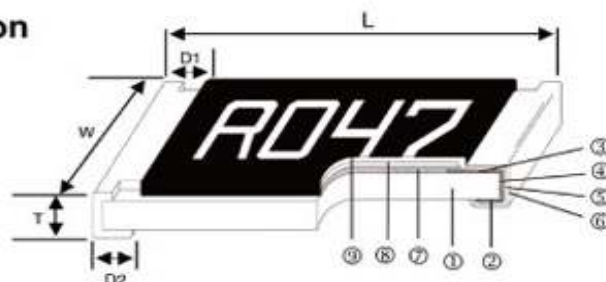


## Current Sensing Chip Resistor—CS Series



### Construction



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

### Features

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

### 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)

### Dimensions

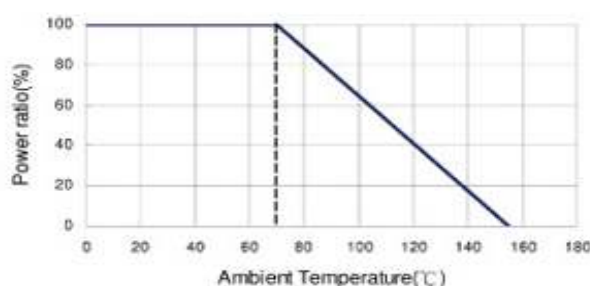
Unit: mm

| Type      | Size (Inch)                  | L               | W               | T               | D1              | D2              | Weight (g) (1000pcs) |
|-----------|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|
| CS01      | 0201                         | $0.58 \pm 0.05$ | $0.29 \pm 0.05$ | $0.23 \pm 0.05$ | $0.12 \pm 0.05$ | $0.15 \pm 0.05$ | 0.18                 |
| CS02      | 0402                         | $1.00 \pm 0.05$ | $0.50 \pm 0.05$ | $0.32 \pm 0.10$ | $0.25 \pm 0.10$ | $0.20 \pm 0.10$ | 0.7                  |
| CS03      | 0603                         | $1.60 \pm 0.10$ | $0.80 \pm 0.10$ | $0.45 \pm 0.10$ | $0.30 \pm 0.20$ | $0.30 \pm 0.20$ | 1.99                 |
| CS05      | 0805                         | $2.00 \pm 0.15$ | $1.25 \pm 0.15$ | $0.55 \pm 0.10$ | $0.30 \pm 0.20$ | $0.40 \pm 0.25$ | 5.3                  |
| CS06      | 1206                         | $3.05 \pm 0.15$ | $1.55 \pm 0.15$ | $0.55 \pm 0.10$ | $0.50 \pm 0.30$ | $0.40 \pm 0.25$ | 8.82                 |
| CS13      | 1210                         | $3.00 \pm 0.15$ | $2.50 \pm 0.15$ | $0.55 \pm 0.10$ | $0.50 \pm 0.30$ | $0.50 \pm 0.25$ | 15.5                 |
| CS10      | 2010                         | $5.00 \pm 0.20$ | $2.45 \pm 0.15$ | $0.60 \pm 0.15$ | $0.60 \pm 0.30$ | $0.50 \pm 0.25$ | 27.03                |
| CS12      | 2512                         | $6.35 \pm 0.20$ | $3.15 \pm 0.15$ | $0.60 \pm 0.10$ | $0.60 \pm 0.30$ | $0.55 \pm 0.25$ | 43.08                |
| CS12 (2W) | 2512<br>10 - 99m $\Omega$    | $6.35 \pm 0.20$ | $3.15 \pm 0.15$ | $0.74 \pm 0.10$ | $0.60 \pm 0.30$ | $0.55 \pm 0.25$ | 43.08                |
| CS12 (2W) | 2512<br>100 - 1000m $\Omega$ | $6.35 \pm 0.20$ | $3.15 \pm 0.15$ | $0.74 \pm 0.10$ | $0.60 \pm 0.30$ | $2.70 \pm 0.10$ | 43.08                |
| CS25      | 1225                         | $3.10 \pm 0.15$ | $6.30 \pm 0.15$ | $0.90 \pm 0.15$ | $0.60 \pm 0.30$ | $0.55 \pm 0.25$ | 53.8                 |
| CS37      | 3720                         | $2.00 \pm 0.20$ | $3.75 \pm 0.20$ | $0.60 \pm 0.10$ | $0.40 \pm 0.20$ | $0.40 \pm 0.20$ | 19.96                |
| CS75      | 7520                         | $2.00 \pm 0.20$ | $7.50 \pm 0.30$ | $0.60 \pm 0.10$ | $0.40 \pm 0.20$ | $0.40 \pm 0.20$ | 35.71                |

