

## Data Sheet

Customer:

Product: Automotive Grade Current Sensing Chip Resistor – CS..A Series

Size: 0402/0603/0805/1206/1210/2010/2512/1225/3720/7520/0508/  
0612/1020

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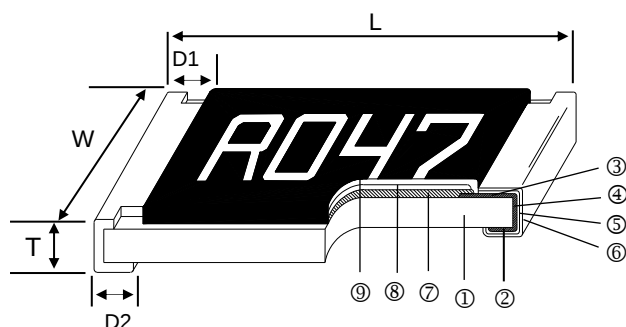
## Automotive Grade Current Sensing Chip Resistor



### ■ Features

- AEC-Q200 Qualified
- Highly reliable multilayer electrode construction
- Reduced size of final equipment reliability
- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of  $\pm 100$  PPM/°C
- Resistance values from 1m to 1 ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating
- Special construction to prevent sulfuration in a sulfur containing environment
- RoHS Compliance
- 100% CCD inspection
- MSL: Level 1

### ■ Construction



### ■ Applications

- Automotive Industry
- 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

|                     |                      |                      |
|---------------------|----------------------|----------------------|
| 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

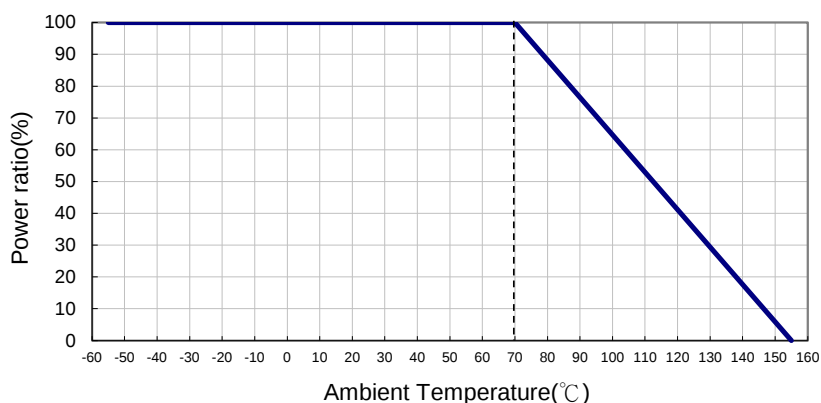
| Type      | Size (Inch)         | L (mm)    | W (mm)    | T (mm)    | D1 (mm)   | D2 (mm)   | Weight (g) (1000pcs) |
|-----------|---------------------|-----------|-----------|-----------|-----------|-----------|----------------------|
| CS02      | 0402                | 1.00±0.05 | 0.50±0.05 | 0.32±0.10 | 0.25±0.10 | 0.25±0.10 | 0.7                  |
| CS03      | 0603                | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 | 1.99                 |
| CS05      | 0805                | 2.00±0.10 | 1.25±0.10 | 0.55±0.10 | 0.30±0.20 | 0.40±0.25 | 5.3                  |
| CS06      | 1206                | 3.10±0.10 | 1.55±0.10 | 0.55±0.10 | 0.50±0.30 | 0.40±0.25 | 8.82                 |
| CS13      | 1210                | 3.10±0.10 | 2.60±0.15 | 0.55±0.10 | 0.50±0.30 | 0.50±0.25 | 15.5                 |
| CS10      | 2010                | 5.00±0.10 | 2.50±0.15 | 0.60±0.15 | 0.60±0.30 | 0.50±0.25 | 27.03                |
| CS12      | 2512                | 6.35±0.10 | 3.10±0.15 | 0.60±0.10 | 0.60±0.30 | 0.55±0.25 | 43.08                |
| CS12 (2W) | 2512 (10 - 99mΩ)    | 6.35±0.20 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 0.55±0.25 | 53.08                |
| CS12 (2W) | 2512 (100 - 1000mΩ) | 6.35±0.20 | 3.15±0.15 | 0.74±0.10 | 0.60±0.30 | 2.10±0.10 | 53.08                |
| CS25      | 1225                | 3.20±0.15 | 6.45±0.15 | 0.90±0.15 | 0.60±0.30 | 0.80±0.25 | 64.88                |
| CS37      | 3720                | 2.00±0.20 | 3.75±0.20 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 | 19.96                |
| CS75      | 7520                | 2.00±0.20 | 7.50±0.30 | 0.60±0.10 | 0.40±0.20 | 0.40±0.20 | 35.71                |
| CS08      | 0508                | 1.25±0.10 | 2.00±0.10 | 0.55±0.10 | 0.30±0.15 | 0.30±0.15 | 5.67                 |
| CS62      | 0612                | 1.55±0.10 | 3.10±0.15 | 0.55±0.10 | 0.30±0.15 | 0.45±0.15 | 10.19                |
| CS20      | 1020                | 2.45±0.15 | 5.00±0.10 | 0.60±0.15 | 0.35±0.20 | 0.70±0.20 | 28.41                |

