

SMD - Resistors

| | |
|-----------|--|
| Product : | Thin Film Current Sensing Chip Resistor –SMDS Series |
| Size : | 0402/0603/0805/1206/2010/2512 |



official distributor of



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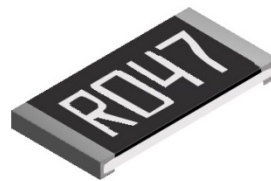
Thin Film Current Sensing Chip Resistor (SMDS Series)

► 1. Features

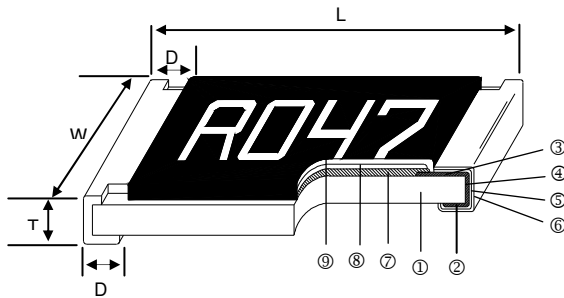
- Thin film process
- High power rating up to 3 Watts in 2512 size
- Tight tolerance down to $\pm 0.5\%$
- Extremely low TCR down to ± 50 PPM/ $^{\circ}\text{C}$
- Resistance values from 50m to 1ohm
- High purity alumina substrate for high power dissipation

► 2. Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver
- Portable Devices (PDA, Cell Phone)



► 3. Construction



| | | |
|-------------------------|---------------------------|-------------------------|
| ① Alumina Substrate | ④ Edge Electrode (NiCr) | ⑦ Resistor Layer (NiCr) |
| ② Bottom Electrode (Ag) | ⑤ Barrier Layer (Ni) | ⑧ Overcoat (Epoxy) |
| ③ Top Electrode (Ag-Pd) | ⑥ External Electrode (Sn) | ⑨ Marking |

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► 4. Dimensions

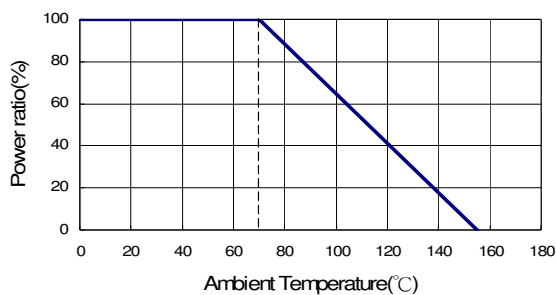
Unit: mm

| Type | Size (Inch) | L | W | T | D1 | D2 | Weight (g) (1000pcs) |
|-----------|-------------|-----------|-----------|-----------|-----------|-----------|----------------------|
| SMDS 0402 | 0402 | 1.00±0.05 | 0.50±0.05 | 0.32±0.10 | 0.25±0.10 | 0.20±0.10 | 0.56 |
| SMDS 0603 | 0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 | 3.1 |
| SMDS 0805 | 0805 | 2.00±0.15 | 1.25±0.15 | 0.55±0.10 | 0.30±0.20 | 0.40±0.25 | 5.6 |
| SMDS 1206 | 1206 | 3.05±0.15 | 1.55±0.15 | 0.55±0.10 | 0.50±0.30 | 0.40±0.25 | 12.3 |
| SMDS 2010 | 2010 | 5.00±0.20 | 2.45±0.15 | 0.60±0.15 | 0.60±0.30 | 0.50±0.25 | 26.7 |
| SMDS 2512 | 2512 | 6.35±0.20 | 3.15±0.15 | 0.60±0.10 | 0.60±0.30 | 0.55±0.25 | 49.6 |

► 5. Part Numbering

| SMDS | 2512 | F | T | E | | R010 | N |
|--------------|--|----------------------|---------------------------|------------------------------|---------------------|---------------------------------------|-----------------------------|
| Product Type | Dimensions (L×W) | Resistance Tolerance | Packaging Code | TCR (PPM/°C) | Power Rating | Resistance | Marking |
| | 0402 0603 0805 1206 2010 2512 | D: ±0.5% F: ±1% | T: Taping Reel B: Bulk | D: ±50 E: ±100 F: ±200 | : Standard R: 3W | R010: 0.01Ω R100: 0.1Ω 1R00: 1Ω | : Standard N: No Marking |

► 6. Derating Curve



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7. Standard Electrical Specifications

| Type | Item | Power Rating at 70°C | Operating Temp. Range | Resistance Range (mΩ) | | TCR (PPM/°C) |
|-----------|------|----------------------|-----------------------|-------------------------------------|-------------------------|---------------------|
| | | | | ±0.5% | ±1% | |
| SMDS 0402 | | 1/16W | -55~+155°C | 500 - 1000 | | ±100 ±50 |
| SMDS 0603 | | 1/10W | -55~+155°C | 200 - 300 301 - 1000 | | ±100 ±50 |
| SMDS 0805 | | 1/8W | | 200 - 300 301 - 1000 | | ±100 ±50 |
| SMDS 1206 | 1/4W | -55~+155°C | — | | 50 - 100 | ±200 ±100 ±50 |
| | | | | | 101 - 300 301 - 1000 | |
| SMDS 2010 | | 3/4W | -55~+155°C | 50 - 100 101 - 300 301 - 1000 | | ±200 ±100 ±50 |
| SMDS 2512 | | 1W | -55~+155°C | 50 - 100 101 - 300 301 - 1000 | | ±200 ±100 ±50 |

