



TR Series Thin Film Chip Resistor Product Specifications

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Thin Film Chip Resistor Product Specifications — TR Series



Top view



Bottom view

Applications

- Consumer electronics
- Computer
- Telecom
- Measuring instrument
- Printing equipment
- Converter

Features

- Tolerance to $\pm 0.1\%$
- Low TCR to $\pm 10 \text{ ppm}/^\circ\text{C}$
- Halogen free and lead free
- RoHS compliant

Parts Number Explanation

Example:

| | | | | | | | |
|-----------------------------------|--|---|--|---|--|--|------------------|
| TR | 1206 | B | 10K0 | P | 05 | 25 | Z |
| Product Type | Size (Inch) | Tolerance | Resistance | Package | Quantity (PCS) | TCR (ppm/$^\circ\text{C}$) | Optional |
| TR Series Thin Film Chip Resistor | 0402 0603 0805 1206 1210 2010 2512 | B : $\pm 0.1\%$ C : $\pm 0.25\%$ D : $\pm 0.5\%$ F : $\pm 1\%$ | 4 digits EX. 1R00 = 1 Ω 10R0 = 10 Ω 100R = 100 Ω 2K20 = 2.2 K Ω 332K = 332 K Ω 1M00 = 1 M Ω | P、Q : Paper Taping E : Embossed Taping B : Bulk | 04 : 4000 05 : 5000 10 : 10000 20 : 20000 40 : 40000 50 : 50000 | 10 : ± 10 15 : ± 15 25 : ± 25 50 : ± 50 | Z : default code |



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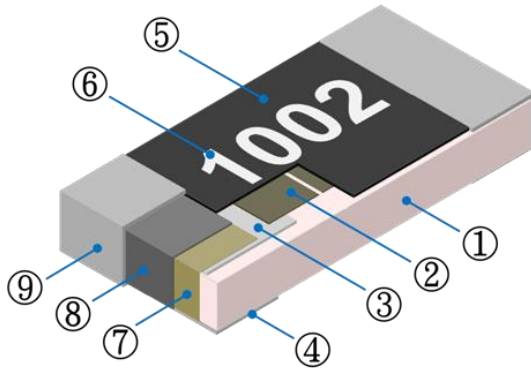
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Standard Electrical Specifications

| 項目 Item 型別 Type | 額定功率 Rated Power at 70°C | 最大工作電壓 Max Working Voltage | 最大過負載電壓 Max Overload Voltage | 溫度係數 T.C.R. (PPM/°C) | 阻值範圍 Resistance Range | | | | | | | |
|--------------------|--------------------------------|----------------------------------|------------------------------------|----------------------------|--|------------|--|---------|--------------|--|------------|--|
| | | | | | B (±0.1%) | C (±0.25%) | D (±0.5%) | F (±1%) | | | | |
| TR0402 | 0.063W | 25V | 50V | ±10 | 10Ω ~ 10KΩ (10.1KΩ~68KΩ developing) | | | | | | | |
| | | | | ±15 | | | | | | | | |
| | | | | ±25 | 4.7Ω ~ 10KΩ (10.1KΩ~220KΩ developing) | | 1Ω ~ 10KΩ (10.1KΩ~220KΩ developing) | | | | | |
| | | | | ±50 | | | | | | | | |
| TR0603 | 0.1W | 75V | 150V | ±10 | 10Ω ~ 100KΩ (101KΩ~332KΩ developing) | | | | | | | |
| | | | | ±15 | | | | | | | | |
| | | | | ±25 | 4.7Ω ~ 100KΩ (101KΩ~680KΩ developing) | | 1Ω ~ 100KΩ (101KΩ~680KΩ developing) | | | | | |
| | | | | ±50 | | | | | | | | |
| TR0805 | 0.125W | 150V | 300V | ±10 | 10Ω ~ 100KΩ (101KΩ~680KΩ developing) | | | | | | | |
| | | | | ±15 | | | | | | | | |
| | | | | ±25 | 4.7Ω ~ 100KΩ (101KΩ~1MΩ developing) | | 1Ω ~ 100KΩ (101KΩ~1MΩ developing) | | | | | |
| | | | | ±50 | | | | | | | | |
| TR1206 | 0.25W | 200V | 400V | ±10 | 10Ω ~ 100KΩ (101KΩ~1MΩ developing) | | | | | | | |
| | | | | ±15 | | | | | | | | |
| | | | | ±25 | 4.7Ω ~ 100KΩ (101KΩ~1.5MΩ developing) | | 1Ω ~ 100KΩ (101KΩ~1.5MΩ developing) | | | | | |
| | | | | ±50 | | | | | | | | |
| TR1210 | 0.25W | | | 200V | 400V | ±10 | 10Ω ~ 100KΩ | | | | | |
| | | | | | | ±15 | | | | | | |
| | | | | | | ±25 | 4.7Ω ~ 100KΩ | | 1Ω ~ 100KΩ | | | |
| | | | | | | ±50 | | | | | | |
| TR2010 | 0.5W | | | | | 200V | 400V | ±10 | 10Ω ~ 100KΩ | | | |
| | | | | | | | | ±15 | | | | |
| | | | | | | | | ±25 | 4.7Ω ~ 100KΩ | | 1Ω ~ 100KΩ | |
| | | | | | | | | ±50 | | | | |
| TR2512 | 0.75W | 200V | 400V | | | | | ±10 | 10Ω ~ 100KΩ | | | |
| | | | | | | | | ±15 | | | | |
| | | | | | | | | ±25 | 4.7Ω ~ 100KΩ | | 1Ω ~ 100KΩ | |
| | | | | | | | | ±50 | | | | |

