

Surface Mount Current Detecting Chip Resistors

**CS Surface Mount Current Detecting Resistors
Save Space and Weight**

▶ Preview

Token Electronics has launched the CS series, a family of ultra small low-value current-sense surface-mount chip resistors. These smaller sizes save space on the circuit board, allowing the production of smaller and lighter products.

The new series complements Token's existing LRC Series, offering metal resistive film on ceramic construction but providing increased choice for product designers in the form of more smaller sizes options of 0201, 0402, 0603, 0805, 1206, 2010, 2512, 1225, 3720, and 7520.

Designed for current detecting in power electronic systems, the fully RoHS compliant CS series is suitable for a range of applications including the monitoring of power usage and battery life; and provision of output protection for power supplies; as well as for a range of consumer and automotive products such as satellite navigation, handheld PDAs and digital set-top boxes.

The series offers ohmic values as low as $1\text{m}\Omega$ to minimise power consumption and has an ambient temperature range of -55°C to $+155^\circ\text{C}$.

Exhibiting a resistance range up to 1Ω and excellent heat dissipation qualities, the series offers designers enhanced power handling capabilities and protection from the threat of localised heating, resulting in the production of a more energy efficient product.

As demand continues to grow for reduced size, handheld and portable devices operating at low voltages, designers will look to manufacturers to produce smaller and smaller current sense resistors. Token expects that demand for its latest range of small size resistors will be high.

Contact us with your specific needs.

▶ Features

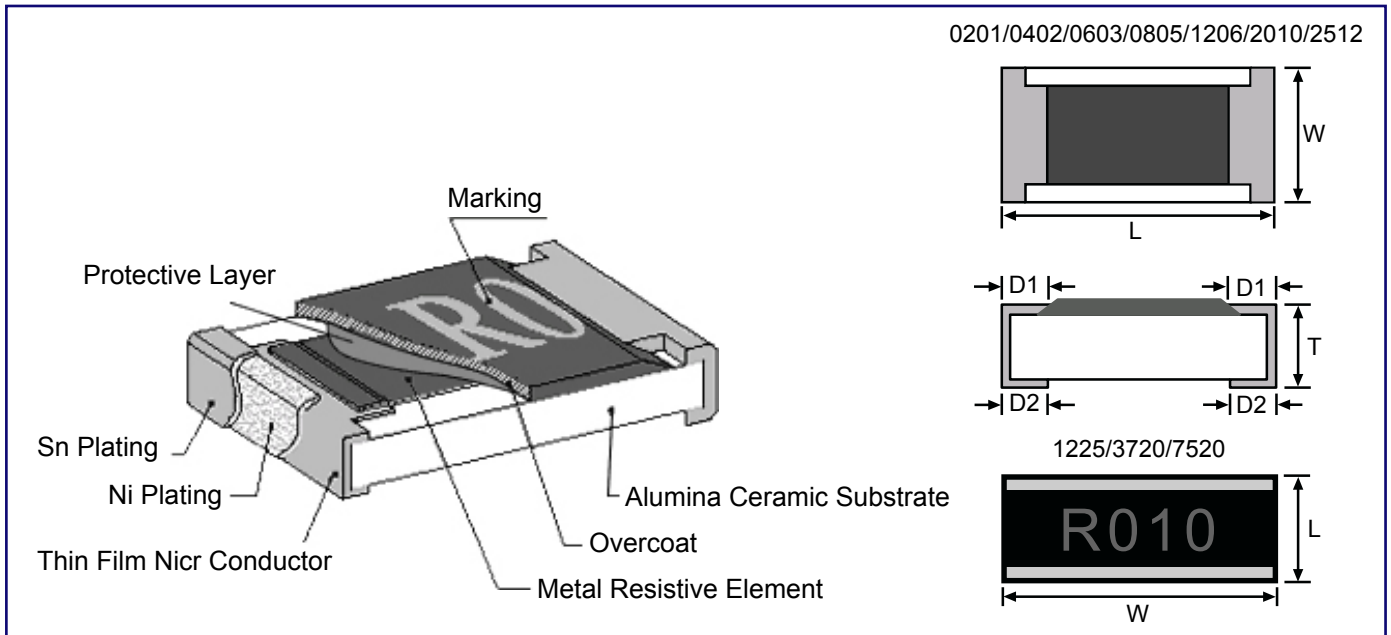
- Low TCR ± 50 , $\pm 100\text{PPM}/^\circ\text{C}$
- Resistance Values from $1\text{m}\Omega$ to 1Ω .
- 3W Power Rating in 1W size, 1225 Package.
- Long size Terminations with Higher Power Rating.
- High Purity Alumina Substrate for High Power Dissipation.
- Products with Pb-free Terminations Meet RoHS Requirements.