7.1 High Power Rating Electrical Specifications

| Type | Item | Power Rating at 70°C | Operating Temp. Range | Resistance Range (mΩ) | | TCR (PPM/°C) |
|-----------|------|----------------------|-----------------------|-----------------------|--|--------------|
| | | | | ±1% | | |
| SMDS 2512 | | 3W | -55~+155°C | 100 - 1000 | | ±100 |

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

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

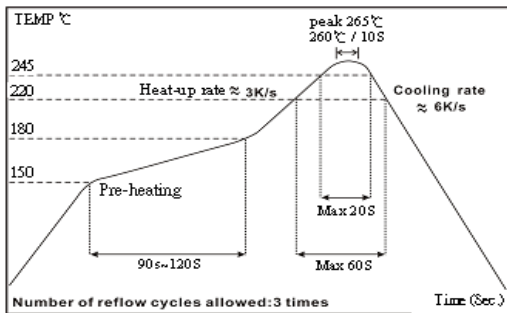
8. Environmental Characteristics

| Item | Requirement | Test Method |
|--|-------------------|--|
| Temperature Coefficient of Resistance (T.C.R.) | As Spec. | MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C |
| Short Time Overload | ±1% | JIS-C-5201-1 5.5 RCWV*2.5 or Max. overload voltage for 5 seconds |
| Insulation Resistance | >1000MΩ | MIL-STD-202F Method 302 Apply 100V _{DC} for 1 minute |
| Endurance | ±1% | MIL-STD-202F Method 108A 70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" |
| Damp Heat with Load | ±0.5% | MIL-STD-202F Method 103B 40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" |
| Bending Strength | As Spec. | JIS-C-5201-1 6.1.4 Bending amplitude 3mm for 10 seconds |
| Solderability | 95% min. coverage | MIL-STD-202F Method 208H 245±5°C for 3 seconds |
| Resistance to Soldering Heat | ±0.5% | MIL-STD-202F Method 210E 260±5°C for 10 seconds |
| Dielectric Withstand Voltage | By Type | MIL-STD-202F Method 301 Apply Max. Overload Voltage for 1 minute |
| Thermal Shock | ±0.5% | MIL-STD-202F Method 107G -55°C ~150°C, 100 cycles |
| Low Temperature Operation | ±0.5% | JIS-C-5201-1 7.1 1 hour, -65°C followed by 45 minutes of RCWV |

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

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► 9. Reflow



► 10. Marking

0603 3digit marking

Example :

| Resistance | 1Ω | 0.1Ω | 0.15Ω | 0.01Ω | 0.101Ω | 0.035Ω |
|------------|-----|------|-------|-------|------------|------------|
| Codes | 1R0 | R10 | R15 | R01 | <u>101</u> | <u>035</u> |

0805-2512 4digit marking

Example :

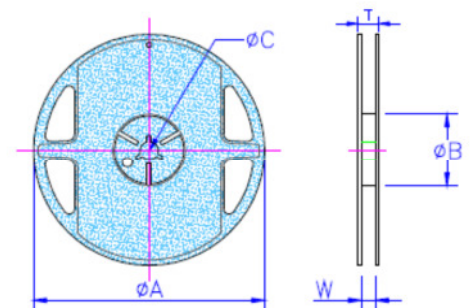
| Resistance | 1Ω | 0.1Ω | 0.05Ω | 0.015Ω | 0.01Ω |
|------------|------|------|-------|--------|-------|
| Codes | 1R00 | R100 | R050 | R015 | R010 |

► 11. Packaging

Packaging Quantity & Reel Specifications

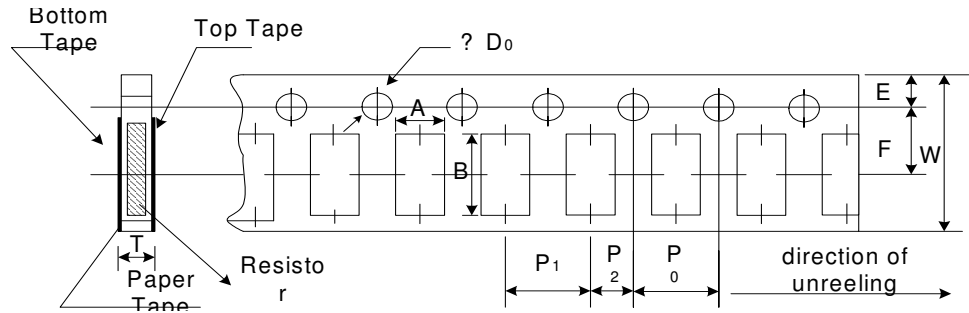
Unit :mm

| Type | ψA | ΦB | ψC | W | T | Paper Tape (EA) | Emboss Plastic Tape (EA) |
|-------|-----------|----------|----------|-----------|----------|-----------------|--------------------------|
| TCS02 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 10,000 | |
| TCS03 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 5,000 | - |
| TCS05 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 5,000 | - |
| TCS06 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 5,000 | - |
| TCS10 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.00 | 15.5±1.0 | - | 4,000 |
| TCS12 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.00 | 15.5±1.0 | - | 4,000 |



