High performance chip resistor

Small size & High power type
High precision type
Current sensing type
Anti-Sulfurated series
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.

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The switchover date for compliance with the RoHS Directive/REACH Regulations varies depending on the part number or series of our products.

If you are not sure whether it applies to RoHS/REACH directive or not when using stock items, please do not hesitate to contact our sales representative.

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.
Panasonic has produced resistors for more than 85 years. Based on the concept, "Good products begin with Good components." by our founder Konosuke Matsushita, Panasonic started manufacturing fixed carbon film resistors for radio receivers in 1933 and reached the milestone of accumulative 2 trillion pieces production by 2013.

By lining up with this number of resistors, standard 1608 mm size, we can make a round trip to the moon (244,198 miles).
Chip resistors

- Thin film type
- Thick film type
- Metal plate type

- Thin film chip resistors, High reliability type / Anti-Surge type
- Metal plate chip resistors

- Standard
- High performance
- Resistor network

※ Products listed in this catalog

- Small size & High power
  - Anti-Surge type
  - Wide terminal type

- High precision
  - High precision thick film type

- Current sensing
  - Low TCR high power / wide terminal type
  - Double-sided resistive elements structure type

- Anti-Sulfurated
  - Normal
  - Array
  - Low resistance
  - Small size & High power
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- ERJB series
  Wide terminal type

High precision
- ERJPB series
  High precision thick film type

Current sensing
- ERJD series
  Low TCR high power / wide terminal type
- ERJ*BW series
  Double-sided resistive elements structure type

Anti-Sulfurated series
- Normal: ERJS/U series
- Array: EXBU series
- Low resistance: ERJU*S/Q series
  Small size & High power: ERJC/ERJUP series

Characteristics of Panasonic thick film chip resistors (Anti-Solder joint crack)

Main locations

[Description of the icon]
- Reducing size with same power rating
- Improving durability for overloading
- Reaching same total tolerance level as thin film
- Reducing anti-solder joint crack in heat cycle environment
- Reaching higher power rating with same size
- Reducing variation of resistance value under temperature variation
- Reducing variation of resistance value under sulfur environment
- Conforming AEC-Q200 Grade 0
Small size & High power Anti-Surge type

ERJPA/P0 series

Improvement of High power & Anti-Surge rating

Number of pieces reduction
1. Down sizing
2. Weight saving
3. Cost saving

High Anti-Surge performance
1. Failure reduction
2. Design margin securing

Surge distribution by unique resistive material / trimming

Point

Unique “Double-C shaped trimming” for surge distribution.
Achieved small size & high power and overload characteristics.

Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (mm)</th>
<th>Power rating (W)</th>
<th>Limiting element voltage (V.DC)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (±x10^-6/ ℃)</th>
<th>Category temp. range (℃)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJPA2</td>
<td>1005</td>
<td>0.20</td>
<td>50</td>
<td>± 0.5, ± 1</td>
<td>10 to 1 M</td>
<td>± 100</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJPA3  (51)</td>
<td>1608</td>
<td>0.25</td>
<td>150</td>
<td>± 0.5, ± 1</td>
<td>10 to 1 M</td>
<td>± 100</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJP06</td>
<td>2012</td>
<td>0.50</td>
<td>400</td>
<td>± 0.5, ± 1</td>
<td>10 to 1 M</td>
<td>± 100</td>
<td>-55 to 155</td>
</tr>
</tbody>
</table>

※1: Power rating up to 105 ℃

Please visit our website for details!
**Small size & High power**
**Wide terminal type**

**ERJB series**

**Improvement of High power & Anti-Surge rating**

- Separated resistive elements for surge distribution.
- Achieved small size & high power and overload characteristics.