▶ Applications

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



► Dimensions (Unit: mm)



| Type | L (Unit: mm) | W (Unit: mm) | T (Unit: mm) | D1 (Unit: mm) | D2 (Unit: mm) |
|-----------------------------|--------------|--------------|--------------|---------------|---------------|
| CS01 (0201) | 0.58±0.05 | 0.29±0.05 | 0.23±0.05 | 0.12±0.05 | 0.15±0.05 |
| CS02 (0402) | 1.00±0.05 | 0.50±0.05 | 0.32±0.10 | 0.25±0.10 | 0.20±0.10 |
| CS03 (0603) | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| CS05 (0805) | 2.00±0.15 | 1.25±0.15 | 0.55±0.10 | 0.30±0.20 | 0.40±0.25 |
| CS06 (1206) | 3.05±0.15 | 1.55±0.15 | 0.55±0.10 | 0.50±0.30 | 0.40±0.25 |
| CS13 (1210) | 3.00±0.15 | 2.50±0.15 | 0.55±0.10 | 0.50±0.30 | 0.50±0.25 |
| CS10 (2010) | 5.00±0.20 | 2.45±0.15 | 0.60±0.15 | 0.60±0.30 | 0.50±0.25 |
| CS12 (2512) | 6.35±0.20 | 3.15±0.15 | 0.60±0.10 | 0.60±0.30 | 0.55±0.25 |
| CS12 (2512)(2W)(10~99mΩ) | 6.35±0.20 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 0.55±0.25 |
| CS12 (2512)(2W)(100~1000mΩ) | 6.35±0.20 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 2.70±0.10 |
| CS25 (1225) | 3.10±0.15 | 6.30±0.15 | 0.90±0.15 | 0.60±0.30 | 0.55±0.25 |
| CS37 (3720) | 2.00±0.20 | 3.75±0.20 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 |
| CS75 (7520) | 2.00±0.20 | 7.50±0.30 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 |

Standard Electrical Specifications

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

Note:Token has the ability to manufacture following options based on customer's requirement.

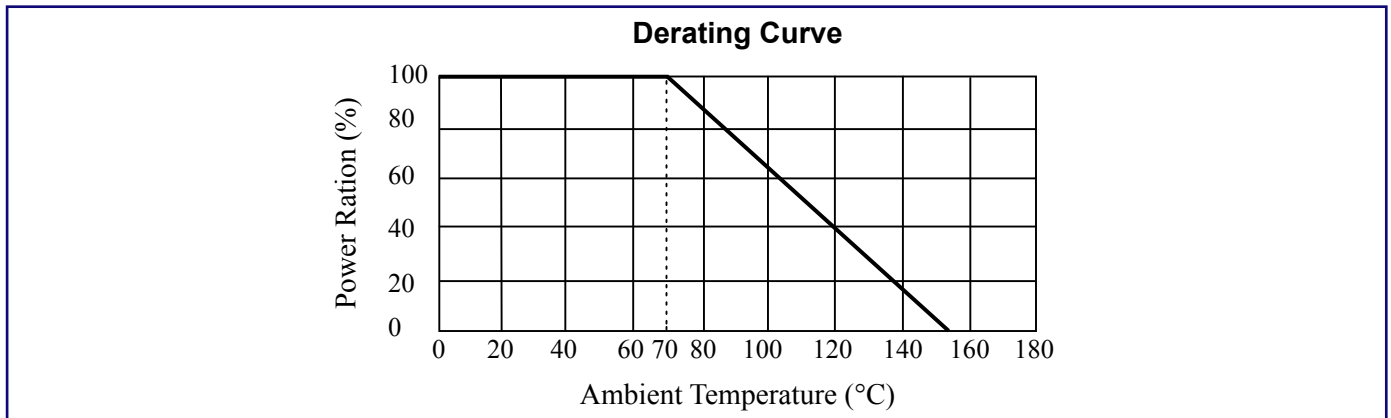
Low TCR Electrical Specifications

| Type | Power Rating at 70°C | Operating Temp. Range | Resistance Tolerance | Resistance Range | TCR |
|------------|----------------------|-----------------------|----------------------|------------------|------------|
| CS06*TRE** | 1/4W | -55 ~ +155°C | ±1% ±2% ±5% | 100mΩ~1000mΩ | ±100PPM/°C |
| CS13*TRE** | 1/2W | | | 100mΩ~1000mΩ | ±100PPM/°C |
| CS10*TRE** | 3/4W | | | 100mΩ~1000mΩ | ±100PPM/°C |
| CS12*TRE** | 1W | | | 20mΩ~1000mΩ | ±100PPM/°C |
| CS37*TRE** | 1W | | | 100mΩ~500mΩ | ±100PPM/°C |
| CS75*TRE** | 2W | | | 50mΩ~350mΩ | ±100PPM/°C |