SMD - Resistors

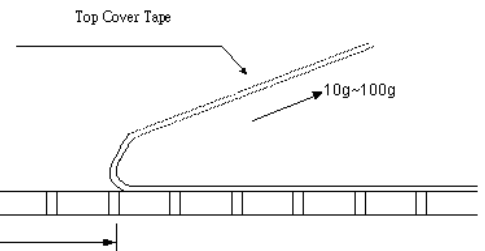
Paper Tape Specifications



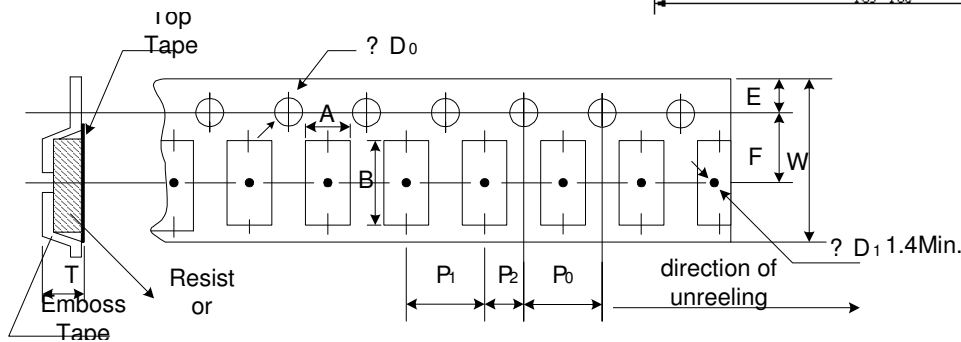
Unit: mm

| Type | A | B | W | E | F | P ₀ | P ₁ | P ₂ | ψD ₀ | T |
|----------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| SMDS0402 | 0.70±0.05 | 1.16±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.55±0.05 | 0.40±0.03 |
| SMDS0603 | 1.10±0.05 | 1.90±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.60±0.03 |
| SMDS0805 | 1.60±0.05 | 2.37±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |
| SMDS1206 | 2.00±0.05 | 3.55±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |

- Peel force of top cover tape
- The peel speed shall be about 300mm/min±5%
- The peel force of top cover tape shall be between 10 to 100g



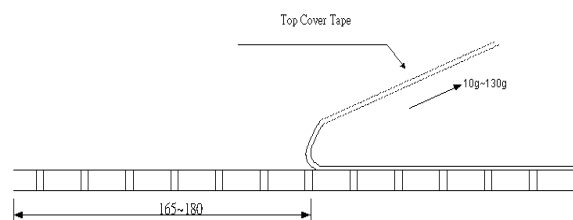
Emboss Plastic Tape Specifications



Unit: mm

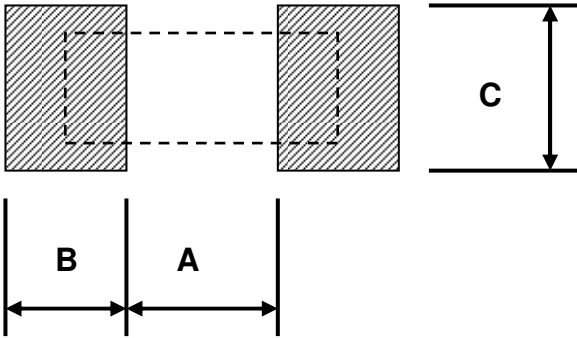
| Type | A | B | W | E | F | P ₀ | P ₁ | P ₂ | ψD ₀ | T |
|----------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| SMDS2010 | 2.85±0.10 | 5.45±0.10 | 12.0±0.10 | 1.75±0.10 | 5.5±0.05 | 4.00±0.05 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 1.00±0.20 |
| SMDS2512 | 3.40±0.10 | 6.65±0.10 | 12.0±0.10 | 1.75±0.10 | 5.5±0.05 | 4.00±0.05 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 1.00±0.20 |

- Peel force of top cover tape
- The peel speed shall be about 300mm/min±5%
- The peel force of top cover tape shall be between 10 to 130g



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▶ 12. Recommended Land Pattern



Unit : mm

| Type | A | B | C |
|----------|------|------|----------|
| SMDS0402 | 0.50 | 0.50 | 0.60±0.2 |
| SMDS0603 | 0.80 | 1.00 | 0.90±0.2 |
| SMDS0805 | 1.00 | 1.00 | 1.35±0.2 |
| SMDS1206 | 2.00 | 1.15 | 1.70±0.2 |
| SDMS2010 | 3.60 | 1.40 | 2.50±0.2 |
| SDMS2512 | 4.90 | 1.60 | 3.10±0.2 |