High performance chip resistor

- High precision chip resistors
- High temperature chip resistors
- Anti-sulfurated chip resistors
- Current sensing chip resistors
- Small & High power chip resistors
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 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.

- 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.

- 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.

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).

85 years history of Panasonic resistors

- 1933: Started manufacturing resistors
- 1966: Established Fukui Matsushita Electric Company
- 1974: Completed Morita factory
- 2003: Reached total 1 trillion pieces production
- 2013: Reached total 2 trillion pieces production
- 2018: 85th Anniversary of production
## INDEX

### Panasonic chip resistors, product line-up
- P4

### Proper Usage : Thick film & Thin film chip resistors
- P5

#### High precision

<table>
<thead>
<tr>
<th>Type</th>
<th>Series</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin film, High reliability type</td>
<td>ERA*A series</td>
<td>P6</td>
</tr>
<tr>
<td>Thin film, High stability and reliability type</td>
<td>ERA*V/K series</td>
<td>P7</td>
</tr>
<tr>
<td>High precision thick film type</td>
<td>ERJPB series</td>
<td>P9</td>
</tr>
</tbody>
</table>

### Application
- P10

### Characteristics of Panasonic thick film chip resistors (Anti solder joint crack)
- P11

#### Environment resistant

<table>
<thead>
<tr>
<th>Type</th>
<th>Specifications</th>
<th>Series</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>High temperature type</td>
<td>Normal, High precision, Small &amp; high power, Low resistance, Array, Wide terminal</td>
<td>ERJH series</td>
<td>P12</td>
</tr>
<tr>
<td>Anti-sulfurated type</td>
<td>Normal, High precision, Small &amp; high power, Low resistance, Array, Wide terminal</td>
<td>: ERJU series, : ERJC* series</td>
<td>P13</td>
</tr>
</tbody>
</table>

#### Anti-sulfurated series line-up
- P14

<table>
<thead>
<tr>
<th>Type</th>
<th>Specifications</th>
<th>Series</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low TCR high power / wide terminal type</td>
<td>: Reducing variation of resistance value under sulfur environment, : Reducing variation of resistance value under high temperature environment, : Reducing anti solder joint crack in heat cycle environment</td>
<td>ERJD series</td>
<td>P15</td>
</tr>
<tr>
<td>Double-sided resistive element structure type</td>
<td>: Reducing variation of resistance value under temperature variation</td>
<td>ERJ*BW series</td>
<td>P16</td>
</tr>
<tr>
<td>Anti-surge type</td>
<td>: Reducing variation of resistance value under temperature variation.</td>
<td>ERJPA/P series</td>
<td>P17</td>
</tr>
<tr>
<td>Wide terminal type</td>
<td>: Reaching higher power rating with same size.</td>
<td>ERJB series</td>
<td>P18</td>
</tr>
</tbody>
</table>

### Current sensing
- P19

### Down sizing proposal
- P20

### Main locations

### Description of the icon
- Reducing size what same power rating
- Improving durability for overloading
- Significantly reducing total resistance tolerance
- Reducing anti solder joint crack in heat cycle environment
- Reducing variation of resistance value under sulfur environment
- Reducing variation of resistance value under high temperature environment
- Conforming AEC-Q200 grade 0
- ERJPAL2 Grade 1
Panasonic chip resistors, product line-up

**High precision**
- ERA*A series
- ERA*V/K series
- ERA*BW series
- ERJA series
- ERJMB1 series

**Environment resistant**
- ERJU/ERJS series
- ERJU*R series
- ERJH series
- ERJUP series
- ERJP series
- ERJPB series
- ERJUP series
- ERJPA series

