# ***Data Sheet***

| | |
|---|---|
| Customer: | |
| Product: | Automotive Grade Metal Film Precision High Voltage MELF Resistor - CSRP Series |
| Size: | 0204/0207 |
| Issued Date: | 10-Feb-25 |
| Edition: | REV.B1 |

RoHS Compliant

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| Produced by (QC) | Checked (QC) | Approved by (QC) | Prepared by (Sales) | Accepted by (Customer) |
|---|---|---|---|---|
| 10-Feb-25 | 10-Feb-25 | 10-Feb-25 | | |
| ***Irene Weng*** | ***Susan Huang*** | ***Susan Huang*** | | |

# Automotive Grade Metal Film Precision High Voltage MELF Resistor



## ■Features

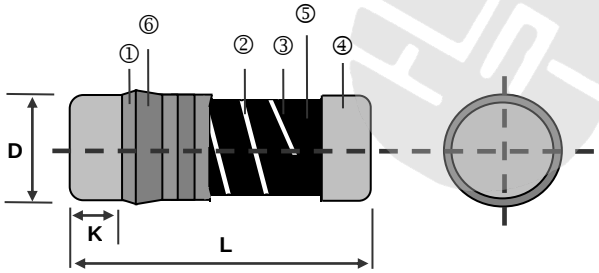
- AEC-Q200 Qualified
- Thin film technology
- High voltage application
- Sn termination on Ni barrier layer
- Tight tolerance down to ±0.1%
- High power rating up to 1 Watts
- SMD enabled structure
- Lead-free and RoHS compliant
- Sulfur resistance unaffected by sulfur environments

## ■Applications

- Industrial
- Telecommunication
- Medical Equipment
- Measurement/Testing Equipment

| TECHNICAL SPECIFICATIONS | | |
|---|---|---|
| **DESCRIPTION** | **CSRP0204** | **CSRP0207** |
| Resistance range | 100KΩ-10MΩ | 100KΩ-10MΩ |
| Resistance tolerance | ±1%;±0.5%;±0.25%;±0.1% | |
| Temperature coefficient | ±50ppm/℃; ±25ppm/℃ | |
| Power rating $P_{70}$ | 2/5W | 1W |
| Operating voltage $U_{max.}$ | 700V | 1200V |
| Operating temperature range | -55℃~155℃ | |
| Max. resistance change at P70 for resistance range, △R/R max., after 1000 h | ≦0.5% | ≦0.5% |

## ■Construction & Dimension




| Type | L (mm) | ΦD (mm) | K (mm) | Weight 1,000EA (g) |
|---|---|---|---|---|
| CSRP0204 | 3.50±0.2 | 1.40±0.15 | 0.8±0.1 | 18.7 |
| CSRP0207 | 5.90±0.2 | 2.20±0.20 | 1.3±0.1 | 80.9 |

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

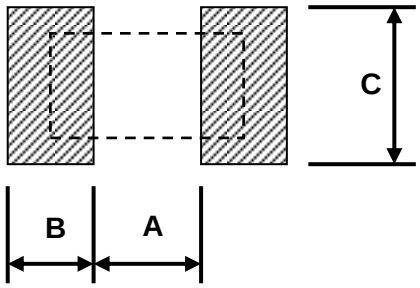
## ■Part Numbering

**Part Number：CSRP0204FTDG1004**

| C | S | R | P | 0 | 2 | 0 | 4 | D | T | D | G | 1 | 0 | 0 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

