

■ Thin Film Chip Resistor — TR Series



■ Application

- Medical equipments, Military equipments
- Converters
- Consumer products
- Communication devices
- Measurement instruments
- Printers

■ Features

- Tight tolerance from $\pm 0.01\%$, $\pm 0.1\%$, $\pm 0.25\%$, $\pm 0.5\%$, $\pm 1\%$
- Low T.C.R. $\pm 10\text{ppm}$, $\pm 25\text{ppm}$, $\pm 50\text{ppm}$

■ Type Dimension



TR0402 / TR0603 / TR0805 / TR1206 /
TR1210 / TR2010 / TR2512

TR1218

■ Dimension

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 | 0.30 ± 0.20 | 0.30 ± 0.10 |
| TR0805 | 2.00 ± 0.20 | 1.25 ± 0.15 | 0.50 ± 0.15 | 0.30 ± 0.15 | 0.40 ± 0.15 |
| TR1206 | 3.05 ± 0.10 | 1.60 ± 0.20 | 0.55 ± 0.15 | 0.40 ± 0.20 | 0.50 ± 0.20 |
| TR1210 | 3.05 ± 0.10 | 2.50 ± 0.20 | 0.55 ± 0.15 | 0.50 ± 0.20 | 0.50 ± 0.20 |
| TR2010 | 5.00 ± 0.20 | 2.50 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20 | 0.60 ± 0.20 |
| TR1218 | 3.10 ± 0.10 | 4.60 ± 0.10 | 0.55 ± 0.05 | 0.40 ± 0.20 | 0.50 ± 0.20 |
| TR2512 | 6.30 ± 0.20 | 3.20 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20 | 0.60 ± 0.20 |

Standard Electrical Specifications

| TYPE | Rated Power at 70°C | Max Working Voltage | Max Overload Voltage | T.C.R. (PPM/°C) | Resistance Range | | | |
|--------|---------------------|---------------------|----------------------|-----------------|------------------------|-------------|-----------------------|-------------|
| | | | | | T(±0.01%) W(±0.05%) | B(±0.1%) | C(±0.25%) D(±0.5%) | F(±1%) |
| TR0402 | 0.063W | 25V | 50V | ±10 | - | 40.2Ω~42K2Ω | 40.2Ω~42K2Ω | 40.2Ω~42K2Ω |
| | | | | ±25 | | 10Ω~100KΩ | 10Ω~100KΩ | 10Ω~100KΩ |
| | | | | ±50 | | 10Ω~1MΩ | 10Ω~1MΩ | 10Ω~1MΩ |
| TR0603 | 0.1W | 75V | 150V | ±10 | 24.9Ω~100KΩ | 10Ω~100KΩ | 10Ω~100KΩ | 10Ω~100KΩ |
| | | | | ±25 | | 4.7Ω~332KΩ | 4.7Ω~332KΩ | 4.7Ω~332KΩ |
| | | | | ±50 | | 4.7Ω~4M7Ω | 4.7Ω~4M7Ω | 1Ω~4M7Ω |
| TR0805 | 0.125W | 150V | 300V | ±10 | 24.9Ω~100KΩ | 10Ω~220KΩ | 10Ω~220KΩ | 10Ω~220KΩ |
| | | | | ±25 | | 4.7Ω~3M32Ω | 4.7Ω~3M32Ω | 4.7Ω~3M32Ω |
| | | | | ±50 | | 4.7Ω~3M32Ω | 4.7Ω~3M32Ω | 1Ω~3M32Ω |
| TR1206 | 0.25W | 200V | 400V | ±10 | 24.9Ω~100KΩ | 10Ω~220KΩ | 10Ω~220KΩ | 10Ω~220KΩ |
| | | | | ±25 | | 4.7Ω~2M74Ω | 4.7Ω~2M74Ω | 4.7Ω~2M74Ω |
| | | | | ±50 | | 4.7Ω~2M74Ω | 4.7Ω~2M74Ω | 1Ω~2M74Ω |
| TR1210 | 0.25W | 200V | 400V | ±10 | 24.9Ω~100KΩ | 10Ω~499KΩ | 10Ω~499KΩ | 10Ω~499KΩ |
| | | | | ±25 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 4.7Ω~1MΩ |
| | | | | ±50 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 1Ω~1MΩ |
| TR2010 | 0.5W | 200V | 400V | ±10 | 24.9Ω~100KΩ | 10Ω~499KΩ | 10Ω~499KΩ | 10Ω~499KΩ |
| | | | | ±25 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 4.7Ω~1MΩ |
| | | | | ±50 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 1Ω~1MΩ |
| TR1218 | 0.5W | 200V | 400V | ±10 | 24.9Ω~100KΩ | 10Ω~499KΩ | 10Ω~499KΩ | 10Ω~499KΩ |
| | | | | ±25 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 4.7Ω~1MΩ |
| | | | | ±50 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 1Ω~1MΩ |
| TR2512 | 0.75W | 200V | 400V | ±10 | 24.9Ω~100KΩ | 10Ω~499KΩ | 10Ω~499KΩ | 10Ω~499KΩ |
| | | | | ±25 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 4.7Ω~1MΩ |
| | | | | ±50 | | 4.7Ω~1MΩ | 4.7Ω~1MΩ | 1Ω~1MΩ |

