*Towards Excellence in* *Quality, Service & Innovation*

ASJ

# DATA SHEET

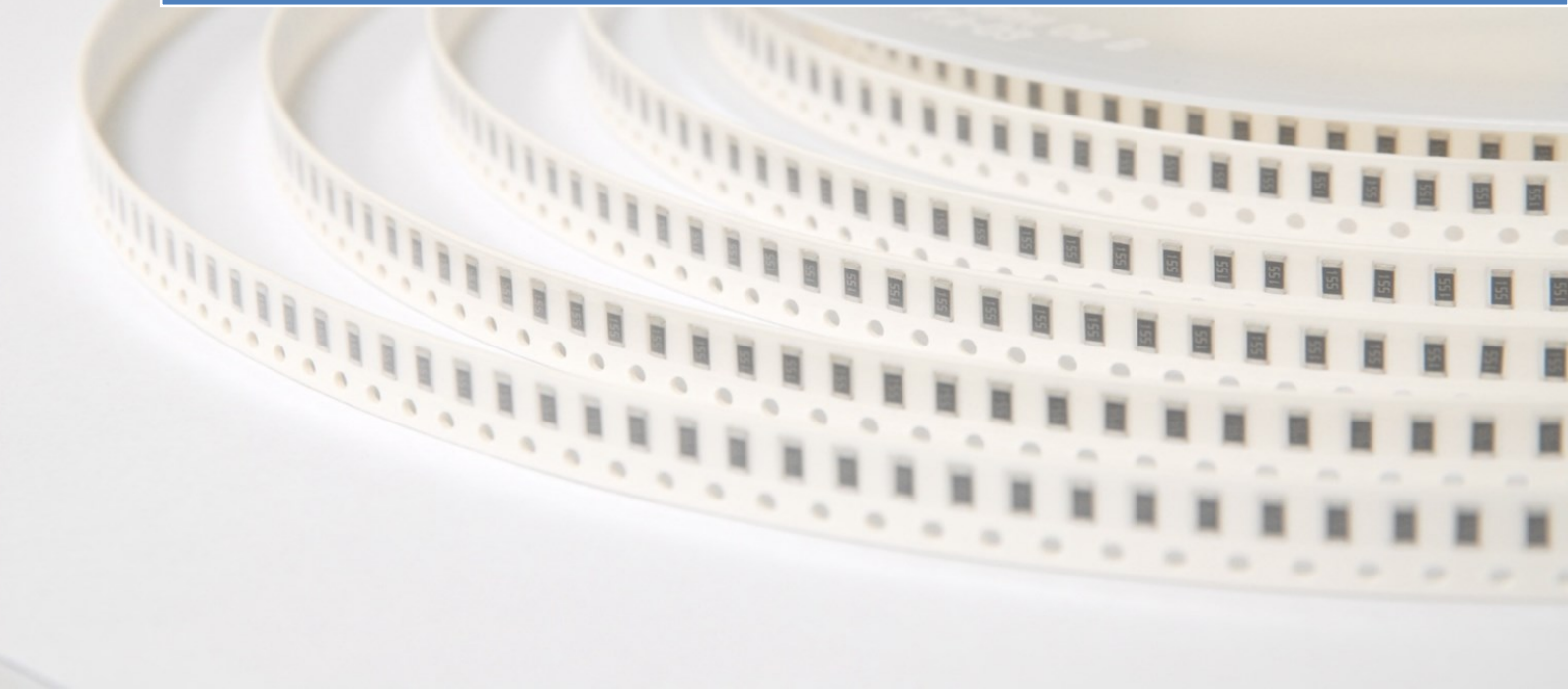
## General Purpose Thick Film Chip Resistor

## CR Series

**0.1% TO 5%, TCR ±100 TO ±200**

**SIZE: 0402/0603/0805/1206**

**RoHs Compliant**



***Product Specification –May 22, 2020 V.17***

## 1. SCOPE

1.1 This specification specifies fixed thick film chip resistor (referred to as resistor hereinafter) for use in electronic equipment. In case there are discrepancies in specifications between this specification and the Customer's specifications, the latter shall precede.

1.2 The products are tested and passed based on the test conditions and methods defined in AEC-Q200.

## 2. PART NUMBERING SYSTEM

Part Numbering is made in accordance with the following system:

| CR | 10 | - | XXXX | | - | F | K | - | F |
|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Size(Inch/mm)** | | **Nominal Resistance** | | | **Resistance Tolerance** | **Packaging** | | **T.C.R** |
| General Purpose Thick Film Chip Resistors | 10 (0402/1005)<br>16 (0603/1608)<br>21 (0805/2012)<br>32 (1206/3216) | | Resistors | 3-Digit: E24 Series 2.2Ω=2R2 100Ω=101 | | B=0.1%<br>D=0.5%<br>F=±1%<br>G=±2%<br>J=±5%<br>Z=Zero Ohm | L=5,000 pcs Lead Free<br>K=10,000 pcs Lead Free<br>Y=20,000 pcs Lead Free<br>*N=50,000 pcs Lead Free<br><br>Remark :<br>*applicable for CR10(0402/1005) | | F = ±100ppm<br>(Available for 1R to <10MΩ)<br>(Leave blank for standard) |
| | | | | 4-Digit: E96 Series 10.2Ω=10R2 10KΩ=1002 | | | | | |
| | | | Jumper | 000 | | | | | |

## 3. RATING

3.1 Rated Power

3.1.1 Zero Ohm Jumper Rated Power

| | Rated Current | Maximum Working Current | Maximum Overload Current | Resistance Tolerance |
|---|---|---|---|---|
| CR10 | 1A | 1A | 2.5A | < 50m Ω |
| CR16 | 2A | 2A | 5A | < 50m Ω |
| CR21 | 2A | 2A | 5A | < 50m Ω |
| CR32 | 2A | 2A | 5A | < 50m Ω |

3.1.2 Resistor Rated Power

| | Rated Power | Maximum Working Voltage | Maximum Overload Voltage | Maximum Intermittent Overload Voltage | Dielectric Withstanding Voltage |
|---|---|---|---|---|---|
| CR10 | 1/16W | 50V | 100V | 100V | 300V |
| CR16 | 1/10W | 50V | 100V | 100V | 300V |
| CR21 | 1/8W | 150V | 300V | 300V | 500V |
| CR32 | 1/4W | 200V | 400V | 400V | 500V |

3.2 Power Derating Characteristics

Rated Power shall be the load power corresponding to nominal wattage suitable for continuous use at 70°C ambient temperatures. In case the ambient temperature exceeds 70°C, reduce the load power in accordance with Derating curve in Fig. 1.