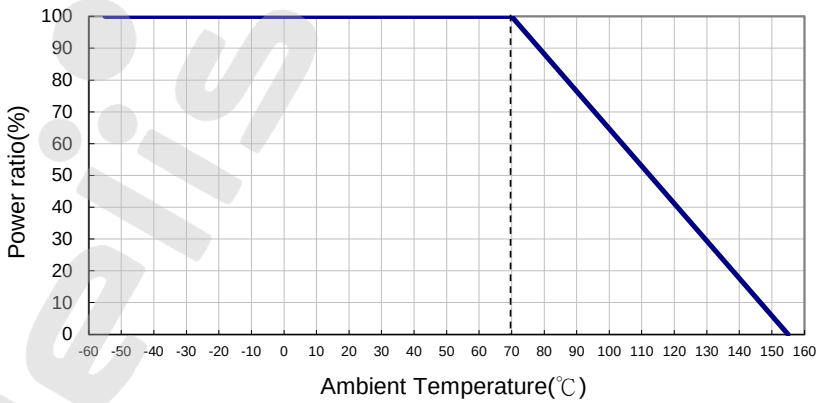
| Product Type | Dimensions (L×ΦD) | Resistance Tolerance | Packaging Code | TCR (PPM/℃) | Power Rating | Resistance |
|---|---|---|---|---|---|---|
| CSRP | 0204: 3.5x1.4<br>0207: 5.9x2.2 | B: ±0.1%<br>C: ±0.25%<br>D: ±0.5%<br>F: ±1% | T: 7" Taping Reel<br>S:7" Taping Reel, **Antistatic Tape**<br>W:13" Taping Reel<br>M:13" Taping Reel, **Antistatic Tape** | C: ±25<br>D: ±50 | T: 1W<br>G: 2/5W | 1004: 1MΩ |

## ■Recommend Land Pattern

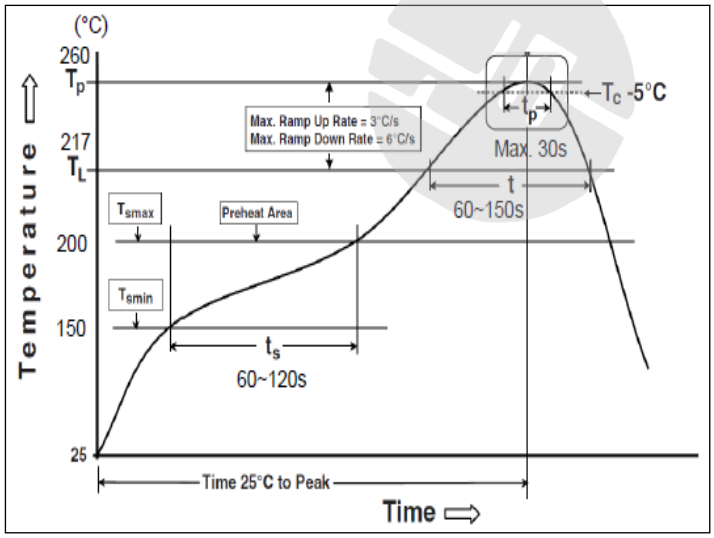



| Type | A (mm) | B (mm) | C (mm) |
|---|---|---|---|
| CSRP0204 | 1.6 | 1.2 | 1.6 |
| CSRP0207 | 3.0 | 1.7 | 2.4 |

## ■Derating Curve




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




| Reflow Profiles | |
|---|---|
| **Profile Feature** | **Pb-Free Assembly** |
| **Preheat**<br>Min. Temperature (Tsmin)<br>Max Temperature (Tsmax)<br>Preheating time (ts) from (Tsmin to Tsmax) | <br>150 °C<br>200 °C<br>60-120 seconds |
| Ramp-up rate ($T_L$ to Tp) | 3 °C/second max. |
| Liquidous temperature ($T_L$)<br>Time ($t_L$) maintained above $T_L$ | 217 °C<br>60-150 seconds |
| Min. Peak temperature (Tp min) | 235°C |
| Max. Peak temperature (Tp max) | 260°C |
| Time (tp) within 5 °C of the specified classification temperature (Tc) | 30 seconds max. |
| Ramp-down rate (Tp to $T_L$) | 6 °C/second max. |
| Time 25 °C to peak temperature | 8 minutes max. |