## Part Numbering

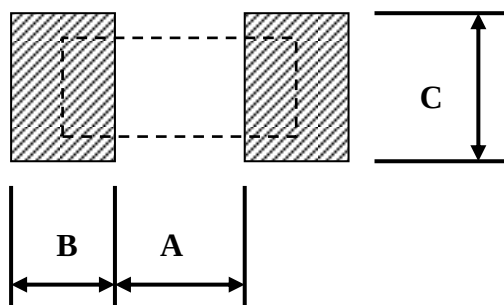
| CS           | 06                                                                                                                                                       | F                          | T              | G                                                              | U                                                                                                               | R100                                  | A                                     |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|
| Product Type | Dimensions (L×W)                                                                                                                                         | Resistance Tolerance       | Packaging Code | TCR (PPM/°C)                                                   | Power Rating                                                                                                    | Resistance                            | Marking                               |
|              | 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<br>08: 0508<br>62: 0612<br>20: 1020 | F: ±1%<br>G: ±2%<br>J: ±5% | T: Taping Reel | E: ±100<br>F: ±200<br>G: ±300<br>H: ±400<br>J: ±600<br>K: ±150 | : Standard*<br>(See Remark)<br>S: 2W<br>A: 1.5W<br>T: 1W<br>Q: 3/4W<br>U: 1/2W<br>V: 1/4W<br>P: 1/5W<br>W: 1/8W | R010: 0.01Ω<br>R100: 0.1Ω<br>1R00: 1Ω | NA: No Marking<br>A: Automotive Grade |

\*Remark: Standard part no need for power rating code.

## Derating Curve



## Recommend Land Pattern



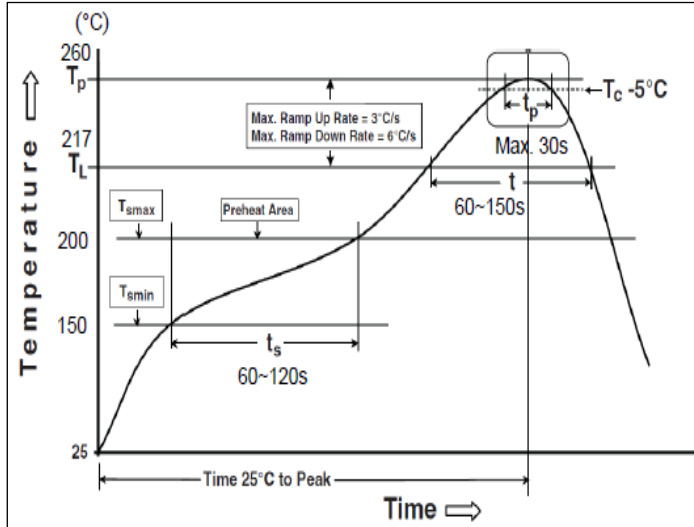
Pad Layout (Except For CS12:High Power Rating Series)

