

# Metal Film Precision Resistor (CSR Series)

## Features

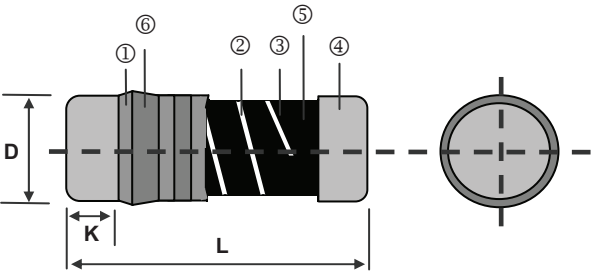
- Excellent overall stability
- Tight tolerance down to  $\pm 0.1\%$
- Extremely low TCR down to  $\pm 10$  PPM/ $^{\circ}\text{C}$
- High power rating up to 1 Watts

## Applications

- Automotive
- Telecommunication
- Medical Equipment



## Construction



|                      |                  |
|----------------------|------------------|
| ① Insulation Coating | ④ Electrode Cap  |
| ② Trimming Line      | ⑤ Resistor Layer |
| ③ Ceramic Rod        | ⑥ Marking        |

## Dimensions

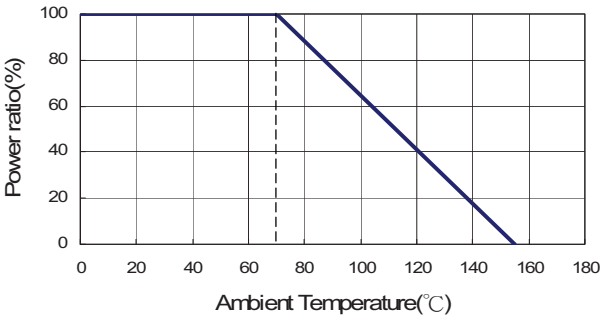
Unit: mm

| Type    | L              | $\Phi D$        | K min. | Weight (g)<br>(1000pcs) | Packaging  |
|---------|----------------|-----------------|--------|-------------------------|------------|
|         |                |                 |        |                         | 180mm (7") |
| CSR0204 | 3.50 $\pm$ 0.2 | 1.40 $\pm$ 0.15 | 0.5    | 18.7                    | 3000EA     |
| CSR0207 | 5.90 $\pm$ 0.2 | 2.20 $\pm$ 0.20 | 0.5    | 80.9                    | 2000EA     |

## Part Numbering

| CSR          | 0204                             | D                                                                                   | T                         | D                                                                        | V                           | 1000                                                                                                     |
|--------------|----------------------------------|-------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------|
| Product Type | Dimensions (L $\times$ $\Phi$ D) | Resistance Tolerance                                                                | Packaging Code            | TCR (PPM/ $^{\circ}\text{C}$ )                                           | Power Rating                | Resistance                                                                                               |
|              | 0204: 3.5x1.4<br>0207: 5.9x2.2   | B: $\pm 0.1\%$<br>C: $\pm 0.25\%$<br>D: $\pm 0.5\%$<br>F: $\pm 1\%$<br>J: $\pm 5\%$ | T: Taping Reel<br>B: Bulk | B: $\pm 10$<br>N: $\pm 15$<br>C: $\pm 25$<br>D: $\pm 50$<br>E: $\pm 100$ | T: 1W<br>U: 1/2W<br>V: 1/4W | 0100: 10 $\Omega$<br>1000: 100 $\Omega$<br>2201: 2200 $\Omega$<br>1001: 1K $\Omega$<br>1004: 1M $\Omega$ |

## Derating Curve



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## ■ Standard Electrical Specifications

| Type\Item | Power Rating at 70 °C | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range |           |            |             |     | TCR (PPM/°C) |
|-----------|-----------------------|-----------------------|------------------------|-----------------------|------------------|-----------|------------|-------------|-----|--------------|
|           |                       |                       |                        |                       | ±0.1%            | ±0.25%    | ±0.5%      | ±1%         | ±5% |              |
| 0204      | 1/4W                  | -55 ~ +155°C          | 200V                   | 400V                  | 100Ω-20KΩ        | 10Ω-20KΩ  |            |             |     | ±10          |
|           |                       |                       |                        |                       | 100Ω-100KΩ       | 10Ω-100KΩ |            |             |     | ±15          |
|           |                       |                       |                        |                       | 100Ω-270KΩ       | 10Ω-330KΩ | 4.7Ω-560KΩ | 4.7Ω-1MΩ    |     | ±25          |
|           |                       |                       |                        |                       | 100Ω-270KΩ       | 1Ω-330KΩ  | 1Ω-1MΩ     | 1Ω-10MΩ     |     | ±50          |
|           |                       |                       |                        |                       | -                |           |            | 5.11MΩ-10MΩ | -   | ±100         |
|           |                       |                       |                        |                       |                  |           |            | 0.1Ω-0.91Ω  |     |              |
| 0207      | 1/2W                  | -55 ~ +155°C          | 300V                   | 500V                  | 100Ω-20KΩ        | 10Ω-20KΩ  |            |             |     | ±10          |
|           |                       |                       |                        |                       | 100Ω-100KΩ       | 10Ω-100KΩ |            |             |     | ±15          |
|           |                       |                       |                        |                       | 100Ω-400KΩ       | 10Ω-400KΩ | 10Ω-560KΩ  | 10Ω-560KΩ   |     | ±25          |
|           |                       |                       |                        |                       | 100Ω-400KΩ       | 1Ω-330KΩ  | 1Ω-1MΩ     | 1Ω-5.1MΩ    |     | ±50          |
|           |                       |                       |                        |                       | -                |           |            | 0.1Ω-0.91Ω  |     | ±100         |
|           |                       |                       |                        |                       |                  |           |            |             |     |              |