- For non-standard parts, please contact our sales dept.
- Operating Temperature Range : -55°C ~ +155°C.

Construction



| | | | | | |
|---|---------------------|---|------------------------|---|----------------------|
| ① | Alumina Substrate | ④ | Bottom Inner Electrode | ⑦ | Side Inner Electrode |
| ② | Resistive Layer | ⑤ | Protective Overcoat | ⑧ | Nickel Barrier |
| ③ | Top Inner Electrode | ⑥ | Marking | ⑨ | Solder coating (Sn) |

Dimensions



Unit : mm

| TYPE | L | W | H | l_1 | l_2 |
|--------|-----------------|-----------------|-----------------|-----------------|-----------------|
| TR0402 | 1.00 ± 0.10 | 0.50 ± 0.05 | 0.30 ± 0.05 | 0.15 ± 0.10 | 0.20 ± 0.10 |
| TR0603 | 1.60 ± 0.20 | 0.80 ± 0.15 | 0.40 ± 0.10 | 0.20 ± 0.15 | 0.30 ± 0.10 |
| TR0805 | 2.00 ± 0.20 | 1.25 ± 0.15 | 0.50 ± 0.15 | 0.20 ± 0.15 | 0.40 ± 0.15 |
| TR1206 | 3.05 ± 0.10 | 1.60 ± 0.20 | 0.55 ± 0.15 | 0.30 ± 0.20 | 0.50 ± 0.20 |
| TR1210 | 3.05 ± 0.10 | 2.50 ± 0.20 | 0.55 ± 0.15 | 0.30 ± 0.20 | 0.50 ± 0.20 |
| TR2010 | 5.00 ± 0.20 | 2.50 ± 0.20 | 0.55 ± 0.10 | 0.30 ± 0.15 | 0.60 ± 0.20 |
| TR2512 | 6.30 ± 0.20 | 3.20 ± 0.20 | 0.55 ± 0.10 | 0.40 ± 0.20 | 0.60 ± 0.20 |



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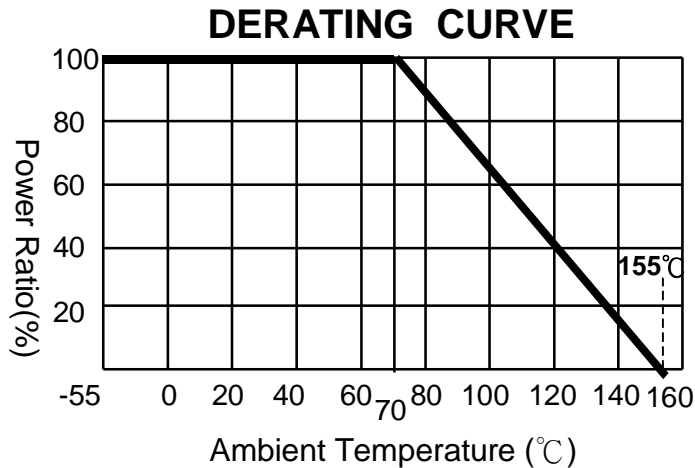
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■ Performance Characteristics

■ Power Derating Curve

The Operating Temperature Range: -55°C ~+155°C.

