

## Fixed Resistors

Products Catalog



**Guidelines and precautions regarding the technical information and use of our products described in this online catalog.**

- If you want to use our products described in this online catalog for applications requiring special qualities or reliability, or for applications where the failure or malfunction of the products may directly jeopardize human life or potentially cause personal injury (e.g. aircraft and aerospace equipment, traffic and transportation equipment, combustion equipment, medical equipment, accident prevention, anti-crime equipment, and/or safety equipment), it is necessary to verify whether the specifications of our products fit to such applications. Please ensure that you will ask and check with our inquiry desk as to whether the specifications of our products fit to such applications use before you use our products.
- The quality and performance of our products as described in this online catalog only apply to our products when used in isolation. Therefore, please ensure you evaluate and verify our products under the specific circumstances in which our products are assembled in your own products and in which our products will actually be used.
- If you use our products in equipment that requires a high degree of reliability, regardless of the application, it is recommended that you set up protection circuits and redundancy circuits in order to ensure safety of your equipment.
- The products and product specifications described in this online catalog are subject to change for improvement without prior notice. Therefore, please be sure to request and confirm the latest product specifications which explain the specifications of our products in detail, before you finalize the design of your applications, purchase, or use our products.
- The technical information in this online catalog provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.
- If any of our products, product specifications and/or technical information in this online catalog is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially with regard to security and export control, shall be observed.

**<Regarding the Certificate of Compliance with the EU RoHS Directive/REACH Regulations>**

- The switchover date for compliance with the RoHS Directive/REACH Regulations varies depending on the part number or series of our products.
- When you use the inventory of our products for which it is unclear whether those products are compliant with the RoHS Directive/REACH Regulation, please select "Sales Inquiry" in the website inquiry form and contact us.

**We do not take any responsibility for the use of our products outside the scope of the specifications, descriptions, guidelines and precautions described in this online catalog.**

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## 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 under the actual conditions for use.
- 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.
  - \* Systems equipped with an arresting the spread of fire or preventing glitch.

### (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). For applications in which special quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or cause threat of personal injury (such as for aircraft and aerospace equipment, traffic and transport equipment, combustion equipment, medical equipment, accident prevention and anti-theft devices, and safety equipment), please be sure to consult with our sales representative in advance and to exchange product specifications which conform to such applications.
- 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  $\text{NO}_x$ .
  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 and Radioactive Environment.

Avoid any environment where strong electromagnetic waves and radiation 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.
- Do not apply flux to these products after soldering. The activity of flux may be a cause of failures in these products.
- Refer to the recommended soldering conditions and set the soldering condition. High peak temperature or long heating time may impair the performance or the reliability of these products.
- Recommended soldering condition is for the guideline for ensuring the basic characteristics of the products, not for the stable soldering conditions. Conditions for proper soldering should be set up according to individual conditions.

- Do not reuse any products after removal from mounting boards.
- Do not drop these products. If these products are dropped, do not use them. Such products may have received mechanical or electrical damage.
- If any doubt or concern to the safety on these products arise, make sure to inform us immediately and conduct technical examinations at your side.

## **(2) Precautions for storage**

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

Even within the above guarantee periods, do not store these products in the following conditions.

Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

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

## **(3) AEC-Q200 Compliant**

The products are tested based on all or part of the test conditions and methods defined in AEC-Q200.

Please consult with Panasonic for the details of the product specification and specific evaluation test results, etc., and please review and approve Panasonic's product specification before ordering.

### **<Package markings>**

Package markings include the product number, quantity, and country of origin.

In principle, the country of origin should be indicated in English.

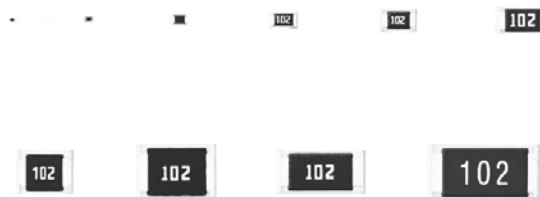
### **Safety Precautions (Common precautions for Surface Mount Resistors)**

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. 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 resistors mounted on your product rather than only depending on the calculated power limit or steady-state conditions.
5. If the resistors are to be used in high frequency circuits, carefully check the operation before use. Such circuits change the electrical characteristics of the resistors.
6. 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.
7. 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.).
8. Mounting of the resistors with excessive or insufficient wetting amount of solder may affect the connection reliability or the performance of the resistors. Carefully check the effects and apply a proper amount of solder for use.
9. 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.
10. 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.
11. Avoid excessive bending of printed circuit boards in order to protect the resistors from abnormal stress.
12. Do not immerse the resistors in solvent for a long time. Before using solvent, carefully check the effects of immersion.
13. Do not apply excessive tension to the terminals.

## Thick Film Chip Resistors

**Series: 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 Standard ... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 compliant (except ERJXG)
- RoHS compliant

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

### Explanation of Part Numbers

- Series ERJXGN, 1GN, 2GE, 3GE, 6GE, 8GE, 14, 12, 12Z, 1T, ±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 |           | Resistance Value                                                                                                                                                               |    | Packaging Methods |                                               |                            |
| Thick Film Chip Resistors |     | Code               | inch    | Power Rating | Code    | Marking                     | Code                 | Tolerance | The first two digits are significant figures of resistance and the third one denotes number of zeros following. Jumper is expressed by R00.<br>(Ex.) 222: 2.2 kΩ<br>4R7: 4.7 Ω |    | 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  |              | *Nil    | No marking                  | 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     |              |         |                             |                      |           |                                                                                                                                                                                |    |                   |                                               |                            |

\*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.

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Please omit the letter "Y" from the part number for these series of parts.  
The other part number factors will move up respectively.

## Ratings

## [For Resistor]

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

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

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

(3) 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.

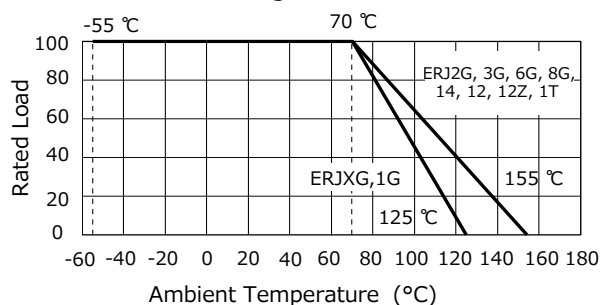
## [For Jumper]

| Part No. | Resistance(Ω) | Rated Current(A) | Maximum Overload<br>Current (A) <sup>(1)</sup> |
|----------|---------------|------------------|------------------------------------------------|
| ERJXG    | 50 mΩ or less | 0.5              | 1                                              |
| ERJ1G    |               |                  |                                                |
| ERJ2G    |               |                  |                                                |
| ERJ3G    |               | 1                | 2                                              |
| ERJ6G    |               |                  |                                                |
| ERJ8G    |               |                  |                                                |
| ERJ14    |               | 2                | 4                                              |
| ERJ12    |               |                  |                                                |
| ERJ12Z   |               |                  |                                                |
| ERJ1T    |               |                  |                                                |

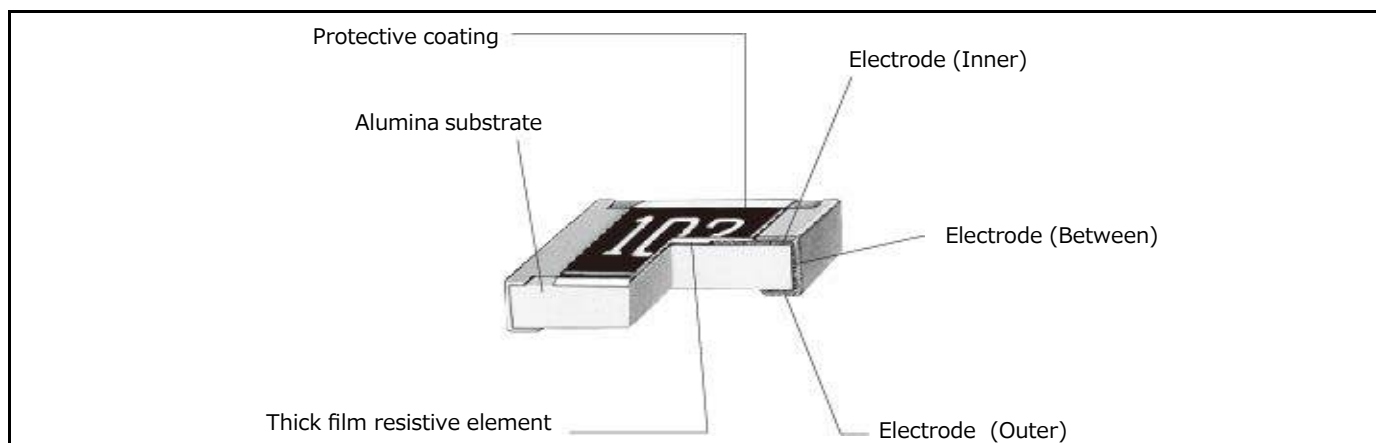
(1) Overload test current

## Power Derating Curve

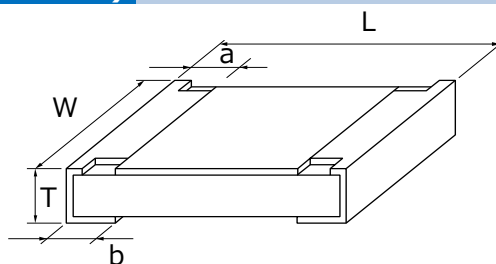
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



## Construction



## Dimensions in mm (not to scale)



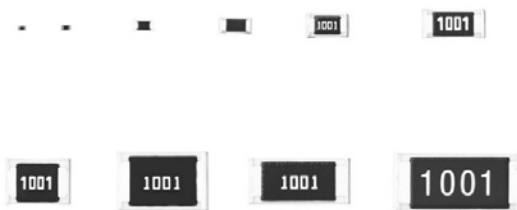
| Part No. | Dimensions (mm) |                 |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------------|-----------|-----------|-----------|-------------------------------|
|          | L               | W               | a         | b    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

## Performance

| Test Item                    | Performance Requirements $\Delta R$ |               | 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,1G : +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 (30 min.) / +155 °C (ERJXG,1G : +125 °C) (30 min.), 100 cycles                                  |
| High Temperature Exposure    | ±1 %                                | 50 mΩ or less | +155 °C (ERJXG,1G : +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

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



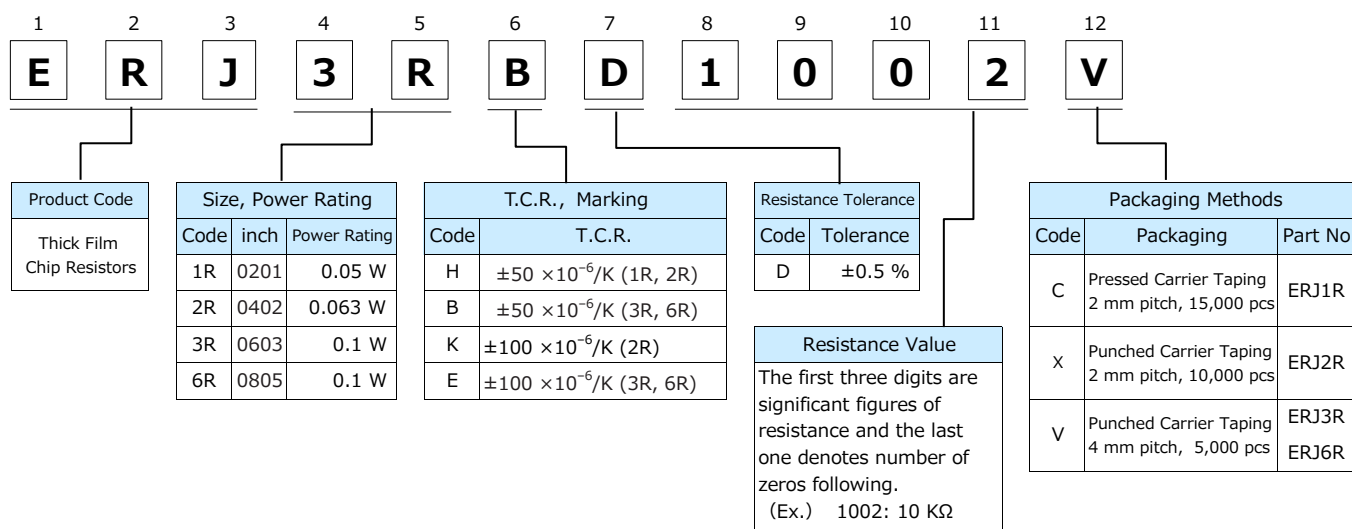
### Features

- 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 :  $\pm 1\%$   
ERJ1R, 2R, 3R, 6R :  $\pm 0.5\%$
- Reference Standard ... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 compliant (except ERJXG, ERJ1R)
- RoHS compliant

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

### Explanation of Part Numbers

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



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

|                              |   |                    |       |              |                      |           |                                                                                                                                                                          |   |    |                   |                                                  |                            |  |  |  |  |  |
|------------------------------|---|--------------------|-------|--------------|----------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|-------------------|--------------------------------------------------|----------------------------|--|--|--|--|--|
| 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                 |   | Size, Power Rating |       |              | Resistance Tolerance |           | Resistance Value                                                                                                                                                         |   |    | Packaging Methods |                                                  |                            |  |  |  |  |  |
| Thick Film<br>Chip Resistors |   | Code               | inch  | Power Rating | Code                 | Tolerance | The first three digits are significant figures of resistance and the last one denotes number of zeros following. Decimal point is expressed by "R".<br>(Ex.) 1002: 10 kΩ |   |    | Code              | Packaging                                        | Part No.                   |  |  |  |  |  |
|                              |   | XGN                | 01005 | 0.031 W      | F                    | ±1 %      |                                                                                                                                                                          |   |    | Y                 | Pressed Carrier Taping<br>W8P2, 20,000 pcs       | ERJXGN                     |  |  |  |  |  |
|                              |   | 1GN                | 0201  | 0.05 W       |                      |           |                                                                                                                                                                          |   |    | U                 | Embossed Carrier Taping<br>W4P1, 40,000 pcs      |                            |  |  |  |  |  |
|                              |   | 2RC                | 0402  | 0.1 W        |                      |           |                                                                                                                                                                          |   |    | C                 | Pressed Carrier Taping<br>2 mm pitch, 15,000 pcs | ERJ1GN                     |  |  |  |  |  |
|                              |   | 2RK                | 0402  | 0.1 W        |                      |           |                                                                                                                                                                          |   |    | X                 | Punched Carrier Taping<br>2 mm pitch, 10,000 pcs | ERJ2RC<br>ERJ2RK           |  |  |  |  |  |
|                              |   | 3EK                | 0603  | 0.1 W        |                      |           |                                                                                                                                                                          |   |    | V                 | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs  | ERJ3EK<br>ERJ6EN<br>ERJ8EN |  |  |  |  |  |
|                              |   | 6EN                | 0805  | 0.125 W      |                      |           |                                                                                                                                                                          |   |    | U                 | Embossed Carrier Taping<br>4 mm pitch, 5,000 pcs | ERJ14N                     |  |  |  |  |  |
|                              |   | 8EN                | 1206  | 0.25 W       |                      |           |                                                                                                                                                                          |   |    |                   |                                                  | ERJ12N                     |  |  |  |  |  |
|                              |   | 14N                | 1210  | 0.5 W        |                      |           |                                                                                                                                                                          |   |    |                   |                                                  | ERJ12S                     |  |  |  |  |  |
|                              |   | 12N                | 1812  | 0.75 W       |                      |           |                                                                                                                                                                          |   |    |                   | Embossed Carrier Taping<br>4 mm pitch, 4,000 pcs | ERJ1TN                     |  |  |  |  |  |
|                              |   | 12S                | 2010  | 0.75 W       |                      |           |                                                                                                                                                                          |   |    |                   |                                                  |                            |  |  |  |  |  |
|                              |   | 1TN                | 2512  | 1 W          |                      |           |                                                                                                                                                                          |   |    |                   |                                                  |                            |  |  |  |  |  |

## Ratings

< $\pm 0.5\%$ >

| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Limiting<br>Element<br>Voltage <sup>(2)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(3)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>( $\Omega$ )  | T.C.R.<br>( $\times 10^{-6}/K$ ) | Category<br>Temperature<br>Range<br>(°C) | AEC-<br>Q200<br>Grade |
|-------------------------|------------------------------------------------|------------------------------------------------------|------------------------------------------------------|--------------------------------|--------------------------------------|----------------------------------|------------------------------------------|-----------------------|
| ERJ1RH<br>(0201)        | 0.05                                           | 15                                                   | 30                                                   | $\pm 0.5$                      | 1 k to 1 M (E24,E96)                 | $\pm 50$                         | -55 to +125                              | -                     |
| ERJ2RH<br>(0402)        | 0.063                                          | 50                                                   | 100                                                  | $\pm 0.5$                      | 100 to 100 k (E24,E96)               | $\pm 50$                         | -55 to +155                              | Grade 0               |
| ERJ2RK<br>(0402)        | 0.063                                          | 50                                                   | 100                                                  | $\pm 0.5$                      | 10 to 97.6<br>102 k to 1 M (E24,E96) | $\pm 100$                        | -55 to +155                              | Grade 0               |
| ERJ3RB<br>(0603)        | 0.1                                            | 50                                                   | 100                                                  | $\pm 0.5$                      | 100 to 100 k (E24,E96)               | $\pm 50$                         | -55 to +155                              | Grade 0               |
| ERJ3RE<br>(0603)        | 0.1                                            | 50                                                   | 100                                                  | $\pm 0.5$                      | 10 to 97.6<br>102 k to 1 M (E24,E96) | $\pm 100$                        | -55 to +155                              | Grade 0               |
| ERJ6RB<br>(0805)        | 0.1                                            | 150                                                  | 200                                                  | $\pm 0.5$                      | 100 to 100 k (E24,E96)               | $\pm 50$                         | -55 to +155                              | Grade 0               |
| ERJ6RE<br>(0805)        | 0.1                                            | 150                                                  | 200                                                  | $\pm 0.5$                      | 10 to 97.6<br>102 k to 1 M (E24,E96) | $\pm 100$                        | -55 to +155                              | Grade 0               |

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

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

(3) 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.

## Ratings

&lt;±1 %&gt;

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

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

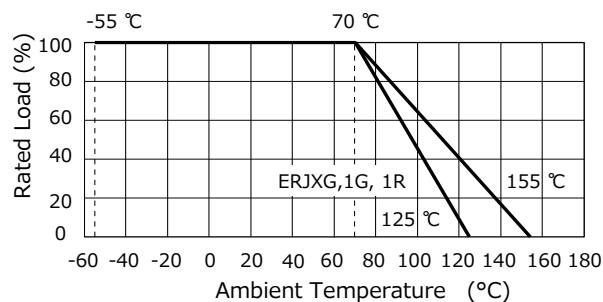
(2) Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$ , or Limiting Element Voltage listed above, whichever less.

(3) 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.

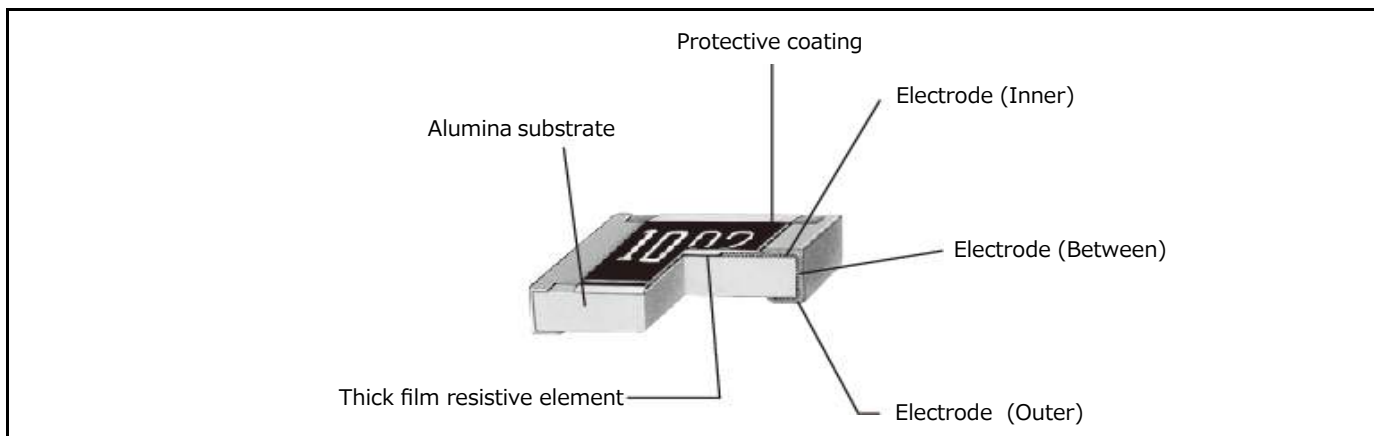
(4) Please contact us when you need a type with a resistance of less than 10 Ω.

## Power Derating Curve

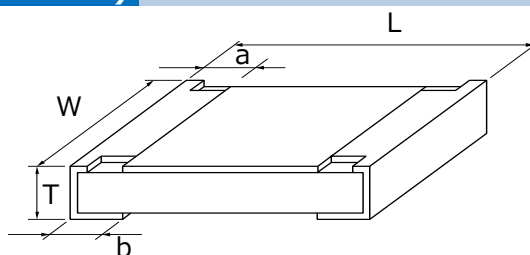
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



## Construction



## Dimensions in mm (not to scale)



| Part No.         | Dimensions (mm) |                 |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|------------------|-----------------|-----------------|-----------|-----------|-----------|-------------------------------|
|                  | L               | W               | a         | b         | T         |                               |
| ERJXGN           | 0.40±0.02       | 0.20±0.02       | 0.10±0.03 | 0.10±0.03 | 0.13±0.02 | 0.04                          |
| ERJ1GN<br>ERJ1R□ | 0.60±0.03       | 0.30±0.03       | 0.10±0.05 | 0.15±0.05 | 0.23±0.03 | 0.15                          |
| ERJ2R□           | 1.00±0.05       | 0.50±0.05       | 0.20±0.10 | 0.25±0.05 | 0.35±0.05 | 0.8                           |
| ERJ3R□<br>ERJ3EK | 1.60±0.15       | 0.80+0.15/-0.05 | 0.30±0.20 | 0.30±0.15 | 0.45±0.10 | 2                             |
| ERJ6R□<br>ERJ6EN | 2.00±0.20       | 1.25±0.10       | 0.40±0.20 | 0.40±0.20 | 0.60±0.10 | 4                             |
| ERJ8EN           | 3.20+0.05/-0.20 | 1.60+0.05/-0.15 | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 10                            |
| ERJ14N           | 3.20±0.20       | 2.50±0.20       | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 16                            |
| ERJ12N           | 4.50±0.20       | 3.20±0.20       | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 27                            |
| ERJ12S           | 5.00±0.20       | 2.50±0.20       | 0.60±0.20 | 0.60±0.20 | 0.60±0.10 | 27                            |
| ERJ1TN           | 6.40±0.20       | 3.20±0.20       | 0.65±0.20 | 0.60±0.20 | 0.60±0.10 | 45                            |

## Performance

### ● Series ERJ1R, 2R, 3R, 6R, ±0.5 %(D)

| Test Item                    | Performance Requirements ΔR | 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.) / +155 °C (ERJ1R : +125 °C)(30 min.), 100 cycles        |
| High Temperature Exposure    | ±1 %                        | +155 °C (ERJ1R : +125 °C), 1000 h                                        |
| Damp Heat, Steady State      | ±1 %                        | 60 °C, 90 % to 95 %RH, 1000 h                                            |
| Load Life in Humidity        | ±2 %<br>ERJ1R : ±3 %        | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±2 %<br>ERJ1R : ±3 %        | 70 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                 |

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

| Test Item                    | Performance Requirements ΔR | 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                     | ±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.)/+155 °C (ERJXG,ERJ1G : +125 °C)(30 min.), 100 cycles    |
| High Temperature Exposure    | ±1 %                        | +155 °C (ERJXG,ERJ1G : +125 °C), 1000 h                                  |
| Damp Heat, Steady State      | ±1 %                        | 60 °C, 90 % to 95 %RH, 1000 h                                            |
| Load Life in Humidity        | ±2 %<br>ERJXG,1G : ±3 %     | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | ±2 %<br>ERJXG,1G : ±3 %     | 70 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                 |

## Thin Film Chip Resistors, High Stability and Reliability Type

### ERA V (High resistance value ERA K)

Series: ERA 2V, 3V, 6V

(Series: ERA 3K, 6K )

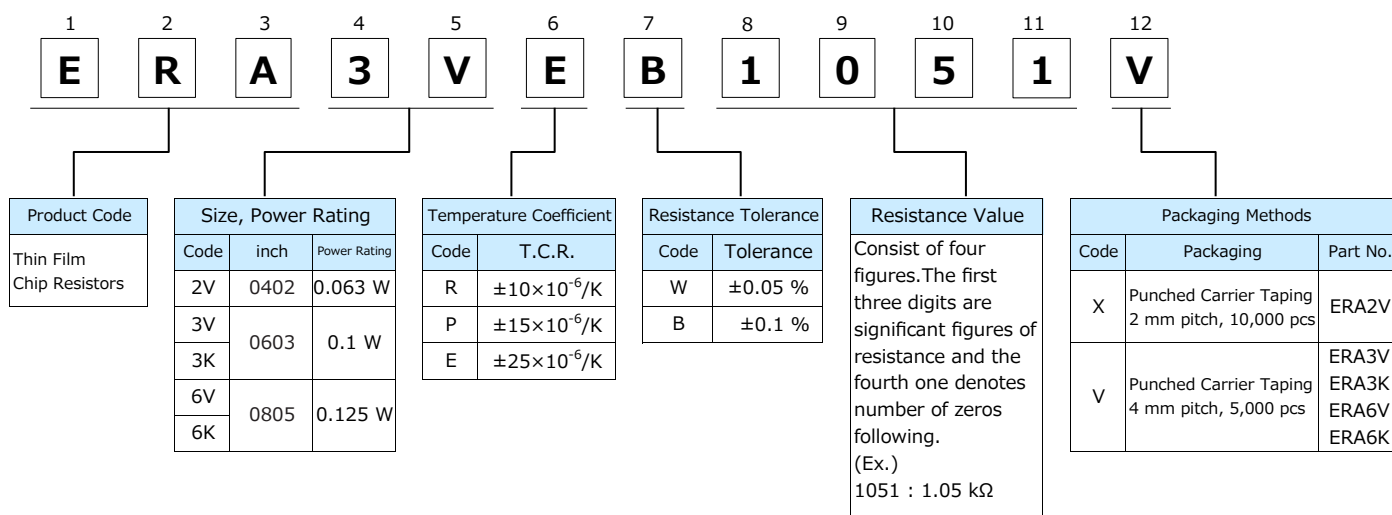


#### Features

- High reliability..... Stable at high temperature and humidity  
(85 °C 85 %RH rated load, Category temperature range : -55 °C to +155 °C)
- High accuracy..... Low resistance tolerance and Temperature Coefficient of Resistance
- High performance... Low current noise, excellent linearity
- Anti-ESD..... Original structure for high ESD performance  
(AEC-Q200-002 HBM Level 1c and above)
- Anti-sulfurated..... Original structure for sulfurated performance
- Reference Standard..... IEC 60115-8, JIS C 5201-8, JEITA RC-2133C
- AEC-Q200 compliant
- RoHS compliant

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

#### Explanation of Part Numbers



## Ratings

| Part No.<br>(inch size) | Power Rating<br>at 85 °C <sup>(1)</sup><br>(W) | Limiting<br>Element<br>Voltage <sup>(2)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(3)</sup><br>(V) | Part No.<br>(detail) | Resistance<br>Tolerance<br>(%) | T.C.R.<br>(×10 <sup>-6</sup> /K) | Resistance Range <sup>(4)</sup><br>(Ω) | Category<br>Temperature<br>Range<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|------------------------------------------------|------------------------------------------------------|------------------------------------------------------|----------------------|--------------------------------|----------------------------------|----------------------------------------|------------------------------------------|-------------------|
| ERA2V<br>(0402)         | 0.063                                          | 50                                                   | 100                                                  | ERA2VEB              | ±0.1                           | ±25                              | 47 to 10 k (E24, E96)                  | -55 to +155                              | Grade 0           |
|                         |                                                |                                                      |                                                      | ERA2VPB              | ±0.1                           | ±15                              | 1 K to 10 k (E24, E96)                 |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA2VRB              | ±0.1                           | ±10                              |                                        |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA2VRW              | ±0.05                          |                                  |                                        |                                          |                   |
| ERA3V<br>(0603)         | 0.1                                            | 75                                                   | 150                                                  | ERA3VEB              | ±0.1                           | ±25                              | 47 to 100 k (E24, E96)                 |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA3VPB              | ±0.1                           | ±15                              | 1 K to 100 k (E24, E96)                |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA3VRB              | ±0.1                           | ±10                              |                                        |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA3VRW              | ±0.05                          |                                  |                                        |                                          |                   |
| ERA3K<br>(0603)         | 0.1                                            | 75                                                   | 150                                                  | ERA3KEB              | ±0.1                           | ±25                              | 102 K to 240 k (E24, E96)              |                                          |                   |
| ERA6V<br>(0805)         | 0.125                                          | 100                                                  | 200                                                  | ERA6VEB              | ±0.1                           | ±25                              | 47 to 100 k (E24, E96)                 |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA6VPB              | ±0.1                           | ±15                              | 1 K to 100 k (E24, E96)                |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA6VRB              | ±0.1                           | ±10                              |                                        |                                          |                   |
|                         |                                                |                                                      |                                                      | ERA6VRW              | ±0.05                          |                                  |                                        |                                          |                   |
| ERA6K<br>(0805)         | 0.125                                          | 100                                                  | 200                                                  | ERA6KEB              | ±0.1                           | ±25                              | 102 K to 750 k (E24, E96)              |                                          |                   |

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

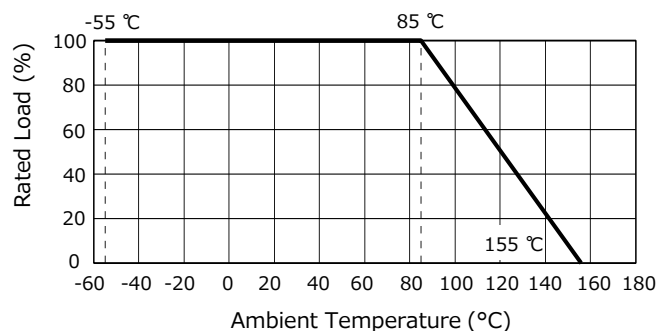
(2) Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ , or Limiting Element Voltage listed above, whichever less.

