

## Data Sheet

Customer:

Product: Current Sensing Metal Chip Resistor –CSM Series

Size: 0603/0805/1206/2010/2512

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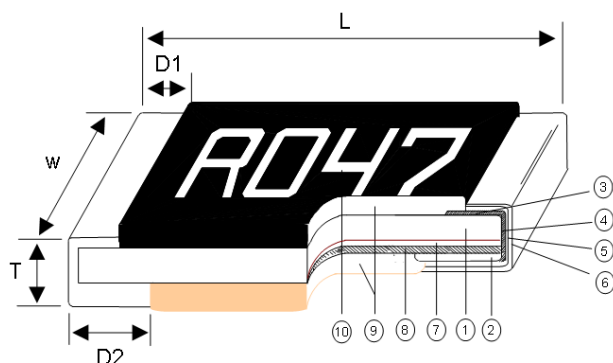
## Current Sensing Metal Chip Resistor



### Features

- SMD Type designed for automatic insertion
- High power rating in small size
- Low resistance resistor for current detection
- Metal foil construction ensures high reliability and performance with very low and stable TCR
- Designed for current sense circuits in power electronic systems
- Pb-Free to meet RoHS requirements

### Construction



### Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor

|                     |                      |                    |
|---------------------|----------------------|--------------------|
| ① Alumina Substrate | ⑤ Barrier Layer      | ⑨ Primary Overcoat |
| ② Bottom Electrode  | ⑥ External Electrode | ⑩ Marking          |
| ③ Top Electrode     | ⑦ Adhesive           |                    |
| ④ Edge Electrode    | ⑧ Resistor Layer     |                    |

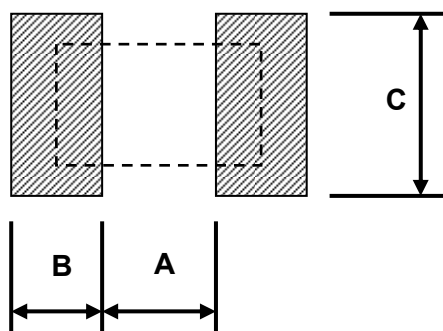
### Dimensions

| Type  | Size (Inch) | Resistance Range (mΩ) | L (mm)    | W (mm)    | T (mm)    | D1 (mm)   | D2 (mm)   |
|-------|-------------|-----------------------|-----------|-----------|-----------|-----------|-----------|
| CSM03 | 0603        | 10 - 29               | 1.55±0.10 | 0.85±0.10 | 0.40±0.10 | 0.30±0.15 | 0.45±0.15 |
|       |             | 30 - 100              | 1.55±0.10 | 0.85±0.10 | 0.40±0.10 | 0.30±0.15 | 0.35±0.15 |
| CSM05 | 0805        | 10 - 29               | 2.00±0.15 | 1.25±0.15 | 0.55±0.10 | 0.30±0.20 | 0.50±0.20 |
|       |             | 30 - 100              | 2.00±0.15 | 1.25±0.15 | 0.52±0.10 | 0.30±0.20 | 0.35±0.20 |
| CSM06 | 1206        | 10 - 29               | 3.05±0.15 | 1.55±0.15 | 0.58±0.15 | 0.50±0.25 | 0.90±0.25 |
|       |             | 30 - 100              | 3.05±0.15 | 1.55±0.15 | 0.55±0.15 | 0.50±0.25 | 0.60±0.25 |
| CSM10 | 2010        | 10 - 29               | 5.00±0.20 | 2.50±0.20 | 0.58±0.15 | 0.60±0.30 | 1.50±0.30 |
|       |             | 30 - 100              | 5.00±0.20 | 2.50±0.20 | 0.55±0.15 | 0.60±0.30 | 0.90±0.30 |
| CSM12 | 2512        | 10 - 29               | 6.30±0.20 | 3.15±0.20 | 0.58±0.15 | 0.60±0.30 | 1.80±0.30 |
|       |             | 30 - 100              | 6.30±0.20 | 3.15±0.20 | 0.55±0.15 | 0.60±0.30 | 1.20±0.30 |