Power rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.



■ Rated Voltage

Resistance Range: $\geq 1\Omega$

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$V = \sqrt{P \times R}$$

V = Rated voltage (V)

P = Rated power (W)

R = Nominal resistance (Ω)



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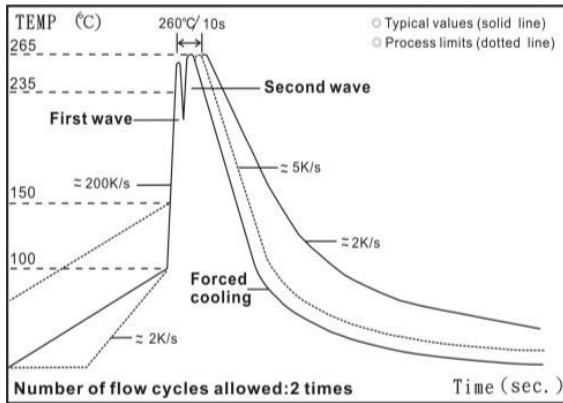
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■ Reliability Tests and Requirements

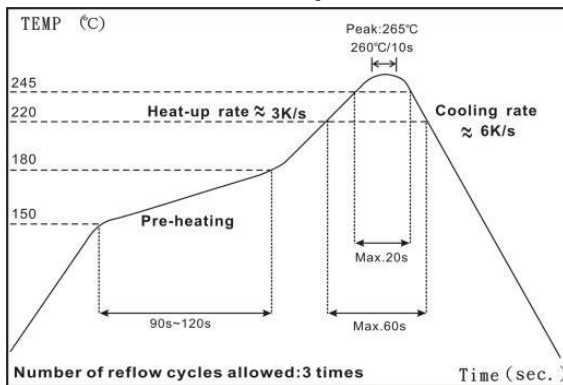
| Test Item | Test Method | Procedure | Requirements |
|---|--------------------------|---|---|
| Temperature Coefficient of Resistance (T.C.R) | JIS C 5201-1 clause 4.8 | At +25°C/-55°C and +25°C/+125°C. | Refer to Standard Electrical Specifications |
| Short Time Overload | JIS C 5201-1 clause 4.13 | 2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds. | ±(0.5%+0.05Ω) No Visual damage |
| Insulation Resistance | JIS C 5201-1 clause 4.6 | 100V for 1 minute. | ≥10GΩ |
| Solderability | JIS C 5201-1 clause 4.17 | 245±5°C for 3±0.5secs. | >95% Coverage No Visual damage |
| Resistance to Soldering Heat | JIS-C5201-1 clause 4.18 | 260±5°C for 10 seconds. | ±(0.5%+0.05Ω) No Visual damage |
| Leaching | JIS-C5201-1 clause 4.18 | 260±5°C for 30 seconds. | >95% Coverage No Visual damage |
| Temperature Cycling | JIS C 5201-1 clause 4.19 | -55°C to +155°C, 300 cycles | ±(0.5%+0.05Ω) No Visual damage |
| High Temperature Exposure | JIS-C5201-1 4.25 | 155±5°C for 1000 +48/-0 hours. | ±(0.5%+0.05Ω) |
| Resistance to Solvent | JIS C 5201-1 clause 4.29 | The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs. Then the resistor is left in the room for 48 hrs. | ±(0.5%+0.05Ω) No Visual damage |
| Load Life in Humidity | JIS C 5201-1 clause 4.24 | 40±2°C, 90~95% R.H. , Rated power or Max. working current whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" . | ±(0.5%+0.05Ω) |
| Load Life (Endurance) | JIS C 5201-1 clause 4.25 | 70±2°C, Rated power, or Max. working current whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" . | ±(0.5%+0.05Ω) |
| Terminal Bending Strength | JIS C 5201-1 clause 4.33 | Bending once for 5 seconds D : 0402 · 0603 · 0805=5mm 1206 · 1210 =3mm 2010 · 2512 = 2mm | ±(0.5%+0.05Ω) No Visual damage |