| Type | A (mm) | B (mm) | C (mm)   |
|------|--------|--------|----------|
| 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   | 3.20±0.2 |
| CS25 | 1.20   | 2.00   | 7.00±0.2 |
| CS37 | 1.00   | 1.80   | 3.90±0.2 |
| CS75 | 1.00   | 1.80   | 7.60±0.2 |
| CS08 | 0.55   | 0.90   | 2.00±0.2 |
| CS62 | 0.60   | 1.00   | 3.20±0.2 |
| CS20 | 1.00   | 1.20   | 5.00±0.2 |

Pad Layout ( For CS12:High Power Rating Series)

| Type | Resistance Range | A (mm) | B (mm) | C (mm)  |
|------|------------------|--------|--------|---------|
| CS12 | 10~99 mΩ         | 4.9    | 1.6    | 3.2±0.2 |
| CS12 | 100~1000mΩ       | 1.0    | 3.55   | 3.2±0.2 |

■ Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)



| Reflow Profiles                                                                     |  |                  |
|-------------------------------------------------------------------------------------|--|------------------|
| Profile Feature                                                                     |  | Pb-Free Assembly |
| <b>Preheat</b>                                                                      |  |                  |
| Min. Temperature (T <sub>min</sub> )                                                |  | 150 °C           |
| Max Temperature (T <sub>max</sub> )                                                 |  | 200 °C           |
| Preheating time (ts) from (T <sub>min</sub> to T <sub>max</sub> )                   |  | 60-120 seconds   |
| Ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )                                    |  | 3 °C/second max. |
| Liquidous temperature (T <sub>L</sub> )                                             |  | 217 °C           |
| Time (t <sub>L</sub> ) maintained above T <sub>L</sub>                              |  | 60-150 seconds   |
| Min. Peak temperature (T <sub>p</sub> min)                                          |  | 235°C            |
| Max. Peak temperature (T <sub>p</sub> max)                                          |  | 260°C            |
| Time (tp) within 5 °C of the specified classification temperature (T <sub>c</sub> ) |  | 30 seconds max.  |
| Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )                                  |  | 6 °C/second max. |
| Time 25 °C to peak temperature                                                      |  | 8 minutes max.   |

■ Standard Electrical Specifications

| Type \ Item | Power Rating<br>at 70°C | Operating Temp.<br>Range | Max. Operating<br>Current | Resistance Range<br>(mΩ)                       |       |              | TCR<br>(PPM/°C)              |
|-------------|-------------------------|--------------------------|---------------------------|------------------------------------------------|-------|--------------|------------------------------|
|             |                         |                          |                           | ±1%                                            | ±2%   | ±5%          |                              |
| CS02 (0402) | 1/16W                   | -55 ~ +155°C             | 1.11A                     | 50 - 100<br>102 - 500<br>510 - 1000            |       |              | ±400<br>±300<br>±200         |
| CS03 (0603) | 1/10W                   |                          | 2.23A                     | 20 - 50<br>51 - 100<br>102 - 300<br>301 - 1000 |       |              | ±600<br>±400<br>±300<br>±200 |
| CS05 (0805) | 1/8W                    |                          | 2.50A                     | 20 - 50<br>51 - 100<br>102 - 196<br>200 - 1000 |       |              | ±600<br>±400<br>±300<br>±200 |
| CS06 (1206) | 1/4W                    |                          | 5.00A                     | 10 - 20<br>21 - 50<br>51 - 91<br>100 - 1000    |       |              | ±600<br>±400<br>±300<br>±200 |
| CS13 (1210) | 1/2W                    |                          | 7.07A                     |                                                |       |              |                              |
| CS10 (2010) | 3/4W                    |                          | 8.66A                     |                                                |       |              |                              |
| CS12 (2512) | 1W                      |                          | 10.0A                     |                                                |       |              |                              |
| CS25 (1225) | 3W                      |                          | 31.6A                     | 3 - 5<br>6 - 20<br>21 - 30<br>33 - 8000        |       |              | ±300<br>±200<br>±150<br>±100 |
| CS37 (3720) | 1W                      |                          | 10.0A                     | 10 - 18<br>20 - 500                            |       |              | ±300<br>±150                 |
| CS75 (7520) | 2W                      |                          | 44.7A                     | —                                              | 1 - 4 |              | ±300                         |
|             |                         |                          |                           | 5 - 10<br>11 - 350                             |       | ±200<br>±150 |                              |
| CS62 (0612) | 1W                      |                          | 10.0A                     | 10 – 27<br>30 – 91<br>100 – 499<br>500 - 1000  |       |              | ±600<br>±300<br>±200<br>±100 |

