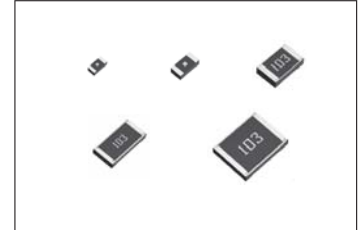


# Anti-surge Chip Resistors

## ESR Series

### ●Features

- 1) Exclusive resistive element pattern and laser trimming technology results in significantly improved surge resistance characteristics.
- 2) 2kV to 5kV electrostatic discharge resistance.
- 3) Superior power ratings.
- 4) ROHM resistors have obtained ISO9001 / ISO / TS16949 certification.
- 5) Corresponds to AEC-Q200.(ESR10/18)



### ●Products List

| Part No. | Size |        | Rated Power (70°C)<br>(W) | Limiting Element Voltage<br>(V) | Maximum Overload Voltage<br>(V) | Temperature Coefficient<br>(ppm / °C) | Resistance Tolerance<br>(%) | Resistance Range | Series | Operating Temperature Range<br>(°C) |
|----------|------|--------|---------------------------|---------------------------------|---------------------------------|---------------------------------------|-----------------------------|------------------|--------|-------------------------------------|
|          | (mm) | (inch) |                           |                                 |                                 |                                       |                             |                  |        |                                     |
| ESR01    | 1005 | 0402   | 0.2                       | 50                              | 100                             | ±200                                  | J(±5%)                      | 10Ω to 1MΩ       | E24    | -55 to +155                         |
|          |      |        |                           |                                 |                                 | ±100                                  | F(±1%)                      |                  |        |                                     |
| ESR03    | 1608 | 0603   | 0.25                      | 150                             | 200                             | ±200                                  | J(±5%)                      | 1Ω to 10MΩ       | E24    | -55 to +155                         |
|          |      |        |                           |                                 |                                 | ±100                                  | F(±1%)                      | 10Ω to 1MΩ       |        |                                     |
|          |      |        |                           |                                 |                                 | ±100                                  | D(±0.5%)                    | 10Ω to 1MΩ       |        |                                     |
| ESR10    | 2012 | 0805   | 0.4                       | 150                             | 200                             | ±200                                  | J(±5%)                      | 1Ω to 10MΩ       | E24    | -55 to +155                         |
|          |      |        |                           |                                 |                                 | ±100                                  | F(±1%)                      | 10Ω to 1MΩ       |        |                                     |
| ESR18    | 3216 | 1206   | 0.33                      | 200                             | 400                             | ±200                                  | J(±5%)                      | 1Ω to 10MΩ       | E24    | -55 to +155                         |
|          |      |        |                           |                                 |                                 | ±100                                  | F(±1%)                      | 10Ω to 1MΩ       |        |                                     |
|          |      |        |                           |                                 |                                 | ±100                                  | D(±0.5%)                    | 10Ω to 1MΩ       |        |                                     |
| ESR25    | 3225 | 1210   | 0.5                       | 200                             | 400                             | ±200                                  | J(±5%)                      | 1Ω to 10MΩ       | E24    | -55 to +155                         |
|          |      |        |                           |                                 |                                 | ±100                                  | F(±1%)                      | 10Ω to 1MΩ       |        |                                     |
|          |      |        |                           |                                 |                                 | ±100                                  | D(±0.5%)                    | 10Ω to 1MΩ       |        |                                     |

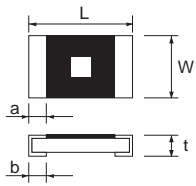
\*Design and specifications are subject to change without notice.  
Carefully check the specification sheet supplied with the product before using or ordering it.