## ■ High Power Rating Electrical Specifications

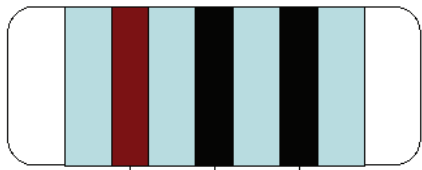
| Item<br>Type | Power<br>Rating<br>at 70 °C | Operating<br>Temp.<br>Range | Max.<br>Operating<br>Voltage | Max.<br>Overload<br>Voltage | Resistance Range |            |            |              |     | TCR<br>(PPM/°C) |
|--------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|------------------|------------|------------|--------------|-----|-----------------|
|              |                             |                             |                              |                             | ±0.1%            | ±0.25%     | ±0.5%      | ±1%          | ±5% |                 |
| 0207         | 1W                          | -55 ~<br>+155°C             | 350V                         | 700V                        | 100Ω-100KΩ       | 10Ω-100KΩ  |            |              |     | ±15             |
|              |                             |                             |                              |                             | 100Ω-100KΩ       | 4.7Ω - 1MΩ | 4.7Ω - 1MΩ | 4.7Ω-560KΩ   |     | ±25             |
|              |                             |                             |                              |                             | 100Ω-100KΩ       | 10Ω - 1MΩ  | 1Ω - 1MΩ   | 1Ω - 2.2MΩ   |     | ±50             |
|              |                             |                             |                              |                             | -                |            |            | 0.1Ω - 0.91Ω |     | ±100            |
|              |                             |                             |                              |                             |                  |            |            |              |     |                 |

## ■ Environmental Characteristics

| Item                                           | Requirement      | Test Method                                                                                                          |
|------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient of Resistance (T.C.R.) | As Spec          | <b>JIS-C-5201-1 5.2</b><br>+20/-15/+20/+100/+20°C                                                                    |
| Short Time Overload                            | △R±0.5%          | <b>JIS-C-5201-1 5.5</b><br>RCWV*2.5 or Max. overload voltage for 5 seconds                                           |
| Endurance                                      | △R±2%            | <b>JIS-C-5201-1 7.10</b><br>70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"            |
| Damp Heat with Load                            | △R±2%            | <b>JIS-C-5201-1 7.9</b><br>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                                       | △R±2%            | <b>JIS-C-5201-1 7.2</b><br>at +155°C for 1000 hrs                                                                    |
| Solderability                                  | 95%min. coverage | <b>JIS-C-5201-1 6.5</b><br>245±5°C for 3 seconds                                                                     |
| Resistance to Soldering Heat                   | △R±0.5%          | <b>JIS-C-5201-1 6.4</b><br>260±5°C for 10 seconds                                                                    |

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

■ Marking & Resistance Tolerance



|     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ±5% | E-24 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | 4.3 | 4.7 | 5.1 | 5.6 | 6.2 | 6.8 | 7.5 | 8.2 | 9.1 |
|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|