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

■ Parts Number Explanation

■ Example:



Appendix For SMD Chip Resistor

Packaging Information

◆ For TR Series



Dimension

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 | 178±2.0 |
| | 13" | 40K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 | 330±2.0 |
| | 13" | 50K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 | 330±2.0 |
| 0603 0805 1206 | 7" | 5K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0 | 11.5±2.0 | 178±2.0 |
| | 10" | 10K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 | 254±2.0 |
| | 13" | 20K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 100±1.0 | 11.5±2.0 | 330±2.0 |
| 1210 | 7" | 5K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0 | 11.5±2.0 | 178±2.0 |
| 2010/2512 1218 | 7" | 4K/Reel | 2.0±0.5 | 13.5±1.0 | 21±1.0 | 60±1.0 | 16.0±2.0 | 178±2.0 |

Tapping Specification



Dimension

Unit: mm

| Packaging | Type | A | B | W | E | F | G | H | T | ϕD | P |
|------------|------|-----------|-----------|----------|-----------|----------|----------|----------|-----------|---------------------|---------|
| Paper Type | 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±0.1 |
| | 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±0.1 |
| | 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 | | 4.0±0.1 |
| | 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 | | 4.0±0.1 |
| | 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 | | 4.0±0.1 |



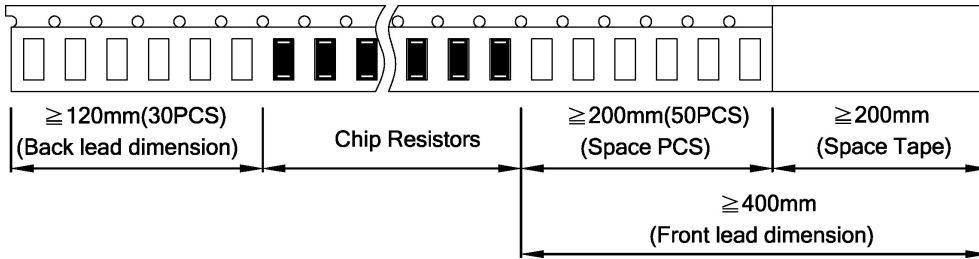
Dimension

Unit: mm

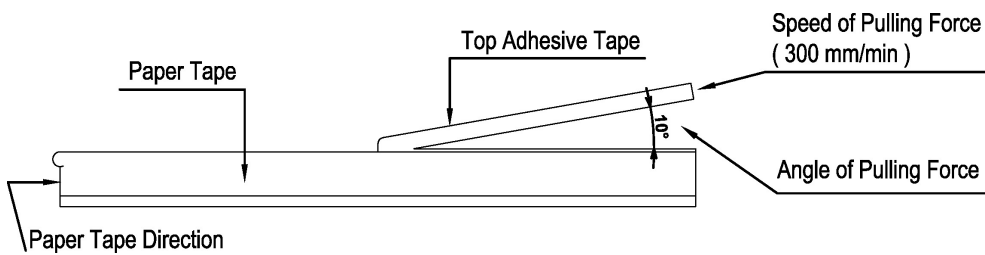
| Packaging | Type | A | B | W | E | F | G | H | T | ϕD | $\psi D1$ | T1 | P |
|---------------|------|-----------|-----------|---------|-----------|----------|----------|----------|-----------|----------|-----------|-----------|---------|
| Embossed Type | 2010 | 2.80±0.20 | 5.60±0.20 | 12±0.10 | 1.75±0.10 | 5.5±0.05 | 4.0±0.10 | 2.0±0.05 | 0.23±0.10 | +0.10 | 1.50±0.10 | 0.85±0.15 | 4.0±0.1 |
| | 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 | 1.50±0.10 | 0.85±0.15 | |
| | 1218 | 3.30±0.20 | 4.60±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 | -0 | 1.50±0.10 | 0.85±0.15 | |