### Part Numbering

| CS                                                                                                                               | 06               | F                                            | T                         | G                                                                                                             | U                                                                                   | R100                                                          | N                           |
|----------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|
| Product Type                                                                                                                     | Dimensions (L×W) | Resistance Tolerance                         | Packaging Code            | TCR (PPM/ $^{\circ}$ C)                                                                                       | Power Rating                                                                        | Resistance                                                    | Marking                     |
| 01: 0201<br>02: 0402<br>03: 0603<br>05: 0805<br>06: 1206<br>13: 1210<br>10: 2010<br>12: 2512<br>25: 1225<br>37: 3720<br>75: 7520 |                  | F: $\pm 1\%$<br>G: $\pm 2\%$<br>J: $\pm 5\%$ | T: Taping Reel<br>B: Bulk | E: $\pm 100$<br>F: $\pm 200$<br>G: $\pm 300$<br>H: $\pm 400$<br>J: $\pm 600$<br>K: $\pm 150$<br>R: $\pm 1000$ | : Standard<br>A: 1.5W<br>Q: 3/4W<br>S: 2W<br>T: 1W<br>U: 1/2W<br>V: 1/4W<br>W: 1/8W | R010: 0.01 $\Omega$<br>R100: 0.1 $\Omega$<br>1R00: 1 $\Omega$ | : Standard<br>N: No Marking |

### Derating Curve



## ■ Standard Electrical Specifications

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

## ■ High Power Rating Electrical Specifications

| Type \ Item | 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<br>101 - 500<br>501 - 1000          |     |     | ±400<br>±300<br>±200         |
| CS05 (0805) | 1/4W                 |                       |                                              |     |     |                              |
| CS06 (1206) | 1/2W                 | -55 ~ +155°C          | 10 - 20<br>21 - 50<br>51 - 500<br>501 - 1000 |     |     | ±600<br>±400<br>±300<br>±200 |
| CS13 (1210) | 3/4W                 |                       |                                              |     |     |                              |
| CS10 (2010) | 1W                   |                       |                                              |     |     |                              |
| CS12 (2512) | 1.5W                 |                       |                                              |     |     |                              |
| CS12 (2512) | 2W                   |                       |                                              |     |     |                              |

## ■ Low TCR Electrical Specifications

| Type \ Item | 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         |
|             |                      |                       |                       |     |     |              |

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.

## ■ Marking for 0603

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



## ■ Environmental Characteristics

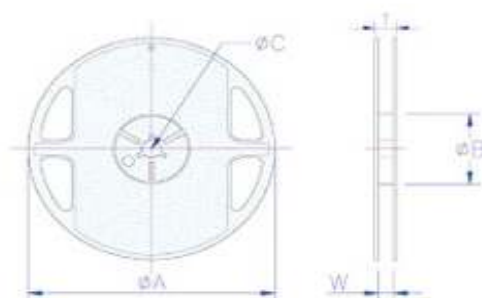
| Item                                           | Requirement                 | Test Method                                                                               |
|------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------|
| Temperature Coefficient of Resistance (T.C.R.) | As Spec.                    | +25/-55/+25/+125/+25°C                                                                    |
| Short Time Overload                            | ±0.5%                       | RCWV*2.5 or Max. overload voltage for 5 seconds                                           |
|                                                | ΔR±1% for high power rating |                                                                                           |
| Insulation Resistance                          | >1000MΩ                     | Apply 100V <sub>DC</sub> for 1 minute                                                     |
| Endurance                                      | ±1%                         | 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%                       | 40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF" |
| Dry Heat                                       | ±0.5%                       | at +155°C for 1000 hrs                                                                    |
| Bending Strength                               | As Spec.                    | Bending amplitude 3mm for 10 seconds                                                      |
| Solderability                                  | 95% min. coverage           | 245±5°C for 3 seconds                                                                     |
| Resistance to Soldering Heat                   | ±0.5%                       | 260±5°C for 10 seconds                                                                    |
| Dielectric Withstand Voltage                   | By Type                     | Apply Max. Overload Voltage for 1 minute                                                  |
| Thermal Shock                                  | ±0.5%                       | -55°C ~150°C, 100 cycles                                                                  |
| Low Temperature Operation                      | ±0.5%                       | 1 hour, -65°C followed by 45 minutes of RCWV                                              |

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

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

## ■ Packaging

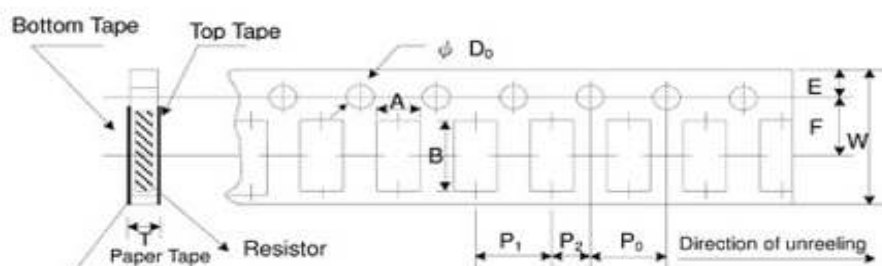
Packaging Quantity & Reel Specifications