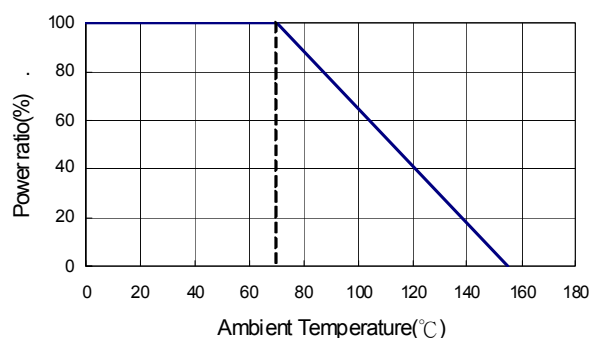
## Part Numbering

| CSM          | 06                                                       | F                                      | T                         | E                 | U                                                 | R100                      |                             |
|--------------|----------------------------------------------------------|----------------------------------------|---------------------------|-------------------|---------------------------------------------------|---------------------------|-----------------------------|
| Product Type | Dimensions (L×W)                                         | Resistance Tolerance                   | Packaging Code            | TCR (PPM/°C)      | Power Rating                                      | Resistance                | Marking                     |
|              | 03: 0603<br>05: 0805<br>06: 1206<br>10: 2010<br>12: 2512 | D: ±0.5%<br>F: ±1%<br>G: ±2%<br>J: ±5% | T: Taping Reel<br>B: Bulk | D: ±50<br>E: ±100 | T: 1W<br>Q: 3/4W<br>U: 1/2W<br>V: 1/4W<br>W: 1/8W | R010: 0.01Ω<br>R100: 0.1Ω | : Standard<br>N: No Marking |

## Recommend Land Pattern



## Derating Curve

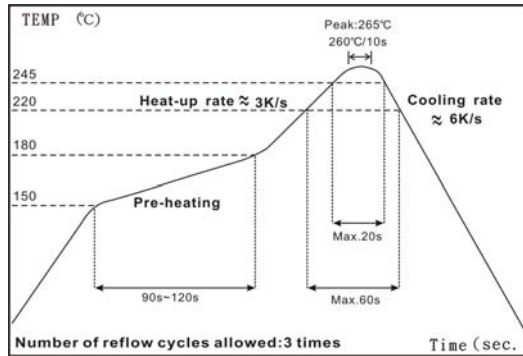


| Type  | Resistance Range | A (mm) | B (mm) | C (mm) |
|-------|------------------|--------|--------|--------|
| CSM03 | 10-29mΩ          | 0.40   | 1.20   | 0.9    |
|       | 30-100mΩ         | 0.70   | 1.05   | 0.9    |
| CSM05 | 10-29mΩ          | 0.80   | 1.10   | 1.35   |
|       | 30-100mΩ         | 1.00   | 1.00   | 1.35   |
| CSM06 | 10-29mΩ          | 0.9    | 1.70   | 1.70   |
|       | 30-100mΩ         | 1.50   | 1.40   | 1.70   |
| CSM10 | 10-29mΩ          | 1.70   | 2.35   | 2.50   |
|       | 30-100mΩ         | 2.80   | 1.80   | 2.50   |
| CSM12 | 10-29mΩ          | 2.30   | 2.90   | 3.10   |
|       | 30-100mΩ         | 3.60   | 2.25   | 3.10   |

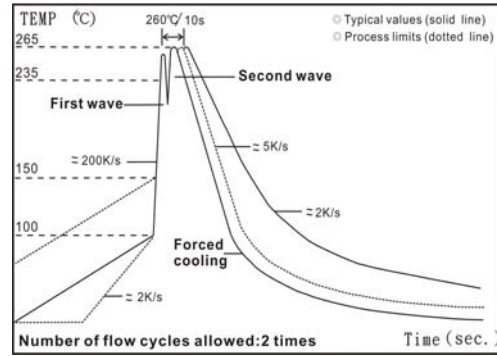
## Marking for 0603

| Type       | Code   |
|------------|--------|
| R10        | 0.100Ω |
| R01        | 0.010Ω |
| <u>101</u> | 0.101Ω |
| <u>035</u> | 0.035Ω |

## Soldering Condition



IR Reflow Soldering



Wave Soldering (Flow Soldering)

- (1) Time of IR reflow soldering at maximum temperature point 260°C : 10s
- (2) Time of wave soldering at maximum temperature point 260°C : 10s
- (3) Time of soldering iron at maximum temperature point 410°C : 5s