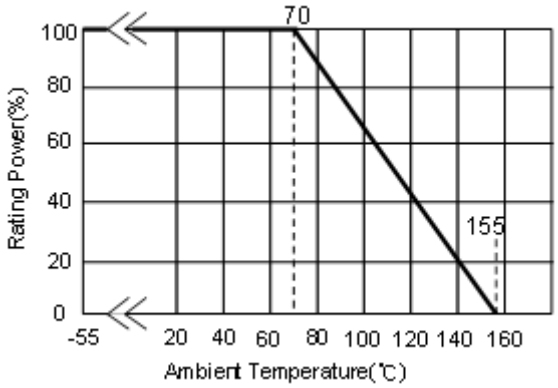



Fig.1 Power Derating Characteristics

3.3 Standard Atmospheric Condition

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:

Ambient Temperature = + 5°C to +35°C

Relative Humidity = < 85% RH

Air Pressure = 86 kPa to 106kPa

If there may be any doubt about the results, measurement shall be made within the following limits:

Ambient Temperature = 20 ± 2°C

Relative Humidity = 60 to 70% RH

Air Pressure = 86 kPa to 106kPa

3.4 Operating Temperature Range -55°C to +155°C

3.4 Storage Temperature Range -5°C to + 40°C / < 85% RH

3.6 Flammability Rating Tested in accordance to UL-94, V-0

3.7 Moisture Sensitivity Level Rating: Level 1

3.8 Product Assurance ASJ resistor shall warranty 24 months from the date of shipment.

3.9 ASJ resistors are RoHS compliance in accordance to RoHS Directive.

3.10 Resistance, Resistance Tolerance and Temperature Coefficient of Resistance.

| Type | Rated Power at 70℃ | Max. Working Voltage | Max. Overload Voltage | T.C.R (ppm/℃) | Resistance Range | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | B(±0.1%) E-24, E-96 | D(±0.5%) E-24, E-96 | F(±1%) E-24 ₹-96 | G(±2%) J(±5%) E-24 |
| **CR10 (0402)** | $\frac{1}{16}$W | 50V | 100V | ±100 | 100Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ |
| | | | | ±200 | ------ | 1Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 10MΩ | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 22MΩ |
| **CR16 (0603)** | $\frac{1}{10}$W | 50V | 100V | ±100 | 100Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ |
| | | | | ±200 | ------ | 1Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 10MΩ | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 22MΩ |
| **CR21 (0805)** | $\frac{1}{8}$W | 150V | 300V | ±100 | 100Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ |
| | | | | ±200 | ------ | 1Ω≤R < 10Ω<br>1MΩ ≤ R < 10MΩ | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 10MΩ | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 22MΩ |
| **CR32 (1206)** | $\frac{1}{4}$W | 200V | 400V | ±100 | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ | 10Ω ≤ R < 1MΩ |
| | | | | ±200 | 3Ω ≤ R < 10Ω | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 10MΩ | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 10MΩ | 1Ω ≤ R < 10Ω<br>1MΩ ≤ R < 22MΩ |
| Zero Ohm Jumper < 50mΩ (Z, 5%) | | | | | | | | |

3.11 Rated Voltage

The rated voltage is calculated from the rated power and nominal resistance by the following formula:

$$E = \sqrt{P.R}$$

Where E : Rated Voltage (V)
P : Rated Power (W)
R : Nominal Resistance (Ω)

In case the value calculated by the formula exceeds the maximum working voltage given in Section 3.1.2, the maximum working voltage in Section 3.1.2 shall be regarded as the rated voltage.

3.12 All product, product specifications and data are subject to change without notice to improve reliability, function or design or otherwise.

## 4. MARKING ON PRODUCT

The nominal resistance shall be marked on the surface of each resistor

| Part Number | Color | Marking on Product |
|---|---|---|
| CR10 (0402) | - | No marking |
| CR16 (0603) | Light Yellow | 1) Tolerance : ± 1.0% (F)<br>° Four Numerals Marking (E96 Series)<br>° 0603 Three Characters Marking based on E-96 marking standard.<br>2) Tolerance; ± 2.0% (G), ±5.0% (J)<br>Three Numerals Marking<br>3) Zero ohm jumper resistor<br>The marking used shall be 0 |
| CR21 (0805) | Light Yellow | |
| CR32 (1206) | Light Yellow | |

4.1 Numeric Numbering

4.1.1 5% Tolerance: ***Three Numerals Marking***

First 2 digits are significant figures; third digit is number of zeros. Letter R is decimal point.

Example

| ***Nominal Resistance*** | ***Marking*** | ***Remarks*** |
|---|---|---|
| 1 Ω | 1R0 | 1 X $10^0$ = 1 |
| 10 Ω | 100 | 10 X $10^0$ = 1 0 |
| 100 Ω | 101 | 10 X $10^1$ = 1 00 |
| 4.7K Ω | 472 | 47 X $10^2$ = 47 00 |
| 47K Ω | 473 | 47 X $10^3$ = 47 000 |
| 470K Ω | 474 | 47 X $10^4$ = 47 0000 |
| 4.7M Ω | 475 | 47 X $10^5$ = 47 00000 |

4.1.2 1% Tolerance : ***Four Numerals Marking***

First 3 digits are significant figures; fourth digit is number of zeros.

Examples:

| ***Nominal Resistance*** | ***Marking*** | ***Remarks*** |
|---|---|---|
| 1 Ω | 1R00 | 1 X $10^0$ = 1 |
| 10 Ω | 10R0 | 10 X $10^0$ = 10 |
| 100 Ω | 1000 | 100 X $10^0$ = 100 |
| 4.7K Ω | 4701 | 470 X $10^1$ = 470 0 |
| 47K Ω | 4702 | 470 X $10^2$ = 470 00 |
| 470K Ω | 4703 | 470 X $10^3$ = 470 000 |
| 1M Ω | 1004 | 100 X $10^4$ = 100 0000 |

4.1.3 0603 1% Tolerance: ***Three Character E-96 Marking Standard.***

The first 2 digits for the 3 digits E-96 part marking standard, (Refer Table 2 & 3).

