

Data Sheet

Customer:

Product: Current Sensing Thick Film Chip Resistor - RS Series

Size: 0402/0603/0805/1206/1210/2010/2512

Issued Date: 15-Nov-21

Edition: REV.B4



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|---------------------|-----------------|---------------------|------------------------|---------------------------|
| 15-Nov-21 | 15-Nov-21 | 15-Nov-21 | | |
| Susan Huang | J.C. Liu | J.C. Liu | | |

Current Sensing Thick Film Chip Resistor
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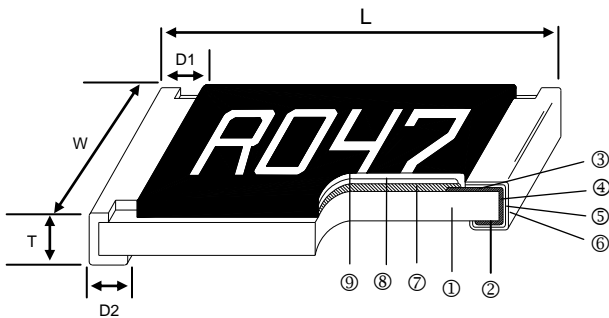
Scope

– This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

Features

- Low inductance
- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Reduced size of final equipment reliability
- RoHS Compliance

Construction



Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Application
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Disk Driver

| | | |
|---------------------|----------------------|----------------------|
| ① Alumina Substrate | ④ Edge Electrode | ⑦ Resistor Layer |
| ② Bottom Electrode | ⑤ Barrier Layer | ⑧ Primary Overcoat |
| ③ Top Electrode | ⑥ External Electrode | ⑨ Secondary Overcoat |

Dimensions

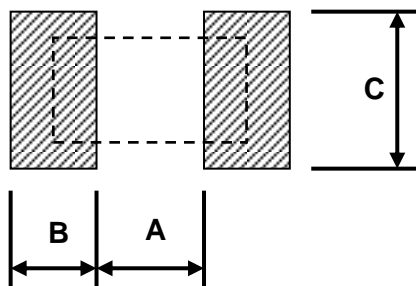
| Type | Size (Inch) | L (mm) | W (mm) | T (mm) | D1 (mm) | D2 (mm) | Weight (g) (1000pcs) |
|-------|-------------|-----------|-----------|-----------|-----------|-----------|----------------------|
| RS-02 | 0402 | 1.00±0.05 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.20±0.10 | 0.620 |
| RS-03 | 0603 | 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 |

Part Numbering

Part Number : RS-03FL7-0R047

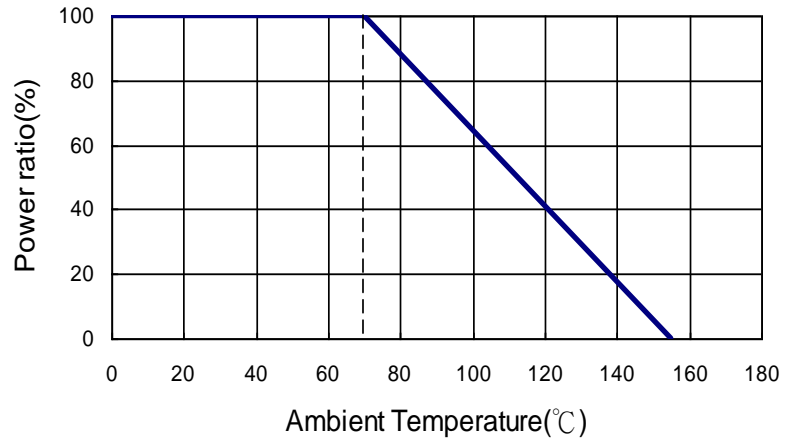
| | | | | | |
|---------------------|--|------------------------------|------------------------------|---|---|
| RS- | 03 | F | L | 7 | - 0 R 0 4 7 |
| Product Type | Dimensions | Resistance Tolerance | Function Code | Packaging Code | Resistance |
| RS | 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512 | F: $\pm 1\%$ J: $\pm 5\%$ | L: Standard P: High Power | 4: 7" Reel 4Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs 9: 10" Reel 8Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs F: Bulk | - 0R047: 0.047Ω --- 0R1: 0.1Ω "-" to fill up 6 spaces |