### Number of pieces reduction

1. Down sizing
2. Weight saving
3. Cost saving

### High Anti-Surge performance

1. Failure reduction
2. Design margin securing

### Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (mm)</th>
<th>Power rating (W)</th>
<th>Limiting element voltage (V.DC)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10^-6/°C)</th>
<th>Category temp. range (°C)</th>
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</thead>
<tbody>
<tr>
<td>ERJB1</td>
<td>2550</td>
<td>2.0 (2W)</td>
<td>200</td>
<td>± 1</td>
<td>10 m to 10 k</td>
<td>± 350</td>
<td>-55 to 155</td>
</tr>
<tr>
<td></td>
<td>2550</td>
<td>2.0 (2W)</td>
<td>200</td>
<td>± 1</td>
<td>10 m to 10 k</td>
<td>± 350</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJB2</td>
<td>1632</td>
<td>1.0 (3W)</td>
<td>200</td>
<td>± 1</td>
<td>10 m to 10 M</td>
<td>± 350</td>
<td>-55 to 155</td>
</tr>
<tr>
<td></td>
<td>1632</td>
<td>1.0 (3W)</td>
<td>200</td>
<td>± 1</td>
<td>10 m to 10 M</td>
<td>± 350</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJB3</td>
<td>1220</td>
<td>0.33</td>
<td>150</td>
<td>± 1</td>
<td>20 m to 10</td>
<td>± 350</td>
<td>-55 to 155</td>
</tr>
<tr>
<td></td>
<td>1220</td>
<td>0.33</td>
<td>150</td>
<td>± 1</td>
<td>20 m to 10</td>
<td>± 350</td>
<td>-55 to 155</td>
</tr>
</tbody>
</table>

※1: Power rating up to 105 °C
※2: Resistance value 10.2 Ω or more, Power rating 1.0 W
※3: Resistance value 10.2 Ω or more, Power rating 0.75 W

Please visit our website for details!
## Down sizing proposal

By the replacement with high power resistors from standard resistors, “Panasonic contributes to make PCB smaller.”

<table>
<thead>
<tr>
<th>Size (mm)</th>
<th>1005</th>
<th>1608</th>
<th>2012</th>
<th>3216 (Wide terminal)</th>
<th>3225</th>
<th>5025 (Wide terminal)</th>
<th>6432</th>
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</thead>
<tbody>
<tr>
<td>Power (W)</td>
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<tr>
<td>2.0</td>
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<td></td>
</tr>
<tr>
<td>1.0</td>
<td>ERJB1</td>
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<td></td>
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<tr>
<td>0.75</td>
<td>ERJB2</td>
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<td></td>
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<td>0.5</td>
<td></td>
<td>ERJP06</td>
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<tr>
<td>0.25</td>
<td>ERJPA3</td>
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<td></td>
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<tr>
<td>0.2</td>
<td>ERJPA2</td>
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<td>0.125</td>
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</tbody>
</table>

※ “ ” means down sizing rate(%) of PCB.
ERJPB series

Same tolerance level as thin film by thick film

- Resistance tolerance ± 0.1%
- TCR ± 50 ppm/K
- Endurance test tolerance ± 0.5%

Cut the total tolerance to 1/5

1. Design margin securing
2. Improvement of reliability
3. Cost saving for IC by reducing correction circuit

Achieved high precision resistance tolerance: ±0.1%
by unique resistive material and trimming

By unique “Double L-shaped trimming” process, we can make slight adjustments of resistance value.
(2nd small L-shaped trimming has low adjustment rate)

Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (mm)</th>
<th>Power rating (W)</th>
<th>Limiting element voltage (V DC)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10⁶ / °C)</th>
<th>Category temp. range (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJPB3B</td>
<td>1608</td>
<td>0.20</td>
<td>150</td>
<td>± 0.1, ± 0.5</td>
<td>200 to 100 k</td>
<td>± 50</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJPB6B</td>
<td>2012</td>
<td>0.25</td>
<td>150</td>
<td>± 0.1, ± 0.5</td>
<td>200 to 1M</td>
<td>± 50</td>
<td>-55 to 155</td>
</tr>
</tbody>
</table>
Achieved low-resistance/low-TCR by thick film ~ VA proposal for metal shunt resistors ~

Achieved same level performance as metal shunt resistor

1. Design margin securing
2. Improvement of reliability
3. Cost saving

Achieved low resistance TCR by unique resistive material

Reducing resistance value on the electrode

- Reducing low resistance TCR by applying Pd-Ag resistive element on the high resistance value, CuNi resistive material on the low.
- Achieved low TCR as same level as metal shunt resistors at more than 10Ω.

Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (mm)</th>
<th>Power rating (W)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10^−6/ ℃)</th>
<th>Category temp. range (℃)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJD1</td>
<td>2550</td>
<td>2.0</td>
<td>± 1, ± 5</td>
<td>10 mΩ to 200 m</td>
<td>± 100</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJD2</td>
<td>1632</td>
<td>1.0</td>
<td>± 1, ± 5</td>
<td>10 mΩ to 200 m</td>
<td>± 100</td>
<td></td>
</tr>
</tbody>
</table>

Please visit our website for details!
ERJ*BW series

Small case size, low resistance, and high power by double-sided resistive elements structure

1. Down sizing  2. Weight saving  3. Cost saving

PCB area reduction

1. Down sizing  2. Weight saving  3. Cost saving

Realized small current sensing resistors by double-sided resistive elements structure

Double-sided resistive elements structure

- By original double sided resistive trimming “The front and back symmetrical double L-shaped trimming” process, load concentration can be avoided.
- Achieved small size & high power and overload characteristics.

Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (mm)</th>
<th>Power rating (W)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10⁻⁶ / ℃)</th>
<th>Category temp. range (℃)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJ2JB</td>
<td>1005</td>
<td>0.25</td>
<td>± 1, ± 2, ± 5</td>
<td>47 m to 100 m</td>
<td>± 300</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJ3BW</td>
<td>1608</td>
<td>0.33</td>
<td>± 1, ± 2, ± 5</td>
<td>20 m to 200 m</td>
<td>20mΩ≤R&lt;39mΩ : ± 250</td>
<td></td>
</tr>
<tr>
<td>ERJ6BW</td>
<td>2012</td>
<td>0.5</td>
<td>± 1, ± 2, ± 5</td>
<td>10 m to 100 m</td>
<td>10mΩ≤R&lt;15mΩ : ± 300</td>
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</tr>
<tr>
<td>ERJ8BW</td>
<td>3216</td>
<td>1.0</td>
<td>± 1, ± 2, ± 5</td>
<td>10 m to 100 m</td>
<td>10mΩ≤R&lt;20mΩ : ± 200</td>
<td></td>
</tr>
</tbody>
</table>

Please visit our website for details!
Anti-Sulfurated Anti-Sulfurated series

Standard : ERJS/U series
Array*1 : EXBU series

Low resistance : ERJU*S/Q series
Small size & High power : ERJC/ERJUP series

*1 : AEC-Q200 Grade 1

Anti-Sulfurated terminal reduces variation in the resistance value under harsh environment (sulfur)

- Sulfurized oil immersion test of chip resistors

- Sulfurized oil immersion test of Au terminal and high Pd-Ag terminal

With Anti-Sulfurated characteristics,
1. High reliability by reducing sulfurated breakage
2. Improve reliability of device at harsh environment
3. Cost reduction by unnecessary of sealing substrate

Covered with nickel plating layers, there is no anti-sulfurated characteristic difference between Au terminal and Pd-Ag terminal.

While Pd-Ag terminal has some variations in resistance value, Au terminal has very little variations in sulfurized oil immersion test. It shows that Au terminal has higher anti-sulfurated characteristics of terminal itself.
# Anti-Sulfurated series Line-up

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<th>Size (mm) Type</th>
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<th>3216</th>
<th>3225</th>
<th>5025</th>
<th>2550 (Wide terminal)</th>
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<td>Standard</td>
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<td>ERJS02</td>
<td>ERJS03</td>
<td>ERJS06</td>
<td>ERJS08</td>
<td>ERJS14</td>
<td>ERJS1D</td>
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<td>ERJU1D</td>
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<td>ERJUP8</td>
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<tr>
<td>Low resistance (0.1 Ω to 10 Ω)</td>
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<td>Low resistance (10 mΩ to 1 Ω)</td>
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</tbody>
</table>
Anti-Solder joint crack

Reduces solder joint crack progression by own-developed soft terminal

Reduce solder joint crack on the substrate

1. Long life for the set of device
2. Improvement of reliability

Point

Soft termination technology adopted

- Cooling and heating cycle lightens the stress -

Maintain excellent solder connection reliability even in harsh temperature environment such as for automotive.
Main locations

■ Japan bases

- Sales office
- Production base

■ Overseas bases

- Sales office
- Production base
CAUTION AND WARNING

1. The electronic components contained in this catalog are designed and produced for use in home electric appliances, office equipment, information equipment, communications equipment, and other general purpose electronic devices. Before use of any of these components for equipment that requires a high degree of safety, such as medical instruments, aerospace equipment, disaster-prevention equipment, security equipment, vehicles (automobile, train, vessel), please be sure to contact our sales representative corporation.

2. When applying one of these components for equipment requiring a high degree of safety, no matter what sort of application it might be, be sure to install a protective circuit or redundancy arrangement to enhance the safety of your equipment. In addition, please carry out the safety test on your own responsibility.

3. 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.

4. Technical information contained in this catalog is intended to convey examples of typical performances and or applications and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of our company or any third parties nor grant any license under such rights.

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High performance chip resistor

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