**Current sensing**
- Thick film type
- Thin film type
- Metal plate type

**Small & High power**
Proper Usage:
Thick film & Thin film chip resistors

**Tolerance • TCR Matrix**

<table>
<thead>
<tr>
<th>TCR (ppm/℃)</th>
<th>10</th>
<th>15</th>
<th>25</th>
<th>50</th>
<th>100</th>
<th>100 &lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerance (%)</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERA*V/K</td>
<td></td>
<td></td>
<td></td>
<td>Thick film chip area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERA*A</td>
<td></td>
<td></td>
<td></td>
<td>or more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td></td>
<td>ERA*V/K</td>
<td>ERA*A</td>
<td></td>
<td>or more</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td>or more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>or more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>or more</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Our recommended combinations for Tolerance & TCR

**Chip resistors selection guide**

TCR

Less than ±50 ppm/℃

Resistance value tolerance

Less than ±0.1 %

Endurance test tolerance

Less than ±0.5 %

 Thin film chip resistors

TCR

±25 ppm/℃ or more

Anti-ESD

Less than ±25 ppm/℃

High reliability ERA*A P6

Unnecessary

High stability and reliability ERA*V/K P7

Necessary
ERA*A series

Reduce total resistance value by 1/4 from high-precision thick film resistors

- Resistance tolerance ± 0.1%
- TCR ± 25 ppm/°C
- Endurance test tolerance ± 0.1%

Quarter total tolerance from high-precision thick film resistors

1. Suppress deterioration of set's performance and reliability in long-term use and temperature change
2. Save design cost by design margin securing

Point

Achieving high-precision (Endurance test tolerance ±0.1%) by original Ni & Cr & Si - High-precision resistance materials and protecting resistor by Sputter protection film.

Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (inch)</th>
<th>Power rating (W)</th>
<th>Limiting element voltage (V)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10^-6 / °C)</th>
<th>Category temp. range (°C)</th>
<th>AEC-Q200</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERA1AEB</td>
<td>0201</td>
<td>0.05</td>
<td>25</td>
<td>± 0.1</td>
<td>100 to 10 k</td>
<td>± 25</td>
<td>-55 to 155</td>
<td>Grade 1</td>
</tr>
<tr>
<td>ERA2AEB</td>
<td>0402</td>
<td>0.063</td>
<td>50</td>
<td>± 0.1</td>
<td>47 to 100 k</td>
<td>± 25</td>
<td>Grade 0</td>
<td></td>
</tr>
<tr>
<td>ERA3AEB</td>
<td>0603</td>
<td>0.1</td>
<td>75</td>
<td>± 0.1</td>
<td>47 to 330 k</td>
<td>± 25</td>
<td>Grade 0</td>
<td></td>
</tr>
<tr>
<td>ERA6AEB</td>
<td>0805</td>
<td>0.125</td>
<td>100</td>
<td>± 0.1</td>
<td>47 to 1 M</td>
<td>± 25</td>
<td>Grade 0</td>
<td></td>
</tr>
<tr>
<td>ERA8AEB</td>
<td>1206</td>
<td>0.25</td>
<td>150</td>
<td>± 0.1</td>
<td>47 to 1 M</td>
<td>± 25</td>
<td>Grade 0</td>
<td></td>
</tr>
</tbody>
</table>

Visit our website for details!
ERA*V/K series

Achieving higher-precision and longer-life than conventional*1 series

- Resistance tolerance ± 0.05 %
- TCR ± 10 ppm/°C
- Endurance test tolerance ± 0.1 %

Half total tolerance from thin film chip resistors (Conventional series)

1. High-precision, design margin securing and improve performance
2. Improve reliability in severe conditions

High precision
Thin film, High stability and reliability type

Point

Highest level of ESD resistance by preventing current concentration and reducing electric field strength

Anti-ESD

- ESD test (1 kΩ)
  HBM: 150 pF, 2 kV, ±5 times
  0603 Thin film chip resistors

- Anti-ESD improved design
  Resistor film thickness regularization
  Expand resistor pattern length

Conventional*1 A series

Current intense prevention
Regulate resistor film by smoothing surface of alumina substrates and prevent current intensity

