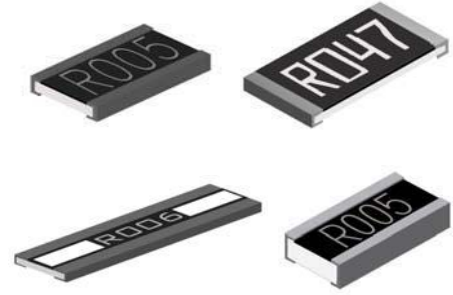


Current Sensing Resistor (CS Series)

1. Application

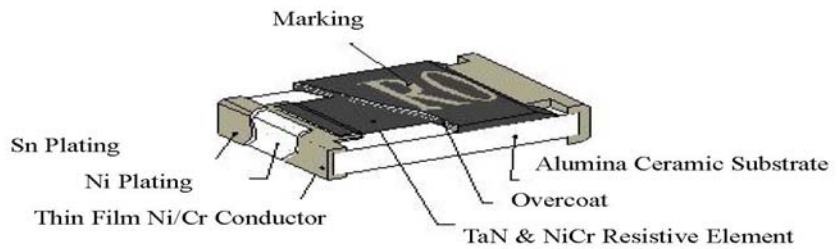
- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Application
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver
- Portable Devices (PDA, Cell phone)



2. Features

- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of $\pm 100\text{PPM}/^\circ\text{C}$
- Resistance values from 1m to 1 ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating

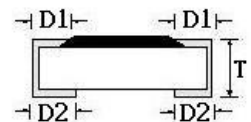
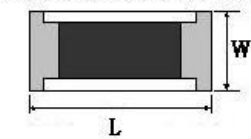
Construction



3. Dimensions

Unit: mm

0402/0603/0805/1206/2010/2512



1225/3720/7520



| SIZE | STYLE | L | W | T | D1 | D2 |
|---------|-------|-----------|-----------|-----------|-----------|-----------|
| 0201 | CS01 | 0.58±0.05 | 0.29±0.05 | 0.23±0.05 | 0.12±0.05 | 0.15±0.05 |
| 0402 | CS02 | 1.00±0.05 | 0.50±0.05 | 0.32±0.10 | 0.25±0.10 | 0.20±0.10 |
| 0603 | CS03 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| 0805 | CS05 | 2.00±0.15 | 1.25±0.15 | 0.55±0.10 | 0.30±0.20 | 0.40±0.25 |
| 1206 | CS06 | 3.05±0.15 | 1.55±0.15 | 0.55±0.10 | 0.50±0.30 | 0.40±0.25 |
| 1210 | CS13 | 3.00±0.15 | 2.50±0.15 | 0.55±0.10 | 0.50±0.30 | 0.50±0.25 |
| 2010 | CS10 | 5.00±0.2 | 2.45±0.15 | 0.60±0.15 | 0.60±0.30 | 0.50±0.25 |
| 2512 | CS12 | 6.35±0.2 | 3.15±0.15 | 0.60±0.10 | 0.60±0.30 | 0.55±0.25 |
| 2512 | CS12 | 6.35±0.2 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 0.55±0.25 |
| 10-99mΩ | (2W) | | | | | |
| 2512 | CS12 | 6.35±0.2 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 2.70±0.10 |
| 10-99mΩ | (2W) | | | | | |
| 1225 | CS25 | 3.10±0.15 | 6.30±0.15 | 0.90±0.15 | 0.60±0.30 | 0.55±0.25 |
| 3720 | CS37 | 2.00±0.20 | 3.75±0.20 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 |
| 7520 | CS75 | 2.00±0.20 | 7.50±0.30 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 |

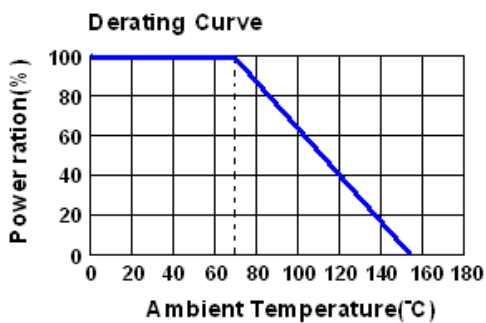
Current Sensing Resistor (CS Series)