### ●Part Number Description

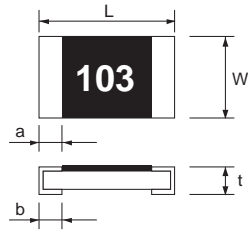
| <b>E S R</b>   | <b>1 0</b>  | <b>E Z P</b>   | <b>J</b>        | <b>1 0 0</b> |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
|--|---|--|-----------------|--------------|--------------------------|-----------------|-------|-----|------------------------|--------|-------|-----|------------------------|-------|-------|-----|------------------------|-------|-------|-----|------------------------|-------|-------|-----|---------------------------|-------|--|--|----------------------|-----------------|------|------------|---|------------|
| <b>Part No.</b><br><b>ESR</b><br>(Anti-surge chip resistors) | <b>Size (mm [inch])</b><br>01 (1005 [0402])<br>03 (1608 [0603])<br>10 (2012 [0805])<br>18 (3216 [1206])<br>25 (3225 [1210]) | <b>Packaging Specifications Code</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Part No.</th> <th>Code</th> <th>Packaging specifications</th> <th>Quantity / Reel</th> </tr> </thead> <tbody> <tr> <td>ESR01</td> <td>MZP</td> <td>Paper tape (4mm Pitch)</td> <td>10,000</td> </tr> <tr> <td>ESR03</td> <td>EZP</td> <td>Paper tape (4mm Pitch)</td> <td>5,000</td> </tr> <tr> <td>ESR10</td> <td>EZP</td> <td>Paper tape (4mm Pitch)</td> <td>5,000</td> </tr> <tr> <td>ESR18</td> <td>EZP</td> <td>Paper tape (4mm Pitch)</td> <td>5,000</td> </tr> <tr> <td>ESR25</td> <td>JZP</td> <td>Embossed tape (4mm Pitch)</td> <td>4,000</td> </tr> </tbody> </table> | Part No.        | Code         | Packaging specifications | Quantity / Reel | ESR01 | MZP | Paper tape (4mm Pitch) | 10,000 | ESR03 | EZP | Paper tape (4mm Pitch) | 5,000 | ESR10 | EZP | Paper tape (4mm Pitch) | 5,000 | ESR18 | EZP | Paper tape (4mm Pitch) | 5,000 | ESR25 | JZP | Embossed tape (4mm Pitch) | 4,000 | <b>Resistance Tolerance</b><br>D ( ±0.5% )<br>F ( ±1% )<br>J ( ±5% ) | <b>Nominal Resistance</b><br>Resistance code, 3 or 4 digits.<br>000 denotes jumper type. <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th>Resistance tolerance</th> <th>Resistance code</th> </tr> </thead> <tbody> <tr> <td>D, F</td> <td>: 4 digits</td> </tr> <tr> <td>J</td> <td>: 3 digits</td> </tr> </tbody> </table> <p>Ex.)</p> <p>1Ω = 1R00 ( ±1% )<br/>                     1R0 ( ±5% )<br/>                     10Ω = 10R0 ( ±0.5%, ±1% )<br/>                     100 ( ±5% )<br/>                     1MΩ = 1004 ( ±0.5%, ±1% )<br/>                     105 ( ±5% )</p> | Resistance tolerance | Resistance code | D, F | : 4 digits | J | : 3 digits |
| Part No.   | Code  | Packaging specifications   | Quantity / Reel |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| ESR01  | MZP   | Paper tape (4mm Pitch)   | 10,000          |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| ESR03  | EZP   | Paper tape (4mm Pitch)   | 5,000           |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| ESR10  | EZP   | Paper tape (4mm Pitch)   | 5,000           |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| ESR18  | EZP   | Paper tape (4mm Pitch)   | 5,000           |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| ESR25  | JZP   | Embossed tape (4mm Pitch)  | 4,000           |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| Resistance tolerance   | Resistance code   |  |                 |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| D, F   | : 4 digits  |  |                 |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |
| J  | : 3 digits  |  |                 |              |                          |                 |       |     |                        |        |       |     |                        |       |       |     |                        |       |       |     |                        |       |       |     |                           |       |  |  |                      |                 |      |            |   |            |

●Chip Resistor Dimensions and Markings

■ ESR01 / 03



■ ESR10 / 18 / 25



<Marking method>

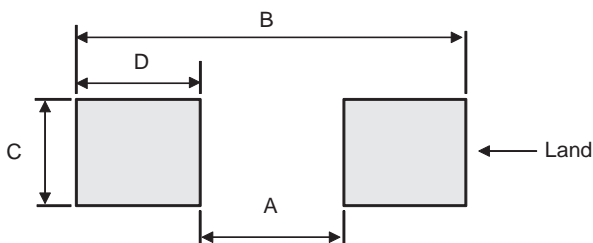
There are three or four digits used for the calculation number according to IEC code and "R" is used for the decimal point.

(Unit : mm)

| Part No. | (mm) | (inch) | L        | W        | t         | a        | b                                     | Marking existence |
|----------|------|--------|----------|----------|-----------|----------|---------------------------------------|-------------------|
| ESR01    | 1005 | 0402   | 1.0±0.05 | 0.5±0.05 | 0.35±0.05 | 0.2±0.1  | 0.25 <sup>+0.05</sup> <sub>-0.1</sub> | No *              |
| ESR03    | 1608 | 0603   | 1.6±0.1  | 0.8±0.1  | 0.45±0.1  | 0.3±0.2  | 0.3±0.2                               | No *              |
| ESR10    | 2012 | 0805   | 2.0±0.1  | 1.25±0.1 | 0.55±0.1  | 0.3±0.2  | 0.4±0.2                               | Yes               |
| ESR18    | 3216 | 1206   | 3.2±0.15 | 1.6±0.15 | 0.55±0.1  | 0.3±0.25 | 0.5±0.25                              | Yes               |
| ESR25    | 3225 | 1210   | 3.2±0.15 | 2.5±0.15 | 0.55±0.1  | 0.3±0.25 | 0.5±0.25                              | Yes               |