Recommend Land Pattern

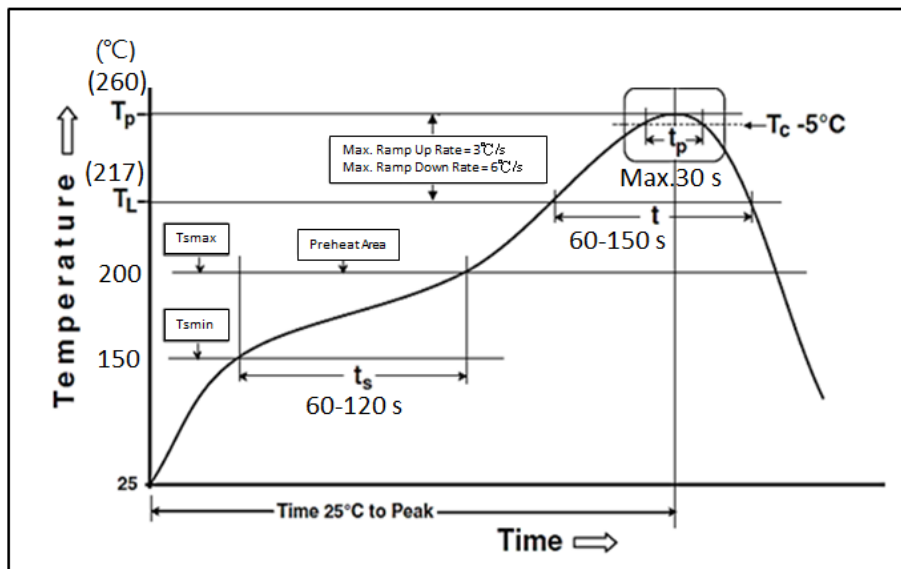


| Type | A (mm) | B (mm) | C (mm) |
|-------|--------|--------|--------|
| RS-02 | 0.50 | 0.45 | 0.60 |
| RS-03 | 0.90 | 0.60 | 0.90 |
| RS-05 | 1.20 | 0.70 | 1.30 |
| RS-06 | 2.00 | 0.90 | 1.60 |
| RS-10 | 2.00 | 0.90 | 2.80 |
| RS-0A | 3.80 | 0.90 | 2.80 |
| RS-12 | 3.80 | 1.60 | 3.50 |

Derating Curve



Soldering Condition (IPC/JEDEC J-STD-020)



Standard Electrical Specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Max. Operating Current | Resistance Range (mΩ) | | TCR (PPM/°C) |
|--------------|-------------------------|--------------------------|---------------------------|--|-----|--------------------------------|
| | | | | ±1% | ±5% | |
| RS-02 (0402) | 1/16W | -55 ~ +155°C | 1.11A | 50 - 91 100 - 976 | | ±800 ±500 |
| RS-03 (0603) | 1/10W | -55 ~ +155°C | 2.23A | 20 - 47 50 - 91 100 - 976 | | ±1200 ±800 ±500 |
| RS-05 (0805) | 1/8W | -55 ~ +155°C | 3.53A | 10 - 18 20 - 47 50 - 91 100 - 976 | | ±1500 ±1200 ±800 ±500 |
| RS-06 (1206) | 1/4W | -55 ~ +155°C | 5.00A | | | |
| RS-10 (1210) | 1/3W | -55 ~ +155°C | 5.77A | | | |
| RS-0A (2010) | 3/4W | -55 ~ +155°C | 8.66A | 10 - 18 20 - 91 100 - 976 | | ±1500 ±800 ±500 |
| RS-12 (2512) | 1W | -55 ~ +155°C | 10.0A | | | |

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

High Power Electrical Specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Max. Operating Current | Resistance Range (mΩ) | | TCR (PPM/°C) |
|--------------|-------------------------|--------------------------|---------------------------|--|-----|--------------------------------|
| | | | | ±1% | ±5% | |
| RS-02 (0402) | 1/10W | -55 ~ +155°C | 1.40A | 50 - 91 100 - 976 | | ±800 ±500 |
| RS-03 (0603) | 1/8W | -55 ~ +155°C | 2.50A | 20 - 47 50 - 91 100 - 976 | | ±1200 ±800 ±500 |
| RS-05 (0805) | 1/4W | -55 ~ +155°C | 5.00A | 10 - 18 20 - 47 50 - 91 100 - 976 | | ±1500 ±1200 ±800 ±500 |
| RS-06 (1206) | 1/2W | -55 ~ +155°C | 7.07A | | | |
| RS-10 (1210) | 1/2W | -55 ~ +155°C | 7.07A | | | |
| RS-0A (2010) | 1W | -55 ~ +155°C | 10.0A | 10 - 18 20 - 91 100 - 976 | | ±1500 ±800 ±500 |
| RS-12 (2512) | 2W | -55 ~ +155°C | 14.1A | | | |