■ Packing Material Data / Storage Data

■ Front & Back Lead Dimension

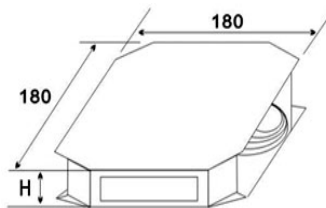


■ Top Adhesive Peel Off Strength : 10~70g

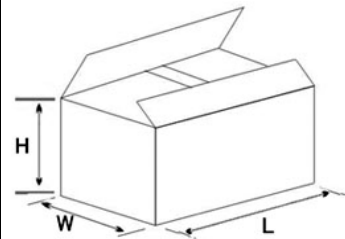


■ Package

| 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) | Height (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±5°C & humidity: 60±20% is valid for one year from the date of delivery.

● Reliability Test and Requirement

◆ For TR Series

| Test Item | Test Method | Procedure | Requirements |
|---|--------------------------|---|------------------|
| Temperature Coefficient of Resistance (T.C.R) | JIS C 5201-1 clause 4.8 | TCR +155 °C , 25°C is the reference temperature | Refer to Ratings |
| Short Time Overload | JIS C 5201-1 clause 4.13 | General : 2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds. High Power : 2.5 times RCWV or Max. Overload voltage whichever is less for 2 seconds. | ±(0.5%+0.05Ω) |
| IR Reflow | Sony SS-00254 |  | ±(0.5%+0.05Ω) |
| Leaching | Sony SS-00254-9 | 260±5°C for 30 seconds. | >95% Coverage |
| Soldering Heat | JIS C 5201-1 clause 4.18 | 260±5°C for 10 seconds. | ±(0.5%+0.05Ω) |
| Temperature Cycling | JIS C 5201-1 clause 4.19 | -55°C to +155°C, 5 cycles | ±(0.5%+0.05Ω) |
| Electric Iron | Sony SS-00254-5 | Preheating temperature : 350±10°C Electric iron preheating time : 3+1/-0 sec | ±(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) |
| Load Life in Humidity | JIS C 5201-1 clause 4.24 | 40±2°C, 90~95% R.H. RCWV or Max. working voltage 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, RCWV or Max. working voltage 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 : TR Series 0402、0603、0805=5mm TR Series 1206、1210 =3mm TR Series 1218、2010、2512、2030=2mm | ±(0.5%+0.05Ω) |
| Insulation Resistance | JIS C 5201-1 clause 4.6 | 100V for 1 minute. | ≥ 10GΩ |

● Temperature Coefficient of Resistance test to - 55 °C is available on request

● General Information

■ Recommend Land Pattern Design (For Reflow Soldering)



■ Dimension

Unit: mm

| Type Item | 0402 | 0603 | 0805 | 1206 | 1210 | 2010 | 1218 | 2512 |
|--------------|------|------|------|------|------|------|------|------|
| A | 0.60 | 0.80 | 1.30 | 2.20 | 2.00 | 3.80 | 2.04 | 4.90 |
| B | 1.60 | 2.40 | 2.90 | 4.20 | 4.40 | 6.60 | 4.24 | 8.10 |
| C | 0.70 | 1.00 | 1.45 | 1.80 | 2.70 | 2.70 | 4.80 | 3.40 |

■ Performance Characteristics

■ Power Derating Curve



Power rating or current 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.

■ Voltage Rating or Current Rating

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:

$$E(RCWV) = \sqrt{P \times R}$$

E=Rated voltage(V)

P=Power rating(W)

R=Nominal resistance(Ω)

■ Standard Resistance Values in a Decade

Marking code:

1%: marking code, please refer to E96 and E24 data form as below

Ex: 120K, The marking code is 1203 in E24

121K, The marking code is 1213 in E96

Note: 0402 series resistor has no marking code.

