.05}$ | 0.30 $^{+0.20}_{-0.20}$ | 0.30 $^{+0.15}_{-0.15}$ | 0.45 $^{+0.10}_{-0.10}$ | 2                              |
| ERJ6R□<br>ERJ6EN | 2.00 $^{+0.20}_{-0.20}$ | 1.25 $^{+0.10}_{-0.10}$ | 0.40 $^{+0.20}_{-0.20}$ | 0.40 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 4                              |
| ERJ8EN           | 3.20 $^{+0.05}_{-0.20}$ | 1.60 $^{+0.05}_{-0.15}$ | 0.50 $^{+0.20}_{-0.20}$ | 0.50 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 10                             |
| ERJ14N           | 3.20 $^{+0.20}_{-0.20}$ | 2.50 $^{+0.20}_{-0.20}$ | 0.50 $^{+0.20}_{-0.20}$ | 0.50 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 16                             |
| ERJ12N           | 4.50 $^{+0.20}_{-0.20}$ | 3.20 $^{+0.20}_{-0.20}$ | 0.50 $^{+0.20}_{-0.20}$ | 0.50 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 27                             |
| ERJ12S           | 5.00 $^{+0.20}_{-0.20}$ | 2.50 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 27                             |
| ERJ1TN           | 6.40 $^{+0.20}_{-0.20}$ | 3.20 $^{+0.20}_{-0.20}$ | 0.65 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 45                             |

## Ratings

<±0.5 %>

| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(4)</sup><br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω)             | T.C.R.<br>(×10 <sup>-6</sup> /°C) | Category<br>Temperature Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------------------------|----------------------------------------|-----------------------------------|---------------------------------------|-------------------|
| ERJ1RH<br>(0201)        | 0.05                                           | 15                                                | 30                                                | ±0.5                           | 1k to 1M<br>(E24, E96)                 | ±50                               | -55 to +125                           | –                 |
| ERJ2RH<br>(0402)        | 0.063                                          | 50                                                | 100                                               | ±0.5                           | 100 to 100k<br>(E24, E96)              | ±50                               | -55 to +155                           | Grade 0           |
| ERJ2RK<br>(0402)        | 0.063                                          | 50                                                | 100                                               | ±0.5                           | 10 to 97.6<br>102k to 1M<br>(E24, E96) | ±100                              | -55 to +155                           | Grade 0           |
| ERJ3RB<br>(0603)        | 0.1                                            | 50                                                | 100                                               | ±0.5                           | 100 to 100k<br>(E24, E96)              | ±50                               | -55 to +155                           | Grade 0           |
| ERJ3RE<br>(0603)        | 0.1                                            | 50                                                | 100                                               | ±0.5                           | 10 to 97.6<br>102k to 1M<br>(E24, E96) | ±100                              | -55 to +155                           | Grade 0           |
| ERJ6RB<br>(0805)        | 0.1                                            | 150                                               | 200                                               | ±0.5                           | 100 to 100k<br>(E24, E96)              | ±50                               | -55 to +155                           | Grade 0           |
| ERJ6RE<br>(0805)        | 0.1                                            | 150                                               | 200                                               | ±0.5                           | 10 to 97.6<br>102k to 1M<br>(E24, E96) | ±100                              | -55 to +155                           | Grade 0           |

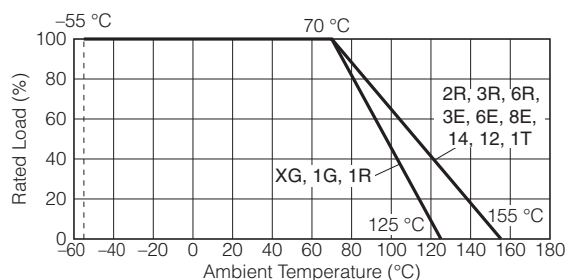
<±1 %>

| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(4)</sup><br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω)            | T.C.R.<br>(×10 <sup>-6</sup> /°C) | Category<br>Temperature Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------------------------|---------------------------------------|-----------------------------------|---------------------------------------|-------------------|
| ERJXGN<br>(01005)       | 0.031                                          | 15                                                | 30                                                | ±1                             | 10 to 1M <sup>(3)</sup><br>(E24, E96) | <100 Ω : ±300<br>100 Ω ≤ : ±200   | -55 to +125                           | –                 |
| ERJ1GN<br>(0201)        | 0.05                                           | 25                                                | 50                                                | ±1                             | 10 to 1M <sup>(3)</sup><br>(E24, E96) | ±200                              | -55 to +125                           | Grade 1           |
| ERJ2RC<br>(0402)        | 0.1                                            | 50                                                | 100                                               | ±1                             | 1 to 9.76<br>(E24, E96)               | -100 to +600                      | -55 to +155                           | Grade 0           |
| ERJ2RK<br>(0402)        | 0.1                                            | 50                                                | 100                                               | ±1                             | 10 to 1M<br>(E24, E96)                | ±100                              | -55 to +155                           | Grade 0           |
| ERJ3EK<br>(0603)        | 0.1                                            | 75                                                | 150                                               | ±1                             | 10 to 1M<br>(E24, E96)                | ±100                              | -55 to +155                           | Grade 0           |
| ERJ6EN<br>(0805)        | 0.125                                          | 150                                               | 200                                               | ±1                             | 10 to 2.2M<br>(E24, E96)              | ±100                              | -55 to +155                           | Grade 0           |
| ERJ8EN<br>(1206)        | 0.25                                           | 200                                               | 400                                               | ±1                             | 10 to 2.2M<br>(E24, E96)              | ±100                              | -55 to +155                           | Grade 0           |
| ERJ14N<br>(1210)        | 0.5                                            | 200                                               | 400                                               | ±1                             | 10 to 1M<br>(E24, E96)                | ±100                              | -55 to +155                           | Grade 0           |
| ERJ12N<br>(1812)        | 0.75                                           | 200                                               | 500                                               | ±1                             | 10 to 1M<br>(E24, E96)                | ±100                              | -55 to +155                           | Grade 0           |
| ERJ12S<br>(2010)        | 0.75                                           | 200                                               | 500                                               | ±1                             | 10 to 1M<br>(E24, E96)                | ±100                              | -55 to +155                           | Grade 0           |
| ERJ1TN<br>(2512)        | 1                                              | 200                                               | 500                                               | ±1                             | 10 to 1M<br>(E24, E96)                | ±100                              | -55 to +155                           | Grade 0           |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.  
(3) Please contact us when you need a type with a resistance of less than 10 Ω.  
(4) Use it on the condition that the case temperature is below the upper category temperature.

## 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

### ● ERJ1R, 2R, 3R, 6R Series, $\pm 0.5\%$ (D)

| Test Item                    | Performance Requirements      | Test Conditions                                                        |
|------------------------------|-------------------------------|------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance    | 20 °C                                                                  |
| T. C. R.                     | Within Specified T. C. R.     | +25 °C/+125 °C                                                         |
| Overload                     | $\pm 2\%$                     | Rated Voltage $\times$ 2.5, 5 s                                        |
| Resistance to Soldering Heat | $\pm 1\%$                     | 270 °C, 10 s                                                           |
| Rapid Change of Temperature  | $\pm 1\%$                     | –55 °C (30min.) / +155 °C (ERJ1R : +125 °C) (30min.), 100 cycles       |
| High Temperature Exposure    | $\pm 1\%$                     | +155 °C (ERJ1R : +125 °C) , 1000 h                                     |
| Damp Heat, Steady State      | $\pm 1\%$                     | 60 °C, 90 % to 95 %RH, 1000 h                                          |
| Load Life in Humidity        | $\pm 2\%$<br>ERJ1R: $\pm 3\%$ | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | $\pm 2\%$<br>ERJ1R: $\pm 3\%$ | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                 |

### ● ERJXGN, 1GN, 2RC, 2RK, 3EK, 6EN, 8EN, 14N, 12N, 12S, 1TN Series, $\pm 1\%$ (F)

| Test Item                    | Performance Requirements             | Test Conditions                                                         |
|------------------------------|--------------------------------------|-------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance           | 20 °C                                                                   |
| T. C. R.                     | Within Specified T. C. R.            | +25 °C/+155 °C (ERJXG, ERJ1G : +25 °C/+125 °C)                          |
| Overload                     | $\pm 2\%$                            | Rated Voltage $\times$ 2.5, 5 s                                         |
| Resistance to Soldering Heat | $\pm 1\%$                            | 270 °C, 10 s                                                            |
| Rapid Change of Temperature  | $\pm 1\%$                            | –55 °C (30min.) / +155 °C (ERJXG, ERJ1G : +125 °C) (30min.), 100 cycles |
| High Temperature Exposure    | $\pm 1\%$                            | +155 °C (ERJXG, ERJ1G : +125 °C) , 1000 h                               |
| Damp Heat, Steady State      | $\pm 1\%$                            | 60 °C, 90 % to 95 %RH, 1000 h                                           |
| Load Life in Humidity        | $\pm 2\%$<br>ERJXG, ERJ1G: $\pm 3\%$ | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h  |
| Endurance at 70 °C           | $\pm 2\%$<br>ERJXG, ERJ1G: $\pm 3\%$ | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                  |

## Metal Film (Thin Film) Chip Resistors, High Reliability Type

Type: **ERA 1A, 2A, 3A, 6A, 8A**

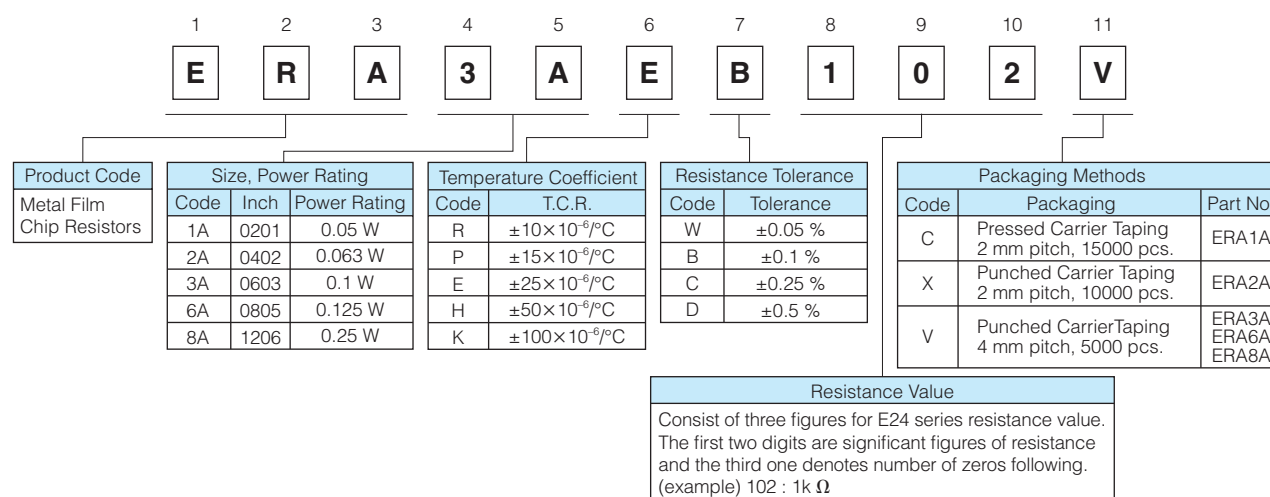
### Features

- High reliability ..... Stable at high temperature and humidity  
(85 °C 85 %RH rated load, Category temperature range : –55 °C to +155 °C)
- High accuracy ..... Small resistance tolerance and Temperature Coefficient of Resistance
- High performance ..... Low current noise, excellent linearity
- Reference Standard ..... IEC 60115-8, JIS C 5201-8, EIAJ RC-2133B
- AEC-Q200 qualified
- RoHS compliant

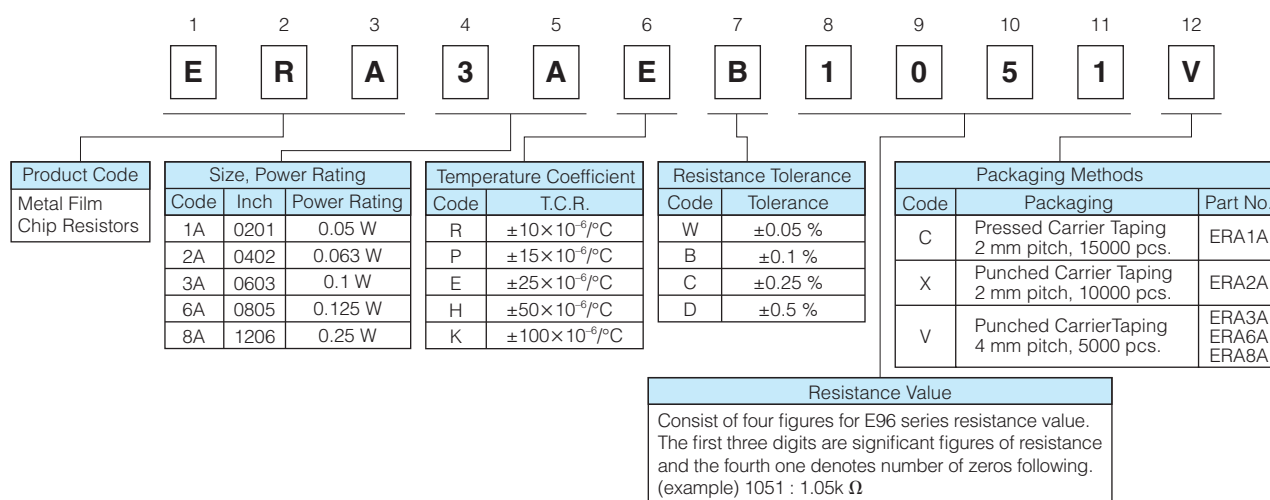
■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

#### ● E24 Series

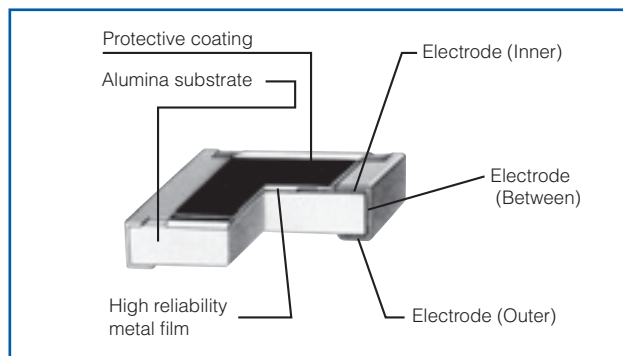


#### ● E96 Series and other Resistance values

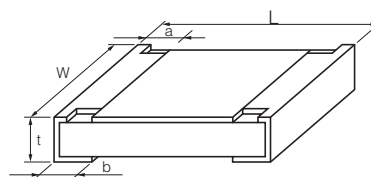


note : Duplicated resistance values as E24 series part numbers shall follow E24 part numbers.  
(apply three digit resistance value)

### Construction



### Dimensions in mm (not to scale)



| Part No.<br>(inch size) | Dimensions (mm) |                 |                 |                 |                 | Mass (Weight)<br>[g/1000pcs.] |
|-------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------------------|
|                         | L               | W               | a               | b               | t               |                               |
| ERA1A (0201)            | 0.60 $\pm$ 0.03 | 0.30 $\pm$ 0.03 | 0.15 $\pm$ 0.05 | 0.15 $\pm$ 0.05 | 0.23 $\pm$ 0.03 | 0.14                          |
| ERA2A (0402)            | 1.00 $\pm$ 0.10 | 0.50 $\pm$ 0.05 | 0.15 $\pm$ 0.10 | 0.25 $\pm$ 0.10 | 0.35 $\pm$ 0.05 | 0.6                           |
| ERA3A (0603)            | 1.60 $\pm$ 0.20 | 0.80 $\pm$ 0.20 | 0.30 $\pm$ 0.20 | 0.30 $\pm$ 0.20 | 0.45 $\pm$ 0.10 | 2                             |
| ERA6A (0805)            | 2.00 $\pm$ 0.20 | 1.25 $\pm$ 0.10 | 0.40 $\pm$ 0.25 | 0.40 $\pm$ 0.25 | 0.50 $\pm$ 0.10 | 4                             |
| ERA8A (1206)            | 3.20 $\pm$ 0.20 | 1.60 $\pm$ 0.15 | 0.50 $\pm$ 0.25 | 0.50 $\pm$ 0.25 | 0.60 $\pm$ 0.10 | 8                             |

### Ratings

| Part No.<br>(inch size) | Power Rating<br>at 85 °C<br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum<br>Overload Voltage <sup>(2)</sup><br>(V) | Part No.<br>(detail) | Resistance<br>Tolerance<br>(%) | T.C.R.<br>(×10 <sup>-6</sup> /°C) | Resistance<br>Range <sup>(3)(4)</sup><br>(Ω) | Category<br>Temperature Range<br>(°C) |
|-------------------------|---------------------------------|---------------------------------------------------|---------------------------------------------------|----------------------|--------------------------------|-----------------------------------|----------------------------------------------|---------------------------------------|
| ERA1A<br>(0201)         | 0.05                            | 25                                                | 50                                                | ERA1AEB              | ±0.1                           | ±25                               | 100 to 10k (E24, E96)                        | -55 to +155                           |
|                         |                                 |                                                   |                                                   | ERA1AEC              | ±0.25                          |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA1ARC              | ±0.25                          | ±10                               | 100 to 10k (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA1ARB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA1ARW              | ±0.05                          |                                   | 1k to 10k (E24, E96)                         |                                       |
| ERA2A<br>(0402)         | 0.063                           | 50                                                | 100                                               | ERA2AKD              | ±0.5                           | ±100                              | 10 to 46.4 (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA2AED              | ±0.5                           | ±25                               | 47 to 100k (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA2AEC              | ±0.25                          |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA2AEB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA2APC              | ±0.25                          | ±15                               | 200 to 47k (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA2APB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA2ARC              | ±0.25                          | ±10                               | 200 to 47k (E24, E96)                        |                                       |
| ERA2ARB                 | ±0.1                            |                                                   |                                                   |                      |                                |                                   |                                              |                                       |
| ERA3A<br>(0603)         | 0.1                             | 75                                                | 150                                               | ERA3AHD              | ±0.5                           | ±50                               | 10 to 46.4 (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA3AED              | ±0.5                           | ±25                               | 47 to 330k (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA3AEC              | ±0.25                          |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA3AEB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA3APC              | ±0.25                          | ±15                               | 470 to 100k (E24, E96)                       |                                       |
|                         |                                 |                                                   |                                                   | ERA3APB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA3ARC              | ±0.25                          | ±10                               | 1k to 100k (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA3ARB              | ±0.1                           |                                   |                                              |                                       |
| ERA3ARW                 | ±0.05                           |                                                   |                                                   |                      |                                |                                   |                                              |                                       |
| ERA6A<br>(0805)         | 0.125                           | 100                                               | 200                                               | ERA6AHD              | ±0.5                           | ±50                               | 10 to 46.4 (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA6AED              | ±0.5                           | ±25                               | 47 to 1M (E24, E96)                          |                                       |
|                         |                                 |                                                   |                                                   | ERA6AEC              | ±0.25                          |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA6AEB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA6APC              | ±0.25                          | ±15                               | 470 to 100k (E24, E96)                       |                                       |
|                         |                                 |                                                   |                                                   | ERA6APB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA6ARC              | ±0.25                          | ±10                               | 1k to 100k (E24, E96)                        |                                       |
| ERA6ARB                 | ±0.1                            |                                                   |                                                   |                      |                                |                                   |                                              |                                       |
| ERA6ARW                 | ±0.05                           |                                                   |                                                   |                      |                                |                                   |                                              |                                       |
| ERA8A<br>(1206)         | 0.25                            | 150                                               | 300                                               | ERA8AHD              | ±0.5                           | ±50                               | 10 to 46.4 (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA8AED              | ±0.5                           | ±25                               | 47 to 1M (E24, E96)                          |                                       |
|                         |                                 |                                                   |                                                   | ERA8AEC              | ±0.25                          |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA8AEB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA8APC              | ±0.25                          | ±15                               | 470 to 100k (E24, E96)                       |                                       |
|                         |                                 |                                                   |                                                   | ERA8APB              | ±0.1                           |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | ERA8ARC              | ±0.25                          | ±10                               | 1k to 100k (E24, E96)                        |                                       |
|                         |                                 |                                                   |                                                   | ERA8ARB              | ±0.1                           |                                   |                                              |                                       |
| ERA8ARW                 | ±0.05                           |                                                   |                                                   |                      |                                |                                   |                                              |                                       |

(1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Rated Power} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.

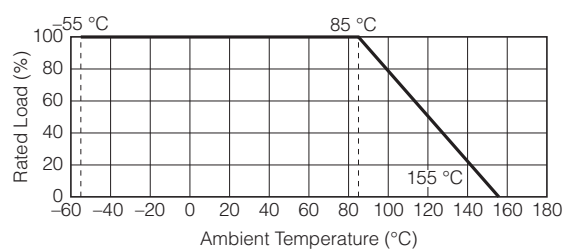
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from  $\text{SOTV} = 2.5 \times \text{RCWV}$  or max. Overload Voltage listed above whichever less.

(3) E192 series resistance values are also available. Please contact us for details.

(4) Duplicated resistance values between E96, E192 and E24 series shall follow E24 Part Numbers. (apply three digit resistance value)

### Power Derating Curve

For resistors operated in ambient temperatures above 85 °C, power rating shall be derated in accordance with the figure on the right.



## High Precision Thick Film Chip Resistors



Type: **ERJ PB3, PB6**

### Features

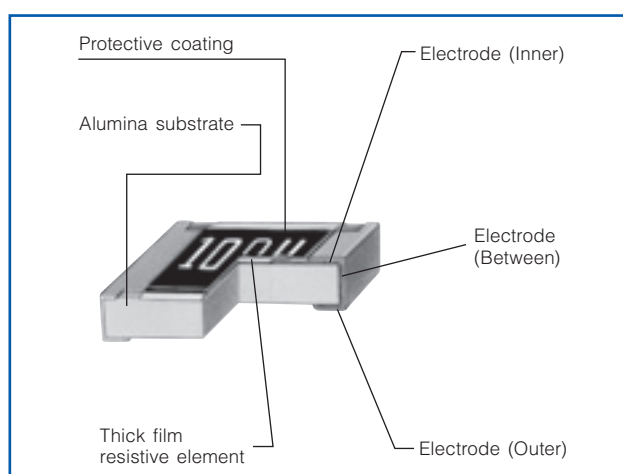
- Achieve the resistance tolerance  $\pm 0.1\%$  with high reliability metal glaze thick film resistor
- Guarantee the temperature coefficient of Resistance  $\pm 50 \times 10^{-6}/^{\circ}\text{C}$  in high resistance range up to  $1\text{ M}\Omega$
- Suitable for both reflow and flow soldering
- High power ...  $0.20\text{ W}$  : 0603 inch / 1608 mm size (ERJPB3)  
 $0.25\text{ W}$  : 0805 inch / 2012 mm size (ERJPB6)
- Reference Standards... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
 Please see Data Files

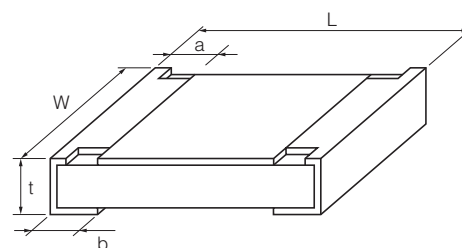
### Explanation of Part Numbers

|                           |   |                    |      |                      |      |                  |                                                                                                                                                                                     |   |                   |      |                                                  |                  |
|---------------------------|---|--------------------|------|----------------------|------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------|------|--------------------------------------------------|------------------|
| 1                         | 2 | 3                  | 4    | 5                    | 6    | 7                | 8                                                                                                                                                                                   | 9 | 10                | 11   | 12                                               |                  |
| E                         | R | J                  | P    | B                    | 6    | B                | 1                                                                                                                                                                                   | 0 | 0                 | 2    | V                                                |                  |
| Product Code              |   | Size, Power Rating |      | Resistance Tolerance |      | Resistance Value |                                                                                                                                                                                     |   | Packaging Methods |      |                                                  |                  |
| Thick Film Chip Resistors |   | Code               | Inch | Power R.             | Code | Tolerance        | <p>The first three digits are significant figures of resistance and the last one denotes number of zeros following.</p> <p>Example : 5110 → 511 Ω<br/>          : 1003 → 100 kΩ</p> |   |                   | Code | Packaging                                        | Part No.         |
|                           |   | PB3                | 0603 | 0.20 W               | B    | ± 0.1 %          |                                                                                                                                                                                     |   |                   | V    | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs. | ERJPB3<br>ERJPB6 |
|                           |   | PB6                | 0805 | 0.25 W               | D    | ± 0.5 %          |                                                                                                                                                                                     |   |                   |      |                                                  |                  |

### Construction



### Dimensions in mm (not to scale)



| Part No. | Dimensions (mm) |                 |                 |                 |                 | Mass (Weight)<br>[g/1000 pcs.] |
|----------|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------------------|
|          | L               | W               | a               | b               | t               |                                |
| ERJPB3   | $1.60 \pm 0.15$ | $0.80 \pm 0.05$ | $0.15 \pm 0.10$ | $0.25 \pm 0.10$ | $0.45 \pm 0.10$ | 2                              |
| ERJPB6   | $2.00 \pm 0.20$ | $1.25 \pm 0.10$ | $0.25 \pm 0.20$ | $0.40 \pm 0.20$ | $0.60 \pm 0.10$ | 4                              |

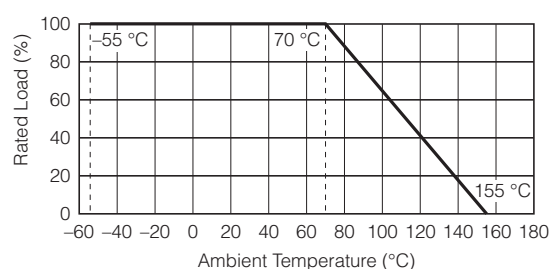
## Ratings

| Part No.<br>(inch size) | Power Rating <sup>(3)</sup><br>at 70 °C<br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ ) | Category<br>Temperature<br>Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|------------------------------------------------------|--------------------------------|----------------------------|-------------------------------------------------|------------------------------------------|-------------------|
| ERJPB3<br>(0603)        | 0.20                                           | 150                                               | 200                                                  | $\pm 0.1$<br>$\pm 0.5$         | 200 to 100 k<br>(E24, E96) | $\pm 50$                                        | -55 to +155                              | Grade 0           |
| ERJPB6<br>(0805)        | 0.25                                           | 150                                               | 200                                                  | $\pm 0.1$<br>$\pm 0.5$         | 200 to 1 M<br>(E24, E96)   | $\pm 50$                                        | -55 to +155                              | Grade 0           |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$  or Maximum Overload Voltage listed above, whichever less.  
(3) Use it on the condition that the case temperature is below the upper category temperature.

