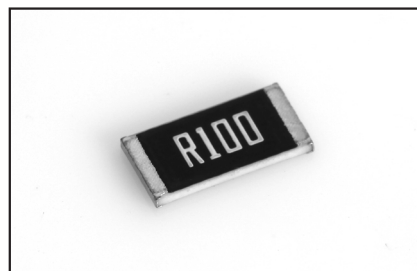


# Current Sensing Thick Film Chip Resistors

- Low inductance
- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Reduced size of final equipment
- Power management applications
- Switching power supply
- Over current protection in audio application
- Voltage regulation module (VRM)
- DC-DC converter, battery pack, charger, adaptor
- Automotive engine control, Disk driver



Wire Wound Resistors

Current Sensing Resistors

Precision Resistors

Power Film Resistors

High Voltage Resistors

Bulk Ceramic Resistors

Heaters

## GENERAL SPECIFICATIONS

| Model        | Item | Power Rating at 70 °C | Operating Temperature Range | Resistance Range(mΩ) |       | TCR(ppm/°C) |
|--------------|------|-----------------------|-----------------------------|----------------------|-------|-------------|
|              |      |                       |                             | ±1%                  | ±5%   |             |
| RS-02 (0402) |      | 1/16W                 | -55 °C ~ +155 °C            | 50 - 99              |       | ±800        |
|              |      |                       |                             | 100 - 499            |       | ±500        |
|              |      |                       |                             | 500 - 976            |       | ±200        |
| RS-03 (0603) |      | 1/10W                 |                             | 20 - 47              |       | ±1200       |
|              |      |                       |                             | 50 - 99              |       | ±800        |
|              |      |                       |                             | 100 - 499            |       | ±500        |
| RS-05 (0805) |      | 1/8W                  |                             | 500 - 976            |       | ±200        |
|              |      |                       |                             | 10 - 18              |       | ±1500       |
|              |      |                       |                             | 20 - 47              |       | ±1200       |
| RS-06 (1206) |      | 1/4W                  |                             | 50 - 99              |       | ±800        |
|              |      |                       |                             | 100 - 499            |       | ±500        |
|              |      |                       |                             | 500 - 976            |       | ±200        |
| RS-10 (1210) |      | 1/3W                  | 10 - 18                     |                      | ±1500 |             |
| RS-0A (2010) |      | 3/4W                  | 20 - 47                     |                      | ±800  |             |
|              |      |                       | 50 - 99                     |                      | ±800  |             |
| RS-12 (2512) |      | 1W                    | 100 - 499                   |                      | ±200  |             |
|              |      |                       | 500 - 976                   |                      | ±200  |             |

\* Operating Voltage =  $\sqrt{P \cdot R}$  / \*\*Overload Voltage =  $2.5 \cdot \sqrt{P \cdot R}$

## HIGH POWER RATING SPECIFICATIONS

| Model        | Item | Power Rating at 70 °C | Operating Temperature Range | Resistance Range(mΩ) |       | TCR(ppm/°C) |
|--------------|------|-----------------------|-----------------------------|----------------------|-------|-------------|
|              |      |                       |                             | ±1%                  | ±5%   |             |
| RS-02 (0402) |      | 1/10W                 | -55 °C ~ +155 °C            | 50 - 99              |       | ±800        |
|              |      |                       |                             | 100 - 499            |       | ±500        |
|              |      |                       |                             | 500 - 976            |       | ±200        |
| RS-03 (0603) |      | 1/8W                  |                             | 20 - 47              |       | ±1200       |
|              |      |                       |                             | 50 - 99              |       | ±800        |
|              |      |                       |                             | 100 - 499            |       | ±500        |
| RS-05 (0805) |      | 1/4W                  |                             | 500 - 976            |       | ±200        |
|              |      |                       |                             | 10 - 18              |       | ±1500       |
|              |      |                       |                             | 20 - 47              |       | ±1200       |
| RS-06 (1206) |      | 1/3W                  |                             | 50 - 99              |       | ±800        |
|              |      |                       |                             | 100 - 499            |       | ±500        |
|              |      |                       |                             | 500 - 976            |       | ±200        |
| RS-10 (1210) |      | 1/2W                  | 10 - 18                     |                      | ±1500 |             |
| RS-0A (2010) |      | 1W                    | 20 - 47                     |                      | ±800  |             |
|              |      |                       | 50 - 99                     |                      | ±800  |             |
| RS-12 (2512) |      | 2W                    | 100 - 499                   |                      | ±200  |             |
|              |      |                       | 500 - 976                   |                      | ±200  |             |