## ■Electrical Specifications

| Item / Type | Power Rating at 70°C | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range | | | | TCR (PPM/°C) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | ±0.1% (E24,E96) | ±0.25% (E24,E96) | ±0.5% (E24,E96) | ±1% (E24,E96) | |
| 0204 | 2/5W | -55 ~ +155°C | 700V | 1400V | 100KΩ-1MΩ | | 100KΩ-3.4MΩ | | ±25 |
| | | | | | 100KΩ-1MΩ | | 100KΩ-3.4MΩ | 100KΩ-10MΩ | ±50 |
| 0207 | 1W | -55 ~ +155°C | 1200V | 2400V | 100KΩ-1MΩ | | 100KΩ-3.4MΩ | | ±25 |
| | | | | | 100KΩ-1MΩ | | 100KΩ-3.4MΩ | 100KΩ-10MΩ | ±50 |

Operating Voltage=√(P*R) or Max. Operating Voltage listed above, whichever is lower.
Overload Voltage=2.5*√(P*R) or Max. Overload Voltage listed above, whichever is lower.
RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.
■ 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 | **JIS-C-5201-1 4.8**<br>**IEC-60115-1 4.8**<br>At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature |
| Short Time Overload | ±(0.15%+0.01Ω) | **JIS-C-5201-1 4.13**<br>**IEC-60115-1 4.13**<br>RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds |
| Insulation Resistance | ≥10G | **JIS-C-5201-1 4.6**<br>**IEC-60115-1 4.6**<br>Max. Overload Voltage for 1 minute |
| Endurance | ≤332KΩ: ±(0.25%+0.01Ω)<br>>332KΩ: ±(0.5%+0.01Ω) | **JIS-C-5201-1 4.25**<br>**IEC-60115-1 4.25.1**<br>**MIL-STD-202 Method 108**<br>70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" |
| Biased Humidity | ≤332KΩ: ±(0.25%+0.01Ω)<br>>332KΩ: ±(1%+0.01Ω) | **MIL-STD-202 Method 103**<br>1344 hrs 85°C/85%RH 10% of operating power. (≦100 V) |
| High Temperature Exposure | ≤332KΩ: ±(0.25%+0.01Ω)<br>>332KΩ: ±(0.5%+0.01Ω) | **MIL-STD-202 Method 108**<br>at +155°C for 1000 hrs |
| Board Flex | ±(0.2%+0.01Ω) | **AEC-Q200-005**<br>Bending once for 60 seconds with 2mm |
| Solderability | 95% min. coverage | **JIS-C-5201-1 4.17**<br>**IEC-60115-1 4.17**<br>**J-STD-002**<br>245±5°C for 3 seconds |
| Resistance to Soldering Heat | ±(0.25%+0.01Ω) | **MIL-STD-202 Method 210**<br>260±5°C for 10 seconds |
| Voltage Proof | No breakdown or flashover | **JIS-C-5201-1 4.7**<br>**IEC-60115-1 4.7**<br>1.42 times Max. Operating Voltage for 1 minute |
| Leaching | Individual leaching area ≦5%<br>Total leaching area ≦ 10% | **JIS-C-5201-1 4.18**<br>**IEC-60068-2-58 8.2.1**<br>260±5°C for 30 seconds |
| Temperature Cycling | ≤332KΩ: ±(0.15%+0.01Ω)<br>>332KΩ: ±(0.25%+0.01Ω) | **JESD22 Method JA-104**<br>-55°C to +125°C, 1000 cycles |
| Resistance to Solvents | No visible damage on appearance and marking. | **MIL-STD-202 Method 215**<br>Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents. |