## ■ High Power & Ultra High Rating Electrical Specifications

| Type \ Item | Power Rating<br>at 70°C | Operating Temp.<br>Range | Max. Operating<br>Current | Resistance Range<br>(mΩ)                       |     |     | TCR<br>(PPM/°C)              |
|-------------|-------------------------|--------------------------|---------------------------|------------------------------------------------|-----|-----|------------------------------|
|             |                         |                          |                           | ±1%                                            | ±2% | ±5% |                              |
| CS02 (0402) | 1/8W                    | -55 ~ +155°C             | 1.58A                     | 50 - 100<br>102 - 500<br>510 - 1000            |     |     | ±400<br>±300<br>±200         |
| CS03 (0603) | 1/8W<br>1/5W            |                          | 1.58A                     |                                                |     |     |                              |
| CS05 (0805) | 1/4W<br>1/2W            |                          | 2.23A                     |                                                |     |     |                              |
| CS06 (1206) | 1/2W                    |                          | 3.16A                     | 50 - 91<br>100 - 1000                          |     |     | ±300<br>±200                 |
| CS13 (1210) | 3/4W                    |                          | 3.87A                     |                                                |     |     |                              |
| CS10 (2010) | 1W                      |                          | 4.47A                     |                                                |     |     |                              |
| CS12 (2512) | 1.5W                    |                          | 5.47A                     |                                                |     |     |                              |
| CS12 (2512) | 2W*                     |                          | 6.32A                     |                                                |     |     |                              |
| CS08(0508)  | 1W                      |                          | 7.07A                     | 20 - 30<br>33 - 100<br>102 - 499<br>500 - 1000 |     |     | ±600<br>±400<br>±200<br>±100 |
| CS20(1020)  | 2W                      |                          | 14.14A                    | 10 - 30<br>33 - 100<br>102 - 499<br>500 - 1000 |     |     | ±600<br>±400<br>±200<br>±100 |

\*: Ultra High Power

## ■ Low TCR Electrical Specifications

| Type \ Item | Power Rating<br>at 70°C | Operating Temp.<br>Range | Max. Operating<br>Current | Resistance Range<br>(mΩ) |     |     | TCR<br>(PPM/°C) |
|-------------|-------------------------|--------------------------|---------------------------|--------------------------|-----|-----|-----------------|
|             |                         |                          |                           | ±1%                      | ±2% | ±5% |                 |
| CS05 (0805) | 1/8W                    | -55 ~ +155°C             | 1.11A                     | 100 - 1000               |     |     | ±100            |
| CS06 (1206) | 1/4W                    |                          | 1.58A                     | 100 - 1000               |     |     | ±100            |
| CS13 (1210) | 1/2W                    |                          | 2.58A                     | 75 - 1000                |     |     | ±100            |
| CS10 (2010) | 3/4W                    |                          | 3.87A                     | 50 - 1000                |     |     | ±100            |
| CS12 (2512) | 1W                      |                          | 4.47A                     | 50 - 1000                |     |     | ±100            |
| CS12 (2512) | 2W                      |                          | 6.32A                     | 50 - 1000                |     |     | ±100            |
| CS37 (3720) | 1W                      |                          | 3.16A                     | 100 - 500                |     |     | ±100            |
| CS75 (7520) | 2W                      |                          | 6.32A                     | 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.

