

信昌電子陶瓷股份有限公司

Prosperity Dielectrics Co., Ltd.
No.220-1, Sec. 2, Nanshan Rd., Lujhu, Taoyuan 33860, Taiwan, R.O.C.

SPECIFICATION FOR APPROVAL

DATE:

CUSTOMER: _____

PART NAME: General Purpose Lead Free &. Halogen Free Chip Resistors

CUSTOMER'S DWG. NO. _____

CUSTOMER'S PART NO. _____

PDC PART NO. FCF SERIES APPROVED

DESCRIPTION. _____

| RESULT \ ACTION | " ~ " | CUSTOMER'S SIGNATURE | NOTE |
|----------------------|-------|----------------------|------|
| FULL APPROVED | | | |
| CONDITIONAL APPROVED | | | |
| REJECTED | | | |

| OUR ACTION | SIGNATURE |
|-------------|--------------------|
| PREPARED BY | <i>Jenny Tseng</i> |
| CHECKED BY | <i>Tony Chou</i> |
| APPROVED BY | <i>Byron Tsai</i> |

| |
|---|
| <p>CUSTOMER SIGNATURE FOR ACCEPTANCE</p> |
|---|

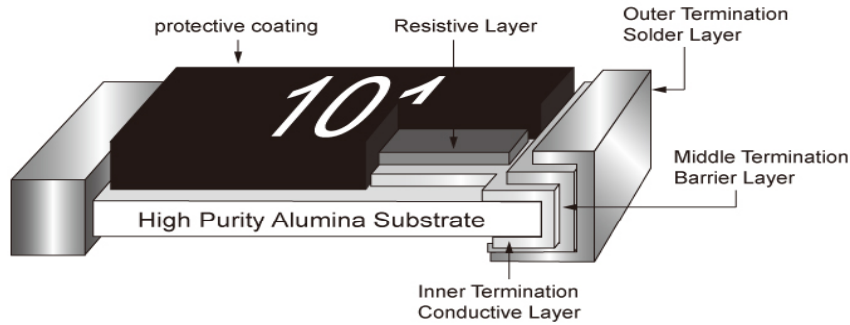
■ Features

- Suitable for lead free soldering.
- Compatible with wave and reflow soldering
- RoHS compliant & Halogen Free

■ Applications

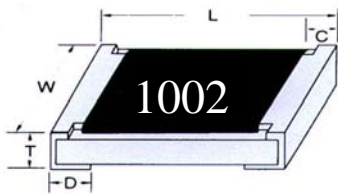
- Portable Devices
- Consumer Electronics
- Measurement instrument
- Computer / Motherboard

■ Configuration



Construction of Chip-Resistor

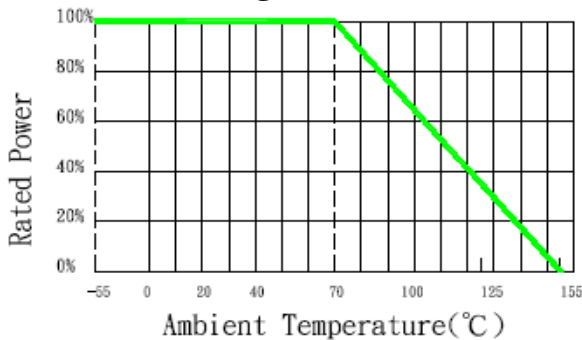
■ Dimensions



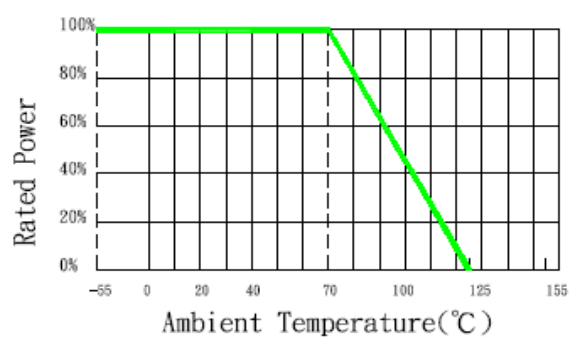
| Size | L | W | C | D | T |
|-------|-----------|-----------|-----------|-----------|-----------|
| 01005 | 0.40±0.02 | 0.20±0.02 | 0.08±0.03 | 0.10±0.03 | 0.13±0.02 |
| 0201 | 0.60±0.03 | 0.30±0.03 | 0.10±0.05 | 0.15±0.05 | 0.23±0.03 |
| 0402 | 1.00±0.05 | 0.50±0.05 | 0.20±0.10 | 0.25±0.10 | 0.35±0.05 |
| 0603 | 1.60±0.10 | 0.80±0.10 | 0.30±0.20 | 0.30±0.20 | 0.45±0.10 |
| 0805 | 2.00±0.10 | 1.25±0.10 | 0.40±0.20 | 0.40±0.20 | 0.50±0.10 |
| 1206 | 3.10±0.10 | 1.60±0.10 | 0.50±0.20 | 0.50±0.25 | 0.55±0.10 |
| 1210 | 3.10±0.10 | 2.60±0.15 | 0.50±0.25 | 0.50±0.25 | 0.55±0.10 |
| 2010 | 5.00±0.20 | 2.50±0.20 | 0.60±0.25 | 0.60±0.25 | 0.60±0.10 |
| 2512 | 6.40±0.20 | 3.20±0.20 | 0.60±0.25 | 0.90±0.25 | 0.60±0.15 |