## 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

| Test Item                    | Performance Requirements   | Test Conditions                                                          |
|------------------------------|----------------------------|--------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                    |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                           |
| Overload                     | $\pm 0.5$ %                | Rated Voltage $\times$ 2.0, 5 s                                          |
| Resistance to Soldering Heat | $\pm 0.5$ %                | 270 °C, 10 s                                                             |
| Rapid Change of Temperature  | $\pm 0.5$ %                | -55 °C (30min.) / +155 °C (30min.), 100 cycles                           |
| High Temperature Exposure    | $\pm 0.5$ %                | +155 °C, 1000 h                                                          |
| Damp Heat, Steady State      | $\pm 0.5$ %                | 60 °C, 90 % to 95 %RH, 1000 h                                            |
| Load Life in Humidity        | $\pm 0.5$ %                | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | $\pm 0.5$ %                | 70 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                 |

## Thick Film Chip Resistors / Low Resistance Type

Type: **ERJ 2LW, 3LW, 6LW**  
**2BW, 3BW, 6BW,**  
**8BW, 6CW, 8CW**  
**ERJ 2B, 3B, 6D, 6B, 8B,**  
**14B, 3R, 6R, 8R, 14R,**  
**12R, 12Z, 1TR**  
**ERJ L03, L06, L08, L14,**  
**L12, L1D, L1W**



### Features

- Current Sensing resistor
- Small size and lightweight
- Realize both low-resistance & High-precision by original thick film resistive element & special electrode structure
- Suitable for both reflow and flow soldering
- Realize High-power by double-sided resistive elements structure that aimed to suppress temperature rising : ERJ2LW, 3LW, 6LW, 2BW, 3BW, 6BW, 8BW, 6CW, 8CW
- Low TCR :  $\pm 75 \times 10^{-6}/^{\circ}\text{C}$  (ERJ6CW, 8CW)
- Low Resistance Value : Thick film resistors available from  $5\text{m } \Omega$  (ERJ3LW, 6LW)
- Reference Standards : IEC 60115-8, JIS C 5201-8, JEITA RC-2144
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

- ERJ2LW, 3LW, 6LW, 2BW, 3BW, 6BW, 8BW, 6CW, 8CW  
<High power (double-sided resistive elements structure) type>

|                                              |      |      |              |                  |   |                                                                    |           |                                                             |   |                   |                                                   |                                                                    |  |  |
|----------------------------------------------|------|------|--------------|------------------|---|--------------------------------------------------------------------|-----------|-------------------------------------------------------------|---|-------------------|---------------------------------------------------|--------------------------------------------------------------------|--|--|
|                                              | 1    | 2    | 3            | 4                | 5 | 6                                                                  | 7         | 8                                                           | 9 | 10                | 11                                                | 12                                                                 |  |  |
|                                              | E    | R    | J            | 2                | B | W                                                                  | G         | R                                                           | 0 | 4                 | 7                                                 | X                                                                  |  |  |
| Product Code<br>Thick Film<br>Chip Resistors | Code | Inch | Power Rating | Resistance Value |   | Resistance Tolerance                                               |           | Resistance Value                                            |   | Packaging Methods |                                                   |                                                                    |  |  |
|                                              | 2LW  | 0402 | 0.2 W        | 10m Ω            |   | Code                                                               | Tolerance | Shown by 4 digits or letters.<br>(Ex.) R047 : 0.047 Ω=47m Ω |   | Code              | Packaging                                         | Part No.                                                           |  |  |
|                                              | 3LW  | 0603 | 0.25 W       | 5m Ω, 10m Ω      |   | D                                                                  | ± 0.5 %*  |                                                             |   | X                 | Pressed Carrier Taping<br>2 mm pitch, 10,000 pcs. | ERJ2LW<br>ERJ2BW                                                   |  |  |
|                                              | 6LW  | 0805 | 0.5 W        | 5, 6, 7, 8, 9m Ω |   | F                                                                  | ± 1 %     |                                                             |   | V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  | ERJ3LW<br>ERJ6LW<br>ERJ3BW<br>ERJ6BW<br>ERJ8BW<br>ERJ6CW<br>ERJ8CW |  |  |
|                                              | 2BW  | 0402 | 0.25 W       | 47m Ω to 100m Ω  |   | G                                                                  | ± 2 %     |                                                             |   |                   |                                                   |                                                                    |  |  |
|                                              | 3BW  | 0603 | 0.33 W       | 20m Ω to 100m Ω  |   | J                                                                  | ± 5 %     |                                                             |   |                   |                                                   |                                                                    |  |  |
|                                              | 6BW  | 0805 | 0.5 W        | 10m Ω to 100m Ω  |   | * Please refer to the rating table<br>for the resistance tolerance |           |                                                             |   |                   |                                                   |                                                                    |  |  |
|                                              | 8BW  | 1206 | 1 W          | 10m Ω to 100m Ω  |   |                                                                    |           |                                                             |   |                   |                                                   |                                                                    |  |  |
|                                              | 6CW  | 0805 | 0.5 W        | 10m Ω to 30m Ω   |   |                                                                    |           |                                                             |   |                   |                                                   |                                                                    |  |  |
|                                              | 8CW  | 1206 | 1 W          | 10m Ω to 50m Ω   |   |                                                                    |           |                                                             |   |                   |                                                   |                                                                    |  |  |

- ERJ2BS/2BQ, 3BS/3BQ, 6BS/6BQ, 8BS/8BQ, 14BS/14BQ, 6D, 3R, 6R, 8R, 14R, 12R, 12Z, 1TR  
<High power type/Standard type>

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|----|----|
| E | R | J | 8 | R | Q | F | R | 2 | 2  | V  |

| Product Code              | Size, Power Rating |      |          | Resistance Value |                  | Resistance Tolerance |           | Packaging Methods |                                                   |                                     |
|---------------------------|--------------------|------|----------|------------------|------------------|----------------------|-----------|-------------------|---------------------------------------------------|-------------------------------------|
| Thick Film Chip Resistors | Type               | Inch | Power R. | Code             | Res. Value       | Code                 | Tolerance | Code              | Packaging                                         | Part No.                            |
|                           | 2B                 | 0402 | 0.166 W  | S                | 0.1 Ω to 0.2 Ω   | D                    | ± 0.5 %*  | X                 | Punched Carrier Taping<br>2 mm pitch, 10,000 pcs. | ERJ2B                               |
|                           | 3B                 | 0603 | 0.25 W   | Q                | 0.22 Ω to 9.1 Ω* | F                    | ± 1 %     | V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  | ERJ3B/3R<br>ERJ6D/6B/6R<br>ERJ8B/8R |
|                           | 3R                 | 0603 | 0.1 W    |                  |                  | G                    | ± 2 %     |                   |                                                   |                                     |
|                           | 6D                 | 0805 | 0.5 W    |                  |                  | J                    | ± 5 %     |                   |                                                   |                                     |
|                           | 6B                 | 0805 | 0.33 W   |                  |                  |                      |           | U                 | Embossed Carrier Taping<br>4 mm pitch, 5,000 pcs. | ERJ14B/14R<br>ERJ12R<br>ERJ12Z      |
|                           | 6R                 | 0805 | 0.125 W  |                  |                  |                      |           |                   |                                                   |                                     |
|                           | 8B                 | 1206 | 0.5 W    |                  |                  |                      |           |                   |                                                   |                                     |
|                           | 8R                 | 1206 | 0.25 W   |                  |                  |                      |           |                   |                                                   |                                     |
|                           | 14B                | 1210 | 0.5 W    |                  |                  |                      |           |                   |                                                   |                                     |
|                           | 14R                | 1210 | 0.25 W   |                  |                  |                      |           |                   |                                                   |                                     |
|                           | 12R                | 1812 | 0.5 W    |                  |                  |                      |           |                   |                                                   |                                     |
|                           | 12Z                | 2010 | 0.5 W    |                  |                  |                      |           |                   |                                                   |                                     |
|                           | 1TR                | 2512 | 1 W      |                  |                  |                      |           |                   |                                                   |                                     |

| Resistance Value                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shown by 3 digits or letters.<br>Only when it is D (E24,E96)<br>or F (E96), shown by<br>4 digits or letters.<br>(Ex.) R22 : 0.22 Ω<br>R102 : 0.102 Ω |

| Resistance Tolerance                                            |
|-----------------------------------------------------------------|
| * Please refer to the rating table for the resistance tolerance |

- ERJL03, L06, L08, L14, L12, L1D, L1W <Low TCR type>

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|----|----|----|
| E | R | J | L | 1 | 4 | K | J | 5 | 0  | M  | U  |

| Product Code              | Size, Power Rating |      |          | Code | Res. Value                                                     | Resistance Tolerance |           | Packaging Methods |                                                   |                            |
|---------------------------|--------------------|------|----------|------|----------------------------------------------------------------|----------------------|-----------|-------------------|---------------------------------------------------|----------------------------|
| Thick Film Chip Resistors | Type               | Inch | Power R. |      |                                                                | Code                 | Tolerance | Code              | Packaging                                         | Part No.                   |
|                           | L03                | 0603 | 0.2 W    | K    | Std.<br>20m Ω, 22m Ω, 33m Ω,<br>39m Ω, 47m Ω, 50m Ω,<br>100m Ω | F                    | ± 1 %     | V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  | ERJL03<br>ERJL06<br>ERJL08 |
|                           | L06                | 0805 | 0.25 W   |      |                                                                | J                    | ± 5 %     |                   |                                                   |                            |
|                           | L08                | 1206 | 0.33 W   | U    | 20m Ω to 100m Ω*                                               |                      |           | U                 | Embossed Carrier Taping<br>4 mm pitch, 5,000 pcs. | ERJL14<br>ERJL12<br>ERJL1D |
|                           | L14                | 1210 | 0.33 W   |      |                                                                |                      |           |                   |                                                   |                            |
|                           | L12                | 1812 | 0.5 W    |      |                                                                |                      |           |                   |                                                   |                            |
|                           | L1D                | 2010 | 0.5 W    |      |                                                                |                      |           |                   |                                                   |                            |
|                           | L1W                | 2512 | 1 W      |      |                                                                |                      |           |                   |                                                   |                            |

| Resistance Value                                              |
|---------------------------------------------------------------|
| Shown by 3 digits or letters.<br>(Ex.) 50M:50m Ω, 10 C:100m Ω |

| Resistance Tolerance                                            |
|-----------------------------------------------------------------|
| * L03, L06, L08 : 47m Ω to 100m Ω<br>L1D, L1W : 40m Ω to 100m Ω |

## Ratings

<High power (double-sided resistive elements structure) type>

| Part No.<br>(inch size) | Power Rating <sup>(2)</sup><br>at 70 °C<br>(W) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C)                                                 | Category<br>Temperature Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|--------------------------------|----------------------------|-----------------------------------------------------------------------------------|---------------------------------------|-------------------|
| ERJ2LW (0402)           | 0.2                                            | ±1, ±2, ±5                     | 10m                        | 0 to 500                                                                          | -55 to +125                           | Grade 1           |
| ERJ3LW (0603)           | 0.25                                           | ±1, ±2, ±5                     | 5m                         | 0 to 700                                                                          | -55 to +125                           | Grade 1           |
|                         |                                                |                                | 10m                        | 0 to 300                                                                          | -55 to +125                           |                   |
| ERJ6LW (0805)           | 0.5                                            | ±1, ±2, ±5                     | 5, 6, 7, 8, 9m             | 0 to 300                                                                          | -55 to +125                           | Grade 1           |
| ERJ2BW (0402)           | 0.25                                           | ±1, ±2, ±5                     | 47m to 100m (E24)          | ±300                                                                              | -55 to +155                           | Grade 0           |
| ERJ3BW (0603)           | 0.33                                           | ±1, ±2, ±5                     | 20m to 100m (E24)          | 20m Ω ≤ R < 39m Ω : ±250<br>39m Ω ≤ R ≤ 100m Ω : ±150                             | -55 to +155                           | Grade 0           |
| ERJ6BW (0805)           | 0.5                                            | ±1, ±2, ±5                     | 10m to 100m (E24)          | 10m Ω ≤ R < 15m Ω : ±300<br>15m Ω ≤ R ≤ 100m Ω : ±200                             | -55 to +155                           | Grade 0           |
| ERJ8BW (1206)           | 1                                              | ±1, ±2, ±5                     | 10m to 100m (E24)          | 10m Ω ≤ R < 20m Ω : ±200<br>20m Ω ≤ R < 47m Ω : ±150<br>47m Ω ≤ R ≤ 100m Ω : ±100 | -55 to +155                           | Grade 0           |
| ERJ6CW (0805)           | 0.5                                            | ±0.5, ±1, ±2, ±5               | 10m to 30m (E24)           | ±75                                                                               | -55 to +125                           | Grade 1           |
| ERJ8CW (1206)           | 1                                              | ±1, ±2, ±5                     | 10m to 50m (E24)           | ±75                                                                               | -55 to +125                           | Grade 1           |

(1) Please contact us when resistors of irregular series are needed.

(2) Use it on the condition that the case temperature is below the upper category temperature.

- Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ .
- Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

## Ratings

&lt;High power type&gt;

| Part No.<br>(inch size) | Power Rating <sup>(2)</sup><br>at 70 °C<br>(W) | Resistance <sup>(3)</sup><br>Tolerance<br>(%) | Resistance <sup>(1)</sup><br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C) | Category<br>Temperature Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|-----------------------------------------------|-------------------------------------------|-----------------------------------|---------------------------------------|-------------------|
| ERJ2BS (0402)           | 0.166                                          | ±1, ±2, ±5                                    | 0.10 to 0.20 (E24)                        | ±300                              | -55 to +155                           | Grade 0           |
| ERJ2BQ (0402)           |                                                |                                               | 0.22 to 1.0 (E24)                         | ±250                              |                                       |                   |
| ERJ3BS (0603)           | 0.25                                           | ±1, ±2, ±5                                    | 0.10 to 0.20 (E24)                        | ±300                              | -55 to +155                           | Grade 0           |
| ERJ3BQ (0603)           |                                                |                                               | 0.22 to 0.91 (E24)                        |                                   |                                       |                   |
|                         |                                                |                                               | 1.0 to 9.1 (E24)                          |                                   |                                       |                   |
| ERJ6DS (0805)           | 0.5                                            | ±0.5, ±1,<br>±2, ±5                           | 0.10 to 0.20 (E24, E96)                   | ±150                              | -55 to +155                           | Grade 0           |
| ERJ6DQ (0805)           |                                                |                                               | 0.22 to 9.1 (E24, E96)                    | ±100                              |                                       |                   |
| ERJ6BS (0805)           | 0.33                                           | ±1, ±2, ±5                                    | 0.10 to 0.20 (E24)                        | ±250                              | -55 to +155                           | Grade 0           |
| ERJ6BQ (0805)           |                                                |                                               | 0.22 to 0.91 (E24)                        |                                   |                                       |                   |
|                         |                                                |                                               | 1.0 to 9.1 (E24)                          |                                   |                                       |                   |
| ERJ8BS (1206)           | 0.5                                            | ±1, ±2, ±5                                    | 0.10 to 0.20 (E24)                        | ±250                              | -55 to +155                           | Grade 0           |
| ERJ8BQ (1206)           |                                                |                                               | 0.22 to 0.91 (E24)                        |                                   |                                       |                   |
|                         |                                                |                                               | 1.0 to 9.1 (E24)                          |                                   |                                       |                   |
| ERJ14BS (1210)          | 0.5                                            | ±1, ±2, ±5                                    | 0.10 to 0.20 (E24)                        | ±200                              | -55 to +155                           | Grade 0           |
| ERJ14BQ (1210)          |                                                |                                               | 0.22 to 0.91 (E24)                        |                                   |                                       |                   |
|                         |                                                |                                               | 1.0 to 9.1 (E24)                          |                                   |                                       |                   |

(1) Please contact us when resistors of irregular series are needed.

(2) Use it on the condition that the case temperature is below the upper category temperature.

(3) E96 series also have ±0.5 %, ±1 % line-up.

· Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ .· Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

&lt;Standard type&gt;

| Part No.<br>(inch size) | Power Rating<br>at 70 °C<br>(W) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C) | Category<br>Temperature Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|---------------------------------|--------------------------------|----------------------------|-----------------------------------|---------------------------------------|-------------------|
| ERJ3RS (0603)           | 0.1                             | ±1, ±2, ±5                     | 0.10 to 0.20 (E24)         | ±300                              | -55 to +155                           | Grade 0           |
| ERJ3RQ (0603)           |                                 |                                | 0.22 to 0.91 (E24)         |                                   |                                       |                   |
|                         |                                 |                                | 1.0 to 9.1 (E24)           | ±200                              |                                       |                   |
| ERJ6RS (0805)           | 0.125                           | ±1, ±2, ±5                     | 0.10 to 0.20 (E24)         | ±250                              | -55 to +155                           | Grade 0           |
| ERJ6RQ (0805)           |                                 |                                | 0.22 to 0.91 (E24)         |                                   |                                       |                   |
|                         |                                 |                                | 1.0 to 9.1 (E24)           | ±200                              |                                       |                   |
| ERJ8RS (1206)           | 0.25                            | ±1, ±2, ±5                     | 0.10 to 0.20 (E24)         | ±250                              | -55 to +155                           | Grade 0           |
| ERJ8RQ (1206)           |                                 |                                | 0.22 to 0.91 (E24)         |                                   |                                       |                   |
|                         |                                 |                                | 1.0 to 9.1 (E24)           | ±200                              |                                       |                   |
| ERJ14RS (1210)          | 0.25                            | ±1, ±2, ±5                     | 0.10 to 0.20 (E24)         | ±200                              | -55 to +155                           | Grade 0           |
| ERJ14RQ (1210)          |                                 |                                | 0.22 to 0.91 (E24)         |                                   |                                       |                   |
|                         |                                 |                                | 1.0 to 9.1 (E24)           | ±100                              |                                       |                   |
| ERJ12RS (1812)          | 0.5                             | ±1, ±2, ±5                     | 0.10 to 0.20 (E24)         | ±200                              | -55 to +155                           | Grade 0           |
| ERJ12RQ (1812)          |                                 |                                | 0.22 to 0.91 (E24)         |                                   |                                       |                   |
|                         |                                 |                                | 1.0 to 9.1 (E24)           | ±100                              |                                       |                   |
| ERJ12ZS (2010)          | 0.5                             | ±1, ±2, ±5                     | 0.10 to 0.20 (E24)         | ±200                              | -55 to +155                           | Grade 0           |
| ERJ12ZQ (2010)          |                                 |                                | 0.22 to 0.91 (E24)         |                                   |                                       |                   |
|                         |                                 |                                | 1.0 to 9.1 (E24)           | ±100                              |                                       |                   |
| ERJ1TRS (2512)          | 1                               | ±1, ±2, ±5                     | 0.10 to 0.20 (E24)         | ±200                              | -55 to +155                           | Grade 0           |
| ERJ1TRQ (2512)          |                                 |                                | 0.22 to 0.91 (E24)         |                                   |                                       |                   |
|                         |                                 |                                | 1.0 to 9.1 (E24)           | ±100                              |                                       |                   |

(1) Please contact us when resistors of irregular series are needed.

(2) Use it on the condition that the case temperature is below the upper category temperature.

· Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ .· Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

## <Low TCR type>

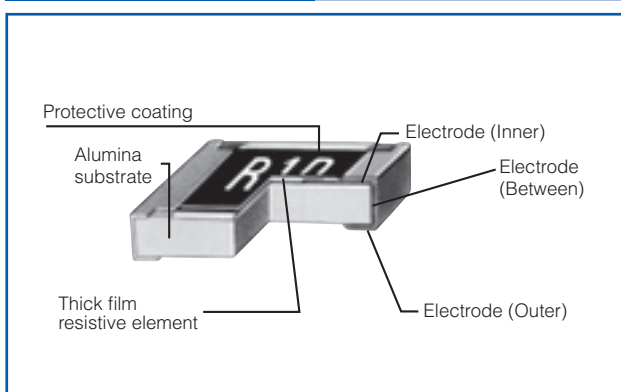
| Part No.<br>(inch size) | Power Rating<br>at 70 °C<br>(W) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>( $\Omega$ ) | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ )                   | Category<br>Temperature Range<br>( $^{\circ}\text{C}$ ) | AEC-Q200<br>Grade |
|-------------------------|---------------------------------|--------------------------------|-------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------|-------------------|
| ERJL03 (0603)           | 0.2                             | $\pm 1, \pm 5$                 | 47m to 100m                         | $\pm 200$                                                         | -55 to +125                                             | Grade 1           |
| ERJL06 (0805)           | 0.25                            | $\pm 1, \pm 5$                 | 47m to 100m                         | $\pm 100$                                                         | -55 to +125                                             | Grade 1           |
| ERJL08 (1206)           | 0.33                            | $\pm 1, \pm 5$                 | 47m to 100m                         | $\pm 100$                                                         | -55 to +125                                             | Grade 1           |
| ERJL14 (1210)           | 0.33                            | $\pm 1, \pm 5$                 | 20m to 100m                         | R < 47m $\Omega$ : $\pm 300$<br>R $\geq$ 47m $\Omega$ : $\pm 100$ | -55 to +125                                             | Grade 1           |
| ERJL12 (1812)           | 0.5                             | $\pm 1, \pm 5$                 | 20m to 100m                         |                                                                   | -55 to +125                                             | Grade 1           |
| ERJL1D (2010)           | 0.5                             | $\pm 1, \pm 5$                 | 40m to 100m                         |                                                                   | -55 to +125                                             | Grade 1           |
| ERJL1W (2512)           | 1                               | $\pm 1, \pm 5$                 | 40m to 100m                         |                                                                   | -55 to +125                                             | Grade 1           |

(1) Standard R.V. : 20m  $\Omega$ , 22m  $\Omega$ , 33m  $\Omega$ , 39m  $\Omega$ , 47m  $\Omega$ , 50m  $\Omega$ , 100m  $\Omega$ , Custom R.V. : Each 1m  $\Omega$  within upper range.

(2) Use it on the condition that the case temperature is below the upper category temperature.

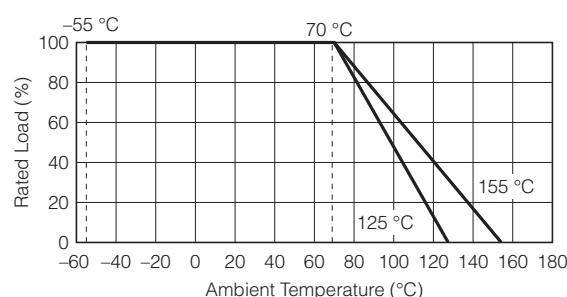
- Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ .
- Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$ .

## Construction

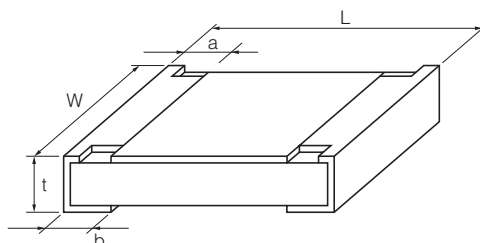


## Power Derating Curve

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



## Dimensions in mm (not to scale)



| Part No.                     | Dimensions (mm) |                 |                 |                 |                 | Mass(Weight)<br>[g/1000 pcs.] |
|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------------------|
|                              | L               | W               | a               | b               | t               |                               |
| ERJ2LW                       | 1.00 $\pm 0.10$ | 0.50 $\pm 0.05$ | 0.25 $\pm 0.10$ | 0.25 $\pm 0.10$ | 0.40 $\pm 0.05$ | 0.8                           |
| ERJ2BW                       | 1.00 $\pm 0.10$ | 0.50 $\pm 0.05$ | 0.24 $\pm 0.10$ | 0.24 $\pm 0.10$ | 0.35 $\pm 0.05$ | 0.8                           |
| ERJ2BS                       | 1.00 $\pm 0.10$ | 0.50 $\pm 0.05$ | 0.20 $\pm 0.10$ | 0.27 $\pm 0.10$ | 0.35 $\pm 0.05$ | 0.8                           |
| ERJ2BQ                       |                 |                 |                 |                 |                 |                               |
| ERJ3LW (5m $\Omega$ )        | 1.60 $\pm 0.15$ | 0.80 $\pm 0.15$ | 0.50 $\pm 0.20$ | 0.50 $\pm 0.20$ | 0.55 $\pm 0.10$ | 3                             |
| ERJ3LW (10m $\Omega$ )       | 1.60 $\pm 0.15$ | 0.80 $\pm 0.15$ | 0.40 $\pm 0.20$ | 0.40 $\pm 0.20$ | 0.55 $\pm 0.10$ | 3                             |
| ERJ3BW                       |                 |                 |                 |                 |                 |                               |
| ERJ3R                        | 1.60 $\pm 0.15$ | 0.80 $\pm 0.15$ | 0.30 $\pm 0.20$ | 0.30 $\pm 0.15$ | 0.45 $\pm 0.10$ | 2                             |
| ERJ3B                        |                 |                 |                 |                 |                 |                               |
| ERJL03                       | 2.00 $\pm 0.20$ | 1.25 $\pm 0.20$ | 0.63 $\pm 0.20$ | 0.63 $\pm 0.20$ | 0.70 $\pm 0.10$ | 6                             |
| ERJ6LW                       |                 |                 |                 |                 |                 |                               |
| ERJ6BW                       | 2.00 $\pm 0.20$ | 1.25 $\pm 0.20$ | 0.55 $\pm 0.20$ | 0.55 $\pm 0.20$ | 0.65 $\pm 0.10$ | 6                             |
| ERJ6CW (10 to 13m $\Omega$ ) |                 |                 |                 |                 |                 |                               |
| ERJ6CW (15 to 30m $\Omega$ ) | 2.05 $\pm 0.20$ | 1.30 $\pm 0.20$ | 0.60 $\pm 0.20$ | 0.60 $\pm 0.20$ | 0.65 $\pm 0.10$ | 6                             |
| ERJ6D                        |                 |                 |                 |                 |                 |                               |
| ERJ6R                        | 2.00 $\pm 0.20$ | 1.25 $\pm 0.10$ | 0.40 $\pm 0.20$ | 0.55 $\pm 0.25$ | 0.60 $\pm 0.10$ | 5                             |
| ERJ6B                        |                 |                 |                 |                 |                 |                               |
| ERJL06                       | 2.00 $\pm 0.20$ | 1.25 $\pm 0.10$ | 0.40 $\pm 0.20$ | 0.40 $\pm 0.20$ | 0.60 $\pm 0.10$ | 5                             |

| Part No.                     | Dimensions (mm) |                 |                 |                 |                 | Mass(Weight)<br>[g/1000 pcs.] |
|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------------------|
|                              | L               | W               | a               | b               | t               |                               |
| ERJ8BW                       | 3.20 $\pm 0.20$ | 1.60 $\pm 0.20$ | 1.00 $\pm 0.20$ | 1.00 $\pm 0.20$ | 0.65 $\pm 0.10$ | 13                            |
| ERJ8CW (10 to 16m $\Omega$ ) | 3.20 $\pm 0.20$ | 1.60 $\pm 0.20$ | 1.10 $\pm 0.20$ | 1.10 $\pm 0.20$ | 0.65 $\pm 0.10$ | 13                            |
| ERJ8CW (18 to 50m $\Omega$ ) | 3.20 $\pm 0.20$ | 1.60 $\pm 0.20$ | 0.60 $\pm 0.20$ | 0.60 $\pm 0.20$ | 0.65 $\pm 0.10$ | 13                            |
| ERJ8R                        | 3.20 $\pm 0.20$ | 1.60 $\pm 0.15$ | 0.50 $\pm 0.20$ | 0.50 $\pm 0.20$ | 0.60 $\pm 0.10$ | 10                            |
| ERJ8B                        |                 |                 |                 |                 |                 |                               |
| ERJL08                       | 3.20 $\pm 0.20$ | 2.50 $\pm 0.20$ | 0.50 $\pm 0.20$ | 0.50 $\pm 0.20$ | 0.60 $\pm 0.10$ | 16                            |
| ERJ14R                       |                 |                 |                 |                 |                 |                               |
| ERJ14B                       | 4.50 $\pm 0.20$ | 3.20 $\pm 0.20$ | 0.50 $\pm 0.20$ | 0.50 $\pm 0.20$ | 0.60 $\pm 0.10$ | 27                            |
| ERJ12R                       |                 |                 |                 |                 |                 |                               |
| ERJ12Z                       | 5.00 $\pm 0.20$ | 2.50 $\pm 0.20$ | 0.60 $\pm 0.20$ | 0.60 $\pm 0.20$ | 0.60 $\pm 0.10$ | 27                            |
| ERJL1D                       | 6.40 $\pm 0.20$ | 3.20 $\pm 0.20$ | 0.65 $\pm 0.20$ | 0.60 $\pm 0.20$ | 0.60 $\pm 0.10$ | 45                            |
| ERJ1TR                       | 6.40 $\pm 0.20$ | 3.20 $\pm 0.20$ | 0.65 $\pm 0.20$ | 1.30 $\pm 0.20$ | 1.10 $\pm 0.10$ | 79                            |
| ERJL1W                       | 6.40 $\pm 0.20$ | 3.20 $\pm 0.20$ | 0.65 $\pm 0.20$ | 1.30 $\pm 0.20$ | 1.10 $\pm 0.10$ | 79                            |

## Performance

- ERJ2LW, 3LW, 6LW, 2BW, 3BW, 6BW, 8BW, 6CW, 8CW  
<High power (double-sided resistive elements structure) type>

| Test Item                    | Performance Requirements   | Test Conditions                                                                       |
|------------------------------|----------------------------|---------------------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                                 |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                                        |
| Overload                     | ±2%                        | Rated Voltage × 2.0, 5 s<br>ERJ6LW : × 1.77, 5 s<br>ERJ8BW (R > 0.05 Ω) : × 1.77, 5 s |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                                          |
| Rapid Change of Temperature  | ±1%<br>ERJ2LW : ±2%        | −55 °C (30 min.) / +155 °C (ERJ*LW, ERJ*CW : +125 °C) (30 min.), 100 cycles           |
| High Temperature Exposure    | ±1%                        | +155 °C (ERJ*LW, ERJ*CW : +125 °C), 1000 h                                            |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95%RH, 1000 h                                                           |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95%RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                  |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                                |

- ERJ2BS/2BQ, 3BS/3BQ, 6BS/6BQ, 8BS/8BQ, 14BS/14BQ, 6D, 3R, 6R, 8R, 14R, 12R, 12Z, 1TR  
<High power type/Standard type>

| Test Item                    | Performance Requirements   | Test Conditions                                                      |
|------------------------------|----------------------------|----------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                       |
| Overload                     | ±2%                        | Rated Voltage × 2.5 (ERJ6D : × 1.77), 5 s                            |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                         |
| Rapid Change of Temperature  | ±1%                        | −55 °C (30 min.) / +155 °C (30 min.), 100 cycles                     |
| High Temperature Exposure    | ±1%                        | +155 °C, 1000 h                                                      |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95%RH, 1000 h                                          |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95%RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h               |

- ERJL03, L06, L08, L14, L12, L1D, L1W <Low TCR type>

| Test Item                    | Performance Requirements   | Test Conditions                                                      |
|------------------------------|----------------------------|----------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                       |
| Overload                     | ±2%                        | Rated Voltage × 2.5, 5 s                                             |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                         |
| Rapid Change of Temperature  | ±1%                        | −55 °C (30 min.) / +125 °C (30 min.), 100 cycles                     |
| High Temperature Exposure    | ±1%                        | +125 °C, 1000 h                                                      |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95%RH, 1000 h                                          |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95%RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h               |

## Current Sensing Resistors, Metal Plate Type

Type: **ERJ MS4, MB1**



### Features

- Ideal for current sensing solution
- Small case size with high power
- Metal plate bonding technology. Excellent long term stability
- Outer Resin with high heat dissipation. Wide temperature range (-65 °C to +170 °C)
- AEC-Q200 qualified
- RoHS compliant
- ISO9001, ISO/TS16949 certified

### ■ As for Packaging Methods, Soldering Conditions and Safety Precautions,

Please see Data Files

### Explanation of Part Numbers

| 1                          | 2 | 3         | 4         | 5              | 6                    | 7         | 8                                                                                        | 9 | 10                | 11                                                | 12       |
|----------------------------|---|-----------|-----------|----------------|----------------------|-----------|------------------------------------------------------------------------------------------|---|-------------------|---------------------------------------------------|----------|
| E                          | R | J         | M         | S              | 4                    | S         | F                                                                                        | 2 | M                 | 0                                                 | U        |
| Product Code               |   | Type Code |           |                | Resistance Tolerance |           | Resistance Value                                                                         |   | Packaging Methods |                                                   |          |
| Metal Plate Chip Resistors |   | Code      | Inch size | Electrode type | Code                 | Tolerance | Shown by 3 digits or letters. Decimal point is expressed by M as 2.0 mΩ=2M0, 10.0 mΩ=10M |   | Code              | Packaging                                         | Part No. |
|                            |   | S4S       | 2512      | Standard       | F                    | ±1 %      |                                                                                          |   | U                 | Embossed Carrier Taping<br>4 mm pitch, 2,000 pcs. | ERJMS4   |
|                            |   | S4H       | 2512      | Narrow         |                      |           |                                                                                          |   |                   | Embossed Carrier Taping<br>4 mm pitch, 3,000 pcs. | ERJMB1   |
|                            |   | B1S       | 1020      | Standard       |                      |           |                                                                                          |   |                   |                                                   |          |

### Ratings

| Part No.<br>(inch size) | Power Rating<br>at 70 °C<br>(W) | Resistance<br>Range<br>(mΩ) | Resistance<br>Tolerance<br>(%) | T.C.R.<br>(×10 <sup>-6</sup> /°C) | Category<br>Temperature Range<br>(°C) | Terminal temp.<br>upper limit<br>(°C) |
|-------------------------|---------------------------------|-----------------------------|--------------------------------|-----------------------------------|---------------------------------------|---------------------------------------|
| ERJMS4S<br>(2512)       | 3                               | 1, 2, 3, 4                  | F : ±1                         | ±75                               | -65 to +170                           | 130                                   |
| ERJMS4H<br>(2512)       | 3                               | 5, 6                        | F : ±1                         | ±75                               | -65 to +170                           | 130                                   |
|                         | 2                               | 7, 8, 9, 10                 | F : ±1                         | ±75                               | -65 to +170                           | 100                                   |
| ERJMB1S<br>(1020)       | 2                               | 1, 2, 3, 4, 5               | F : ±1                         | ±75                               | -65 to +170                           | 130                                   |

\* Please contact us when resistors of irregular series are needed.