**■ Environmental Characteristics**

| Item                                           | Requirement                                                            | Test Method                                                                                                                                                                                      |
|------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient of Resistance (T.C.R.) | As Spec.                                                               | <b>JIS C 5201-1 4.8</b><br><b>IEC 60115-1 4.8</b><br>At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature                                                                            |
| Short Time Overload                            | $\pm(0.5\%+0.05\Omega)$                                                | <b>JIS C 5201-1 4.13</b><br><b>IEC 60115-1 4.13</b>                                                                                                                                              |
|                                                | $\pm(1.0\%+0.05\Omega)$<br>for high power rating                       | RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds                                                                                                                               |
| Insulation Resistance                          | $\geq 10G$                                                             | <b>JIS C 5201-1 4.6</b><br><b>IEC 60115-1 4.6</b><br>Max. Overload Voltage for 1 minute                                                                                                          |
| Operational Life                               | $\pm(1.0\%+0.05\Omega)$                                                | <b>MIL-STD-202 Method 108</b><br>Condition D Steady State TA=125°C at derated power.<br>Measurement at 24±4 hours after test conclusion.                                                         |
| Biased Humidity                                | $\pm(1.0\%+0.05\Omega)$                                                | <b>MIL-STD-202 Method 103</b><br>1000 hrs 85°C/85%RH 10% of operating power.<br>( $\leq 100V$ )                                                                                                  |
| High Temperature Exposure                      | $\pm(0.5\%+0.05\Omega)$                                                | <b>MIL-STD-202 Method 108</b><br>at +155°C for 1000 hrs                                                                                                                                          |
| Board Flex                                     | $\pm(1.0\%+0.05\Omega)$                                                | <b>AEC-Q200-005</b><br>Bending once for 60 seconds<br>2010, 2512 sizes: 2mm Other sizes: 3mm                                                                                                     |
| Solderability                                  | 95% min. coverage                                                      | <b>JIS C 5201-1 4.17</b><br><b>IEC 60115-1 4.17</b><br><b>J-STD-002</b><br>245±5°C for 3 seconds                                                                                                 |
| Resistance to Soldering Heat                   | $\pm(0.5\%+0.05\Omega)$                                                | <b>MIL-STD-202 Method 210</b><br>260±5°C for 10 seconds                                                                                                                                          |
| Voltage Proof                                  | No breakdown or flashover                                              | <b>JIS C 5201-1 4.7</b><br><b>IEC 60115-1 4.7</b><br>1.42 times Max. Operating Voltage for 1 minute<br>CS01:50V; CS02:100V; CS03:150V; CS05/08:300V<br>CS06/13/10/25/37/75/62/20:400V; CS12:500V |
| Leaching                                       | Individual leaching area $\leq 5\%$<br>Total leaching area $\leq 10\%$ | <b>JIS C 5201-1 4.18</b><br><b>IEC 60068-2-58 8.2.1</b><br>260±5°C for 30 seconds                                                                                                                |
| Temperature Cycling                            | $\pm(0.5\%+0.05\Omega)$                                                | <b>JESD22 Method JA-104</b><br>-55°C to +125°C, 1000 cycles                                                                                                                                      |
| Mechanical Shock                               | $\pm(0.25\%+0.05\Omega)$                                               | <b>MIL-STD-202 Method 213</b><br>Wave Form: Tolerance for half sine shock pulse.<br>Peak value is 100g's. Normal duration (D) is 6.                                                              |
| Vibration                                      | $\pm(0.5\%+0.05\Omega)$                                                | <b>MIL-STD-202 Method 204</b><br>5 g's for 20 min., 12 cycles each of 3 orientations,<br>10-2000 Hz                                                                                              |
| ESD                                            | $\pm(1\%+0.05\Omega)$                                                  | <b>AEC-Q200-002</b><br>Human body, 2KV                                                                                                                                                           |
| Resistance to Solvents                         | No visible damage on appearance and marking.                           | <b>MIL-STD-202 Method 215</b><br>Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.                                                                               |