|                            |       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----------------------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| ±1%                        | E-96  | 1.00 | 1.02 | 1.05 | 1.07 | 1.10 | 1.13 | 1.15 | 1.18 | 1.21 | 1.24 | 1.27 | 1.30 | 1.33 | 1.37 | 1.40 | 1.43 | 1.47 | 1.50 | 1.54 | 1.58 | 1.62 | 1.65 | 1.69 | 1.74 |
|                            |       | 1.78 | 1.82 | 1.87 | 1.91 | 1.96 | 2.00 | 2.05 | 2.10 | 2.15 | 2.21 | 2.26 | 2.32 | 2.37 | 2.43 | 2.49 | 2.55 | 2.61 | 2.67 | 2.74 | 2.80 | 2.87 | 2.94 | 3.01 | 3.09 |
|                            |       | 3.16 | 3.24 | 3.32 | 3.40 | 3.48 | 3.57 | 3.65 | 3.74 | 3.83 | 3.92 | 4.02 | 4.12 | 4.22 | 4.32 | 4.42 | 4.53 | 4.64 | 4.75 | 4.87 | 4.99 | 5.11 | 5.23 | 5.36 | 5.49 |
|                            |       | 5.62 | 5.76 | 5.90 | 6.04 | 6.19 | 6.34 | 6.49 | 6.65 | 6.81 | 6.98 | 7.15 | 7.32 | 7.50 | 7.68 | 7.87 | 8.06 | 8.25 | 8.45 | 8.66 | 8.87 | 9.09 | 9.31 | 9.53 | 9.76 |
| ±0.50%<br>±0.25%<br>±0.10% | E-192 | 10.0 | 10.1 | 10.2 | 10.4 | 10.5 | 10.6 | 10.7 | 10.9 | 11.0 | 11.1 | 11.3 | 11.4 | 11.5 | 11.7 | 11.8 | 12.0 | 12.1 | 12.3 | 12.4 | 12.6 | 12.7 | 12.9 | 13.0 | 13.2 |
|                            |       | 13.3 | 13.5 | 13.7 | 13.8 | 14.0 | 14.2 | 14.3 | 14.5 | 14.7 | 14.9 | 15.0 | 15.2 | 15.4 | 15.6 | 15.8 | 16.0 | 16.2 | 16.4 | 16.5 | 16.7 | 16.9 | 17.2 | 17.4 | 17.6 |
|                            |       | 17.8 | 18.0 | 18.2 | 18.4 | 18.7 | 18.9 | 19.1 | 19.3 | 19.6 | 19.8 | 20.0 | 20.3 | 20.5 | 20.8 | 21.0 | 21.3 | 21.5 | 21.8 | 22.1 | 22.3 | 22.6 | 22.9 | 23.2 | 23.4 |
|                            |       | 23.7 | 24.0 | 24.3 | 24.6 | 24.9 | 25.2 | 25.5 | 25.8 | 26.1 | 26.4 | 26.7 | 27.1 | 27.4 | 27.7 | 28.0 | 28.4 | 28.7 | 29.1 | 29.4 | 29.8 | 30.1 | 30.5 | 30.9 | 31.2 |
|                            |       | 31.6 | 32.0 | 32.4 | 32.8 | 33.2 | 33.6 | 34.0 | 34.4 | 34.8 | 35.2 | 35.7 | 36.1 | 36.5 | 37.0 | 37.4 | 37.9 | 38.3 | 38.8 | 39.2 | 39.7 | 40.2 | 40.7 | 41.2 | 41.7 |
|                            |       | 42.2 | 42.7 | 43.2 | 43.7 | 44.2 | 44.8 | 45.3 | 45.9 | 46.4 | 47.0 | 47.5 | 48.1 | 48.7 | 49.3 | 49.9 | 50.5 | 51.1 | 51.7 | 52.3 | 53.0 | 53.6 | 54.2 | 54.9 | 55.6 |
|                            |       | 56.2 | 56.9 | 57.6 | 58.3 | 59.0 | 59.7 | 60.4 | 61.2 | 61.9 | 62.6 | 63.4 | 64.2 | 64.9 | 65.7 | 66.5 | 67.3 | 68.1 | 69.0 | 69.8 | 70.6 | 71.5 | 72.3 | 73.2 | 74.1 |
|                            |       | 75.0 | 75.9 | 76.8 | 77.7 | 78.7 | 79.6 | 80.6 | 81.6 | 82.5 | 83.5 | 84.5 | 85.6 | 86.6 | 87.6 | 88.7 | 89.8 | 90.9 | 92.0 | 93.1 | 94.2 | 95.3 | 96.5 | 97.6 | 98.8 |

| Cold   | Digit | Multiplier       |
|--------|-------|------------------|
| Silver | -     | 10 <sup>-2</sup> |
| Gold   | -     | 10 <sup>-1</sup> |
| Black  | 0     | 10 <sup>0</sup>  |
| Brown  | 1     | 10 <sup>1</sup>  |
| Red    | 2     | 10 <sup>2</sup>  |
| Orange | 3     | 10 <sup>3</sup>  |
| Yellow | 4     | 10 <sup>4</sup>  |
| Green  | 5     | 10 <sup>5</sup>  |
| Blue   | 6     | 10 <sup>6</sup>  |
| Violet | 7     | 10 <sup>7</sup>  |
| Grey   | 8     | 10 <sup>8</sup>  |
| White  | 9     | 10 <sup>9</sup>  |