Intensity of overcurrent locally → Destory resistor

Expand resistor pattern length

Conventional*1 A series

Electric field strength reduction
Reduce electric potential difference on length wise by expanding resistor pattern length

NewV/K series

No intensity of overcurrent → No destory resistor

*1:ERA*A
### ERA*V/K series

**Point**

Improve anti-sulfurated by the introduction of edge sputtering electrode covering gap between protection film and electrode

#### Anti-sulfurated

- Sulfurization gas test
  - ASTM B809 : 105 ℃ 0603 Thin film chip resistors

![Graph showing resistance fluctuation over time](image)

- Achieve excellent anti solder joint crack by back side resin layer

![Diagram showing stress lightening at solder fillet](image)

#### Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (inch)</th>
<th>Power rating (W)</th>
<th>Limiting element voltage (V)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10^-6 / ℃)</th>
<th>ESD withstand voltage (kV)</th>
<th>Category temp. range (℃)</th>
<th>AEC-Q200</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERA2V</td>
<td>0402</td>
<td>0.100</td>
<td>75</td>
<td>± 0.1 ±0.05</td>
<td>1 k ≤ R ≤ 47 k–1</td>
<td>±10(R)</td>
<td>+25(E)</td>
<td>-55 to 155</td>
<td>Grade 0</td>
</tr>
<tr>
<td>EAK</td>
<td>0603</td>
<td>0.125</td>
<td>100</td>
<td>± 0.1 ±0.05</td>
<td>47 ≤ R ≤ 100 k</td>
<td>+10(R)</td>
<td>+25(P)</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>ERA6V</td>
<td>0805</td>
<td>0.250</td>
<td>150</td>
<td>± 0.1 ±0.05</td>
<td>1 k ≤ R ≤ 100 k</td>
<td>+10(R)</td>
<td>+25(P)</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>EAK</td>
<td>1206</td>
<td>0.250</td>
<td>150</td>
<td>± 0.1 ±0.05</td>
<td>47 ≤ R ≤ 1 M</td>
<td>+10(R)</td>
<td>+25(P)</td>
<td>2.0</td>
<td></td>
</tr>
</tbody>
</table>

*1: Expanded resistance range

Please visit our website for details!
High precision thick film type

ERJPB series

Same tolerance level as thin film

- Resistance tolerance ± 0.1%
- TCR ± 50 ppm/°C
- 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 (inch)</th>
<th>Power rating (W)</th>
<th>Limiting element voltage (V)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10^4/°C)</th>
<th>Category temp. range (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJPB3B</td>
<td>0603</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 〜 155</td>
</tr>
<tr>
<td>ERJPB6B</td>
<td>0805</td>
<td>0.25</td>
<td>150</td>
<td>± 0.1, ± 0.5</td>
<td>200 to 1M</td>
<td>± 50</td>
<td>-55 〜 155</td>
</tr>
</tbody>
</table>
Application

Application Example ①
Current detection amplifier circuit for motor drive control unit

![Circuit diagram for current detection amplifier](image)

Vout = Vs \( \frac{R_2}{R_1} \)

(amplification rate)

\(< \text{Achieve high-precise amplifier ratio}>\)

\(V_0 = V\) \(\frac{R_2}{3R_1 + R_2}\)

(partial pressure ratio)

Application Example ②
Voltage detection circuit for battery unit

![Circuit diagram for voltage detection](image)
Anti solder joint crack

Reduces solder joint crack progression by originally developed soft terminal

**Reduce solder joint crack**

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

**Soft termination technology adopted**

◆ Cooling and heating cycle lightens the stress ◆

Lighten the stress at solder fillet by soft termination

Maintain excellent solder connection reliability even in harsh temperature environment such as for automotive.
Environment resistant
High temperature chip resistor

ERJH series

Achieves high heat resistance by new materials developing

Guarantees that the resistor endures 1000 cycles of thermal shock testing (-55°C/+175°C)