\* Operating Voltage =  $\sqrt{P \cdot R}$

\*\*Overload Voltage =  $2.5 \cdot \sqrt{P \cdot R}$

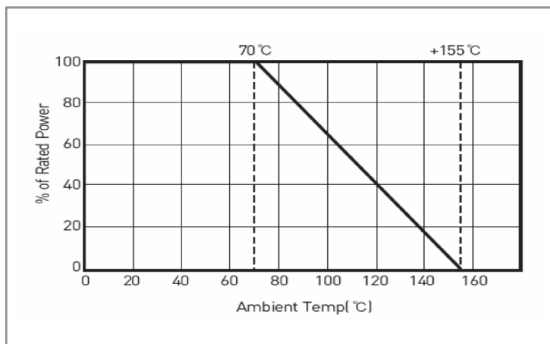
### CHARACTERISTICS

| Item                         | Requirement  |               | Test Method  |
|------------------------------|--|---------------|--|
|                              | ±1%  | ±5%           |  |
| Temperature Coefficient      | As Spec.   |               | -55°C~+125°C, 25°C is the reference temperature  |
| Short Time Overload          | ±(1.0%+0.05Ω)  | ±(2.0%+0.05Ω) | RCWV*2.5 or maximum overload voltage for 5 seconds<br>2 seconds for high power series              |
| Insulation Resistance        | ≥10GΩ  |               | Maximum overload voltage for 1 minute  |
| Endurance                    | ±(2.0%+0.10Ω)  | ±(3.0%+0.10Ω) | 70±2°C, maximum working voltage for 1000hours with<br>1.5 hours "ON" and 0.5 hour "OFF"            |
| Damp Heat with Load          | ±(2.0%+0.10Ω)  | ±(3.0%+0.10Ω) | 40±2°C, 90-95% RH maximum working voltage for 1000 hours with<br>1.5 hours "ON" and 0.5 hour "OFF" |
| Dry Heat                     | ±(1.0%+0.05Ω)  | ±(1.5%+0.05Ω) | At +155°C for 1000hours  |
| Bending Strength             | ±(1.0%+0.05Ω)  | ±(1.0%+0.05Ω) | Bending once for 5 seconds<br>2010, 2512 sizes: 2mm, Other sizes: 3mm                              |
| Solderability                | 95% minimum coverage                                       |               | 245±5°C for 3 seconds  |
| Resistance to Soldering Heat | ±(0.5%+0.05Ω)  | ±(1.0%+0.05Ω) | 260±5°C for 10 seconds   |
| Voltage Proof                | No breakdown or flashover                                  |               | 1.42 times RCWV(RMS) for 1 minute  |
| Leaching                     | Individual leaching area ≤ 5%<br>Total leaching area ≤ 10% |               | 260±5°C for 30 seconds   |
| Rapid Change of Temperature  | ±(0.5%+0.05Ω)  | ±(1.0%+0.05Ω) | -55°C to +155°C, 5 cycles  |

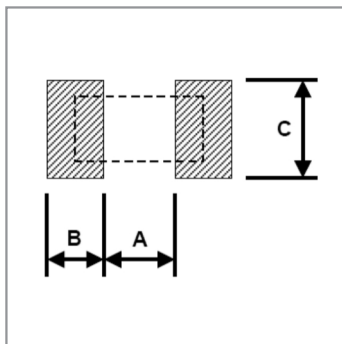
\* Reference Standards : IEC 60115-1, 60068-2-58; JIS-C 5201-1

