



RSR Series Thick Film Chip Resistors Product Specification

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| Document No. | IE-SP-145 |
| Released Date | 2019/05/15 |
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1 Scope:

- 1.1 This specification is applicable to lead-free and halogen-free RSR series anti-sulfurated precision thick film chip resistors.
- 1.2 Superior Sulfur resistant capability (Refer to ASTM-B-809-95&EIA977sulfur vapor test).
- 1.3 The product is for general purpose.

2 Explanation Of Part Number:

(EX)



| Type | Size | Nominal Resistance | | Resistance Tolerance | Packaging |
|---|--|--------------------|--------------------------------|----------------------|---|
| anti-sulfurated Precision Thick Film Chip Resistors | 01(0201) 02(0402) 03(0603) 05(0805) 06(1206) 12(1210) 20(2010) 25(2512) | 4-Digit | EX. 10.2Ω=10R2 10KΩ=1002 | D=± 0.5% F=± 1% | Q1 : 1 mm Pitch Carrier Tape 20000 pcs QE : 1 mm Pitch Carrier Tape 150000 pcs TH : 2 mm Pitch Carrier Tape 10000 pcs H0 : 2 mm Pitch Carrier Tape 15000 pcs H1 : 2 mm Pitch Carrier Tape 20000 pcs H2 : 2 mm Pitch Carrier Tape 20000 pcs H3 : 2 mm Pitch Carrier Tape 30000 pcs H4 : 2 mm Pitch Carrier Tape 40000 pcs H5 : 2 mm Pitch Carrier Tape 50000 pcs H6 : 2 mm Pitch Carrier Tape 60000 pcs TP : 4 mm Pitch Carrier Tape 5000 pcs P2 : 4 mm Pitch Carrier Tape 10000 pcs P3 : 4 mm Pitch Carrier Tape 15000 pcs P4 : 4 mm Pitch Carrier Tape 20000 pcs TE : 4 mm Pitch Carrier Tape 4000 pcs |

| | | | | | |
|---------|---------|----------|---------|--|-------------------------|
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3 General Specifications:

| Type | Rated Power at 70°C | Max. Working Voltage | Max. Overload Voltage | T.C.R (ppm / °C) | Resistance Range |
|-----------------------------|---------------------|----------------------|-----------------------|---------------------------------------|----------------------------------|
| | | | | | D(±0.5%) · F(±1%) E-24 · E-96 |
| RSR01 (0201) | $\frac{1}{20}$ W | 30V | 60V | ±100 | $100\Omega \leq R < 1M\Omega$ |
| RSR02 (0402) | $\frac{1}{16}$ W | 50V | 100V | ±50 | $100\Omega \leq R < 1M\Omega$ |
| RSR03 (0603) | $\frac{1}{10}$ W | 75V | 150V | ±50 | $100\Omega \leq R < 1M\Omega$ |
| RSR05 (0805) | $\frac{1}{8}$ W | 150V | 300V | ±50 | $10\Omega \leq R < 1M\Omega$ |
| RSR06 (1206) | $\frac{1}{4}$ W | 200V | 400V | ±50 | $10\Omega \leq R < 1M\Omega$ |
| RSR12 (1210) | $\frac{1}{2}$ W | 200V | 400V | ±50 | $10\Omega \leq R < 1M\Omega$ |
| RSR20 (2010) | $\frac{3}{4}$ W | 200V | 400V | ±50 | $100\Omega \leq R < 1M\Omega$ |
| RSR25 (2512) | 1W | 200V | 400V | ±50 | $10\Omega \leq R < 1M\Omega$ |
| Operating Temperature Range | | | | -55°C ~ +155°C (0201: -55°C ~ +125°C) | |

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3.1 Power Derating Curve:

| Type | RSR01 (0201) | Other |
|-----------------------------|--|--|
| Operating Temperature Range | -55°C ~ +125°C | -55°C ~ +155°C |
| Explain | If the ambient temperature exceeds 70 degrees centigrade to 125 degrees centigrade, the power can be modified by the curve as below. | If the ambient temperature exceeds 70 degrees centigrade to 155 degrees centigrade, the power can be modified by the curve as below. |
| Figure | | |

3.2 Voltage Rating or Current Rating:

Rated Voltage: DC voltage or AC voltage (rms) based on the rated power.