■ **Recommended Customer Soldering Parameters**

■ **Wave solder Temperature condition**



■ **Solder reflow Temperature condition**



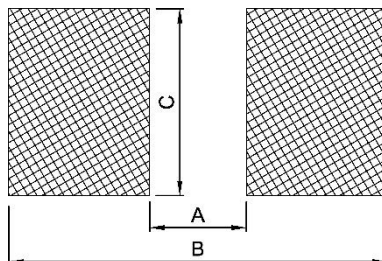
■ **Rework temperature (hot air equipment) : 350°C, 3~5seconds**

■ **Recommended reflow methods**

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

■ **Recommend Land Pattern Design (For Reflow Soldering)**



Unit: mm

| Type | 0402 | 0603 | 0805 | 1206 | 1210 | 2010 | 2512 |
|------|------|------|------|------|------|------|------|
| A | 0.60 | 0.80 | 1.30 | 2.20 | 2.00 | 3.80 | 4.90 |
| B | 1.60 | 2.40 | 2.90 | 4.20 | 4.40 | 6.60 | 8.10 |
| C | 0.70 | 1.00 | 1.40 | 1.70 | 2.70 | 2.70 | 3.40 |



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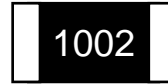
■ Marking



0402: no marking



0603: 3 digits code



0805~2512: 4 digits code

■ No marking on 0402 type

■ 3 digits code for 0603 type

● Standard E96 Values and 0603 Resistance Codes

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

● E96 Multiplier Code

| 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 |

1. 0603 3 digits coding formula for E96 values as following:

CODING FORMULA

$$\begin{array}{c} \text{XX} \\ \uparrow \\ \text{Resistance Code} \end{array} \quad \begin{array}{c} \text{X} \\ \swarrow \\ \text{Multiplier Code} \end{array} \quad \text{Example: } 10.2\text{K}\Omega = \underline{102} \times \underline{10^2}\Omega = \mathbf{02C}$$

$$33.2\Omega = \underline{332} \times \underline{10^{-1}}\Omega = \mathbf{51X}$$

EX.: 1Ω=01Y ; 7.5Ω=85Y ; 11Ω=05X ; 130Ω=12A ; 2KΩ= 30B ; 10KΩ=01C ; 150KΩ=18D

2. 0603 3 digits for E24 values

| E24 | 12 | 16 | 18 | 22 | 24 | 27 | 30 | 33 | 36 | 39 | 43 | 47 | 51 | 56 | 62 | 68 | 82 | 91 |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

Examples:

| Resistance | 2.2Ω | 33Ω | 470Ω | 5.6KΩ | 62KΩ | 680KΩ |
|---------------|------|-----|------|-------|------|-------|
| 3 digits code | 2R2 | 330 | 471 | 562 | 623 | 684 |

("R"= decimal point)

3. 0603 E192 values are no marking.

■ 4 digits code for 0805 ~ 2512 type

First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point.

Examples:

| Resistance | 1Ω | 5.6Ω | 10Ω | 22.6Ω | 100Ω | 1.1KΩ | 10KΩ | 332KΩ | 1MΩ |
|---------------|------|------|------|-------|------|-------|------|-------|------|
| 4 digits code | 1R00 | 5R60 | 10R0 | 22R6 | 1000 | 1101 | 1002 | 3323 | 1004 |



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■ Packaging Information

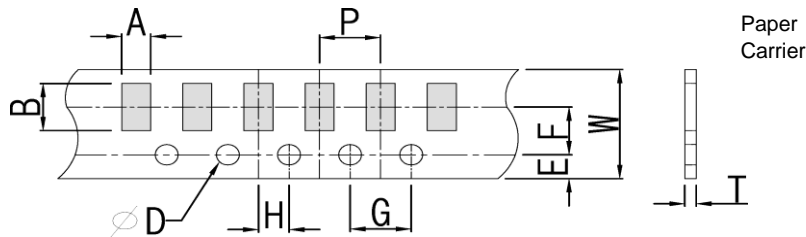
■ Reel Dimensions



Unit: mm

| TYPE | SIZE | A | φB | φC | φD | W | φM |
|-------------------------|------|--------------|---------|----------|--------|---------|----------|
| 0402 | 7" | 10K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0 | 11.5±2.0 |
| 0402 | 13" | 40K/50K Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 |
| 0603/0805/1206/ 1210 | 7" | 5K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0 | 11.5±2.0 |
| 0603/0805 /1206 | 10" | 10K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 |
| | 13" | 20K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 |
| 2010/2512 | 7" | 4K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0 | 16.0±2.0 |