\* Storage Temperature : 25±3°C; Humidity < 80%RH

### DERATING CURVE

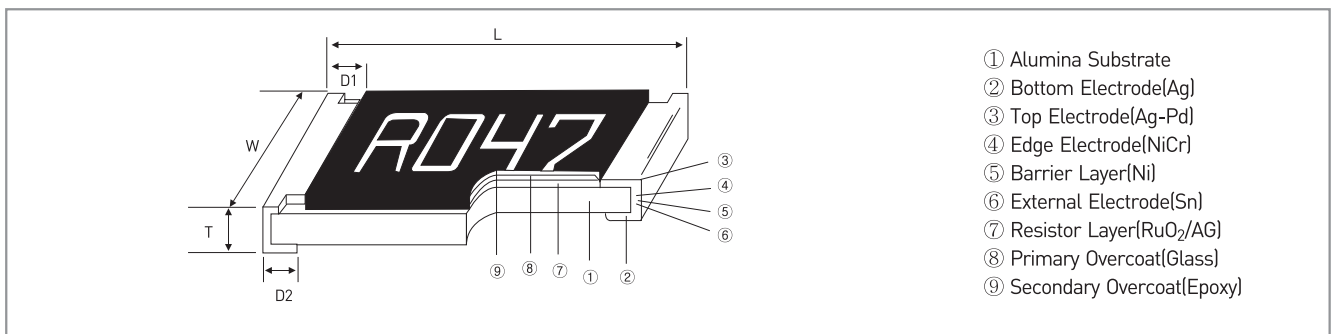


### RECOMMENDED LAND PATTERN [mm]



| Model | A    | B    | C    |
|-------|------|------|------|
| RS-02 | 0.50 | 0.45 | 0.60 |
| RS-03 | 0.90 | 0.60 | 0.90 |
| RS-05 | 1.20 | 0.70 | 1.30 |
| RS-06 | 2.00 | 0.90 | 1.60 |
| RS-10 | 2.00 | 0.90 | 2.80 |
| RS-0A | 3.80 | 0.90 | 2.80 |
| RS-12 | 3.80 | 1.60 | 3.50 |

### DIMENSIONS [mm]



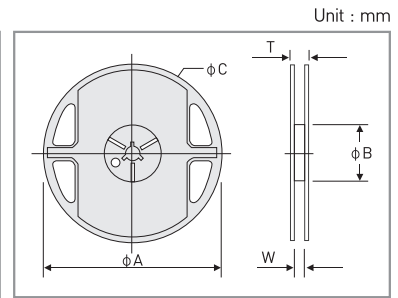
- ① Alumina Substrate
- ② Bottom Electrode(Ag)
- ③ Top Electrode(Ag-Pd)
- ④ Edge Electrode(NiCr)
- ⑤ Barrier Layer(Ni)
- ⑥ External Electrode(Sn)
- ⑦ Resistor Layer(RuO<sub>2</sub>/AG)
- ⑧ Primary Overcoat(Glass)
- ⑨ Secondary Overcoat(Epoxy)

| Model | Size(Inch) | L         | W         | T         | D1        | D2        | Weight(g) (1000pcs) |
|-------|------------|-----------|-----------|-----------|-----------|-----------|---------------------|
| RS-02 | 0402       | 1.00±0.05 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.20±0.10 | 0.620               |
| RS-03 | 0603       | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 | 2.042               |
| RS-05 | 0805       | 2.00±0.10 | 1.25±0.10 | 0.50±0.10 | 0.35±0.20 | 0.40±0.20 | 4.368               |
| RS-06 | 1206       | 3.10±0.10 | 1.55±0.10 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 | 8.947               |
| RS-10 | 1210       | 3.10±0.10 | 2.60±0.15 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 | 15.959              |
| RS-0A | 2010       | 5.00±0.10 | 2.50±0.15 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 | 24.241              |
| RS-12 | 2512       | 6.35±0.10 | 3.10±0.15 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 | 39.448              |