(3) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (2.5)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.

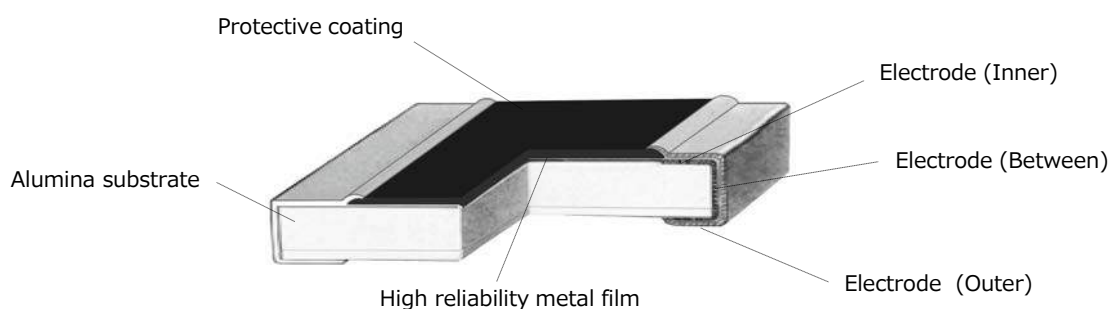
(4) E192 series resistance values are also available. The E192 series has custom part numbers. Please contact us for details.

## Power Derating Curve

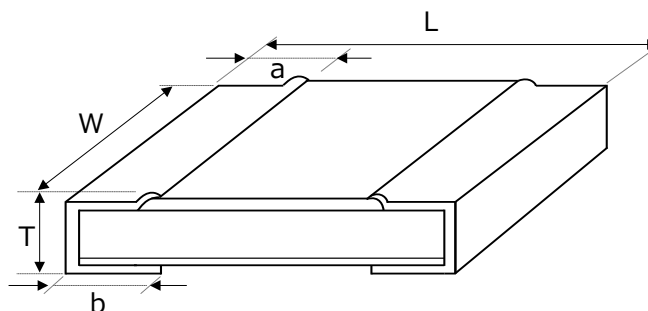
For resistors operated in ambient temperatures above 85 °C, power rating shall be derated in accordance with the figure on the right.



## Construction



**Dimensions in mm (not to scale)**



| Part No.  | Dimensions (mm) |                 |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|-----------|-----------------|-----------------|-----------|-----------|-----------|-------------------------------|
|           | L               | W               | a         | b         | T         |                               |
| ERA2V     | 1.00±0.05       | 0.50+0.10/-0.05 | 0.25±0.10 | 0.25±0.10 | 0.35±0.05 | 0.6                           |
| ERA3V, 3K | 1.60±0.15       | 0.80±0.10       | 0.30±0.20 | 0.30±0.20 | 0.45±0.10 | 2                             |
| ERA6V, 6K | 2.00±0.20       | 1.25±0.10       | 0.40±0.20 | 0.40±0.20 | 0.55±0.10 | 5                             |

**Performance**

| Test Item                      | Performance Requirements $\Delta R$ | Test Conditions                                                                                                                                                  |
|--------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resistance                     | Within Specified Tolerance          | 20 °C                                                                                                                                                            |
| T. C. R.                       | Within Specified T. C. R.           | +25 °C/+125 °C                                                                                                                                                   |
| Overload                       | ±0.1 %                              | Rated Voltage× 2.5, 5 s                                                                                                                                          |
| Resistance to Soldering Heat   | ±0.1 %                              | 270 °C, 10 s                                                                                                                                                     |
| Rapid Change of Temperature    | ±0.1 %                              | -55 °C (30 min.) / +155 °C (30 min.), 1000 cycles                                                                                                                |
| High Temperature Exposure      | ±0.1 %                              | +155 °C, 1000 h                                                                                                                                                  |
| Damp Heat, Steady State        | ±0.1 %                              | 85 °C, 85 %RH, 1000 h                                                                                                                                            |
| Load Life in Humidity          | ±0.1 %                              | 85 °C, 85 %RH, 10 % of Rated Power <sup>(1)</sup> ,<br>1.5 h ON / 0.5 h OFF cycle , 1000 h                                                                       |
| Endurance at 85 °C             | ±0.1 %                              | 85 °C , Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                                                                                                        |
| Electro Static Discharge (HBM) | ±0.1 % <sup>(2)</sup>               | AEC-Q200-002 : 150 pF, 2000 Ω , positive 5 times, negative 5 times<br>ERA2V : 1.0 kV (level 1c)<br>ERA3V(3K) : 1.5 kV (level 1c)<br>ERA6V(6K) : 2.0 kV (level 2) |

(1) Applied Voltage is " $\sqrt{0.1 \times \text{Power Rating} \times \text{Resistance Values}}$ ", or "Limiting Element Voltage×0.316", whichever less.

(2) Depends on resistance value.

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

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

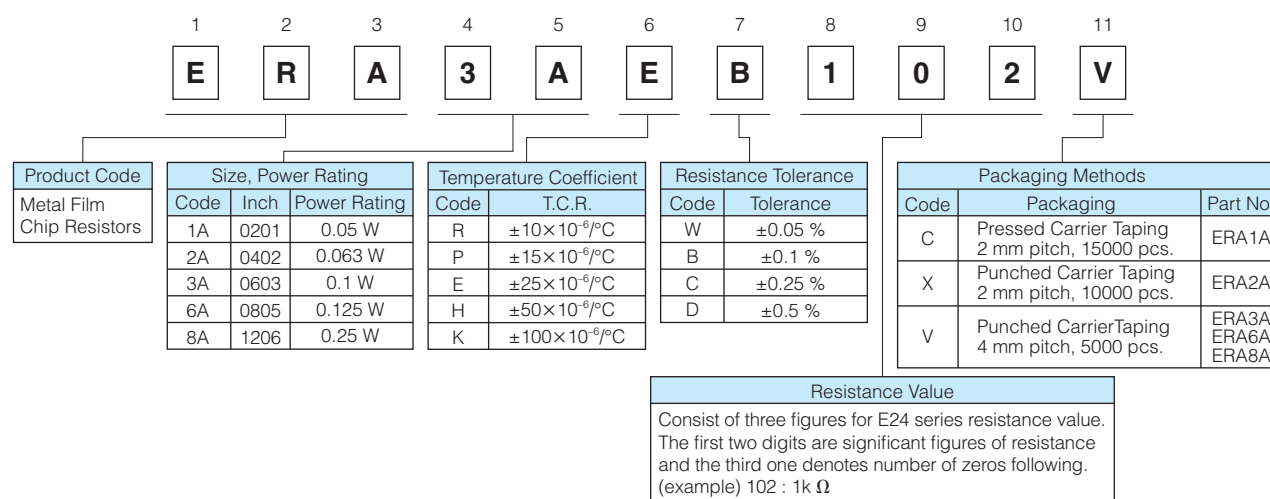
#### Features

- 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

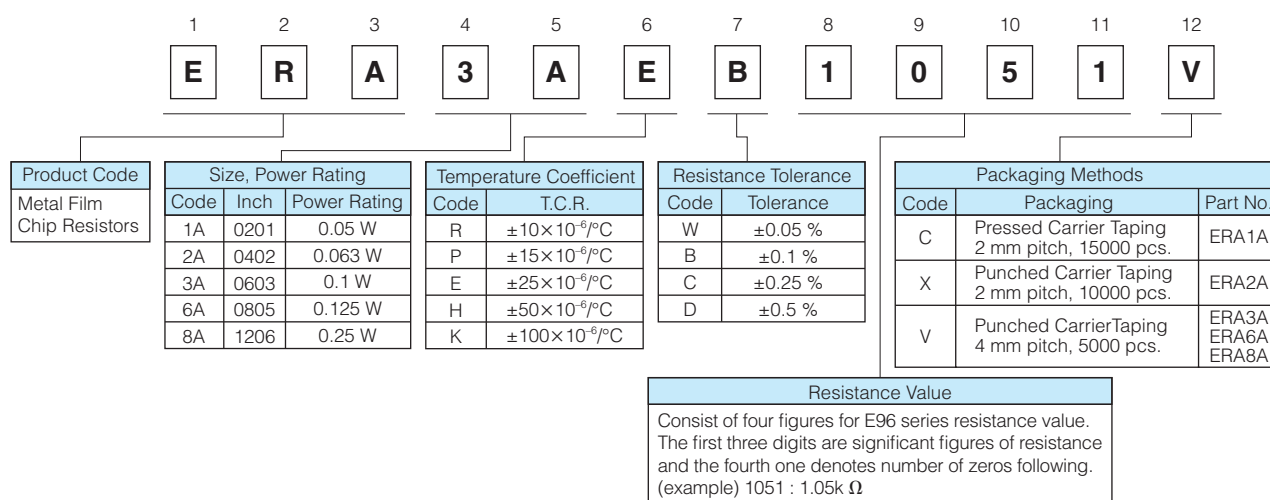
■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

#### Explanation of Part Numbers

##### ● E24 Series

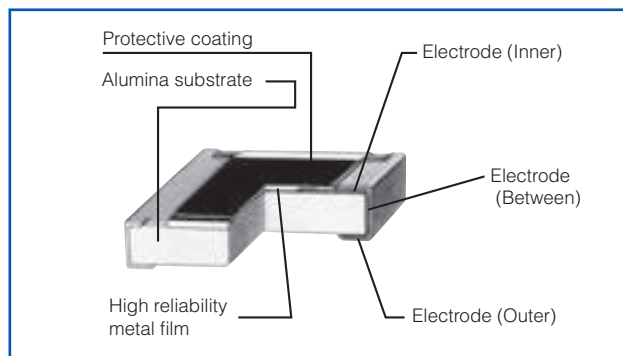


##### ● E96 Series and other Resistance values

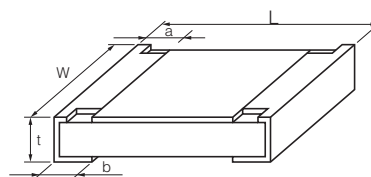


note : Duplicated resistance values as E24 series part numbers shall follow E24 part numbers.  
(apply three digit resistance value)

### 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                            |                                                   |                                                   |                      |                                |                                   |                                              |                                       |
| ERA8A<br>(1206)         | 0.25                            | 150                                               | 300                                               | ERA6ARW              | ±0.05                          |                                   |                                              |                                       |
|                         |                                 |                                                   |                                                   | 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.

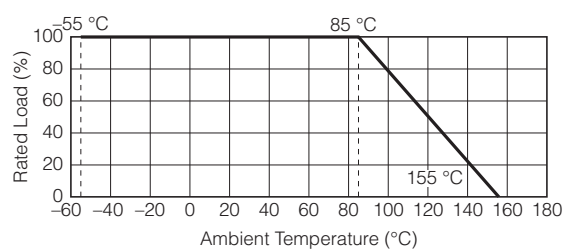
(2) Overload (Short-time Overload) Test Voltage (SOTV) shall be determined from  $\text{SOTV} = 2.5 \times \text{RCWV}$  or max. Overload Voltage listed above whichever less.

(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

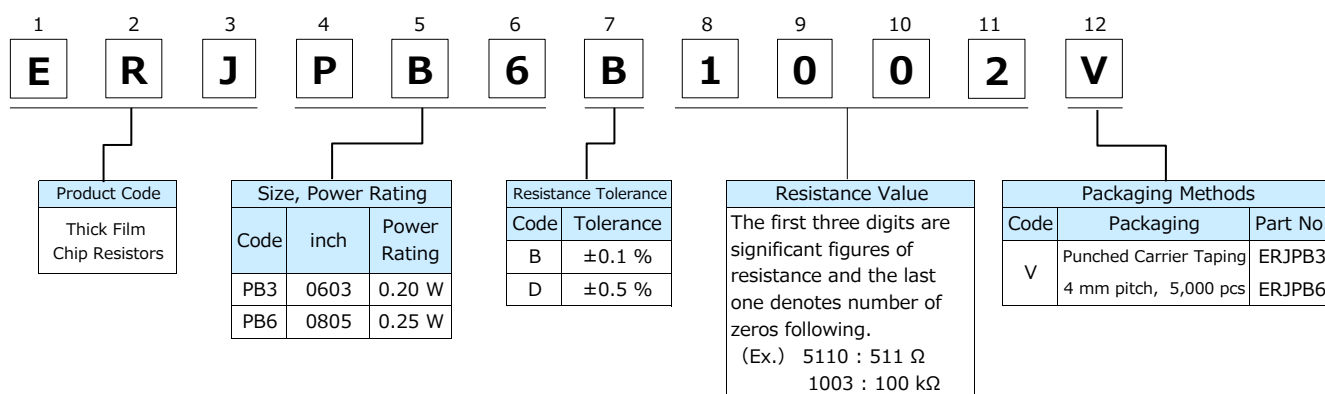
**Series: ERJ PB3, PB6**

### Features

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

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

### Explanation of Part Numbers



### Ratings

| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Limiting<br>Element<br>Voltage <sup>(2)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(3)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>( $\Omega$ ) | T.C.R.<br>( $\times 10^{-6}/K$ ) | Category<br>Temperature<br>Range<br>(°C) | AEC-<br>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               |

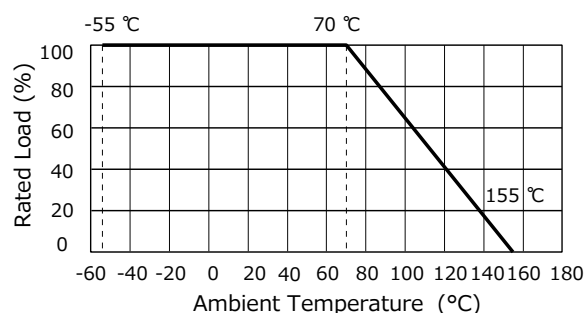
(1) Use it on the condition that the case temperature is below the upper category temperature.

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

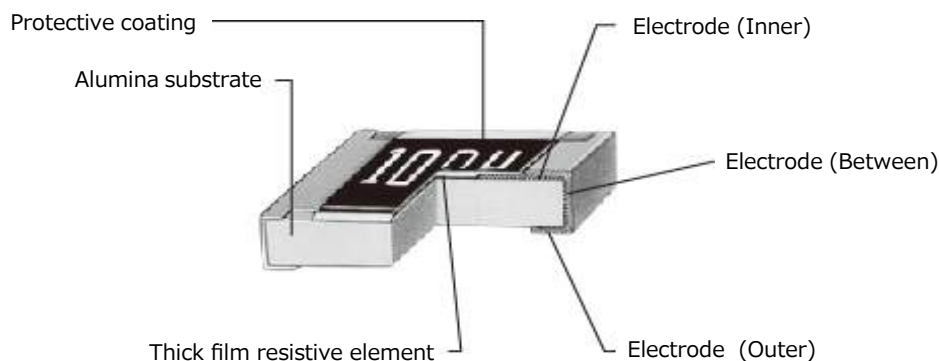
(3) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$   
or Maximum Overload Voltage listed above, whichever less.

### Power Derating Curve

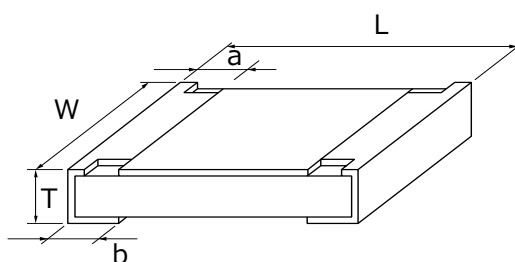
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



## 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±0.15       | 0.80+0.15/-0.05 | 0.15+0.15/-0.10 | 0.25±0.10 | 0.45±0.10 | 2                             |
| ERJPB6   | 2.00±0.20       | 1.25±0.10       | 0.25±0.20       | 0.40±0.20 | 0.60±0.10 | 4                             |

## Performance

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

# Thick Film Chip Resistors / Low Resistance Type

Series: ERJ 2LW, 3LW, 6LW,  
ERJ 2BW, 3BW, 6BW, 8BW, 6CW, 8CW  
ERJ 2B, 3B, 6D, 6B, 8B, 14B,  
ERJ 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.....  $\pm 75 \times 10^{-6}/K$  (ERJ6CW, ERJ8CW)
- Low Resistance Value... Thick film resistors available from 5 mΩ (ERJ3LW, 6LW)
- Reference Standard..... IEC 60115-8, JIS C 5201-8, JEITA RC-2144
- AEC-Q200 compliant
- 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

Thick Film Chip Resistors

| Code | inch size | Power Rating | Resistance Value |
|------|-----------|--------------|------------------|
| 2LW  | 0402      | 0.2 W        | 10 mΩ            |
| 3LW  | 0603      | 0.25 W       | 5 mΩ, 10 mΩ      |
| 6LW  | 0805      | 0.5 W        | 5, 6, 7, 8, 9 mΩ |
| 2BW  | 0402      | 0.25 W       | 47 m to 100 mΩ   |
| 3BW  | 0603      | 0.33 W       | 20 m to 100 mΩ   |
| 6BW  | 0805      | 0.5 W        | 10 m to 100 mΩ   |
| 8BW  | 1206      | 1 W          | 10 m to 100 mΩ   |
| 6CW  | 0805      | 0.5 W        | 10 m to 30 mΩ    |
| 8CW  | 1206      | 1 W          | 10 m to 50 mΩ    |

Resistance Tolerance

| Code | Tolerance |
|------|-----------|
| D    | ±0.5 %*   |
| F    | ±1 %      |
| G    | ±2 %      |
| J    | ±5 %      |

Resistance Value

Shown by 4 digits or letters.

(Ex.)

R005 : 0.05 Ω = 5 mΩ

R047 : 0.047 Ω = 47 mΩ

\*Please refer to the rating table for the resistance tolerance.

Packaging Methods

| Code | Packaging                                        | Part No.                                                           |
|------|--------------------------------------------------|--------------------------------------------------------------------|
| X    | Pressed Carrier Taping<br>2 mm pitch, 10,000 pcs | ERJ2LW<br>ERJ2BW                                                   |
| V    | Punched Carrier Taping<br>4 mm pitch, 5,000 pcs  | ERJ3LW<br>ERJ6LW<br>ERJ3BW<br>ERJ6BW<br>ERJ8BW<br>ERJ6CW<br>ERJ8CW |

- 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 Region |                 | Resistance Tolerance                                              |           | Resistance Value                                                                                                                      | Packaging Methods |                                               |                                            |
|---------------------------|--------------------|-----------|--------------|-------------------------|-----------------|-------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------|--------------------------------------------|
| Thick Film Chip Resistors | Code               | inch size | Power Rating | S                       | 0.1Ω to 0.2Ω    | Code                                                              | Tolerance | Shown by 3 digits or letters. Only when it is D (E24,E96) or F (E96), shown by 4 digits or letters. (Ex.) R22 : 0.22 Ω R102 : 0.102 Ω | Code              | Packaging                                     | Part No.                                   |
|                           | 2B                 | 0402      | 0.166 W      | Q                       | 0.22Ω to 9.1Ω * | D                                                                 | ±0.5 %*   |                                                                                                                                       | X                 | Punched Carrier Taping 2 mm pitch, 10,000 pcs | ERJ2B                                      |
|                           | 3B                 | 0603      | 0.25 W       | *2B:0.22 Ω to 1.0 Ω     |                 | F                                                                 | ±1 %      |                                                                                                                                       | V                 | Punched Carrier Taping 4 mm pitch, 5,000 pcs  | ERJ3B/3R<br>ERJ6D/6B/<br>ERJ6R<br>ERJ8B/8R |
|                           | 3R                 | 0603      | 0.1 W        |                         |                 | G                                                                 | ±2 %      |                                                                                                                                       | U                 | Embossed Carrier Taping 4 mm pitch, 5,000 pcs | ERJ14B/14R<br>ERJ12R<br>ERJ12Z             |
|                           | 6D                 | 0805      | 0.5 W        |                         |                 | J                                                                 | ±5 %      |                                                                                                                                       |                   | Embossed Carrier Taping 4 mm pitch, 4,000 pcs | ERJ1TR                                     |
|                           | 6B                 | 0805      | 0.33 W       |                         |                 | *Please refer to the □ rating table for the resistance tolerance. |           |                                                                                                                                       |                   |                                               |                                            |
|                           | 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          |                         |                 |                                                                   |           |                                                                                                                                       |                   |                                               |                                            |

- 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                              | Resistance Value                                                       | Resistance Tolerance |           | Resistance Value                                              | Packaging Methods |                                               |                            |
|---------------------------|--------------------|-----------|--------------|-----------------------------------|------------------------------------------------------------------------|----------------------|-----------|---------------------------------------------------------------|-------------------|-----------------------------------------------|----------------------------|
| Thick Film Chip Resistors | Code               | inch size | Power Rating | K                                 | Standard *<br>20 mΩ, 22 mΩ,<br>33 mΩ, 39 mΩ,<br>47 mΩ, 50 mΩ,<br>100mΩ | Code                 | Tolerance | Shown by 3 digits or letters. (Ex.) 50M : 50 mΩ, 10C : 100 mΩ | Code              | Packaging                                     | Part No.                   |
|                           | L03                | 0603      | 0.2 W        | U                                 | 20 mΩ to 100 mΩ *                                                      | F                    | ±1 %      |                                                               | V                 | Punched Carrier Taping 4 mm pitch, 5,000 pcs  | ERJL03<br>ERJL06<br>ERJL08 |
|                           | L06                | 0805      | 0.25 W       | * L03, L06, L08 : 47 mΩ to 100 mΩ |                                                                        | J                    | ±5 %      |                                                               | U                 | Embossed Carrier Taping 4 mm pitch, 5,000 pcs | ERJL14<br>ERJL12<br>ERJL1D |
|                           | L08                | 1206      | 0.33 W       | L1D, L1W : 40 mΩ to 100 mΩ        |                                                                        |                      |           |                                                               |                   | Embossed Carrier Taping 4 mm pitch, 3,000 pcs | ERJL1W                     |
|                           | L14                | 1210      | 0.33 W       |                                   |                                                                        |                      |           |                                                               |                   |                                               |                            |
|                           | L12                | 1812      | 0.5 W        |                                   |                                                                        |                      |           |                                                               |                   |                                               |                            |
|                           | L1D                | 2010      | 0.5 W        |                                   |                                                                        |                      |           |                                                               |                   |                                               |                            |
|                           | L1W                | 2512      | 1 W          |                                   |                                                                        |                      |           |                                                               |                   |                                               |                            |

## Ratings

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

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

(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  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$ .

• Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

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

## Ratings

## &lt;High power type&gt;

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

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

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

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

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

## &lt;Standard type&gt;

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

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

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

## Ratings

### <Low TCR type>

| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range <sup>(2)</sup><br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /K)     | Category<br>Temperature<br>Range (°C) | AEC-<br>Q200<br>Grade |
|-------------------------|------------------------------------------------|--------------------------------|-------------------------------------------|--------------------------------------|---------------------------------------|-----------------------|
| ERJL03 (0603)           | 0.2                                            | ±1, ±5                         | 47 m to 100 m                             | ±200                                 | -55 to +125                           | Grade 1               |
| ERJL06 (0805)           | 0.25                                           | ±1, ±5                         | 47 m to 100 m                             | ±100                                 | -55 to +125                           | Grade 1               |
| ERJL08 (1206)           | 0.33                                           | ±1, ±5                         | 47 m to 100 m                             | ±100                                 | -55 to +125                           | Grade 1               |
| ERJL14 (1210)           | 0.33                                           | ±1, ±5                         | 20 m to 100 m                             | R < 47 mΩ : ±300<br>R ≥ 47 mΩ : ±100 | -55 to +125                           | Grade 1               |
| ERJL12 (1812)           | 0.5                                            | ±1, ±5                         | 20 m to 100 m                             |                                      | -55 to +125                           | Grade 1               |
| ERJL1D (2010)           | 0.5                                            | ±1, ±5                         | 40 m to 100 m                             |                                      | -55 to +125                           | Grade 1               |
| ERJL1W (2512)           | 1                                              | ±1, ±5                         | 40 m to 100 m                             |                                      | -55 to +125                           | Grade 1               |

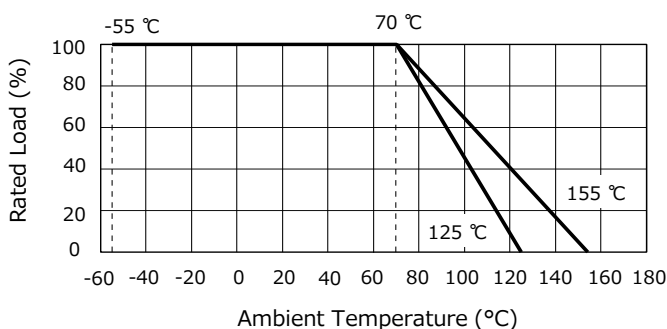
(1) Use it on the condition that the case temperature is below the upper category temperature.

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

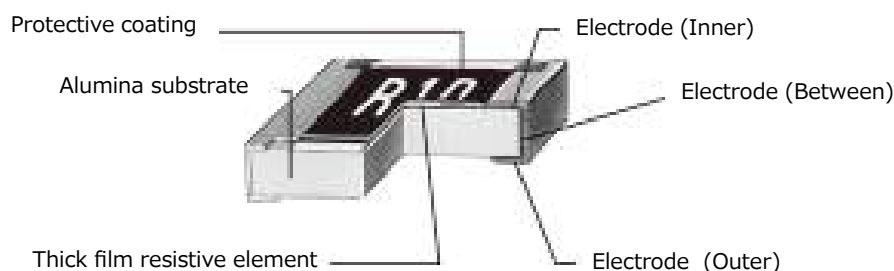
(2) Standard R.V. : 20 mΩ, 22 mΩ, 33 mΩ, 39 mΩ, 47 mΩ, 50 mΩ, 100 mΩ, Custom R.V. : Each 1 mΩ within upper range.