(unit: mm)

■ Power Derating Curve



Maximum dissipation in percentage of rated power as a function of the ambient temperature for 0402,0603,0805,1206,1210,2010,2512



Maximum dissipation in percentage of rated power as a function of the ambient temperature for 01005,0201

Rating

FCF Series

• LEAD FREE CHIP RESISTORS

| Type | Size | Power Rating at 70°C | Max. RCWV | Max. Overload Voltage | Resistance Tolerance (%) | Temperature Coefficient (TCR; ppm/°C) | Resistance Range(Ω) | | Standard Resistance Values | |
|-------|-------|----------------------|-----------|-----------------------|--------------------------|---------------------------------------|---------------------|--------|----------------------------|------|
| | | | | | | | Min. | Max. | | |
| FCF0A | 01005 | 1/32W | 15V | 30V | ±1%(F) | ±200 | 100 | 1M | E-96 | |
| | | | | | | ±300 | 0 & .47 | 91 | E-96 | |
| | | | | | ±5%(J) | ±200 | 100 | 1M | E-24 | |
| | | | | | | ±300 | 0 & .47 | 91 | E-24 | |
| FCF01 | 0201 | 1/20W | 25V | 50V | ±1%(F) | ±200 | 1 | 3.3M | E-96/24 | |
| | | | | | ±5%(J) | | 0 & .1 | 10M | E-24 | |
| FCF02 | 0402 | 1/16W | 50V | 100V | ±0.1%(B) | ±100 | 10 | 1M | E-96 | |
| | | | | | ±0.5%(D) | | 10 | 1M | E-96 | |
| | | | | | ±1%(F) | | 1 | 10M | E-96 | |
| | | | | | ±5%(J) | | 0 & .1 | 10M | E-24 | |
| FCF03 | 0603 | 1/10W | 50V | 100V | ±0.1%(B) | ±50 | 20 | 510K | E-96 | |
| | | | | | ±0.25%(C) | | | | E-96 | |
| | | | | | ±0.5%(D) | | | | E-96 | |
| FCF05 | 0805 | 1/8W | 150V | 300V | ±1%(F) | ±100 | 1 | 10M | E-96 | |
| | | | | | ±1%(F) | | ±100 | 1 | 10M | E-96 |
| FCF06 | 1206 | 1/4W | 200V | 400V | ±2%(G) | ±200 | 1 | 10M | E-24 | |
| | | | | | ±5%(J) | | ±200 | 0 & .1 | 10M | E-24 |
| | | | | | ±1%(F) | | ±100 | 1 | 10M | E-96 |
| FCF12 | 1210 | 1/3W | 200V | 400V | ±1%(F) | ±100 | 1 | 10M | E-96 | |
| | | | | | ±5%(J) | | ±200 | 0 & .1 | 10M | E-24 |
| FCF20 | 2010 | 3/4W | 200V | 400V | ±1%(F) | ±100 | 1 | 10M | E-96 | |
| | | | | | ±5%(J) | | ±200 | 0 & .1 | 10M | E-24 |
| FCF25 | 2512 | 1W | 200V | 400V | ±1%(F) | ±100 | 1 | 10M | E-96 | |
| | | | | | ±5%(J) | | ±200 | 0 & .1 | 10M | E-24 |

Jumper(0Ω) : ◎ 01005 size maximum resistance $R_{max} < 50m\Omega$ and rated current $I_R \leq 0.8A$

◎ 0201,0402,0603 size maximum resistance $R_{max} < 50m\Omega$ and rated current $I_R \leq 1A$