■ Paper Tape Dimensions



Unit: mm

| Type | A | B | W | E | F | G | H | T | φD | P |
|------|-----------|-----------|----------|-----------|----------|----------|----------|-----------|-------------------------------------|----------|
| 0402 | 0.70±0.10 | 1.20±0.10 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.45±0.10 | 1.50 ^{+0.10} ₋₀ | 2.0±0.10 |
| 0603 | 1.05±0.20 | 1.80±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.60±0.10 | | 4.0±0.10 |
| 0805 | 1.55±0.20 | 2.30±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 | | |
| 1206 | 1.90±0.20 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 | | |
| 1210 | 2.85±0.20 | 3.50±0.20 | 8.0±0.20 | 1.75±0.10 | 3.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.75±0.10 | | |

■ Plastic Embossed Tape Dimensions



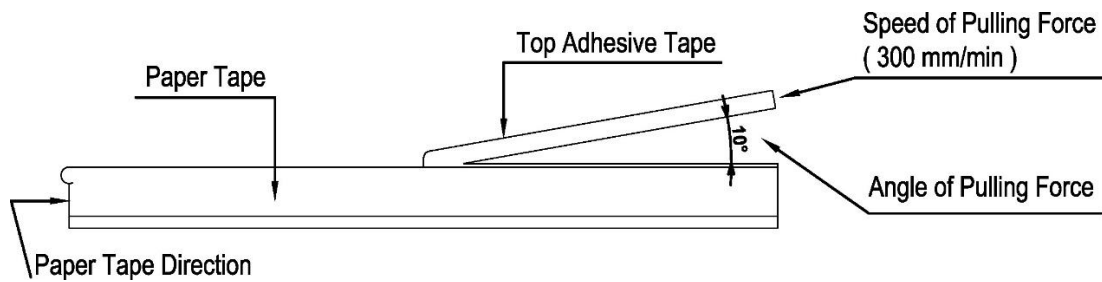
Unit: mm

| Type | A | B | W | E | F | G | H | T | φD | ψD1 | T1 | P |
|------|-----------|-----------|---------|-----------|----------|----------|----------|-----------|-------------------------------------|-----------|-----------|----------|
| 2010 | 2.80±0.20 | 5.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | 1.50 ^{+0.10} ₋₀ | 1.50±0.10 | 0.85±0.15 | 4.0±0.10 |
| 2512 | 3.40±0.20 | 6.70±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | | 1.50±0.10 | 0.85±0.15 | |

■ **Front & Back Lead Dimensions**

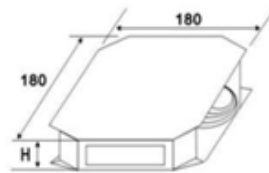


■ **Top Adhesive Peel Off Strength : 10~70g**

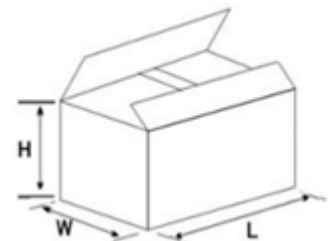


■ **Package**

| Inner Box Size | |
|----------------|------------|
| Reel | Size H(mm) |
| 1 | 13 |
| 2 | 24 |
| 3 | 36 |
| 5 | 60 |
| 10 | 113 |



| External Box Size | | | |
|-------------------|-------------|------------|------------|
| Contain (Kpcs) | Length (mm) | Width (mm) | Width (mm) |
| 25K | 180 | 180 | 60 |
| 50K | 180 | 180 | 110 |
| 150K | 430 | 200 | 200 |
| 300K | 400 | 400 | 200 |



■ **Storage Data :**

Storage time at the environment temp: $25\pm 5^\circ\text{C}$ & humidity: $60\pm 20\%$ is valid for one year from the date of delivery.

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[M55342K06B1E78RS3](#) [M55342K06B24E9RS6](#) [M55342K06B6E19RWL](#) [M55342K06B6E81RS3](#) [M55342M05B200DRWB](#)
[M55342M06B4K70MS3](#) [MC0603-511-JTW](#) [742C083750JTR](#) [MCR01MZPF1202](#) [MCR01MZPF1601](#) [MCR01MZPF1800](#)
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