### Power Derating Curve

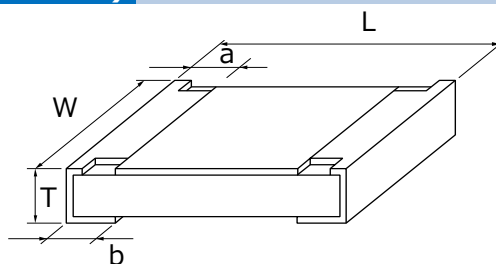
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



## Construction



**Dimensions in mm (not to scale)**



| Part No.                    | Dimensions (mm) |                 |           |           |           | Mass (Weight)<br>(g/1000pcs) |
|-----------------------------|-----------------|-----------------|-----------|-----------|-----------|------------------------------|
|                             | L               | W               | a         | b         | T         |                              |
| ERJ2LW                      | 1.00±0.10       | 0.50+0.10/-0.05 | 0.25±0.10 | 0.25±0.10 | 0.40±0.05 | 0.8                          |
| ERJ2BW                      | 1.00±0.10       | 0.50+0.10/-0.05 | 0.24±0.10 | 0.24±0.10 | 0.35±0.05 | 0.8                          |
| ERJ2B                       | 1.00±0.10       | 0.50+0.10/-0.05 | 0.20±0.10 | 0.27±0.10 | 0.35±0.05 | 0.8                          |
| ERJ3LW<br>(5 mΩ)            | 1.60±0.15       | 0.80±0.15       | 0.50±0.20 | 0.50±0.20 | 0.55±0.10 | 3                            |
| ERJ3LW<br>(10 mΩ)<br>ERJ3BW | 1.60±0.15       | 0.80±0.15       | 0.40±0.20 | 0.40±0.20 | 0.55±0.10 | 3                            |
| ERJ3R<br>ERJ3B<br>ERJL03    | 1.60±0.15       | 0.80+0.15/-0.05 | 0.30±0.20 | 0.30±0.15 | 0.45±0.10 | 2                            |
| ERJ6LW                      | 2.00±0.20       | 1.25±0.20       | 0.63±0.20 | 0.63±0.20 | 0.70±0.10 | 6                            |
| ERJ6BW                      | 2.00±0.20       | 1.25±0.20       | 0.55±0.20 | 0.55±0.20 | 0.65±0.10 | 6                            |
| ERJ6CW<br>(10 to 13 mΩ)     | 2.05±0.20       | 1.30±0.20       | 0.60±0.20 | 0.60±0.20 | 0.65±0.10 | 6                            |
| ERJ6CW<br>(15 to 30 mΩ)     |                 |                 | 0.45±0.20 | 0.45±0.20 |           |                              |
| ERJ6D                       | 2.00±0.20       | 1.25±0.10       | 0.40±0.20 | 0.55±0.25 | 0.60±0.10 | 5                            |
| ERJ6R<br>ERJ6B<br>ERJL06    | 2.00±0.20       | 1.25±0.10       | 0.40±0.20 | 0.40±0.20 | 0.60±0.10 | 5                            |
| ERJ8BW                      | 3.20±0.20       | 1.60±0.20       | 1.00±0.20 | 1.00±0.20 | 0.65±0.10 | 13                           |
| ERJ8CW<br>(10 to 16 mΩ)     | 3.20±0.20       | 1.60±0.20       | 1.10±0.20 | 1.10±0.20 | 0.65±0.10 | 13                           |
| ERJ8CW<br>(18 to 50 mΩ)     | 3.20±0.20       | 1.60±0.20       | 0.60±0.20 | 0.60±0.20 | 0.65±0.10 | 13                           |
| ERJ8R<br>ERJ8B<br>ERJL08    | 3.20+0.05/-0.20 | 1.60+0.05/-0.15 | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 10                           |
| ERJ14R<br>ERJ14B<br>ERJL14  | 3.20±0.20       | 2.50±0.20       | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 16                           |
| ERJ12R<br>ERJL12            | 4.50±0.20       | 3.20±0.20       | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 27                           |
| ERJ12Z<br>ERJL1D            | 5.00±0.20       | 2.50±0.20       | 0.60±0.20 | 0.60±0.20 | 0.60±0.10 | 27                           |
| ERJ1TR                      | 6.40±0.20       | 3.20±0.20       | 0.65±0.20 | 0.60±0.20 | 0.60±0.10 | 45                           |
| ERJL1W                      | 6.40±0.20       | 3.20±0.20       | 0.65±0.20 | 1.30±0.20 | 1.10±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 $\Delta R$ | Test Conditions                                                                                                                                         |
|------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance          | 20 °C                                                                                                                                                   |
| T. C. R.                     | Within Specified T. C. R.           | +25 °C/+125 °C                                                                                                                                          |
| Overload                     | $\pm 2$ %                           | ERJ6LW : Rated Voltage $\times$ 1.77, 5 s<br>ERJ8BW (R > 0.05 $\Omega$ ) : Rated Voltage $\times$ 1.77, 5 s<br>Other : Rated Voltage $\times$ 2.0 , 5 s |
| Resistance to Soldering Heat | $\pm 1$ %                           | 270 °C, 10 s                                                                                                                                            |
| Rapid Change of Temperature  | $\pm 1$ %<br>ERJ2LW : $\pm 2$ %     | -55 °C (30min.) / +155 °C (ERJ□LW, ERJ□CW : +125 °C) (30 min.), 100 cycles                                                                              |
| High Temperature Exposure    | $\pm 1$ %                           | +155 °C (ERJ□LW, ERJ□CW : +125 °C), 1000 h                                                                                                              |
| Damp Heat, Steady State      | $\pm 1$ %                           | 60 °C, 90 % to 95 %RH, 1000 h                                                                                                                           |
| Load Life in Humidity        | $\pm 3$ %                           | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle , 1000 h                                                                               |
| Endurance at 70 °C           | $\pm 3$ %                           | 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 $\Delta R$ | 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 (ERJ6D : $\times 1.77$ ), 5 s                  |
| Resistance to Soldering Heat | $\pm 1$ %                           | 270 °C, 10 s                                                              |
| Rapid Change of Temperature  | $\pm 1$ %                           | -55 °C (30 min.) / +155 °C (30 min.), 100 cycles                          |
| High Temperature Exposure    | $\pm 1$ %                           | +155 °C, 1000 h                                                           |
| Damp Heat, Steady State      | $\pm 1$ %                           | 60 °C, 90 % to 95 %RH, 1000 h                                             |
| Load Life in Humidity        | $\pm 3$ %                           | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle , 1000 h |
| Endurance at 70 °C           | $\pm 3$ %                           | 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 $\Delta R$ | 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 (30 min.) / +125 °C (30 min.), 100 cycles                          |
| High Temperature Exposure    | $\pm 1$ %                           | +125 °C, 1000 h                                                           |
| Damp Heat, Steady State      | $\pm 1$ %                           | 60 °C, 90 % to 95 %RH, 1000 h                                             |
| Load Life in Humidity        | $\pm 3$ %                           | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle , 1000 h |
| Endurance at 70 °C           | $\pm 3$ %                           | 70 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                  |

## Current Sensing Resistors, Metal Plate Type



**Series: 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 compliant
- RoHS compliant
- ISO9001, ISO/TS16949 certified

■ **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         | M         | S              | 4                    | S         | F                                                                                                    | 2 | M  | 0                 | U                                                |          |
| Product Code                  |   | Type Code |           |                | Resistance Tolerance |           | Resistance Value                                                                                     |   |    | Packaging Methods |                                                  |          |
| Metal Plate<br>Chip Resistors |   | Code      | inch size | Electrode type | Code                 | Tolerance | Shown by 3 digits or<br>letters. Decimal point is<br>expressed by M as<br>2.0 mΩ=2M0,<br>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> /K) | Category<br>Temperature<br>Range<br>(°C) | Terminal<br>temp.<br>upper limit<br>(°C) | AEC-Q200<br>Grade |
|-------------------------|---------------------------------|-----------------------------|--------------------------------|----------------------------------|------------------------------------------|------------------------------------------|-------------------|
| ERJMS4S<br>(2512)       | 3                               | 1, 2, 3, 4                  | F : ±1                         | ±75                              | -65 to +170                              | 130                                      | Grade 0           |
| ERJMS4H<br>(2512)       | 3                               | 5, 6                        | F : ±1                         | ±75                              | -65 to +170                              | 130                                      | Grade 0           |
|                         | 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                                      | Grade 0           |

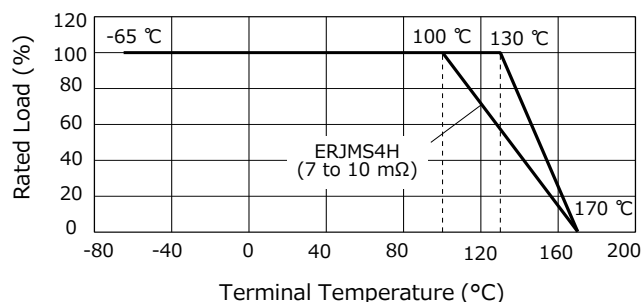
\* Please contact us when resistors of irregular series are needed.

### Power Derating Curve

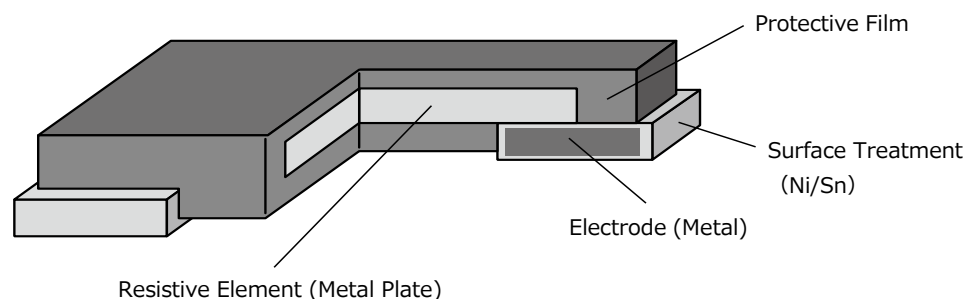
If the terminal temperature of the resistor is more than terminal temperature upper limit value of the rated table, please reduce the rated power according to the Power Derating Curve shown in the figure on the right.  
<Supplemented>

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.

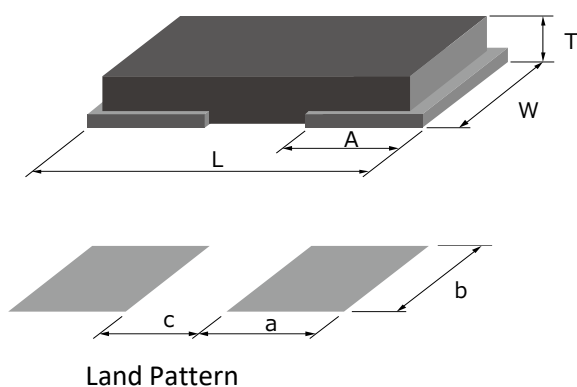


## Construction

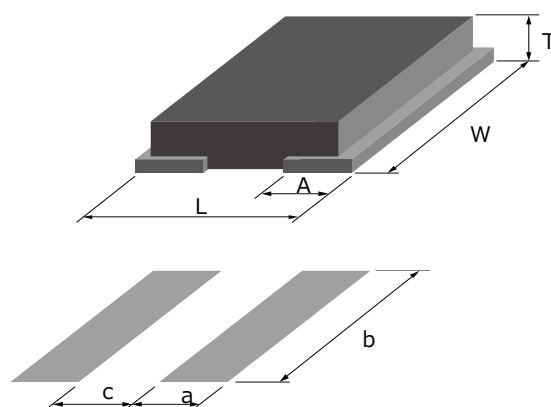


## Dimensions in mm (not to scale), Recommended Land Pattern

### ● ERJMS4S/ERJMS4H

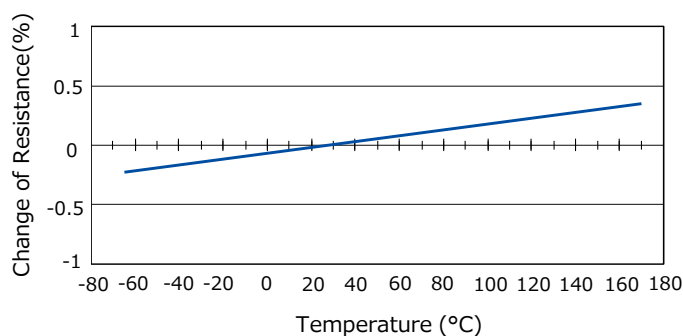


### ● ERJMB1S

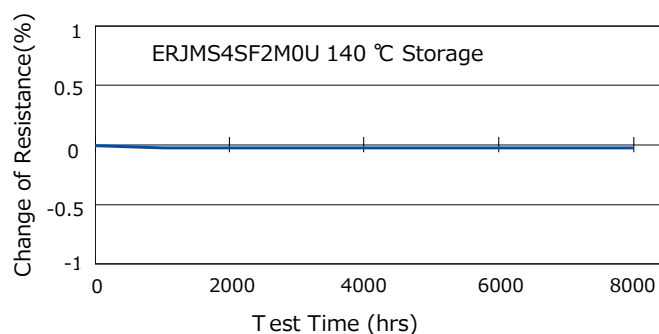


| Part No. | Dimensions (mm) |           |                     |           | Recommended Land Pattern (mm) |     |     | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------|---------------------|-----------|-------------------------------|-----|-----|-------------------------------|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

## Typical Temp. dependence of electrical resistance



## Long-term stability



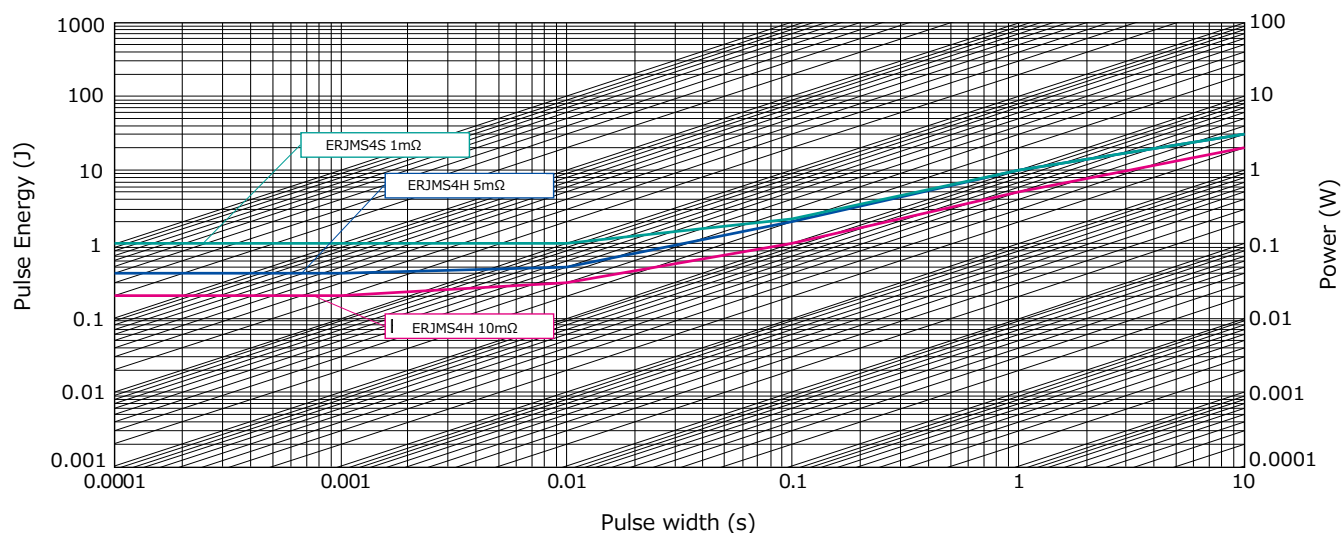
## Maximum pulse energy respectively pulse power for continuous operation

Reference Data

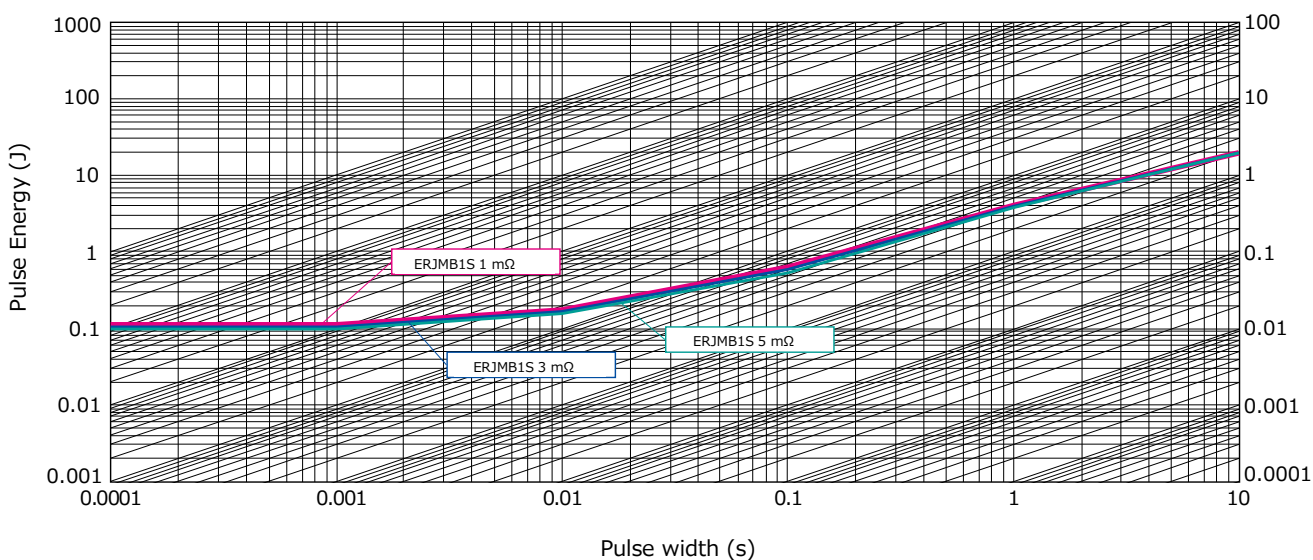
Condition : Room Temperature, OFF : 10 s, 1000 cycle, Wave form : Square

Change of Resistance =  $\pm 1\%$

### ● ERJMS4S/ERJMS4H



### ● ERJMB1S



## Performance (AEC-Q200)

### ● ERJMS4S/ERJMS4H

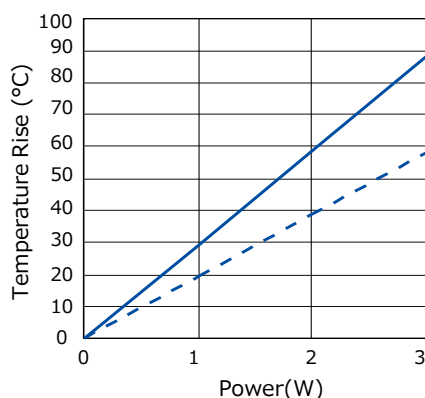
| Test Item                             | Performance Requirements $\Delta R$ | Typical value $\Delta R$ | Test Condition                        |
|---------------------------------------|-------------------------------------|--------------------------|---------------------------------------|
| Thermal Shock                         | $\pm 1 \%$                          | 0.20 %                   | -55 °C / +155 °C, 1000 cycles         |
| Overload                              | $\pm 0.5 \%$                        | 0.10 %                   | Rated Power $\times$ 3, 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

| Test Item                             | Performance Requirements $\Delta R$ | Typical value $\Delta R$ | Test Condition                        |
|---------------------------------------|-------------------------------------|--------------------------|---------------------------------------|
| Thermal Shock                         | $\pm 1 \%$                          | 0.30 %                   | -55 °C / +155 °C, 1000 cycles         |
| Overload                              | $\pm 1 \%$                          | 0.30 %                   | Rated Power $\times$ 2.5, 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                            |

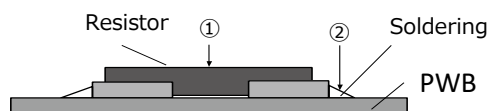
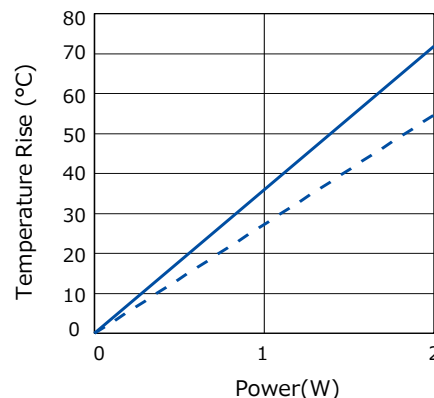
## Temperature Rise

### ● ERJMS4HF5M0U

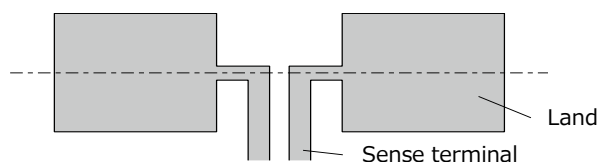


- ① ———— <Condition>  
 ② - - - - - Base material : FR-4 (t 1.6 mm)  
 Copper Thickness : 70  $\mu$ m, Two layer

### ● ERJMB1SF3M0U



## Sense terminal-Layout



# High Power Chip Resistors / Wide Terminal Type



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

## Features

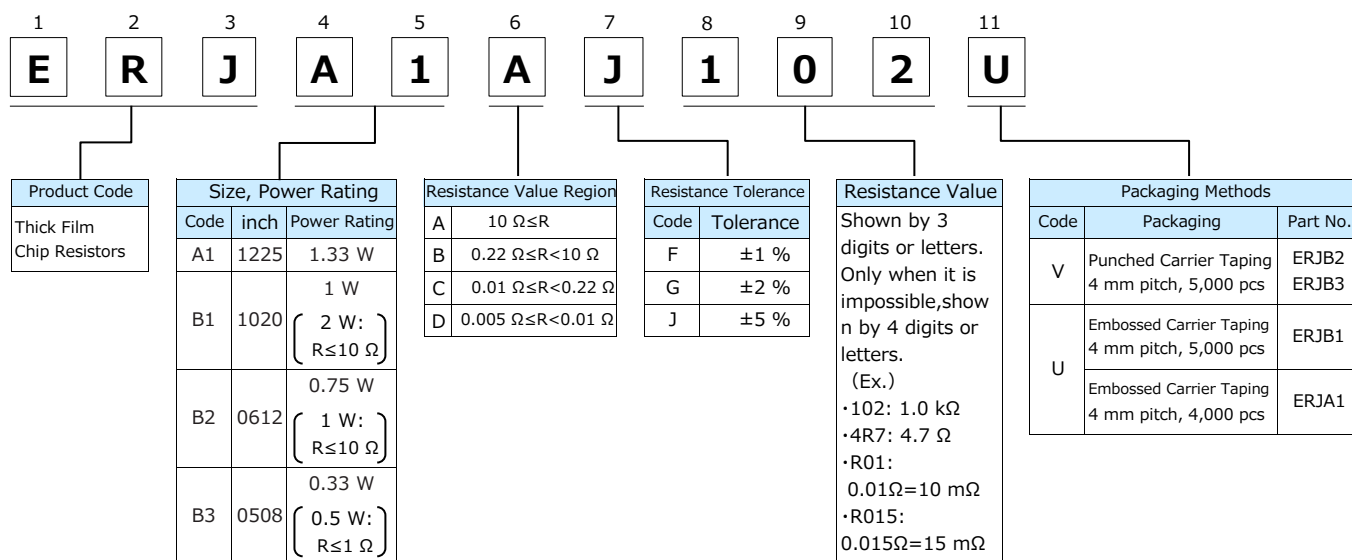
- High solder-joint reliability by wide terminal construction
- Excellent heat dissipation characteristics by wide terminal construction
- AEC-Q200 compliant
- RoHS compliant

## 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



## Ratings

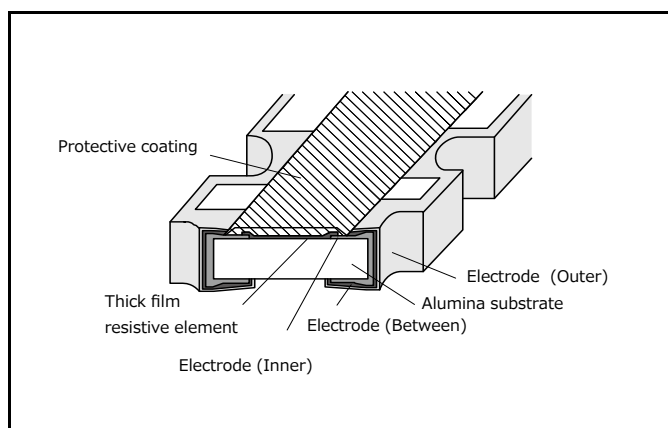
| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Limiting<br>Element<br>Voltage <sup>(2)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(3)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω)                          | T.C.R.<br>(×10 <sup>-6</sup>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

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

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

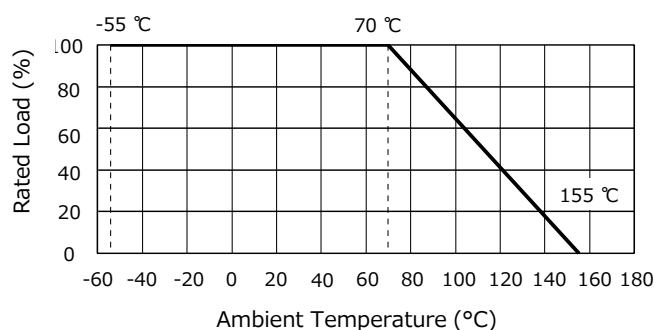
(3) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.