\*Only with square mark

●Land pattern Example



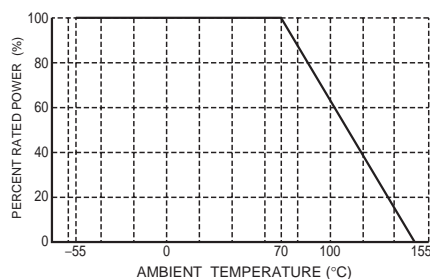
(Unit : mm)

| Part No. | A   | B   | C    | D   |
|----------|-----|-----|------|-----|
| ESR01    | 0.5 | 1.3 | 0.5  | 0.4 |
| ESR03    | 1.0 | 2.0 | 0.8  | 0.5 |
| ESR10    | 1.2 | 2.6 | 1.15 | 0.7 |
| ESR18    | 2.2 | 4.0 | 1.5  | 0.9 |
| ESR25    | 2.2 | 4.0 | 2.3  | 0.9 |

### ●Derating Curve

When the ambient temperature exceeds 70°C, power dissipation must be adjusted according to the derating curves below.

■ ESR01 / 03 / 10 / 18 / 25



### ●Characteristics

| Test Items                               | Guaranteed Value   | Test Conditions   |
|--|--|---|
|  | Resistor Type  |   |
| Resistance                               | See P.1  | 20°C  |
| Variation of resistance with temperature | See P.1  | Measurement : +20 / -55 / +20 / +125°C  |
| Overload                                 | $\pm (2.0\%+0.1\Omega)$  | Rated voltage (current) $\times 2.0$ , 2s (ESR01)<br>Rated voltage (current) $\times 2.5$ , 2s (ESR03 / 10 / 18 / 25)<br>Maximum overload voltage           |
| Solderability                            | A new uniform coating of minimum of 95% of the surface being immersed and no soldering damage. | Rosin-Ethanol : 25% (Weight)<br>Soldering condition : $235\pm 5^\circ\text{C}$<br>Duration of immersion : $2.0\pm 0.5\text{s}$                              |
| Resistance to soldering heat             | $\pm (1.0\%+0.05\Omega)$<br>No remarkable abnormality on the appearance.                       | Soldering condition : $260\pm 5^\circ\text{C}$<br>Duration of immersion : $10\pm 1\text{s}$   |
| Rapid change of temperature              | $\pm (1.0\%+0.05\Omega)$   | Test temp. : $-55^\circ\text{C}$ to $+125^\circ\text{C}$ 5cycle   |
| Damp heat, steady state                  | $\pm (3.0\%+0.1\Omega)$  | $40^\circ\text{C}$ , 93%RH (Relative Humidity)<br>Test time : 1,000h to 1,048h  |
| Endurance at 70°C                        | $\pm (3.0\%+0.1\Omega)$  | $70^\circ\text{C}$<br>Rated voltage (current)<br>1.5h : ON – 0.5h : OFF<br>Test time : 1,000h to 1,048h   |
| Endurance                                | $\pm (3.0\%+0.1\Omega)$  | $155^\circ\text{C}$<br>Test time : 1,000h to 1,048h   |
| Resistance to solvent                    | $\pm (1.0\%+0.05\Omega)$   | $23\pm 5^\circ\text{C}$ , Immersion cleaning, $5\pm 0.5\text{min}$<br>Solvent : 2-propanol  |
| Bend strength of the end face plating    | $\pm (1.0\%+0.05\Omega)$<br>Without mechanical damage such as breaks.                          | —   |
| Static electric characteristics          | $\pm (5.0\%+0.05\Omega)$   | EIAJ ED-4701 / 300 TEST METHOD304<br>Voltage : 2kV (ESR01)<br>3kV (ESR03 / 10 / 18)<br>5kV (ESR25)<br>C : 100pF<br>R : 1.5k $\Omega$<br>Apply cycle : 1time |

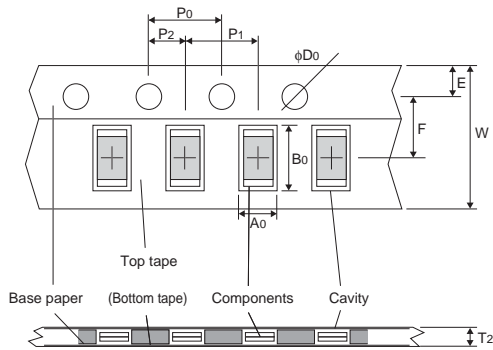
Compliance Standard(s) : IEC60115-8  
JISC 5201-8