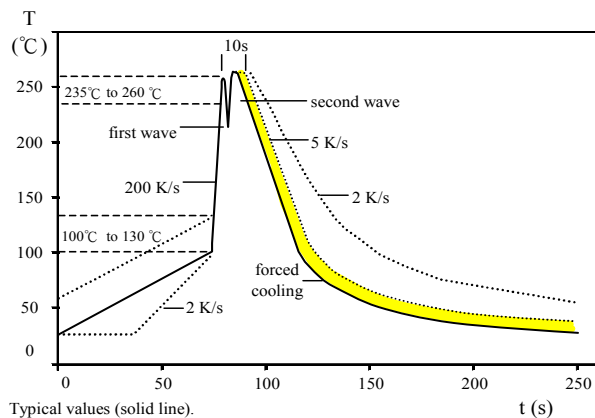
◎ 0805,1206,1210,2010,2512 size maximum resistance $R_{max} < 50m\Omega$ and rated current $I_R \leq 2A$

1Ω~10Ω: ◎ Temperature Coefficient of Resistance for 01005,0201 = -200 ~ +600

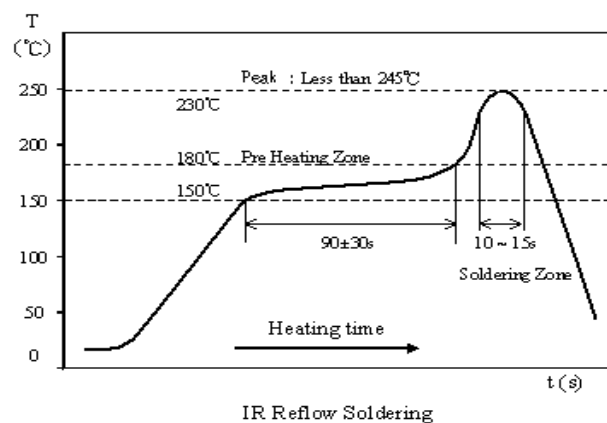
◎ Temperature Coefficient of Resistance for 0402,0603,0805,1206 = -200 ~ +400

◎ Temperature Coefficient of Resistance for 2010,2512 = ±300

Soldering Temperature Curve



WAVE soldering.



IR Reflow Soldering

■ **Part Number**

| FCF | 05 | F | T | — | 1002 | — |
|------------|---------------|------------|------------------|--------|--------------------------|------------------------------------|
| Type | Size | Tolerance | Packing | | GM | TCR |
| FCF | 0A : 01005 | B : ± 0.1% | S : Paper tape | 1Kpcs | examples: | — TCR as Rating Table |
| | 01 : 0201 | C : ±0.25% | T : Paper tape | 5Kpcs | 1002:100*10 ² | |
| | 02 : 0402 | D : ± 0.5% | V : Paper tape | 10Kpcs | =10KΩ | P : 50ppm |
| | 03 : 0603 | F : ± 1% | U : Paper tape | 15Kpcs | 103 :10*10 ³ | |
| | 05 : 0805 | G : ± 2% | W : Paper tape | 20Kpcs | =10KΩ | N:100ppm For 1Ω~10Ω 1% only. |
| | 06 : 1206 | J : ± 5% | P : Plastic tape | 4Kpcs | | |
| | 12 : 1210 | | X : Plastic tape | 8Kpcs | For 0603 | |
| | 20 : 2010 | | Y : Plastic tape | 16Kpcs | E48/E96 | |
| | 25 : 2512 | | | | 01C:100*10 ² | |
| example: | FCF05FT-1002P | | | | =10KΩ | |
| | | | | | (Refer Table 1.) | |

SPECIFICATION

■ **Resistance Marking**

E - 24 SERIES



3 digit marking for ±5% E24
 examples: **473** $47 \times 10^3 = 47K\Omega$
1R5 $= 1.5\Omega$

E - 96 SERIES



4 digit marking for E96
 examples: **1542** $154 \times 10^2 = 15K4\Omega$
22R1 $= 22.1\Omega$



3 digit marking for E96 - 0603
 examples: **02C** (Table 1)
 $102 \times 10^2 = 10K2\Omega$

※ No Marking of 0402、0201、01005.