## Standard Electrical Specifications

| Type         | Item | Power Rating<br>at 70°C | Operating Temp.<br>Range | Resistance Range<br>(mΩ) |          |     |     | TCR<br>(PPM/°C) |
|--------------|------|-------------------------|--------------------------|--------------------------|----------|-----|-----|-----------------|
|              |      |                         |                          | ±0.5%                    | ±1%      | ±2% | ±5% |                 |
| CSM03 (0603) |      | 1/8W                    | -55 ~ +155°C             | -                        | 10 - 19  |     |     | ±100            |
|              |      |                         |                          |                          | 20 - 100 |     |     | ±50<br>±100     |
| CSM05 (0805) |      | 1/4W                    |                          | -                        | 10 - 19  |     |     | ±100            |
|              |      |                         |                          | 30-100                   | 20 - 100 |     |     | ±50<br>±100     |
| CSM06 (1206) |      | 1/2W                    |                          | -                        | 10 - 19  |     |     | ±100            |
|              |      |                         |                          | 30-100                   | 20 - 100 |     |     | ±50<br>±100     |
| CSM10 (2010) |      | 3/4W                    |                          | -                        | 10 - 19  |     |     | ±100            |
|              |      |                         |                          | 30-100                   | 20 - 100 |     |     | ±50<br>±100     |
| CSM12 (2512) |      | 1W                      |                          | -                        | 10 - 19  |     |     | ±100            |
|              |      |                         |                          | 30-100                   | 20 - 100 |     |     | ±50<br>±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>-55°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><br>5 X Rated Power 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                                                |
| Endurance                                      | $\pm(1.0\%+0.05\Omega)$                                                | <b>JIS-C-5201-1 4.25</b><br><b>IEC-60115-1 4.25.1</b><br>70 $\pm$ 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"            |
| Damp Heat with Load                            | $\pm(1.0\%+0.05\Omega)$                                                | <b>JIS-C-5201-1 4.24</b><br><b>IEC-60115-1 4.24</b><br>40 $\pm$ 2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Dry Heat                                       | $\pm(0.5\%+0.05\Omega)$                                                | <b>JIS-C-5201-1 4.23</b><br><b>IEC-60115-1 4.23.2</b><br>at +155°C for 1000 hrs                                                        |
| Bending Strength                               | $\pm(1.0\%+0.05\Omega)$                                                | <b>JIS-C-5201-1 4.33</b><br><b>IEC-60115-1 4.33</b><br>Bending once for 5 seconds with 3mm<br>2010, 2512 sizes: 2mm                    |
| Solderability                                  | 95% min. coverage                                                      | <b>JIS-C-5201-1 4.17</b><br><b>IEC-60115-1 4.17</b><br>245 $\pm$ 5°C for 3 seconds                                                     |
| Resistance to Soldering Heat                   | $\pm(0.5\%+0.05\Omega)$                                                | <b>JIS-C-5201-1 4.18</b><br><b>IEC-60115-1 4.18</b><br>260 $\pm$ 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                                    |
| 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 $\pm$ 5°C for 30 seconds                                                |
| Rapid Change of Temperature                    | $\pm(0.5\%+0.05\Omega)$                                                | <b>JIS-C-5201-1 4.19</b><br><b>IEC-60115-1 4.19</b><br>-55°C to +155°C, 5 cycles                                                       |

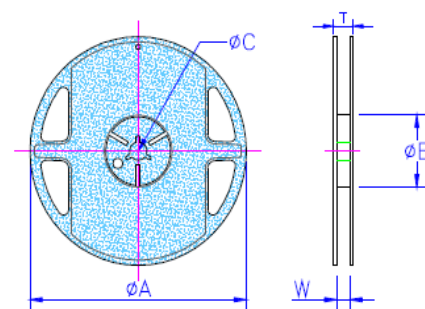
 RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$  or Max. Operating Voltage whichever is lower.