▶ High Power Rating Electrical Specifications

| Type | Power Rating at 70°C | Operating Temp. Range | Resistance Tolerance | Resistance Range | TCR |
|-------------|----------------------|-----------------------|----------------------|------------------|------------|
| CS03*TR*W** | 1/8W | -55 ~ +155°C | ±1% ±2% ±5% | 51mΩ~100mΩ | ±400PPM/°C |
| CS05*TR*V** | 1/4W 1/2W | | | 101mΩ~500mΩ | ±300PPM/°C |
| CS06*TR*U** | 1/2W | | | 501mΩ~1000mΩ | ±200PPM/°C |
| CS13*TR*Q** | 3/4W | | | 10mΩ~20mΩ | ±600PPM/°C |
| CS10*TR*T** | 1W | | | 21mΩ~50mΩ | ±400PPM/°C |
| CS12*TR*A** | 1.5W | | | 51mΩ~500mΩ | ±300PPM/°C |
| CS12*TR*S** | 2W | | | 501mΩ~1000mΩ | ±200PPM/°C |

▶ Power Derating Curve



► Environmental Characteristics

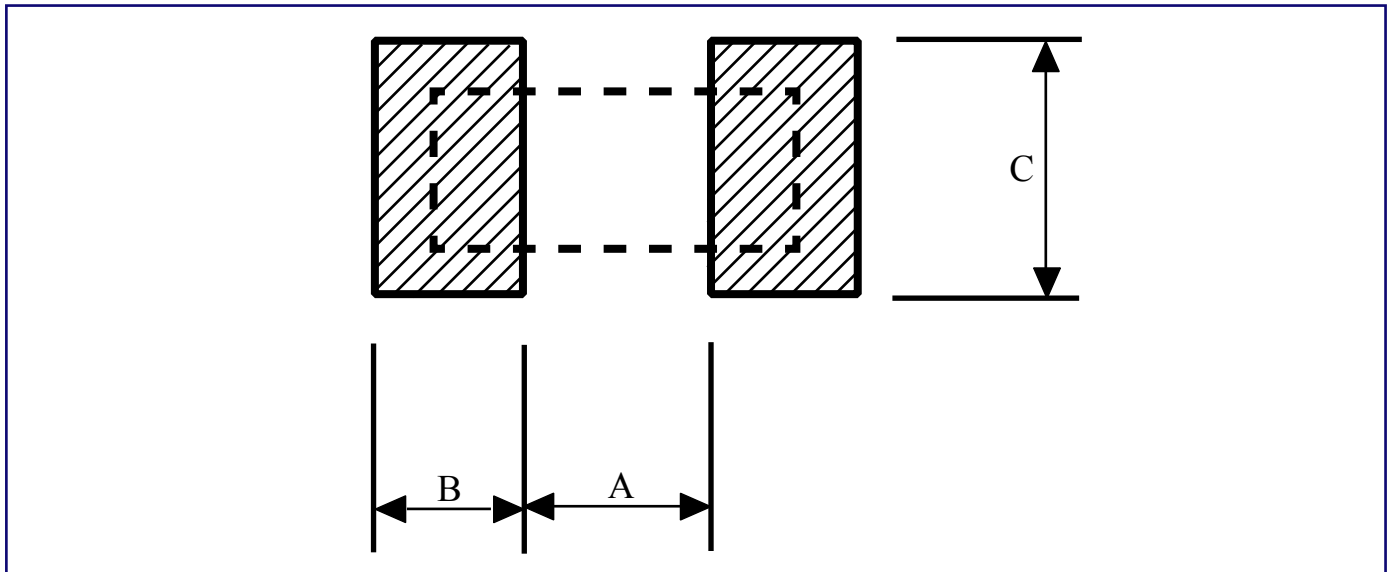
| Item | Specification | Test Method |
|---------------------------------------|--|--|
| Temperature Coefficient of Resistance | As Spec | MIL-STD-202F Method 304 +25/-55/+25/+125/+25°C |
| Short Time Overload | $\pm(0.5\% + 0.05\Omega)$ | JIS-C-5202-5.5 |
| | $\Delta R \pm 1\%$ for high power rating | RCWV*2.5 or Max Overloading Voltage 5seconds |
| Dielectric Withstand Voltage | by Type | MIL-STD-202F Method 301 Apply Max Overload Voltage for 1 minute |
| Insulation Resistance | $>1000M\Omega$ | MIL-STD-202F Method 302 Apply 100VDC for 1minute |
| Thermal Shock | $\pm(0.5\% + 0.05\Omega)$ | MIL-STD-202F Method 107G -55°C~150°C, 100cycles |
| Load Life | $\pm(1\% + 0.05\Omega)$ | MIL-STD-202F Method 108A RCWV, 70°C, 1.5 hours on , 0.5 hours off , 1000~1048 hours |
| humidity (Steady State) | $\pm(0.5\% + 0.05\Omega)$ | MIL-STD-202F Method 103B 40°C, 90~95%RH, RCWV 1.5 hours ON, 0.5 hours OFF, total 1000 ~ 1048 hours |
| Resistance to dry heat | $\pm(0.5\% + 0.05\Omega)$ | JIS-C-5202-7.2 96hours @ +155°C without load |
| Low Temperature Operation | $\pm(0.5\% + 0.05\Omega)$ | JIS-C-5202-7.1 1hour, -65°C followed by 45minutes of RCWV |
| Bending Strength | As Spec | JIS-C-5202-6.1.4 Bending Amplitude 3mm for 10seconds |
| Solderability | 95%min coverage | MIL-STD-202F Method 208H 260°C±5°C, 2±0.5 (sec) |
| Resistance to Soldering Heat | $\pm(0.5\% + 0.05\Omega)$ | MIL-STD-202F Method 210E 260±5°C, 10±1 second |