Unit: mm

| Type      | ΦA          | ΦB         | ΦC         | W          | T          | Paper Tape (EA) | Embossed Plastic Tape (EA) |
|-----------|-------------|------------|------------|------------|------------|-----------------|----------------------------|
| CS01      | 178.0 ± 1.0 | 60.0 ± 1.0 | 13.5 ± 0.7 | 9.5 ± 0.1  | 11.5 ± 1.0 | 10,000          | -                          |
| CS02      | 178.0 ± 1.0 | 60.0 ± 1.0 | 13.5 ± 0.7 | 9.5 ± 0.1  | 11.5 ± 1.0 | 10,000          | -                          |
| CS03      | 178.0 ± 1.0 | 60.0 ± 1.0 | 13.5 ± 0.7 | 9.5 ± 0.1  | 11.5 ± 1.0 | 5,000           | -                          |
| CS05      | 178.0 ± 1.0 | 60.0 ± 1.0 | 13.5 ± 0.7 | 9.5 ± 0.1  | 11.5 ± 1.0 | 5,000           | -                          |
| CS06      | 178.0 ± 1.0 | 60.0 ± 1.0 | 13.5 ± 0.7 | 9.5 ± 0.1  | 11.5 ± 1.0 | 5,000           | -                          |
| CS13      | 178.0 ± 1.0 | 60.0 ± 1.0 | 13.5 ± 0.7 | 9.5 ± 0.1  | 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                      |

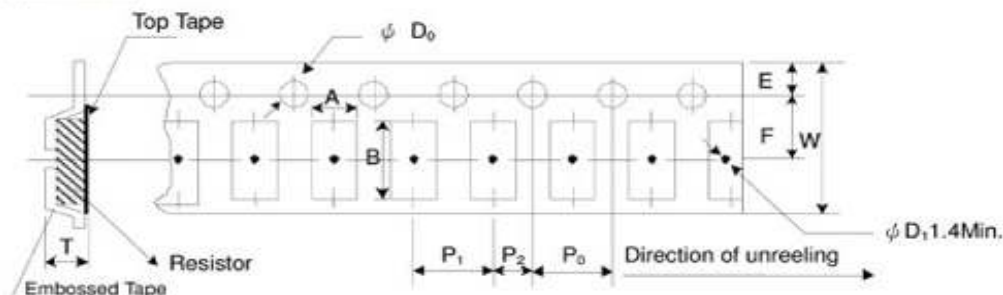
## Paper Tape Specifications



Unit: mm

| Type | A         | B         | W         | E         | F        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ΦD <sub>0</sub> | 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±0.03       | 0.42±0.02 |
| CS02 | 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 |
| CS03 | 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 |
| CS05 | 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 |
| CS06 | 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 |
| 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 |

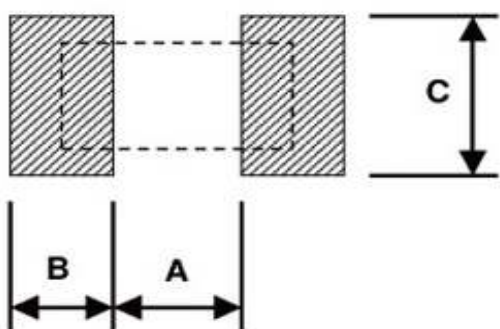
## Embossed Plastic Tape Specifications



Unit: mm

| Type      | A         | B         | W         | E         | F        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | ΦD <sub>0</sub> | T         |
|-----------|-----------|-----------|-----------|-----------|----------|----------------|----------------|----------------|-----------------|-----------|
| CS10      | 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 |
| CS12      | 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 |
| CS12 (2W) | 3.38±0.10 | 6.68±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.10 | 4.00±0.10      | 4.00±0.10      | 2.00±0.05      | 1.55±0.05       | 1.45±0.20 |
| CS25      | 3.38±0.10 | 6.68±0.10 | 12.0±0.30 | 1.75±0.10 | 5.5±0.10 | 4.00±0.10      | 4.00±0.10      | 2.00±0.05      | 1.55±0.05       | 1.45±0.20 |
| CS37      | 2.50±0.20 | 4.45±0.20 | 12.0±0.30 | 1.75±0.01 | 5.5±0.05 | 4.00±0.05      | 4.00±0.10      | 2.00±0.05      | 1.50±0.10       | 1.50±0.10 |
| CS75      | 2.50±0.20 | 8.30±0.20 | 16.0±0.30 | 1.75±0.01 | 7.8±0.05 | 4.00±0.05      | 4.00±0.10      | 2.00±0.05      | 1.50±0.10       | 1.50±0.10 |

## 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        | 4.9 | 1.6  | 3.1±0.2 |
| CS12 | 100 - 1000mΩ     | 1.0 | 3.55 | 3.1±0.2 |