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

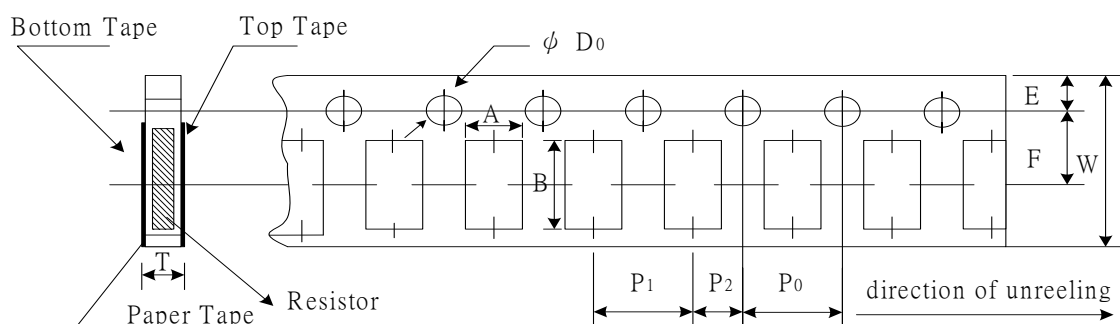
## ■ Packaging

### Packaging Quantity & Reel Specifications

| Type  | ΦA<br>(mm) | ΦB<br>(mm) | ΦC<br>(mm) | W<br>(mm) | T<br>(mm) | Paper<br>Tape (EA) | Emboss<br>Plastic<br>Tape<br>(EA) |
|-------|------------|------------|------------|-----------|-----------|--------------------|-----------------------------------|
| CSM03 | 178.0±1.0  | 60.0±1.0   | 13.5±0.7   | 9.5±0.1   | 11.5±1.0  | 5,000              | -                                 |
| CSM05 | 178.0±1.0  | 60.0±1.0   | 13.5±0.7   | 9.5±0.1   | 11.5±1.0  | 5,000              | -                                 |
| CSM06 | 178.0±1.0  | 60.0±1.0   | 13.5±0.7   | 9.5±0.1   | 11.5±1.0  | 5,000              | -                                 |
| CSM10 | 178.0±1.0  | 60.0±1.0   | 13.5±0.7   | 13.5±1.0  | 15.5±1.0  | -                  | 4,000                             |
| CSM12 | 178.0±1.0  | 60.0±1.0   | 13.5±0.7   | 13.5±1.0  | 15.5±1.0  | -                  | 4,000                             |

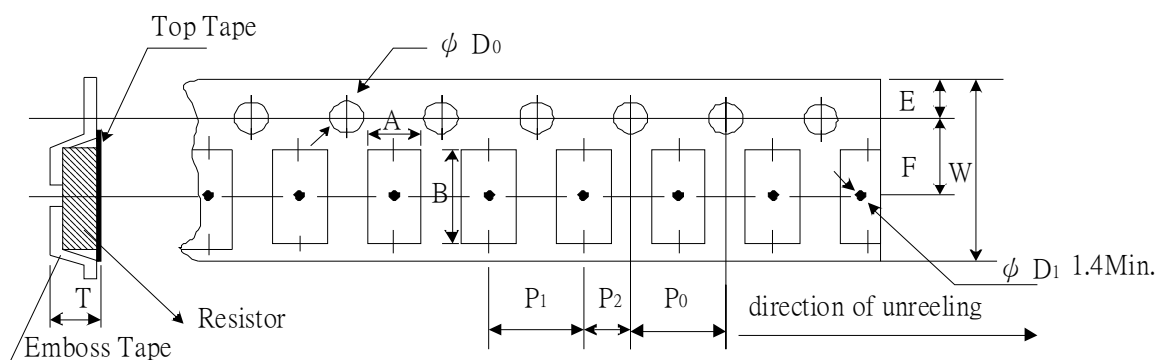


### Paper Tape Specifications



| Type  | A<br>(mm) | B<br>(mm) | W<br>(mm) | E<br>(mm) | F<br>(mm) | P0<br>(mm) | P1<br>(mm) | P2<br>(mm) | ΦD0<br>(mm) | T<br>(mm) |
|-------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|-------------|-----------|
| CSM03 | 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 |
| CSM05 | 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 |
| CSM06 | 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<br>(mm) | B<br>(mm) | W<br>(mm) | E<br>(mm) | F<br>(mm) | P0<br>(mm) | P1<br>(mm) | P2<br>(mm) | ΦD0<br>(mm) | T<br>(mm) |
|-------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|-------------|-----------|
| CSM10 | 2.80±0.10 | 5.50±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 |
| CSM12 | 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 |