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

► (CS) Marking for 0603

| Marking | Value |
|------------|--------|
| 1R0 | 1.000Ω |
| R10 | 0.100Ω |
| R01 | 0.010Ω |
| <u>101</u> | 0.101Ω |
| <u>035</u> | 0.035Ω |

▶ Except For CS12: High Power Rating Series Recommend Land Pattern

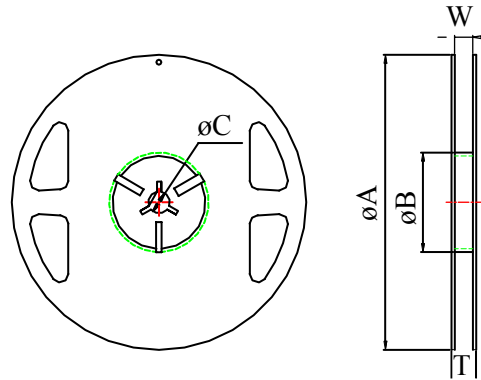


| Codes | A | B | C |
|-------|------|------|----------|
| CS01 | 0.25 | 0.30 | 0.40±0.2 |
| CS02 | 0.50 | 0.50 | 0.60±0.2 |
| CS03 | 0.80 | 1.00 | 0.90±0.2 |
| CS05 | 1.00 | 1.00 | 1.35±0.2 |
| CS06 | 2.00 | 1.15 | 1.70±0.2 |
| CS13 | 2.00 | 1.15 | 2.50±0.2 |
| CS10 | 3.60 | 1.40 | 2.50±0.2 |
| CS12 | 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 |

▶ For CS12 High Power Rating Series Recommend Land Pattern

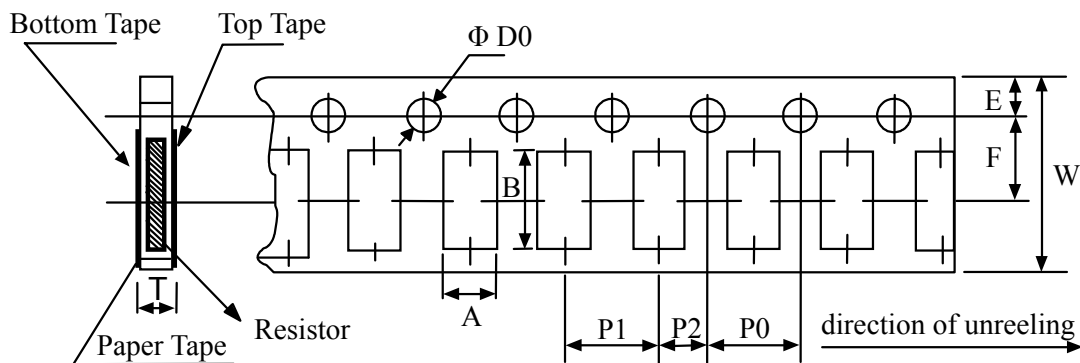
| Codes | Resistance Range | A | B | C |
|-------|------------------|------|------|----------|
| CS12 | 10~99mΩ | 4.90 | 1.60 | 3.10±0.2 |
| CS12 | 100~1000mΩ | 1.00 | 3.55 | 3.10±0.2 |