SPECIFICATION

0603 1% Marking Table (Table 1)

| Code | E48 | E96 | Code | E48 | E96 | Code | E48 | E96 | Code | E48 | E96 |
|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|
| 01 | 100 | 100 | 25 | 178 | 178 | 49 | 316 | 316 | 73 | 562 | 562 |
| 02 | | 102 | 26 | | 182 | 50 | | 324 | 74 | | 576 |
| 03 | 105 | 105 | 27 | 187 | 187 | 51 | 332 | 332 | 75 | 590 | 590 |
| 04 | | 107 | 28 | | 191 | 52 | | 340 | 76 | | 604 |
| 05 | 110 | 110 | 29 | 196 | 196 | 53 | 348 | 348 | 77 | 619 | 619 |
| 06 | | 113 | 30 | | 200 | 54 | | 357 | 78 | | 634 |
| 07 | 115 | 115 | 31 | 205 | 205 | 55 | 365 | 365 | 79 | 649 | 649 |
| 08 | | 118 | 32 | | 210 | 56 | | 374 | 80 | | 665 |
| 09 | 121 | 121 | 33 | 215 | 215 | 57 | 383 | 383 | 81 | 681 | 681 |
| 10 | | 124 | 34 | | 221 | 58 | | 392 | 82 | | 698 |
| 11 | 127 | 127 | 35 | 226 | 226 | 59 | 402 | 402 | 83 | 715 | 715 |
| 12 | | 130 | 36 | | 232 | 60 | | 412 | 84 | | 732 |
| 13 | 133 | 133 | 37 | 237 | 237 | 61 | 422 | 422 | 85 | 750 | 750 |
| 14 | | 137 | 38 | | 243 | 62 | | 432 | 86 | | 768 |
| 15 | 140 | 140 | 39 | 249 | 249 | 63 | 442 | 442 | 87 | 787 | 787 |
| 16 | | 143 | 40 | | 255 | 64 | | 453 | 88 | | 806 |
| 17 | 147 | 147 | 41 | 261 | 261 | 65 | 464 | 464 | 89 | 825 | 825 |
| 18 | | 150 | 42 | | 267 | 66 | | 475 | 90 | | 845 |
| 19 | 154 | 154 | 43 | 274 | 274 | 67 | 487 | 487 | 91 | 866 | 866 |
| 20 | | 158 | 44 | | 280 | 68 | | 499 | 92 | | 887 |
| 21 | 162 | 162 | 45 | 287 | 287 | 69 | 511 | 511 | 93 | 909 | 909 |
| 22 | | 165 | 46 | | 294 | 70 | | 523 | 94 | | 931 |
| 23 | 169 | 169 | 47 | 301 | 301 | 71 | 536 | 536 | 95 | 953 | 953 |
| 24 | | 174 | 48 | | 309 | 72 | | 549 | 96 | | 976 |

| Code | A | B | C | D | E | F | G | H | X | Y | Z |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 ⁰ | 10 ¹ | 10 ² | 10 ³ | 10 ⁴ | 10 ⁵ | 10 ⁶ | 10 ⁷ | 10 ⁻¹ | 10 ⁻² | 10 ⁻³ |