The voltage can be calculated by the following formula. If the calculated value exceeds the Max. voltage specified in the Table 3, the Max. voltage rating is set as the voltage rating.

$$E = \sqrt{R \times P}$$

E= Voltage rating (V)
 P= Power rating (W)
 R= Nominal resistance(Ω)

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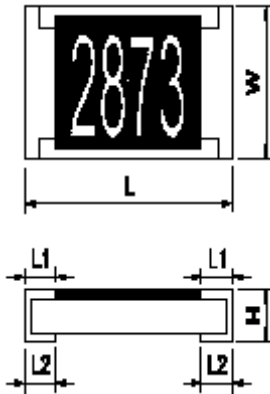
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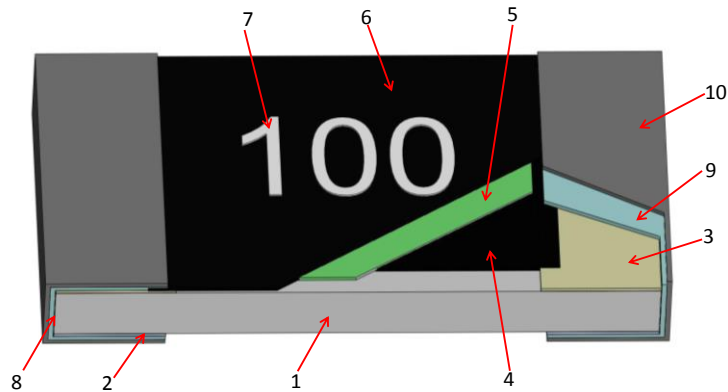
4 Dimensions:

Unit:mm



| Dimension | | L | W | H | L1 | L2 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Type | Size Code | | | | | |
| RSR01 | 0201 | 0.60±0.03 | 0.30±0.03 | 0.23±0.03 | 0.10±0.05 | 0.15±0.05 |
| RSR02 | 0402 | 1.00±0.10 | 0.50±0.05 | 0.30±0.05 | 0.20±0.10 | 0.25±0.10 |
| RSR03 | 0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.15 | 0.30±0.15 |
| RSR05 | 0805 | 2.00±0.10 | 1.25±0.10 | 0.50±0.10 | 0.35±0.20 | 0.35±0.20 |
| RSR06 | 1206 | 3.05±0.10 | 1.55±0.10 | 0.50±0.10 | 0.45±0.20 | 0.35±0.20 |
| RSR12 | 1210 | 3.05±0.10 | 2.55±0.10 | 0.55±0.10 | 0.50±0.20 | 0.50±0.20 |
| RSR20 | 2010 | 5.00±0.20 | 2.50±0.20 | 0.55±0.10 | 0.60±0.20 | 0.60±0.20 |
| RSR25 | 2512 | 6.30±0.20 | 3.20±0.20 | 0.55±0.10 | 0.60±0.20 | 0.60±0.20 |

5 Structure Graph:



| | | | |
|---|------------------------|----|--------------------------|
| 1 | Ceramic substrate | 6 | 2nd Protective coating |
| 2 | Bottom inner electrode | 7 | Marking |
| 3 | Top inner electrode | 8 | Terminal inner electrode |
| 4 | Resistive layer | 9 | Ni plating |
| 5 | 1st Protective coating | 10 | Sn plating |

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6 Reliability Test:

6.1 Electrical Performance Test

| Item | Conditions | Specifications |
|---------------------------------------|--|---|
| Temperature Coefficient of Resistance | $TCR \text{ (ppm/}^\circ\text{C)} = \frac{(R2 - R1)}{R1 (T2 - T1)} \times 10^6$ R1: Resistance at room temperature R2: Resistance at -55°C or +125°C T1: Room temperature T2: Temperature -55°C or +125°C Refer to JIS-C5201-1 4.8 | Refer to item 3. general specifications |
| Short Time Overload | Applied 2.5 times rated voltage for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Rated voltage refer to item 3. general specifications) Refer to JIS-C5201-1 4.13 | $\Delta R\% = \pm 1.0\%$ |
| Insulation Resistance | Put the resistor in the fixture, add 100 VDC in +, - terminal for 60 sec then measured the insulation resistance between electrodes and insulating enclosure or between electrodes and base material. Refer to JIS-C5201-1 4.6 | $\geq 10^9 \Omega$ |
| Dielectric Withstand Voltage | Put the resistor in the fixture, add VAC (see spec. below) in +, - terminal for. RSR05、06、12、20、25 apply 500 VAC 1 minute. RSR01、02、03 apply 300 VAC 1 minute. Refer to JIS-C5201-1 4.7 | No short or burned on the appearance. |

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6.2 Mechanical Performance Test

| Item | Conditions | Specifications |
|------------------------------|---|--|
| | | Resistors |
| Terminal Strength | Test1: The resistor mounted on the board applied 5N pushing force on the sample rear for 10 sec. (RSR01:3N) Test2: The resistor mounted on the board slowly add force on the sample rear until the sample termination is breakdown. Refer to JIS-C5201-1 4.16 | Test 1: No evidence of mechanical damage. Test 2: RSR01 $\geq 3N$ Other $\geq 5N$ |
| Resistance to Solvent | The tested resistor be immersed into isopropyl alcohol of 20~25°C for 5 minutes, then the resistor is left in the room for 48 hrs., and measured its resistance variance rate. Refer to JIS-C5201-1 4.29 | RSR01 : $\Delta R\% = \pm 1.0\%$ Other : $\Delta R\% = \pm 0.5\%$ |
| Solderability | Preconditioning: Put the tested resistor in the apparatus of PCT, at a temperature of 105°C, humidity of 100% RH, and pressure of 1.22×10^5 Pa for a duration of 4 hours. Then after left the tested resistor in room temperature for 2 hours or more. Test method: The resistor be immersed into solder pot in temperature $235 \pm 5^\circ C$ for 2 sec, then the resistor is left as placed under microscope to observed its solder area. Refer to JIS-C5201-1 4.17 | Solder coverage over 95% |
| Resistance to Soldering Heat | ◎Test method 1 (solder pot test): The tested resistor be immersed into molten solder of $260 + 5 / - 0^\circ C$ for 10 seconds. Then the resistor is left in the room for 1 hour. ◎Test method 2 (solder pot test): The tested resistor be immersed into molten solder of $260 + 5 / - 0^\circ C$ for 30 seconds. Then the resistor is left as placed under microscope to observe its solder area. ◎Test method 3 (Electric iron test): Preheating temperature : $350 \pm 10^\circ C$ Electric iron preheating time : $3 + 1 / - 0$ sec Preheating the electric iron on electrode termination, as after that step placed the iron over 60 min. and measured its resistance variance rate. Refer to JIS-C5201-1 4.18 | Test item 1: (1). Variance rate on resistance $\Delta R\% = \pm 1.0\%$ (2). No evidence of electrode damage. No side conductive peeling off. Test item 2: (1). Solder coverage over 95%. (2). The underlying material (such as ceramic) shall not be visible at the crest corner area of the electrode. Test item 3: (1). Variance rate on resistance $\Delta R\% = \pm 1.0\%$ (2). No evidence of electrode damage. No side conductive peeling off. |

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| Item | Conditions | Specifications |
|--------------------------|---|---|
| | | Resistors |
| Joint Strength of Solder | <p>Bending Strength: Solder tested resistor on to PC board. Add force in the middle down, and under load measured its resistance variance rate. D:RSR02、03、05=5mm RSR01、06、12=3mm RSR20、25=2mm</p> <p>Refer to JIS-C5201-1 4.33</p> | <p>(1).Variance rate on resistance $\Delta R\%=\pm 1.0\%$ (2).No evidence of mechanical damage. No terminal peeling off and core body cracked.</p> |

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