1. Expand of max operating temperature 155 °C ⇒ 175 °C
2. Expand of rated operating temperature 70 °C ⇒ 105 °C
3. Improvement of solder crack resistance

Excellent high heat resistance due to both material flexibility and heat resistance

Overcome the trade-offs of conventional materials by reviewing the design of raw materials

✓ Improvement of operating temperature
✓ Suppression of solder cracks

Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (inch)</th>
<th>Power rating (W)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>Category temp. range (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJH2</td>
<td>0402</td>
<td>0.10</td>
<td>± 0.5, ± 1, ±5</td>
<td>1 to 300 k</td>
<td>-55 to 175</td>
</tr>
<tr>
<td>ERJH3</td>
<td>0603</td>
<td>0.125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERJHP6</td>
<td>0805</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Environment resistant Anti-Sulfurated series

Standard: ERJS/U series
Array: EXBU series
High precision: ERJU*R series
Low resistance: ERJU*S/Q series
Small size & High power: ERJC/ERJUP series
Wide terminal: ERJC 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

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.

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
### Anti-Sulfurated series Line-up

< Wide lineup of Anti-Sulfurated chip resistors with anti-sulfurated ctrode >

- **Chip resistor (standard size)**

<table>
<thead>
<tr>
<th>Size (inch)</th>
<th>Type</th>
<th>0201</th>
<th>0402</th>
<th>0603</th>
<th>0805</th>
<th>1206</th>
<th>1210</th>
<th>2010 1020 (Wide terminal)</th>
<th>2512</th>
<th>Web catalog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td></td>
<td>ERJS02</td>
<td>ERJS03</td>
<td>ERJS06</td>
<td>ERJS08</td>
<td>ERJS14</td>
<td>ERJS1D</td>
<td>ERJS1T</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERJU01</td>
<td>ERJU02</td>
<td>ERJU03</td>
<td>ERJU06</td>
<td>ERJU08</td>
<td>ERJU14</td>
<td>ERJU1D</td>
<td>ERJU1T</td>
<td></td>
</tr>
<tr>
<td>Precision</td>
<td></td>
<td>ERJU2R</td>
<td>ERJU3R</td>
<td>ERJU6R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Click</td>
</tr>
<tr>
<td>Small &amp; High power</td>
<td></td>
<td>ERJUP3</td>
<td>ERJUP6</td>
<td>ERJUP8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Click</td>
</tr>
<tr>
<td>Low resistance (0.1 Ω to 10 Ω)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Click</td>
</tr>
<tr>
<td>Array</td>
<td>2 resistors</td>
<td>EXBU14</td>
<td>EXBU24</td>
<td>EXBU34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Click</td>
</tr>
<tr>
<td></td>
<td>4 resistors</td>
<td>EXBU18</td>
<td>EXBU28</td>
<td>EXBU38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Click</td>
</tr>
<tr>
<td></td>
<td>8 resistors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Click</td>
</tr>
<tr>
<td>Wide terminal</td>
<td>Low resistance (10 mΩ to 1 Ω)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERJC1B</td>
<td>Click</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ERJC1C</td>
<td>Click</td>
</tr>
</tbody>
</table>
Achieved low-resistance/low-TCR
~ VA proposal for metal shunt resistors ~

[ Achieved TCR 350 ppm/℃ → 100 ppm/℃ in 10 mΩ ]

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 (inch)</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>1020</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>0612</td>
<td>1.0</td>
<td>± 1, ± 5</td>
<td>10 mΩ to 30 mΩ</td>
<td>± 100</td>
<td>-55 to 155</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