| Item              | Requirement                                                        | Test Method                                                                |
|-------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------|
| Terminal Strength | No broken                                                          | <b>AEC-Q200-006</b><br>Force of 1.8kg for 60 seconds.                      |
| Flammability      | No ignition of the tissue paper or scorching or the pinewood board | <b>UL-94</b><br>V-0 or V-1 are acceptable. Electrical test not required.   |
| Sulfur Test       | $\pm(0.5\%+0.05\Omega)$                                            | <b>EIA-977 (Condition A)</b><br>60 $\pm$ 2°C, no power rating for 500 hrs. |

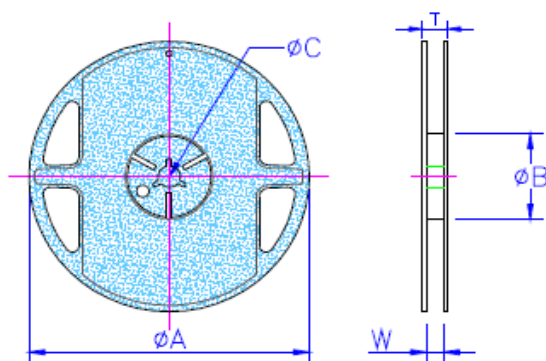
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$  or Max. Operating Voltage whichever is lower.

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

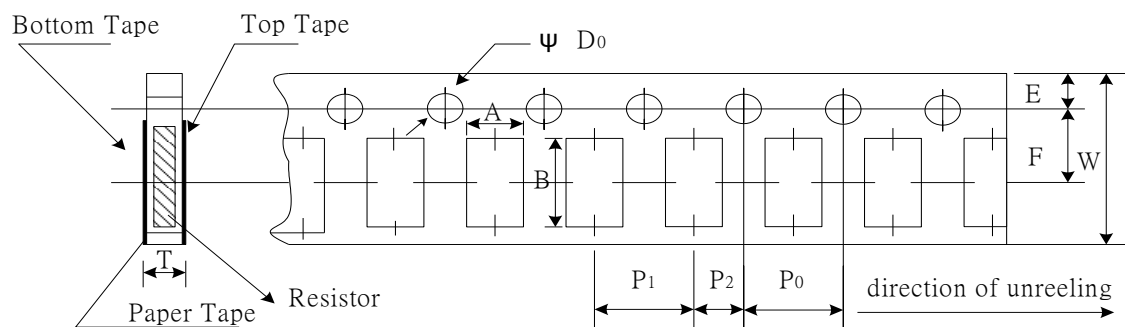
■ **Shelf Life: 2 years from production date.**

## ■ Packaging

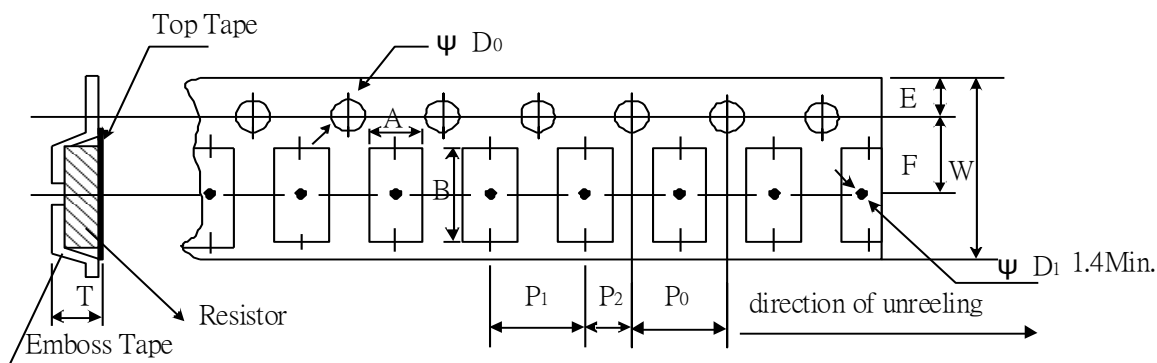
Packaging Quantity & Reel Specifications