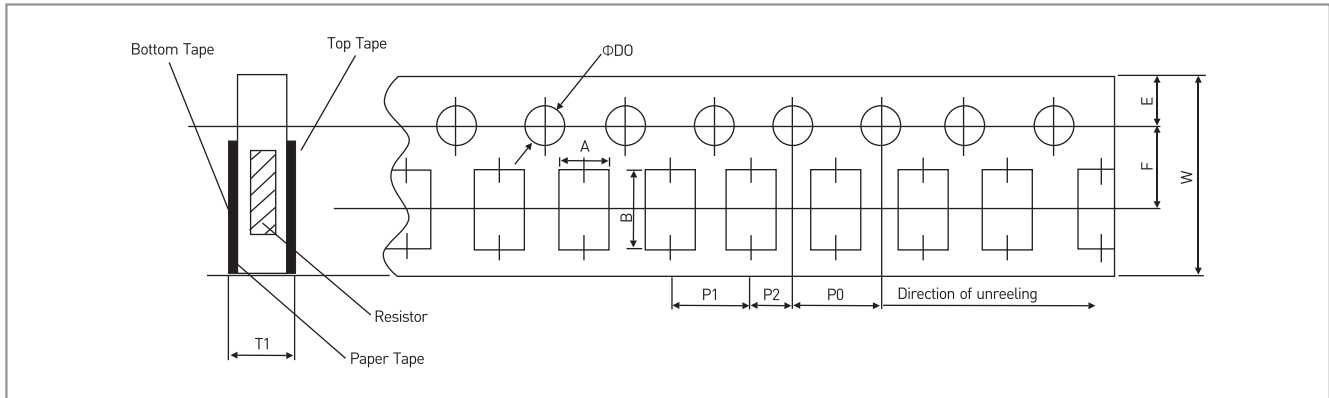
**PACKAGING**

**Reel Specifications & Packaging Quantity**

| Model | Packaging Quantity | Tape Width | Reel Dia. | ΦA        | ΦB                  | ΦC                  | W      | T        |
|-------|--------------------|------------|-----------|-----------|---------------------|---------------------|--------|----------|
| RS-02 | Paper              | 10K        | 7 inch    | 178.5±1.5 | 60 <sup>+1/-0</sup> | 13±0.2              | 9±0.5  | 12.5±0.5 |
|       |                    | 20K        |           |           |                     |                     |        |          |
|       |                    | 40K        |           |           |                     |                     |        |          |
| RS-03 | Paper              | 5K         | 8mm       | 10 inch   | 254±1.0             | 100±0.5             | 13±0.2 | 9.5±0.5  |
|       |                    | 10K        |           |           |                     |                     |        |          |
|       |                    | 20K        |           |           |                     |                     |        |          |
| RS-0A | Embossed           | 4K         | 12mm      | 7 inch    | 178.5±1.5           | 60 <sup>+1/-0</sup> | 13±0.5 | 13±0.5   |
| RS-12 |                    | 8K         |           |           |                     |                     |        |          |