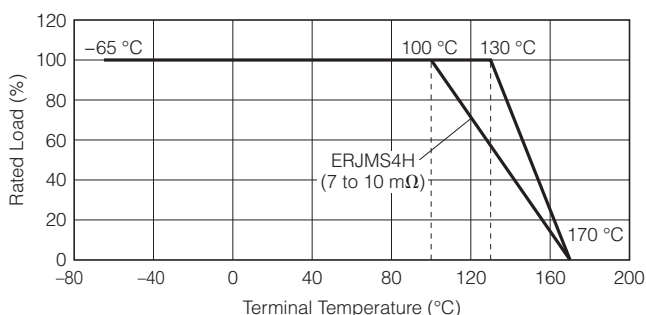
### Power Derating Curve

If the terminal temperature of the resistor is more than terminal temperature upper limit value of the rated table, please reduce the rated power according to the Power Derating Curve shown in the figure on the right.

<Supplemented>

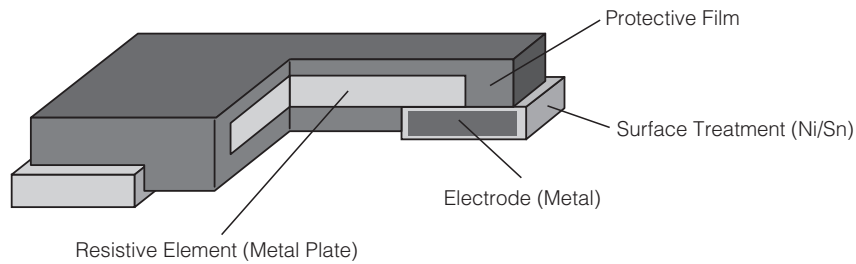
In the case of the temperature measurement of the terminal portion of the resistor, Please perform under the following conditions.

- 1) Terminal temperature measurement, please apply the temperature of the higher of either the left or right electrode upper surface of the resistor.
- 2) Please measure the temperature of the resistor in the land pattern printed of circuit board and plan to use by real conditions.



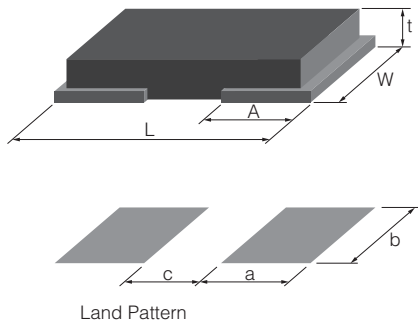
# Panasonic Current Sensing Resistors, Metal Plate Type

## Construction

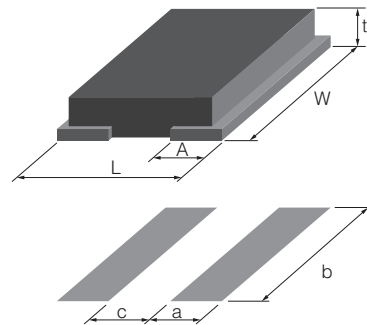


## Dimensions in mm (not to scale), Recommended Land Pattern

### ● ERJMS4S/ERJMS4H

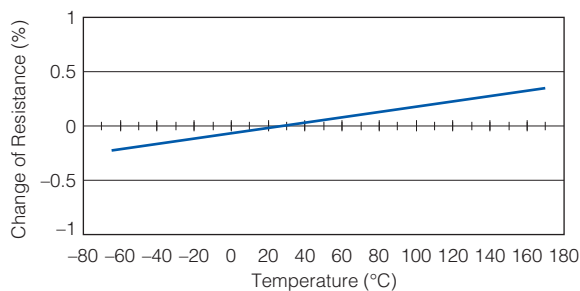


### ● ERJMB1S

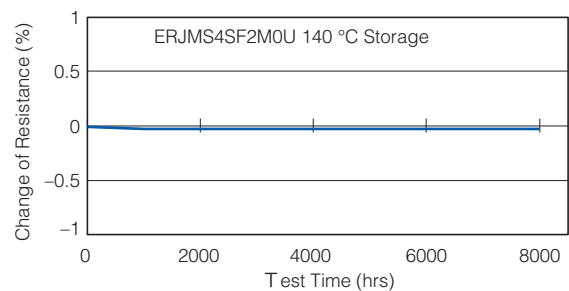


| Part No.<br>(inch size) | Dimension (mm) |           |                                        |           | Recommended Land Pattern (mm) |     |     | Mass (Weight)<br>(g/1000 pcs.) |
|-------------------------|----------------|-----------|----------------------------------------|-----------|-------------------------------|-----|-----|--------------------------------|
|                         | L              | W         | A                                      | t         | a                             | b   | c   |                                |
| ERJMS4S<br>(2512)       | 6.40±0.25      | 3.20±0.25 | 2.20±0.25                              | 1.20±0.15 | 2.7                           | 3.4 | 2.0 | 120                            |
| ERJMS4H<br>(2512)       | 6.40±0.25      | 3.20±0.25 | 1.25±0.25                              | 1.20±0.15 | 1.7                           | 3.4 | 4.0 | 115                            |
| ERJMB1S<br>(1020)       | 2.55±0.25      | 5.00±0.25 | 0.68 <sup>+0.15</sup> <sub>-0.20</sub> | 0.90±0.15 | 1.15                          | 5.5 | 1.1 | 40                             |

## Typical Temperature dependence of electrical resistance



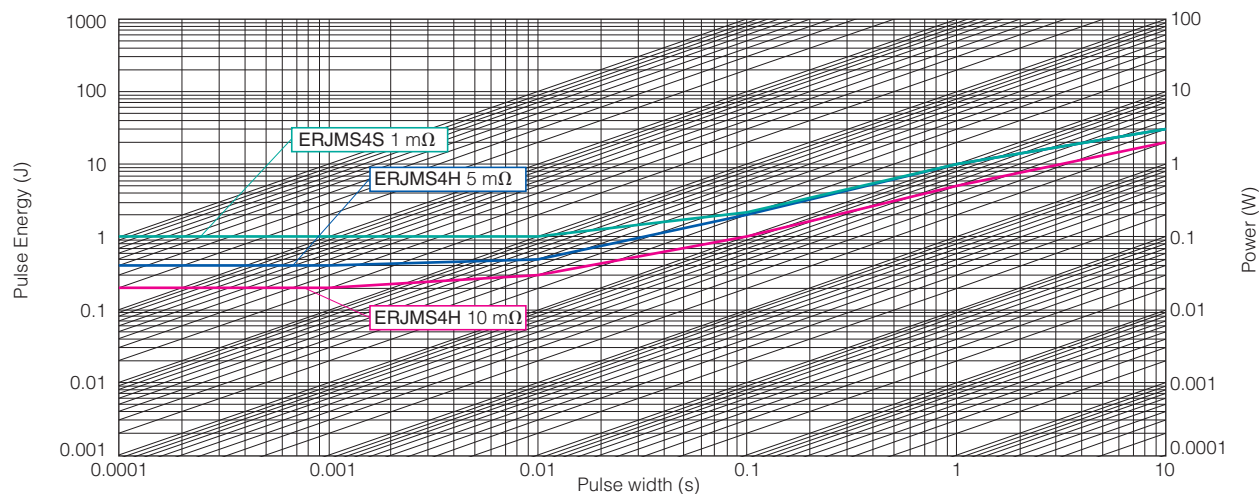
## Long-term stability



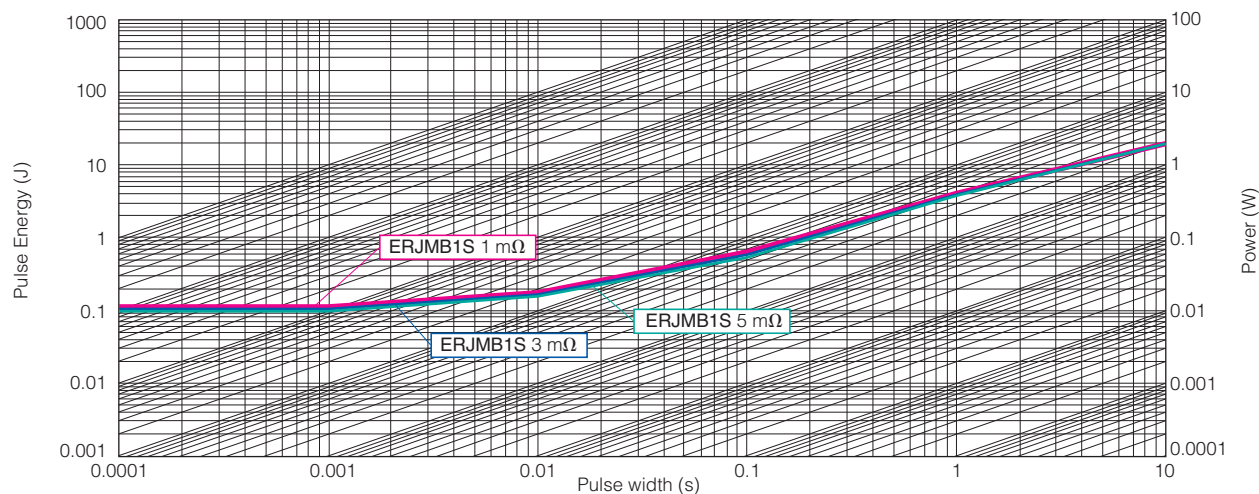
## Maximum pulse energy respectively pulse power for continuous operation

Reference Data  
Condition : Room Temperature, OFF : 10 s, 1000 cycle, Wave form : Square  
Change of Resistance =  $\pm 1\%$

### ● ERJMS4 Series



### ● ERJMB1 Series



## Performance (AEC-Q200)

### ● ERJMS4 Series

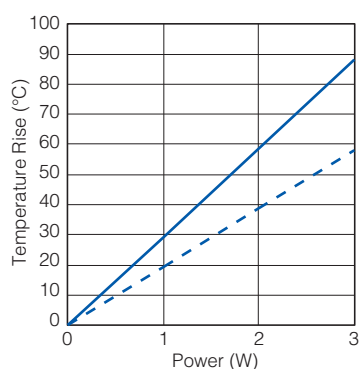
| Test Item                             | Performance Requirements | Typical value  | Test Condition                        |
|---------------------------------------|--------------------------|----------------|---------------------------------------|
| Thermal Shock                         | $\pm 1 \%$               | 0.20 %         | -55 °C/+155 °C, 1000 cycles           |
| Overload                              | $\pm 0.5 \%$             | 0.10 %         | 3 × Rated Power, 5 s                  |
| Solderability                         | > 95% coverage           | > 95% coverage | 245 °C, 3 s                           |
| Resistance to Solvents                | No damage                | No damage      | MIL-STD-202 method 215, 2.1a, 2.1d    |
| Low Temperature Storage and Operation | $\pm 0.5 \%$             | 0.03 %         | -65 °C, 24 h                          |
| Resistance to Soldering Heat          | $\pm 0.5 \%$             | 0.10 %         | MIL-STD-202 method 210 (260 °C, 10 s) |
| Moisture Resistance                   | $\pm 0.5 \%$             | 0.10 %         | MIL-STD-202 method 106                |
| Shock                                 | $\pm 0.5 \%$             | 0.10 %         | MIL-STD-202 method 213-A              |
| Vibration, High Frequency             | $\pm 0.5 \%$             | 0.05 %         | 10 to 2000 (Hz)                       |
| Life                                  | $\pm 1 \%$               | 0.30 %         | 70 °C, Rated Power, 2000 h            |
| Storage Life at Elevated Temperature  | $\pm 1 \%$               | 0.30 %         | 170 °C, 2000 h                        |
| High Temperature Characteristics      | $\pm 0.5 \%$             | 0.05 %         | 140 °C, 2000 h                        |
| Frequency Characteristics             | < 5 nH                   | < 2 nH         | Inductance                            |

### ● ERJMB1 Series

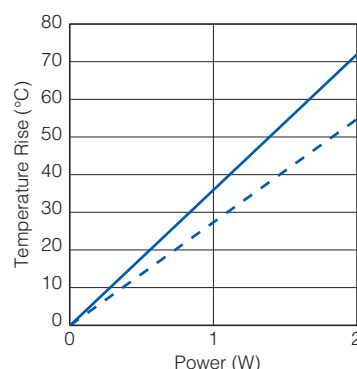
| Test Item                             | Performance Requirements | Typical value  | Test Condition                        |
|---------------------------------------|--------------------------|----------------|---------------------------------------|
| Thermal Shock                         | $\pm 1 \%$               | 0.30 %         | -55 °C/+155 °C, 1000 cycles           |
| Overload                              | $\pm 1 \%$               | 0.30 %         | 2.5 × Rated Power, 5 s                |
| Solderability                         | > 95% coverage           | > 95% coverage | 245 °C, 3 s                           |
| Resistance to Solvents                | No damage                | No damage      | MIL-STD-202 method 215, 2.1a, 2.1d    |
| Low Temperature Storage and Operation | $\pm 0.5 \%$             | 0.03 %         | -65 °C, 24 h                          |
| Resistance to Soldering Heat          | $\pm 0.5 \%$             | 0.10 %         | MIL-STD-202 method 210 (260 °C, 10 s) |
| Moisture Resistance                   | $\pm 0.5 \%$             | 0.10 %         | MIL-STD-202 method 106                |
| Shock                                 | $\pm 0.5 \%$             | 0.10 %         | MIL-STD-202 method 213-A              |
| Vibration, High Frequency             | $\pm 0.5 \%$             | 0.05 %         | 10 to 2000 (Hz)                       |
| Life                                  | $\pm 1 \%$               | 0.30 %         | 70 °C, Rated Power, 2000 h            |
| Storage Life at Elevated Temperature  | $\pm 1 \%$               | 0.30 %         | 170 °C, 2000 h                        |
| High Temperature Characteristics      | $\pm 0.5 \%$             | 0.05 %         | 140 °C, 2000 h                        |
| Frequency Characteristics             | < 5 nH                   | < 2 nH         | Inductance                            |

## Temperature Rise

### ● ERJMS4HF5M0U

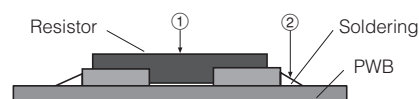


### ● ERJMB1SF3M0U

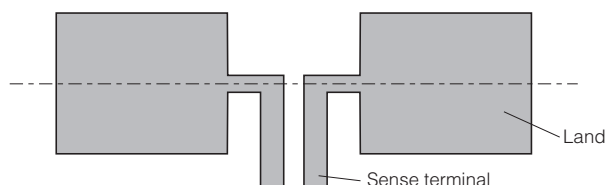


① ————  
② - - - -

<Condition>  
Base material : FR-4 (t1.6mm)  
Copper Thickness : 70  $\mu$ m, Two layer



## Sense terminal-Layout



## High Power Chip Resistors / Wide Terminal Type



Type: **ERJ A1, B1, B2, B3**

### Features

- High solder-joint reliability by wide terminal construction
- Excellent heat dissipation characteristics by wide terminal construction
- AEC-Q200 qualified
- RoHS compliant

### Recommended Applications

- Automotive electronic circuits including ECUs (Electrical control unit), anti-lock breaking systems and air-bag systems
- Current sensing for power supply circuits in a variety of equipment

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

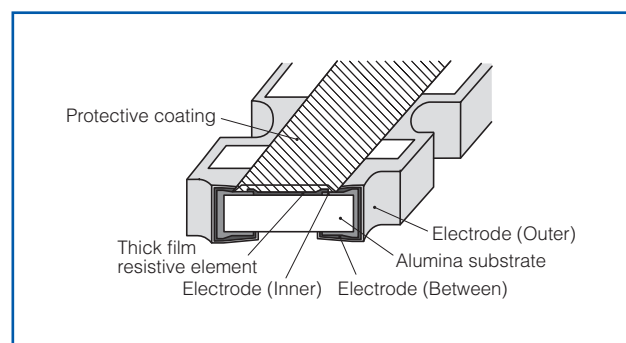
|                           |  |                                                                                                                                                                                          |      |                               |                         |                      |  |                      |       |   |                   |   |  |   |  |   |  |   |  |    |  |                                                   |  |                |  |
|---------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------|-------------------------|----------------------|--|----------------------|-------|---|-------------------|---|--|---|--|---|--|---|--|----|--|---------------------------------------------------|--|----------------|--|
|                           |  | 1                                                                                                                                                                                        |      | 2                             |                         | 3                    |  | 4                    |       | 5 |                   | 6 |  | 7 |  | 8 |  | 9 |  | 10 |  | 11                                                |  |                |  |
|                           |  | E                                                                                                                                                                                        |      | R                             |                         | J                    |  | A                    |       | 1 |                   | A |  | J |  | 1 |  | 0 |  | 2  |  | U                                                 |  |                |  |
| Product Code              |  | Size, Power Rating                                                                                                                                                                       |      |                               | Resistance Value Region |                      |  | Resistance Tolerance |       |   | Packaging Methods |   |  |   |  |   |  |   |  |    |  |                                                   |  |                |  |
| Thick Film Chip Resistors |  | Code                                                                                                                                                                                     | Inch | Power R.                      | A                       | 10 Ω ≤ R             |  | F                    | ± 1 % |   | Code              |   |  |   |  |   |  |   |  |    |  | Packaging                                         |  | Part No.       |  |
|                           |  | A1                                                                                                                                                                                       | 1225 | 1.33 W                        | B                       | 0.22 Ω ≤ R < 10 Ω    |  | G                    | ± 2 % |   | V                 |   |  |   |  |   |  |   |  |    |  | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  |  | ERJB2<br>ERJB3 |  |
|                           |  | B1                                                                                                                                                                                       | 1020 | 1 W,<br>2 W<br>(R ≤ 10 Ω)     | C                       | 0.01 Ω ≤ R < 0.22 Ω  |  | J                    | ± 5 % |   | U                 |   |  |   |  |   |  |   |  |    |  | Embossed Carrier Taping<br>4 mm pitch, 5,000 pcs. |  | ERJB1          |  |
|                           |  | B2                                                                                                                                                                                       | 0612 | 0.75 W,<br>1 W<br>(R ≤ 10 Ω)  | D                       | 0.005 Ω ≤ R < 0.01 Ω |  |                      |       |   |                   |   |  |   |  |   |  |   |  |    |  | Embossed Carrier Taping<br>4 mm pitch, 4,000 pcs. |  | ERJA1          |  |
|                           |  | B3                                                                                                                                                                                       | 0508 | 0.33 W,<br>0.5 W<br>(R ≤ 1 Ω) | Resistance Value        |                      |  |                      |       |   |                   |   |  |   |  |   |  |   |  |    |  |                                                   |  |                |  |
|                           |  | Shown by 3 digits or letters. Only when it is impossible, shown by 4 digits or letters.<br>(Ex.) 102 : 1.0k Ω      R01 : 0.01 Ω = 10m Ω<br>4R7 : 4.7 Ω            R015 : 0.015 Ω = 15m Ω |      |                               |                         |                      |  |                      |       |   |                   |   |  |   |  |   |  |   |  |    |  |                                                   |  |                |  |

## Ratings

| Part No.<br>(inch size) | Power Rating <sup>(3)</sup><br>at 70 °C<br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω)             | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ )                                                                                                  | Category<br>Temperature<br>Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|
| ERJA1<br>(1225)         | 1.33                                           | 200                                               | 400                                               | ±1                             | 100m to 10k (E24)                      | ±100                                                                                                                                             | -55 to +155                              | Grade 0           |
|                         |                                                |                                                   |                                                   | ±2, ±5                         | 10m to 10k (E24)                       | R < 100m Ω : ±350<br>100m Ω ≤ R : ±200                                                                                                           |                                          |                   |
| ERJB1<br>(1020)         | 1<br>2(R ≤ 10 Ω)                               | 200                                               | 400                                               | ±1                             | 10m to 10k (E24)                       | R < 22m Ω : ±350<br>22m Ω ≤ R < 47m Ω : ±200<br>47m Ω ≤ R < 100m Ω : ±150<br>100m Ω ≤ R : ±100                                                   | -55 to +155                              | Grade 0           |
|                         |                                                |                                                   |                                                   | ±2, ±5                         | 10m to 10k (E24)                       | R < 22m Ω : ±350<br>22m Ω ≤ R : ±200                                                                                                             |                                          |                   |
| ERJB2<br>(0612)         | 0.75<br>1(R ≤ 10 Ω)                            | 200                                               | 400                                               | ±1                             | 10m to 1M (E24)                        | R < 22m Ω : 0 to +300<br>22m Ω ≤ R < 47m Ω : 0 to +200<br>47m Ω ≤ R < 100m Ω : 0 to +150<br>100m Ω ≤ R < 220m Ω : 0 to +100<br>220m Ω ≤ R : ±100 | -55 to +155                              | Grade 0           |
|                         |                                                |                                                   |                                                   | ±2                             | 10m to 1M (E24)                        | R < 22m Ω : 0 to +300<br>22m Ω ≤ R < 47m Ω : 0 to +200<br>47m Ω ≤ R < 100m Ω : 0 to +150<br>100m Ω ≤ R < 220m Ω : 0 to +200<br>220m Ω ≤ R : ±200 |                                          |                   |
|                         |                                                |                                                   |                                                   | ±5                             | 5m, 6m, 7m, 8m, 9m,<br>10m to 1M (E24) | R < 22m Ω : 0 to +300<br>22m Ω ≤ R < 47m Ω : 0 to +200<br>47m Ω ≤ R < 100m Ω : 0 to +150<br>100m Ω ≤ R < 220m Ω : 0 to +200<br>220m Ω ≤ R : ±200 |                                          |                   |
| ERJB3<br>(0508)         | 0.33<br>0.5(R ≤ 1 Ω)                           | 150                                               | 200                                               | ±1                             | 20m to 10 (E24)                        | R < 47m Ω : 0 to +300<br>47m Ω ≤ R < 1 Ω : 0 to +200<br>1 Ω ≤ R : ±100                                                                           | -55 to +155                              | Grade 0           |
|                         |                                                |                                                   |                                                   | ±2, ±5                         | 20m to 10 (E24)                        | R < 47m Ω : 0 to +300<br>47m Ω ≤ R < 1 Ω : 0 to +200<br>1 Ω ≤ R : ±200                                                                           |                                          |                   |

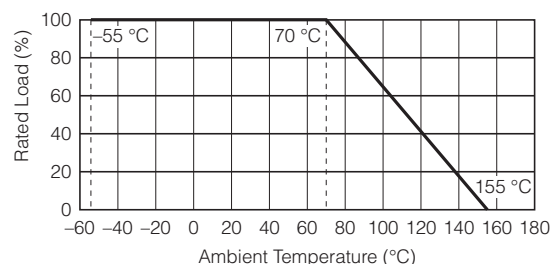
- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$  or Maximum Overload Voltage listed above, whichever less.  
(3) Use it on the condition that the case temperature is below the upper category temperature.

## Construction (Example : ERJA1 type)



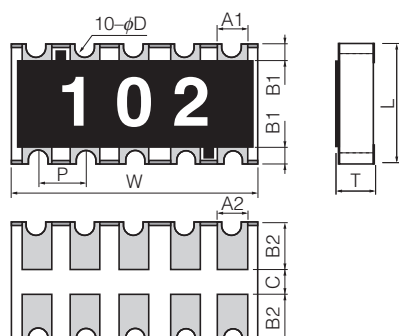
## Power Derating Curve

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



## Dimensions in mm (not to scale)

ERJA1 type

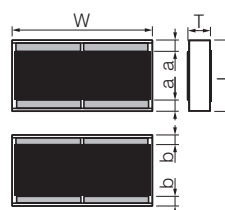


Mass (Weight) [1000 pcs.] : 40 g

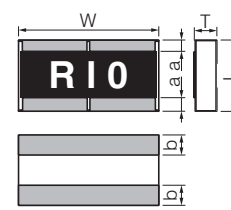
| Dimensions (mm) | L              | W              | T         | A <sub>1</sub>                         | B <sub>1</sub> |
|-----------------|----------------|----------------|-----------|----------------------------------------|----------------|
|                 | 3.20±0.20      | 6.40±0.20      | 0.55±0.10 | 0.70±0.20                              | 0.45±0.20      |
| Dimensions (mm) | A <sub>2</sub> | B <sub>2</sub> | P         | φD                                     | C              |
|                 | 0.70±0.20      | 1.25±0.15      | 1.27±0.10 | 0.30 <sup>+0.10</sup> <sub>-0.20</sub> | 0.4 min.       |

ERJB2 type

(  $R < 10\text{m}\Omega$  )



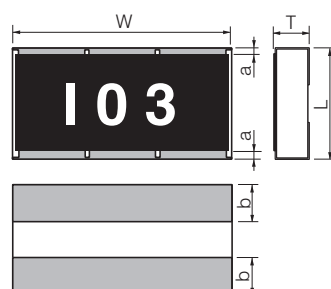
(  $10\text{m}\Omega \leq R \leq 1\text{M}\Omega$  )



Mass (Weight) [1000 pcs.] : 11 g

| Dimensions (mm)  | L         | W         | T         | a         | b         |
|------------------|-----------|-----------|-----------|-----------|-----------|
| 5mΩ ≤ R < 10mΩ   | 1.60±0.15 | 3.20±0.20 | 0.65±0.15 | 0.30±0.20 | 0.30±0.20 |
| 10mΩ ≤ R < 220mΩ |           |           | 0.55±0.15 | 0.30±0.20 | 0.50±0.20 |
| 220mΩ ≤ R ≤ 1MΩ  |           |           |           |           |           |
|                  |           |           |           | 0.25±0.20 |           |

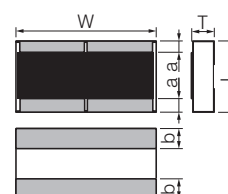
ERJB1 type



Mass (Weight) [1000 pcs.] : 27 g

| Dimensions (mm) | L         | W         | T         | a         | b         |
|-----------------|-----------|-----------|-----------|-----------|-----------|
|                 | 2.50±0.20 | 5.00±0.20 | 0.55±0.20 | 0.25±0.20 | 0.90±0.20 |

ERJB3 type

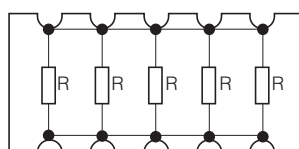


Mass (Weight) [1000 pcs.] : 4.8 g

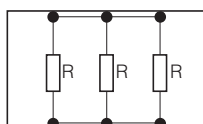
| Dimensions (mm) | L         | W         | T         | a         | b         |
|-----------------|-----------|-----------|-----------|-----------|-----------|
|                 | 1.25±0.10 | 2.00±0.15 | 0.50±0.10 | 0.25±0.20 | 0.40±0.20 |

## Circuit Configuration

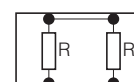
ERJA1 type



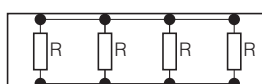
ERJB1 type



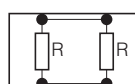
ERJB3 type



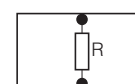
< Less than 10mΩ >



< Low resistance zone >



< High resistance zone >



| Performance                  |                            |                                                                                                                                                                                          |
|------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Item                    | Performance Requirements   | Test Conditions                                                                                                                                                                          |
| Resistance                   | Within Specified Tolerance | 20 °C                                                                                                                                                                                    |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                                                                                                                                           |
| Overload                     | ±2%                        | ERJA1, ERJB1 (R > 10), ERJB3 (R > 1) : Rated Voltage × 2.5, 5 s<br>ERJB2 (R > 10) : Rated Voltage × 2.2, 5 s<br>ERJB1 (R ≤ 10), ERJB2 (R ≤ 10), ERJB3 (R ≤ 1) : Rated Voltage × 2.0, 5 s |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                                                                                                                                             |
| Rapid Change of Temperature  | ±2%                        | −55 °C (30min.) / +125 °C (30min.), 1000 cycles                                                                                                                                          |
| High Temperature Exposure    | ±1%                        | +155 °C, 1000 h                                                                                                                                                                          |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95 %RH, 1000 h                                                                                                                                                             |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95 %RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                                                                                                                    |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                                                                                                                                   |

## Low TCR High Power Chip Resistors / Wide Terminal Type

.010

.010

Type: **ERJ D1, D2**

### Features

- Achieved High power and low TCR ( $\pm 100 \times 10^{-6}/^{\circ}\text{C}$ ) using wide terminal electrode structure and original material
- Suitable for small size/high power current detection (Low TCR enables high accuracy of current detection)
- High solder-joint reliability by wide terminal construction
- Excellent heat dissipation characteristics by wide terminal construction
- AEC-Q200 qualified
- RoHS compliant

### Recommended Applications

- Automotive electronic circuits including ECUs (Electrical control unit), anti-lock breaking systems and air-bag systems
- Current sensing for power supply circuits in a variety of equipment

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

|                                              |      |      |          |                         |   |                      |   |                                                                 |   |                   |                                                   |          |
|----------------------------------------------|------|------|----------|-------------------------|---|----------------------|---|-----------------------------------------------------------------|---|-------------------|---------------------------------------------------|----------|
|                                              | 1    | 2    | 3        | 4                       | 5 | 6                    | 7 | 8                                                               | 9 | 10                | 11                                                | 12       |
|                                              | E    | R    | J        | D                       | 1 | D                    | F | R                                                               | 0 | 1                 | 0                                                 | U        |
| Product Code<br>Thick Film<br>Chip Resistors | Code | Inch | Power R. | Resistance Value Region |   | Resistance Tolerance |   | Resistance Value                                                |   | Packaging Methods |                                                   |          |
|                                              | D1C  | 1020 | 2 W      | 22m Ω ≤ R ≤ 200m Ω      |   | F ±1 %               |   | Shown by 4 digits or letters.<br><br>(Ex.) R010 : 0.010 Ω=10m Ω |   | Code              | Packaging                                         | Part No. |
|                                              | D1D  |      |          | 10m Ω ≤ R ≤ 20m Ω       |   | J ±5 %               |   |                                                                 |   | U                 | Embossed Carrier Taping<br>4 mm pitch, 5,000 pcs. | ERJD1    |
|                                              | D2C  | 0612 | 1 W      | 33m Ω ≤ R ≤ 200m Ω      |   |                      |   |                                                                 |   | V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  | ERJD2    |
|                                              | D2D  |      |          | 10m Ω ≤ R ≤ 30m Ω       |   |                      |   |                                                                 |   |                   |                                                   |          |

### Ratings

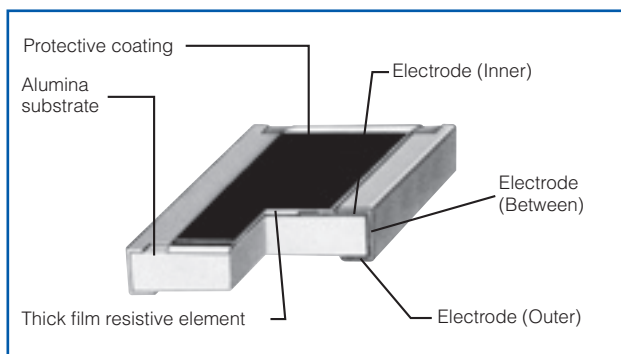
| Part No.<br>(inch size) | Power Rating <sup>(2)</sup><br>at 70 °C (W) | Resistance Tolerance<br>(%) | Resistance Range <sup>(1)</sup><br>( $\Omega$ ) | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ ) | Category Temperature Range<br>(°C) | AEC-Q200 Grade |
|-------------------------|---------------------------------------------|-----------------------------|-------------------------------------------------|-------------------------------------------------|------------------------------------|----------------|
| ERJD1<br>(1020)         | 2                                           | ±1, ±5                      | 10m to 200m (E24)                               | ±100                                            | -55 to +155                        | Grade 0        |
| ERJD2<br>(0612)         | 1                                           | ±1, ±5                      | 10m to 200m (E24)                               | ±100                                            |                                    |                |

(1) Please contact us when resistors of irregular series are needed.