Metal Film Precision High Voltage MELF Resistor

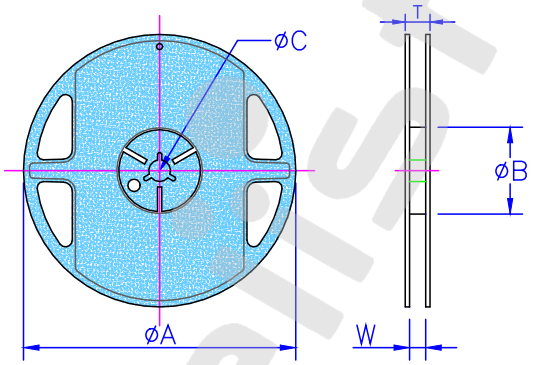
| Item | Requirement | Test Method |
|---|---|---|
| Mechanical Shock | ±(0.25%+0.01Ω) | **MIL-STD-202 Method 213**<br>Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6. |
| Vibration | ±(0.5%+0.01Ω) | **MIL-STD-202 Method 204**<br>5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz |
| ESD | ±(0.5%+0.01Ω) | **AEC-Q200-002**<br>Human body, 0204:2KV; 0207:4KV |
| Terminal Strength | No broken | **AEC-Q200-006**<br>Force of 1.8kg for 60 seconds. |
| Flammability | No ignition of the tissue paper or scorching or the pinewood board | **UL-94**<br>V-0 or V-1 are acceptable. Electrical test not required. |

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

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

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

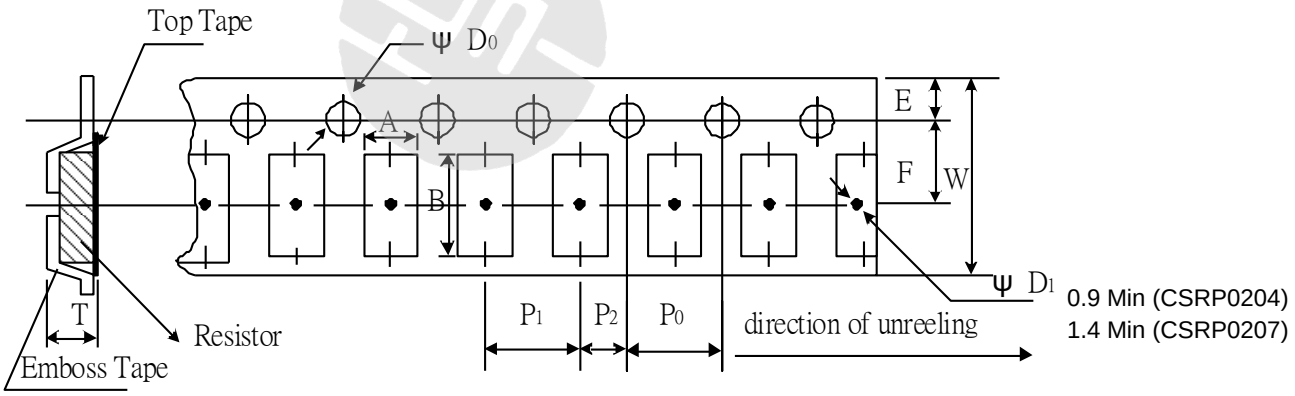
## ■Packaging




Packaging Quantity & Reel Specifications

| Type | Reel Diameter | ΦA (mm) | ΦB (mm) | ΦC (mm) | W (mm) | T (mm) | Emboss Plastic Tape (EA) |
|---|---|---|---|---|---|---|---|
| CSRP0204 | 7 inch | 178.5±1.5 | 60.0+1.0 | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 | 3,000 |
| | 13 inch | 330±1.0 | 100±0.5 | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 | 10,000 |
| CSRP0207 | 7 inch | 178.5±1.5 | 60.0+1.0 | 13.0±0.5 | 13.0±0.5 | 15.5±0.5 | 2,000 |
| | 13 inch | 330±1.0 | 99±0.5 | 13.5±0.5 | 13.4±1 | 17.8±1 | 6,000 |