4. Product Identification

CS 06 F T G U R100 N
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

| ① Product Type | | |
|------------------------|-------------------------------|------|
| Product Type | | |
| CS | Current Sensing Chip Resistor | |
| ② Dimensions (LxW) | | |
| Codes | Dimension (LxW) | |
| CS01 | 0.58x0.29mm | 0201 |
| CS02 | 1.00x0.50mm | 0402 |
| CS03 | 1.60x0.80mm | 0603 |
| CS05 | 2.00x1.25mm | 0805 |
| CS06 | 3.10x1.55mm | 1206 |
| CS13 | 3.00x2.50mm | 1210 |
| CS10 | 5.00x2.50mm | 2010 |
| CS12 | 6.30x3.10mm | 2512 |
| CS25 | 3.10x6.30mm | 1225 |
| CS37 | 3.75x2.00mm | 3720 |
| CS75 | 7.50x2.00mm | 7520 |
| ③ Resistance Tolerance | | |
| Codes | Resistance Tolerance | |
| J | ±5% | |
| G | ±2% | |
| F | ±1% | |
| ④ Packaging | | |
| Codes | Type | |
| T | Taping Reel | |
| B | Bulk | |

| ⑤ TCR | |
|----------------|-------------|
| Codes | Type |
| E | ±100PPM/°C |
| K | ±150PPM/°C |
| F | ±200PPM/°C |
| G | ±300PPM/°C |
| H | ±400PPM/°C |
| I | ±500PPM/°C |
| J | ±600PPM/°C |
| R | ±1000PPM/°C |
| ⑥ Power Rating | |
| Codes | Type |
| A | 1.5W |
| T | 1W |
| Q | 3/4W |
| U | 1/2W |
| S | 2W |
| W | 1/8W |
| V | 1/4W |
| ⑦ Resistance | |
| Codes | Type |
| R010 | 0.010Ω |
| R100 | 0.100Ω |
| 1R00 | 1.000Ω |
| ⑧ Marking | |
| Codes | Type |
| | Standard* |
| N | No marking |



Current Sensing Resistor (CS Series)

5. Environmental Characteristics

| Item | | Specification | Test Method |
|------|------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------|
| 1 | Temperature Coefficient of Resistance (T.C.R.) | As Spec | +25/-55/+25/+125/+25°C |
| 2 | Short Time Overload | ±0.5% | RCWV*2.5 or Max Overloading Voltage for 5 Seconds |
| | | △R±1% for high power rating | |
| 3 | Insulation Resistance | > 1000MΩ | Apply 100VCD for 1 minute |
| 4 | Endurance | ±1% | 70±2°C, Max. working voltage for 1000hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" |
| 5 | Damp Heat with Load | ±0.5% | 40±2°C, 90~95% R.H. Max working voltage for 1000hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" |
| 6 | Dry Heat | ±0.5% | At +155°C for 1000 hrs |
| 7 | Bending Strength | As SPEC | Bending Amplitude 3mm for 10 seconds |
| 8 | Solderability | 95%min coverage | 245°C±5°C for 3 seconds |
| 9 | Resistance to Soldering Heat | ±0.5% | 260±5°C for 10 seconds |
| 10 | Dielectric Withstand Voltage | by Type | Apply Max Overload Voltage for 1 minute |
| 11 | Thermal Shock | ±0.5% | -55°C~150°C, 100 cycles |
| 12 | Low Temperature Operation | ±0.5% | 1 hour, -65°C followed by 45minutes of RCWV |

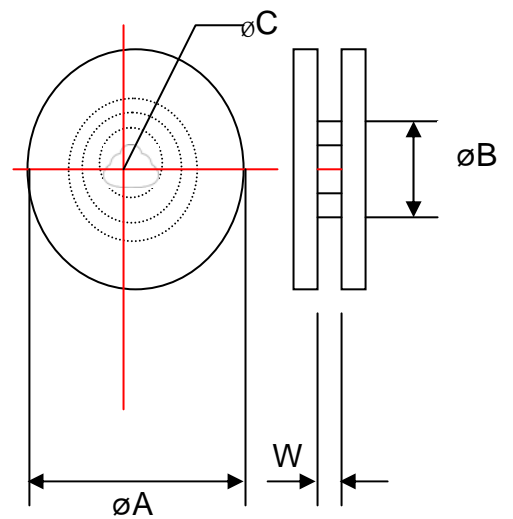
*Reference Standards: MIL-STD-202, JIS-C 5201-1