(2) Use it on the condition that the case temperature is below the upper category temperature.

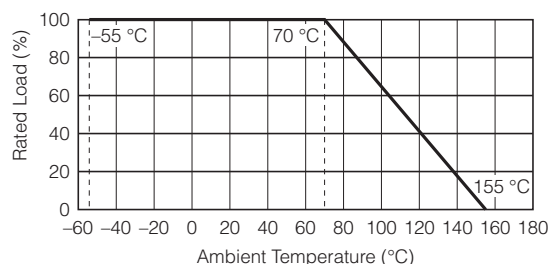
- Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ .
- Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$ .

## Construction

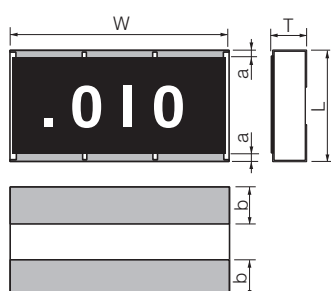


## Power Derating Curve

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

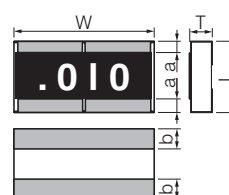


## Dimensions in mm (not to scale)



Mass (Weight) [1000 pcs.] : 27 g

| Part No. | Dimensions (mm) |           |           |           |           |
|----------|-----------------|-----------|-----------|-----------|-----------|
|          | L               | W         | T         | a         | b         |
| ERJD1    | 2.50±0.20       | 5.00±0.20 | 0.60±0.20 | 0.30±0.20 | 0.90±0.20 |

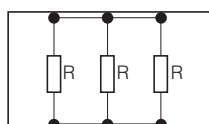


Mass (Weight) [1000 pcs.] : 11 g

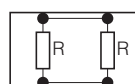
| Part No. | Dimensions (mm) |           |           |           |           |
|----------|-----------------|-----------|-----------|-----------|-----------|
|          | L               | W         | T         | a         | b         |
| ERJD2    | 1.60±0.15       | 3.20±0.20 | 0.65±0.15 | 0.30±0.20 | 0.50±0.20 |

## Circuit Configuration

ERJD1 type



ERJD2 type



## Performance

| Test Item                    | Performance Requirements   | Test Conditions                                                       |
|------------------------------|----------------------------|-----------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                 |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                        |
| Overload                     | ±2%                        | Rated Voltage × 2.0, 5 s                                              |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                          |
| Rapid Change of Temperature  | ±2%                        | −55 °C (30min.) / +125 °C (30min.), 1000 cycles                       |
| High Temperature Exposure    | ±1%                        | +155 °C, 1000 h                                                       |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95%RH, 1000 h                                           |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95 %RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                |

## Anti-Surge Thick Film Chip Resistors

Type: **ERJ PA2, P03, PA3, P06, P08, P14**



### Features

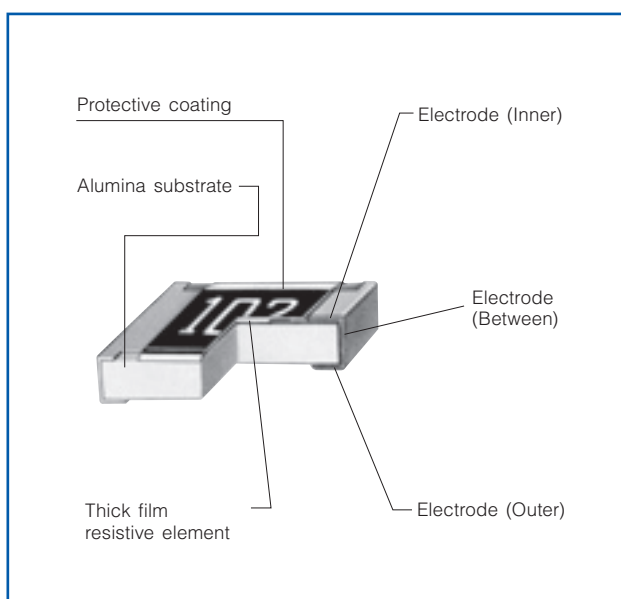
- ESD surge characteristics superior to standard metal film resistors
- High reliability  
Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- High power ... 0.20 W : 0402 inch / 1005 mm size (ERJPA2), 0603 inch / 1608 mm size (ERJP03)  
0.25 W : 0603 inch / 1608 mm size (ERJPA3)  
0.50 W : 0805 inch / 2012 mm size (ERJP06), 1210 inch / 3225 mm size (ERJP14)  
0.66 W : 1206 inch / 3216 mm size (ERJP08)
- Reference Standards... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

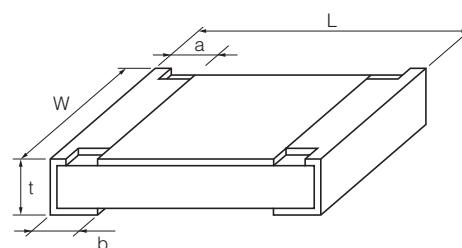
### Explanation of Part Numbers

|                                              |                    |      |          |                      |             |                                                                                                                                                                                                                                                                       |   |   |   |                   |                                                   |                                      |
|----------------------------------------------|--------------------|------|----------|----------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|-------------------|---------------------------------------------------|--------------------------------------|
|                                              | 1                  | 2    | 3        | 4                    | 5           | 6                                                                                                                                                                                                                                                                     | 7 | 8 | 9 | 10                | 11                                                | 12                                   |
|                                              | E                  | R    | J        | P                    | 0           | 6                                                                                                                                                                                                                                                                     | D | 1 | 0 | 0                 | 2                                                 | V                                    |
| Product Code<br>Thick Film<br>Chip Resistors | Size, Power Rating |      |          | Resistance Tolerance |             | Resistance Value                                                                                                                                                                                                                                                      |   |   |   | Packaging Methods |                                                   |                                      |
|                                              | Code               | Inch | Power R. | Code                 | Tolerance   | The first two or three digits are significant figures of resistance and the third or 4th one denotes number of zeros following.<br>Three digit type ( $\pm 5\%$ ),<br>four digit type ( $\pm 1\%$ , $\pm 0.5\%$ )<br>Example: 222→2.2 k $\Omega$ , 1002→10 k $\Omega$ |   |   |   | Code              | Packaging                                         | Part No.                             |
|                                              | PA2                | 0402 | 0.20 W   | D                    | $\pm 0.5\%$ |                                                                                                                                                                                                                                                                       |   |   |   | X                 | Punched Carrier Taping<br>2 mm pitch, 10,000 pcs. | ERJPA2                               |
|                                              | P03                | 0603 | 0.20 W   | F                    | $\pm 1\%$   |                                                                                                                                                                                                                                                                       |   |   |   | V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  | ERJP03<br>ERJPA3<br>ERJP06<br>ERJP08 |
|                                              | PA3                | 0603 | 0.25 W   | J                    | $\pm 5\%$   |                                                                                                                                                                                                                                                                       |   |   |   | U                 | Embossed Carrier Taping<br>4 mm pitch, 5,000 pcs. | ERJP14                               |
|                                              | P06                | 0805 | 0.50 W   |                      |             |                                                                                                                                                                                                                                                                       |   |   |   |                   |                                                   |                                      |
|                                              | P08                | 1206 | 0.66 W   |                      |             |                                                                                                                                                                                                                                                                       |   |   |   |                   |                                                   |                                      |
|                                              | P14                | 1210 | 0.50 W   |                      |             |                                                                                                                                                                                                                                                                       |   |   |   |                   |                                                   |                                      |

### Construction



### Dimensions in mm (not to scale)



| Part No. | Dimensions (mm)                     |                                     |                                     |                 |                 | Mass (Weight)<br>[g/1000 pcs.] |
|----------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------|-----------------|--------------------------------|
|          | L                                   | W                                   | a                                   | b               | t               |                                |
| ERJPA2   | 1.00 $\pm 0.05$                     | 0.50 $\pm 0.05$                     | 0.20 $\pm 0.15$                     | 0.25 $\pm 0.05$ | 0.35 $\pm 0.05$ | 0.8                            |
| ERJP03   | 1.60 $\pm 0.15$                     | 0.80 $\pm 0.15$<br><sub>-0.05</sub> | 0.15 $\pm 0.15$<br><sub>-0.10</sub> | 0.30 $\pm 0.15$ | 0.45 $\pm 0.10$ | 2                              |
| ERJPA3   | 1.60 $\pm 0.15$                     | 0.80 $\pm 0.15$<br><sub>-0.05</sub> | 0.15 $\pm 0.15$<br><sub>-0.10</sub> | 0.25 $\pm 0.10$ | 0.45 $\pm 0.10$ | 2                              |
| ERJP06   | 2.00 $\pm 0.20$                     | 1.25 $\pm 0.10$                     | 0.25 $\pm 0.20$                     | 0.40 $\pm 0.20$ | 0.60 $\pm 0.10$ | 4                              |
| ERJP08   | 3.20 $\pm 0.05$<br><sub>-0.20</sub> | 1.60 $\pm 0.05$<br><sub>-0.15</sub> | 0.40 $\pm 0.20$                     | 0.50 $\pm 0.20$ | 0.60 $\pm 0.10$ | 10                             |
| ERJP14   | 3.20 $\pm 0.20$                     | 2.50 $\pm 0.20$                     | 0.35 $\pm 0.20$                     | 0.50 $\pm 0.20$ | 0.60 $\pm 0.10$ | 16                             |

## Ratings

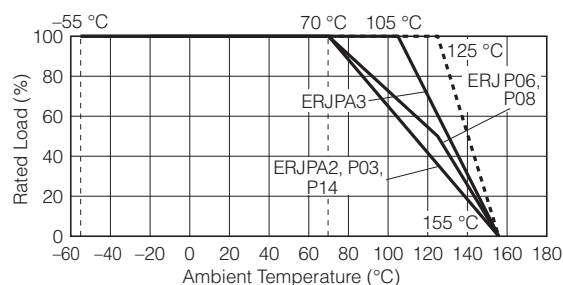
| Part No.<br>(inch size) | Power<br>Rating <sup>(3)</sup><br>at 70 °C<br>(W) | Limiting<br>Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ )                                                                                       | Category<br>Temperature<br>Range (°C) | AEC-Q200<br>Grade |
|-------------------------|---------------------------------------------------|------------------------------------------------------|------------------------------------------------------|--------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------|
| ERJPA2<br>(0402)        | 0.20                                              | 50                                                   | 100                                                  | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\pm 100$                                                                                                                             | -55 to +155                           | Grade 0           |
|                         |                                                   |                                                      |                                                      | $\pm 5$                        | 10 to 1M (E24)             | $\pm 200$                                                                                                                             |                                       |                   |
| ERJP03<br>(0603)        | 0.20                                              | 150                                                  | 200                                                  | $\pm 0.5$                      | 10 to 1M (E24, E96)        | $\pm 150$                                                                                                                             | -55 to +155                           | Grade 0           |
|                         |                                                   |                                                      |                                                      | $\pm 1$                        | 10 to 1M (E24, E96)        | $\pm 200$                                                                                                                             |                                       |                   |
|                         |                                                   |                                                      |                                                      | $\pm 5$                        | 1 to 1M (E24)              | $\begin{matrix} R < 10 \Omega & : -150 \text{ to } +400 \\ 10 \Omega \leq R & : \pm 200 \end{matrix}$                                 |                                       |                   |
| ERJPA3<br>(0603)        | 0.25<br>(105 °C)                                  | 150                                                  | 200                                                  | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\pm 100$                                                                                                                             | -55 to +155                           | Grade 0           |
|                         |                                                   |                                                      |                                                      | $\pm 5$                        | 1 to 1.5M (E24)            | $\pm 200$                                                                                                                             |                                       |                   |
| ERJP06<br>(0805)        | 0.50                                              | 400                                                  | 600                                                  | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\begin{matrix} R < 33 \Omega & : \pm 300 \\ 33 \Omega \leq R & : \pm 100 \end{matrix}$                                               | -55 to +155                           | Grade 0           |
|                         |                                                   |                                                      |                                                      | $\pm 5$                        | 1 to 3.3M (E24)            | $\begin{matrix} R < 10 \Omega & : -100 \text{ to } +600 \\ 10 \Omega \leq R & : \pm 300 \\ 33 \Omega \leq R & : \pm 200 \end{matrix}$ |                                       |                   |
| ERJP08<br>(1206)        | 0.66                                              | 500                                                  | 1000                                                 | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\pm 100$                                                                                                                             | -55 to +155                           | Grade 0           |
|                         |                                                   |                                                      |                                                      | $\pm 5$                        | 1 to 10M (E24)             | $\begin{matrix} R < 10 \Omega & : -100 \text{ to } +600 \\ 10 \Omega \leq R & : \pm 200 \end{matrix}$                                 |                                       |                   |
| ERJP14<br>(1210)        | 0.50                                              | 200                                                  | 400                                                  | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\pm 100$                                                                                                                             | -55 to +155                           | Grade 0           |
|                         |                                                   |                                                      |                                                      | $\pm 5$                        | 1 to 1M (E24)              | $\begin{matrix} R < 10 \Omega & : -100 \text{ to } +600 \\ 10 \Omega \leq R & : \pm 200 \end{matrix}$                                 |                                       |                   |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$  or Maximum Overload Voltage listed above, whichever less.  
(3) Use it on the condition that the case temperature is below the upper category temperature.

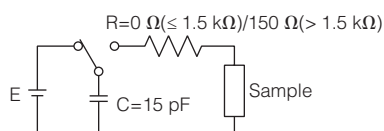
## Power Derating Curve

For resistors operated in rated temperatures above 70 °C or 105 °C, power rating shall be derated in accordance with the figure on the right.

\* When the temperature of ERJP14 is 155 °C or less, the derating start temperature can be changed to 125 °C. (See the dotted line)

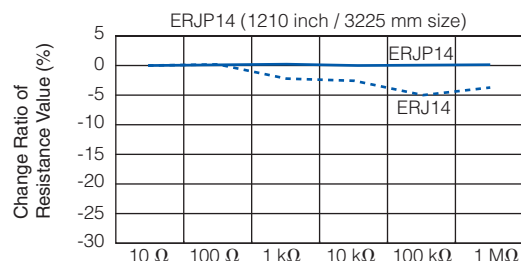
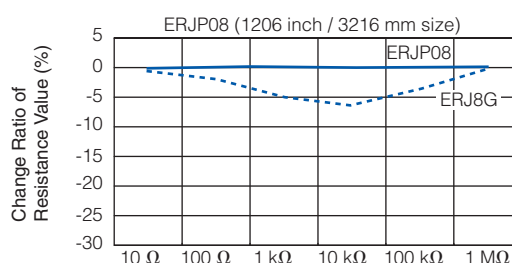
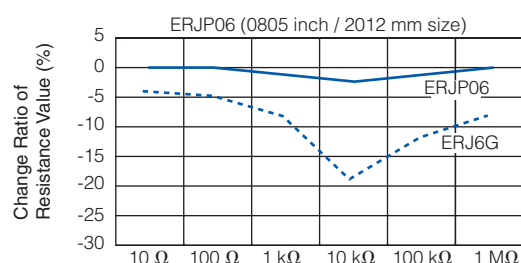
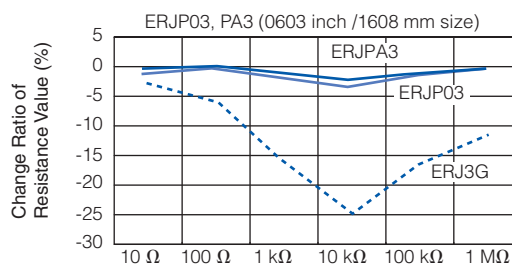
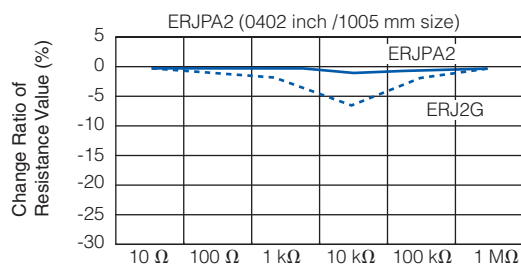


## ESD Characteristic



0402 inch size : E=±1 kV  
0603, 0805, 1206, 1210 inch size : E=±3 kV

— Anti-Surge Thick Film Chip Resistors (ERJP Series)  
- - - Thick Film Chip Resistors (ERJ Series)



## Performance

| Test Item                            | Performance Requirements                             | Test Conditions                                                                                                                |
|--------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Resistance                           | Within Specified Tolerance                           | 20 °C                                                                                                                          |
| T. C. R.                             | Within Specified T. C. R.                            | +25 °C/+155 °C (ERJPA2 : +125 °C)                                                                                              |
| Overload                             | ±2 %<br>Only when it is ERJP03 (D), P14 (D) : ±0.5 % | ERJP06 : Rated Voltage×1.77, 5 s<br>ERJPA2, ERJPA3, ERJP08 : Rated Voltage×2.0, 5 s<br>ERJP03, ERJP14 : Rated Voltage×2.5, 5 s |
| Resistance to Soldering Heat         | D : ±0.5 %, F, J : ±1 %                              | 270 °C, 10 s                                                                                                                   |
| Rapid Change of Temperature          | ±1 %                                                 | −55 °C (30min.) / +155 °C (30min.) , 100 cycles                                                                                |
| High Temperature Exposure            | ±1 %                                                 | +155 °C, 1000 h                                                                                                                |
| Damp Heat, Steady State              | ±1 %                                                 | 60 °C, 90 % to 95 %RH, 1000 h                                                                                                  |
| Load Life in Humidity                | ±3 %<br>Only when it is ERJP03 (D), P14 (D) : ±1 %   | 60 °C, 90 % to 95 %RH,<br>Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                                                    |
| Endurance at 70 °C (ERJPA3 : 105 °C) | ±3 %<br>Only when it is ERJP03 (D), P14 (D) : ±1 %   | 70 °C (ERJPA3 : 105 °C), Rated Voltage,<br>1.5 h ON / 0.5 h OFF cycle, 1000 h                                                  |

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.

## Anti-Pulse Thick Film Chip Resistors



Type: **ERJ T06, T08, T14**  
**ERJ T14L**

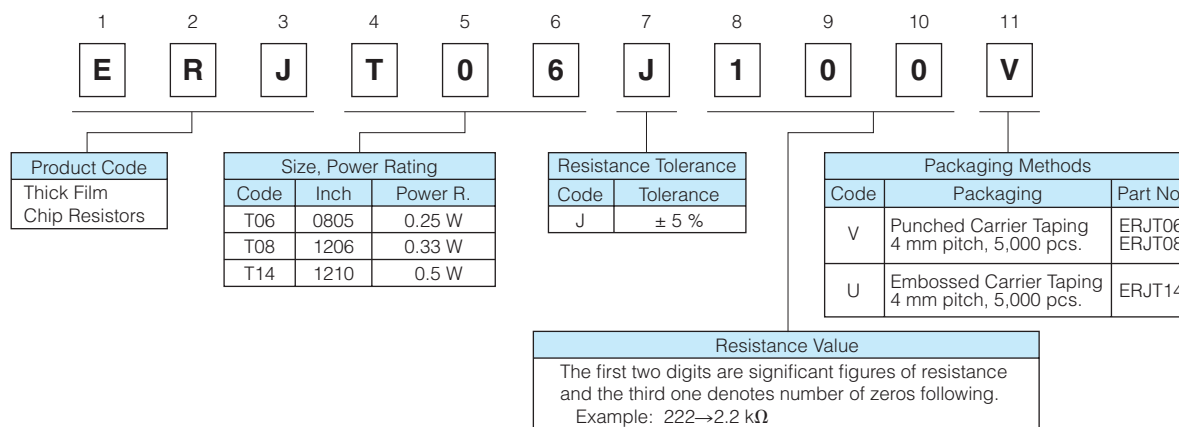
### Features

- Anti-Pulse characteristics  
High pulse characteristics achieved by the optimized trimming specifications (ERJT06, T08, T14)
- Further high pulse characteristics achieved by trimming-less specifications (ERJT14L)
- High reliability  
Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- High power ... 0.25W : 0805 inch / 2012 mm size (ERJT06)  
0.33W : 1206 inch / 3216 mm size (ERJT08)  
0.50W : 1210 inch / 3225 mm size (ERJT14, ERJT14L)
- Reference Standards...IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 qualified
- RoHS compliant

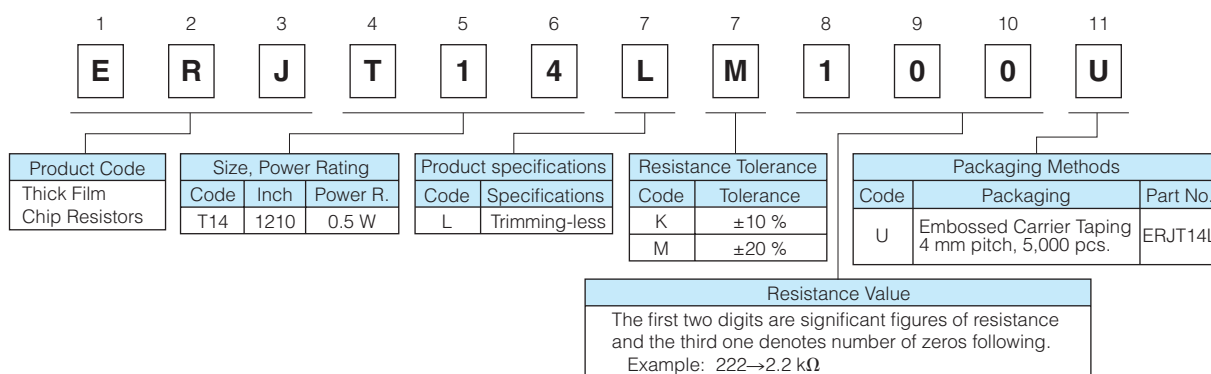
■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

- ERJT06, T08, T14 Series

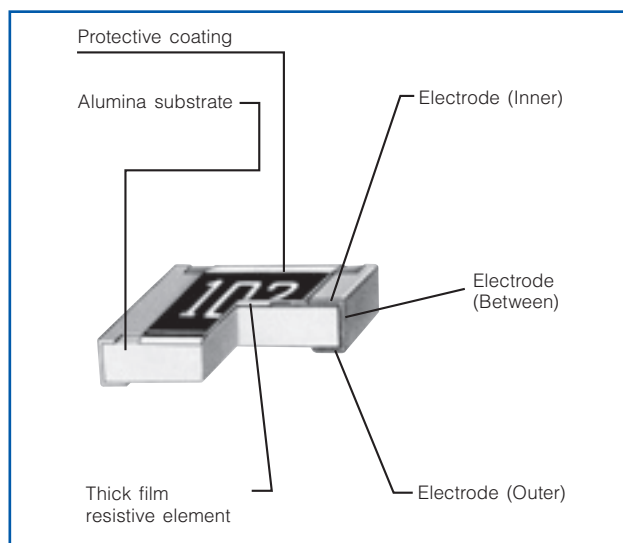


- ERJT14L Series

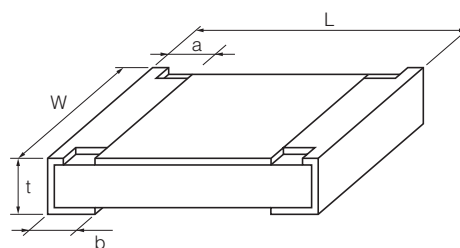


\* Please contact us for 2012 (mm) and 3216 (mm) size trimming-less types.

## Construction



## Dimensions in mm (not to scale)



| Part No.          | Dimensions (mm)                        |                                        |                       |                       |                       | Mass (Weight)<br>[g/1000 pcs.] |
|-------------------|----------------------------------------|----------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|
|                   | L                                      | W                                      | a                     | b                     | t                     |                                |
| ERJT06            | 2.00 <sup>+0.20</sup>                  | 1.25 <sup>+0.10</sup>                  | 0.25 <sup>+0.20</sup> | 0.40 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 4                              |
| ERJT08            | 3.20 <sup>+0.05</sup> <sub>-0.20</sub> | 1.60 <sup>+0.05</sup> <sub>-0.15</sub> | 0.40 <sup>+0.20</sup> | 0.50 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 10                             |
| ERJT14<br>ERJT14L | 3.20 <sup>+0.20</sup>                  | 2.50 <sup>+0.20</sup>                  | 0.35 <sup>+0.20</sup> | 0.50 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 16                             |

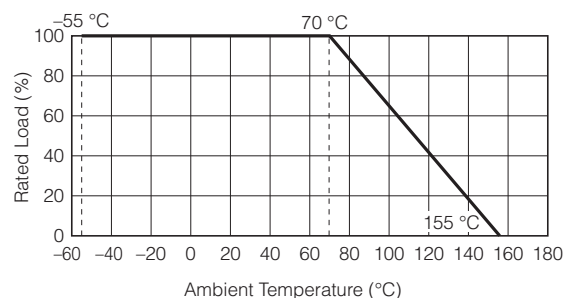
## Ratings

| Part No.<br>(inch size) | Power Rating <sup>(3)</sup><br>at 70 °C<br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C)                                    | Category<br>Temperature<br>Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|------------------------------------------------------|--------------------------------|----------------------------|----------------------------------------------------------------------|------------------------------------------|-------------------|
| ERJT06<br>(0805)        | 0.25                                           | 150                                               | 200                                                  | ±5                             | 1 to 1M<br>(E24)           | R < 10 Ω : -100 to +600<br>10 Ω ≤ R < 33 Ω : ±300<br>33 Ω ≤ R : ±200 | -55 to +155                              | Grade 0           |
| ERJT08<br>(1206)        | 0.33                                           | 200                                               | 400                                                  | ±5                             | 1 to 1M<br>(E24)           | R < 10 Ω : -100 to +600<br>10 Ω ≤ R : ±200                           | -55 to +155                              | Grade 0           |
| ERJT14<br>(1210)        | 0.50                                           | 200                                               | 400                                                  | ±5                             | 1 to 1M<br>(E24)           | R < 10 Ω : -100 to +600<br>10 Ω ≤ R : ±200                           | -55 to +155                              | Grade 0           |
| ERJT14L<br>(1210)       | 0.50                                           | 200                                               | 400                                                  | ±10<br>±20                     | 1 to 1M<br>(E12)           | R < 10 Ω : -100 to +600<br>10 Ω ≤ R : ±200                           | -55 to +155                              | Grade 0           |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.  
(3) Use it on the condition that the case temperature is below the upper category temperature.

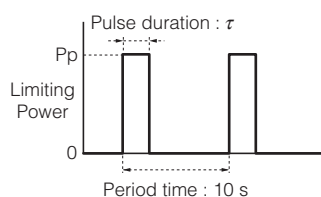
### Power Derating Curve

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



## Limiting Power Curve

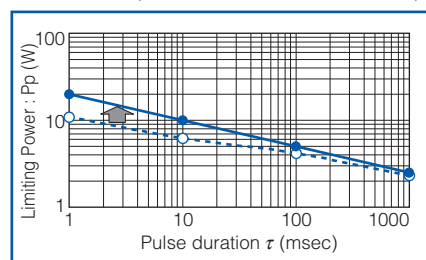
- In rush pulse Characteristic



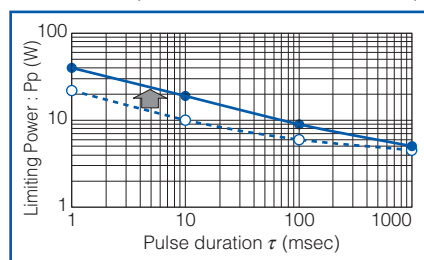
Test cycle : 1000 cycles  
Spec : Resistance value = within  $\pm 5\%$

- ▲ : Anti-Pulse Thick Film Chip Resistors (ERJT14L Series)
- : Anti-Pulse Thick Film Chip Resistors (ERJT Series)
- : Thick Film Chip Resistors (ERJ Series : 1  $\Omega$ )

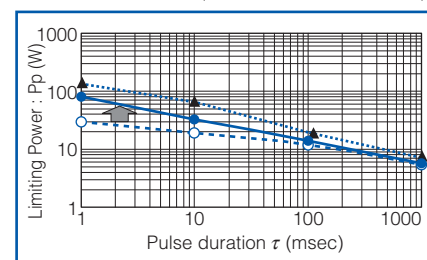
- ERJT06 (0805 inch/2012 mm size)



- ERJT08 (1206 inch/3216 mm size)



- ERJT14,ERJT14L (1210 inch/3225 mm size)



\* Please contact us for 2012 (mm) and 3216 (mm) size trimming-less types.