Packing Quantity & Reel Specifications



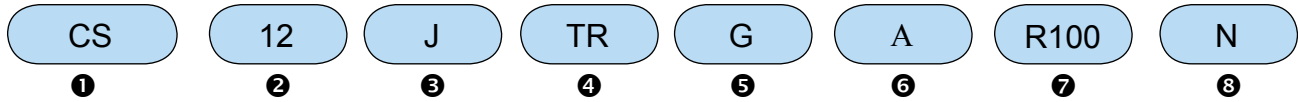
| Type | ΦA | ΦB | ΦC | W | T | Paper Tape(EA) | Emboss Plastic Tape(EA) |
|----------|-----------|----------|----------|----------|----------|----------------|-------------------------|
| CS01 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 10,000 | - |
| CS02 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 10,000 | - |
| CS03 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 5,000 | - |
| CS05 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 5,000 | - |
| CS06 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 5,000 | - |
| CS13 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 9.5±1.0 | 11.5±1.0 | 5,000 | - |
| CS10 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 4,000 |
| CS12 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 4,000 |
| CS12(2W) | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 2,000 |
| CS25 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 2,000 |
| CS37 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 13.5±1.0 | 15.5±1.0 | - | 2,000 |
| CS75 | 178.0±1.0 | 60.0±1.0 | 13.5±0.7 | 17.5±1.0 | 19.5±1.0 | - | 2,000 |

Paper Tape Specifications



| Type | A | B | W | E | F | P0 | P1 | P2 | ΦD0 | T |
|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| CS01 | 0.40±0.05 | 0.70±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 | 0.42±0.02 |
| CS02 | 0.70±0.05 | 1.16±0.05 | 8.00±0.10 | 1.75±0.05 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.55±0.05 | 0.40±0.03 |
| CS03 | 1.10±0.05 | 1.90±0.05 | 8.00±0.10 | 1.75±0.05 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.60±0.03 |
| CS05 | 1.60±0.05 | 2.37±0.05 | 8.00±0.10 | 1.75±0.05 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |
| CS06 | 2.00±0.05 | 3.55±0.05 | 8.00±0.10 | 1.75±0.05 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |
| CS13 | 2.75±0.05 | 3.40±0.05 | 8.00±0.10 | 1.75±0.05 | 3.5±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.55±0.05 | 0.75±0.05 |

How to Order



1 Part Number

2 Dimensions (L×W)

| Code | Dimensions (L×W) | |
|------|------------------|------|
| 01 | 0.58×0.29 | 0201 |
| 02 | 1.00×0.50mm | 0402 |
| 03 | 1.60×0.80mm | 0603 |
| 05 | 2.00×1.25mm | 0805 |
| 06 | 3.10×1.55mm | 1206 |
| 13 | 3.00×2.50 | 1210 |
| 10 | 5.00×2.50mm | 2010 |
| 12 | 6.30×3.10mm | 2512 |
| 25 | 3.10×6.30mm | 1225 |
| 37 | 3.75×2.00mm | 3720 |
| 75 | 7.50×2.00mm | 7520 |

3 Resistance Tolerance

| Code | Resistance Tolerance |
|------|----------------------|
| J | ±5% |
| G | ±2% |
| F | ±1% |

4 Packaging

| Code | Packaging |
|------|-------------|
| TR | Taping Reel |
| P | Bulk |

5 TCR

| Code | TCR |
|------|-------------|
| E | ±100ppm/°C |
| K | ±150ppm/°C |
| F | ±200ppm/°C |
| G | ±300ppm/°C |
| H | ±400ppm/°C |
| J | ±600ppm/°C |
| R | ±1000ppm/°C |

6 Power Rating

| Code | Power Rating |
|------|--------------|
| S | 2W |
| A | 1.5W |
| T | 1W |
| Q | 3/4W |
| U | 1/2W |
| V | 1/4W |
| W | 1/8W |

7 Resistance

| Code | Resistance |
|------|------------|
| R010 | 0.01Ω |
| R100 | 0.100Ω |
| 1R00 | 1.000Ω |

8 Marking

| Code | Resistance |
|------|------------|
| | Standard |
| N | No Marking |

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