The third character is a letter multiplier:

| ***Nominal resistance*** | ***Marking*** | ***Remark*** |
|---|---|---|
| 33.2 Ω | 51 X | 332 X $10^{-1}$ Ω |
| 150 Ω | 18 A | 150 X $10^{0}$ Ω |
| 4.99K Ω | 68 B | 499 X $10^{1}$ Ω |
| 1 0.2K Ω | 02 C | 102 X $10^{2}$ Ω |
| 100K Ω | 01 D | 100 X $10^{3}$ Ω |

4.1.3.1 EIA-96 Marking Scheme

Table 2 Significant figures

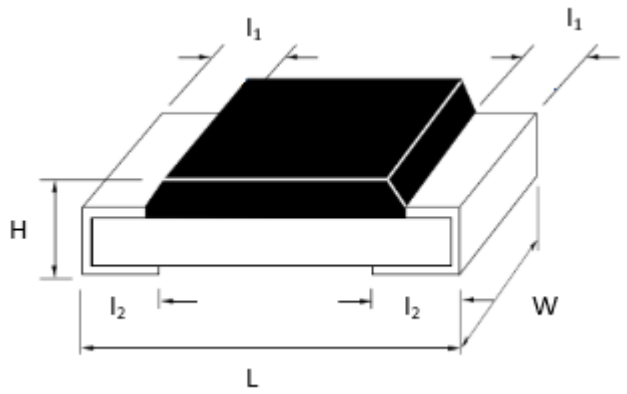
| Significant Figures | Symbol | Significant Figures | Symbol | Significant Figures | Symbol | Significant Figures | Symbol |
|---|---|---|---|---|---|---|---|
| 100 | 01 | 178 | 25 | 316 | 49 | 562 | 73 |
| 102 | 02 | 182 | 26 | 324 | 50 | 576 | 74 |
| 105 | 03 | 187 | 27 | 332 | 51 | 590 | 75 |
| 107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

Table 3 Multiplier

| Symbol | Multiplier | Symbol | Multiplier |
|---|---|---|---|
| A | $10^0$ | G | $10^6$ |
| B | $10^1$ | H | $10^7$ |
| C | $10^2$ | X | $10^{-1}$ |
| D | $10^3$ | Y | $10^{-2}$ |
| E | $10^4$ | | |
| F | $10^5$ | | |

## 5. DIMENSIONS, CONSTRUCTIONS AND MATERIALS

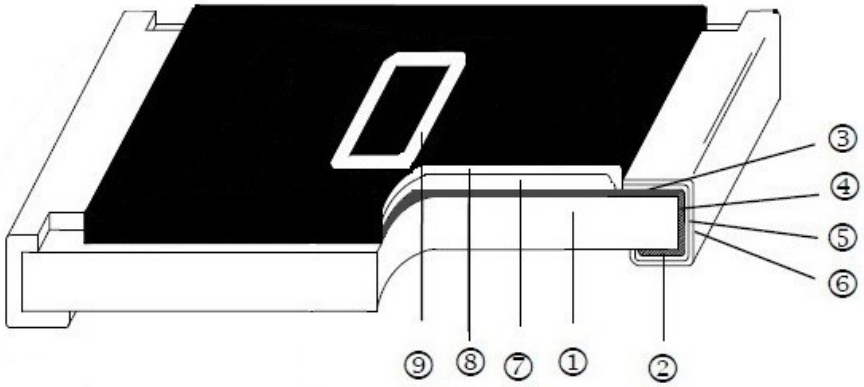
### 5.1 Dimensions




Unit: Inches (Millimeters)

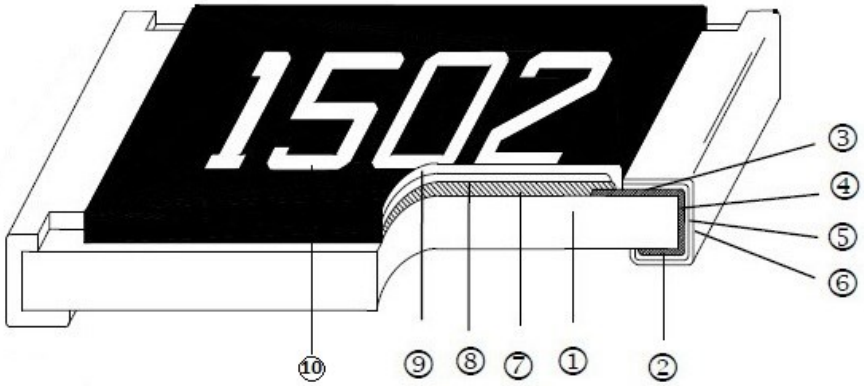
| CODE | L | W | H | $I_1$ | $I_2$ |
|---|---|---|---|---|---|
| CR10 (0402) | 0.040±0.004 (1.00±0.10) | 0.020±0.002 (0.50±0.05) | 0.014±0.002 (0.35±0.05) | 0.008±0.004 (0.20±0.10) | 0.010±0.004 (0.25±0.10) |
| CR16 (0603) | 0.063±0.004 (1.60±0.10) | 0.031±0.004 (0.80±0.10) | 0.018±0.004 (0.45±0.10) | 0.012±0.008 (0.30±0.20) | 0.012±0.008 (0.30±0.20) |
| CR21 (0805) | 0.079±0.006 (2.00±0.15) | 0.049±0.004 (1.25±0.10) | 0.020±0.004 (0.50±0.10) | 0.016±0.008 (0.40±0.20) | 0.016±0.008 (0.40±0.20) |
| CR32 (1206) | 0.122±0.004 (3.10±0.10) | 0.063±0.006 (1.60±0.15) | 0.022±0.002 (0.55±0.05) | 0.020±0.010 (0.50±0.25) | 0.020±0.010 (0.50±0.25) |

5.2 Zero Ohm Construction




| | | | |
|---|---|---|---|
| 1 | ALUMINA SUBSTRATE | 6 | PURE TIN PLATING |
| 2 | BOTTOM CONDUCTOR | 7 | OVERGLAZE |
| 3 | TOP CONDUCTOR | 8 | OVERCOAT |
| 4 | SPUTTERING EDGE TERMINAL | 9 | MARKING (CR10 No Marking) |
| 5 | NIKEL PLATING | | |

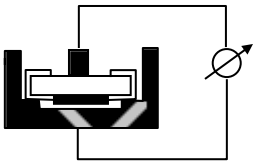
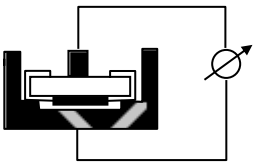
5.3 Resistor Construction




| | | | |
|---|---|---|---|
| 1 | ALUMINA SUBSTRATE | 6 | PURE TIN PLATING |
| 2 | BOTTOM CONDUCTOR | 7 | RESISTOR |
| 3 | TOP CONDUCTOR | 8 | OVERGLAZE |
| 4 | SPUTTERING EDGE TERMINAL | 9 | OVERCOAT |
| 5 | NIKEL PLATING | 10 | MARKING (CR10 No Marking) |