## Performance

| Test Item                    | Performance Requirements   | Test Conditions                                                                     |
|------------------------------|----------------------------|-------------------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                               |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+155 °C                                                                      |
| Overload                     | $\pm 2\%$                  | Rated Voltage $\times$ 2.5, 5 s                                                     |
| Resistance to Soldering Heat | $\pm 1\%$                  | 270 °C $\pm$ 3 °C, 10 s $\pm$ 1 s                                                   |
| Rapid Change of Temperature  | $\pm 1\%$                  | -55 °C (30min.) / +155 °C (30min.), 100 cycles                                      |
| High Temperature Exposure    | $\pm 1\%$                  | +155 °C, 1000 h                                                                     |
| Damp Heat, Steady State      | $\pm 1\%$                  | 60 °C $\pm$ 2 °C, 90 % to 95 %RH, 1000 h                                            |
| Load Life in Humidity        | $\pm 3\%$                  | 60 °C $\pm$ 2 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | $\pm 3\%$                  | 70 °C $\pm$ 2 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                 |

## Anti-Sulfurated Thick Film Chip Resistors



Type: **ERJ S02, S03, S06, S08, S14, S12, S1D, S1T**  
(Au-based inner electrode type)

Type: **ERJ U01, U02, U03, U06, U08, U14, U12, U1D, U1T, U6S, U6Q**  
(Ag-Pd-based inner electrode type)

### Features

- High resistance to sulfurization achieved by adopting an Au-based inner electrode (ERJS Series) and Ag-Pd-based inner electrode (ERJU Series)
- High reliability  
Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- Low Resistance type ... ERJU6S, U6Q : 0.1  $\Omega$  to 1.0  $\Omega$
- Reference Standard ... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 qualified (Exemption ERJU01)
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

- ERJU01 to ERJU1T, ERJS02 to ERJS1T Series

|   |   |   |   |   |   |   |   |   |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| E | R | J | S | 0 | 6 | F | 1 | 0 | 0  | 2  | V  |

| Product Code              |  |  |
|---------------------------|--|--|
| Thick Film Chip Resistors |  |  |

| Size, Power Rating |      |          |            |      |          |
|--------------------|------|----------|------------|------|----------|
| Code               | Inch | Power R. | Code       | Inch | Power R. |
| U01                | 0201 | 0.05 W   | S14<br>U14 | 1210 | 0.5 W    |
| S02<br>U02         | 0402 | 0.1 W    | S12<br>U12 | 1812 | 0.75 W   |
| S03<br>U03         | 0603 | 0.1 W    | S1D<br>U1D | 2010 | 0.75 W   |
| S06<br>U06         | 0805 | 0.125 W  | S1T<br>U1T | 2512 | 1 W      |
| S08<br>U08         | 1206 | 0.25 W   |            |      |          |

| Resistance Tolerance |           |      |           |
|----------------------|-----------|------|-----------|
| Code                 | Tolerance | Code | Tolerance |
| D                    | ± 0.5 %   | J    | ± 5 %     |
| F                    | ± 1 %     | 0    | Jumper    |

| Resistance Value                                                                                                                                                                                                                                         |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| The first two or three digits are significant figures of resistance and the third or 4th one denotes number of zeros following. Jumper is expressed by R00.<br>Three digit type (±5 %), four digit type (±0.5 %, ±1 %)<br>Example: 222→2.2 kΩ, 1002→10kΩ |  |

| Packaging Methods |                                                   |                                                    |
|-------------------|---------------------------------------------------|----------------------------------------------------|
| Code              | Packaging                                         | Part No.                                           |
| C                 | Pressed Carrier Taping<br>2 mm pitch, 15,000 pcs. | ERJU01                                             |
| X                 | Punched Carrier Taping<br>2 mm pitch, 10,000 pcs. | ERJS02, ERJU02                                     |
| V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  | ERJS03, ERJU03<br>ERJS06, ERJU06<br>ERJS08, ERJU08 |
| U                 | Embossed Carrier Taping<br>4 mm pitch, 5,000 pcs. | ERJS14, ERJU14<br>ERJS12, ERJU12<br>ERJS1D, ERJU1D |
|                   | Embossed Carrier Taping<br>4 mm pitch, 4,000 pcs. | ERJS1T, ERJU1T                                     |

- ERJU6S, U6Q Series

|   |   |   |   |   |   |   |   |   |    |    |
|---|---|---|---|---|---|---|---|---|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| E | R | J | U | 6 | S | J | R | 2 | 0  | V  |

Size, Power Rating

| Code | Inch | Power R. |
|------|------|----------|
| U6   | 0805 | 0.25 W   |

Resistance Value

| Code | Res. Value     |
|------|----------------|
| S    | 0.1 Ω to 0.2 Ω |
| Q    | 0.22 Ω to 1 Ω  |

Resistance Tolerance

| Code | Tolerance |
|------|-----------|
| F    | ±1 %      |
| G    | ±2 %      |
| J    | ±5 %      |

Resistance Value

Shown by 3 digits or letters.  
(Example)  
R20 : 0.20 Ω=200 mΩ  
1R0 : 1.0 Ω=1000 mΩ

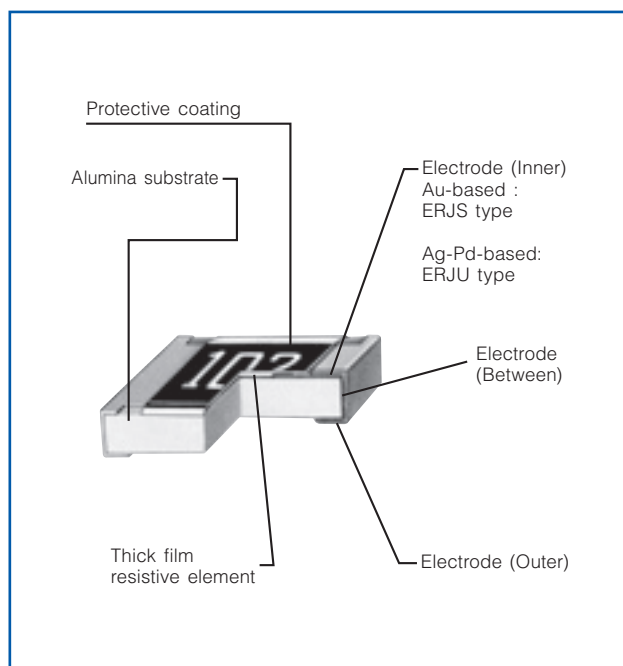
Packaging Methods

| Code | Packaging                                        | Part No.         |
|------|--------------------------------------------------|------------------|
| V    | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs. | ERJU6S<br>ERJU6Q |

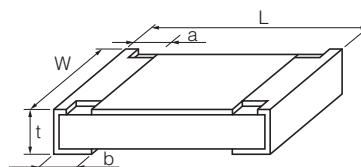
Product Code

Thick Film Chip Resistors

## Construction



## Dimensions in mm (not to scale)



| Part No.         | Dimensions (mm)       |                       |                       |                       |                       | Mass (Weight)<br>[g/1000 pcs.] |
|------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------------|
|                  | L                     | W                     | a                     | b                     | t                     |                                |
| ERJU01           | 0.60 <sup>+0.03</sup> | 0.30 <sup>+0.03</sup> | 0.10 <sup>+0.05</sup> | 0.15 <sup>+0.05</sup> | 0.23 <sup>+0.03</sup> | 0.15                           |
| ERJS02<br>ERJU02 | 1.00 <sup>+0.05</sup> | 0.50 <sup>+0.05</sup> | 0.20 <sup>+0.10</sup> | 0.25 <sup>+0.10</sup> | 0.35 <sup>+0.05</sup> | 0.8                            |
| ERJS03<br>ERJU03 | 1.60 <sup>+0.15</sup> | 0.80 <sup>+0.15</sup> | 0.30 <sup>+0.20</sup> | 0.30 <sup>+0.15</sup> | 0.45 <sup>+0.10</sup> | 2                              |
| ERJS06<br>ERJU06 | 2.00 <sup>+0.20</sup> | 1.25 <sup>+0.10</sup> | 0.40 <sup>+0.20</sup> | 0.40 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 4                              |
| ERJU6□           | 2.00 <sup>+0.20</sup> | 1.25 <sup>+0.10</sup> | 0.45 <sup>+0.20</sup> | 0.45 <sup>+0.20</sup> | 0.55 <sup>+0.10</sup> | 6                              |
| ERJS08<br>ERJU08 | 3.20 <sup>+0.05</sup> | 1.60 <sup>+0.05</sup> | 0.50 <sup>+0.20</sup> | 0.50 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 10                             |
| ERJS14<br>ERJU14 | 3.20 <sup>+0.20</sup> | 2.50 <sup>+0.20</sup> | 0.50 <sup>+0.20</sup> | 0.50 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 16                             |
| ERJS12<br>ERJU12 | 4.50 <sup>+0.20</sup> | 3.20 <sup>+0.20</sup> | 0.50 <sup>+0.20</sup> | 0.50 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 27                             |
| ERJS1D<br>ERJU1D | 5.00 <sup>+0.20</sup> | 2.50 <sup>+0.20</sup> | 0.60 <sup>+0.20</sup> | 0.60 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 27                             |
| ERJS1T<br>ERJU1T | 6.40 <sup>+0.20</sup> | 3.20 <sup>+0.20</sup> | 0.65 <sup>+0.20</sup> | 0.60 <sup>+0.20</sup> | 0.60 <sup>+0.10</sup> | 45                             |

## Ratings

| Part No.<br>(inch size)    | Power Rating <sup>(3)</sup><br>at 70 °C<br>(W) | Limiting Element Voltage <sup>(1)</sup><br>(V) | Maximum Overload Voltage <sup>(2)</sup><br>(V) | Resistance Tolerance (%) | Resistance Range (Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C)                                                                                                                           | Category Temperature Range (°C) | AEC-Q200 Grade |
|----------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|--------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------|
| ERJU01<br>(0201)           | 0.05                                           | 25                                             | 50                                             | ±1                       | 10 to 1M (E24, E96)  | <10 Ω:<br>-100 to +600<br><br>10 Ω to 1 MΩ:<br>±200(±5 %)<br>±100(±0.5, ±1 %)*<br><br>*ERJU01,<br>ERJS02,<br>ERJU02 :<br>±200<br><br>1 MΩ<:<br>-400 to +150 | -55 to +125                     | —              |
| ERJS02<br>ERJU02<br>(0402) | 0.1                                            | 50                                             | 100                                            | ±0.5, ±1                 | 1 to 1M (E24, E96)   |                                                                                                                                                             | -55 to +155                     | Grade 0        |
| ERJS03<br>ERJU03<br>(0603) | 0.1                                            | 75                                             | 150                                            | ±0.5, ±1                 | 1 to 3.3M (E24)      |                                                                                                                                                             | -55 to +155                     | Grade 0        |
| ERJS06<br>ERJU06<br>(0805) | 0.125                                          | 150                                            | 200                                            | ±0.5, ±1                 | 1 to 1M (E24, E96)   |                                                                                                                                                             | -55 to +155                     | Grade 0        |
| ERJS08<br>ERJU08<br>(1206) | 0.25                                           | 200                                            | 400                                            | ±0.5, ±1                 | 1 to 10M (E24)       |                                                                                                                                                             | -55 to +155                     | Grade 0        |
| ERJS14<br>ERJU14<br>(1210) | 0.5                                            | 200                                            | 400                                            | ±0.5, ±1                 | 1 to 1M (E24, E96)   |                                                                                                                                                             | -55 to +155                     | Grade 0        |
| ERJS12<br>ERJU12<br>(1812) | 0.75                                           | 200                                            | 500                                            | ±0.5, ±1                 | 1 to 10M (E24)       |                                                                                                                                                             | -55 to +155                     | Grade 0        |
| ERJS1D<br>ERJU1D<br>(2010) | 0.75                                           | 200                                            | 500                                            | ±0.5, ±1                 | 1 to 1M (E24, E96)   |                                                                                                                                                             | -55 to +155                     | Grade 0        |
| ERJS1T<br>ERJU1T<br>(2512) | 1.0                                            | 200                                            | 500                                            | ±0.5, ±1                 | 1 to 10M (E24)       |                                                                                                                                                             | -55 to +155                     | Grade 0        |
|                            |                                                |                                                |                                                | ±5                       | 1 to 10M (E24)       |                                                                                                                                                             | -55 to +155                     | Grade 0        |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.  
(3) Use it on the condition that the case temperature is below the upper category temperature.

## [Low Resistance type]

| Part No.<br>(inch size) | Power Rating <sup>(1)</sup><br>at 70 °C<br>(W) | Resistance Tolerance (%) | Resistance Range (Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C) | Category Temperature Range (°C) | AEC-Q200 Grade |
|-------------------------|------------------------------------------------|--------------------------|----------------------|-----------------------------------|---------------------------------|----------------|
| ERJU6S (0805)           | 0.25                                           | ±1, ±2, ±5               | 0.1 to 0.2 (E24)     | ±150                              | -55 to +155                     | Grade 0        |
| ERJU6Q (0805)           |                                                |                          | 0.22 to 1 (E24)      |                                   |                                 |                |

- (1) Use it on the condition that the case temperature is below the upper category temperature.  
· Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ .  
· Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

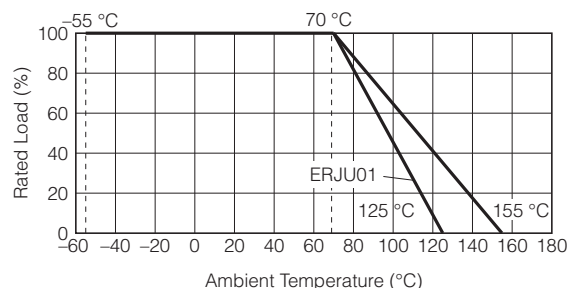
## [For Jumper]

| Part No.<br>(inch size)    | Rated Current<br>(A) | Maximum Overload Current <sup>(1)</sup><br>(A) |
|----------------------------|----------------------|------------------------------------------------|
| ERJU01<br>(0201)           | 0.5                  | 1                                              |
| ERJS02<br>ERJU02<br>(0402) | 1                    | 2                                              |
| ERJS03<br>ERJU03<br>(0603) |                      |                                                |
| ERJS06<br>ERJU06<br>(0805) | 2                    | 4                                              |
| ERJS08<br>ERJU08<br>(1206) |                      |                                                |
| ERJS14<br>ERJU14<br>(1210) |                      |                                                |
| ERJS12<br>ERJU12<br>(1812) |                      |                                                |
| ERJS1D<br>ERJU1D<br>(2012) |                      |                                                |
| ERJS1T<br>ERJU1T<br>(2512) |                      |                                                |

(1) Overload test current

## Power Derating Curve

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



## Performance

### ● ERJU01 to ERJU1T, ERJS02 to ERJS1T Series

| Test Item                    | Performance Requirements   |                | Test Conditions                                                                                      |
|------------------------------|----------------------------|----------------|------------------------------------------------------------------------------------------------------|
|                              | Resistor type              | Jumper type    |                                                                                                      |
| Resistance                   | Within Specified Tolerance | 100 mΩ or less | 20 °C                                                                                                |
| T. C. R.                     | Within Specified T. C. R.  | 200 mΩ or less | +25 °C/+155 °C (ERJU01 : +25 °C/+125 °C)                                                             |
| Overload                     | ±2 %                       | 100 mΩ or less | Rated Voltage × 2.5, 5 s<br>Jumper type : Max. Overload Current, 5 s                                 |
| Resistance to Soldering Heat | ±1 %                       | 100 mΩ or less | 270 °C, 10 s                                                                                         |
| Rapid Change of Temperature  | ±1 %                       | 100 mΩ or less | -55 °C (30min.) / +155 °C (ERJU01: +125 °C) (30min.), 100 cycles                                     |
| High Temperature Exposure    | ±1 %                       | 100 mΩ or less | +155 °C (ERJU01 : +125 °C), 1000 h                                                                   |
| Damp Heat, Steady State      | ±1 %                       | 100 mΩ or less | 60 °C, 90 % to 95 %RH, 1000 h                                                                        |
| Load Life in Humidity        | ±3 %                       | 100 mΩ or less | 60 °C, 90 % to 95 %RH, Rated Voltage (Jumper type : Rated Current), 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3 %                       | 100 mΩ or less | 70 °C, Rated Voltage (Jumper type : Rated Current), 1.5 h ON/0.5 h OFF cycle, 1000 h                 |

### ● ERJU6S, U6Q Series

| Test Item                    | Performance Requirements   | Test Conditions                                                        |
|------------------------------|----------------------------|------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                  |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                         |
| Overload                     | ±1 %                       | Rated Voltage × 2.5, 5 s                                               |
| Resistance to Soldering Heat | ±1 %                       | 270 °C, 10 s                                                           |
| Rapid Change of Temperature  | ±1 %                       | -55 °C (30min.) / +125 °C (30min.), 100 cycles                         |
| High Temperature Exposure    | ±1 %                       | +155 °C, 1000 h                                                        |
| Damp Heat, Steady State      | ±1 %                       | 60 °C, 90 % to 95 %RH, 1000 h                                          |
| Load Life in Humidity        | ±3 %                       | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3 %                       | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                 |

## Anti-Sulfurated Thick Film Chip Resistors / Anti-Surge Type



Type: **ERJ UP3, UP6, UP8**

### Features

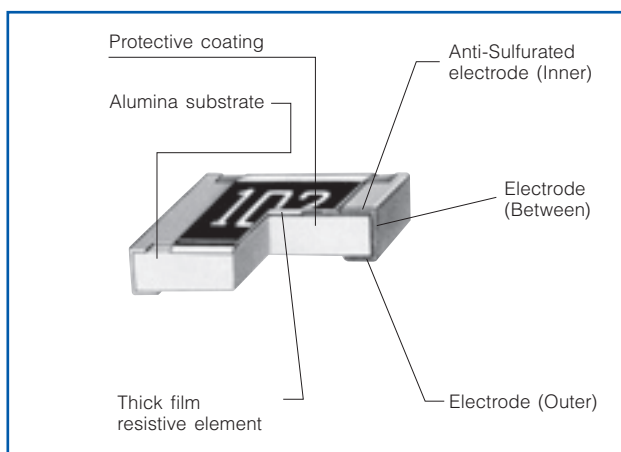
- High resistance to sulfurization achieved by adopting Anti-Sulfurated electrode structure and material
- ESD surge characteristics superior to standard metal film resistors
- High reliability
  - Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- High power ... 0.25 W : 0603 inch / 1608 mm size (ERJUP3)
  - 0.50 W : 0805 inch / 2012 mm size (ERJUP6)
  - 0.66 W : 1206 inch / 3216 mm size (ERJUP8)
- Reference Standards... IEC 60115-8, JIS C 5201-8, EIAJ RC-2134B
- AEC-Q200 qualified
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

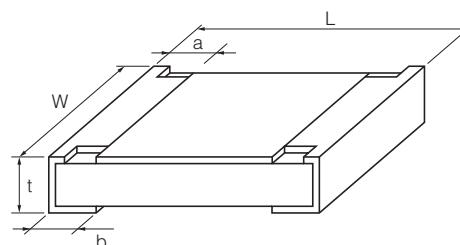
### Explanation of Part Numbers

|                                              |                    |      |          |                      |           |                                                                                                                                                                                                                                                      |   |   |                   |                                                  |          |
|----------------------------------------------|--------------------|------|----------|----------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|-------------------|--------------------------------------------------|----------|
| 1                                            | 2                  | 3    | 4        | 5                    | 6         | 7                                                                                                                                                                                                                                                    | 8 | 9 | 10                | 11                                               | 12       |
| E                                            | R                  | J    | U        | P                    | 6         | D                                                                                                                                                                                                                                                    | 1 | 0 | 0                 | 2                                                | V        |
| Product Code<br>Thick Film<br>Chip Resistors | Size, Power Rating |      |          | Resistance Tolerance |           | Resistance Value<br>The first two or three digits are significant figures of resistance and the third or 4th one denotes number of zeros following.<br>Three digit type (±5 %),<br>four digit type (±1 %, ±0.5 %)<br>Example: 222→2.2k Ω, 1002→10k Ω |   |   | Packaging Methods |                                                  |          |
|                                              | Code               | Inch | Power R. | Code                 | Tolerance |                                                                                                                                                                                                                                                      |   |   | Code              | Packaging                                        | Part No. |
|                                              | ▲UP3               | 0603 | 0.25 W   | D                    | ± 0.5 %   |                                                                                                                                                                                                                                                      |   |   | V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs. | ▲ERJUP3  |
|                                              | UP6                | 0805 | 0.50 W   | F                    | ± 1 %     |                                                                                                                                                                                                                                                      |   |   |                   |                                                  | ERJUP6   |
|                                              | UP8                | 1206 | 0.66 W   | J                    | ± 5 %     |                                                                                                                                                                                                                                                      |   |   |                   |                                                  | ERJUP8   |
| ▲Under development                           |                    |      |          |                      |           |                                                                                                                                                                                                                                                      |   |   |                   |                                                  |          |

### Construction



### Dimensions in mm (not to scale)



| Part No. | Dimensions (mm)         |                         |                         |                         |                         | Mass (Weight)<br>[g/1000 pcs.] |
|----------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------------|
|          | L                       | W                       | a                       | b                       | t                       |                                |
| ▲ERJUP3  | 1.60 $^{+0.15}_{-0.05}$ | 0.80 $^{+0.15}_{-0.05}$ | 0.15 $^{+0.15}_{-0.10}$ | 0.25 $^{+0.10}_{-0.10}$ | 0.45 $^{+0.10}_{-0.10}$ | 2                              |
| ERJUP6   | 2.00 $^{+0.20}_{-0.20}$ | 1.25 $^{+0.10}_{-0.10}$ | 0.25 $^{+0.20}_{-0.20}$ | 0.40 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 4                              |
| ERJUP8   | 3.20 $^{+0.05}_{-0.20}$ | 1.60 $^{+0.05}_{-0.15}$ | 0.40 $^{+0.20}_{-0.20}$ | 0.50 $^{+0.20}_{-0.20}$ | 0.60 $^{+0.10}_{-0.10}$ | 10                             |

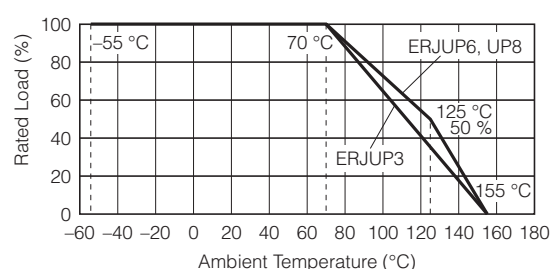
## Ratings

| Part No.<br>(inch size) | Power Rating <sup>(3)</sup><br>at 70 °C<br>(W) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ )                         | Category<br>Temperature<br>Range (°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|------------------------------------------------------|--------------------------------|----------------------------|-------------------------------------------------------------------------|---------------------------------------|-------------------|
| ▲ERJUP3<br>(0603)       | 0.25                                           | 150                                               | 200                                                  | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\pm 100$                                                               | -55 to +155                           | Grade 0           |
|                         |                                                |                                                   |                                                      | $\pm 5$                        | 1 to 1.5M (E24)            | $\pm 200$                                                               |                                       |                   |
| ERJUP6<br>(0805)        | 0.50                                           | 400                                               | 600                                                  | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\pm 100$                                                               | -55 to +155                           | Grade 0           |
|                         |                                                |                                                   |                                                      | $\pm 5$                        | 1 to 3.3M (E24)            | $R < 10 \Omega : -100 \text{ to } +600$<br>$10 \Omega \leq R : \pm 200$ |                                       |                   |
| ERJUP8<br>(1206)        | 0.66                                           | 500                                               | 1000                                                 | $\pm 0.5, \pm 1$               | 10 to 1M (E24, E96)        | $\pm 100$                                                               | -55 to +155                           | Grade 0           |
|                         |                                                |                                                   |                                                      | $\pm 5$                        | 1 to 10M (E24)             | $R < 10 \Omega : -100 \text{ to } +600$<br>$10 \Omega \leq R : \pm 200$ |                                       |                   |

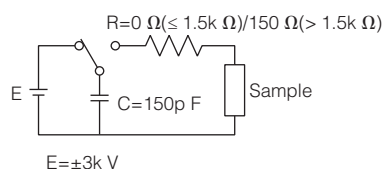
(1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$  or Maximum Overload Voltage listed above, whichever less.  
(3) Use it on the condition that the case temperature is below the upper category temperature.

## Power Derating Curve

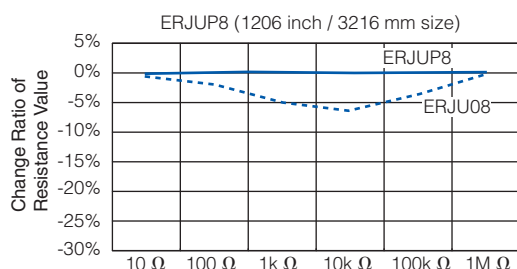
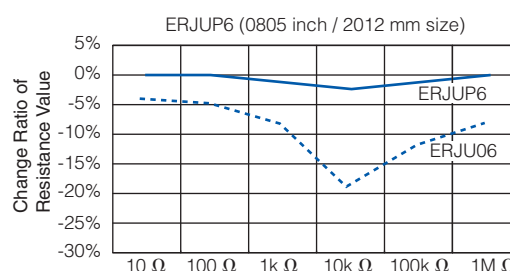
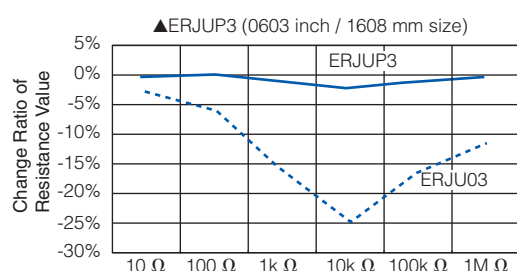
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



## ESD Characteristic



— Anti-Sulfurated Thick Film Chip Resistors / Anti-Surge Type (ERJUP Type)  
- - - Anti-Sulfurated Thick Film Chip Resistors (ERJU Type)



| Performance                  |                            |                                                                                  |
|------------------------------|----------------------------|----------------------------------------------------------------------------------|
| Test Item                    | Performance Requirements   | Test Conditions                                                                  |
| Resistance                   | Within Specified Tolerance | 20 °C                                                                            |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+155 °C                                                                   |
| Overload                     | ±2%                        | ERJUP6 : Rated Voltage × 1.77, 5 s<br>▲ERJUP3, ERJUP8 : Rated Voltage × 2.0, 5 s |
| Resistance to Soldering Heat | D : ±0.5%<br>F, J : ±1%    | 270 °C, 10 s                                                                     |
| Rapid Change of Temperature  | ±1%                        | −55 °C (30 min.) / +155 °C (30 min.), 100 cycles                                 |
| High Temperature Exposure    | ±1%                        | +155 °C, 1000 h                                                                  |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95%RH, 1000 h                                                      |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95%RH,<br>Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h        |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                         |

## Anti-Sulfurated High Power Chip Resistors / Wide Terminal Type



Type: **ERJ C1**

### Features

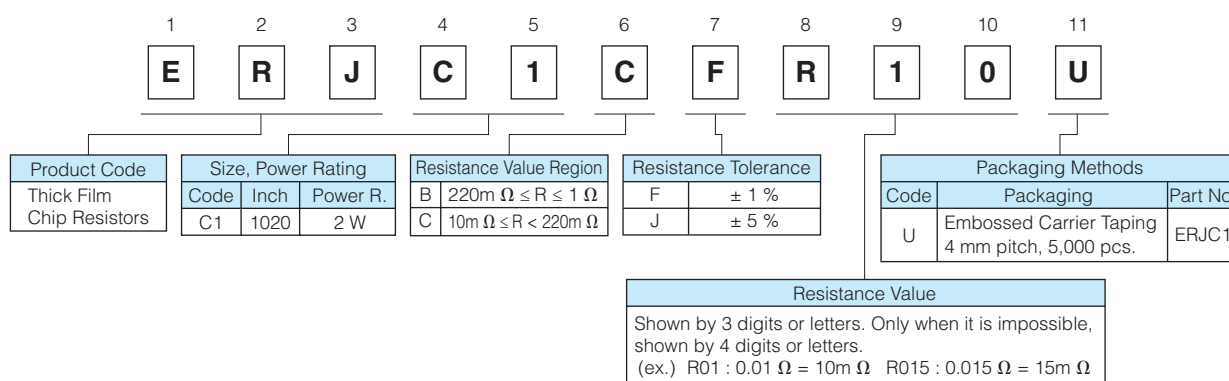
- High resistance to sulfurization achieved by adopting Anti-Sulfurated electrode structure and material
- High solder-joint reliability by wide terminal construction
- Excellent heat dissipation characteristics by wide terminal construction
- AEC-Q200 qualified
- RoHS compliant

### Recommended Applications

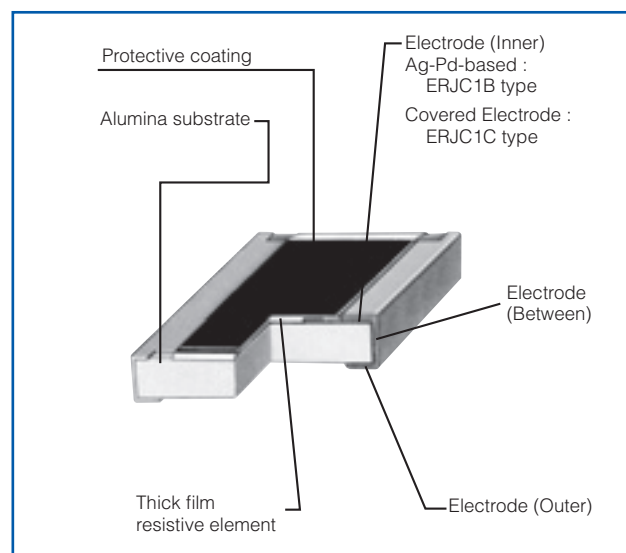
- Motor control circuit of the industrial equipment
- Automotive electronic circuits including ECUs (Electrical control unit), anti-lock breaking systems and air-bag systems
- Current sensing for power supply circuits in a variety of equipment

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

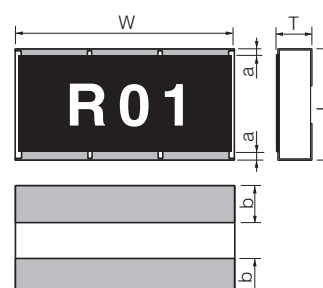
### Explanation of Part Numbers



### Construction



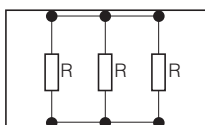
### Dimensions in mm (not to scale)



| Part No. | Dimensions (mm) |           |           |           |           | Mass (Weight)<br>[g/1000 pcs.] |
|----------|-----------------|-----------|-----------|-----------|-----------|--------------------------------|
|          | L               | W         | T         | a         | b         |                                |
| ERJC1B   | 2.50±0.20       | 5.00±0.20 | 0.55±0.20 | 0.35±0.20 | 0.90±0.20 | 27                             |
| ERJC1C   |                 |           |           | 0.60±0.20 |           |                                |

## Circuit Configuration

Type ERJC1



## Ratings

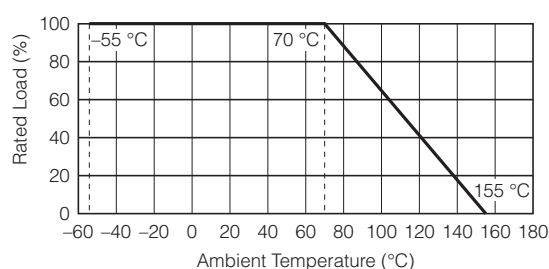
| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Resistance<br>Tolerance (%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C)                                                                            | Category<br>Temperature<br>Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|-----------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|
| ERJC1<br>(1020)         | 2                                              | ±1                          | 10m to 1<br>(E24)          | 10m Ω ≤ R < 22m Ω : ±350<br>22m Ω ≤ R < 47m Ω : ±200<br>47m Ω ≤ R < 100m Ω : ±150<br>100m Ω ≤ R ≤ 1 Ω : ±100 | -55 to +155                              | Grade 0           |
|                         |                                                | ±5                          |                            | 10m Ω ≤ R < 22m Ω : ±350<br>22m Ω ≤ R < 1 Ω : ±200                                                           |                                          |                   |

(1) Use it on the condition that the case temperature is below the upper category temperature.

- Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ .
- Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

## 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.

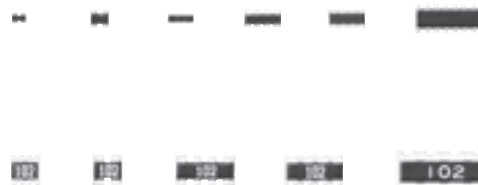


## Performance

| Test Item                    | Performance Requirements   | Test Conditions                                                       |
|------------------------------|----------------------------|-----------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                 |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                        |
| Overload                     | ±2%                        | Rated Voltage × 2.0, 5 s                                              |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                          |
| Rapid Change of Temperature  | ±2%                        | -55 °C (30min.) / +125 °C (30min.), 1000 cycles                       |
| High Temperature Exposure    | ±1%                        | +155 °C, 1000 h                                                       |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95 %RH, 1000 h                                          |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95 %RH, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage, 1.5 h ON/0.5 h OFF cycle, 1000 h                |

## Chip Resistor Array

Type: **EXB 14V, 18V, 24V, 28V,  
N8V, 2HV, 34V, V4V,  
38V, V8V, S8V**



### Features

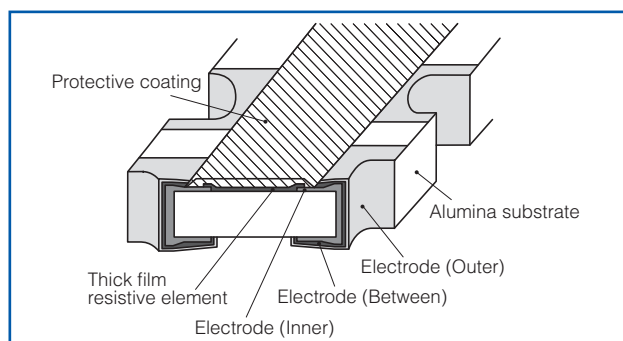
- High density  
2 resistors in 0.8 mm × 0.6 mm size / 0302 inch size : EXB14V  
4 resistors in 1.4 mm × 0.6 mm size / 0502 inch size : EXB18V  
2 resistors in 1.0 mm × 1.0 mm size / 0404 inch size : EXB24V  
4 resistors in 2.0 mm × 1.0 mm size / 0804 inch size : EXB28V, EXBN8V  
8 resistors in 3.8 mm × 1.6 mm size / 1506 inch size : EXB2HV  
2 resistors in 1.6 mm × 1.6 mm size / 0606 inch size : EXB34V, EXBV4V  
4 resistors in 3.2 mm × 1.6 mm size / 1206 inch size : EXB38V, EXBV8V  
4 resistors in 5.1 mm × 2.2 mm size / 2009 inch size : EXBS8V
- Improvement of placement efficiency  
Placement efficiency of Chip Resistor Array is two, four or eight times of the flat type chip resistor
- Reference Standard...IEC 60115-9, JIS C 5201-9, EIAJ RC-2129
- AEC-Q200 qualified (EXB2, EXB3)
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

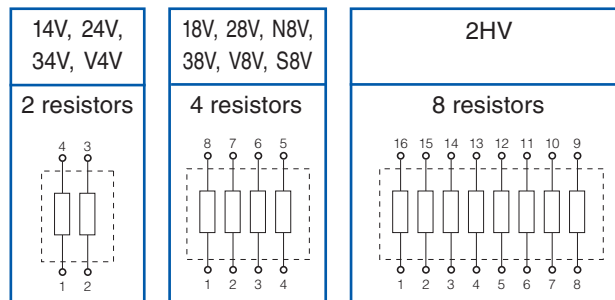
|                                                         |      |        |                  |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|---------------------------------------------------------|------|--------|------------------|------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|-------------------------|-------------------|-----|---------------------------------------------------|--------|---|---------------------------------------------------|-------------------------------|---|
|                                                         | 1    | 2      | 3                | 4          | 5                | 6                                                                                                                                                                                                    | 7 | 8 | 9                       | 10                | 11  |                                                   |        |   |                                                   |                               |   |
|                                                         | E    | X      | B                | V          | 8                | V                                                                                                                                                                                                    | 4 | 7 | 2                       | J                 | V   |                                                   |        |   |                                                   |                               |   |
| Product Code<br>Thick Film<br>Chip Resistor<br>Networks | Code | Inch   | Construction     | Schematics |                  | Resistance Value                                                                                                                                                                                     |   |   | Resistance<br>Tolerance | Packaging Methods |     |                                                   |        |   |                                                   |                               |   |
|                                                         | 14   | 0201×2 | Convex Terminal  | V          | Isolated<br>type | The first two digits are<br>significant figures of<br>resistance value and<br>the third one denotes<br>the number of zeros<br>following. Jumper is<br>expressed by R00<br><br>Example : 222 → 2.2k Ω |   |   | J                       | ±5 %              | Nil | Embossed Carrier Taping<br>4 mm pitch, 2,500 pcs. | EXBS8V |   |                                                   |                               |   |
|                                                         | 18   | 0201×4 | Flat Terminal    |            |                  |                                                                                                                                                                                                      |   |   | 0                       | Jumper            |     |                                                   |        | X | Punched Carrier Taping<br>2 mm pitch, 10,000 pcs. | EXB14V, 18V,<br>24V, 28V, N8V |   |
|                                                         | 24   | 0402×2 | Convex Terminal  |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               | V |
|                                                         | 28   | 0402×4 | Convex Terminal  |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|                                                         | 2H   | 0602×8 | Convex Terminal  |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|                                                         | 34   | 0603×2 | Convex Terminal  |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|                                                         | 38   | 0603×4 | Convex Terminal  |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|                                                         | N8   | 0402×4 | Concave Terminal |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|                                                         | V4   | 0603×2 | Concave Terminal |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|                                                         | V8   | 0603×4 | Concave Terminal |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |
|                                                         | S8   | 0805×4 | Concave Terminal |            |                  |                                                                                                                                                                                                      |   |   |                         |                   |     |                                                   |        |   |                                                   |                               |   |

### Construction (Example : Concave Terminal)



### Schematics

- Isolated type



## Ratings

### [For Resistor]

| Part No.<br>(inch size) | Power Rating<br>at 70 °C<br>(W / element) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>( $\times 10^{-6}/^{\circ}\text{C}$ )       | Category<br>Temperature Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|-------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------------------------|----------------------------|-------------------------------------------------------|---------------------------------------|-------------------|
| EXB14V<br>(0201×2)      | 0.031                                     | 12.5                                              | 25                                                | ±5                             | 10 to 1M (E24)             | <10 Ω :<br>-200 to +600<br><br>10 Ω to 1M Ω :<br>±200 | -55 to +125                           | —                 |
| EXB18V<br>(0201×2)      | 0.031<br>(0.1 W / package)                | 12.5                                              | 25                                                | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | —                 |
| EXB24V<br>(0402×2)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |
| EXB28V<br>(0402×4)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |
| EXB2HV<br>(0602×8)      | 0.063<br>(0.25 W / package)               | 25                                                | 50                                                | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | Grade 1           |
| EXB34V<br>(0603×2)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |
| EXB38V<br>(0603×4)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |
| EXBN8V<br>(0402×4)      | 0.031                                     | 50                                                | 100                                               | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | —                 |
| EXBV4V<br>(0603×2)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | —                 |
| EXBV8V<br>(0603×4)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | —                 |
| EXBS8V<br>(0805×4)      | 0.1                                       | 100                                               | 200                                               | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | —                 |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
(2) Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$  or Maximum Overload Voltage listed above, whichever less.

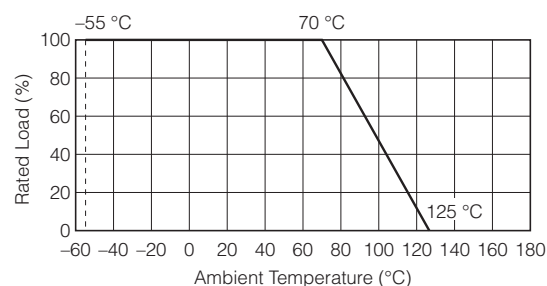
### [For Jumper]

| Part No.<br>(inch size) | Rated Current<br>(A / element) | Maximum Overload Current <sup>(1)</sup><br>(A) |
|-------------------------|--------------------------------|------------------------------------------------|
| EXB14V<br>(0201×2)      | 0.5                            | 1                                              |
| EXB18V<br>(0201×4)      | 0.5                            | 1                                              |
| EXB24V<br>(0402×2)      | 1                              | 2                                              |
| EXB28V<br>(0402×4)      | 1                              | 2                                              |
| EXB2HV<br>(0602×8)      | 1                              | 2                                              |
| EXB34V<br>(0603×2)      | 1                              | 2                                              |
| EXB38V<br>(0603×4)      | 1                              | 2                                              |
| EXBN8V<br>(0402×4)      | 1                              | 2                                              |
| EXBV4V<br>(0603×2)      | 1                              | 2                                              |
| EXBV8V<br>(0603×4)      | 1                              | 2                                              |
| EXBS8V<br>(0805×4)      | 2                              | 4                                              |

(1) Overload test current

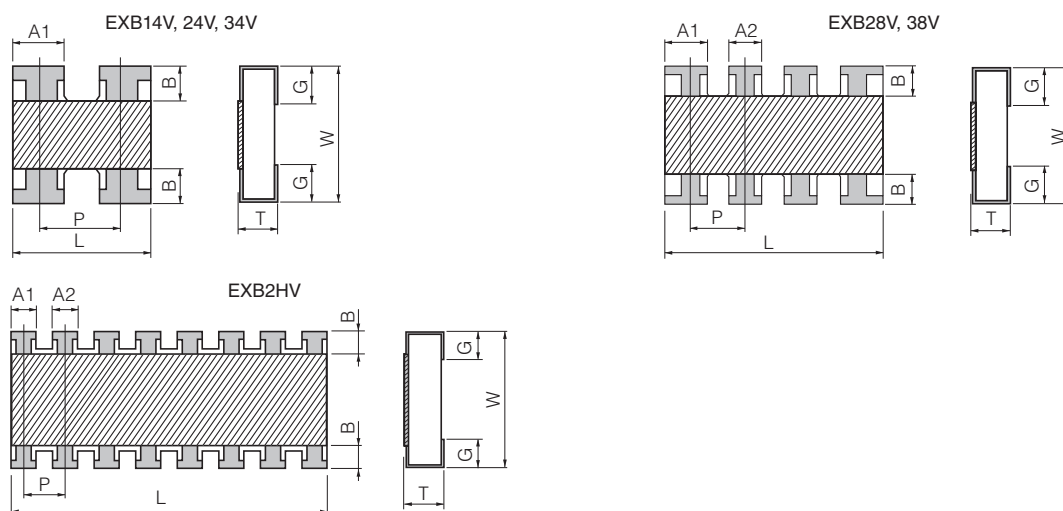
### Power Derating Curve

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



## Dimensions in mm (not to scale)

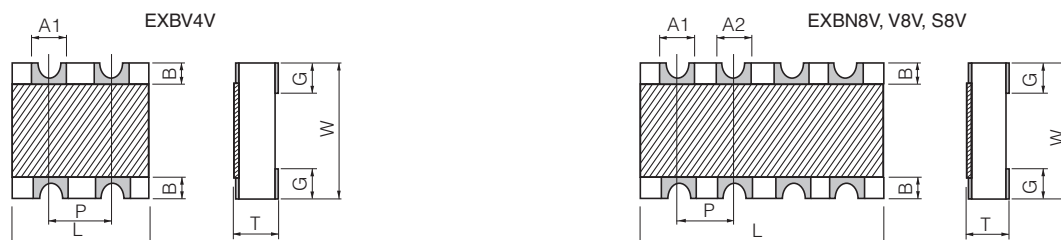
### (1) Convex Terminal type



| Part No.<br>(inch size) | Dimensions (mm)       |                       |                       |                       |                       |                       |        |                       | Mass (Weight)<br>[g/1000 pcs.] |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------|-----------------------|--------------------------------|
|                         | L                     | W                     | T                     | A1                    | A2                    | B                     | P      | G                     |                                |
| EXB14V (0201×2)         | 0.80 <sup>±0.10</sup> | 0.60 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | —                     | 0.15 <sup>±0.10</sup> | (0.50) | 0.15 <sup>±0.10</sup> | 0.5                            |
| EXB24V (0402×2)         | 1.00 <sup>±0.10</sup> | 1.00 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | 0.40 <sup>±0.10</sup> | —                     | 0.18 <sup>±0.10</sup> | (0.65) | 0.25 <sup>±0.10</sup> | 1.2                            |
| EXB28V (0402×4)         | 2.00 <sup>±0.10</sup> | 1.00 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | 0.45 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | 0.20 <sup>±0.10</sup> | (0.50) | 0.25 <sup>±0.10</sup> | 2.0                            |
| EXB2HV (0602×8)         | 3.80 <sup>±0.10</sup> | 1.60 <sup>±0.10</sup> | 0.45 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | 0.30 <sup>±0.10</sup> | (0.50) | 0.30 <sup>±0.10</sup> | 9.0                            |
| EXB34V (0603×2)         | 1.60 <sup>±0.20</sup> | 1.60 <sup>±0.15</sup> | 0.50 <sup>±0.10</sup> | 0.65 <sup>±0.15</sup> | —                     | 0.30 <sup>±0.20</sup> | (0.80) | 0.30 <sup>±0.20</sup> | 3.5                            |
| EXB38V (0603×4)         | 3.20 <sup>±0.20</sup> | 1.60 <sup>±0.15</sup> | 0.50 <sup>±0.10</sup> | 0.65 <sup>±0.15</sup> | 0.45 <sup>±0.15</sup> | 0.30 <sup>±0.20</sup> | (0.80) | 0.35 <sup>±0.20</sup> | 7.0                            |

( ) Reference

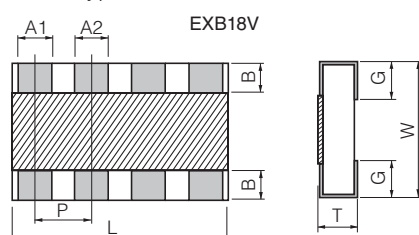
### (2) Concave Terminal type



| Part No.<br>(inch size) | Dimensions (mm)       |                       |                       |                       |                       |                       |        |                       | Mass (Weight)<br>[g/1000 pcs.] |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------|-----------------------|--------------------------------|
|                         | L                     | W                     | T                     | A1                    | A2                    | B                     | P      | G                     |                                |
| EXBN8V (0402×4)         | 2.00 <sup>±0.10</sup> | 1.00 <sup>±0.10</sup> | 0.45 <sup>±0.10</sup> | 0.30 <sup>±0.10</sup> | 0.30 <sup>±0.10</sup> | 0.20 <sup>±0.15</sup> | (0.50) | 0.30 <sup>±0.15</sup> | 3.0                            |
| EXBV4V (0603×2)         | 1.60 <sup>±0.20</sup> | 1.60 <sup>±0.20</sup> | 0.60 <sup>±0.10</sup> | 0.60 <sup>±0.10</sup> | —                     | 0.30 <sup>±0.15</sup> | (0.80) | 0.45 <sup>±0.15</sup> | 5.0                            |
| EXBV8V (0603×4)         | 3.20 <sup>±0.20</sup> | 1.60 <sup>±0.20</sup> | 0.60 <sup>±0.10</sup> | 0.60 <sup>±0.10</sup> | 0.60 <sup>±0.10</sup> | 0.30 <sup>±0.15</sup> | (0.80) | 0.45 <sup>±0.15</sup> | 10                             |
| EXBS8V (0805×4)         | 5.08 <sup>±0.20</sup> | 2.20 <sup>±0.10</sup> | 0.70 <sup>±0.20</sup> | 0.80 <sup>±0.15</sup> | 0.80 <sup>±0.15</sup> | 0.50 <sup>±0.15</sup> | (1.27) | 0.55 <sup>±0.15</sup> | 30                             |

( ) Reference

### (3) Flat Terminal type



| Part No.<br>(inch size) | Dimensions (mm)       |                       |                       |                       |                       |                       |        |                       | Mass (Weight)<br>[g/1000 pcs.] |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------|-----------------------|--------------------------------|
|                         | L                     | W                     | T                     | A1                    | A2                    | B                     | P      | G                     |                                |
| EXB18V (0201×4)         | 1.40 <sup>±0.10</sup> | 0.60 <sup>±0.10</sup> | 0.35 <sup>±0.10</sup> | 0.20 <sup>±0.10</sup> | 0.20 <sup>±0.10</sup> | 0.10 <sup>±0.10</sup> | (0.40) | 0.20 <sup>±0.10</sup> | 1.0                            |

( ) Reference

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.

## Performance

| Test Item                    | Performance Requirements   | Test Conditions                                                                                       |
|------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                                                 |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                                                        |
| Overload                     | ±2%                        | Rated Voltage × 2.5, 5 s<br>Jumper type : Max. Overload Current, 5 s                                  |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                                                          |
| Rapid Change of Temperature  | ±1%                        | –55 °C (30min.) / +125 °C (30min.), 100 cycles                                                        |
| High Temperature Exposure    | ±1%                        | +125 °C , 1000 h                                                                                      |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95 %RH, 1000 h                                                                          |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95 %RH, Rated Voltage (Jumper type: Rated Current),<br>1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage(Jumper type: Rated Current),<br>1.5 h ON/0.5 h OFF cycle, 1000 h                 |

## Anti-Sulfurated Chip Resistor Array

Type: **EXB U14, U18, U24, U28, U2H, U34, U38**



### Features

- High resistance to sulfurization achieved by adopting an Ag-Pd-based inner electrode
- High density
  - 2 resistors in 0.8 mm × 0.6 mm size / 0302 inch size : EXBU14
  - 4 resistors in 1.4 mm × 0.6 mm size / 0502 inch size : EXBU18
  - 2 resistors in 1.0 mm × 1.0 mm size / 0404 inch size : EXBU24
  - 4 resistors in 2.0 mm × 1.0 mm size / 0804 inch size : EXBU28
  - 8 resistors in 3.8 mm × 1.6 mm size / 1506 inch size : EXBU2H
  - 2 resistors in 1.6 mm × 1.6 mm size / 0606 inch size : EXBU34
  - 4 resistors in 3.2 mm × 1.6 mm size / 1206 inch size : EXBU38
- Improvement of placement efficiency  
Placement efficiency of Chip Resistor Array is two, four or eight times of the flat type chip resistor
- Reference Standard...IEC 60115-9, JIS C 5201-9, EIAJ RC-2129
- AEC-Q200 qualified (EXBU2, EXBU3)
- RoHS compliant

■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

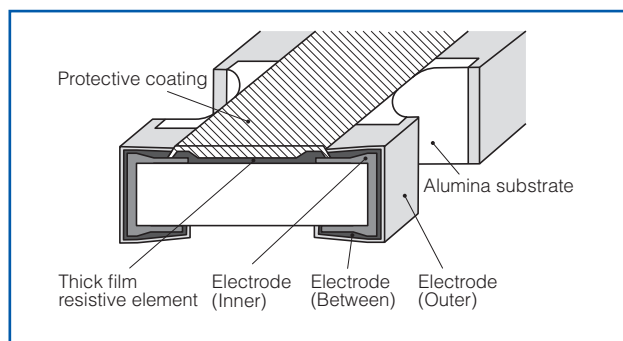
### Explanation of Part Numbers

|   |   |   |   |   |   |   |   |   |    |    |
|---|---|---|---|---|---|---|---|---|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| E | X | B | U | 2 | 8 | 4 | 7 | 2 | J  | X  |

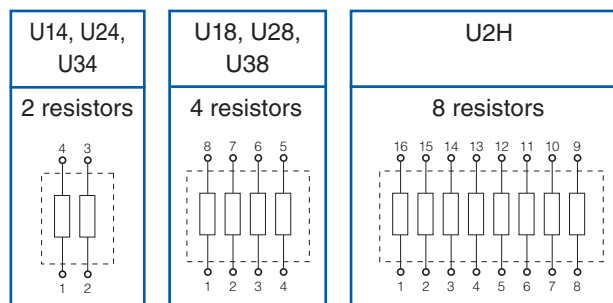
| Product Code                      | Code | Inch   | Construction    | Resistance Value                                                                                                                                                               | Resistance Tolerance | Packaging Methods                                   |
|-----------------------------------|------|--------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------|
| Thick Film Chip Resistor Networks | U14  | 0201×2 | Convex Terminal | The first two digits are significant figures of resistance value and the third one denotes the number of zeros following. Jumper is expressed by R00<br>Example : 222 → 2.2k Ω | J ±5 %               | X Punched Carrier Taping<br>2 mm pitch, 10,000 pcs. |
|                                   | U18  | 0201×4 | Flat Terminal   |                                                                                                                                                                                | 0 Jumper             |                                                     |
|                                   | U24  | 0402×2 | Convex Terminal |                                                                                                                                                                                |                      | V Punched Carrier Taping<br>4 mm pitch, 5,000 pcs.  |
|                                   | U28  | 0402×4 | Convex Terminal |                                                                                                                                                                                |                      |                                                     |
|                                   | U2H  | 0602×8 | Convex Terminal |                                                                                                                                                                                |                      |                                                     |
|                                   | U34  | 0603×2 | Convex Terminal |                                                                                                                                                                                |                      |                                                     |
|                                   | U38  | 0603×4 | Convex Terminal |                                                                                                                                                                                |                      |                                                     |
|                                   |      |        |                 |                                                                                                                                                                                |                      | Part No.                                            |
|                                   |      |        |                 |                                                                                                                                                                                |                      | EXBU14, U18, U24, U28                               |
|                                   |      |        |                 |                                                                                                                                                                                |                      | EXBU2H, U34, U38                                    |

### Construction



### Schematics

- Isolated type



## Ratings

### [For Resistor]

| Part No.<br>(inch size) | Power Rating<br>at 70 °C<br>(W / element) | Limiting Element<br>Voltage <sup>(1)</sup><br>(V) | Maximum Overload<br>Voltage <sup>(2)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /°C)                     | Category<br>Temperature Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|-------------------------------------------|---------------------------------------------------|---------------------------------------------------|--------------------------------|----------------------------|-------------------------------------------------------|---------------------------------------|-------------------|
| EXBU14<br>(0201×2)      | 0.031                                     | 12.5                                              | 25                                                | ±5                             | 10 to 1M (E24)             | <10 Ω :<br>-200 to +600<br><br>10 Ω to 1M Ω :<br>±200 | -55 to +125                           | –                 |
| EXBU18<br>(0201×4)      | 0.031<br>(0.1 W / package)                | 12.5                                              | 25                                                | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | –                 |
| EXBU24<br>(0402×2)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |
| EXBU28<br>(0402×4)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |
| EXBU2H<br>(0602×8)      | 0.063<br>(0.25 W / package)               | 25                                                | 50                                                | ±5                             | 10 to 1M (E24)             |                                                       | -55 to +125                           | Grade 1           |
| EXBU34<br>(0603×2)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |
| EXBU38<br>(0603×4)      | 0.063                                     | 50                                                | 100                                               | ±5                             | 1 to 1M (E24)              |                                                       | -55 to +125                           | Grade 1           |

(1) Rated Continuous Working Voltage (RCWW) shall be determined from  $RCWW = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.

(2) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWW$  or Maximum Overload Voltage listed above, whichever less.

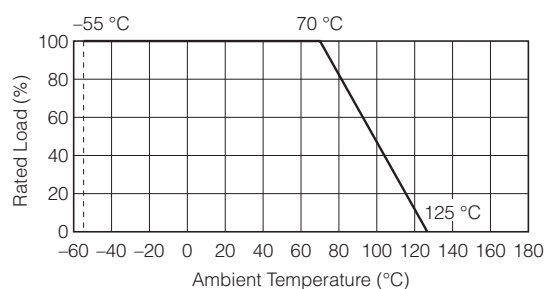
### [For Jumper]

| Part No.<br>(inch size) | Rated Current<br>(A / element) | Maximum Overload Current <sup>(1)</sup><br>(A) |
|-------------------------|--------------------------------|------------------------------------------------|
| EXBU24<br>(0402×2)      | 1                              | 2                                              |
| EXBU28<br>(0402×4)      |                                |                                                |
| EXBU2H<br>(0602×8)      |                                |                                                |
| EXBU34<br>(0603×2)      |                                |                                                |
| EXBU38<br>(0603×4)      |                                |                                                |

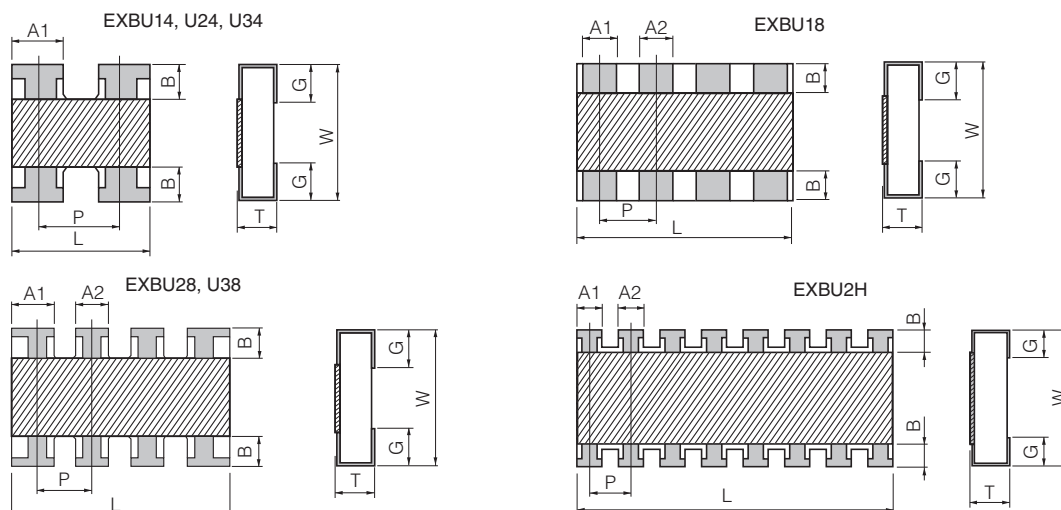
(1) Overload test current

### Power Derating Curve

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



## Dimensions in mm (not to scale)



| Part No.<br>(inch size) | Dimensions (mm) |           |           |           |           |           |        |           | Mass (Weight)<br>[g/1000 pcs.] |
|-------------------------|-----------------|-----------|-----------|-----------|-----------|-----------|--------|-----------|--------------------------------|
|                         | L               | W         | T         | A1        | A2        | B         | P      | G         |                                |
| EXBU14 (0201×2)         | 0.80±0.10       | 0.60±0.10 | 0.35±0.10 | 0.35±0.10 | —         | 0.15±0.10 | (0.50) | 0.15±0.10 | 0.5                            |
| EXBU18 (0201×4)         | 1.40±0.10       | 0.60±0.10 | 0.35±0.10 | 0.20±0.10 | 0.20±0.10 | 0.10±0.10 | (0.40) | 0.20±0.10 | 1.0                            |
| EXBU24 (0402×2)         | 1.00±0.10       | 1.00±0.10 | 0.35±0.10 | 0.40±0.10 | —         | 0.18±0.10 | (0.65) | 0.25±0.10 | 1.2                            |
| EXBU28 (0402×4)         | 2.00±0.10       | 1.00±0.10 | 0.35±0.10 | 0.45±0.10 | 0.35±0.10 | 0.20±0.10 | (0.50) | 0.25±0.10 | 2.0                            |
| EXBU2H (0602×8)         | 3.80±0.10       | 1.60±0.10 | 0.45±0.10 | 0.35±0.10 | 0.35±0.10 | 0.30±0.10 | (0.50) | 0.30±0.10 | 9.0                            |
| EXBU34 (0603×2)         | 1.60±0.20       | 1.60±0.15 | 0.50±0.10 | 0.65±0.15 | —         | 0.30±0.20 | (0.80) | 0.30±0.20 | 3.5                            |
| EXBU38 (0603×4)         | 3.20±0.20       | 1.60±0.15 | 0.50±0.10 | 0.65±0.15 | 0.45±0.15 | 0.30±0.20 | (0.80) | 0.35±0.20 | 7.0                            |

( ) Reference

## Performance

| Test Item                    | Performance Requirements   | Test Conditions                                                                                    |
|------------------------------|----------------------------|----------------------------------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                                              |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                                                     |
| Overload                     | ±2%                        | Rated Voltage × 2.5, 5 s<br>Jumper type : Max. Overload Current, 5 s                               |
| Resistance to Soldering Heat | ±1%                        | 270 °C, 10 s                                                                                       |
| Rapid Change of Temperature  | ±1%                        | −55 °C (30min.) / +125 °C (30min.), 100 cycles                                                     |
| High Temperature Exposure    | ±1%                        | +125 °C, 1000 h                                                                                    |
| Damp Heat, Steady State      | ±1%                        | 60 °C, 90% to 95 %RH, 1000 h                                                                       |
| Load Life in Humidity        | ±3%                        | 60 °C, 90% to 95 %RH, Rated Voltage (Jumper type: Rated Current), 1.5 h ON/0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±3%                        | 70 °C, Rated Voltage(Jumper type: Rated Current), 1.5 h ON/0.5 h OFF cycle, 1000 h                 |

## Chip Resistor Networks

Type: **EXBD**  
**EXBE**  
**EXBA**  
**EXBQ**

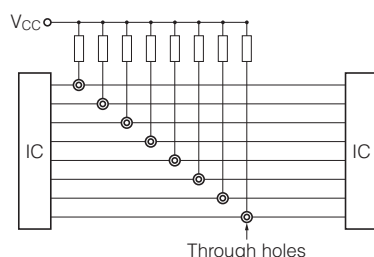


### Features

- High density placing for digital signal circuits
  - Bussed 8 or 15 resistors for pull up/down circuits  
EXBD: 3.2 mm × 1.6 mm × 0.55 mm, 0.635 mm pitch  
EXBE: 4.0 mm × 2.1 mm × 0.55 mm, 0.8 mm pitch  
EXBA: 6.4 mm × 3.1 mm × 0.55 mm, 1.27 mm pitch  
EXBQ: 3.8 mm × 1.6 mm × 0.45 mm, 0.5 mm pitch
  - Available direct placing on the bus line by means of half pitch spacing without through-holes on PWB ("High density placing" is shown below)
- High speed mounting using conventional placing machine
- Reference Standard...IEC 60115-9, JIS C 5201-9, EIAJ RC-2130
- RoHS compliant