Emboss Plastic Tape Specifications

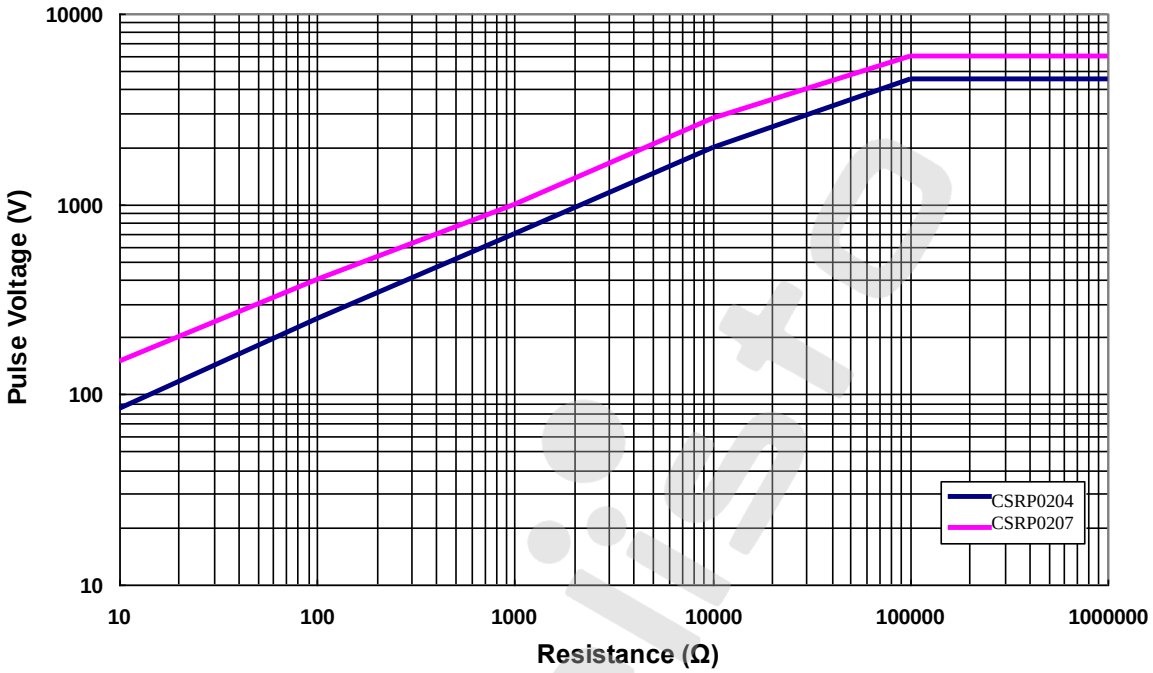



| Type | A (mm) | B (mm) | W (mm) | E (mm) | F (mm) | $P_0$ (mm) | $P_1$ (mm) | $P_2$ (mm) | $\Phi D_0$ (mm) | T (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| CSRP0204 | 1.55±0.20 | 3.65±0.20 | 8.0±0.10 | 1.75±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.10 | 1.80±0.10 |
| CSRP0207 | 2.40±0.10 | 6.15±0.10 | 12.0±0.10 | 1.75±0.10 | 5.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.10 | 2.70±0.10 |