## 6. ELECTRICAL CHARACTERISTICS AND TEST CONDITIONS

| CHARACTERISTICS | | SPECIFICATIONS | | TESTING CONDITIONS |
|---|---|---|---|---|
| | | **Zero Ohm** | Resistance | |
| 1 | Resistance Value | ≤ 50 mΩ<br>For 5% (Z) | Resistance accuracy being fully relies with respect to tolerance of resistor. | ***JIS C 5201-1 4.5***<br>Application time to be within 5 secs.<br><br>Applied Voltage for resistance measurement:<br><10Ω 0.1V<br>10 ~ 99Ω 0.3V<br>100 ~ 999 1.0V<br>1k ~ 9.9k 3.0 V<br>10k ~ 99.9k 10.0 V<br>100k ~ 999k 25.0 V<br>1M & Over 50.0 V |
| 2 | Resistance Temperature Coefficient | NA | Refer Section 3.10 Table 1 | ***MIL-STD-202 Method 304***<br>Measure R at $t_o$=25$^0$C and after 45 minutes measure R at t=125$^0$C.<br>*Calculation :*<br>$TCR(ppm/^{\circ}C) = \frac{R-R_0}{R_0(t-t_0)} x10^6$ |
| 3 | Voltage Coefficient<br>(Applicable for > 1kΩ only) | NA | Voltage coefficient<br>≤ 100ppm/V | ***JIS C 5201-1 4.11***<br>Measured resistance $R_2$ at 100%V rated voltage or the limiting element voltage (> 0.5s in every 5s) and $R_1$ 10% V (4.5s)<br><br>*Calculation :*<br>$V_c = \frac{R_2 - R_1}{0.9\ x\ U\ x\ R_1}$ |
| 4 | Short Time Overload | ≤ 50 mΩ<br>For 1% and 5% tolerance resistor | ± 0.5% for<br>1% tolerance resistor<br><br>± 1.0% for<br>5% tolerance resistor | ***JIS C 5201-1 4.13***<br>Apply at 2.5 times rated voltage for 5 seconds.<br>Applied voltage shall not exceed maximum overload voltage or current. |

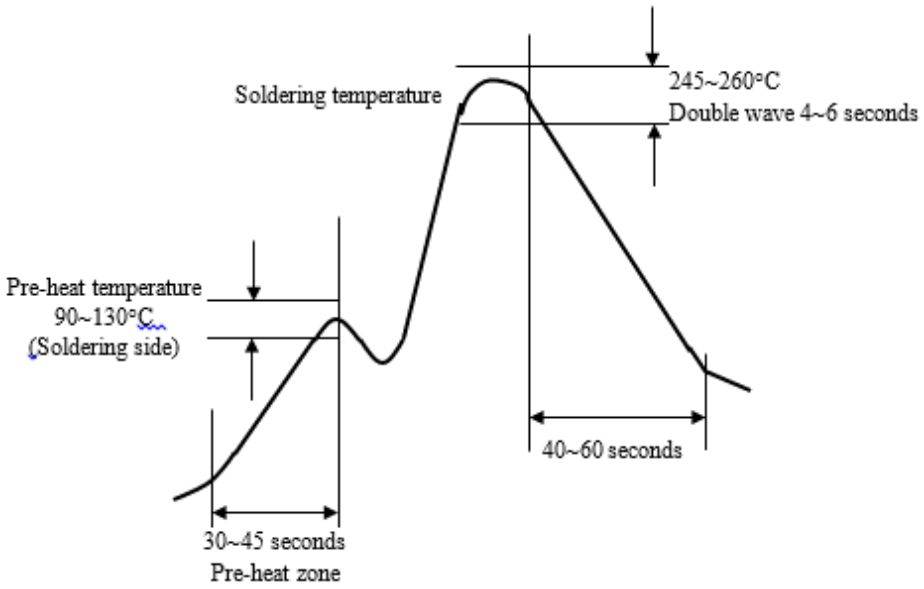
| | | | | | |
|---|---|---|---|---|---|
| 5 | Insulation Resistance | > 10G Ω | | | ***JIS C 5201-1 4.6***<br>Apply (100 ±15) Vdc for 1 minute. Measured the insulation resistance between electrodes and insulating enclosure or between electrodes and base.<br>  |
| 6 | Dielectric Withstanding Voltage | No failure of resistor such as short-circuit, burning, breakdown. | | | ***JIS C 5201-1 4.7***<br>Apply 500Vac for 1 minute ± 5secs. for chip ≥ 0805.<br>Apply 300Vac for 1 minute ± 5secs. for chip 0402 & 0603<br>Apply 50Vac for 1 minute ± 5secs for 0201<br>  <br>The variation in relation to the initial resistance shall be within ± 1%. |
| | | ≤ 50 mΩ For 1% & 5% tolerance resistor | ± (1%+0.05Ω) for 1% & 5% tolerance resistor | | |
| 7 | Intermittent Overload | ≤ 100mΩ For 1% & 5% tolerance resistor | ±(5%+0.1Ω) for 1% & 5% tolerance resistor | | ***JIS C 5201-1 4.13***<br>Apply 2.5 times rated voltage for 1 secs ON and 25 secs OFF.<br>Total $10{,}000^{+400}_{-0}$ cycles.<br>Applied voltage/current shall not exceed maximum intermittent overload voltage/ current.<br>***IEC 60115-1 4.39***<br>2.5 times of rated voltage or maximum overload voltage whichever is less for 1 sec ON and 25 secs OFF.<br>Total $10{,}000^{+400}_{-0}$ cycles. |
| 8 | Noise | NA | 1 ~ 9<br>10 ~ 99<br>100 ~ 999<br>1k ~ 9.9k<br>10k ~ 99.9k<br>100k ~9 99.9k<br>>1M | -10dB(0.32μv/v)<br>- 5 dB(0.52μv/v)<br>0 dB(1.0μv/v)<br>10 dB(3.2μv/v)<br>18 dB(5.6μv/v)<br>20 dB(10μv/v)<br>30 dB(32μv/v) | ***JIS C 5201-1 4.12***<br>$V_0$(dB) = T-*f*(T-S)-D |

| | | | | |
|---|---|---|---|---|
| 9 | Terminal Strength<br><br>A) Bend Test (Applicable for chip size smaller than 1210)<br>B) Pull Test (Applicable for chip size bigger than 0805)<br>C) Push Test (Applicable for chip size bigger than 0805)<br>D) Robustness test | ≤ 50mΩ For 1% & 5% tolerance resistor | Tolerance resistor. With no evidence of mechanical damage after releasing the pressure.<br><br>± (0.5%+ 0.05Ω) for 1% & 5%<br><br>± 1% for 1% & 5%<br><br>± (1.0%+0.05Ω) for 1% & 5%<br><br>After reading/initial reading ≥5N | ***JIS C 5201-1 4.16 / AEC Q200-005***<br><br>***AEC Q200-005***<br>Board Flex : Apply force till 2mm bend and hold for 60 ± 5 secs. Measure resistance while applying pressure.<br><br>***JIS C 5201-1 4.16.2***<br>Pull Test : Apply 0.5kgF for 30 sec<br><br>***AEC Q200-006***<br>Push Test : Apply 1.8kgF for 60 ± 1secs<br><br>Component mounted on board precondition using steam aging for 4 hour.<br>Initial reading = Force required to break away components mounted on board.<br>After Reading = Force required to break away components mounted on board after preconditioned. |
| 10 | Resistance to soldering heat | ≤ 50mΩ For 1% & 5% tolerance resistor | ± (0.5%+0.05Ω) for 1% & 5% tolerance resistor | ***MIL-STD-202 Method 210***<br>Solder bath method<br>Resistor dipped entirely in solder bath of 260 ± 5°C for $10^{+1}_{0}$ sec.<br>After which the sample shall be left at ambient temperature for 1~ 2 hrs before measurement. |
| 11 | Solderability | ≥ 95% Coverage at all terminal | | ***J-STD-002***<br>For both Leaded & SMD. Electrical test not required.<br>Magnification 50 X. Conditions:<br>Leaded: Method A @ 235°C, category 3.<br>SMD:<br>a) Method B, 4 hrs @ 155°C dry heat @ 235°C<br>b) Method B @ 215°C category 3.<br>c) Method D category 3 @ 260°C. |