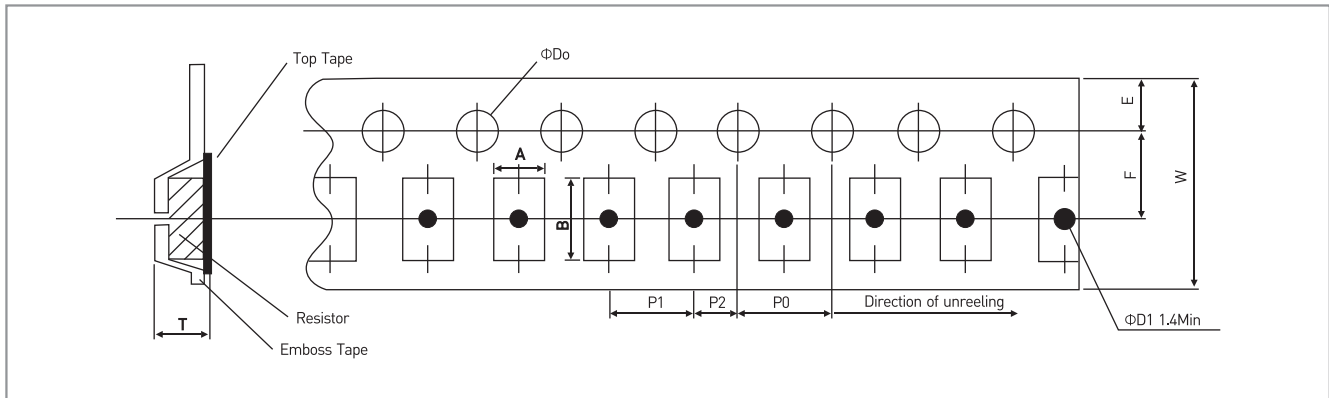


**PAPER TAPE SPECIFICATIONS**



| Model | A        | B        | W     | E        | F        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ΦD <sub>0</sub>        | T        |
|-------|----------|----------|-------|----------|----------|----------------|----------------|----------------|------------------------|----------|
| RS-02 | 0.65±0.1 | 1.15±0.1 | 8±0.2 | 1.75±0.1 | 3.5±0.05 | 4±0.1          | 2±0.05         | 2±0.05         | 1.5 <sup>+0.1/-0</sup> | 0.45±0.1 |
| RS-03 | 1.1±0.1  | 1.9±0.1  | 8±0.2 | 1.75±0.1 | 3.5±0.05 | 4±0.1          | 4±0.05         | 2±0.05         | 1.5 <sup>+0.1/-0</sup> | 0.7±0.1  |
| RS-06 | 1.9±0.1  | 3.5±0.2  | 8±0.2 | 1.75±0.1 | 3.5±0.05 | 4±0.1          | 4±0.05         | 2±0.05         | 1.5 <sup>+0.1/-0</sup> | 0.85±0.1 |
| RS-10 | 2.9±0.1  | 3.5±0.2  | 8±0.2 | 1.75±0.1 | 3.5±0.05 | 4±0.1          | 4±0.05         | 2±0.05         | 1.5 <sup>+0.1/-0</sup> | 0.85±0.1 |

**EMBOSSED PLASTIC TAPE SPECIFICATIONS**



| Model | A        | B        | W         | E         | F        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ΦD <sub>0</sub>      | T     |
|-------|----------|----------|-----------|-----------|----------|----------------|----------------|----------------|----------------------|-------|
| RS-0A | 2.8±0.10 | 5.5±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10       | 4.0±0.10       | 2.0±0.05       | 1.5 <sup>+1/-0</sup> | 1.2±0 |
| RS-12 | 3.5±0.10 | 6.7±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10       | 4.0±0.10       | 2.0±0.05       | 1.5 <sup>+1/-0</sup> | 1.2±0 |

**ORDERING PROCEDURE EXAMPLE**

| Ordering Example | Model | Power Rating  | Resistance | Tolerance | Code               |
|------------------|-------|---------------|------------|-----------|--------------------|
| RS-02 L0R05F4    | RS-02 | L(Standard)   | 50mΩ       | F[±1%]    | 4(7" Reel 4Kpcs)   |
| RS-03 P0R1J6     | RS-03 | P(High Power) | 100mΩ      | J[±5%]    | 6(7" Reel 10Kpcs)  |
| RS-05 L0R02F7    | RS-05 | L(Standard)   | 20mΩ       | F[±1%]    | 7(7" Reel 5Kpcs)   |
| RS-06 P0R5J9     | RS-06 | P(High Power) | 500mΩ      | J[±5%]    | 9(10" Reel 8Kpcs)  |
| RS-10 L0R01FA    | RS-10 | L(Standard)   | 10mΩ       | F[±1%]    | A(10" Reel 10Kpcs) |
| RS-0A P0R05JC    | RS-0A | P(High Power) | 50mΩ       | J[±5%]    | C(13" Reel 40Kpcs) |
| RS-12 L0R5FF     | RS-12 | L(Standard)   | 500mΩ      | F[±1%]    | F(Bulk)            |