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

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

Operating Current= $\sqrt{P/R}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

| Item | Requirement | | Test Method |
|--|---|---------------|---|
| | ±1% | ±5% | |
| Temperature Coefficient of Resistance (T.C.R.) | As Spec. | | JIS-C-5201-1 4.8 IEC-60115-1 4.8 At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature |
| Short Time Overload | ±(1.0%+0.05Ω) | ±(2.0%+0.05Ω) | JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds, 2 seconds for High Power Series |
| Insulation Resistance | ≥10G | | JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute |
| Endurance | ±(1.0%+0.10Ω) | ±(2.0%+0.10Ω) | JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Damp Heat with Load | ±(1.0%+0.10Ω) | ±(2.0%+0.10Ω) | JIS-C-5201-1 4.24 IEC-60115-1 4.24 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Dry Heat | ±(1.0%+0.05Ω) | ±(1.5%+0.10Ω) | JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +155°C for 1000 hrs |
| Bending Strength | ±(1.0%+0.05Ω) | ±(1.0%+0.05Ω) | JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm |
| Solderability | 95% min. coverage | | JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds |
| Resistance to Soldering Heat | ±(0.5%+0.05Ω) | ±(1.0%+0.05Ω) | JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds |
| Voltage Proof | No breakdown or flashover | | JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute RS-02:100V; RS-03:150V; RS-05:300V RS-06/10/0A:400V; RS-12:500V |
| Leaching | Individual leaching area ≤5% Total leaching area ≤ 10% | | JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds |
| Rapid Change of Temperature | ±(0.5%+0.05Ω) | ±(1.0%+0.05Ω) | JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +155°C, 5 cycles |

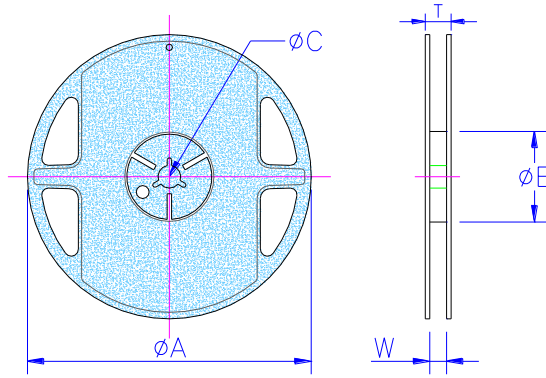
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ **Storage Temperature: 15~28°C; Humidity < 80%RH**