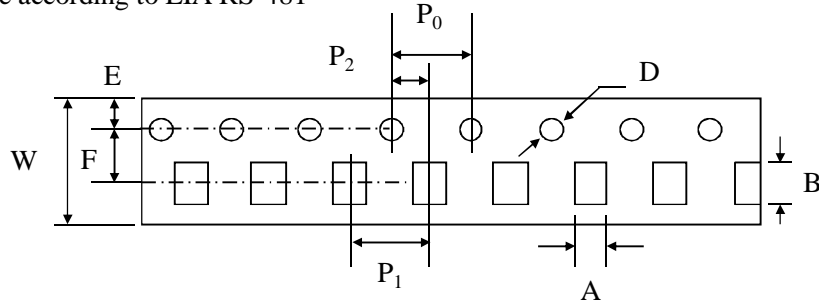
Standard resistance value

| | | | | | | | | | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| E3 | 10 | | | | 22 | | | | 47 | | | | | | | | |
| E6 | 10 | | 15 | | 22 | | 33 | | 47 | | | 68 | | | | | |
| E12 | 10 | 12 | 15 | 18 | 22 | 27 | 33 | 39 | 47 | 56 | 68 | 82 | | | | | |
| E24 | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 | 33 | 36 | 39 | 43 | 47 |
| | 51 | 56 | 62 | 68 | 75 | 82 | 91 | | | | | | | | | | |
| E96 | 100 | 102 | 105 | 107 | 110 | 113 | 115 | 118 | 121 | 124 | 127 | 130 | 133 | 137 | 140 | 143 | 147 |
| | 150 | 154 | 158 | 162 | 165 | 169 | 174 | 178 | 182 | 187 | 191 | 196 | 200 | 205 | 210 | 215 | 221 |
| | 226 | 232 | 237 | 243 | 249 | 255 | 261 | 267 | 274 | 280 | 287 | 294 | 301 | 309 | 316 | 324 | 332 |
| | 340 | 348 | 357 | 365 | 374 | 383 | 392 | 402 | 412 | 422 | 432 | 442 | 453 | 464 | 475 | 487 | 499 |
| | 511 | 523 | 536 | 549 | 562 | 576 | 590 | 604 | 619 | 634 | 649 | 665 | 681 | 698 | 715 | 732 | 750 |
| | 768 | 787 | 806 | 825 | 845 | 866 | 887 | 909 | 931 | 953 | 976 | | | | | | |

SPECIFICATION

■ **Tape And Reel Package**

- Taping specs are according to EIA RS-481



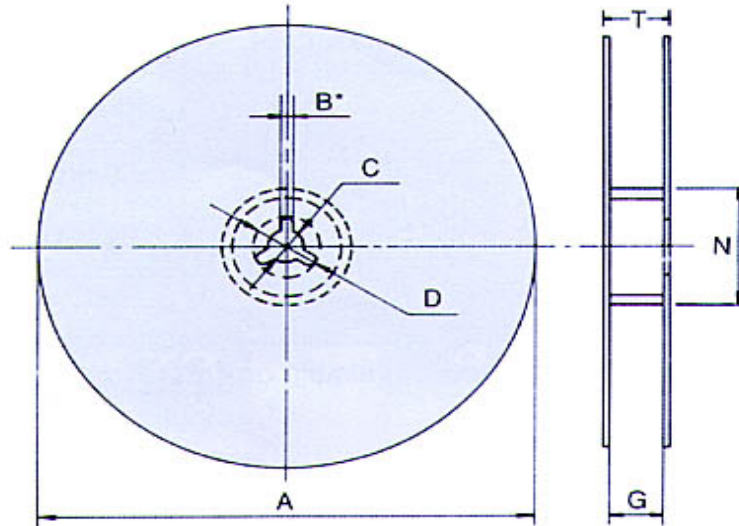
Accumulated dimensional tolerance $40\pm 0.2\text{mm}$

| Size | A | B | W | F | E | P1 | P2 | P0 | D |
|-------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 01005 | 0.24 ± 0.03 | 0.45 ± 0.03 | 8.00 ± 0.20 | 3.50 ± 0.05 | 1.75 ± 0.10 | 2.00 ± 0.05 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 0201 | 0.37 ± 0.05 | 0.67 ± 0.05 | 8.00 ± 0.20 | 3.50 ± 0.05 | 1.75 ± 0.10 | 2.00 ± 0.05 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 0402 | 0.70 ± 0.10 | 1.20 ± 0.10 | 8.00 ± 0.30 | 3.50 ± 0.05 | 1.75 ± 0.10 | 2.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 0603 | 1.10 ± 0.20 | 1.90 ± 0.20 | 8.00 ± 0.30 | 3.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 0805 | 1.65 ± 0.20 | 2.40 ± 0.20 | 8.00 ± 0.30 | 3.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 1206 | 2.00 ± 0.20 | 3.60 ± 0.20 | 8.00 ± 0.30 | 3.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 1210 | 3.00 ± 0.20 | 3.60 ± 0.20 | 8.00 ± 0.30 | 3.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 2010 | 2.80 ± 0.20 | 5.50 ± 0.20 | 12.00 ± 0.30 | 5.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |
| 2512 | 3.50 ± 0.20 | 6.70 ± 0.20 | 12.00 ± 0.30 | 5.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | $1.50+0.10/-0$ |

(unit: mm)

SPECIFICATION

- Reel Package



| Size | Packaging Q'ty | A | N | C | D | B | G | T |
|------------------------------|----------------|-----------|-----------|----------|-------|---------|----------|-----------|
| 01005 | 20Kpcs / Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20min | 2.0±0.5 | 9.0±1.0 | 14.9 max. |
| 0201 | 15Kpcs / Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| 0402 | 10Kpcs / Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| 0603 0805 1206 1210 | 1Kpcs / Reel | 100.0±0.5 | 52.0±0.5 | 13.0±0.5 | 20min | 2.0±0.5 | 9.0±0.5 | 12.5 max. |
| | 5Kpcs / Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| | 10Kpcs / Reel | 254.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| | 20Kpcs / Reel | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20min | 2.0±0.5 | 10.0±1.5 | 14.9 max. |
| 2010 2512 | 4Kpcs / Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20min | 2.0±0.5 | 13.8±1.5 | 16.7 max. |
| | 8Kpcs / Reel | 254.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20min | 2.0±0.5 | 13.8±1.5 | 16.7 max. |
| | 16Kpcs / Reel | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20min | 2.0±0.5 | 13.8±1.5 | 20.0 max. |