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

6. Packaging

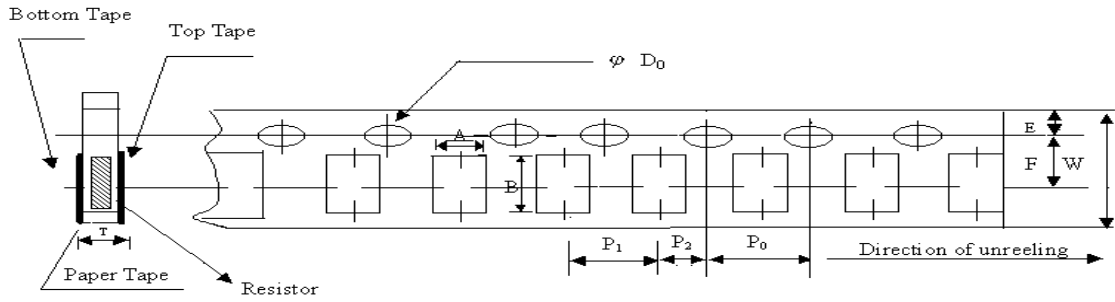
Packaging Quantity & Reel Specifications

| Type | øA | øB | øC | W | T | Unit: mm | |
|----------|-------|------|---------|---------|---------|----------------|----------------------------|
| | | | | | | Paper Tape(EA) | Embossed Plastic Tape (EA) |
| CS01 | 178±1 | 60±1 | 13.5±0. | 9.5±1.0 | 11.5±1. | 10,000 | - |
| CS02 | 178±1 | 60±1 | 13.5±0. | 9.5±1.0 | 11.5±1. | 10,000 | - |
| CS03 | 178±1 | 60±1 | 13.5±0. | 9.5±1.0 | 11.5±1. | 5,000 | - |
| CS05 | 178±1 | 60±1 | 13.5±0. | 9.5±1.0 | 11.5±1. | 5,000 | - |
| CS06 | 178±1 | 60±1 | 13.5±0. | 9.5±1.0 | 11.5±1. | 5,000 | - |
| CS13 | 178±1 | 60±1 | 13.5±0. | 9.5±1.0 | 11.5±1. | 5,000 | - |
| CS10 | 178±1 | 60±1 | 13.5±0. | 13.5±1. | 15.5±1. | - | 4,000 |
| CS12 | 178±1 | 60±1 | 13.5±0. | 13.5±1. | 15.5±1. | - | 4,000 |
| CS12(2W) | 178±1 | 60±1 | 13.5±0. | 13.5±1. | 15.5±1. | - | 2,000 |
| CS25 | 178±1 | 60±1 | 13.5±0. | 13.5±1. | 15.5±1. | - | 2,000 |
| CS37 | 178±1 | 60±1 | 13.5±0. | 13.5±1. | 15.5±1. | - | 2,000 |
| CS75 | 178±1 | 60±1 | 13.5±0. | 17.5±1. | 19.5±1. | - | 2,000 |



Current Sensing Resistor (CS Series)