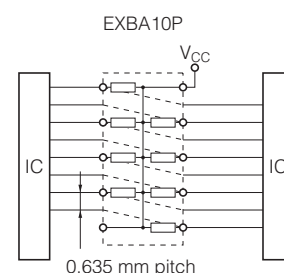
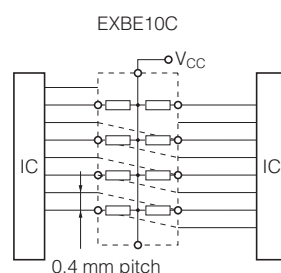
### [High density placing]

Pull up resistors



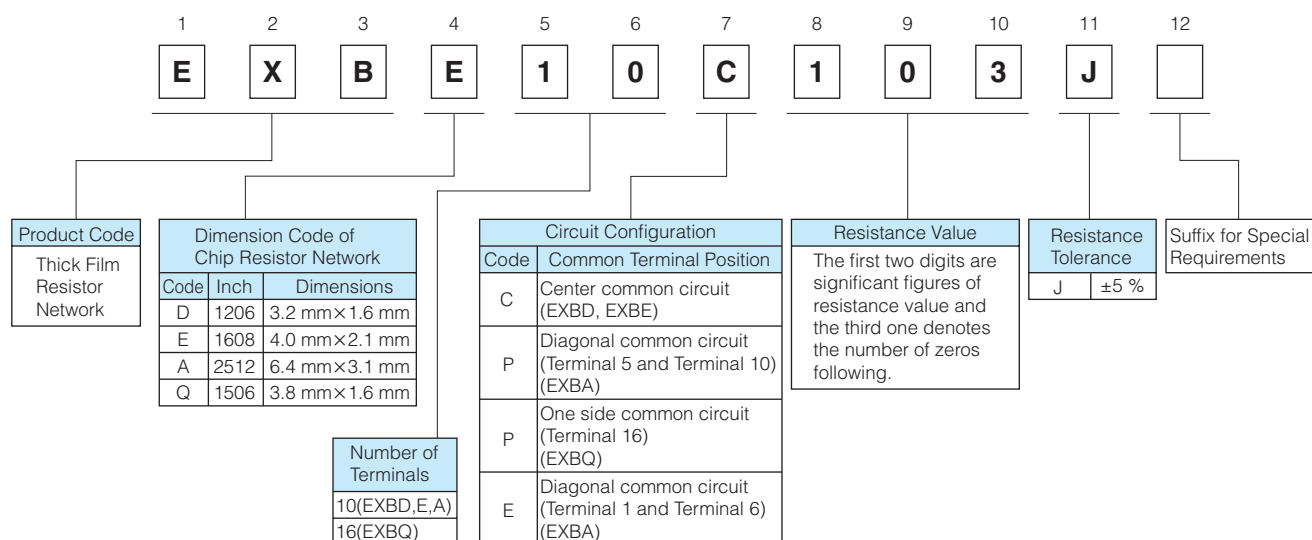
No through hole

Direct placement on the bus line

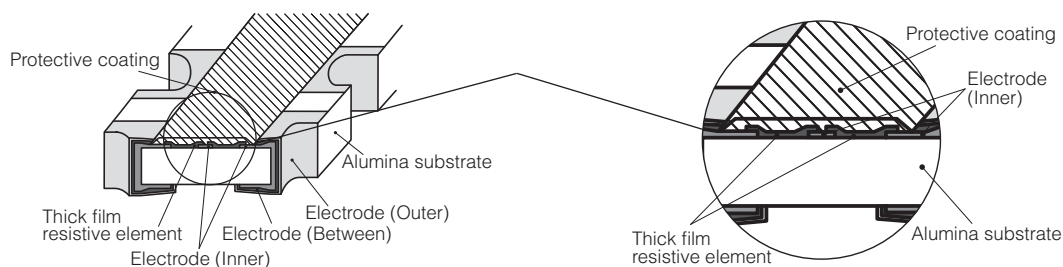


■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers



## Construction (Example : EXBD)



## Dimensions in mm (not to scale)

| EXBD                                   | EXBE                                   |
|----------------------------------------|----------------------------------------|
| <p>Mass (Weight)[1000 pcs.] : 10 g</p> | <p>Mass (Weight)[1000 pcs.] : 16 g</p> |
| EXBA                                   | EXBQ                                   |
| <p>Mass (Weight)[1000 pcs.] : 40 g</p> | <p>Mass (Weight)[1000 pcs.] : 9 g</p>  |

## Circuit Configuration

| EXBD, EXBE | EXBA                                  | EXBQ |
|------------|---------------------------------------|------|
|            | <div>EXBA10P</div> <div>EXBA10E</div> |      |

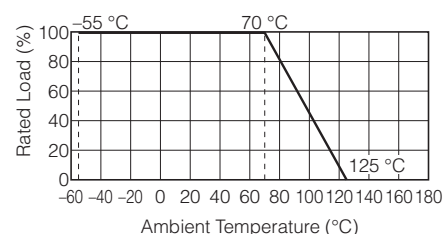
## Ratings

| Item                                            | Specifications        |                |      |                         |
|-------------------------------------------------|-----------------------|----------------|------|-------------------------|
| Part No.                                        | EXBD                  | EXBE           | EXBA | EXBQ                    |
| Resistance Range ( $\Omega$ )                   | 47 to 1M (E12 series) |                |      | 100 to 470k (E6 series) |
| Resistance Tolerance (%)                        | $\pm 5$               |                |      |                         |
| Number of Terminals                             | 10 terminals          |                |      | 16 terminals            |
| Number of Resistors                             | 8 element             |                |      | 15 element              |
| Power Rating <sup>(3)</sup> at 70 °C (W)        | 0.05 /element         | 0.063 /element |      | 0.025 /element          |
| Limiting Element Voltage <sup>(1)</sup> (V)     | 25                    |                | 50   | 25                      |
| Maximum Overload Voltage <sup>(2)</sup> (V)     | 50                    |                | 100  | 50                      |
| T. C. R. ( $\times 10^{-6} / ^\circ\text{C}$ )  | $\pm 200$             |                |      |                         |
| Category Temperature Range ( $^\circ\text{C}$ ) | -55 to +125           |                |      |                         |
| AEC-Q200 Grade                                  | -                     |                |      |                         |

- (1) Rated Continuous Working Voltage (RCWV) shall be determined from  $\text{RCWV} = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.  
 (2) Overload Test Voltage (OTV) shall be determined from  $\text{OTV} = \text{Specified Magnification (refer to performance)} \times \text{RCWV}$  or Maximum Overload Voltage listed above, whichever less.  
 (3) Use it on the condition that the case temperature is below the upper category temperature.

## 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

| Test Item                    | Performance Requirements   | Test Conditions                                                                                |
|------------------------------|----------------------------|------------------------------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance | 20 °C                                                                                          |
| T. C. R.                     | Within Specified T. C. R.  | +25 °C/+125 °C                                                                                 |
| Overload                     | $\pm 3 \%$                 | Rated Voltage $\times 2.5$ , 5 s                                                               |
| Resistance to Soldering Heat | $\pm 1 \%$                 | 260 °C $\pm 5$ °C, 5 s $\pm 1$ s                                                               |
| Rapid Change of Temperature  | $\pm 2 \%$                 | -55 °C (30min.) / +125 °C (30min.), 5 cycles                                                   |
| High Temperature Exposure    | $\pm 3 \%$                 | +125 °C, 100 h                                                                                 |
| Load Life in Humidity        | $\pm 3 \%$                 | 60 °C $\pm 2$ °C, 90 % to 95 %RH, Rated Power $\times 0.1$ , 1.5 h ON / 0.5 h OFF cycle, 500 h |
| Endurance at 70 °C           | $\pm 5 \%$                 | 70 °C $\pm 2$ °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                            |

## Chip Attenuator

Type: **EXB 14AT**  
**EXB 24AT**



### Features

- Unbalanced  $\pi$  type attenuator circuit in one chip  
EXB14AT (0.8 mm  $\times$  0.6 mm), EXB24AT (1.0 mm  $\times$  1.0 mm)
- Reduced mounting area :  
EXB14AT : About 60 % smaller than the area of an attenuator circuit consisting of three 0603 chip resistors, almost equal to the area of three 0402 chip resistors  
EXB24AT : About 50 % smaller than the area of an attenuator circuit consisting of three 1005 chip resistors, almost equal to the area of three 0603 chip resistors
- Mounting cost reduction : (Only 1 chip placed as compared to 3)
- Attenuation : 1 dB to 10 dB
- RoHS compliant

### Recommended Applications

- Attenuation / level control / impedance matching of high frequency  
(communication signalling equipment cellular phones(GSM, CDMA, PDC, etc.), PHS, PDAs)

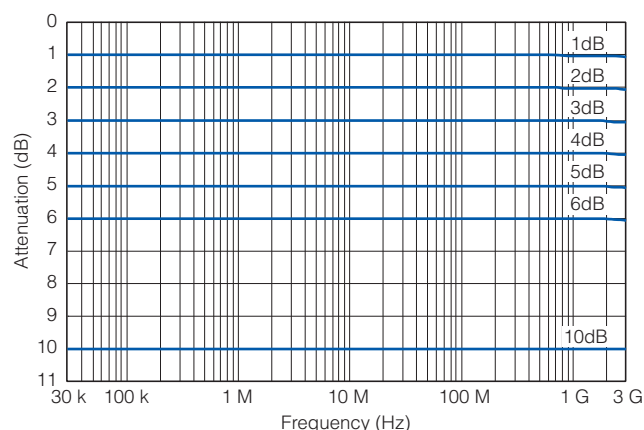
■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

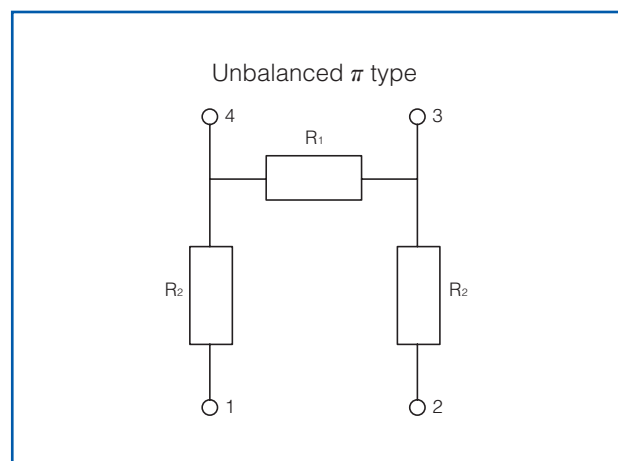
|                             |   |   |      |                                                            |   |                                                                               |   |                           |         |                                                        |    |  |  |  |  |
|-----------------------------|---|---|------|------------------------------------------------------------|---|-------------------------------------------------------------------------------|---|---------------------------|---------|--------------------------------------------------------|----|--|--|--|--|
| 1                           | 2 | 3 | 4    | 5                                                          | 6 | 7                                                                             | 8 | 9                         | 10      | 11                                                     | 12 |  |  |  |  |
| E                           | X | B | 1    | 4                                                          | A | T                                                                             | 3 | A                         | R       | 3                                                      | X  |  |  |  |  |
| Product Code                |   |   | Code | Dimensions and Circuit Configuration                       |   | Attenuation Value                                                             |   | Tolerance                 |         | Packaging                                              |    |  |  |  |  |
| Thick Film Resistor Network |   |   | 14AT | 0.8 mm × 0.6 mm<br>(inch size : 0302)<br>π type attenuator |   | One-digit number /one letter shows attenuation value<br>(ex.) 1→1 dB, A→10 dB |   | R3                        | ±0.3 dB | X<br>Punched Carrier Taping<br>2 mm pitch, 10,000 pcs. |    |  |  |  |  |
|                             |   |   | 24AT | 1.0 mm × 1.0 mm<br>(inch size : 0404)<br>π type attenuator |   |                                                                               |   | R5                        | ±0.5 dB |                                                        |    |  |  |  |  |
|                             |   |   |      |                                                            |   |                                                                               |   | Characteristics Impedance |         |                                                        |    |  |  |  |  |
|                             |   |   |      |                                                            |   |                                                                               |   | A                         |         | 50 Ω                                                   |    |  |  |  |  |

### Attenuation-Frequency Characteristics

(EXB14AT, EXB24AT)

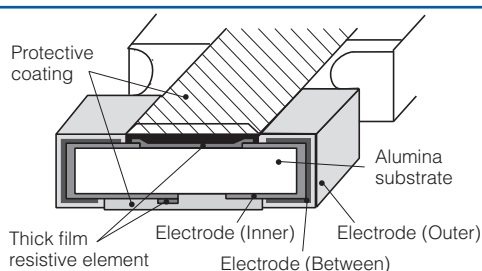


### Circuit Configuration

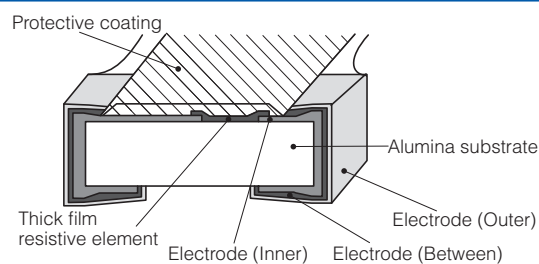


## Construction

EXB14AT

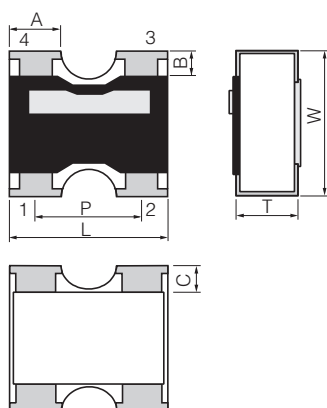


EXB24AT



## Dimensions in mm (not to scale)

EXB14AT

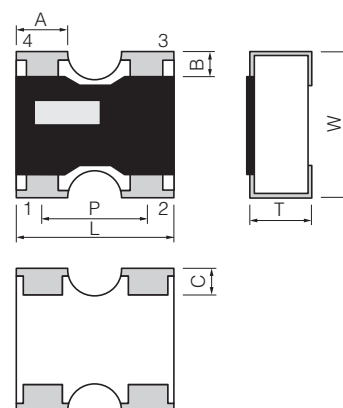


| Dimensions (mm) | L               | W               | T               | A               | B               | C               | P (typical value) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------|
|                 | 0.80 $\pm$ 0.10 | 0.60 $\pm$ 0.10 | 0.35 $\pm$ 0.10 | 0.35 $\pm$ 0.10 | 0.15 $\pm$ 0.10 | 0.15 $\pm$ 0.10 | 0.50              |

### <Marking Configuration>

The bar marking for recognizing terminal direction is located on the side of terminal 3, 4.  
Mass (Weight) [1000 pcs.] : 0.7 g

EXB24AT



| Dimensions (mm) | L               | W               | T               | A               | B               | C               | P (typical value) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------|
|                 | 1.00 $\pm$ 0.10 | 1.00 $\pm$ 0.10 | 0.35 $\pm$ 0.10 | 0.40 $\pm$ 0.10 | 0.15 $\pm$ 0.10 | 0.25 $\pm$ 0.10 | 0.65              |

### <Marking Configuration>

The bar marking for recognizing terminal direction is located on the side of terminal 4.  
Mass (Weight) [1000 pcs.] : 1.1 g

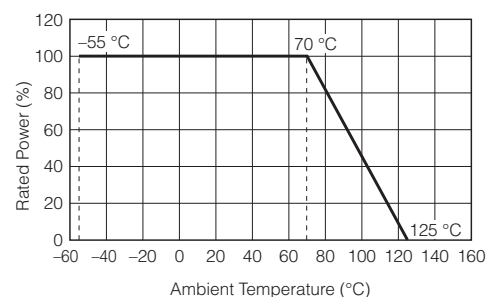
## Ratings

| Part No.                           | EXB14AT, EXB24AT                                                          |
|------------------------------------|---------------------------------------------------------------------------|
| Attenuation Value                  | 1 dB, 2 dB, 3 dB, 4 dB, 5 dB, 6 dB, 10 dB*                                |
| Attenuation Value Tolerance        | 1 dB, 2 dB, 3 dB, 4 dB, 5 dB : $\pm$ 0.3 dB<br>6 dB, 10 dB : $\pm$ 0.5 dB |
| Characteristic Impedance           | 50 $\Omega$                                                               |
| Power Rating                       | 0.04 W /package                                                           |
| Frequency Range at 70 °C           | DC to 3.0 GHz                                                             |
| VSWR (Voltage Standing Wave Ratio) | 1.3 max.                                                                  |
| Number of Resistors                | 3 resistors                                                               |
| Number of Terminals                | 4 terminals                                                               |
| Category Temperature Range         | -55 °C to +125 °C                                                         |

\* Please inquire about the other Attenuator 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.



| Surface Mount Resistors Series                                              |                             |                | Packaging (Standard Quantity : pcs./reel) |                                     |                                     |                                      |
|-----------------------------------------------------------------------------|-----------------------------|----------------|-------------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|
| Products                                                                    | Part No.                    | Size mm (inch) | Pressed Carrier Taping (2 mm pitch)       | Punched Carrier Taping (2 mm pitch) | Punched Carrier Taping (4 mm pitch) | Embossed Carrier Taping (4 mm pitch) |
| Thick Film Chip Resistors                                                   | ERJXGN                      | 0402(01005)    | 20,000 *                                  | —                                   | —                                   | 4,0000 **                            |
|                                                                             | ERJ1GN                      | 0603(0201)     | 15,000                                    | —                                   | —                                   | —                                    |
|                                                                             | ERJ2GE                      | 1005(0402)     | —                                         | 10,000, 20,000                      | —                                   | —                                    |
|                                                                             | ERJ3GE                      | 1608(0603)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ6GE                      | 2012(0805)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ8GE                      | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ14                       | 3225(1210)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ12                       | 4532(1812)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ12Z                      | 5025(2010)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ1T                       | 6432(2512)     | —                                         | —                                   | —                                   | 4,000                                |
| Precision Thick Film Chip Resistors                                         | ERJXGN                      | 0402(01005)    | 20,000 *                                  | —                                   | —                                   | 4,0000 **                            |
|                                                                             | ERJ1GN/1RH                  | 0603(0201)     | 15,000                                    | —                                   | —                                   | —                                    |
|                                                                             | ERJ2RC/2RH/2RK              | 1005(0402)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                                             | ERJ3RB/3RE/3EK              | 1608(0603)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ6RB/6RE/6EN              | 2012(0805)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ8EN                      | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ14N                      | 3225(1210)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ12N                      | 4532(1812)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ12S                      | 5025(2010)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ1TN                      | 6432(2512)     | —                                         | —                                   | —                                   | 4,000                                |
| Metal Film (Thin Film) Chip Resistors, High Reliability Type /Anti-ESD Type | ERA1A                       | 0603(0201)     | 15,000                                    | —                                   | —                                   | —                                    |
|                                                                             | ERA2A/2V                    | 1005(0402)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                                             | ERA3A/3V                    | 1608(0603)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERA6A/6V                    | 2012(0805)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERA8A                       | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
| Thick Film Chip Resistors/ Low Resistance Type                              | ERJ2LW/2BW                  | 1005(0402)     | 10,000                                    | —                                   | —                                   | —                                    |
|                                                                             | ERJ2BS/2BQ                  | 1005(0402)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                                             | ERJ3L/3B/3R/L03             | 1608(0603)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ6L/6B/6C<br>ERJ6D/6R/L06 | 2012(0805)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ8B/8C/8R/L08             | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                                             | ERJ14B/14R/L14              | 3225(1210)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ12R/L12                  | 4532(1812)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ12Z/L1D                  | 5025(2010)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                                             | ERJ1TR                      | 6432(2512)     | —                                         | —                                   | —                                   | 4,000                                |
|                                                                             | ERJL1W                      | 6432(2512)     | —                                         | —                                   | —                                   | 3,000                                |
| Current Sensing Resistors, Metal Plate Type                                 | ERJMP2                      | 3216(1206)     | —                                         | —                                   | —                                   | 3,000                                |
|                                                                             | ERJMP3                      | 5025(2010)     | —                                         | —                                   | —                                   | 3,000                                |
|                                                                             | ERJMP4                      | 6432(2512)     | —                                         | —                                   | —                                   | 2,000                                |
|                                                                             | ERJMS4                      | 6432(2512)     | —                                         | —                                   | —                                   | 2,000                                |
|                                                                             | ERJMS6                      | 6468(2526)     | —                                         | —                                   | —                                   | 1,000 (8 mm Pitch)                   |
|                                                                             | ERJMB1                      | 2550(1020)     | —                                         | —                                   | —                                   | 3,000                                |
|                                                                             | ERJM1W                      | 6432(2512)     | —                                         | —                                   | —                                   | 3,000                                |
| Current Sensing Resistors, Metal Foil Type                                  | ERJMFBA                     | 1005(0402)     | —                                         | 10,000                              | —                                   | —                                    |

\* W8P2 : Width 8 mm, Pitch 2 mm, \*\* W4P1 : Width 4 mm, Pitch 1 mm

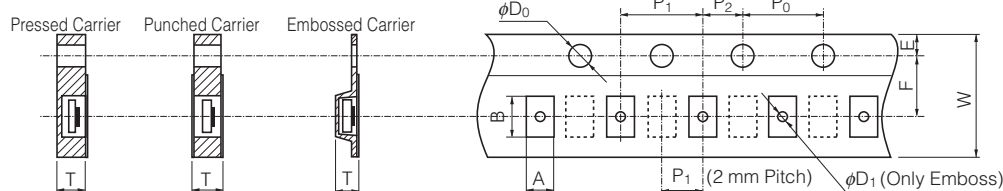
(1) Anti-Sulfurated High Power Chip Resistors / Wide Terminal Type

| Surface Mount Resistors Series                             |                                                    |                | Packaging (Standard Quantity : pcs./reel) |                                     |                                     |                                      |
|------------------------------------------------------------|----------------------------------------------------|----------------|-------------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|
| Products                                                   | Part No.                                           | Size mm (inch) | Pressed Carrier Taping (2 mm pitch)       | Punched Carrier Taping (2 mm pitch) | Punched Carrier Taping (4 mm pitch) | Embossed Carrier Taping (4 mm pitch) |
| High Power Chip Resistors/<br>Wide Terminal Type           | ERJA1                                              | 3264(1225)     | —                                         | —                                   | —                                   | 4,000                                |
|                                                            | ERJB1/ERJC1 <sup>(1)</sup><br>ERJC1 <sup>(2)</sup> | 2550(1020)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                            | ERJB2/ERJD2 <sup>(2)</sup>                         | 1632(0612)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJB3                                              | 1220(0508)     | —                                         | —                                   | 5,000                               | —                                    |
| High Precision/<br>Anti-Surge Thick Film<br>Chip Resistors | ERJPA2                                             | 1005(0402)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | ERJPB3/P03/PA3                                     | 1608(0603)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJPB6/P06                                         | 2012(0805)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJP08                                             | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
| Anti-Pulse Thick Film<br>Chip Resistors                    | ERJP14                                             | 3225(1210)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                            | ERJT06                                             | 2012(0805)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJT08                                             | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJT14                                             | 3225(1210)     | —                                         | —                                   | —                                   | 5,000                                |
| Anti-Sulfurated Thick Film<br>Chip Resistors               | ERJU01                                             | 0603(0201)     | 15,000                                    | —                                   | —                                   | —                                    |
|                                                            | ERJS02/U02                                         | 1005(0402)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | ERJS03/U03                                         | 1608(0603)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJS06/U06<br>ERJU6S/U6Q/UP6                       | 2012(0805)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJS08/U08/UP8                                     | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | ERJS14/U14                                         | 3225(1210)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                            | ERJS12/U12                                         | 4532(1812)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                            | ERJS1D/U1D                                         | 5025(2010)     | —                                         | —                                   | —                                   | 5,000                                |
|                                                            | ERJS1T/U1T                                         | 6432(2512)     | —                                         | —                                   | —                                   | 4,000                                |
| Chip Resistor Array                                        | EXB14V                                             | 0806(0302)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXB24V                                             | 1010(0404)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXB34V                                             | 1616(0606)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | EXBV4V                                             | 1616(0606)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | EXB18V                                             | 1406(0502)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXB28V                                             | 2010(0804)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXBN8V                                             | 2010(0804)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXB38V                                             | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | EXBV8V                                             | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | EXBS8V                                             | 5022(2009)     | —                                         | —                                   | —                                   | 2,500                                |
|                                                            | EXB2HV                                             | 3816(1506)     | —                                         | —                                   | 5,000                               | —                                    |
| Anti-Sulfurated Chip Resistor Array                        | EXBU14                                             | 0806(0302)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXBU18                                             | 1406(0502)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXBU24                                             | 1010(0404)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXBU34                                             | 1616(0606)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | EXBU28                                             | 2010(0804)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXBU38                                             | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | EXBU2H                                             | 3816(1506)     | —                                         | —                                   | 5,000                               | —                                    |
| Chip Resistor Networks                                     | EXBD                                               | 3216(1206)     | —                                         | —                                   | 5,000                               | —                                    |
|                                                            | EXBE                                               | 4021(1608)     | —                                         | —                                   | —                                   | 4,000                                |
|                                                            | EXBA                                               | 6431(2512)     | —                                         | —                                   | —                                   | 4,000                                |
|                                                            | EXBQ                                               | 3816(1506)     | —                                         | —                                   | 5,000                               | —                                    |
| Chip Attenuator                                            | EXB14AT                                            | 0806(0302)     | —                                         | 10,000                              | —                                   | —                                    |
|                                                            | EXB24AT                                            | 1010(0404)     | —                                         | 10,000                              | —                                   | —                                    |

(1) Anti-Sulfurated High Power Chip Resistors / Wide Terminal Type

(2) Low TCR High Power Chip Resistors / Wide Terminal Type

## Carrier Tape



## Pressed Carrier Taping (2 mm Pitch)

● Chip Resistors / Precision Chip / Metal Film(Thin Film)Chip / Low Resistance / Anti-Surge / Anti-Sulfur (Unit : mm)

| Part No. | Size mm<br>(inch) | A                     | B                     | W                     | F                     | E                     | P <sub>1</sub>        | P <sub>2</sub>        | P <sub>0</sub>        | φD <sub>0</sub>                    | T                     |
|----------|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|-----------------------|
| ERJXGN   | 0402(01005)       | 0.24 <sup>±0.03</sup> | 0.45 <sup>±0.03</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 2.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.31 <sup>±0.05</sup> |
| ERJ1GN   | 0603<br>(0201)    | 0.38 <sup>±0.05</sup> | 0.68 <sup>±0.05</sup> |                       |                       |                       |                       |                       |                       |                                    | 0.42 <sup>±0.05</sup> |
| ERJ1R□   |                   |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJU01   |                   |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERA1A    |                   |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ2LW   | 1005(0402)        | 0.68 <sup>±0.10</sup> | 1.20 <sup>±0.10</sup> | 0.60 <sup>±0.05</sup> |                       |                       |                       |                       |                       |                                    |                       |
| ERJ2BW   | 1005(0402)        | 0.67 <sup>±0.10</sup> | 1.17 <sup>±0.10</sup> | 0.61 <sup>±0.05</sup> |                       |                       |                       |                       |                       |                                    |                       |

## Punched Carrier Taping (2 mm Pitch)

● Chip Resistors / Precision Chip / Metal Film(Thin Film)Chip / Low Resistance / Anti-Surge / Anti-Sulfur / Metal Foil Type (Unit : mm)

| Part No. | Size mm (inch) | A                     | B                     | W                     | F                     | E                     | P <sub>1</sub>        | P <sub>2</sub>        | P <sub>0</sub>        | φD <sub>0</sub>                    | T                     |
|----------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|-----------------------|
| ERJ2□    | 1005 (0402)    | 0.67 <sup>±0.05</sup> | 1.17 <sup>±0.05</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 2.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.52 <sup>±0.05</sup> |
| ERJPA2   |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    | 0.60 <sup>±0.05</sup> |
| ERJ□□2   |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERA2□    |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJMFBA  |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    | 0.60 <sup>±0.05</sup> |

● Chip Resistor Array / Anti-Sulfurated Chip Resistor Array / Chip Attenuator (Unit : mm)

| Part No. | Size mm<br>(inch) | A                                      | B                                      | W         | F         | E         | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φD <sub>0</sub>                    | T         |        |
|----------|-------------------|----------------------------------------|----------------------------------------|-----------|-----------|-----------|----------------|----------------|----------------|------------------------------------|-----------|--------|
| EXB14V   | 0806              | 0.70 <sup>+0.10</sup> <sub>-0.05</sub> | 0.95 <sup>+0.05</sup> <sub>-0.10</sub> | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 | 2.00±0.10      | 2.00±0.05      | 4.00±0.10      | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.52±0.05 |        |
| EXB14AT  | (0302)            |                                        |                                        |           |           |           |                |                |                |                                    |           |        |
| EXB18V   | 1406(0502)        |                                        | 1.60±0.10                              |           |           |           |                |                |                |                                    |           |        |
| EXB24V   | 1010              | 1.20±0.10                              | 2.20±0.10                              |           |           |           |                |                |                |                                    |           |        |
| EXBU24   |                   |                                        |                                        |           |           |           |                |                |                |                                    |           | (0404) |
| EXB24AT  |                   |                                        |                                        |           |           |           |                |                |                |                                    |           |        |
| EXB28V   | 2010              | 1.20±0.10                              | 2.20±0.10                              |           |           |           |                |                |                |                                    |           |        |
| EXBU28   |                   |                                        |                                        | (0804)    |           |           |                |                |                |                                    |           |        |
| EXBN8V   |                   |                                        |                                        |           |           |           |                |                |                |                                    |           |        |

## Punched Carrier Taping (4 mm Pitch)

● Chip Resistors / Precision Chip / Metal Film(Thin Film)Chip / Low Resistance / High Power / High Precision / Anti-Surge / Anti-Pulse / Anti-Sulfur (Unit : mm)

| Part No.      | Size mm (inch) | A                     | B                     | W                     | F                     | E                     | P <sub>1</sub>        | P <sub>2</sub>        | P <sub>0</sub>        | φD <sub>0</sub>                    | T                     |
|---------------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|-----------------------|
| ERJ3□         | 1608 (0603)    | 1.10 <sup>±0.10</sup> | 1.90 <sup>±0.10</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 4.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.70 <sup>±0.05</sup> |
| ERJ3LW(10 mΩ) |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ3BW        |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ□□3        |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERA3□         | 2012 (0805)    | 1.65 <sup>±0.15</sup> | 2.50 <sup>±0.20</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 4.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.84 <sup>±0.05</sup> |
| ERJ3LW(5 mΩ)  |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ6□         |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ□□6        |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJU6S, U6Q   | 1220(0508)     | 1.55 <sup>±0.15</sup> | 2.30 <sup>±0.20</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 4.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.94 <sup>±0.05</sup> |
| ERA6□         |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJB3         |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ6BW        |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ6LW        | 3216 (1206)    | 2.00 <sup>±0.15</sup> | 3.60 <sup>±0.20</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 4.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.84 <sup>±0.05</sup> |
| ERJ6CW        |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ8□         |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ8□W        |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJ□□8        | 1632 (0612)    | 2.00 <sup>±0.15</sup> | 3.60 <sup>±0.20</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 4.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 0.84 <sup>±0.05</sup> |
| ERA8A         |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJB2         |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |
| ERJD2         |                |                       |                       |                       |                       |                       |                       |                       |                       |                                    |                       |