(unit: mm)

SPECIFICATION

■ FCF ≥ 1 Ω Specification And Test Methods

| ITEM | SPECIFICATION | TEST METHOD |
|---|--|---|
| DC Resistance | J : ±5% , G: ±2% , F: ±1% D: ±0.5% , C: ±0.25% , B: ±0.1% Zero ohm Jumper < 50mΩ | IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance value. |
| Short time Overload | J、G: $\Delta R \leq \pm (2\% + 0.1\Omega)$ F、D: $\Delta R \leq \pm (1\% + 0.05\Omega)$ C、B: $\Delta R \leq \pm (0.5\% + 0.05\Omega)$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.13 2.5×Rated voltage or Max. Overload Voltage for 5 sec. measure resistance after 30 minutes |
| Solderability | Over 95% of termination must be covered with Solder | IEC 60115-1 / JIS C 5201-1 , Clause 4.17 After immersing flux, dip in the 245±2°C molten solder bath for 3±0.5 sec |
| Resistance to Solder Heat | J、G: $\Delta R \leq \pm (1\% + 0.1\Omega)$ F、D、C、B: $\Delta R \leq \pm (0.5\% + 0.05\Omega)$ No mechanical damage | IEC 60115-1 / JIS C 5201-1 , Clause 4.18 With 260±5°C for 10±1 sec. |
| Temperature Coefficient of Resistance (TCR) | Refer to the rating table information. | IEC 60115-1 / JIS C 5201-1 , Clause 4.8 Test temperature : 25°C (T1) → -55°C (T2) 25°C (T1) → +155°C (T2) $TCR (ppm/^{\circ}C) = \frac{R2-R1}{R1} \times \frac{1}{T2-T1} \times 10^6$ T1: 25°C T2: Test temperature R1: Resistance at reference temperature (T1) R2: Resistance at test temperature (T2) |
| Load Life Humidity | J、G: $\Delta R \leq \pm (3\% + 0.1\Omega)$ F、D: $\Delta R \leq \pm (1\% + 0.05\Omega)$ C、B: $\Delta R \leq \pm (0.5\% + 0.05\Omega)$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.24 Maintain the temperature of the resistor at 40±2°C and 90~95% R.H. with the rated voltage applied. Cycle ON for 1.5 hours and OFF for 0.5 hour for 1000+48/-0 hours. After 1~4 hour, measure the resistance value. |
| Load Life | J、G: $\Delta R \leq \pm (3\% + 0.1\Omega)$ F、D: $\Delta R \leq \pm (1\% + 0.05\Omega)$ C、B: $\Delta R \leq \pm (0.5\% + 0.05\Omega)$ | IEC 60115-1 / JIS C 5201-1 , Clause 4.25 Permanent resistance change after 1000+48/-0 hours (1.5 hours ON , 0.5 hour OFF) at RCWV or Max. Keep the resistor at 70±2°C ambient |
| Temperature Cycle | J、G: $\Delta R \leq \pm (1\% + 0.1\Omega)$ F、D、C、B: $\Delta R \leq \pm (0.5\% + 0.05\Omega)$ No mechanical damage | IEC 60115-1 / JIS C 5201-1 , Clause 4.19 Repeat 5 cycles as follows -55°C (30 min.) + 25°C (2~3 min.) +155°C (30 min.) + 25°C (2~3 min.) |
| Insulation Resistance | Between termination and coating must be over 1000MΩ | IEC 60115-1 / JIS C 5201-1 , Clause 4.6 Test voltage: 100±15V |
| Bending Strength | J、G: $\Delta R \leq \pm (1\% + 0.1\Omega)$ F、D、C、B: $\Delta R \leq \pm (0.5\% + 0.05\Omega)$ No mechanical damage | IEC 60115-1 / JIS C 5201-1 , Clause 4.33 Resistance change after bended on the 90mm PCB. Bend: 3mm for 01005、0201、0402、0603、0805 2mm for 1206、1210、2010、2512 |

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