## Construction (Example : ERJA1 type)

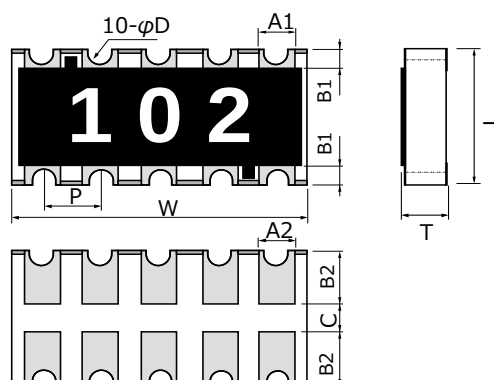


## Power Derating Curve

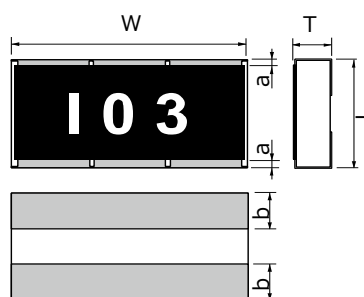
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



Dimensions in mm (not to scale)

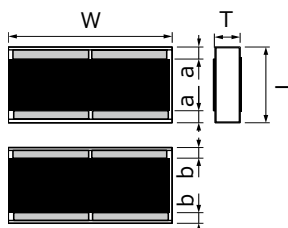


| Part No. | Dimensions (mm) |                |           |                 |                | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|----------------|-----------|-----------------|----------------|-------------------------------|
|          | L               | W              | T         | A <sub>1</sub>  | B <sub>1</sub> |                               |
| ERJA1    | 3.20±0.20       | 6.40±0.20      | 0.55±0.10 | 0.70±0.20       | 0.45±0.20      | 40                            |
|          | A <sub>2</sub>  | B <sub>2</sub> | P         | φ D             | C              |                               |
|          | 0.70±0.20       | 1.25±0.15      | 1.27±0.10 | 0.30+0.10/-0.20 | 0.4 min.       |                               |

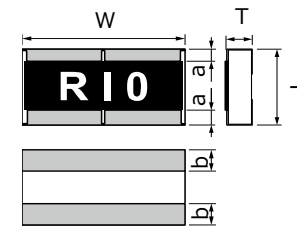


| Part No. | Dimensions (mm) |           |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------|-----------|-----------|-----------|-------------------------------|
|          | L               | W         | T         | a         | b         |                               |
| ERJB1    | 2.50±0.20       | 5.00±0.20 | 0.55±0.20 | 0.25±0.20 | 0.90±0.20 | 27                            |

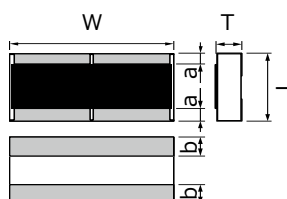
( R < 10 mΩ )



( 10 mΩ ≤ R ≤ 1 MΩ )

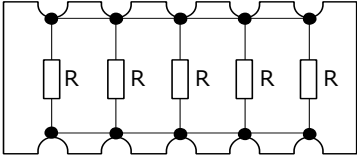
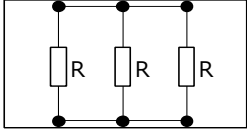
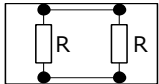
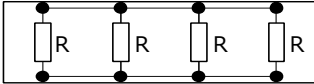
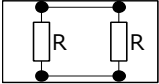
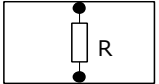


| Part No.       | Dimensions (mm) |           |           |           |           | Mass (Weight) |
|----------------|-----------------|-----------|-----------|-----------|-----------|---------------|
| ERJB2          | L               | W         | T         | a         | b         | (g/1000 pcs)  |
| 5 mΩ≤R< 10 mΩ  | 1.60±0.15       | 3.20±0.20 | 0.65±0.15 | 0.30±0.20 | 0.30±0.20 | 11            |
| 10 mΩ≤R<220 mΩ |                 |           | 0.55±0.15 |           | 0.50±0.20 |               |
| 220 mΩ≤R≤ 1 MΩ |                 |           |           | 0.25±0.20 |           |               |



| Part No. | Dimensions (mm) |           |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------|-----------|-----------|-----------|-------------------------------|
|          | L               | W         | T         | a         | b         |                               |
| ERJB3    | 1.25±0.10       | 2.00±0.15 | 0.50±0.10 | 0.25±0.20 | 0.40±0.20 | 4.8                           |

## Circuit Configuration

| ERJA1 Series                                                                      | ERJB1 Series                                                                      | ERJB3 Series                                                                        |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |
| ERJB2 Series                                                                      |                                                                                   |                                                                                     |
| Less than 10 mΩ                                                                   | Low resistance zone                                                               | High resistance zone                                                                |
|  |  |  |

## Performance

| Test Item                    | Performance Requirements $\Delta R$ | 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 (30 min.) / +125 °C(30 min.), 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

**Series: ERJ D1, D2**

## Features

- Achieved High power and low TCR ( $\pm 100 \times 10^{-6}/K$ ) 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 compliant
- 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              |   |   | Power Rating |      |              | Resistance Tolerance                         |   | Resistance Value                                                                   |    | Packaging Methods |          |
| Thick Film Chip Resistors |   |   | Code         | inch | Power Rating | Resistance Value Region                      |   | Shown by 4 digits or letters.<br>(Ex.)<br>•R010:<br>0.010 $\Omega$ = 10 m $\Omega$ |    | Code              | Part No. |
|                           |   |   | D1C          | 1020 | 2 W          | 22 m $\Omega$ $\leq$ R $\leq$ 200 m $\Omega$ |   | Code Tolerance                                                                     |    | U                 | ERJD1    |
|                           |   |   | D1D          |      |              | 10 m $\Omega$ $\leq$ R $\leq$ 20 m $\Omega$  |   | F $\pm 1\%$                                                                        |    |                   |          |
|                           |   |   | D2C          | 0612 | 1 W          | 33 m $\Omega$ $\leq$ R $\leq$ 200 m $\Omega$ |   | J $\pm 5\%$                                                                        |    | V                 | ERJD2    |
|                           |   |   | D2D          |      |              | 10 m $\Omega$ $\leq$ R $\leq$ 30 m $\Omega$  |   |                                                                                    |    |                   |          |

## Ratings

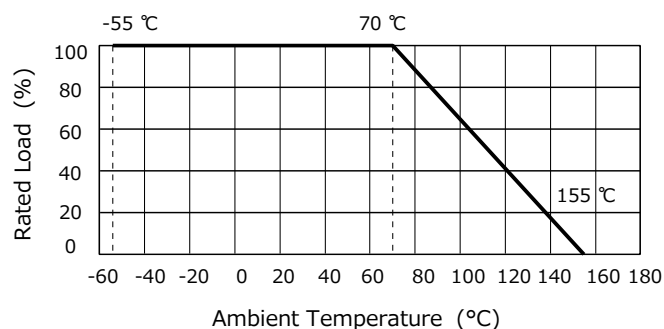
| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Resistance<br>Tolerance<br>(%) | Resistance Range<br>( $\Omega$ ) | T.C.R.<br>( $\times 10^{-6}/K$ ) | Category<br>Temperature<br>Range<br>(°C) | AEC-<br>Q200<br>Grade |
|-------------------------|------------------------------------------------|--------------------------------|--------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

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

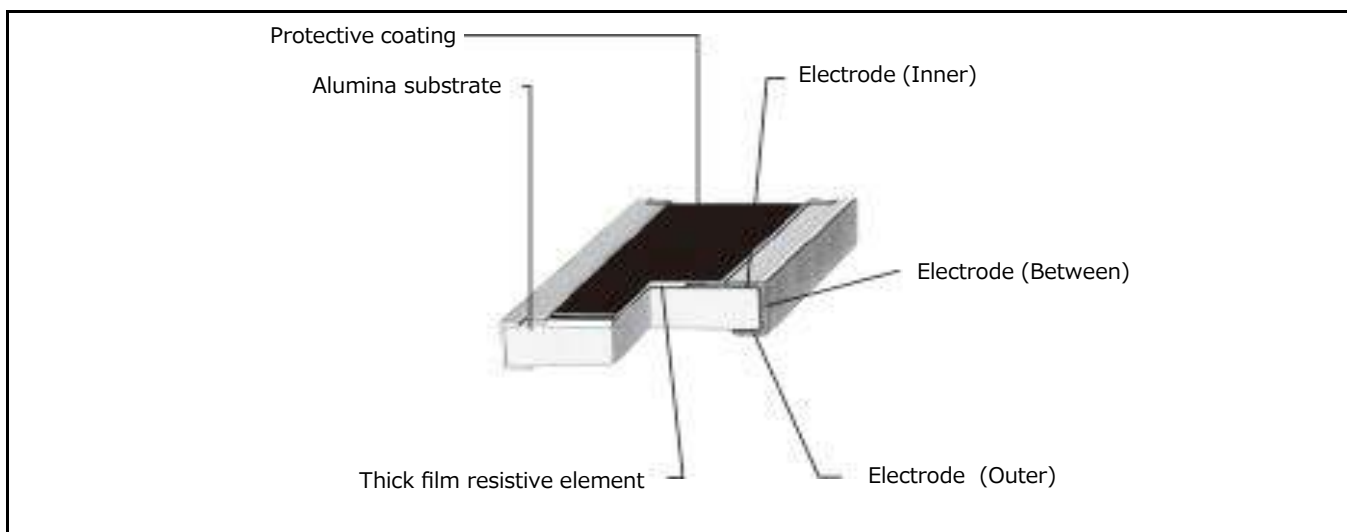
- Please contact us when resistors of irregular series are needed.
- Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$ .
- Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

### Power Derating Curve

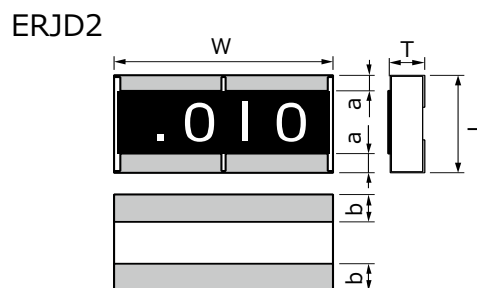
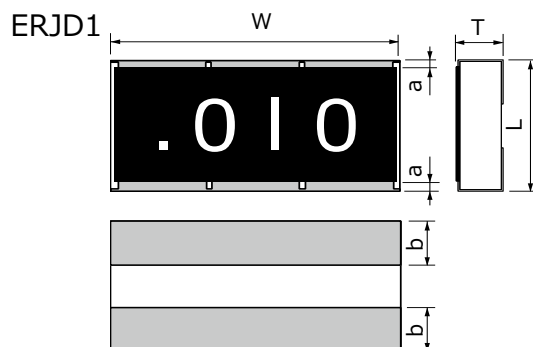
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



### Construction

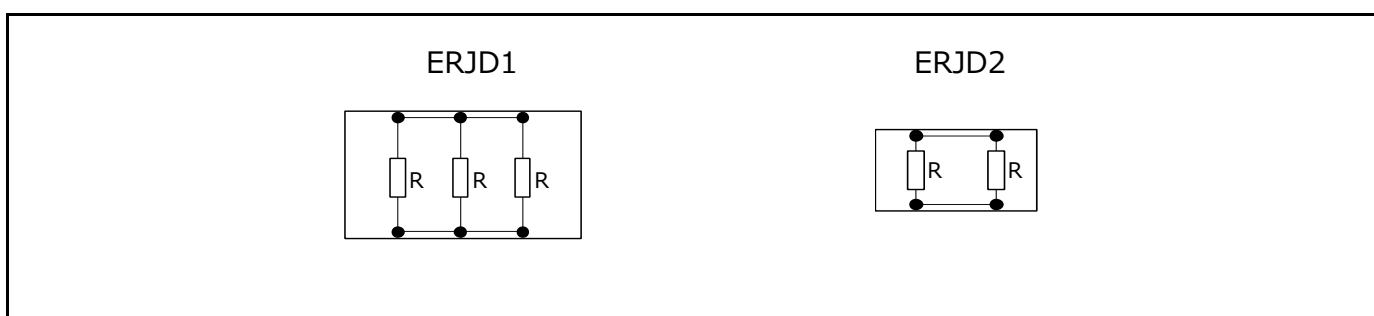


### Dimensions in mm (not to scale)



| Part No. | Dimensions (mm) |           |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------|-----------|-----------|-----------|-------------------------------|
|          | 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 | 27                            |
| ERJD2    | 1.60±0.15       | 3.20±0.20 | 0.65±0.15 | 0.30±0.20 | 0.50±0.20 | 11                            |

### Circuit Configuration



**Performance**

| Test Item                    | Performance Requirements $\Delta R$ | 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 (30 min.) / +125 °C(30 min.), 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



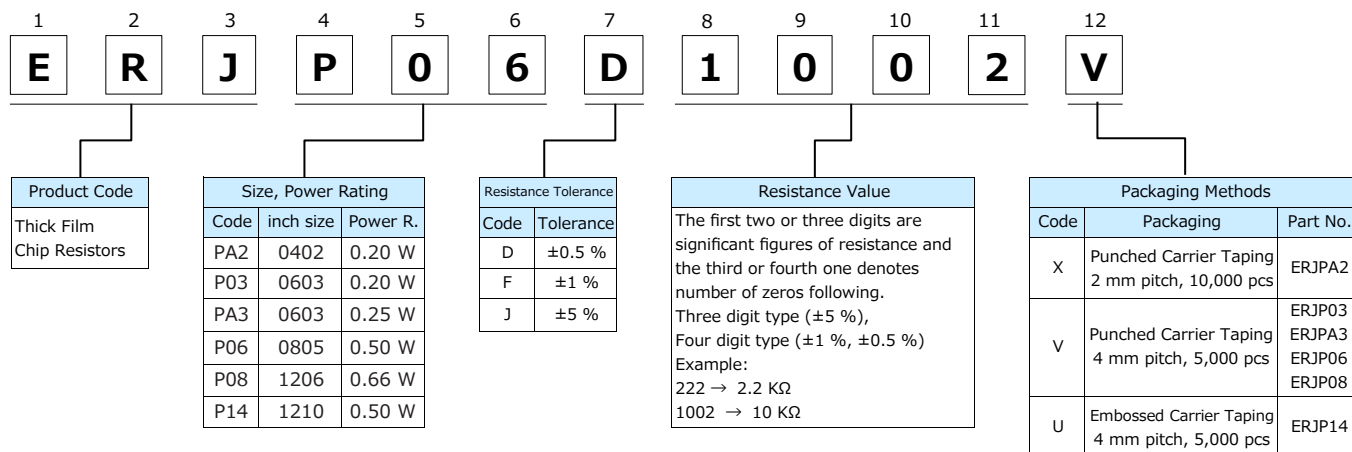
**Series: ERJ PA2, P03, PA3, P06, P08, P14**

### 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 Standard ... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 compliant
- RoHS compliant

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

### Explanation of Part Numbers



## Ratings

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

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

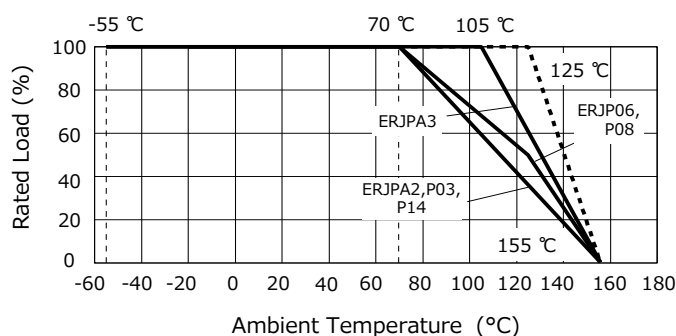
(2) Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$ , or Limiting Element Voltage listed above, whichever less.

(3) 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.

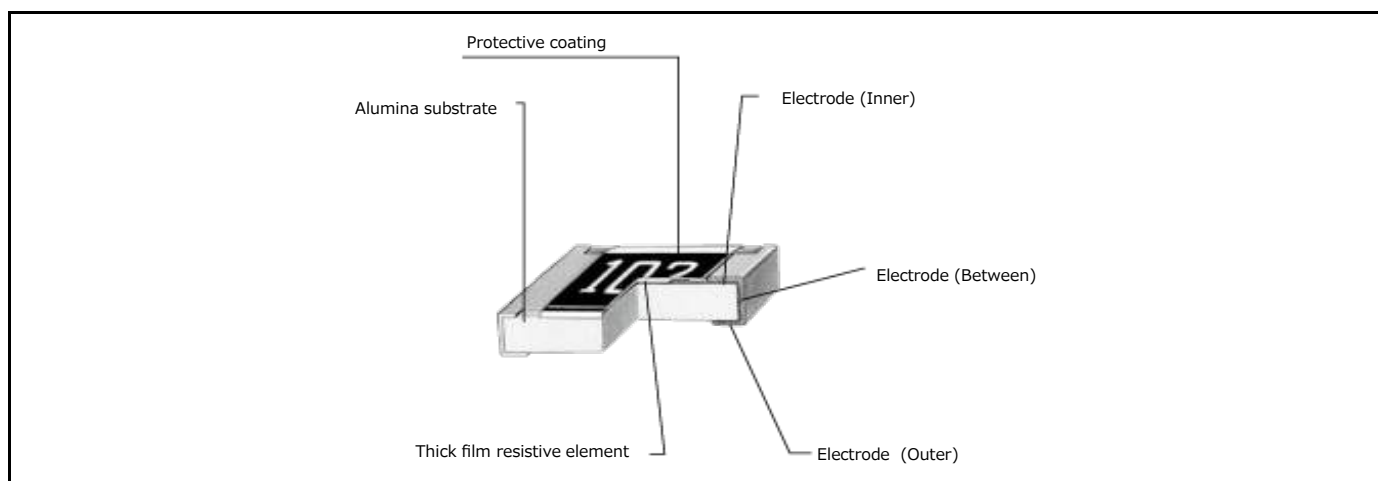
## Power Derating Curve

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.

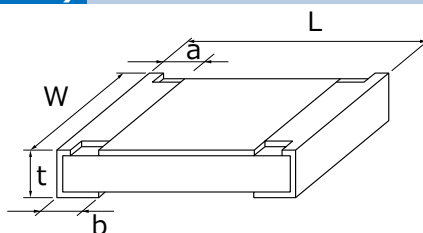
\* When the temperature of ERJP14 is 155 °C or less, the derating start temperature can be changed to 125 °C. (See the dotted line)



## Construction

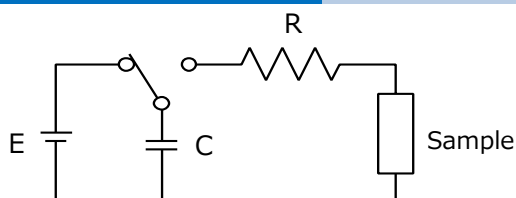


## Dimensions in mm (not to scale)



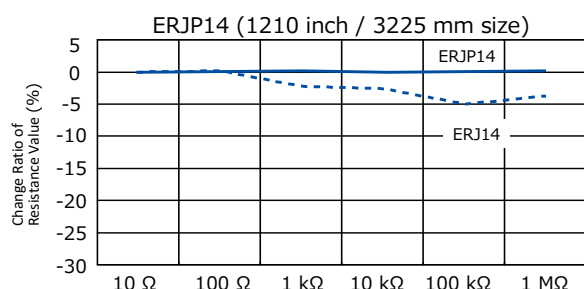
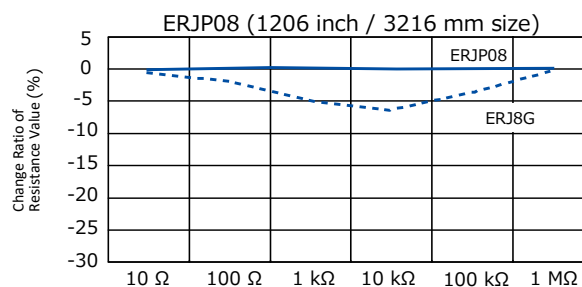
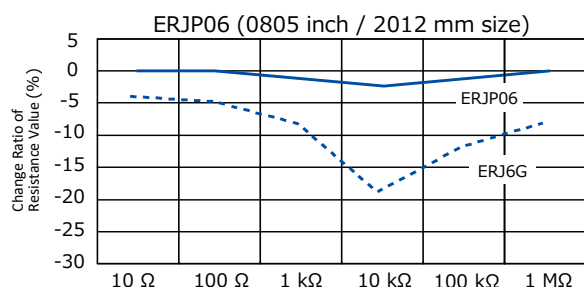
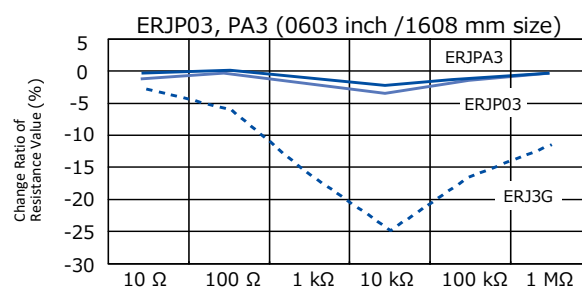
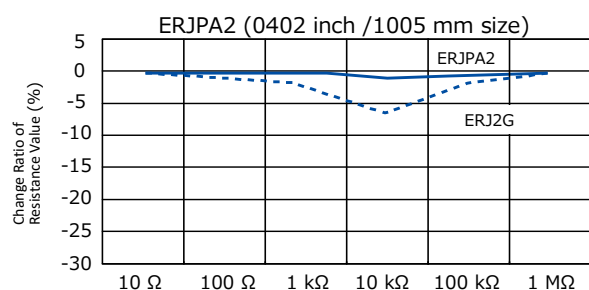
| Part No. | Dimensions (mm) |                 |                 |           |           | Mass (Weight) |
|----------|-----------------|-----------------|-----------------|-----------|-----------|---------------|
|          | L               | W               | a               | b         | t      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

## ESD Characteristic



| Size (inch) | 0402   | 0603, 0805, 1206, 1210           |
|-------------|--------|----------------------------------|
| R           | 1.5 kΩ | R=0 Ω(≤1.5 kΩ) / 150 Ω(> 1.5 kΩ) |
| C           | 100 pF | 150 pF                           |
| E           | ±1 kV  | ±3 kV                            |

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



※This data is for reference purposes.  
 Please check with the actual equipment before use.

## Performance

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

## Anti-Pulse Thick Film Chip Resistors



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

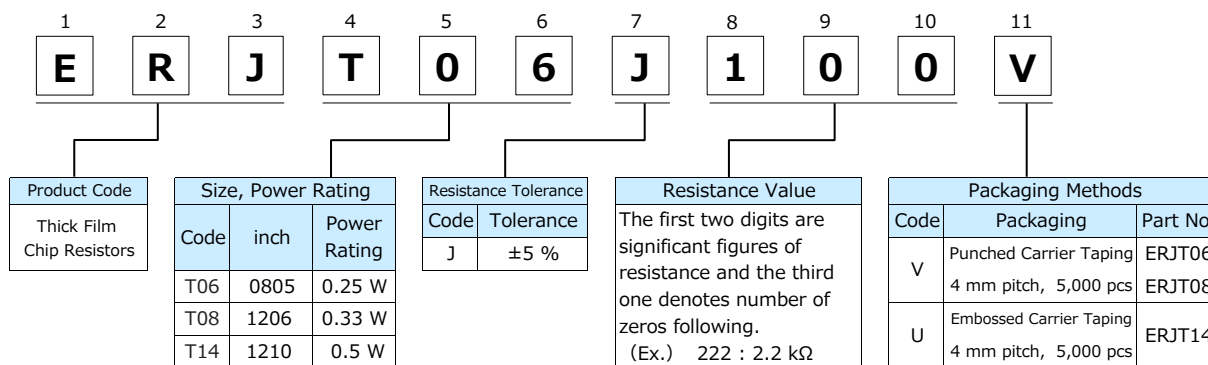
### Features

- 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 …… 0.25 W : 0805 inch /2012 mm size (ERJT06)  
0.33 W : 1206 inch /3216 mm size (ERJT08)  
0.50 W : 1210 inch /3225 mm size (ERJT14, ERJT14L)
- Reference Standard … IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 compliant
- RoHS compliant

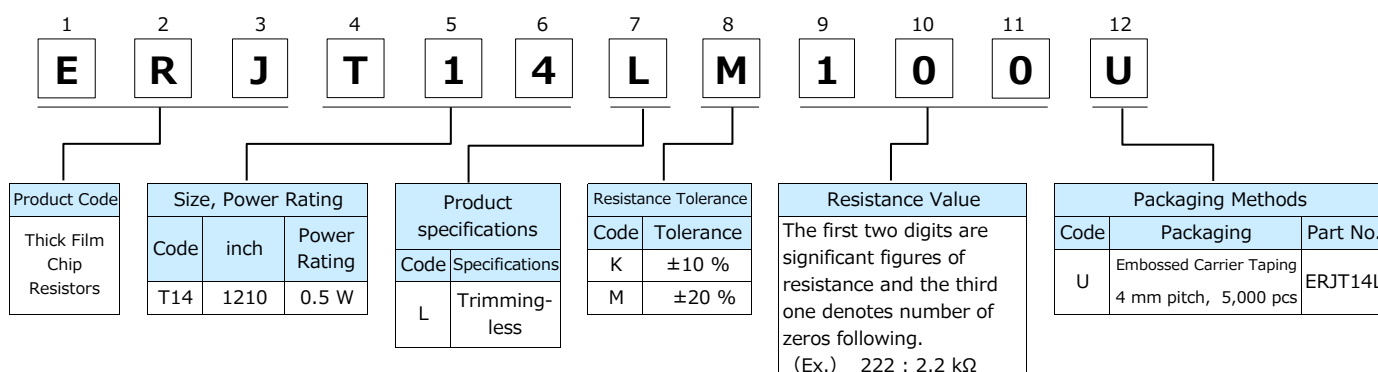
■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

### Explanation of Part Numbers

#### ● Series ERJT06, T08, T14



#### ● Series ERJT14L



\* Please contact us for 0805 (inch) and 1206 (inch) size trimming-less types.

## Ratings

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

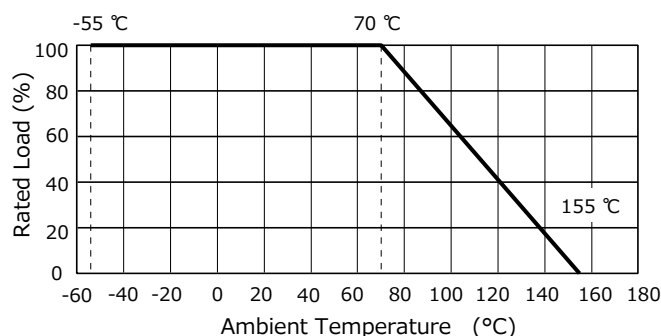
(1) Use it on the condition that the case temperature is below the upper category temperature.

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

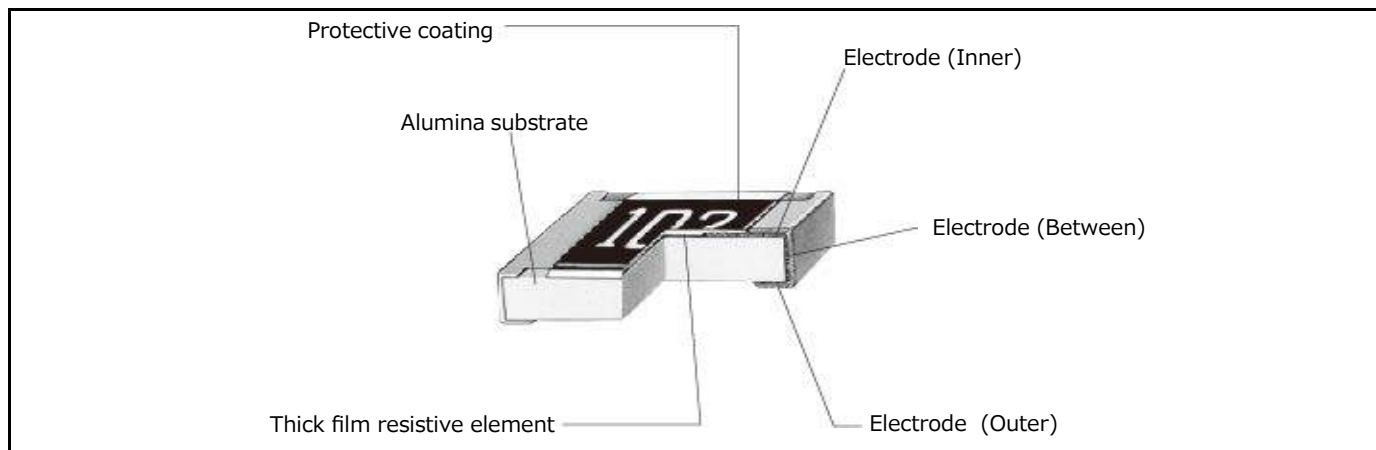
(3) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.

## Power Derating Curve

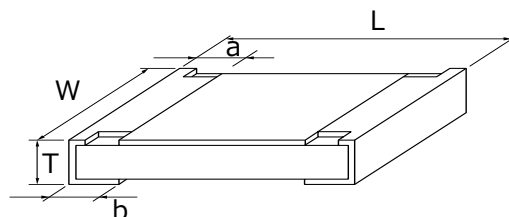
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



## Construction



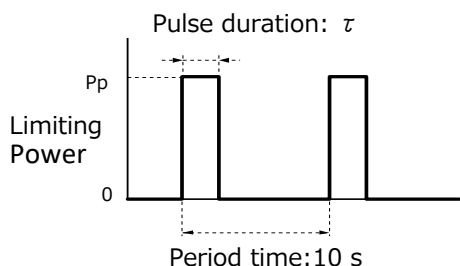
## Dimensions in mm (not to scale)



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

## Limiting Power Curve

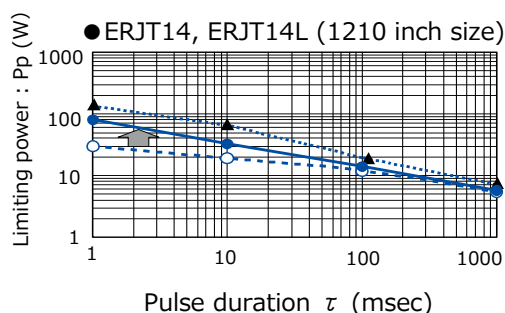
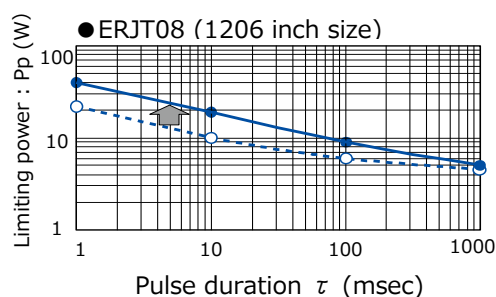
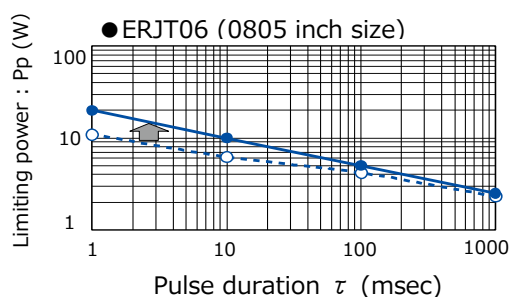
- In rush pulse Characteristic



Test cycle : 1000 cycles

Spec : Resistance value = within  $\pm 5\%$

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



※ This data is for reference purposes.

Please check with the actual equipment before use.

※ Please contact us for 0805 (inch) and 1206 (inch) size trimming-less types.