# Panasonic Surface Mount Resistors Packaging Method (Taping)

## ● Chip Resistor Array / Anti-Sulfurated Chip Resistor Array / Chip Resistor Networks

(Unit : mm)

| Part No.         | Size mm (inch) | A                     | B                     | W                     | F                     | E                     | P <sub>1</sub>        | P <sub>2</sub>        | P <sub>0</sub>        | φD <sub>0</sub>       | T                     |
|------------------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| EXB34V<br>EXBU34 | 1616(0606)     | 1.95 <sup>±0.15</sup> | 1.95 <sup>±0.20</sup> | 8.00 <sup>±0.20</sup> | 3.50 <sup>±0.05</sup> | 1.75 <sup>±0.10</sup> | 4.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>±0.10</sup> | 0.70 <sup>±0.05</sup> |
| EXB38V<br>EXBU38 | 3216(1206)     |                       | 3.60 <sup>±0.20</sup> |                       |                       |                       |                       |                       |                       |                       |                       |
| EXB2HV<br>EXBU2H | 3816(1506)     |                       | 4.10 <sup>±0.15</sup> |                       |                       |                       |                       |                       |                       |                       |                       |
| EXBV4V           | 1616(0606)     |                       | 1.95 <sup>±0.20</sup> |                       |                       |                       |                       |                       |                       |                       | 0.84 <sup>±0.05</sup> |
| EXBV8V           | 3216(1206)     |                       | 3.60 <sup>±0.20</sup> |                       |                       |                       |                       |                       |                       |                       |                       |
| EXBD             | 3216(1206)     | 2.00 <sup>±0.20</sup> | 3.60 <sup>±0.20</sup> |                       |                       |                       |                       |                       |                       |                       | 0.84 <sup>±0.10</sup> |
| EXBQ             | 3816(1506)     | 1.90 <sup>±0.20</sup> | 4.10 <sup>±0.20</sup> |                       |                       |                       |                       |                       |                       |                       | 0.64 <sup>±0.05</sup> |

## Embossed Carrier Taping (1 mm Pitch)

### ● Chip Resistors

(Unit : mm)

| Part No. | Size mm (inch) | A                     | B                     | W                     | F                     | E                     | P <sub>1</sub>        | P <sub>2</sub>        | P <sub>0</sub>        | φD <sub>0</sub>       | T        |
|----------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|
| ERJXGN   | 0402(01005)    | 0.25 <sup>±0.05</sup> | 0.45 <sup>±0.05</sup> | 4.00 <sup>±0.20</sup> | 1.80 <sup>±0.05</sup> | 0.90 <sup>±0.10</sup> | 1.00 <sup>±0.10</sup> | 1.00 <sup>±0.10</sup> | 2.00 <sup>±0.10</sup> | 0.80 <sup>±0.10</sup> | 0.5 max. |

## Embossed Carrier Taping (4 mm Pitch)

### ● Chip Resistors / Precision Chip / Low Resistance / High Power / Anti-Surge / Anti-Pulse / Anti-Sulfur Pulse / Anti-Sulfur

(Unit : mm)

| Part No.                   | Size mm (inch) | A         | B         | W          | F         | E         | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φD <sub>0</sub> | T         | φD <sub>1</sub> |
|----------------------------|----------------|-----------|-----------|------------|-----------|-----------|----------------|----------------|----------------|-----------------|-----------|-----------------|
| ERJ14□<br>ERJ□14           | 3225<br>(1210) | 2.80±0.20 | 3.50±0.20 | 8.00±0.30  | 3.50±0.05 | 1.75±0.10 | 4.00±0.10      | 2.00±0.05      | 4.00±0.10      | 1.50±0.10       | 1.00±0.10 | 1.00±0.10       |
| ERJ12□<br>ERJ□12           | 4532<br>(1812) | 3.50±0.20 | 4.80±0.20 | 12.00±0.30 | 5.50±0.20 |           |                |                |                |                 |           | 1.5 min         |
| ERJ12Z<br>ERJ12S<br>ERJ□1D | 5025<br>(2010) | 2.80±0.20 | 5.30±0.20 |            |           |           |                |                |                |                 |           |                 |
| ERJB1<br>ERJC1<br>ERJD1    | 2550<br>(1020) |           |           |            |           |           |                |                |                |                 |           |                 |
| ERJ1T□<br>ERJ□1T           | 6432<br>(2512) |           |           |            |           |           |                |                |                |                 |           |                 |
| ERJL1W                     |                | 3.60±0.20 | 6.90±0.20 |            |           |           |                |                |                |                 | 1.60±0.10 |                 |
| ERJA1                      | 3264(1225)     | 3.50±0.20 | 6.80±0.20 |            |           |           |                |                |                |                 | 1.10±0.20 |                 |

### ● Current Sensing Resistors, Metal Plate Type

(Unit : mm)

| Part No.               | Size mm (inch) | A         | B         | W          | F         | E         | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φD <sub>0</sub>                    | T         | φD <sub>1</sub> |
|------------------------|----------------|-----------|-----------|------------|-----------|-----------|----------------|----------------|----------------|------------------------------------|-----------|-----------------|
| ERJMP2<br>(1m Ω)       | 3216(1206)     | 1.90±0.20 | 3.50±0.20 | 8.00±0.30  | 3.50±0.10 | 1.75±0.10 | 4.00±0.10      | 2.00±0.05      | 4.00±0.10      | 1.50 <sup>+0.10</sup> <sub>0</sub> | 1.55±0.20 | —               |
| ERJMP2<br>(2m Ω)       | 3216(1206)     |           |           |            |           |           |                |                |                |                                    | 1.40±0.20 | —               |
| ERJMP2<br>(3 to 50m Ω) | 3216(1206)     |           |           |            |           |           |                |                |                |                                    | 1.10±0.20 | —               |
| ERJMP3<br>(1 to 2m Ω)  | 5025(2010)     | 2.90±0.20 | 5.40±0.20 | 12.00±0.30 | 5.50±0.10 |           |                |                |                |                                    | 1.55±0.20 | —               |
| ERJMP3<br>(3 to 50m Ω) | 5025(2010)     |           |           |            |           |           |                |                |                |                                    | 1.15±0.20 | —               |
| ERJMB1                 | 2550(1020)     |           |           |            |           |           |                |                |                |                                    | 1.55±0.20 | —               |
| ERJMP4<br>(1 to 2m Ω)  | 6432(2512)     | 3.50±0.20 | 6.90±0.20 | 12.00±0.30 | 5.50±0.10 |           |                |                |                |                                    | 1.60±0.20 | 1.5 min         |
| ERJMP4<br>(3 to 50m Ω) | 6432(2512)     |           |           |            |           |           |                |                |                |                                    | 1.20±0.20 | —               |
| ERJMS4                 | 6432(2512)     |           |           |            |           |           |                |                |                |                                    | 1.60±0.20 | 1.5 min         |
| ERJM1W                 | 6432(2512)     |           |           |            |           |           |                |                |                |                                    | 1.80±0.20 | 1.5 min         |

### ● Chip Resistor Array / Chip Resistor Networks

(Unit : mm)

| Part No. | Size mm (inch) | A                     | B                     | W                      | F                     | E                     | P <sub>1</sub>        | P <sub>2</sub>        | P <sub>0</sub>        | φD <sub>0</sub>       | T                     | φD <sub>1</sub> |
|----------|----------------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------|
| EXBS8V   | 5022(2029)     | 2.80 <sup>±0.20</sup> | 5.70 <sup>±0.20</sup> | 12.00 <sup>±0.30</sup> | 5.50 <sup>±0.20</sup> | 1.75 <sup>±0.10</sup> | 4.00 <sup>±0.10</sup> | 2.00 <sup>±0.05</sup> | 4.00 <sup>±0.10</sup> | 1.50 <sup>±0.10</sup> | 1.6 max.              | 1.5 min.        |
| EXBE     | 4021(1608)     | 2.50 <sup>±0.20</sup> | 4.40 <sup>±0.20</sup> |                        |                       |                       |                       |                       |                       |                       | 1.10 <sup>±0.20</sup> |                 |
| EXBA     | 6431(2512)     | 3.50 <sup>±0.20</sup> | 6.80 <sup>±0.20</sup> |                        |                       |                       |                       |                       |                       |                       |                       |                 |

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.

14 Aug. 2018

### Embossed Carrier Taping (8 mm Pitch)

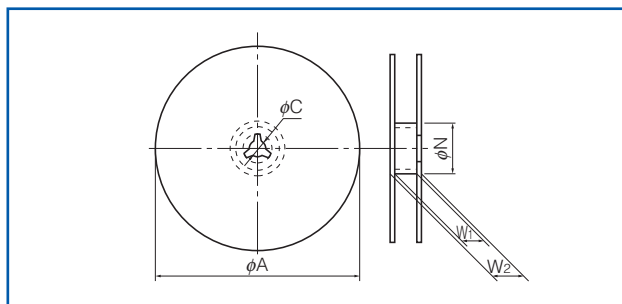
#### ● Current Sensing Resistors, Metal Plate Type

(Unit : mm)

| Part No. | Size mm (inch) | A                                  | B                                  | W                                   | F                                  | E                                  | P <sub>1</sub>                     | P <sub>2</sub>                     | P <sub>0</sub>                     | φD <sub>0</sub>                    | T                                  | φD <sub>1</sub> |
|----------|----------------|------------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-----------------|
| ERJMS6   | 6468(2526)     | 6.90 <sup>+0.20</sup> <sub>0</sub> | 7.50 <sup>+0.20</sup> <sub>0</sub> | 12.00 <sup>+0.30</sup> <sub>0</sub> | 5.50 <sup>+0.05</sup> <sub>0</sub> | 1.75 <sup>+0.10</sup> <sub>0</sub> | 8.00 <sup>+0.10</sup> <sub>0</sub> | 2.00 <sup>+0.05</sup> <sub>0</sub> | 4.00 <sup>+0.10</sup> <sub>0</sub> | 1.50 <sup>+0.10</sup> <sub>0</sub> | 2.45 <sup>+0.20</sup> <sub>0</sub> | 1.5 min.        |

### Taping Reel

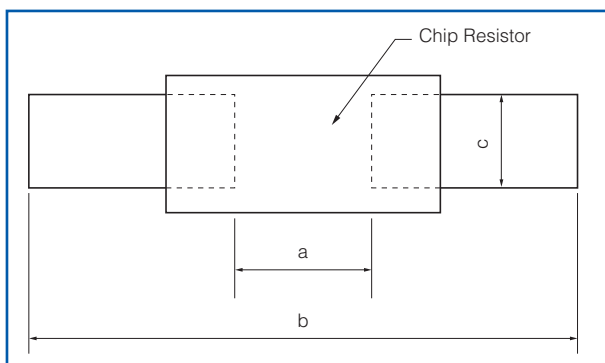
(Unit : mm)



| Tape Width (W) | φA                                  | φN                                | φC                                | W <sub>1</sub>                    | W <sub>2</sub>                    |
|----------------|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 4mm Width      | 180.0 <sup>+3.0</sup> <sub>0</sub>  | 60.0 <sup>+1.0</sup> <sub>0</sub> | 13.0 <sup>+0.2</sup> <sub>0</sub> | 4.5 <sup>+0.5</sup> <sub>0</sub>  | 7.0 <sup>+0.5</sup> <sub>0</sub>  |
| 8mm Width      | 180.0 <sup>+0</sup> <sub>-1.5</sub> |                                   |                                   | 9.0 <sup>+1.0</sup> <sub>0</sub>  | 11.4 <sup>+1.0</sup> <sub>0</sub> |
| 12mm Width     |                                     |                                   |                                   | 13.0 <sup>+1.0</sup> <sub>0</sub> | 15.4 <sup>+1.0</sup> <sub>0</sub> |
| 24mm Width     | 380.0 <sup>+2.0</sup> <sub>0</sub>  | 80.0 <sup>+1.0</sup> <sub>0</sub> |                                   | 25.4 <sup>+1.0</sup> <sub>0</sub> | 29.4 <sup>+1.0</sup> <sub>0</sub> |

## Recommended Land Pattern

- An example of a land pattern for the Rectangular Type is shown below.



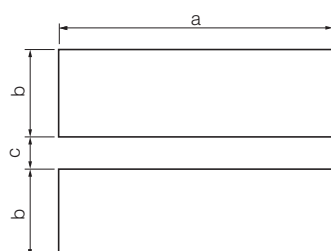
High power (double-sided resistive elements structure) type

| Part No.                | Size<br>mm/inch | Dimensions (mm) |            |            |
|-------------------------|-----------------|-----------------|------------|------------|
|                         |                 | a               | b          | c          |
| ERJ2LW/2BW              | 1005/0402       | 0.52            | 1.4 to 1.6 | 0.4 to 0.6 |
| ERJ3LW/3BW              | 1608/0603       | 0.5 to 0.8      | 2.5 to 2.7 | 0.9 to 1.1 |
| ERJ6LW                  | 2012/0805       | 0.6 to 0.8      | 3.2 to 3.8 | 1.1 to 1.4 |
| ERJ6BW                  | 2012/0805       | 0.9             | 3.2 to 3.8 | 1.1 to 1.4 |
| ERJ6CW<br>(10 to 13 mΩ) | 2012/0805       | 0.7 to 0.9      | 3.2 to 3.8 | 1.1 to 1.4 |
| ERJ6CW<br>(15 to 30 mΩ) | 2012/0805       | 0.9 to 1.1      | 3.2 to 3.8 | 1.1 to 1.4 |
| ERJ8BW                  | 3216/1206       | 1.2             | 4.4 to 5.0 | 1.3 to 1.8 |
| ERJ8CW<br>(10 to 16 mΩ) |                 |                 |            |            |
| ERJ8CW<br>(18 to 50 mΩ) | 3216/1206       | 2.0 to 2.6      | 4.4 to 5.0 | 1.2 to 1.8 |

| Size<br>mm/inch | Dimensions (mm) |            |              |
|-----------------|-----------------|------------|--------------|
|                 | a               | b          | c            |
| 0402/01005      | 0.15 to 0.20    | 0.5 to 0.7 | 0.20 to 0.25 |
| 0603/0201       | 0.3 to 0.4      | 0.8 to 0.9 | 0.25 to 0.35 |
| 1005/0402       | 0.5 to 0.6      | 1.4 to 1.6 | 0.4 to 0.6   |
| 1608/0603       | 0.7 to 0.9      | 2.0 to 2.2 | 0.8 to 1.0   |
| 2012/0805       | 1.0 to 1.4      | 3.2 to 3.8 | 0.9 to 1.4   |
| 3216/1206       | 2.0 to 2.4      | 4.4 to 5.0 | 1.2 to 1.8   |
| 3225/1210       | 2.0 to 2.4      | 4.4 to 5.0 | 1.8 to 2.8   |
| 4532/1812       | 3.3 to 3.7      | 5.7 to 6.5 | 2.3 to 3.5   |
| 5025/2010       | 3.6 to 4.0      | 6.2 to 7.0 | 1.8 to 2.8   |
| 6432/2512       | 5.0 to 5.4      | 7.6 to 8.6 | 2.3 to 3.5   |
| 6432/2512*      | 3.6 to 4.0      | 7.6 to 8.6 | 2.3 to 3.5   |

\* ERJL1W

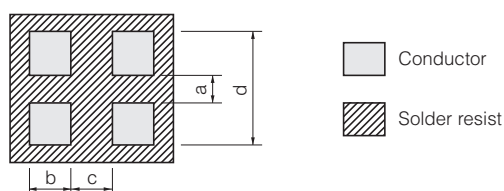
- An example of a land pattern for High Power Chip Resistors / Wide Terminal Type is shown below.



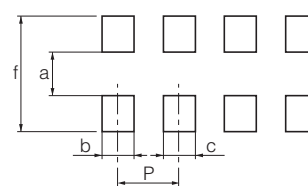
| Part No.                                              | Dimensions (mm) |      |      |
|-------------------------------------------------------|-----------------|------|------|
|                                                       | a               | b    | c    |
| ERJA1                                                 | 6.4             | 1.70 | 0.60 |
| ERJB1<br>ERJC1 <sup>(1)</sup><br>ERJD1 <sup>(2)</sup> | 5.0             | 1.30 | 0.75 |
| ERJB2<br>ERJD2 <sup>(2)</sup>                         | 3.2             | 0.95 | 0.70 |
| ERJB3                                                 | 2.0             | 0.80 | 0.60 |

- (1) Anti-Sulfurated High Power Chip Resistors / Wide Terminal Type  
 (2) Low TCR High Power Chip Resistors / Wide Terminal Type

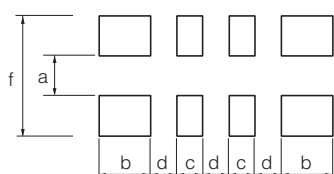
- An example of a land pattern for Chip Resistor Array, Anti-Sulfurated Chip Resistor Array and Chip Attenuator is shown below.



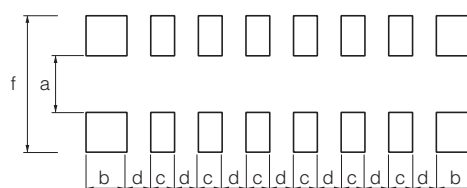
| Part No.                   | Dimensions (mm) |              |      |              |
|----------------------------|-----------------|--------------|------|--------------|
|                            | a               | b            | c    | d            |
| EXB14V<br>EXB14A           | 0.30            | 0.30         | 0.30 | 0.80 to 0.90 |
| EXB24V<br>EXBU24<br>EXB24A | 0.5             | 0.35 to 0.40 | 0.30 | 1.4 to 1.5   |



| Part No.                 | Dimensions (mm) |              |              |              |      |
|--------------------------|-----------------|--------------|--------------|--------------|------|
|                          | a               | b            | c            | f            | P    |
| EXB18V                   | 0.20 to 0.30    | 0.15 to 0.20 | 0.15 to 0.20 | 0.80 to 0.90 | 0.40 |
| EXBV4V,V8V               | 0.7 to 0.9      | 0.4 to 0.45  | 0.4 to 0.45  | 2 to 2.4     | 0.80 |
| EXB34V,38V<br>EXBU34,U38 | 0.7 to 0.9      | 0.4 to 0.5   | 0.4 to 0.5   | 2.2 to 2.6   | 0.80 |
| EXBS8V                   | 1 to 1.2        | 0.5 to 0.75  | 0.5 to 0.75  | 3.2 to 3.8   | 1.27 |



| Part No.         | Dimensions (mm) |              |      |      |              |
|------------------|-----------------|--------------|------|------|--------------|
|                  | a               | b            | c    | d    | f            |
| EXB28V<br>EXBU28 | 0.40            | 0.525        | 0.25 | 0.25 | 1.40         |
| EXBN8V           | 0.45 to 0.50    | 0.35 to 0.38 | 0.25 | 0.25 | 1.40 to 2.00 |



| Part No.         | Dimensions (mm) |       |      |      |      |
|------------------|-----------------|-------|------|------|------|
|                  | a               | b     | c    | d    | f    |
| EXB2HV<br>EXBU2H | 1.00            | 0.425 | 0.25 | 0.25 | 2.00 |

- An example of a land pattern for Chip Resistor Networks is shown below.

|                           | EXBA                                                          | EXBE                                  |
|---------------------------|---------------------------------------------------------------|---------------------------------------|
| For popular pattern       | Pitch 1.27 mm<br>                                             | Pitch 0.8 mm<br>                      |
| For high density pattern* | Pitch 0.635 mm<br>Through-hole less<br>EXBA10P<br>EXBA10E<br> | Pitch 0.4 mm<br>Through-hole less<br> |
|                           | EXBD                                                          | EXBQ                                  |
| For popular pattern       | Pitch 0.635 mm<br>                                            | Pitch 0.5 mm<br>                      |

- \* When designing high density land patterns, examine the reliability of isolation among the lines and adopt the chip resistor networks.

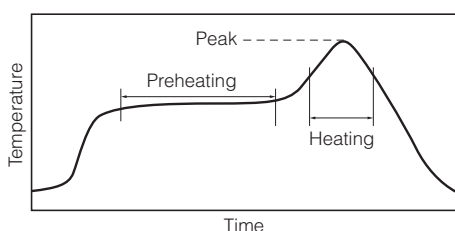
## Recommended Soldering Conditions

Recommendations and precautions are described below.

### ● Rectangular Type

#### ● Recommended soldering conditions for reflow

- Reflow soldering shall be performed a maximum of two times.
- Please contact us for additional information when used in conditions other than those specified.
- Please measure the temperature of the terminals and study every kind of solder and printed circuit board for solderability before actual use.



For soldering (Example : Sn/Pb)

|              | Temperature      | Time          |
|--------------|------------------|---------------|
| Preheating   | 140 °C to 160 °C | 60 s to 120 s |
| Main heating | Above 200 °C     | 30 s to 40 s  |
| Peak         | 235 ± 5 °C       | max. 10 s     |

For lead-free soldering (Example : Sn/Ag/Cu)

|              | Temperature      | Time          |
|--------------|------------------|---------------|
| Preheating   | 150 °C to 180 °C | 60 s to 120 s |
| Main heating | Above 230 °C     | 30 s to 40 s  |
| Peak         | max. 260 °C      | max. 10 s     |

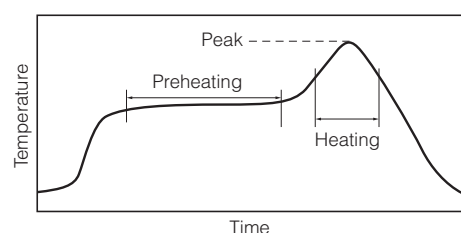
#### ● Recommended soldering conditions for flow

|            | For soldering    |               | For lead-free soldering |               |
|------------|------------------|---------------|-------------------------|---------------|
|            | Temperature      | Time          | Temperature             | Time          |
| Preheating | 140 °C to 180 °C | 60 s to 120 s | 150 °C to 180 °C        | 60 s to 120 s |
| Soldering  | 245 ± 5 °C       | 20 s to 30 s  | max. 260 °C             | max. 10 s     |

### ● Chip Resistor Array, Chip Resistor Networks and Chip Attenuator

#### ● Recommended soldering conditions for reflow

- Reflow soldering shall be performed a maximum of two times.
- Please contact us for additional information when used in conditions other than those specified.
- Please measure the temperature of the terminals and study every kind of solder and printed circuit board for solderability before actual use.



For soldering (Example : Sn/Pb)

|              | Temperature      | Time          |
|--------------|------------------|---------------|
| Preheating   | 140 °C to 160 °C | 60 s to 120 s |
| Main heating | Above 200 °C     | 30 s to 40 s  |
| Peak         | 235 ± 5 °C       | max. 10 s     |

For lead-free soldering (Example : Sn/Ag/Cu)

|              | Temperature      | Time          |
|--------------|------------------|---------------|
| Preheating   | 150 °C to 180 °C | 60 s to 120 s |
| Main heating | Above 230 °C     | 30 s to 40 s  |
| Peak         | max. 260 °C      | max. 10 s     |

#### ● Flow soldering

We do not recommend flow soldering, because a solder bridge may form.  
Please contact us regarding flow soldering of EXBA series.

## Standard for Resistance Value and Resistance Tolerance

### Basis Standard

IEC Publication 60062 : Marking codes for resistors and capacitors.  
 IEC Publication 60063 : Preferred number series for resistors and capacitors.  
 JIS C 5062 : Marking codes for resistors and capacitors.  
 JIS C 5063 : Preferred number series for resistors and capacitors.

### Resistance Values

The resistance values are notched by "Ratio" below in each series.

| Series | Resistance Tolerance (Standard) | Ratio                        | Remarks                                                           |
|--------|---------------------------------|------------------------------|-------------------------------------------------------------------|
| E6     | ±20 %                           | $\sqrt[6]{10} \approx 1.46$  | Please refer to standard resistance values shown on this catalog. |
| E12    | ±10 %                           | $\sqrt[12]{10} \approx 1.21$ |                                                                   |
| E24    | ± 5 %                           | $\sqrt[24]{10} \approx 1.10$ |                                                                   |
| E48    | ± 2 %                           | $\sqrt[48]{10} \approx 1.05$ |                                                                   |
| E96    | ± 1 %                           | $\sqrt[96]{10} \approx 1.02$ |                                                                   |

### How to express the resistance value with a Panasonic part number

The resistance value expressed in ohms is identified by a three digit number or a four digit number.  
 The last digit specifies the number of zeroes to follow.  
 The letter "R" shall be used as the decimal point for less than 10  $\Omega$ .

The examples of a three digit number

| Resistance Code | Value in ohms |
|-----------------|---------------|
| R56             | 0.56          |
| 5R6             | 5.6           |
| 100             | 10            |
| 271             | 270           |
| 102             | 1 k           |
| 273             | 27 k          |
| 104             | 100 k         |
| 275             | 2.7 M         |
| 106             | 10 M          |
| 107             | 100 M         |

The examples of a four digit number

| Resistance Code | Value in ohms |
|-----------------|---------------|
| R562            | 0.562         |
| 5R62            | 5.62          |
| 56R2            | 56.2          |
| 1000            | 100           |
| 2711            | 2.71 k        |
| 1002            | 10 k          |
| 2713            | 271 k         |
| 1004            | 1 M           |
| 2715            | 27.1 M        |
| 1006            | 100 M         |

### How to express the resistance tolerance with a Panasonic part number

The resistance tolerance is identified by a single letter in accordance with the following table and the code is placed just before the resistance code in the following examples.

| Tolerance Code | Tolerance (%) | Examples                      |
|----------------|---------------|-------------------------------|
| W              | ±0.05         | W1001 : 1000 $\Omega$ ±0.05 % |
| B              | ±0.1          | B1001 : 1000 $\Omega$ ±0.1 %  |
| C              | ±0.25         | C1001 : 1000 $\Omega$ ±0.25 % |
| D              | ±0.5          | D1001 : 1000 $\Omega$ ±0.5 %  |
| F              | ±1            | F1001 : 1000 $\Omega$ ±1 %    |
| G              | ±2            | G1001 : 1000 $\Omega$ ±2 %    |
| J              | ±5            | J101 : 100 $\Omega$ ±5 %      |
| K              | ±10           | K101 : 100 $\Omega$ ±10 %     |
| M              | ±20           | M101 : 100 $\Omega$ ±20 %     |

## Standard Resistance Values

| E6 | E12 | E24 | E48 | E96 | E6 | E12 | E24 | E48 | E96 | E6 | E12 | E24 | E48 | E96 |
|----|-----|-----|-----|-----|----|-----|-----|-----|-----|----|-----|-----|-----|-----|
| 10 | 10  | 10  | 100 | 100 |    |     |     | 215 | 215 |    |     |     | 464 | 464 |
|    |     |     | 102 |     | 22 | 22  | 22  |     | 221 | 47 | 47  | 47  |     | 475 |
|    |     |     | 105 | 105 |    |     |     | 226 | 226 |    |     |     | 487 | 487 |
|    |     |     | 107 |     |    |     |     |     | 232 |    |     |     |     | 499 |
|    |     | 11  | 110 | 110 |    |     |     | 237 | 237 |    |     | 51  | 511 | 511 |
|    |     |     | 113 |     |    |     | 24  |     | 243 |    |     |     |     | 523 |
|    |     |     | 115 | 115 |    |     |     | 249 | 249 |    |     |     | 536 | 536 |
|    |     |     | 118 |     |    |     |     |     | 255 |    |     |     |     | 549 |
|    | 12  | 12  | 121 | 121 |    |     |     | 261 | 261 |    | 56  | 56  | 562 | 562 |
|    |     |     | 124 |     |    |     |     |     | 267 |    |     |     |     | 576 |
|    |     |     | 127 | 127 |    | 27  | 27  | 274 | 274 |    |     |     | 590 | 590 |
|    |     | 13  |     | 130 |    |     |     |     | 280 |    |     |     |     | 604 |
|    |     |     | 133 | 133 |    |     |     | 287 | 287 |    |     | 62  | 619 | 619 |
|    |     |     | 137 |     |    |     |     |     | 294 |    |     |     |     | 634 |
|    |     |     | 140 | 140 |    |     | 30  | 301 | 301 |    |     |     | 649 | 649 |
|    |     |     | 143 |     |    |     |     |     | 309 |    |     |     |     | 665 |
|    |     |     | 147 | 147 |    |     |     | 316 | 316 | 68 | 68  | 68  | 681 | 681 |
|    |     |     | 150 |     |    |     |     |     | 324 |    |     |     |     | 698 |
| 15 | 15  | 15  | 154 | 154 | 33 | 33  | 33  | 332 | 332 |    |     |     | 715 | 715 |
|    |     |     | 158 |     |    |     |     |     | 340 |    |     |     |     | 732 |
|    |     | 16  | 162 | 162 |    |     |     | 348 | 348 |    |     | 75  | 750 | 750 |
|    |     |     | 165 |     |    |     |     |     | 357 |    |     |     |     | 768 |
|    |     |     | 169 | 169 |    |     | 36  | 365 | 365 |    |     |     | 787 | 787 |
|    |     |     | 174 |     |    |     |     |     | 374 |    |     |     |     | 806 |
|    |     |     | 178 | 178 |    |     |     | 383 | 383 |    | 82  | 82  | 825 | 825 |
|    | 18  | 18  | 182 |     |    | 39  | 39  |     | 392 |    |     |     |     | 845 |
|    |     |     | 187 | 187 |    |     |     | 402 | 402 |    |     |     | 866 | 866 |
|    |     |     | 191 |     |    |     |     |     | 412 |    |     |     |     | 887 |
|    |     |     | 196 | 196 |    |     |     | 422 | 422 |    |     | 91  | 909 | 909 |
|    |     | 20  |     | 200 |    |     | 43  |     | 432 |    |     |     |     | 931 |
|    |     |     | 205 | 205 |    |     |     | 442 | 442 |    |     |     | 953 | 953 |
|    |     |     | 210 |     |    |     |     |     | 453 |    |     |     |     | 976 |

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