| Type      | ΦA (mm)         | ΦB (mm)        | ΦC (mm)        | W (mm)         | T (mm)         | Paper Tape (EA) | Emboss Plastic Tape (EA) |
|-----------|-----------------|----------------|----------------|----------------|----------------|-----------------|--------------------------|
| CS02      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 9.5 $\pm$ 0.1  | 11.5 $\pm$ 1.0 | 10,000          | -                        |
| CS03      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 9.5 $\pm$ 0.1  | 11.5 $\pm$ 1.0 | 5,000           | -                        |
| CS05      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 9.5 $\pm$ 0.1  | 11.5 $\pm$ 1.0 | 5,000           | -                        |
| CS06      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 9.5 $\pm$ 0.1  | 11.5 $\pm$ 1.0 | 5,000           | -                        |
| CS13      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 9.5 $\pm$ 0.1  | 11.5 $\pm$ 1.0 | 5,000           | -                        |
| CS10      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 13.5 $\pm$ 1.0 | 15.5 $\pm$ 1.0 | -               | 4,000                    |
| CS12      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 13.5 $\pm$ 1.0 | 15.5 $\pm$ 1.0 | -               | 4,000                    |
| CS12 (2W) | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 13.5 $\pm$ 1.0 | 15.5 $\pm$ 1.0 | -               | 2,000                    |
| CS25      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 13.5 $\pm$ 1.0 | 15.5 $\pm$ 1.0 | -               | 2,000                    |
| CS37      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 13.5 $\pm$ 1.0 | 15.5 $\pm$ 1.0 | -               | 2,000                    |
| CS75      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 17.5 $\pm$ 1.0 | 19.5 $\pm$ 1.0 | -               | 2,000                    |
| CS08      | 178.5 $\pm$ 1.5 | 60.0 $\pm$ 1.0 | 13.0 $\pm$ 0.2 | 9.0 $\pm$ 0.5  | 12.5 $\pm$ 0.5 | 5,000           | -                        |
| CS62      | 178.0 $\pm$ 1.0 | 60.0 $\pm$ 1.0 | 13.5 $\pm$ 0.7 | 9.5 $\pm$ 0.1  | 11.5 $\pm$ 1.0 | 5,000           | -                        |
| CS20      | 178.5 $\pm$ 1.5 | 60.0 $\pm$ 1.0 | 13.0 $\pm$ 0.5 | 13.0 $\pm$ 0.5 | 15.5 $\pm$ 0.5 | -               | 4,000                    |

**Paper Tape Specifications**


| Type | A (mm)    | B (mm)    | W (mm)   | E (mm)    | F (mm)    | P0 (mm)   | P1 (mm)   | P2 (mm)   | ΦD <sub>0</sub> (mm) | T (mm)    |
|------|-----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|----------------------|-----------|
| CS02 | 0.65±0.10 | 1.15±0.10 | 8.0±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 |
| CS03 | 1.10±0.10 | 1.90±0.10 | 8.0±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 |
| CS05 | 1.60±0.10 | 2.40±0.20 | 8.0±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 |
| CS06 | 1.90±0.10 | 3.50±0.20 | 8.0±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 |
| CS13 | 2.90±0.10 | 3.50±0.20 | 8.0±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 |
| CS08 | 1.60±0.10 | 2.40±0.20 | 8.0±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 |
| CS62 | 1.90±0.10 | 3.50±0.20 | 8.0±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 |