Type: 0603 1% marking code, please refer to E-96 multiplier code.

| E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | E192 | E96 | E48 | |
|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|----|
| 100 | 100 | 100 | 169 | 169 | 169 | 287 | 287 | 287 | 487 | 487 | 487 | 825 | 825 | 825 | |
| 101 | | | 172 | | | 291 | | | 493 | | | 835 | | | |
| 102 | 102 | | 174 | 174 | | 294 | 294 | | 499 | 499 | | 845 | 845 | | |
| 104 | | | 176 | | | 298 | | | 505 | | | 856 | | | |
| 105 | 105 | 105 | 178 | 178 | 178 | 301 | 301 | 301 | 511 | 511 | 511 | 866 | 866 | 866 | |
| 106 | | | 180 | | | 305 | | | 517 | | | 876 | | | |
| 107 | 107 | | 182 | 182 | | 309 | 309 | | 523 | 523 | | 887 | 887 | | |
| 109 | | | 184 | | | 312 | | | 530 | | | 898 | | | |
| 110 | 110 | 110 | 187 | 187 | 187 | 316 | 316 | 316 | 536 | 536 | 536 | 909 | 909 | 909 | |
| 111 | | | 189 | | | 320 | | | 542 | | | 920 | | | |
| 113 | 113 | | 191 | 191 | | 324 | 324 | | 549 | 549 | | 931 | 931 | | |
| 114 | | | 193 | | | 328 | | | 556 | | | 942 | | | |
| 115 | 115 | 115 | 196 | 196 | 196 | 332 | 332 | 332 | 562 | 562 | 562 | 953 | 953 | 953 | |
| 117 | | | 198 | | | 336 | | | 569 | | | 965 | | | |
| 118 | 118 | | 200 | 200 | | 340 | 340 | | 576 | 576 | | 976 | 976 | | |
| 120 | | | 203 | | | 344 | | | 583 | | | 988 | | | |
| 121 | 121 | 121 | 205 | 205 | 205 | 348 | 348 | 348 | 590 | 590 | 590 | | | | |
| 123 | | | 208 | | | 352 | | | 597 | | | | | | |
| 124 | 124 | | 210 | 210 | | 357 | 357 | | 604 | 604 | | E24 | E12 | E6 | E3 |
| 126 | | | 213 | | | 361 | | | 612 | | | 10 | 10 | 10 | 10 |
| 127 | 127 | 127 | 215 | 215 | 215 | 365 | 365 | 365 | 619 | 619 | 619 | 11 | | | |
| 129 | | | 218 | | | 370 | | | 626 | | | 12 | 12 | | |
| 130 | 130 | | 221 | 221 | | 374 | 374 | | 634 | 634 | | 13 | | | |
| 132 | | | 223 | | | 379 | | | 642 | | | 15 | 15 | 15 | |
| 133 | 133 | 133 | 226 | 226 | 226 | 383 | 383 | 383 | 649 | 649 | 649 | 16 | | | |
| 135 | | | 229 | | | 388 | | | 657 | | | 18 | 18 | | |
| 137 | 137 | | 232 | 232 | | 392 | 392 | | 665 | 665 | | 20 | | | |
| 138 | | | 234 | | | 397 | | | 673 | | | 22 | 22 | 22 | 22 |
| 140 | 140 | 140 | 237 | 237 | 237 | 402 | 402 | 402 | 681 | 681 | 681 | 24 | | | |
| 142 | | | 240 | | | 407 | | | 690 | | | 27 | 27 | | |
| 143 | 143 | | 243 | 243 | | 412 | 412 | | 698 | 698 | | 30 | | | |
| 145 | | | 246 | | | 417 | | | 706 | | | 33 | 33 | 33 | |
| 147 | 147 | 147 | 249 | 249 | 249 | 422 | 422 | 422 | 715 | 715 | 715 | 36 | | | |
| 149 | | | 252 | | | 427 | | | 723 | | | 39 | 39 | | |
| 150 | 150 | | 255 | 255 | | 432 | 432 | | 732 | 732 | | 43 | | | |
| 152 | | | 258 | | | 437 | | | 741 | | | 47 | 47 | 47 | 47 |
| 154 | 154 | 154 | 261 | 261 | 261 | 442 | 442 | 442 | 750 | 750 | 750 | 51 | | | |
| 156 | | | 264 | | | 448 | | | 759 | | | 56 | 56 | | |
| 158 | 158 | | 267 | 267 | | 453 | 453 | | 768 | 768 | | 62 | | | |
| 160 | | | 271 | | | 459 | | | 777 | | | 68 | 68 | 68 | |
| 162 | 162 | 162 | 274 | 274 | 274 | 464 | 464 | 464 | 787 | 787 | 787 | 75 | | | |
| 164 | | | 277 | | | 470 | | | 796 | | | 82 | 82 | | |
| 165 | 165 | | 280 | 280 | | 475 | 475 | | 806 | 806 | | 91 | | | |
| 167 | | | 284 | | | 481 | | | 816 | | | | | | |

According to IEC publication 63

Revision : June 30, 2017

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