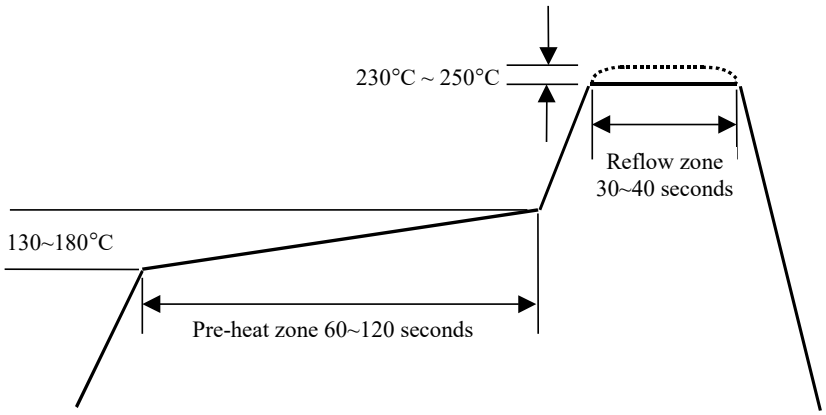
| | | | | |
|---|---|---|---|---|
| 12 | Resistance to Solvent | ≤ 50mΩ For 1% & 5% tolerance resistor | Passed without any damaged to marking & protective material. | ***MIL-STD-202 Method 215*** Immerse in 25°C ± 5°C Isopropyl Alcohol (IPA) for 3 ± 0.5 minutes. |
| 13 | High Temperature | ≤ 100mΩ For 1% & 5% tolerance resistor | ± (0.5%+0.05Ω) for 1% tolerance resistor<br>± (1%+0.05Ω) for 5% tolerance resistor | ***MIL-STD-202 Method 108*** 1000 hours @ T = 125°C. Unpowered measurement at 24 ± 2 hours after test conclusion. |
| 14 | Temperature Cycling | ≤ 50mΩ For 1% & 5% tolerance resistor | ± (0.5%+0.05Ω) for 1% tolerance resistor<br>± (1%+0.05Ω) for 5% tolerance resistor | ***JESD 22 Method JA-104*** 1000 cycles (-55°C to 125°C) measurement at 24 ± 2 hours after test conclusion. |
| 15 | Resistance to damp Heat (Humidity) | ≤ 100mΩ For 1% & 5% tolerance resistor | ± (1%+0.1Ω) for 1% & 5% tolerance resistor | ***JIS-C5201-1 4.24*** Put the tested resistor in the chamber under temperature 40±2℃, relative humidity 90~95% and load the rated voltage for 90 minutes on, 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. |
| 16 | Load life | ≤ 100mΩ For 1% & 5% tolerance resistor | ± (1.0%+0.05Ω) for 1% tolerance resistor<br>± (2.0%+0.1Ω) for 5% tolerance resistor | ***MIL-STD-202 Method 108*** At 70 ± 3°C Apply DC rated voltage at 90minutes On, 30minutes Off for $1000^{+48}_{-0}$ hours Sample shall be left at ambient temperature for 1~ 2 hrs after test before measuring final resistance. |
| 17 | Salt Spray | ≤ 50mΩ For 1% & 5% tolerance resistor | ± (3%+0.1Ω) for 1% & 5% tolerance resistor | ***MIL-STD-202 Method 101*** Spray 5 ± 1 Wt% salt water for 96±4 hours at 35± 2°C |
| 18 | Mounting Quality Test | ≤ 50mΩ For 1% & 5% tolerance resistor | Visual check for solder joint wetting condition, resistor body damages | ***JESD22-B102E*** Solder Paste: Sn-3Ag-0.5Cu Reflow soldering method Peak : $250^{+5}_{-0}$ °C and 230 ± 5°C for 60sec |