■ **Shelf Life: 2 years from production date.**

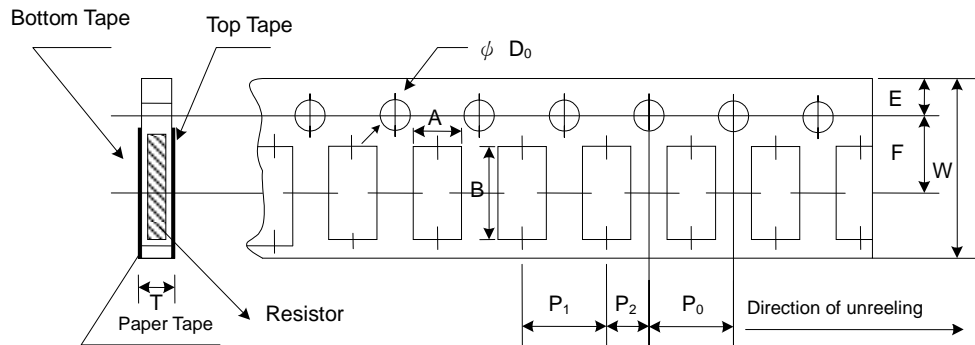
■ Packaging

Reel Specifications & Packaging Quantity



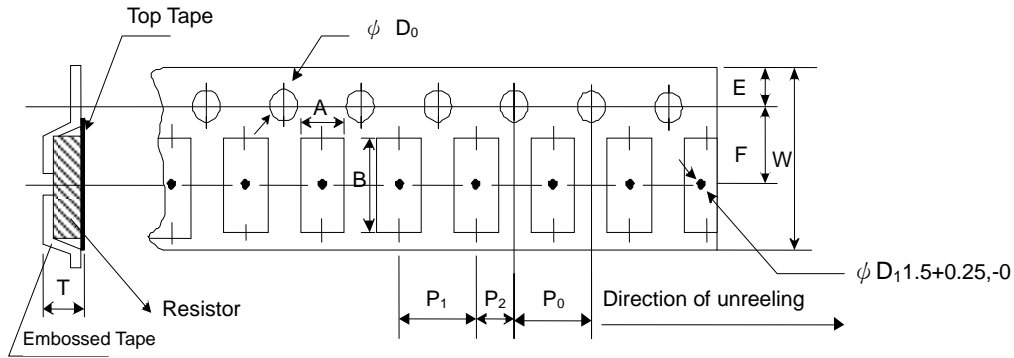
| Type | Packaging Quantity | Tape Width | Reel Diameter | ΦA (mm) | ΦB (mm) | ΦC (mm) | W (mm) | T (mm) | |
|-------|--------------------|------------|---------------|---------------|---------------|---------------------|----------|----------|----------|
| RS-02 | Paper | 10K | 8mm | 7 inch | 178.5±1.5 | 60 ^{+1/-0} | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 |
| | | 20K | 8mm | 10 inch | 254±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| | | 40K | 8mm | 13 inch | 330±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| RS-03 | Paper | 5K | 8mm | 7 inch | 178.5±1.5 | 60 ^{+1/-0} | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 |
| RS-05 | | 10K | 8mm | 10 inch | 254±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| RS-06 | | 20K | 8mm | 13 inch | 330±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
| RS-10 | Embossed | 4K | 12mm | 7 inch | 178.5±1.5 | 60 ^{+1/-0} | 13.0±0.5 | 13.0±0.5 | 15.5±0.5 |
| RS-12 | | 8K | 12mm | 10 inch | 250±1.0 | 62±0.5 | 13.0±0.5 | 12.5±0.5 | 16.5±0.5 |

Paper Tape Specifications



| Type | A (mm) | B (mm) | W (mm) | E (mm) | F (mm) | P ₀ (mm) | P ₁ (mm) | P ₂ (mm) | ΦD_0 (mm) | T (mm) |
|-------|-----------|-----------|-----------|-----------|-----------|---------------------|---------------------|---------------------|-----------------|-----------|
| RS-02 | 0.65±0.10 | 1.15±0.10 | 8.00±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.45±0.10 |
| RS-03 | 1.10±0.10 | 1.90±0.10 | 8.00±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.70±0.10 |
| RS-05 | 1.60±0.10 | 2.40±0.20 | 8.00±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.10 |
| RS-06 | 1.90±0.10 | 3.50±0.20 | 8.00±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.10 |
| RS-10 | 2.90±0.10 | 3.50±0.20 | 8.00±0.20 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.10 |

Embossed Plastic Tape Specifications



| Type | A (mm) | B (mm) | W (mm) | E (mm) | F (mm) | P ₀ (mm) | P ₁ (mm) | P ₂ (mm) | ΦD ₀ (mm) | T (mm) |
|-------|-----------|-----------|-----------|-----------|-----------|---------------------|---------------------|---------------------|----------------------|-------------------|
| RS-0A | 2.80±0.10 | 5.40±0.20 | 12.0±0.30 | 1.75±0.10 | 5.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.1, -0 | 1.2 ⁺⁰ |
| RS-12 | 3.50±0.10 | 6.70±0.10 | 12.0±0.30 | 1.75±0.10 | 5.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.1, -0 | 1.2 ⁺⁰ |

■ Marking

No Marking for 0402

1%, 5% for 0805/1206/1210/2010/2512: 4 digits marking

Example:

| | | | | | |
|------------|------|------|------|-------|-------|
| Resistance | 47mΩ | 75mΩ | 15mΩ | 750mΩ | 820mΩ |
| Marking | R047 | R075 | R015 | R750 | R820 |

5% for 0603: 3 digits marking in E24

1% for 0603: 3 digits marking with under-line in E96 (non-including E24 series)



3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ



3 digits marking for E96: 243=243mΩ; 511=511mΩ

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------------|--------------|----------------------------|--|
| Version A9 | Jun 03, 2014 | - | - Environmental Characteristics updated |
| Version B | Jul 15, 2016 | - | - Remove Material Description - Modify Storage Temperature |
| Version B1 | Mar 06, 2017 | - | - Size 1206 High power product Power rating 1/3W upgrade to 1/2W |
| Version B2 | May 20, 2019 | - | - Modify TCR Test description |
| Version B3 | Mar 10, 2021 | - | - Modify Bending Test description - Modify 2010 Embossed Plastic Tape B Specification - Modify Soldering Condition (IPC/JEDEC J-STD-020) |
| Version B4 | Nov 15, 2021 | - | - Increase the shelf life description |

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