## Performance

| Test Item                    | Performance Requirements $\Delta R$ | 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 (30 min.) / +155 °C (30 min.), 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

### ERJ S (Au-based inner electrode type)

Series: ERJ S02, S03, S06, S08, S14, S12, S1D, S1T

### ERJ U (Ag-Pd-based inner electrode type)

Series: ERJ **U0X**, U01, U02, U03, U06, U08, U14, U12, U1D, U1T, U6S, U6Q

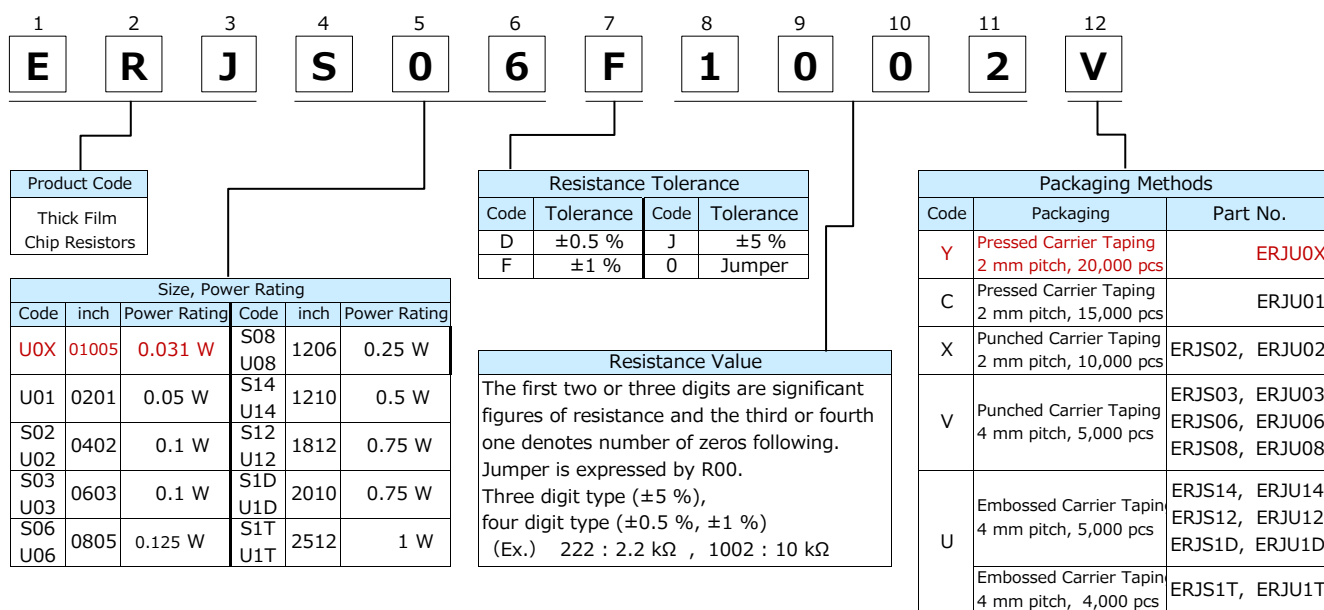
#### Features

- High resistance to sulfurization achieved by adopting an Au-based inner electrode (Series ERJS) and Ag-Pd-based inner electrode (Series ERJU)
- High reliability...Metal glaze thick film resistive element and three layers of electrodes
- Suitable for both reflow and flow soldering
- Low Resistance type ...Series ERJU6S, U6Q : 0.1  $\Omega$  to 1  $\Omega$
- Reference Standard ... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 compliant (except **ERJU0X**, ERJU01)
- RoHS compliant

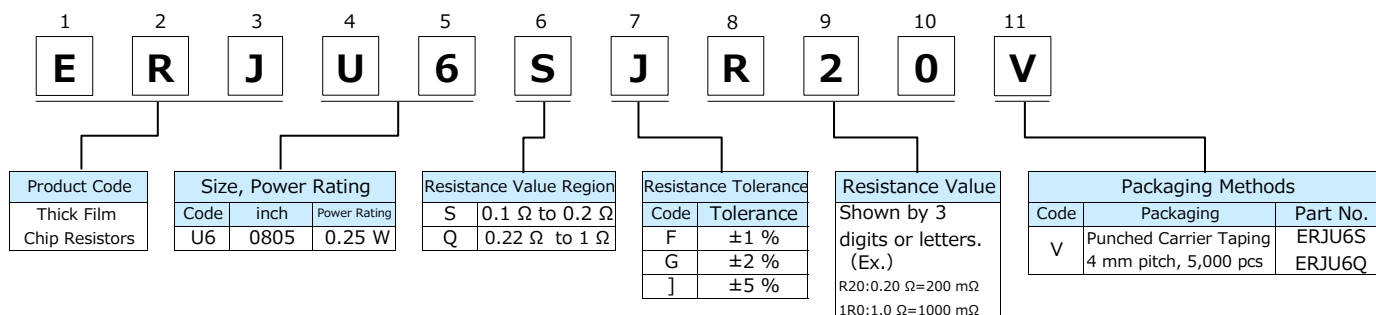
■ **As for Packaging Methods, Land Pattern, Soldering Conditions and Safety Precautions,**  
Please see Data Files

#### Explanation of Part Numbers

- Series ERJS02 to ERJS1T, ERJU0X to ERJU1T



- Series ERJU6S, U6Q



## Ratings

| Part No.<br>(inch size)         | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Limiting<br>Element<br>Voltage <sup>(2)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(3)</sup><br>(V) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /K)                               | Category<br>Temperature<br>Range<br>(°C) | AEC-<br>Q200<br>Grade |
|---------------------------------|------------------------------------------------|------------------------------------------------------|------------------------------------------------------|--------------------------------|----------------------------|----------------------------------------------------------------|------------------------------------------|-----------------------|
| <b>NEW</b><br>ERJU0X<br>(01005) | 0.031                                          | 15                                                   | 30                                                   | ±1                             | 10 to 1 M (E24, E96)       | R<10 Ω : -100 to +600<br>10 Ω≤R<100 Ω : ±300<br>100 Ω≤R : ±200 | -55 to +125                              | -                     |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 1 M (E24)             |                                                                |                                          |                       |
| ERJU01<br>(0201)                | 0.05                                           | 25                                                   | 50                                                   | ±1                             | 10 to 1 M (E24, E96)       | R<10 Ω :<br>-100 to +600                                       | -55 to +125                              | -                     |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 1 M (E24)             |                                                                |                                          |                       |
| ERJS02<br>ERJU02<br>(0402)      | 0.1                                            | 50                                                   | 100                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        | 10 Ω to 1 MΩ : ±200<br>1 MΩ<R :<br>-400 to +150                | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 3.3 M (E24)           |                                                                |                                          |                       |
| ERJS03<br>ERJU03<br>(0603)      | 0.1                                            | 75                                                   | 150                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        |                                                                | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 10 M (E24)            |                                                                |                                          |                       |
| ERJS06<br>ERJU06<br>(0805)      | 0.125                                          | 150                                                  | 200                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        | R<10 Ω :<br>-100 to +600                                       | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 10 M (E24)            |                                                                |                                          |                       |
| ERJS08<br>ERJU08<br>(1206)      | 0.25                                           | 200                                                  | 400                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        |                                                                | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 10 M (E24)            |                                                                |                                          |                       |
| ERJS14<br>ERJU14<br>(1210)      | 0.5                                            | 200                                                  | 400                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        | 10 Ω to 1 MΩ :<br>±200 (± 5 %)<br>±100 (±0.5 %, ±1 %)          | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 10 M (E24)            |                                                                |                                          |                       |
| ERJS12<br>ERJU12<br>(1812)      | 0.75                                           | 200                                                  | 500                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        |                                                                | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 10 M (E24)            |                                                                |                                          |                       |
| ERJS1D<br>ERJU1D<br>(2010)      | 0.75                                           | 200                                                  | 500                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        | 1 MΩ<R :<br>-400 to +150                                       | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 10 M (E24)            |                                                                |                                          |                       |
| ERJS1T<br>ERJU1T<br>(2512)      | 1.0                                            | 200                                                  | 500                                                  | ±0.5, ±1                       | 1 to 1 M (E24, E96)        |                                                                | -55 to +155                              | Grade 0               |
|                                 |                                                |                                                      |                                                      | ±5                             | 1 to 10 M (E24)            |                                                                |                                          |                       |

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

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

(3) 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.

## [Low Resistance type]

| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω) | T.C.R.<br>(×10 <sup>-6</sup> /K) | Category Temperature<br>Range<br>(°C) | AEC-<br>Q200<br>Grade |
|-------------------------|------------------------------------------------|--------------------------------|----------------------------|----------------------------------|---------------------------------------|-----------------------|
| ERJU6S (2012)           | 0.25                                           | ±1, ±2, ±5                     | 0.1 to 0.2 (E24)           | 0 to +150                        | -55 to +155                           | Grade 0               |
| ERJU6Q (2012)           |                                                |                                | 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  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$ .

• Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

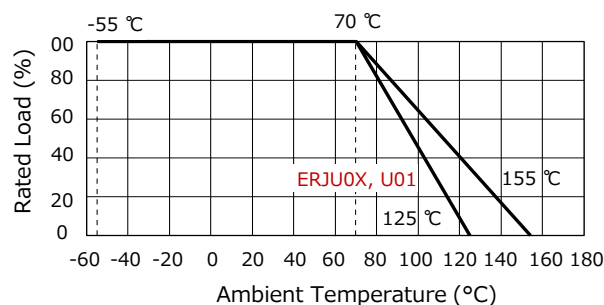
## [For Jumper]

| Part No.         | Resistance(Ω)  | Rated<br>Current(A) | Maximum Overload<br>Current (A) <sup>(1)</sup> |
|------------------|----------------|---------------------|------------------------------------------------|
| ERJU0X<br>ERJU01 | 100 mΩ or less | 0.5                 | 1                                              |
| ERJS02 ERJU02    |                |                     |                                                |
| ERJS03 ERJU03    |                | 1                   | 2                                              |
| ERJS06 ERJU06    |                |                     |                                                |
| ERJS08 ERJU08    |                | 2                   | 4                                              |
| ERJS14 ERJU14    |                |                     |                                                |
| ERJS12 ERJU12    |                |                     |                                                |
| ERJS1D ERJU1D    |                |                     |                                                |
| ERJS1T ERJU1T    |                |                     |                                                |

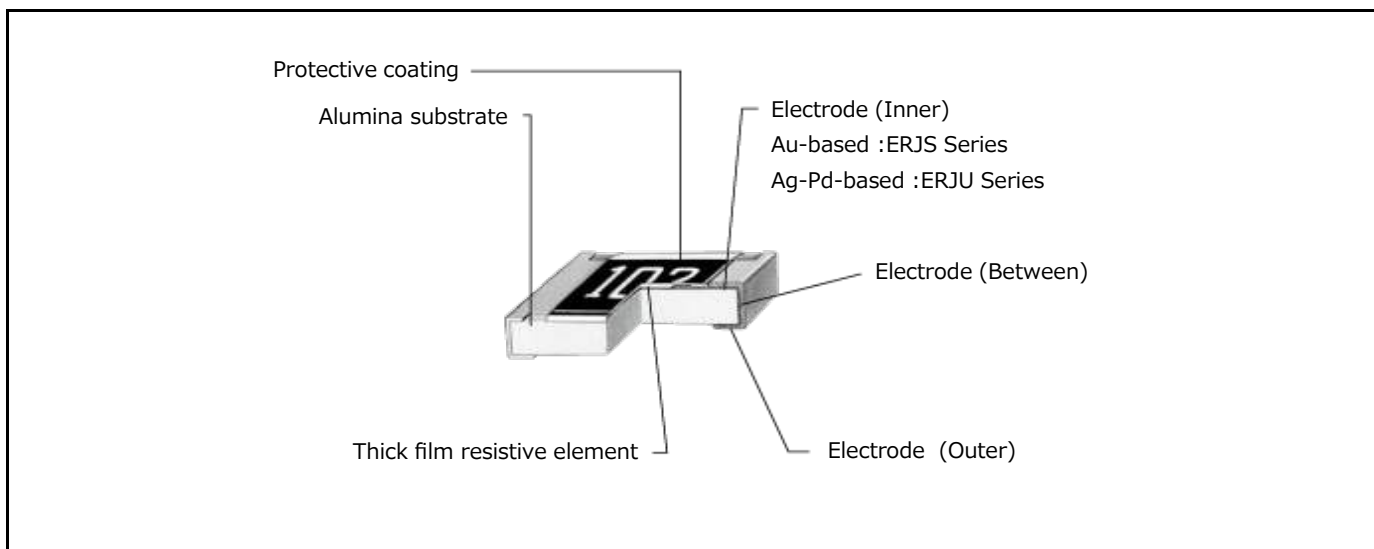
(1) Overload test current

## Power Derating Curve

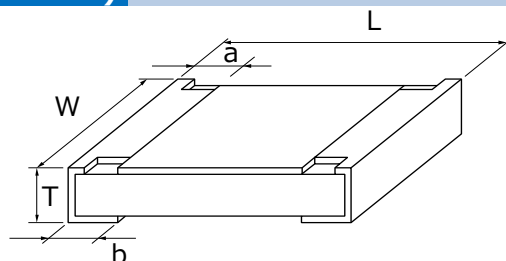
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure below.



## Construction



## Dimensions in mm (not to scale)



| Part No.         | Dimensions (mm) |                 |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|------------------|-----------------|-----------------|-----------|-----------|-----------|-------------------------------|
|                  | L               | W               | a         | b         | T         |                               |
| ERJU0X           | 0.40±0.02       | 0.20±0.02       | 0.10±0.03 | 0.10±0.03 | 0.13±0.02 | 0.04                          |
| ERJU01           | 0.60±0.03       | 0.30±0.03       | 0.10±0.05 | 0.15±0.05 | 0.23±0.03 | 0.15                          |
| ERJS02<br>ERJU02 | 1.00±0.05       | 0.50±0.05       | 0.20±0.10 | 0.25±0.10 | 0.35±0.05 | 0.8                           |
| ERJS03<br>ERJU03 | 1.60±0.15       | 0.80+0.15/-0.05 | 0.30±0.20 | 0.30±0.15 | 0.45±0.10 | 2                             |
| ERJS06<br>ERJU06 | 2.00±0.20       | 1.25±0.10       | 0.40±0.20 | 0.40±0.20 | 0.60±0.10 | 4                             |
| ERJU6□           | 2.00±0.20       | 1.25±0.10       | 0.45±0.20 | 0.45±0.20 | 0.55±0.10 | 6                             |
| ERJS08<br>ERJU08 | 3.20+0.05/-0.20 | 1.60+0.05/-0.15 | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 10                            |
| ERJS14<br>ERJU14 | 3.20±0.20       | 2.50±0.20       | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 16                            |
| ERJS12<br>ERJU12 | 4.50±0.20       | 3.20±0.20       | 0.50±0.20 | 0.50±0.20 | 0.60±0.10 | 27                            |
| ERJS1D<br>ERJU1D | 5.00±0.20       | 2.50±0.20       | 0.60±0.20 | 0.60±0.20 | 0.60±0.10 | 27                            |
| ERJS1T<br>ERJU1T | 6.40±0.20       | 3.20±0.20       | 0.65±0.20 | 0.60±0.20 | 0.60±0.10 | 45                            |

**Performance**

- Series ERJS02 to ERJS1T, ERJU0X to ERJU1T

| Test Item                    | Performance Requirements $\Delta R$ |                        | Test Conditions                                                                                         |
|------------------------------|-------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------|
|                              | Resistor type                       | Jumper type            |                                                                                                         |
| Resistance                   | Within Specified Tolerance          | 100 m $\Omega$ or less | 20 °C                                                                                                   |
| T. C. R.                     | Within Specified T. C. R.           | 200 m $\Omega$ or less | +25 °C/+155 °C (ERJU0X,U01 : +25 °C/+125 °C)                                                            |
| Overload                     | $\pm 2$ %                           | 100 m $\Omega$ or less | Rated Voltage $\times$ 2.5, 5 s<br>Jumper type : Max. Overload Current, 5 s                             |
| Resistance to Soldering Heat | $\pm 1$ %                           | 100 m $\Omega$ or less | 270 °C, 10 s                                                                                            |
| Rapid Change of Temperature  | $\pm 1$ %                           | 100 m $\Omega$ or less | -55 °C (30min.)/+155 °C (ERJU0X,U01 : +125 °C) (30min.), 100 cycles                                     |
| High Temperature Exposure    | $\pm 1$ %                           | 100 m $\Omega$ or less | +155 °C (ERJU0X,U01 : +125 °C), 1000 h                                                                  |
| Damp Heat, Steady State      | $\pm 1$ %                           | 100 m $\Omega$ or less | 60 °C, 90 % to 95 %RH, 1000 h                                                                           |
| Load Life in Humidity        | $\pm 3$ %                           | 100 m $\Omega$ 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           | $\pm 3$ %                           | 100 m $\Omega$ or less | 70 °C, Rated Voltage (Jumper type : Rated Current), 1.5 h ON / 0.5 h OFF cycle, 1000 h                  |

- Series ERJU6S, U6Q

| Test Item                    | Performance Requirements $\Delta R$ | Test Conditions                                                          |
|------------------------------|-------------------------------------|--------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance          | 20 °C                                                                    |
| T. C. R.                     | Within Specified T. C. R.           | +25 °C/+125 °C                                                           |
| Overload                     | $\pm 1$ %                           | 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 (30 min.) / +125 °C(30min.), 100 cycles                           |
| High Temperature Exposure    | $\pm 1$ %                           | +155 °C, 1000 h                                                          |
| Damp Heat, Steady State      | $\pm 1$ %                           | 60 °C, 90 % to 95 %RH, 1000 h                                            |
| Load Life in Humidity        | $\pm 3$ %                           | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h |
| Endurance at 70 °C           | $\pm 3$ %                           | 70 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                 |

# Anti-Sulfurated Thick Film Chip Resistors /Precision Type



Series: ERJ U2R, U3R, U6R  
(Ag-Pd-based inner electrode type)

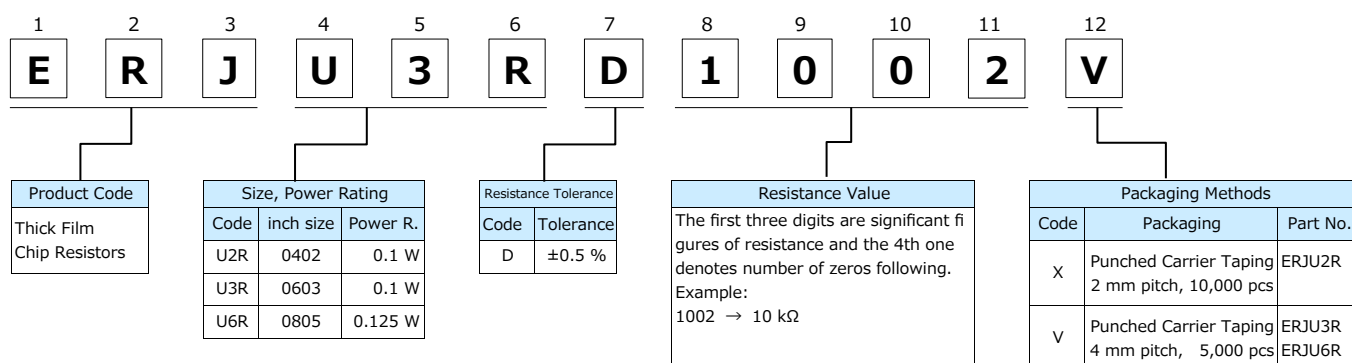
## Features

- High resistance to sulfurization achieved by adopting an Ag-Pd-based inner electrode.
- High precision ... Resistance tolerance :  $\pm 0.5\%$ , TCR :  $\pm 50 \times 10^{-6}/K$
- High reliability ... Metal glaze thick film resistive element and three layers of electrodes.
- Suitable for both reflow and flow soldering.
- Reference Standard ... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 compliant
- RoHS compliant

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

## Explanation of Part Numbers

### ● ERJU2R, U3R, U6R Series



## Ratings

| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Limiting Element<br>Voltage <sup>(2)</sup><br>(V) | Maximum Overload<br>Voltage <sup>(3)</sup><br>(V) | Resistance Tolerance<br>(%) | Resistance Range<br>( $\Omega$ ) | T.C.R.<br>( $\times 10^{-6}/K$ ) | Category Temperature Range<br>(°C) | AEC-Q200 Grade |
|-------------------------|------------------------------------------------|---------------------------------------------------|---------------------------------------------------|-----------------------------|----------------------------------|----------------------------------|------------------------------------|----------------|
| ERJU2R<br>(0402)        | 0.1                                            | 50                                                | 100                                               | $\pm 0.5$                   | 100 to 100 k<br>(E24, E96)       | $\pm 50$                         | -55 to +155                        | Grade 0        |
| ERJU3R<br>(0603)        | 0.1                                            | 50                                                | 100                                               | $\pm 0.5$                   | 100 to 100 k<br>(E24, E96)       |                                  | -55 to +155                        | Grade 0        |
| ERJU6R<br>(0805)        | 0.125                                          | 150                                               | 200                                               | $\pm 0.5$                   | 100 to 100 k<br>(E24, E96)       |                                  | -55 to +155                        | Grade 0        |

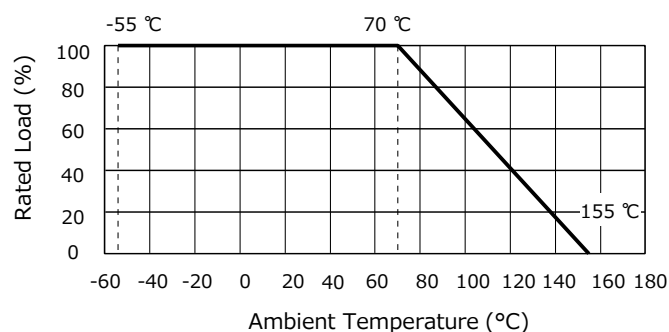
(1) Use it on the condition that the case temperature is below the upper category temperature.

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

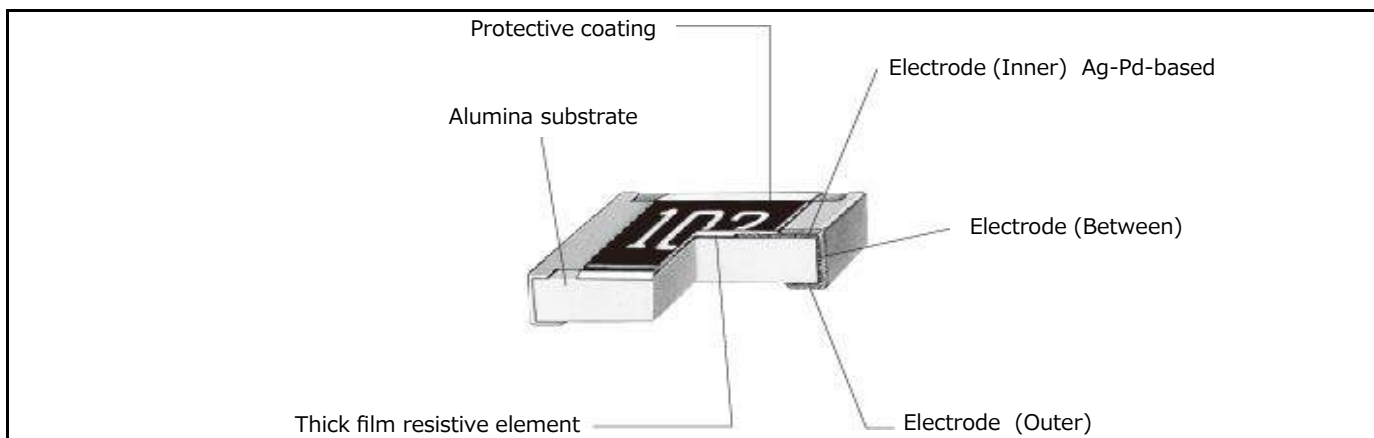
(3) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.

### Power Derating Curve

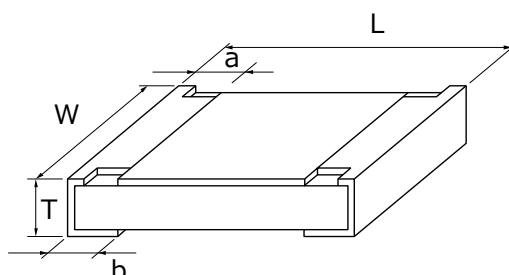
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



### Construction



### Dimensions in mm (not to scale)



| Part No. | Dimensions (mm) |                 |           |           |           | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------------|-----------|-----------|-----------|-------------------------------|
|          | L               | W               | a         | b         | T         |                               |
| ERJU2R   | 1.00±0.05       | 0.50±0.05       | 0.20±0.10 | 0.25±0.10 | 0.35±0.05 | 0.8                           |
| ERJU3R   | 1.60±0.15       | 0.80+0.15/-0.05 | 0.30±0.20 | 0.30±0.15 | 0.45±0.10 | 2                             |
| ERJU6R   | 2.00±0.20       | 1.25±0.10       | 0.40±0.20 | 0.40±0.20 | 0.60±0.10 | 4                             |

### Performance

| Test Item                    | Performance Requirements ΔR | Test Conditions                                                           |
|------------------------------|-----------------------------|---------------------------------------------------------------------------|
| Resistance                   | Within Specified Tolerance  | 20 °C                                                                     |
| T. C. R.                     | Within Specified T. C. R.   | +25 °C/+155 °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.) / +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        | ±2 %                        | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle , 1000 h |
| Endurance at 70 °C           | ±2 %                        | 70 °C, , Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                |

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

102 102 102

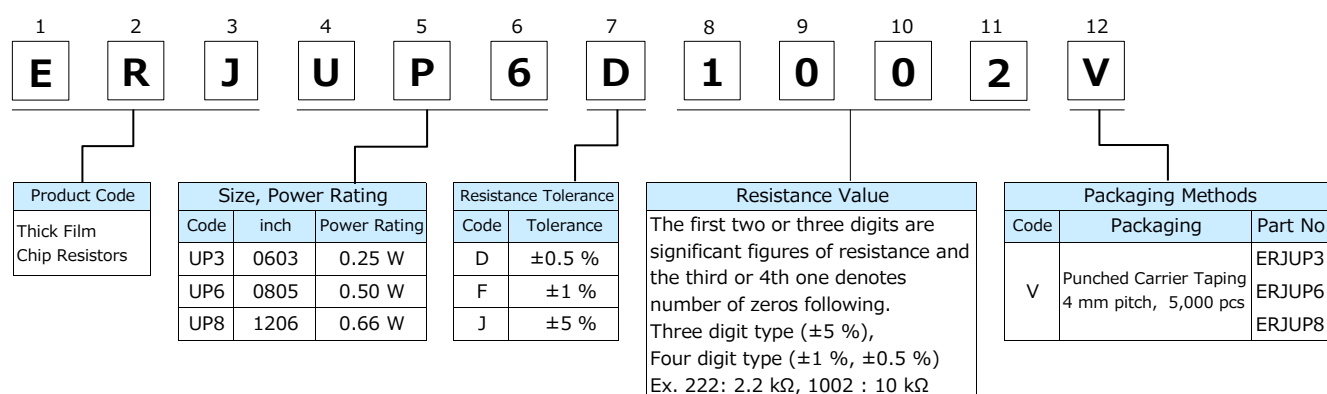
## Series: ERJ UP3, UP6, UP8

### Features

- High resistance to sulfurization achieved by adopting Anti-Sulfurated electrode material (Ag-Pd-based inner electrode) and structure
- 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 Standard ... IEC 60115-8, JIS C 5201-8, JEITA RC-2134C
- AEC-Q200 compliant
- RoHS compliant

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

### Explanation of Part Numbers



### Ratings

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

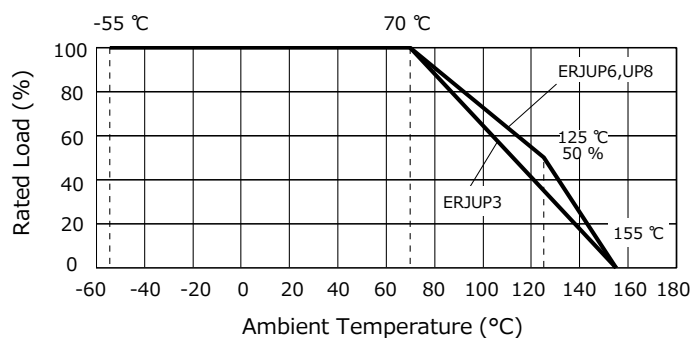
(1) Use it on the condition that the case temperature is below the upper category temperature.

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

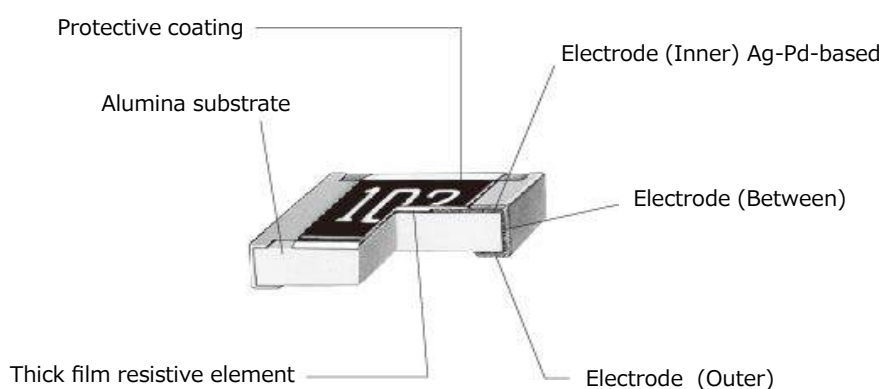
(3) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.