## 6.1 Soldering Profile

### 6.1.1 Wave Soldering




### 6.1.2 Reflow Soldering

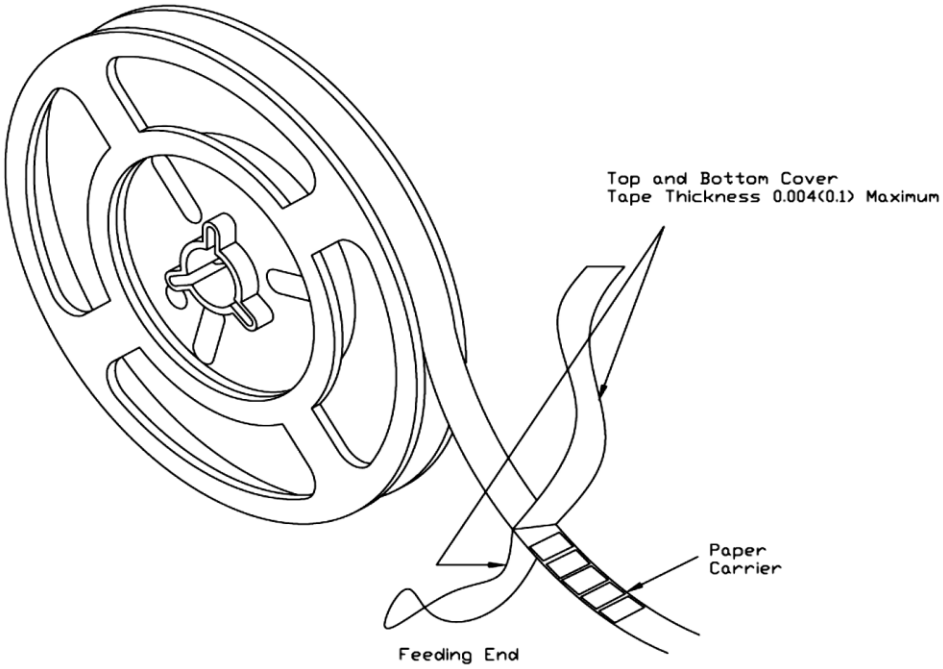



6.1.3 Soldering Iron: temperature 350°C±10°C, dwell time shall be less than 3 sec

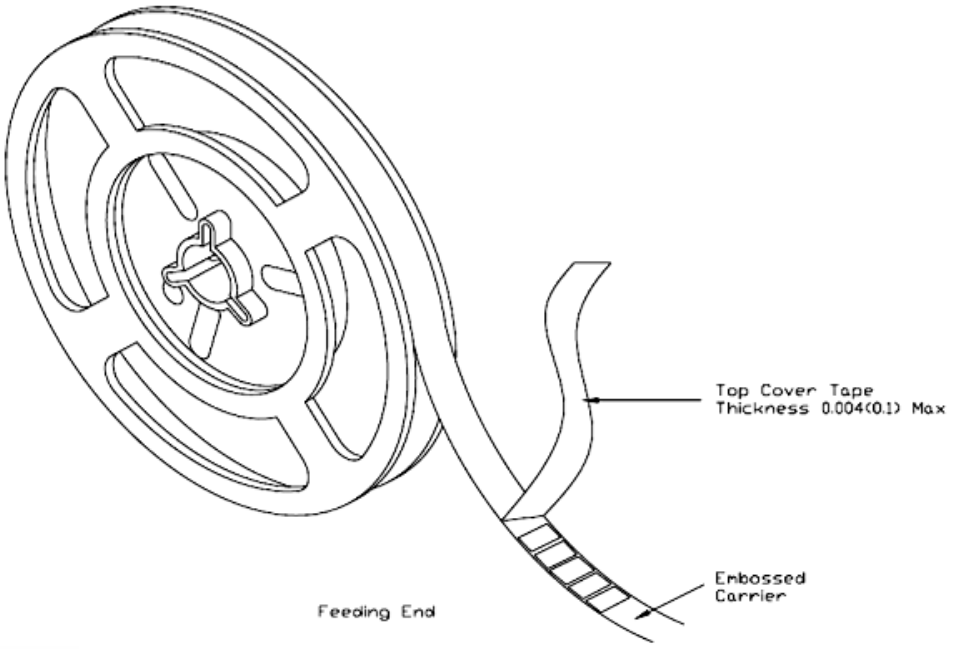
## 7. TAPING

### 7.1 Structure of Taping

Paper Carrier

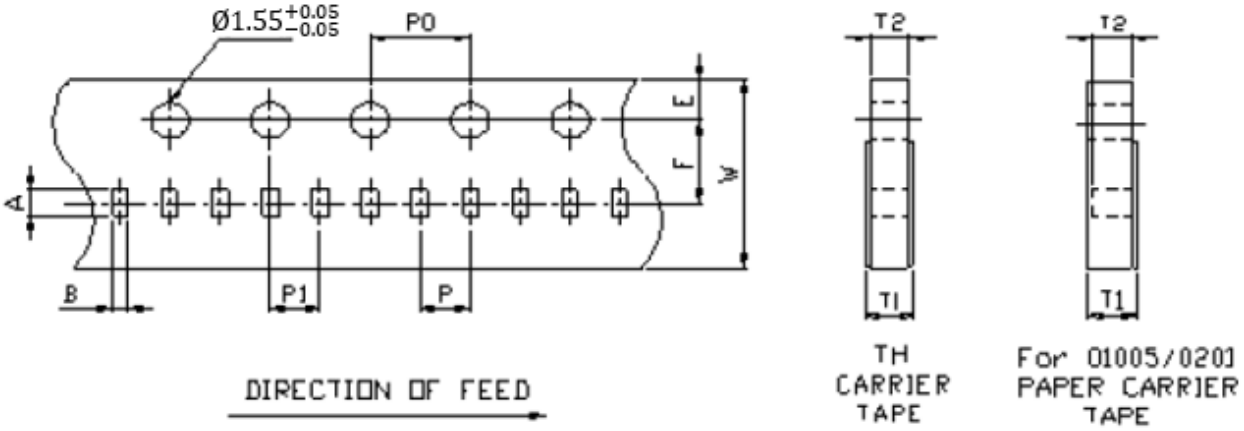



Embossed Plastic Carrier



7.2 Dimension

7.2.1 Dimension of Punched Paper Tape Carrier System (CR -03, 05, 10)




Remark: Pitch tolerance over any 10 pitches of Po is ± 0.2 mm

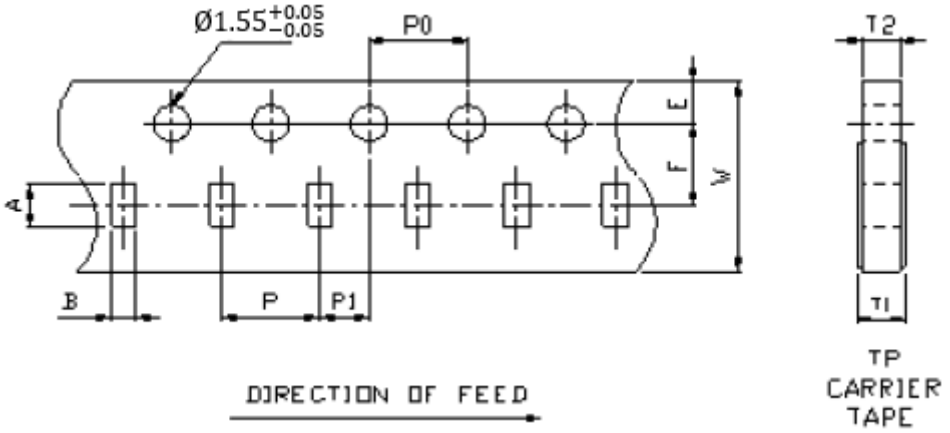
Dimension of Punched Paper Tape Carrier System (CR-03, 05, 10)

(unit : mm)

| Code | A | B | W | E | F | T1 |
|---|---|---|---|---|---|---|
| CR10 | 1.15±0.03 | 0.65±0.03 | 8.00±0.10 | 1.75±0.10 | 3.50±0.05 | $0.42^{+0.2}_{-0}$ |

| Code | T2 | P | P0 | 10xP0 | P1 |
|---|---|---|---|---|---|
| CR10 | $0.42^{+0.03}_{-0.03}$ | 2.00±0.05 | 4.00±0.10 | 40.0±0.20 | 2.00±0.05 |