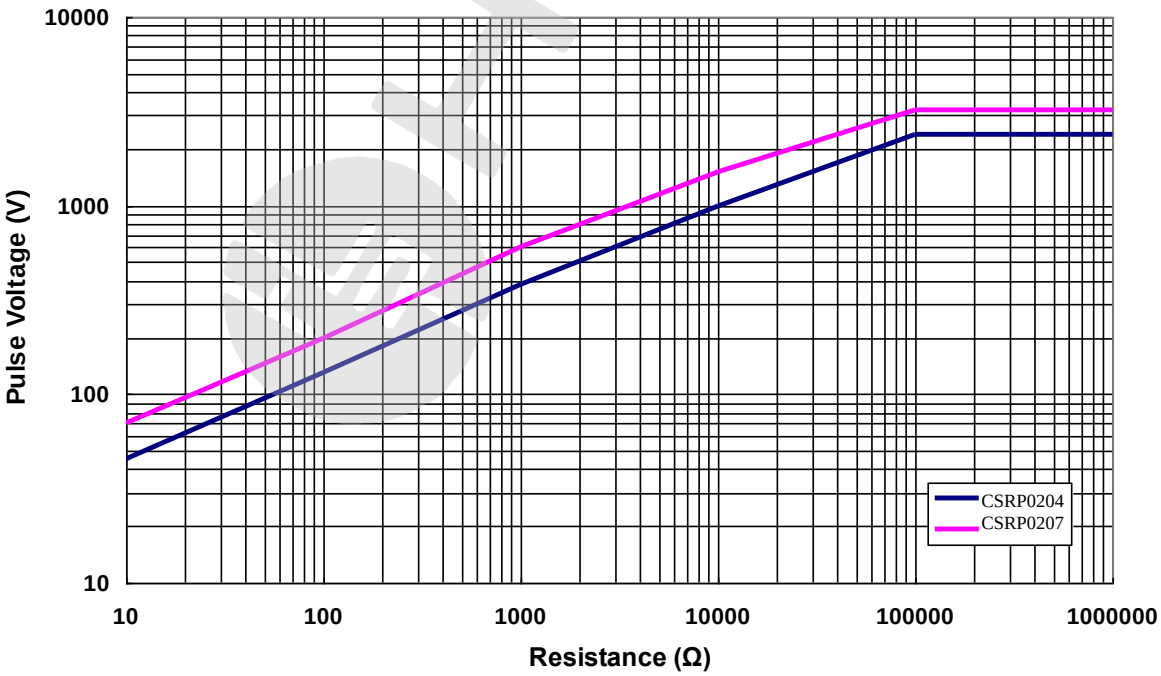
## ■Lightning Surge

Resistors are tested in accordance with IEC 60115-1 using both 1.2/50us and 10/700us pulse shapes. The limit of acceptance is a shift in resistance of less than 0.5% from the initial value.

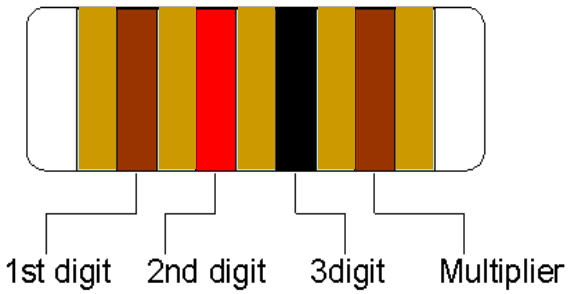
### 1.2/50μs Lightning Surge




### 10/700μs Lightning Surge



## ■Marking & Resistance Tolerance




| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ±1% | 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 |
| | 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 |
| ±0.5%<br>±0.25%<br>±0.1% | 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 |

| Color | Digit | Multiplier |
|---|---|---|
| Silver | - | $10^{-2}$ |
| Gold | - | $10^{-1}$ |
| Black | 0 | $10^{0}$ |
| Brown | 1 | $10^{1}$ |
| Red | 2 | $10^{2}$ |
| Orange | 3 | $10^{3}$ |
| Yellow | 4 | $10^{4}$ |
| Green | 5 | $10^{5}$ |
| Blue | 6 | $10^{6}$ |
| Violet | 7 | $10^{7}$ |
| Grey | 8 | $10^{8}$ |
| White | 9 | $10^{9}$ |

## REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|---|---|---|---|
| Version A | Oct 13, 2017 | - | - Develop a new specification |
| Version A1 | May 20, 2019 | - | - Modify TCR Test description |
| Version A2 | Mar 10, 2021 | - | - Modify Soldering Condition (IPC/JEDEC J-STD-020) |
| Version A3 | Dec 21, 2021 | PCN #: 210602 | - Expand the resistance range to 10M<br>- Newly added antistatic tape packaging method<br>- Change the paint color of the body to brown |
| Version A4 | Feb 15, 2022 | - | - Derating Curve changes the temperature range |
| Version A5 | Jun 15, 2022 | - | - Modify Soldering Condition |
| Version A6 | Nov 16, 2022 | - | - Modify Endurance Spec. |
| Version A7 | Sep 05, 2023 | - | - Features added Thin film technology |
| Version A8 | Oct 03, 2023 | - | - Environmental Characteristics updated |
| Version A9 | Jul 08, 2024 | - | - Modify the descriptions in the Features |
| Version B | Dec 26, 2024 | - | - Electrical Specifications updated<br>- Max. Operating & Max. overload voltage updated<br>- Environmental Characteristics updated |
| Version B1 | Feb 10, 2025 | - | - Modify the descriptions in the Features |