**Emboss Plastic Tape Specifications**


| Type      | A (mm)    | B (mm)    | W (mm)    | E (mm)    | F (mm)   | P <sub>0</sub> (mm) | P <sub>1</sub> (mm) | P <sub>2</sub> (mm) | ΦD <sub>0</sub> (mm) | T (mm)    |
|-----------|-----------|-----------|-----------|-----------|----------|---------------------|---------------------|---------------------|----------------------|-----------|
| CS10      | 2.80±0.10 | 5.40±0.20 | 12.0±0.30 | 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      | 3.50±0.10 | 6.70±0.10 | 12.0±0.30 | 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±0.10 | 5.5±0.05 | 4.00±0.05           | 4.00±0.10           | 2.00±0.05           | 1.50+0.10            | 1.20±0.20 |
| CS75      | 2.50±0.20 | 8.30±0.20 | 16.0±0.30 | 1.75±0.10 | 7.8±0.05 | 4.00±0.05           | 4.00±0.10           | 2.00±0.05           | 1.50+0.10            | 1.20±0.20 |
| CS20      | 2.80±0.15 | 5.40±0.20 | 12.0±0.10 | 1.75±0.10 | 5.5±0.05 | 4.00±0.05           | 4.00±0.10           | 2.00±0.05           | 1.55+0.10            | 1.00±0.20 |

## ■ Marking

No Marking for 0402

1%, 5% for 0805/1206/1210/2010/2512/1225/3720/7520/0508/0612/1020: 4 digits marking

Example:

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

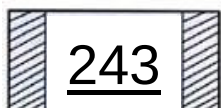
## Marking for 0603

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

Example:

| Resistance | 1.000Ω | 0.100Ω | 0.010Ω | 0.102Ω     | 0.024Ω     |
|------------|--------|--------|--------|------------|------------|
| Marking    | 1R0    | R10    | R01    | <u>102</u> | <u>024</u> |

**REVISION HISTORY**

| REVISION   | DATE         | CHANGE NOTIFICATION | DESCRIPTION                                                                                                  |
|------------|--------------|---------------------|--------------------------------------------------------------------------------------------------------------|
| Version A3 | Jun 03, 2014 | -                   | - Electrical Specifications updated<br>- CS25 Pad Layout updated                                             |
| Version A4 | Apr 30, 2015 | -                   | - Environmental Characteristics updated                                                                      |
| Version A5 | Jul 15, 2016 | -                   | - Remove Material Description<br>- Modify Storage Temperature<br>- CS12 Pad Layout updated                   |
| Version A6 | Jan 12, 2018 | -                   | - Modify 1225 Dimension L, W<br>- Environmental Characteristics updated                                      |
| Version A7 | May 20, 2019 | -                   | - Modify TCR Test description<br>- Features added 100% CCD inspection<br>- Electrical Specifications updated |
| Version A8 | Mar 23, 2020 | -                   | - Environmental Characteristics : Added test voltage for Voltage Proof                                       |
| Version A9 | Mar 10, 2021 | -                   | - Modify 2010 Embossed Plastic Tape B Specification<br>- Modify Soldering Condition (IPC/JEDEC J-STD-020)    |
| Version B  | Nov 15, 2021 | -                   | - Increase the shelf life description                                                                        |
| Version B1 | Feb 15, 2022 | -                   | - Derating Curve changes the temperature range                                                               |
| Version B2 | May 18, 2022 | -                   | - Add 0805 1/2W high power production range                                                                  |
| Version B3 | Jun 15, 2022 | -                   | - Modify Soldering Condition                                                                                 |
| Version B4 | Jul 08, 2024 | -                   | - Modify the descriptions in the Features<br>- Add 0612 production range                                     |
| Version B5 | Aug 26, 2025 | -                   | - Modify the descriptions in the Features<br>- Modify 0402 Dimensions                                        |
| Version B6 | Sep 17, 2025 | -                   | - Add 0508 & 1020 production range                                                                           |