---

### Specifications

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Size (inch)</th>
<th>Power rating (W)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR ((x10^{-6} / °C))</th>
<th>Category temp. range (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJ2BW</td>
<td>0402</td>
<td>0.25</td>
<td>± 1, ± 2, ± 5</td>
<td>47 m to 100 m</td>
<td>0 to +300</td>
<td></td>
</tr>
<tr>
<td>ERJ3BW</td>
<td>0603</td>
<td>0.33</td>
<td>± 1, ± 2, ± 5</td>
<td>20 m to 200 m</td>
<td>0 to +150</td>
<td></td>
</tr>
<tr>
<td>ERJ6BW</td>
<td>0805</td>
<td>0.5</td>
<td>± 1, ± 2, ± 5</td>
<td>10 m to 100 m</td>
<td>0 to +200</td>
<td>-55 to 155</td>
</tr>
<tr>
<td>ERJ8BW</td>
<td>1206</td>
<td>1.0</td>
<td>± 1, ± 2, ± 5</td>
<td>10 m to 100 m</td>
<td>0 to +200</td>
<td></td>
</tr>
</tbody>
</table>

---

• 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.

---

Please visit our website for details!
Small size & High power
Anti-Surge type

ERJPA/P0 series

Improvement of High power & Anti-Surge rating

PCB down sizing 69%

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

PCB area reduction

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 (inch)</th>
<th>Power rating (W)</th>
<th>Limiting element voltage (V)</th>
<th>Resistance tolerance (%)</th>
<th>Resistance range (Ω)</th>
<th>TCR (x10⁻⁶/°C)</th>
<th>Category temp. range (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERJPA2  (*1)</td>
<td>0402</td>
<td>0.20</td>
<td>50</td>
<td>± 0.5, ± 1</td>
<td>10 to 1 M</td>
<td>± 100</td>
<td>±5 to 155</td>
</tr>
<tr>
<td>ERJPA3  (*2)</td>
<td>0603</td>
<td>0.25</td>
<td>150</td>
<td>± 0.5, ± 1</td>
<td>10 to 1 M</td>
<td>± 100</td>
<td>±5 to 155</td>
</tr>
<tr>
<td>ERJP06</td>
<td>0805</td>
<td>0.50</td>
<td>400</td>
<td>± 0.5, ± 1</td>
<td>10 to 1 M</td>
<td>± 100</td>
<td>±5 to 155</td>
</tr>
</tbody>
</table>

Note: *1 : ERJPA : AEC-Q200 Grade 1
*2 : Power rating up to 105 °C

Please visit our website for details!
Improvement of High power & Anti-Surge rating

TCR

R<22mΩ
22mΩ≦R<47mΩ
47mΩ≦R<100mΩ
100mΩ≦R

R<47mΩ
47mΩ≦R<1Ω
1Ω≦R

• Low TCR
• High power
• Anti solder joint crack
• AEC-Q200

ERJB series

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

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

Higher power rating by wide termination structure with separated resistive elements

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

Point

ERJB1 1020 2.0 200 ± 1 10 m to 10 k
ERJB2 1632 1.0 200 ± 1 10 m to 10 M
ERJB3 1220 0.33 150 ± 1 20 m to 10

Specifications

Part No. Size (inch) Power rating (W) Limiting element voltage (V) Resistance tolerance (%) Resistance range (Ω) TCR (x10^-6 / °C) Category temp. range (°C)
ERJB1 1020 2.0 (*) 200 ± 1 10 m to 10 k
ERJB2 1632 1.0 (*) 200 ± 1 10 m to 10 M
ERJB3 1220 0.33 150 ± 1 20 m to 10

*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 (inch)</th>
<th>0402</th>
<th>0603</th>
<th>0805</th>
<th>1206 (Wide terminal)</th>
<th>3225</th>
<th>2010 (Wide terminal)</th>
<th>2512</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (W)</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*" " means down sizing rate (%) of PCB.

*Panasonic Standard*
Main locations

- **Japan bases**
  - Sales office
  - Production base

- **Overseas bases**
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.

5. In order to export products in this catalog, the exporter may be subject to the export license requirement under the Foreign Exchange and Foreign Trade Law of Japan.

6. No ozone-depleting substances (ODSs) under the Montreal Protocol are used in the manufacturing processes of Automotive & Industrial Systems Company, Panasonic Corporation.