### ●Chip weight (typical value)

| Parameter | Unit  | ESR01 | ESR03 | ESR10 | ESR18 | ESR25 |
|-----------|-------|-------|-------|-------|-------|-------|
| Weight    | mg/pc | 0.63  | 2.18  | 5.13  | 9.62  | 16.47 |

●Tape Dimensions

■ Paper Tape

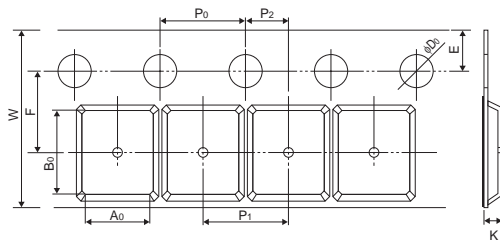


(Unit : mm)

| Part No. | W       | F        | E        | A <sub>0</sub>                        | B <sub>0</sub>                        |
|----------|---------|----------|----------|---------------------------------------|---------------------------------------|
| ESR01    | 8.0±0.3 | 3.5±0.05 | 1.75±0.1 | 0.7±0.1                               | 1.2±0.1                               |
| ESR03    | 8.0±0.3 | 3.5±0.05 | 1.75±0.1 | 1.1±0.1                               | 1.9±0.1                               |
| ESR10    | 8.0±0.3 | 3.5±0.05 | 1.75±0.1 | 1.65 <sup>+0.2</sup> <sub>-0.1</sub>  | 2.4 <sup>+0.2</sup> <sub>-0.1</sub>   |
| ESR18    | 8.0±0.3 | 3.5±0.05 | 1.75±0.1 | 1.95 <sup>+0.1</sup> <sub>-0.05</sub> | 3.5 <sup>+0.15</sup> <sub>-0.05</sub> |

| Part No. | D <sub>0</sub>                    | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | T <sub>2</sub> |
|----------|-----------------------------------|----------------|----------------|----------------|----------------|
| ESR01    | φ1.5 <sup>+0.1</sup> <sub>0</sub> | 4.0±0.1        | 2.0±0.05       | 2.0±0.05       | Max 1.1        |
| ESR03    | φ1.5 <sup>+0.1</sup> <sub>0</sub> | 4.0±0.1        | 4.0±0.1        | 2.0±0.05       | Max 1.1        |
| ESR10    | φ1.5 <sup>+0.1</sup> <sub>0</sub> | 4.0±0.1        | 4.0±0.1        | 2.0±0.05       | Max 1.1        |
| ESR18    | φ1.5 <sup>+0.1</sup> <sub>0</sub> | 4.0±0.1        | 4.0±0.1        | 2.0±0.05       | Max 1.1        |

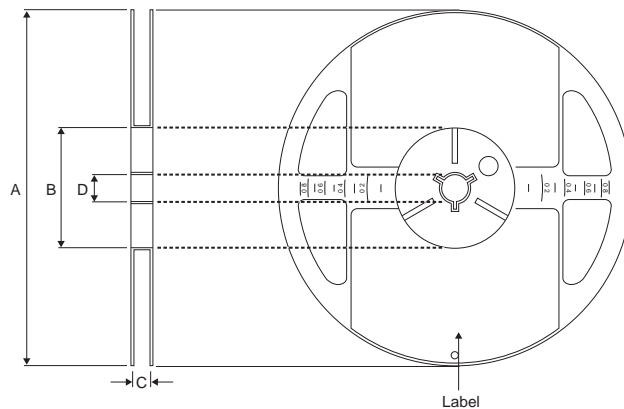
■ Embossed Tape



(Unit : mm)

| Part No. | W                                 | F              | E              | A <sub>0</sub> | B <sub>0</sub> |
|----------|-----------------------------------|----------------|----------------|----------------|----------------|
| ESR25    | 8.0±0.3                           | 3.5±0.05       | 1.75±0.1       | 3.0±0.1        | 3.5±0.1        |
|          | D <sub>0</sub>                    | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | K              |
|          | φ1.5 <sup>+0.1</sup> <sub>0</sub> | 4.0±0.1        | 4.0±0.1        | 2.0±0.05       | Max 1.1        |

●Reel Dimensions



ACCORDING TO EIAJ ET-7200B

(Unit : mm)

| Part No. | A                                 | B                                | C                              | D       |
|----------|-----------------------------------|----------------------------------|--------------------------------|---------|
| ESR01    | φ180 <sup>0</sup> <sub>-1.5</sub> | φ60 <sup>+1.0</sup> <sub>0</sub> | 9 <sup>+1.0</sup> <sub>0</sub> | φ13±0.2 |
| ESR03    |                                   |                                  |                                |         |
| ESR10    |                                   |                                  |                                |         |
| ESR18    |                                   |                                  |                                |         |
| ESR25    |                                   |                                  |                                |         |

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