### Power Derating Curve

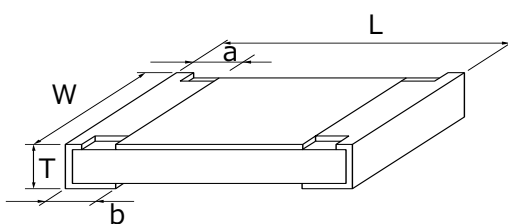
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



### Construction

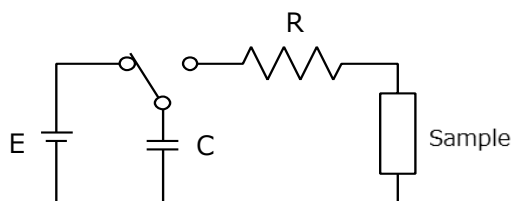


### Dimensions in mm (not to scale)



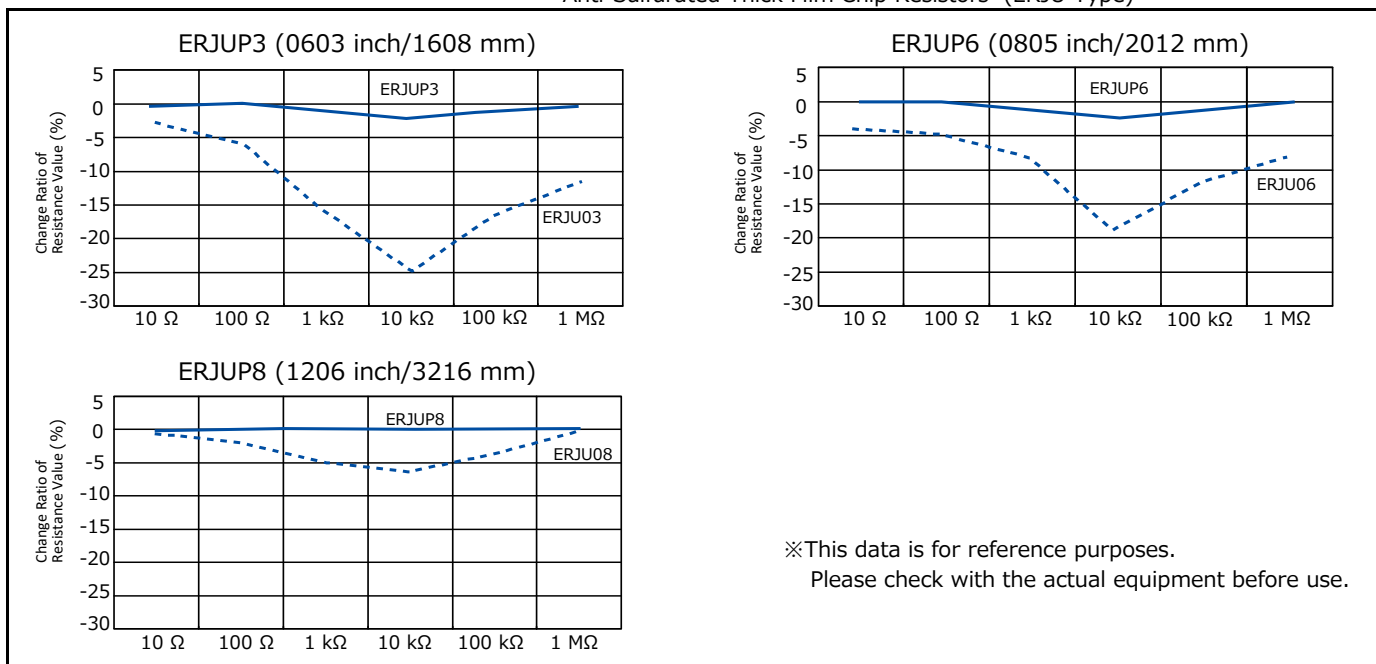
| Part No. | Dimensions (mm) |                 |                 |           |           | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------------|-----------------|-----------|-----------|-------------------------------|
|          | L               | W               | a               | b         | T         |                               |
| ERJUP3   | 1.60±0.15       | 0.80+0.15/-0.05 | 0.15+0.15/-0.10 | 0.25±0.10 | 0.45±0.10 | 2                             |
| ERJUP6   | 2.00±0.20       | 1.25±0.10       | 0.25±0.20       | 0.40±0.20 | 0.60±0.10 | 4                             |
| ERJUP8   | 3.20+0.05/-0.20 | 1.6+0.05/-0.15  | 0.40±0.20       | 0.50±0.20 | 0.60±0.10 | 10                            |

## ESD Characteristic



|   |                                                                              |
|---|------------------------------------------------------------------------------|
| R | $R=0\ \Omega(\leq 1.5\ \text{k}\Omega) / 150\ \Omega(> 1.5\ \text{k}\Omega)$ |
| C | 150 pF                                                                       |
| E | $\pm 3\ \text{kV}$                                                           |

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



## Performance

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

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



**Series: ERJ C1**

## Features

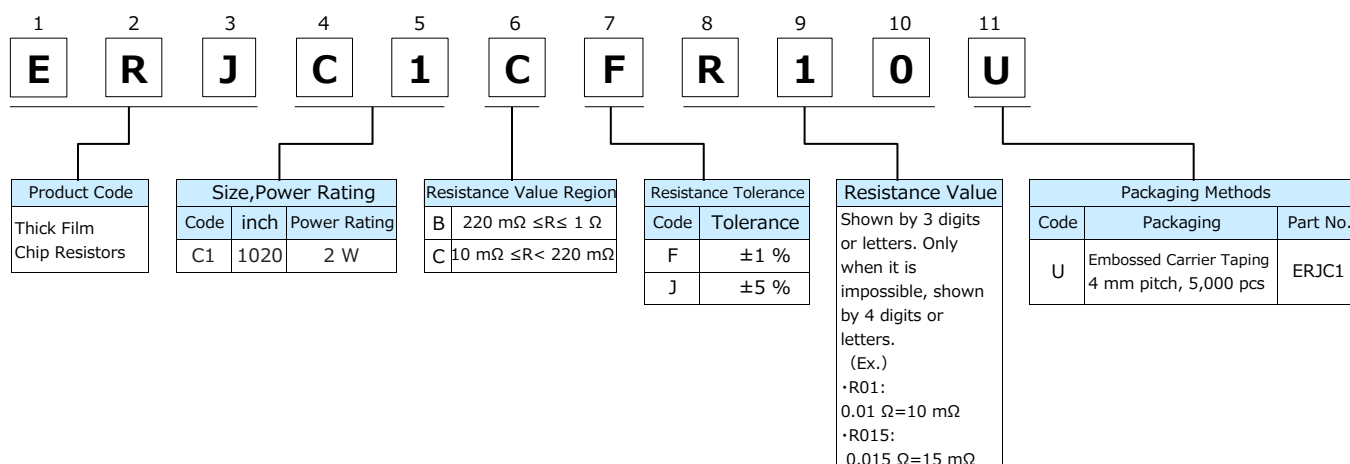
- High resistance to sulfurization achieved by adopting Anti-Sulfurated electrode material (Ag-Pd-based inner electrode) and structure (Covered electrode)
- High solder-joint reliability by wide terminal construction
- Excellent heat dissipation characteristics by wide terminal construction
- AEC-Q200 compliant
- 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



## Ratings

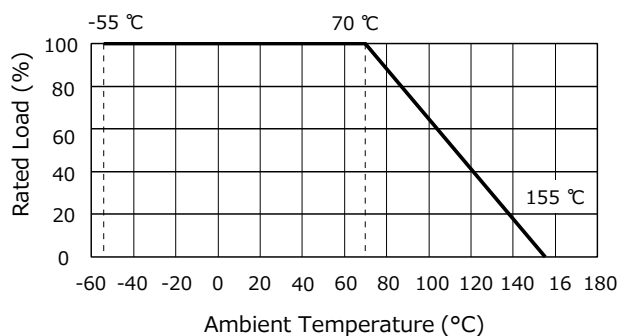
| Part No.<br>(inch size) | Power Rating<br>at 70 °C <sup>(1)</sup><br>(W) | Resistance<br>Tolerance<br>(%) | Resistance<br>Range<br>(Ω)     | T.C.R.<br>(×10 <sup>-6</sup> /K) | Category<br>Temperature<br>Range<br>(°C) | AEC-<br>Q200<br>Grade |
|-------------------------|------------------------------------------------|--------------------------------|----------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

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

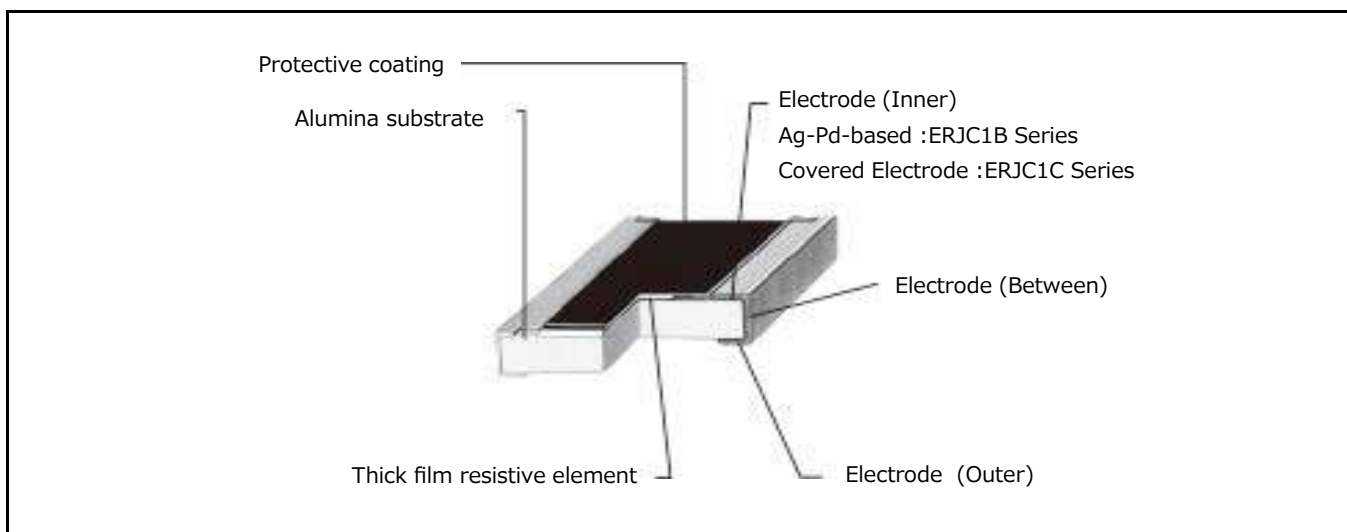
- Rated Continuous Working Voltage (RCWV) shall be determined from  $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$ .
- Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$ .

### Power Derating Curve

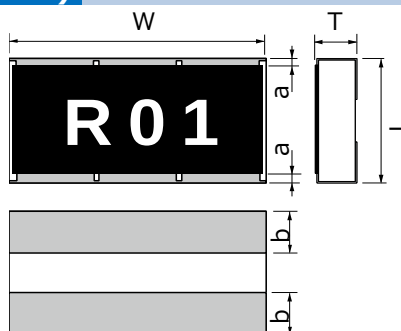
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



### Construction

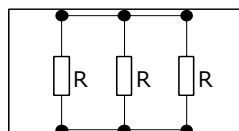


### Dimensions in mm (not to scale)



| 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

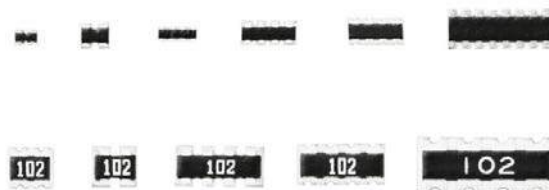


**Performance**

| Test Item                    | Performance Requirements $\angle$ | 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 $\times$ 2.0, 5 s                                           |
| Resistance to Soldering Heat | $\pm 1$ %                         | 270 °C, 10 s                                                              |
| Rapid Change of Temperature  | $\pm 2$ %                         | -55 °C (30 min.) / +125 °C (30 min.), 1000 cycles                         |
| High Temperature Exposure    | $\pm 1$ %                         | +155 °C, 1000 h                                                           |
| Damp Heat, Steady State      | $\pm 1$ %                         | 60 °C, 90 % to 95 %RH, 1000 h                                             |
| Load Life in Humidity        | $\pm 3$ %                         | 60 °C, 90 % to 95 %RH, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle , 1000 h |
| Endurance at 70 °C           | $\pm 3$ %                         | 70 °C, Rated Voltage, 1.5 h ON / 0.5 h OFF cycle, 1000 h                  |

## Chip Resistors Array

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

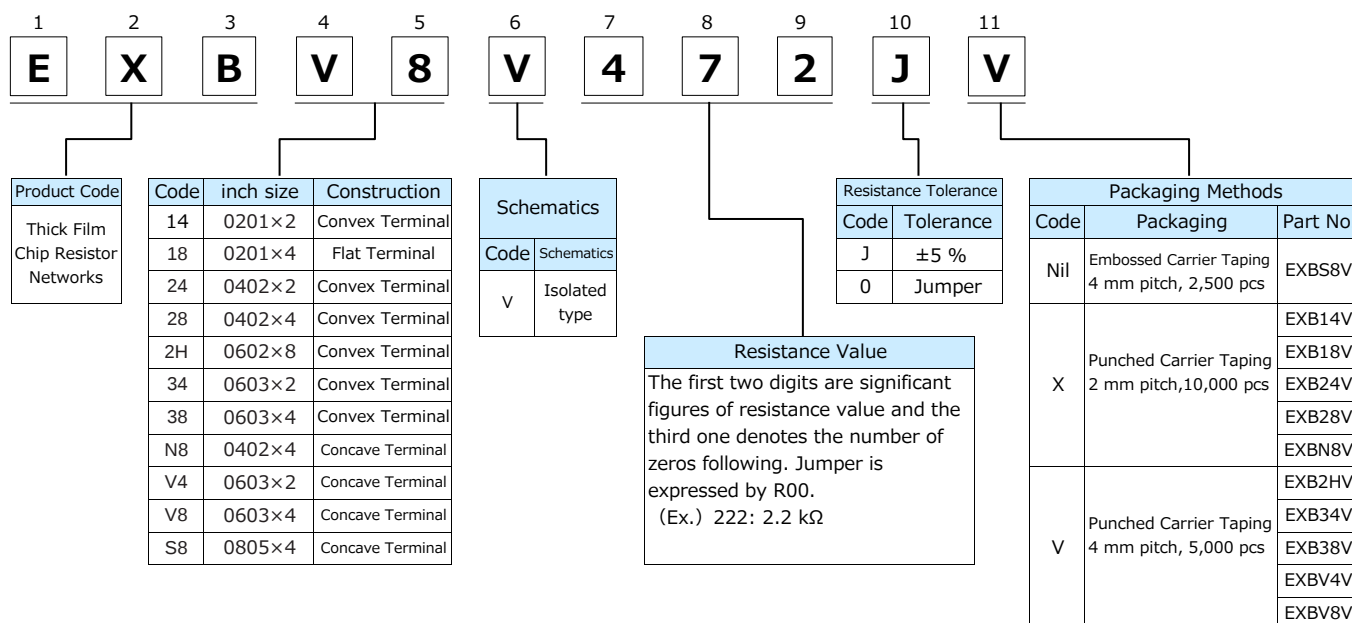


### Features

- 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, N8V  
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, V4V  
4 resistors in 3.2 mm × 1.6 mm size / 1206 inch size : EXB38V, V8V  
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 compliant (EXB2, EXB3)
- RoHS compliant

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

### Explanation of Part Numbers



## 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<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> /K)                      | Category<br>Temperature<br>Range<br>(°C) | AEC-<br>Q200<br>Grade |
|-------------------------|-----------------------------------------|---------------------------------------------------|------------------------------------------------------|--------------------------------|----------------------------|-------------------------------------------------------|------------------------------------------|-----------------------|
| EXB14V<br>(0201×2)      | 0.031                                   | 12.5                                              | 25                                                   | ±5                             | 10 to 1 M (E24)            | R<10 Ω :<br>-200 to +600<br><br>10 Ω to 1 MΩ:<br>±200 | -55 to +125                              | -                     |
| EXB18V<br>(0201×4)      | 0.031<br>(0.1 W / package)              | 12.5                                              | 25                                                   | ±5                             | 10 to 1 M (E24)            |                                                       | -55 to +125                              | -                     |
| EXB24V<br>(0402×2)      | 0.063                                   | 50                                                | 100                                                  | ±5                             | 1 to 1 M (E24)             |                                                       | -55 to +125                              | Grade 1               |
| EXB28V<br>(0402×4)      | 0.063                                   | 50                                                | 100                                                  | ±5                             | 1 to 1 M (E24)             |                                                       | -55 to +125                              | Grade 1               |
| EXB2HV<br>(0602×8)      | 0.063<br>(0.25 W / package)             | 25                                                | 50                                                   | ±5                             | 10 to 1 M (E24)            |                                                       | -55 to +125                              | Grade 1               |
| EXB34V<br>(0603×2)      | 0.063                                   | 50                                                | 100                                                  | ±5                             | 1 to 1 M (E24)             |                                                       | -55 to +125                              | Grade 1               |
| EXB38V<br>(0603×4)      | 0.063                                   | 50                                                | 100                                                  | ±5                             | 1 to 1 M (E24)             |                                                       | -55 to +125                              | Grade 1               |
| EXBN8V<br>(0402×4)      | 0.031                                   | 50                                                | 100                                                  | ±5                             | 10 to 1 M (E24)            |                                                       | -55 to +125                              | -                     |
| EXBV4V<br>(0603×2)      | 0.063                                   | 50                                                | 100                                                  | ±5                             | 10 to 1 M (E24)            |                                                       | -55 to +125                              | -                     |
| EXBV8V<br>(0603×4)      | 0.063                                   | 50                                                | 100                                                  | ±5                             | 10 to 1 M (E24)            |                                                       | -55 to +125                              | -                     |
| EXBS8V<br>(0805×4)      | 0.1                                     | 100                                               | 200                                                  | ±5                             | 10 to 1 M (E24)            |                                                       | -55 to +125                              | -                     |

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

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

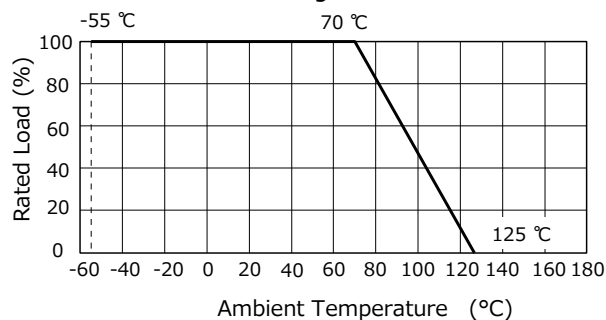
## [For Jumper]

| Part No. | Resistance(Ω) | Rated Current<br>(A / element) | Maximum Overload<br>Current (A) <sup>(1)</sup> |
|----------|---------------|--------------------------------|------------------------------------------------|
| EXB14V   | 50 mΩ or less | 0.5                            | 1                                              |
| EXB18V   |               | 0.5                            | 1                                              |
| EXB24V   |               | 1                              | 2                                              |
| EXB28V   |               | 1                              | 2                                              |
| EXB2HV   |               | 1                              | 2                                              |
| EXB34V   |               | 1                              | 2                                              |
| EXB38V   |               | 1                              | 2                                              |
| EXBN8V   |               | 1                              | 2                                              |
| EXBV4V   |               | 1                              | 2                                              |
| EXBV8V   |               | 1                              | 2                                              |
| EXBS8V   |               | 2                              | 4                                              |

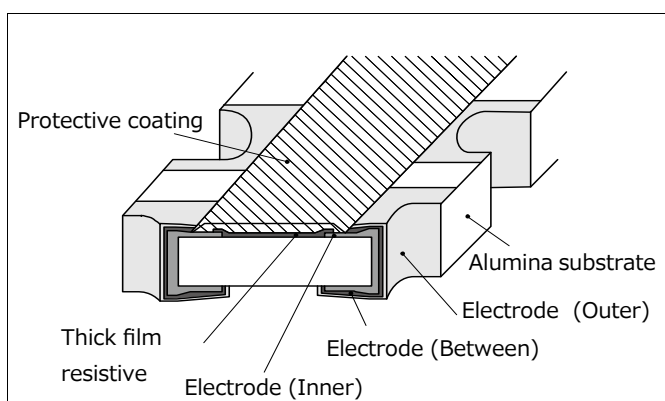
(1) Overload test current

## Power Derating Curve

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

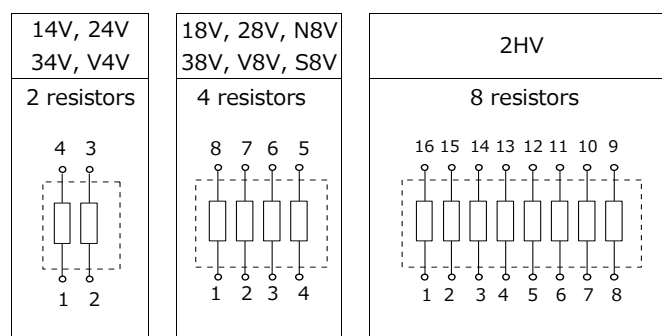


## Construction(Example : Concave Terminal)



## Schematics

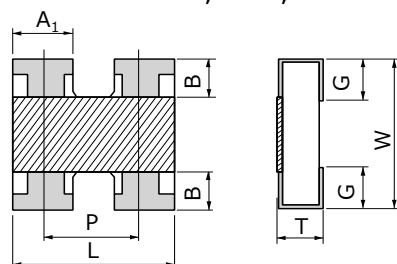
## ● Isolated type



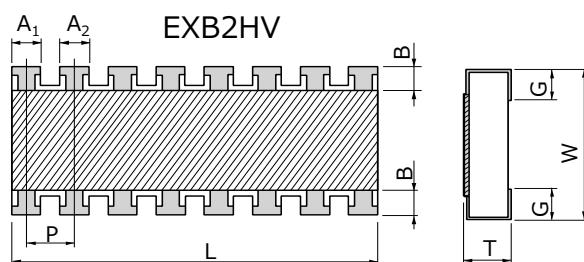
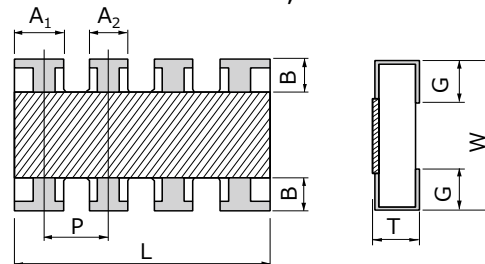
**Dimensions in mm (not to scale)**

**(1) Convex Terminal type**

**EXB14V, 24V, 34V**



**EXB28V, 38V**

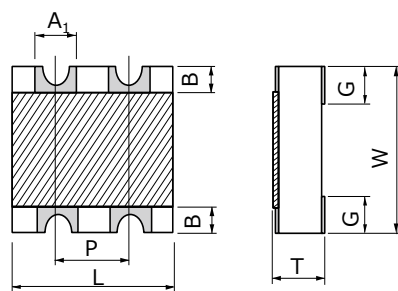


| Part No.<br>(inch size) | Dimensions (mm) |           |           |                |                |           |        |           | Mass (Weight)<br>(g/1000 pcs) |
|-------------------------|-----------------|-----------|-----------|----------------|----------------|-----------|--------|-----------|-------------------------------|
|                         | L               | W         | T         | A <sub>1</sub> | A <sub>2</sub> | B         | P      | G         |                               |
| EXB14V<br>(0603×2)      | 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                           |
| EXB24V<br>(1005×2)      | 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                           |
| EXB28V<br>(1005×4)      | 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                           |
| EXB2HV<br>(1605×8)      | 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                           |
| EXB34V<br>(1608×2)      | 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                           |
| EXB38V<br>(1608×4)      | 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                           |

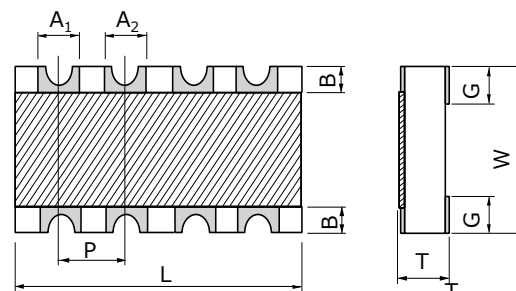
( ) Reference

**(2) Concave Terminal type**

**EXBV4V**



**EXBN8V, V8V, S8V**

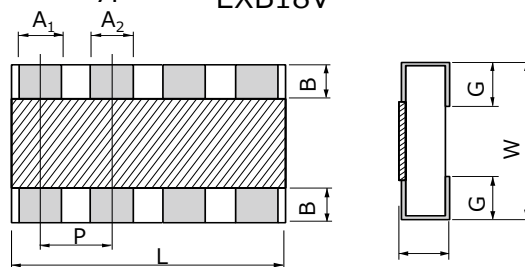


| Part No.<br>(inch size) | Dimensions (mm)     |                     |           |                |                |           |        |           | Mass (Weight)<br>(g/1000 pcs) |
|-------------------------|---------------------|---------------------|-----------|----------------|----------------|-----------|--------|-----------|-------------------------------|
|                         | L                   | W                   | T         | A <sub>1</sub> | A <sub>2</sub> | B         | P      | G         |                               |
| EXBN8V<br>(1005×4)      | 2.00±0.10           | 1.00±0.10           | 0.45±0.10 | 0.30±0.10      | 0.30±0.10      | 0.20±0.15 | (0.50) | 0.30±0.15 | 3.0                           |
| EXBV4V<br>(1608×2)      | 1.60<br>+0.20/-0.10 | 1.60<br>+0.20/-0.10 | 0.60±0.10 | 0.60±0.10      | —              | 0.30±0.15 | (0.80) | 0.45±0.15 | 5.0                           |
| EXBV8V<br>(1608×4)      | 3.20<br>+0.20/-0.10 | 1.60<br>+0.20/-0.10 | 0.60±0.10 | 0.60±0.10      | 0.60±0.10      | 0.30±0.15 | (0.80) | 0.45±0.15 | 10                            |
| EXBS8V<br>(2012×4)      | 5.08<br>+0.20/-0.10 | 2.20<br>+0.20/-0.10 | 0.70±0.20 | 0.80±0.15      | 0.80±0.15      | 0.50±0.15 | (1.27) | 0.55±0.15 | 30                            |

( ) Reference

## Dimensions in mm (not to scale)

### (3) Flat Terminal type EXB18V



| Part No.<br>(inch size) | Dimensions (mm) |           |           |                |                |           |        |           | Mass (Weight)<br>(g/1000 pcs) |
|-------------------------|-----------------|-----------|-----------|----------------|----------------|-----------|--------|-----------|-------------------------------|
|                         | L               | W         | T         | A <sub>1</sub> | A <sub>2</sub> | B         | P      | G         |                               |
| EXB18V<br>(0603×4)      | 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                           |

( ) Reference

## Performance

| Test Item                    | Performance Requirements ΔR | 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 (30 min.) / +155 °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 (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                 |

## Anti-Sulfurated Chip Resistors Array



**Series: 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 compliant (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

Thick Film Chip Resistor Networks

Code

inch size

Construction

U14

0201×2

Convex Terminal

U18

0201×4

Flat Terminal

U24

0402×2

Convex Terminal

U28

0402×4

Convex Terminal

U2H

0602×8

Convex Terminal

U34

0603×2

Convex Terminal

U38

0603×4

Convex Terminal

Resistance Value

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.  
(Ex.) 222: 2.2 kΩ

Resistance Tolerance

Code

Tolerance

J

±5 %

0

Jumper

Packaging Methods

Code

Packaging

Part No.