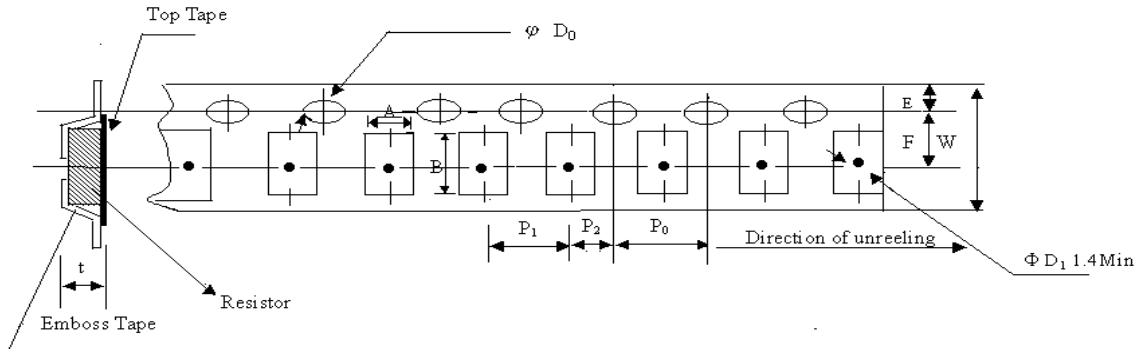
6-1. Paper Tape Specifications



Unit: mm

| Type | A | B | W | E | F | P ₀ | P ₁ | P ₂ | ΨD ₀ | T |
|------|-----------|-----------|---------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| CS01 | 0.40±0.05 | 0.70±0.05 | 8.0±0.1 | 1.75±0.05 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 2.0±0.05 | 1.55±0.03 | 0.42±0.02 |
| CS02 | 0.70±0.05 | 1.16±0.05 | 8.0±0.1 | 1.75±0.05 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 2.0±0.05 | 1.55±0.05 | 0.40±0.03 |
| CS03 | 1.10±0.05 | 1.90±0.05 | 8.0±0.1 | 1.75±0.05 | 3.5±0.05 | 4.0±0.1 | 4.0±0.10 | 2.0±0.05 | 1.55±0.05 | 0.60±0.03 |
| CS05 | 1.60±0.05 | 2.37±0.05 | 8.0±0.1 | 1.75±0.05 | 3.5±0.05 | 4.0±0.1 | 4.0±0.10 | 2.0±0.05 | 1.55±0.05 | 0.75±0.05 |
| CS06 | 2.00±0.05 | 3.55±0.05 | 8.0±0.1 | 1.75±0.05 | 3.5±0.05 | 4.0±0.1 | 4.0±0.10 | 2.0±0.05 | 1.55±0.05 | 0.75±0.05 |
| CS13 | 2.75±0.05 | 3.40±0.05 | 8.0±0.1 | 1.75±0.05 | 3.5±0.05 | 4.0±0.1 | 4.0±0.05 | 2.0±0.05 | 1.55±0.05 | 0.75±0.05 |

6-2. Embossed Plastic Tape Specifications



Unit: mm

| Type | A | B | W | E | F | P ₀ | P ₁ | P ₂ | ΨD ₀ | T |
|--------------|----------|----------|----------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| CS10 | 2.85±0.1 | 5.45±0.1 | 12.0±0.1 | 1.75±0.1 | 5.5±0.05 | 4.0±0.05 | 4.0±0.10 | 2.0±0.05 | 1.50±0.10 | 1.00±0.20 |
| CS12 | 3.40±0.1 | 6.65±0.1 | 12.0±0.1 | 1.75±0.1 | 5.5±0.05 | 4.0±0.05 | 4.0±0.10 | 2.0±0.05 | 1.50±0.10 | 1.00±0.20 |
| CS12 (2W) | 3.38±0.1 | 6.68±0.1 | 12.0±0.3 | 1.75±0.1 | 5.5±0.10 | 4.0±0.1 | 4.0±0.10 | 2.0±0.05 | 1.55±0.05 | 1.45±0.20 |
| CS25 | 3.38±0.1 | 6.68±0.1 | 12.0±0.3 | 1.75±0.1 | 5.5±0.10 | 4.0±0.1 | 4.0±0.10 | 2.0±0.05 | 1.55±0.05 | 1.45±0.20 |
| CS37 | 2.50±0.2 | 4.45±0.2 | 12.0±0.3 | 1.75±0.01 | 5.5±0.05 | 4.0±0.05 | 4.0±0.10 | 2.0±0.05 | 1.50±0.10 | 1.50±0.10 |
| CS75 | 2.50±0.2 | 8.30±0.2 | 16.0±0.3 | 1.75±0.01 | 7.8±0.05 | 4.0±0.05 | 4.0±0.10 | 2.0±0.05 | 1.50±0.10 | 1.50±0.10 |

Current Sensing Resistor (CS Series)

6-3. Recommend Land Pattern

Pad Layout (Except For CS12: High Power Rating Series)

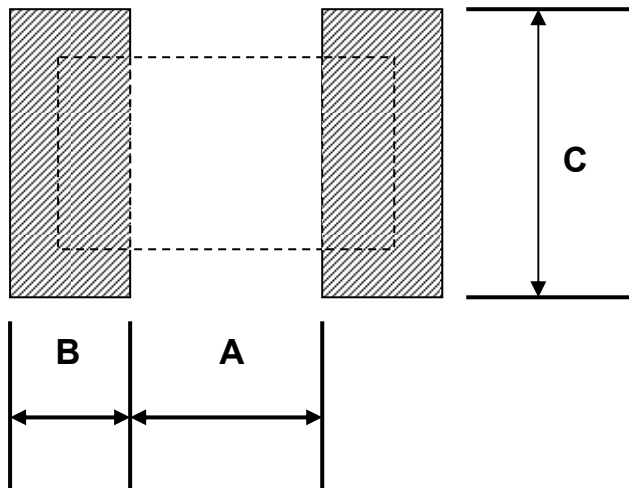
Unit: mm

| Type | A | B | C |
|------|------|------|----------|
| CS01 | 0.25 | 0.30 | 0.40±0.2 |
| CS02 | 0.50 | 0.50 | 0.60±0.2 |
| CS03 | 0.80 | 1.00 | 0.90±0.2 |
| CS05 | 1.00 | 1.00 | 1.35±0.2 |
| CS06 | 2.00 | 1.15 | 1.70±0.2 |
| CS13 | 2.00 | 1.15 | 2.50±0.2 |
| CS10 | 3.60 | 1.40 | 2.50±0.2 |
| CS12 | 4.90 | 1.60 | 3.10±0.2 |
| CS25 | 2.00 | 2.00 | 6.40±0.2 |
| CS37 | 1.00 | 1.80 | 3.90±0.2 |
| CS75 | 1.00 | 1.80 | 7.60±0.2 |