7.2.2 Dimension of Punched Paper Tape Carrier System /Plastic Embossed Carrier System
(CR16, 21, 32, 40)




Remark : Pitch tolerance over any 10 pitches of Po is ± 0.2 mm

Dimension of Punched Paper Tape Carrier System (CR - 16, 21, 32, 40)

| Code | A | B | W | E | F | T1 | T2 | P | P0 | P1 |
|---|---|---|---|---|---|---|---|---|---|---|
| CR16 | 1.8±0.10 | 1.0±0.10 | 8.0±0.10 | 1.75±0.10 | 3.50±0.05 | $0.60^{+0.2}_{-0}$ | $0.60^{+0.03}_{-0.03}$ | 4.0±0.05 | 4.0±0.10 | 2.0±0.05 |
| CR21 | 2.33±0.05 | 1.58±0.05 | 8.0±0.10 | 1.75±0.10 | 3.50±0.05 | $0.75^{+0.2}_{-0}$ | $0.75^{+0.03}_{-0.05}$ | 4.0±0.05 | 4.0±0.10 | 2.0±0.05 |
| CR32 | 3.30±0.05 | 1.90±0.05 | 8.0±0.10 | 1.75±0.10 | 3.50±0.05 | $0.75^{+0.2}_{-0}$ | $0.75^{+0.03}_{-0.05}$ | 4.0±0.05 | 4.0±0.10 | 2.0±0.05 |
| CR40 | 3.5±0.2 | 2.8±0.2 | 8.0±0.20 | 1.75±0.10 | 3.50±0.05 | $0.75^{+0.2}_{-0}$ | $0.75^{+0.1}_{-0.0}$ | 4.0±0.10 | 4.0±0.05 | 2.0±0.05 |

7.3 Packaging

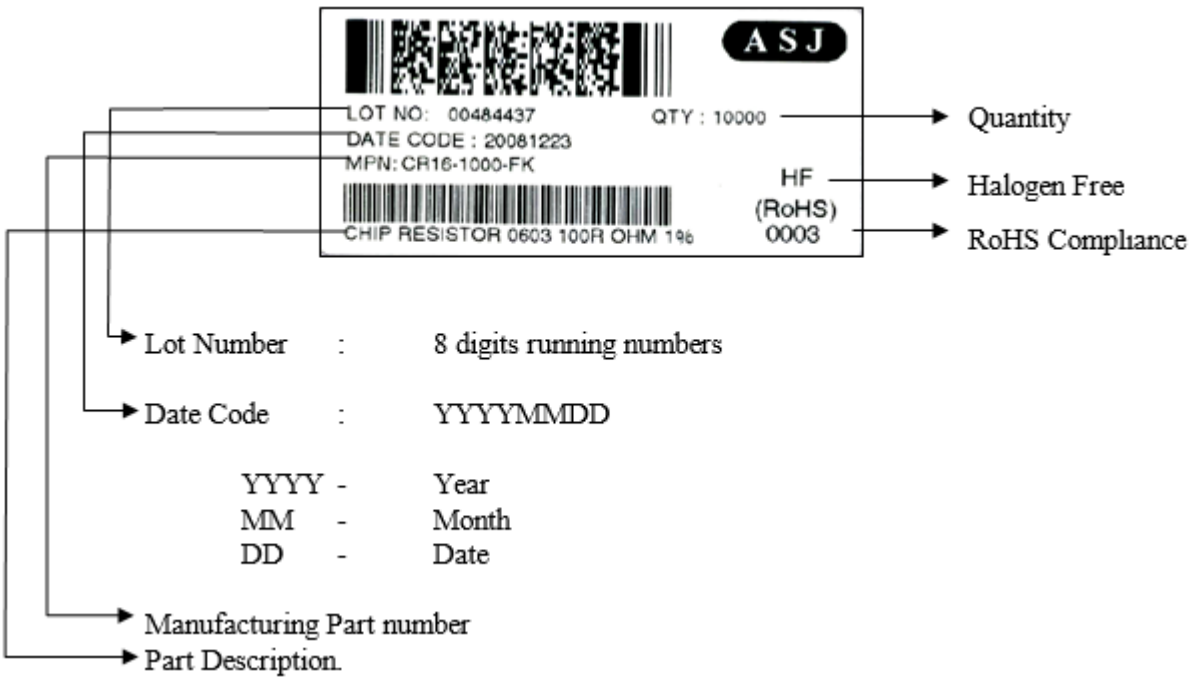
7.3.1 Taping

7.3.2 Quantity – Tape and Reels

| Code | Quantity | Model | Remarks |
|---|---|---|---|
| CR10 | 10,000 pcs | 7” Reel | 2mm pitch |
| | 20,000 pcs | 7” Reel | 2mm pitch |
| | 50,000 pcs | 13” Reel | 2mm pitch |
| CR16<br>CR21<br>CR32 | 5,000 pcs | 7” Reel | 4mm pitch |
| | 10,000 pcs | 10” Reel | 4mm pitch |
| | 20,000 pcs | 13” Reel | 4mm pitch |

7.3.3 Identification

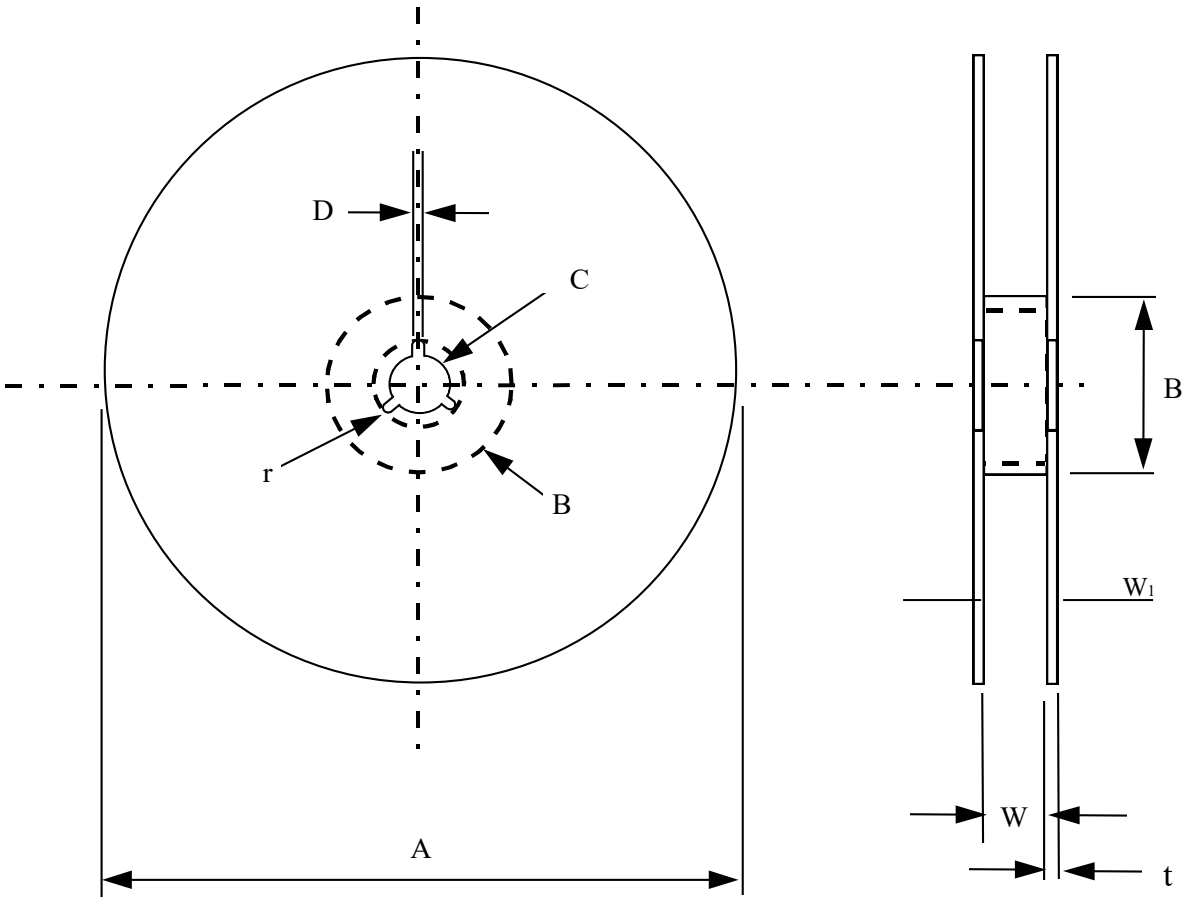
Production label that indicates the 8 digits lot number, product type, resistance value and tolerance shall be pasted on the surface of each reel.