X

Punched Carrier Taping  
2 mm pitch, 10,000 pcs

EXBU14

EXBU18

EXBU24

EXBU28

V

Punched Carrier Taping  
4 mm pitch, 5,000 pcs

EXBU2H

EXBU34

EXBU38

## Ratings

## [For Resistor]

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

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

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

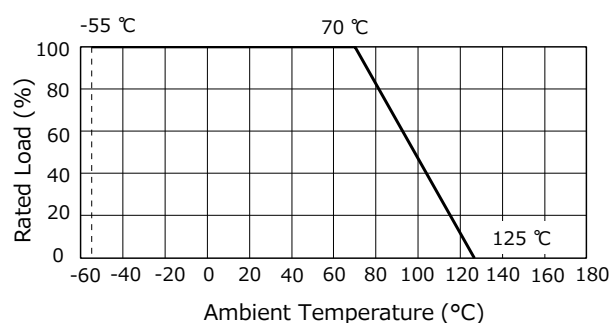
## [For Jumper]

| Part No. | Resistance(Ω)  | Rated Current<br>(A / element) | Maximum Overload<br>Current (A) <sup>(1)</sup> |
|----------|----------------|--------------------------------|------------------------------------------------|
| EXBU24   | 100 mΩ or less | 1                              | 2                                              |
| EXBU28   |                |                                |                                                |
| EXBU2H   |                |                                |                                                |
| EXBU34   |                |                                |                                                |
| EXBU38   |                |                                |                                                |

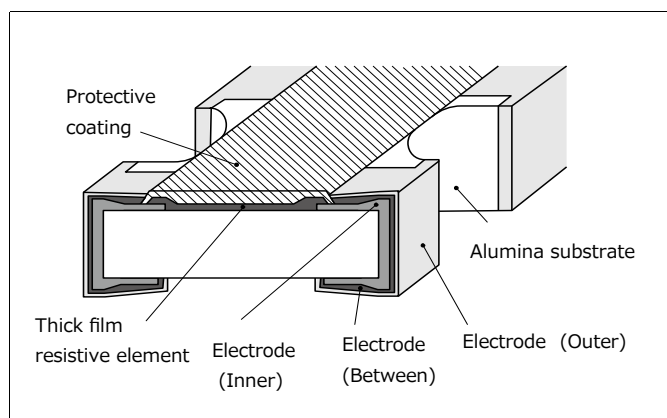
(1) Overload test current

## Power Derating Curve

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

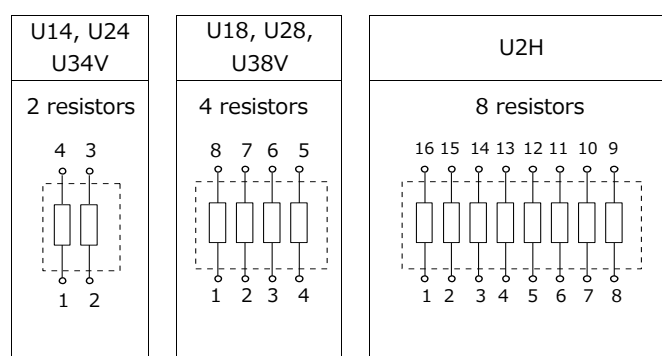


## Construction



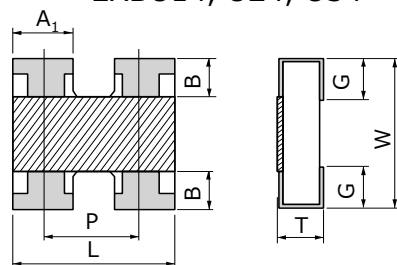
## Schematics

## ● Isolated type

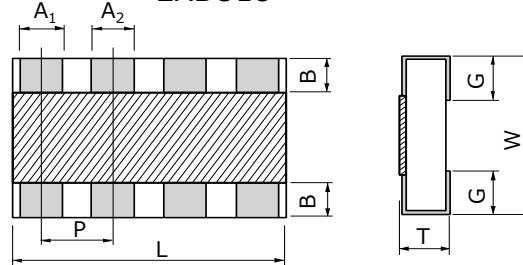


## Dimensions in mm (not to scale)

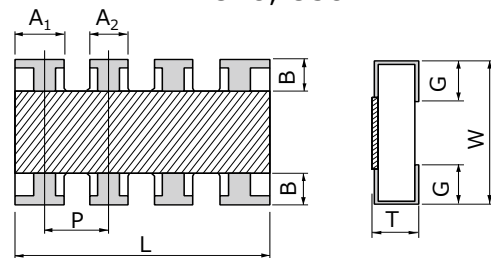
EXBU14, U24, U34



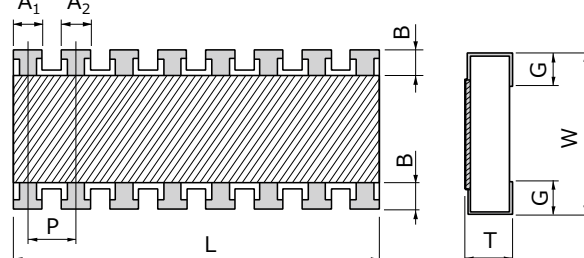
EXBU18



EXBU28, U38



EXBU2H



| Part No.<br>(inch size) | Dimensions (mm) |           |           |                |                |           |        |           | Mass (Weight)<br>(g/1000 pcs) |
|-------------------------|-----------------|-----------|-----------|----------------|----------------|-----------|--------|-----------|-------------------------------|
|                         | L               | W         | T         | A <sub>1</sub> | A <sub>2</sub> | B         | P      | G         |                               |
| EXBU14<br>(0201X2)      | 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<br>(0201X4)      | 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<br>(0402X2)      | 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<br>(0402X4)      | 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<br>(0602X8)      | 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<br>(0603X2)      | 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<br>(0603X4)      | 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                           |

## Performance

| Test Item                    | Performance Requirements ΔR | 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 (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 (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 Resistors Networks



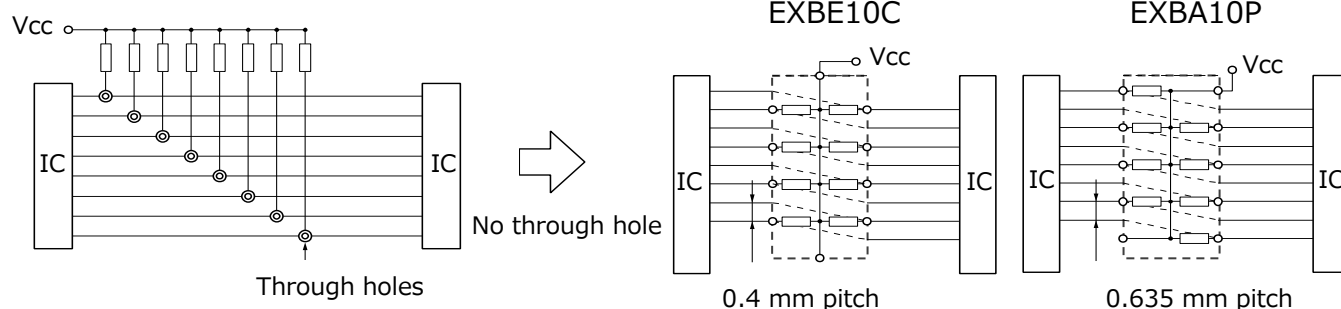
**Series: EXB D, E, A, Q**

### 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



- 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            | E                      | 1                                          | 0 | C                                                           | 1 | 0                        | 3  | J                |                                                                                                                           |                      |      |  |           |
| Suffix for Special Requirements                  |                                         |              |                        |                                            |   |                                                             |   |                          |    |                  |                                                                                                                           |                      |      |  |           |
| Product Code<br><br>Thick Film Resistor Networks | Dimension Code of Chip Resistor Network |              |                        | Number of Terminals                        |   | Circuit Configuration                                       |   |                          |    | Resistance Value |                                                                                                                           | Resistance Tolerance |      |  |           |
|                                                  |                                         |              |                        |                                            |   |                                                             |   |                          |    |                  |                                                                                                                           |                      |      |  |           |
|                                                  |                                         |              |                        |                                            |   |                                                             |   |                          |    |                  |                                                                                                                           |                      |      |  |           |
|                                                  |                                         |              |                        |                                            |   |                                                             |   |                          |    |                  |                                                                                                                           |                      |      |  |           |
|                                                  |                                         |              |                        |                                            |   |                                                             |   |                          |    |                  |                                                                                                                           |                      |      |  |           |
| Code                                             |                                         | Inch         | Dimensions             | 10 Terminals<br>(EXBD)<br>(EXBE)<br>(EXBA) |   | Code                                                        |   | Common Terminal Position |    |                  | The first two digits are significant figures of resistance value and the third one denotes the number of zeros following. |                      | Code |  | Tolerance |
| D                                                | 1206                                    | 3.2 × 1.6 mm | 16 Terminals<br>(EXBQ) |                                            | C | Center common circuit (EXBD,EXBE)                           |   |                          | J  |                  | ±5 %                                                                                                                      |                      |      |  |           |
| E                                                | 1608                                    | 4.0 × 2.1 mm |                        |                                            | P | Diagonal common circuit (Terminal 5 and Terminal 10) (EXBA) |   |                          |    |                  |                                                                                                                           |                      |      |  |           |
| A                                                | 2512                                    | 6.4 × 3.1 mm |                        |                                            | P | One side common circuit (Terminal 16) (EXBQ)                |   |                          |    |                  |                                                                                                                           |                      |      |  |           |
| Q                                                | 1506                                    | 3.8 × 1.6 mm |                        |                                            | E | Diagonal common circuit (Terminal 1 and Terminal 6) (EXBA)  |   |                          |    |                  |                                                                                                                           |                      |      |  |           |

## Ratings

| Part No.<br>(inch size) | Resistance<br>Range<br>(Ω) | Resistance<br>Tolerance<br>(%) | Number of<br>Terminals | Number of<br>Resistors | Power<br>Rating <sup>(1)</sup><br>at 70 °C<br>(W/element) | Limiting<br>Element<br>Voltage <sup>(2)</sup><br>(V) | Maximum<br>Overload<br>Voltage <sup>(3)</sup><br>(V) | T.C.R.<br>(×10 <sup>-6</sup> /K) | Category<br>Temperature<br>Range<br>(°C) | AEC-<br>Q200<br>Grade |
|-------------------------|----------------------------|--------------------------------|------------------------|------------------------|-----------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|----------------------------------|------------------------------------------|-----------------------|
| EXBD<br>(1206)          | 47 to 1 M<br>(E12)         | ±5                             | 10<br>terminals        | 8 element              | 0.05 /<br>element                                         | 25                                                   | 50                                                   | ±200                             | -55 to +125                              | -                     |
| EXBE<br>(1608)          |                            |                                |                        |                        | 0.063 /<br>element                                        | 25                                                   | 50                                                   | ±200                             | -55 to +125                              | -                     |
| EXBA<br>(2512)          |                            |                                |                        |                        | 0.063 /<br>element                                        | 50                                                   | 100                                                  | ±200                             | -55 to +125                              | -                     |
| EXBQ<br>(1506)          | 100 to 470 k<br>(E6)       |                                | 16<br>terminals        | 15 element             | 0.025 /<br>element                                        | 25                                                   | 50                                                   | ±200                             | -55 to +125                              | -                     |

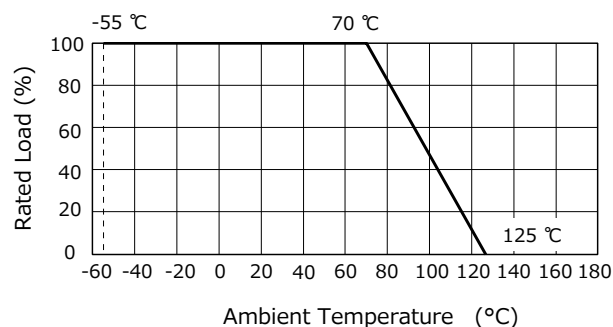
(1) Use it on the condition that the case temperature is below the upper category temperature.

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

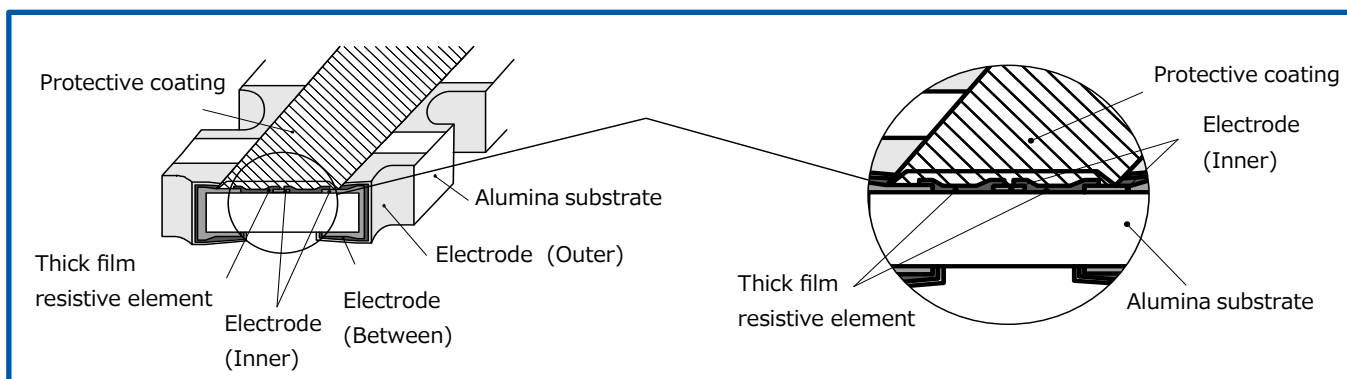
(2) Overload Test Voltage (OTV) shall be determined from  $OTV = \text{Specified Magnification (refer to performance)} \times RCWV$  or Maximum Overload Voltage listed above, whichever less.

## Power Derating Curve

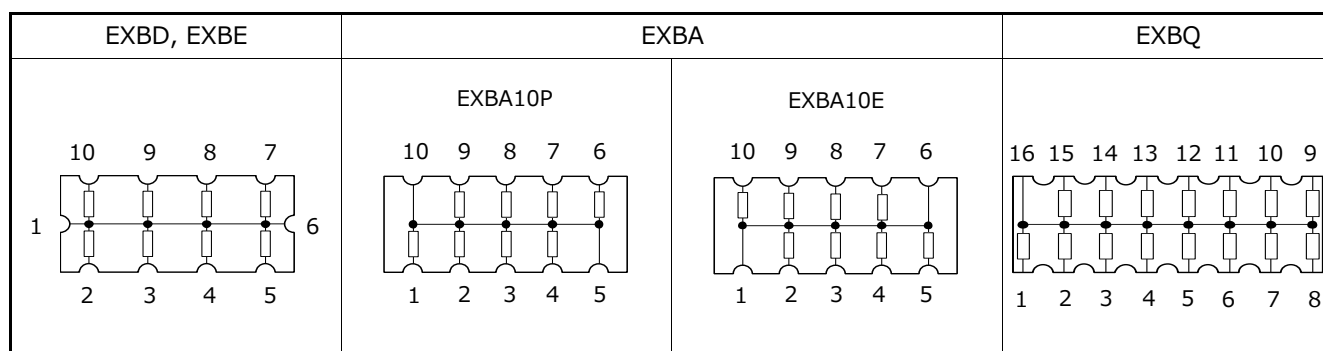
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



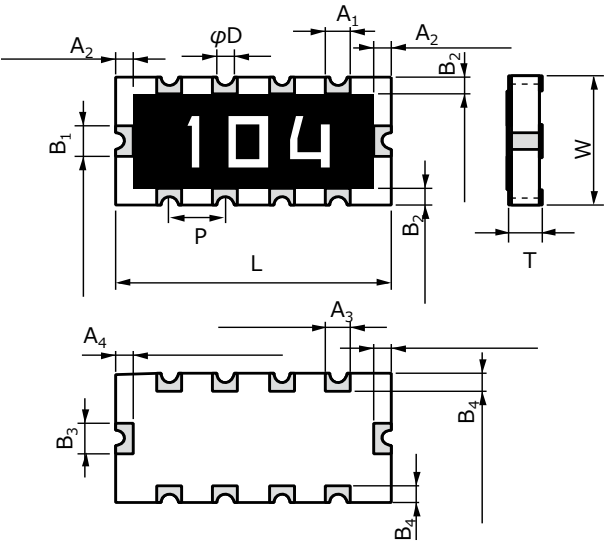
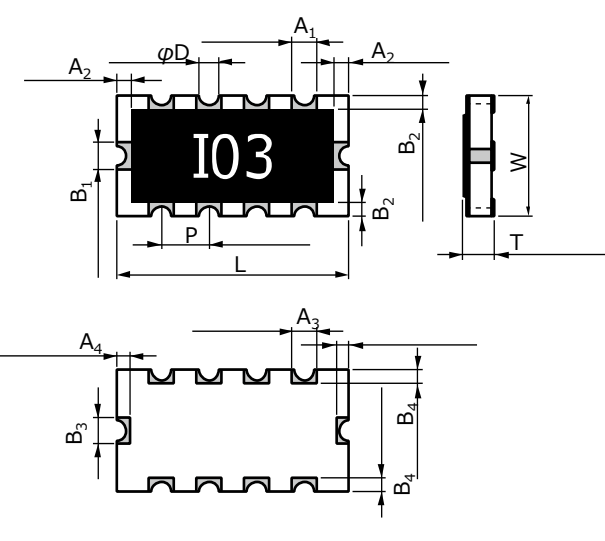
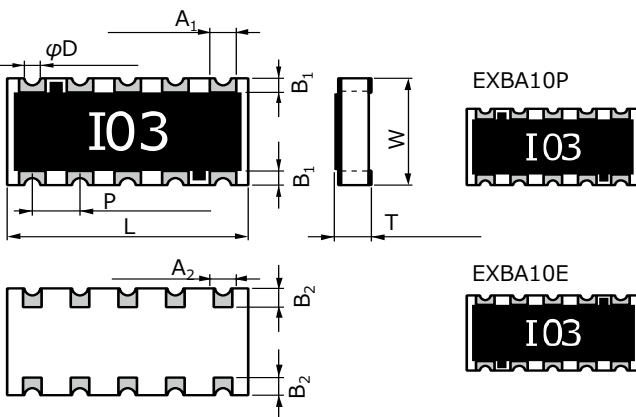
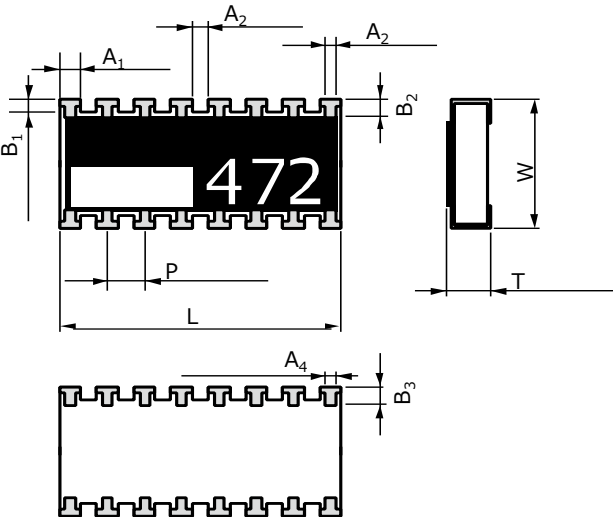
## Construction(Example : EXBD)



## Circuit Configuration



**Dimensions in mm (not to scale)**

|                                                                                                                                   |                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;"><b>EXBD</b></p>   | <p style="text-align: center;"><b>EXBE</b></p>   |
| <p style="text-align: center;"><b>EXBA</b></p>  | <p style="text-align: center;"><b>EXBQ</b></p>  |

| Part No. | Dimensions (mm) |                 |                |                |                |                 |                 | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------------|----------------|----------------|----------------|-----------------|-----------------|-------------------------------|
|          | L               | W               | T              | A <sub>1</sub> | A <sub>2</sub> | B <sub>1</sub>  | B <sub>2</sub>  |                               |
| EXBD     | 3.20±0.15       | 1.60±0.15       | 0.55±0.10      | 0.33±0.15      | 0.2±0.1        | 0.40±0.15       | 0.2±0.1         | 10                            |
|          | A <sub>3</sub>  | A <sub>4</sub>  | B <sub>3</sub> | B <sub>4</sub> | P              | ϕ D             |                 |                               |
|          | 0.3±0.1         | 0.25±0.10       | 0.40±0.15      | 0.35±0.15      | 0.635±0.10     | 0.2±0.1         |                 |                               |
| Part No. | Dimensions (mm) |                 |                |                |                |                 |                 | Mass (Weight)<br>(g/1000 pcs) |
|          | L               | W               | T              | A <sub>1</sub> | A <sub>2</sub> | B <sub>1</sub>  | B <sub>2</sub>  |                               |
| EXBE     | 4.0±0.2         | 2.1±0.2         | 0.55±0.10      | 0.5±0.2        | 0.3±0.2        | 0.5±0.2         | 0.25±0.20       | 16                            |
|          | A <sub>3</sub>  | A <sub>4</sub>  | B <sub>3</sub> | B <sub>4</sub> | P              | ϕ D             |                 |                               |
|          | 0.4±0.2         | 0.35±0.20       | 0.5±0.2        | 0.4±0.2        | 0.8±0.1        | 0.3+0.1/-0.2    |                 |                               |
| Part No. | Dimensions (mm) |                 |                |                |                |                 |                 | Mass (Weight)<br>(g/1000 pcs) |
|          | L               | W               | T              | A <sub>1</sub> | B <sub>1</sub> | A <sub>2</sub>  | B <sub>2</sub>  |                               |
| EXBA     | 6.4±0.2         | 3.1±0.2         | 0.55±0.10      | 0.7±0.2        | 0.3±0.2        | 0.5±0.2         | 0.5±0.20        | 40                            |
|          | P               | ϕ D             |                |                |                |                 |                 |                               |
|          | 1.27±0.10       | 0.3+0.1/-0.2    |                |                |                |                 |                 |                               |
| Part No. | Dimensions (mm) |                 |                |                |                |                 |                 | Mass (Weight)<br>(g/1000 pcs) |
|          | L               | W               | T              | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub>  | B <sub>1</sub>  |                               |
| EXBQ     | 3.8±0.2         | 1.6±0.2         | 0.45±0.10      | 0.3±0.1        | 0.2±0.1        | 0.15+0.15/-0.05 | 0.15+0.15/-0.05 | 9                             |
|          | B <sub>2</sub>  | A <sub>4</sub>  | B <sub>3</sub> | P              |                |                 |                 |                               |
|          | 0.25±0.15       | 0.15+0.20/-0.05 | 0.30±0.15      | 0.5±0.1        |                |                 |                 |                               |

## Performance

| Test Item                    | Performance Requirements $\Delta R$ | 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 (30 min.) / +125 °C (30 min.), 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

**Series: EXB 14AT, 24AT**



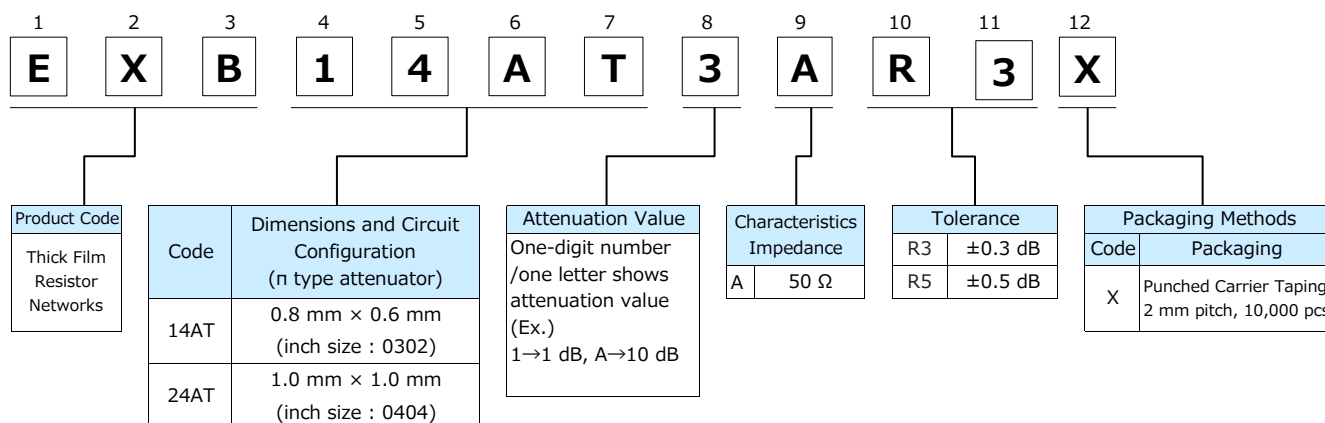
## Features

- Unbalanced n type attenuator circuit in one chip  
EXB14AT(0.8 mm×0.6 mm) , EXB24AT(1.0 mm×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



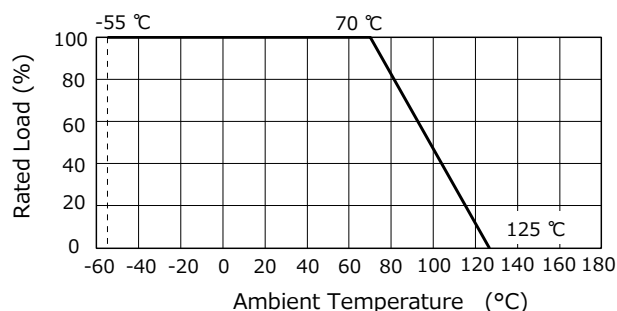
## Ratings

| 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, 5dB : ±0.3 dB<br>6 dB, 10 dB : ±0.5 dB |
| Characteristic Impedance           | 50 Ω                                                           |
| Power Rating at 70 °C              | 0.04 W/ package                                                |
| Frequency Range                    | 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                                              |

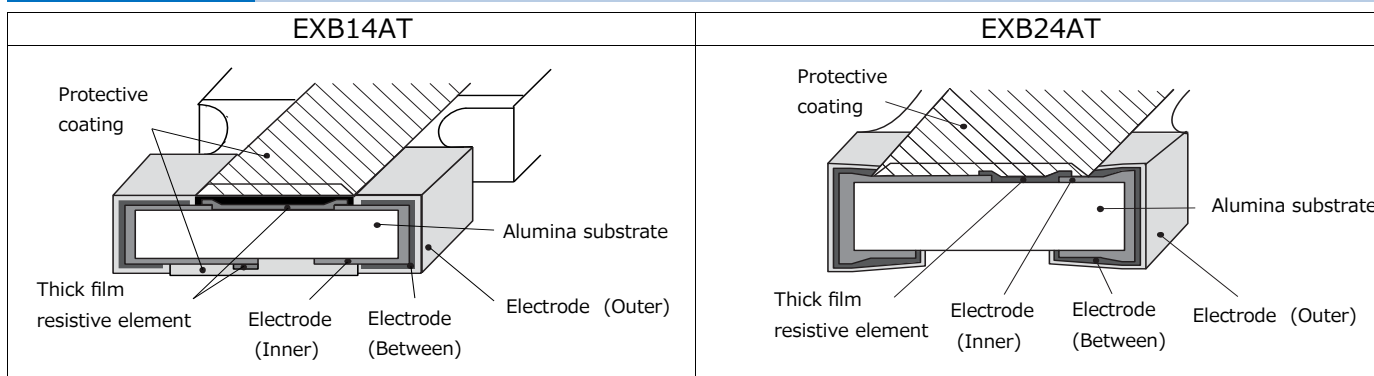
\* Please inquire about the other Attenuator value

## Power Derating Curve

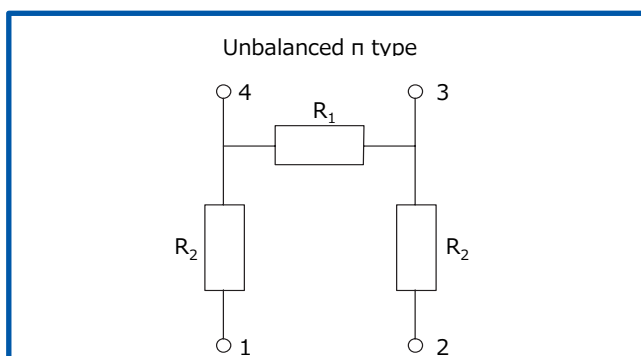
For resistors operated in ambient temperatures above 70 °C, power rating shall be derated in accordance with the figure on the right.