Pad Layout (For CS12: High Power Rating Series)

Unit: mm

| Type | Resistance Range | A | B | C |
|------|------------------|------|------|----------|
| CS12 | 10-99mΩ | 4.90 | 1.60 | 3.10±0.2 |
| CS12 | 100-1000mΩ | 1.00 | 3.55 | 3.10±0.2 |



Current Sensing Resistor (CS Series)

7. Specifications 7-1. Standard electrical specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Resistance Range (mΩ) | | | TCR (PPM/°C) |
|--------------|-------------------------|--------------------------|--------------------------------------------|-----|-----|--------------------------------------|
| | | | ±1% | ±2% | ±5% | |
| CS01 (0201) | 1/20W | -55~+155°C | 100~149 150~500 501~1000 | | | ±1000 ±600 ±300 |
| CS02 (0402) | 1/16W | | 50~100 101~500 501~1000 | | | ±400 ±300 ±200 |
| CS03 (0603) | 1/10W | | 20~50 51~100 101~500 501~1000 | | | ±600 ±400 ±300 ±200 |
| CS05 (0805) | 1/8W | | 20~50 51~100 101~500 501~1000 | | | ±600 ±400 ±300 ±200 |
| CS06 (1206) | 1/4W | | 10~20 21~50 51~99 100~1000 | | | ±600 ±400 ±300 ±200 |
| CS13 (1210) | 1/2W | | | | | |
| CS10 (2010) | 3/4W | | | | | |
| CS12 (2512) | 1W | | | | | |
| CS25 (1225) | 3W | | 3~5 6~20 21~30 31~250 251~8000 | | | ±300 ±200 ±150 ±100 ±200 |
| CS37 (3720) | 1W | | 10~19 20~500 | | | ±300 ±150 |
| CS75 (7520) | 2W | | - | | | ±300 |
| | | | 1~4 | | | ±300 |
| | | | 5~10 11~350 | | | ±200 ±150 |

7-2. High power rating electrical specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Resistance Range (mΩ) | | | TCR (ppm/°C) |
|--------------|-------------------------|--------------------------|--------------------------------------|-----|-----|------------------------------|
| | | | ±1% | ±2% | ±5% | |
| CS03 (0603) | 1/8W | -55~+155°C | 51-100 101-500 501-1000 | | | ±400 ±300 ±200 |
| CS05 (0805) | 1/4W | | | | | |
| CS06 (1206) | 1/2W | | 10-20 21-50 51-500 501-1000 | | | ±600 ±400 ±300 ±200 |
| CS13 (1210) | 3/4W | | | | | |
| CS10 (2010) | 1W | | | | | |
| CS12 (2512) | 1.5W | | | | | |
| CS12 (2512) | 2W | | | | | |

7-3. Low TCR electrical specifications

| Item Type | Power Rating at 70°C | Operating Temp. Range | Resistance Range(mΩ) | | | TCR (PPM/°C) |
|--------------|----------------------------|--------------------------|----------------------|-----|-----|-----------------|
| | | | ±1% | ±2% | ±5% | |
| CS06 (1206) | 1/4W | -55~+155°C | 100~1000 | | | ±100 |
| CS13 (1210) | 1/2W | | 100~1000 | | | ±100 |
| CS10 (2010) | 3/4W | | 100~1000 | | | ±100 |
| CS12 (2512) | 1W | | 20~1000 | | | ±100 |
| CS37 (3720) | 1W | | 100~500 | | | ±100 |
| CS75 (7520) | 2W | | 50~350 | | | ±100 |

7-4. Marking for 0603

| Code | Type |
|------------|---------|
| 1R0 | 1.000 Ω |
| R10 | 0.100 Ω |
| R01 | 0.010 Ω |
| 101 | 0.101 Ω |
| 035 | 0.035 Ω |

*Operating Current $I = \sqrt{(P/R)}$; Overload Voltage $= 2.5 * \sqrt{(P * R)}$; Operating Current $= V = \sqrt{(P * R)}$