7.3.4 Packaging Reel Box

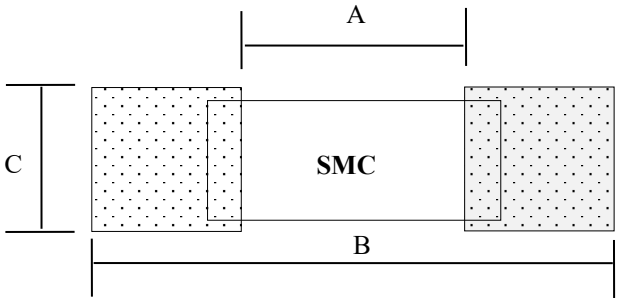
| Dimension | Reel Box | Number of Reels |
|---|---|---|
| 185 × 60 × 186 mm | 25K Box | 5 |
| 185 × 120 × 186 mm | 50K Box | 10 |

7.3.5 Reel Dimensions




| Model | A | B | C | D | W | $W_1$ | t | r |
|---|---|---|---|---|---|---|---|---|
| 7"Reel (5K) (except 0402 10K) | ϕ178±2.0 | ϕ60min | 13± 0.2 | ϕ2.0± 0.5 | 11± 0.1 | 14.4 max | 1.0± 0.1 | 1.0 |
| 7"Reel (4K) | ϕ178±2.0 | ϕ60min | 13± 0.2 | ϕ2.0± 0.5 | 13±1.0 | 14.4 max | 1.2± 0.1 | 1.0 |
| 7''Reel (10K) | ϕ178±2.0 | ϕ60min | 13± 0.2 | ϕ2.0± 0.5 | 11± 0.1 | 14.4 max | 1.0± 0.1 | 1.0 |
| 10"Reel (10K) | ϕ254±2.0 | ϕ60min | 13± 0.2 | ϕ2.0± 0.5 | 11± 1.0 | 14.4 max | 1.5± 0.1 | 1.0 |
| 13"Reel (20K, 50K) | ϕ330±2.0 | ϕ60min | 13± 0.2 | ϕ2.0± 0.5 | 11± 1.0 | 14.4 max | 2.1± 0.1 | - |
| 13"Reel (20K) | ϕ330±1.0 | ϕ100±1 | 13.5±0.5 | 2~3±0.5 | 10±0.5 | - | - | - |

## 8. SURFACE MOUNT LAND PATTERNS




| Product ( Type ) | Land Dimension | | |
|---|---|---|---|
| | A | B | C |
| CR10 (0402) | 0.020 [0.5] | 0.059 [1.5] | 0.024 [ 0.6 ] |
| CR16 (0603) | 0.031 [0.8] | 0.083 [2.1] | 0.035 [ 0.9 ] |
| CR21 (0805) | 0.047 [1.2] | 0.118 [3.0] | 0.051 [ 1.3 ] |
| CR32 (1206) | 0.087 [2.2] | 0.165 [4.2] | 0.063 [ 1.6 ] |

## 9. REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|---|---|---|---|
| Version.1 | 13.02.2015 | | Initial Release |
| Version.2 | 19.02.2016 | Refer to ECO No. : 001/2016 | Change 0201 I1 dimension from 0.15±0.05 mm to 0.10±0.05 mm |
| Version.3 | 25.03.2016 | | Revise clause 6.1.1, typo error, change IR Reflow to Wave Soldering, 6.1.2, change Wave soldering to Reflow Soldering. |
| Version.4 | 08.06.2016 | | Revise clause 7.2.1, change dimension of punch paper carrier system for CR03, 05, 10<br>Revise clause 7.2.2, change dimension of punch paper carrier system for CR16, CR21, CR32, CR40, CR50, CR63 |
| Version.5 | 06.12.2016 | Refer to PCN-ECO :01/2016 | Update clause 7.3.4, insert 13” reel information |
| Version.6 | 06.04.2017 | | Typo error in clause 5.1 review and update dimension |
| Version.7 | 19.05.2017 | | Insert product 01005 into clause 1.2 |
| Version.8 | 14.09.2017 | | Update clause 7.2.1 & 7.2.2 dimension information |
| Version.9 | 05.10.2017 | | Review and update clause 7.3.2 Packaging information |
| Version.10 | 29.11.2019 | Refer to PCR-004/17 | Review clause 6 test condition<br>Revise clause 7.2, update dimension of punch paper tape |
| Version.11 | 22.01.2018 | | Typo Error in clause 2 |
| Version.12 | 18.09.2018 | | Revise clause 2 000-5% to 000,<br>Remove 0000-1% |
| Version.13 | 27.03.2019 | | Remove CR03, CR05, CR40, CR50, CR63 product<br>Update clause 3.2 graph<br>Update clause 3.10 table<br>Update clause 4 table<br>Update clause 6<br>Update clause 7.2.1 & 7.2.2 table<br>Update clause 7.3.2 table<br>Update clause 8 table |
| Version.14 | 30.05.2019 | | Update clause 3.9 |
| Version.15 | 09.07.2019 | | Update clause 3.9 & 3.10<br>Add in clause 6.1.3 |
| Version.16 | 10.09.2019 | | Add in clause 5.2, 5.3 construction and material |
| Version.17 | 22.05.2020 | | Revise clause 3.10 TCR table, add 0.1% and 0.5%<br>Revise clause 3.5<br>Revise clause 6 |