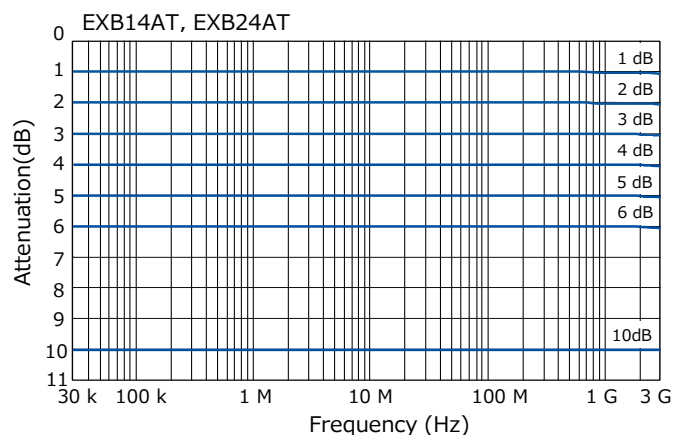
## Construction



## Circuit Configuration

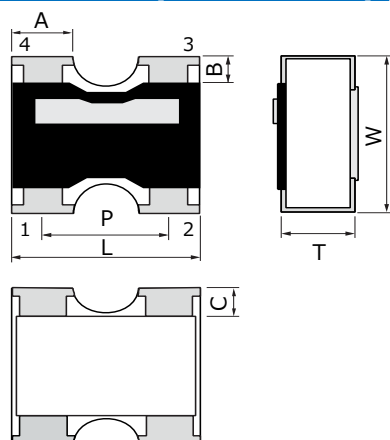


## Attenuation-Frequency Characteristics

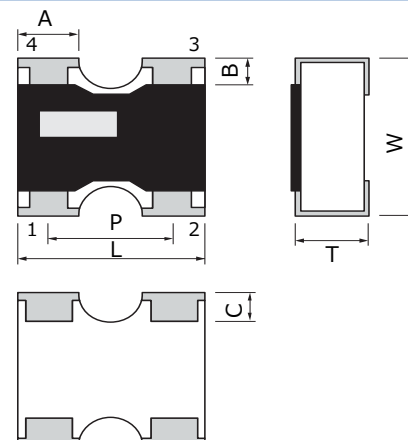


## Dimensions in mm (not to scale)

EXB14AT



EXB24AT



### < Marking Configuration >

The bar marking for recognizing terminal direction is located on the side of terminal 3, 4.

### < Marking Configuration >

The bar marking for recognizing terminal direction is located on the side of terminal 4.

| Part No. | Dimensions (mm) |           |           |           |           |           |                  | Mass (Weight)<br>(g/1000 pcs) |
|----------|-----------------|-----------|-----------|-----------|-----------|-----------|------------------|-------------------------------|
|          | L               | W         | T         | A         | B         | C         | P(typical value) |                               |
| EXB14AT  | 0.80±0.10       | 0.60±0.10 | 0.35±0.10 | 0.35±0.10 | 0.15±0.10 | 0.15±0.10 | 0.50             | 0.7                           |
| EXB24AT  | 1.00±0.10       | 1.00±0.10 | 0.35±0.10 | 0.40±0.10 | 0.15±0.10 | 0.25±0.10 | 0.65             | 1.1                           |

| 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 *                                 | —                                   | —                                   | 40,000 **                            |
|                                                              | 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 *                                 | —                                   | —                                   | 40,000 **                            |
|                                                              | 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 | ERA1A                      | 0603(0201)     | 15,000                                   | —                                   | —                                   | —                                    |
|                                                              | ERA2A/2V                   | 1005(0402)     | —                                        | 10,000                              | —                                   | —                                    |
|                                                              | ERA3A/3V/3K                | 1608(0603)     | —                                        | —                                   | 5,000                               | —                                    |
|                                                              | ERA6A/6V/6K                | 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                | 2012(0805)     | —                                        | —                                   | 5,000                               | —                                    |
|                                                              | ERJ6D/6R/L06               | —              | —                                        | —                                   | —                                   | —                                    |
|                                                              | 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                                |
| Current Sensing Resistors, Metal Plate Type                  | ERJ1LW                     | 6432(2512)     | —                                        | —                                   | —                                   | 3,000                                |
|                                                              | ERJMS4                     | 6432(2512)     | —                                        | —                                   | —                                   | 2,000                                |
| High Power Chip Resistors/Wide Terminal Type                 | ERJMB1                     | 2550(1020)     | —                                        | —                                   | —                                   | 3,000                                |
|                                                              | ERJA1                      | 3264(1225)     | —                                        | —                                   | —                                   | 4,000                                |
|                                                              | ERJB1/ERJC1 <sup>(1)</sup> | 2550(1020)     | —                                        | —                                   | —                                   | 5,000                                |
|                                                              | ERJD1 <sup>(2)</sup>       | —              | —                                        | —                                   | —                                   | —                                    |
|                                                              | ERJB2/ERJD2 <sup>(2)</sup> | 1632(0612)     | —                                        | —                                   | 5,000                               | —                                    |
|                                                              | ERJB3                      | 1220(0508)     | —                                        | —                                   | 5,000                               | —                                    |

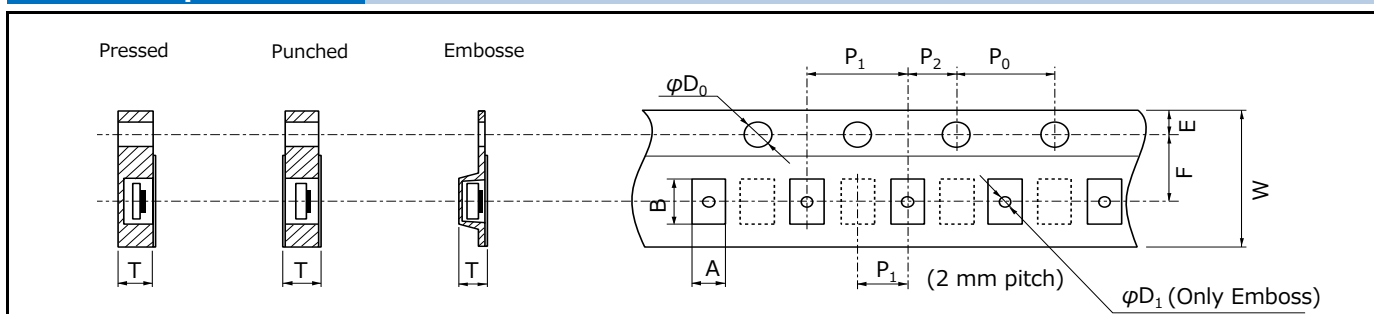
\*W8P2 : Width 8 mm, Pitch 2 mm, \*\* W4P1 : Width 4 mm, Pitch 1 mm

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

(2) Low TCR 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 Precision Thick Film Chip Resistors                    | ERJPB3     | 1608(0603)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJPB6     | 2012(0805)     | —                                        | —                                    | 5,000                                | —                                     |
| Anti-Surge Thick Film Chip Resistors                        | ERJPA2     | 1005(0402)     | —                                        | 10,000                               | —                                    | —                                     |
|                                                             | ERJP03/PA3 | 1608(0603)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJP06     | 2012(0805)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJP08     | 3216(1206)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJP14     | 3225(1210)     | —                                        | —                                    | —                                    | 5,000                                 |
| Anti-Pulse Thick Film Chip Resistors                        | ERJT06     | 2012(0805)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJT08     | 3216(1206)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJT14     | 3225(1210)     | —                                        | —                                    | —                                    | 5,000                                 |
| Anti-Sulfurated Thick Film Chip Resistors                   | ERJU0X     | 0402(01005)    | 20,000                                   | —                                    | —                                    | —                                     |
|                                                             | ERJU01     | 0603(0201)     | 15,000                                   | —                                    | —                                    | —                                     |
|                                                             | ERJS02/U02 | 1005(0402)     | —                                        | 10,000                               | —                                    | —                                     |
|                                                             | ERJS03/U03 | 1608(0603)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJS06/U06 | 2012(0805)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJU6S/U6Q | 3216(1206)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJS08/U08 | 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                                 |
| Anti-Sulfurated Thick Film Chip Resistors / Precision Type  | ERJU2R     | 1005(0402)     | —                                        | 10,000                               | —                                    | —                                     |
|                                                             | ERJU3R     | 1608(0603)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJU6R     | 2012(0805)     | —                                        | —                                    | 5,000                                | —                                     |
| Anti-Sulfurated Thick Film Chip Resistors / Anti-Surge Type | ERJUP3     | 1608(0603)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJUP6     | 2012(0805)     | —                                        | —                                    | 5,000                                | —                                     |
|                                                             | ERJUP8     | 3216(1206)     | —                                        | —                                    | 5,000                                | —                                     |
| 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                               | —                                    | —                                     |

## Carrier Tape



### Pressed Carrier Taping (2 mm Pitch)

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

| Part No.                            | Size mm (inch) | A                      | B                      | W         | F         | E         | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φ D <sub>0</sub> | T                      |
|-------------------------------------|----------------|------------------------|------------------------|-----------|-----------|-----------|----------------|----------------|----------------|------------------|------------------------|
| ERJXGN<br>ERJUOX                    | 0402           | 0.24±0.03              | 0.45±0.03              | 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<br>+0.10/0  | 0.31±0.05              |
| ERJ1GN<br>ERJ1R□<br>ERJU01<br>ERA1A | 0603           | 0.38±0.05              | 0.68±0.05              |           |           |           |                |                |                |                  | 0.42±0.05              |
| ERJ2LW<br>ERJ2BW                    | 1005           | 0.68±0.10<br>0.67±0.10 | 1.20±0.10<br>1.17±0.10 |           |           |           |                |                |                |                  | 0.60±0.05<br>0.61±0.05 |

### 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> | φ D <sub>0</sub> | T         |
|----------------------------------------------|----------------|-----------|-----------|-----------|-----------|-----------|----------------|----------------|----------------|------------------|-----------|
| ERJ2□<br>ERJPA2<br>ERJ□□2<br>ERJ□2□<br>ERA2□ | 1005           | 0.67±0.05 | 1.17±0.05 | 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<br>+0.10/0  | 0.52±0.05 |

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

| Part No.                    | Size mm (inch) | A                   | B                   | W         | F         | E         | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φ D <sub>0</sub> | T         |
|-----------------------------|----------------|---------------------|---------------------|-----------|-----------|-----------|----------------|----------------|----------------|------------------|-----------|
| EXB14V<br>EXB14AT           | 0806           | 0.70<br>+0.10/-0.05 | 0.95<br>+0.05/-0.10 | 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<br>+0.10/0  | 0.52±0.05 |
| EXB18V                      | 1406           | 1.20±0.10           | 1.60±0.10           |           |           |           |                |                |                |                  |           |
| EXB24V<br>EXBU24<br>EXB24AT | 1010           |                     | 1.20±0.10           |           |           |           |                |                |                |                  |           |
| EXB28V<br>EXBU28<br>EXBN8V  | 2010           |                     | 2.20±0.10           |           |           |           |                |                |                |                  |           |

### 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-Sulfurated ( Unit : mm) |                |           |           |           |           |           |                |                |                |                  |           |           |           |           |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|-----------|-----------|-----------|-----------|----------------|----------------|----------------|------------------|-----------|-----------|-----------|-----------|--|--|
| Part No.                                                                                                                                                              | Size mm (inch) | A         | B         | W         | F         | E         | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φ D <sub>0</sub> | T         |           |           |           |  |  |
| ERJ3□<br>ERJ3LW(10mΩ)<br>ERJ3BW<br>ERJ□□3<br>ERJ□ 3 □<br>ERA3□<br>ERJ3LW(5mΩ)                                                                                         | 1608           | 1.10±0.10 | 1.90±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10      | 2.00±0.05      | 4.00±0.10      | 1.50<br>+0.10/0  | 0.70±0.05 |           |           |           |  |  |
| ERJ6□<br>ERJ□□6<br>ERJ□6□<br>ERA6□                                                                                                                                    | 2012           | 1.65±0.15 | 2.50±0.20 |           |           |           |                |                |                |                  | 0.84±0.05 |           |           |           |  |  |
| ERJB3<br>ERJ6BW<br>ERJ6LW<br>ERJ6C                                                                                                                                    | 1220           | 1.55±0.15 | 2.30±0.20 |           |           |           |                |                |                |                  | 0.94±0.05 |           |           |           |  |  |
| ERJ8□<br>ERJ8□W<br>ERJ□□8<br>ERA8□<br>ERJB2<br>ERJD2                                                                                                                  | 3216           |           |           |           |           |           |                |                |                |                  |           | 2.00±0.15 | 3.60±0.20 | 0.84±0.05 |  |  |
|                                                                                                                                                                       | 1632           |           |           |           |           |           |                |                |                |                  |           |           |           |           |  |  |

● 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> | φ D <sub>0</sub> | T         |
|----------|----------------|-----------|-----------|-----------|-----------|-----------|----------------|----------------|----------------|------------------|-----------|
| EXB34V   | 1616           | 1.95±0.15 | 1.95±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10      | 2.00±0.05      | 4.00±0.10      | 1.50<br>+0.10/0  | 0.70±0.05 |
| EXBU34   |                |           |           |           |           |           |                |                |                |                  |           |
| EXB38V   | 3216           |           | 3.60±0.20 |           |           |           |                |                |                |                  |           |
| EXBU38   |                |           |           |           |           |           |                |                |                |                  |           |
| EXB2HV   | 3816           |           | 4.10±0.15 |           |           |           |                |                |                |                  |           |
| EXBU2H   |                |           |           |           |           |           |                |                |                |                  |           |
| EXBV4V   | 1616           | 2.00±0.20 | 1.95±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10      | 2.00±0.05      | 4.00±0.10      | 1.50<br>+0.10/0  | 0.84±0.05 |
| EXBV8V   | 3216           |           | 3.60±0.20 |           |           |           |                |                |                |                  |           |
| EXBD     | 3216           |           | 3.60±0.20 |           |           |           |                |                |                |                  | 0.84±0.10 |
| EXBQ     | 3816           |           | 4.10±0.20 |           |           |           |                |                |                |                  | 0.64±0.05 |

**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> | φ D <sub>0</sub> | T        |
|----------|----------------|-----------|-----------|-----------|-----------|-----------|----------------|----------------|----------------|------------------|----------|
| ERJXGN   | 0402           | 0.25±0.05 | 0.45±0.05 | 4.00±0.20 | 1.80±0.05 | 0.90±0.10 | 1.00±0.10      | 1.00±0.10      | 2.00±0.10      | 0.80±0.10        | 0.5 max. |

**Embossed Carrier Taping (4 mm Pitch)**

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

(Unit : mm)

| (Unit : mm)                |                |           |           |                |           |               |                |                |                |                  |           |                  |           |
|----------------------------|----------------|-----------|-----------|----------------|-----------|---------------|----------------|----------------|----------------|------------------|-----------|------------------|-----------|
| Part No.                   | Size mm (inch) | A         | B         | W              | F         | E             | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φ D <sub>0</sub> | T         | φ D <sub>1</sub> |           |
| ERJ14□<br>ERJ□14           | 3225           | 2.80±0.20 | 3.50±0.20 | 8.00±0.30      | 3.50±0.05 | 1.75<br>±0.10 | 4.00<br>±0.10  | 2.00<br>±0.05  | 4.00<br>±0.10  | 1.50<br>+0.10/0  | 1.00±0.10 | 1.00<br>+0.10/0  |           |
| ERJ12□<br>ERJ□12           | 4532           | 3.50±0.20 | 4.80±0.20 | 12.00<br>±0.30 | 5.50±0.20 |               |                |                |                |                  |           | 15 min.          |           |
| ERJ12Z<br>ERJ12S<br>ERJ□1D | 5025           | 2.80±0.20 | 5.30±0.20 |                |           |               |                |                |                |                  |           |                  |           |
| ERJB1<br>ERJC1<br>ERJD1    | 2550           |           |           |                |           |               |                |                |                |                  |           |                  |           |
| ERJ1T□<br>ERJ□1T<br>ERJL1W | 6432           |           |           |                |           |               |                |                |                |                  |           |                  | 3.60±0.20 |
| ERJA1                      | 3264           | 3.50±0.20 | 6.80±0.20 |                |           |               |                |                |                |                  |           |                  | 1.10±0.20 |

● Current Sensing Resistors, Metal Plate Type

(Unit : mm)

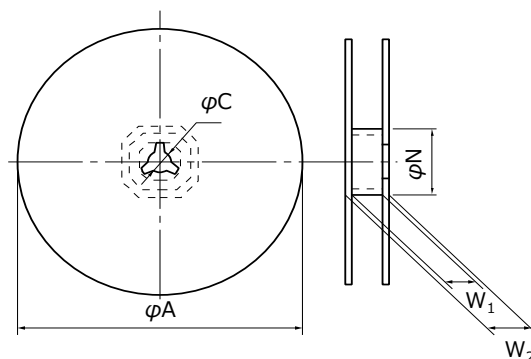
| Part No. | Size mm (inch) | A         | B         | W              | F         | E             | P <sub>1</sub> | P <sub>2</sub> | P <sub>0</sub> | φ D <sub>0</sub> | T         | φ D <sub>1</sub> |
|----------|----------------|-----------|-----------|----------------|-----------|---------------|----------------|----------------|----------------|------------------|-----------|------------------|
| ERJMB1   | 2550           | 2.90±0.20 | 5.40±0.20 | 12.00<br>±0.30 | 5.50±0.10 | 1.75<br>±0.10 | 4.00<br>±0.10  | 2.00<br>±0.05  | 4.00<br>±0.10  | 1.50<br>+0.10/0  | 1.55±0.20 | —                |
| ERJMS4   | 6432           | 3.50±0.20 | 6.90±0.20 | 12.00<br>±0.30 | 5.50±0.10 |               |                |                |                |                  | 1.60±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> | φ D <sub>0</sub> | T         | φ D <sub>1</sub> |
|----------|----------------|-----------|-----------|----------------|-----------|---------------|----------------|----------------|----------------|------------------|-----------|------------------|
| EXBS8V   | 5022           | 2.80±0.20 | 5.70±0.20 | 12.00<br>±0.30 | 5.50±0.20 | 1.75<br>±0.10 | 4.00<br>±0.10  | 2.00<br>±0.05  | 4.00<br>±0.10  | 1.50<br>+0.10/0  | 1.6 max.  | 1.5 min.         |
| EXBE     | 4021           | 2.50±0.20 | 4.40±0.20 |                |           |               |                |                |                |                  |           |                  |
| EXBA     | 6431           | 3.50±0.20 | 6.80±0.20 |                |           |               |                |                |                |                  | 1.10±0.20 |                  |

## Taping Reel

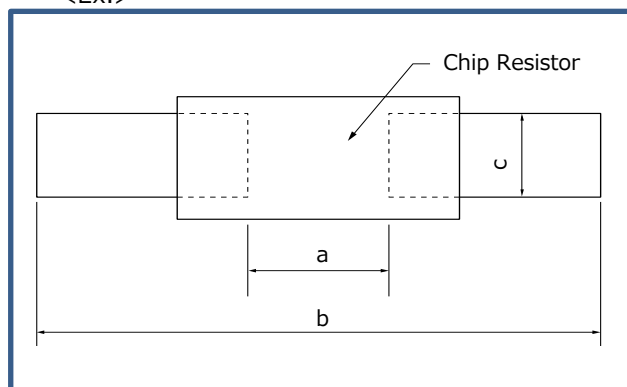


| Tape width(W) | Dimensions (mm) |             |             |                |                |
|---------------|-----------------|-------------|-------------|----------------|----------------|
|               | $\varphi$ A     | $\varphi$ N | $\varphi$ C | W <sub>1</sub> | W <sub>2</sub> |
| 4 mm width    | 180.0±3.0       | 60.0+1.0/0  | 13.0±0.2    | 4.5±0.5        | 7.0±0.5        |
| 8 mm width    | 180.0 0/-1.5    |             |             | 9.0+1.0/0      | 11.4±1.0       |
| 12 mm width   |                 |             |             | 13.0+1.0/0     | 15.4±1.0       |
| 24 mm width   | 380.0±2.0       | 80.0±1.0    |             | 25.4±1.0       | 29.4±1.0       |

## Recommended Land Pattern

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

<Ex.>



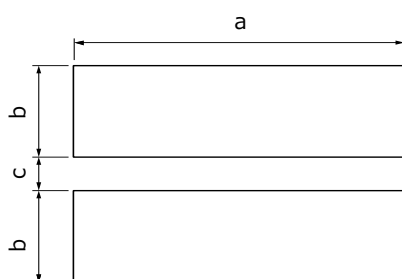
| Size<br>mm/inch | Dimensions(mm) |            |              |
|-----------------|----------------|------------|--------------|
|                 | a              | b          | c            |
| 0402/01005      | 0.15 to 0.20   | 0.5 to 0.7 | 0.20 to 0.25 |
| 0603/0201       | 0.3 to 0.4     | 0.8 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

High power (double-sided resistive elements structure) type

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

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



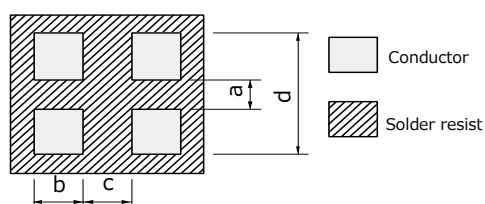
| Part No.             | Dimensions(mm) |      |      |
|----------------------|----------------|------|------|
|                      | a              | b    | c    |
| ERJA1                | 6.4            | 1.70 | 0.60 |
| ERJB1                | 5.0            | 1.30 | 0.75 |
| ERJC1 <sup>(1)</sup>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

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

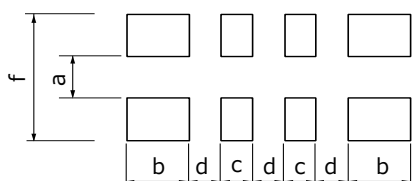
(2) Low TCR High Power Chip Resistors/Wide Terminal Type

## Recommended Land Pattern

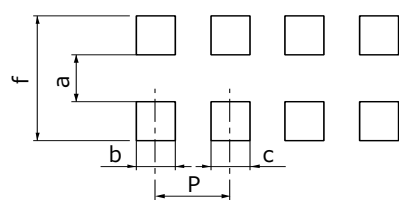
- An example of a land pattern for Chip Resistor Array, Anti-Sulfurated Chip Resistor Array and Chip Attenuator is shown below.



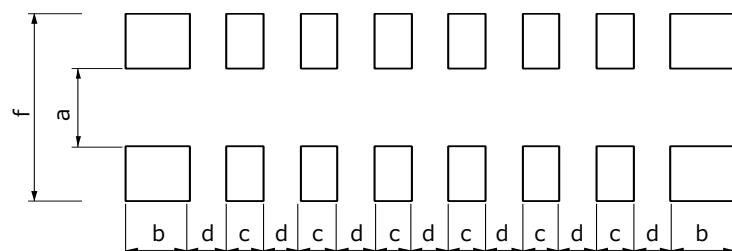
| Part No.                   | Dimensions(mm) |              |      |              |
|----------------------------|----------------|--------------|------|--------------|
|                            | a              | b            | c    | d            |
| EXB14V<br>EXB14A           | 0.30           | 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    | 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            | 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<br>EXBV8V                     | 0.7 to 0.9     | 0.4 to 0.45  | 0.4 to 0.45  | 2 to 2.4     | 0.80 |
| EXB34V<br>EXB38V<br>EXBU34<br>EXBU38 | 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    |
| EXB2HV<br>EXBU2H | 1.00           | 0.425 | 0.25 | 0.25 | 2.00 |

## Recommended Land Pattern

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

|                           | EXBA                                                                                                                                                               | EXBE                                  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| For popular pattern       | <p>Pitch 1.27 mm</p>                                                                                                                                               | <p>Pitch 0.8 mm</p>                   |
| For high density pattern* | <p>Pitch 0.635 mm Through-hole less</p> <div style="display: flex; justify-content: space-around;"> <div> <p>EXBA10P</p> </div> <div> <p>EXBA10E</p> </div> </div> | <p>Pitch 0.8 mm Through-hole less</p> |
|                           | EXBD                                                                                                                                                               | EXBQ                                  |
| For popular pattern       | <p>Pitch 0.635 mm</p>                                                                                                                                              | <p>Pitch 0.5 mm</p>                   |

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

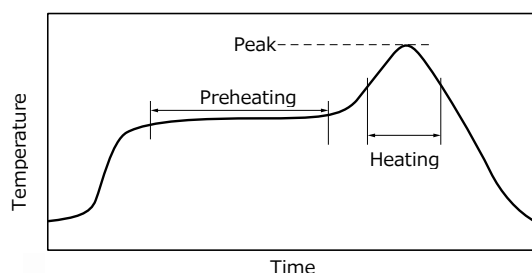
## Recommended Soldering Conditions

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     |

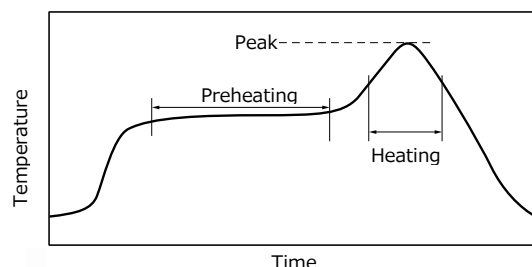
#### ● Recommended soldering conditions for flow

|            | For soldering    |               | For lead-free soldering |               |
|------------|------------------|---------------|-------------------------|---------------|
|            | Temperature      | Time          | Temperature             | Time          |
| Preheating | 140 °C to 160 °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 %                           | $\sqrt[6]{10}=1.46$  | Please refer to standard resistance values shown on this catalog. |
| E12    | ±10 %                           | $\sqrt[12]{10}=1.21$ |                                                                   |
| E24    | ± 5 %                           | $\sqrt[24]{10}=1.10$ |                                                                   |
| E48    | ± 2 %                           | $\sqrt[48]{10}=1.05$ |                                                                   |
| E96    | ± 1 %                           | $\sqrt[96]{10}=1.02$ |                                                                   |

## 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 Ω.

The examples of a three digit number

| Resistance Code | Value in ohms (Ω) |
|-----------------|-------------------|
| 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 (Ω) |
|-----------------|-------------------|
| R562            | 0.562             |
| 5R62            | 5.62              |
| 56R2            | 56.2              |
| 1000            | 100               |
| 2711            | 2.71 k            |
| 1002            | 10 k              |
| 2713            | 271 k             |
| 1004            | 1 M               |
| 2751            | 2.71 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 Ω±0.05 % |
| B              | ±0.1          | B1001 : 1000 Ω±0.1 %  |
| C              | ±0.25         | C1001 : 1000 Ω±0.25 % |
| D              | ±0.5          | D1001 : 1000 Ω±0.5 %  |
| F              | ±1            | F1001 : 1000 Ω±1 %    |
| G              | ±2            | G1001 : 1000 Ω±2 %    |
| J              | ±5            | J101 : 100 Ω±5 %      |
| K              | ±10           | K101 : 100 Ω±10 %     |
| M              | ±20           | M101 : 100 Ω±20 %     |

## Standard Resistance Values

| E6 | E12 | E24 | E48 | E96 | E6 | E12 | E24 | E48 | E96 | E6 | E12 | E24 | E48 | E96 |
|----|-----|-----|-----|-----|----|-----|-----|-----|-----|----|-----|-----|-----|-----|
| 10 | 10  | 10  | 100 | 100 | 22 | 22  | 22  | 215 | 215 | 47 | 47  | 47  | 464 | 464 |
|    |     |     |     | 102 |    |     |     |     | 221 |    |     |     |     | 475 |
|    |     |     | 105 | 105 |    |     |     | 226 | 226 |    |     |     | 487 | 487 |
|    |     |     |     | 107 |    |     |     |     | 232 |    |     |     |     | 499 |
|    |     | 11  | 110 | 110 |    |     |     | 237 | 237 |    |     | 51  | 511 | 511 |
|    |     |     |     | 113 |    |     |     |     | 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 |
|    |     |     |     | 130 |    |     |     |     | 280 |    |     |     |     | 604 |
|    |     | 13  | 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  | 681 | 681 |
|    |     |     |     | 150 |    |     |     |     | 324 |    |     |     |     | 698 |
| 15 | 15  | 15  | 154 | 154 | 33 | 33  | 33  | 332 | 332 |    |     |     | 715 | 715 |
|    |     |     |     | 158 |    |     |     |     | 340 |    |     |     |     | 732 |
|    |     |     | 162 | 162 |    |     |     | 348 | 348 |    |     | 75  | 750 | 750 |
|    |     |     |     | 165 |    |     |     |     | 357 |    |     |     |     | 768 |
|    |     | 16  | 169 | 169 |    |     | 36  | 365 | 365 |    |     |     | 787 | 787 |
|    |     |     |     | 174 |    |     |     |     | 374 |    |     |     |     | 806 |
|    |     |     | 178 | 178 |    |     |     | 383 | 383 |    | 82  | 82  | 825 | 825 |
|    |     |     |     | 182 |    |     |     |     | 392 |    |     |     |     | 845 |
|    |     | 18  | 187 | 187 |    |     | 39  | 402 | 402 |    |     |     | 866 | 866 |
|    |     |     |     | 191 |    |     |     |     | 412 |    |     |     |     | 887 |
|    |     |     | 196 | 196 |    |     |     | 422 | 422 |    |     | 91  | 909 | 909 |
|    |     |     |     | 200 |    |     |     |     | 432 |    |     |     |     | 931 |
|    | 20  | 205 | 205 | 205 |    |     | 43  | 442 | 442 |    |     |     | 953 | 953 |
|    |     |     |     | 210 |    |     |     |     | 453 |    |     |     |     | 976 |

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