

薄膜高精密貼片電阻

TFR Series
Thin Film Precision Chip Resistor

FEATURE

- ◆ Thin Film Passivated NiCr Resistor
- ◆ Very Tight Tolerance from $\pm 0.01\%$ ~ $\pm 1\%$
- ◆ Extremely Low TCR from $\pm 5 \sim \pm 50$ PPM/°C
- ◆ Wide R-Value Range
- ◆ Rated Power : 0.063W ~ 0.5W

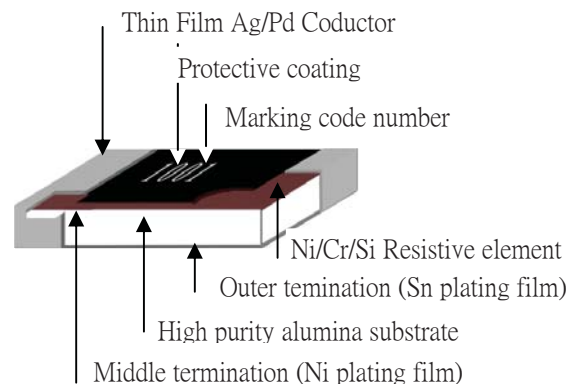
Applications

- ◆ Medical Equipment
- ◆ Testing / Measurement Equipment
- ◆ Consumer Product
- ◆ Printer Equipment
- ◆ Automatic Equipment Controller
- ◆ Converters
- ◆ Communication Device, Cell phone, GPS, PDA
- ◆ Measurement instruments

FIGURE



CONSTRUCTION



ORDERING INFORMATION

Example: TFR03DS10R0

| Power | Size | Type | Tolerance | TCR(°C) | Resistance | Packing |
|--------|------|-------|---|--|--|----------|
| 0.063W | 0402 | TFR02 | F = $\pm 1\%$ D = $\pm 0.5\%$ C = $\pm 0.25\%$ B = $\pm 0.1\%$ T = $\pm 0.01\%$ | S = ± 5 ppm B = ± 10 ppm N = ± 15 ppm C = ± 25 ppm D = ± 50 ppm E = ± 100 ppm | 1R = 1R00 10R = 10R0 100R = 100R 1K = 1001 10K = 1002 100K = 1003 1M = 1-004 | 10K Reel |
| 0.063W | 0603 | TFR03 | | | | 5K Reel |
| 0.1W | 0805 | TFR05 | | | | 5K Reel |
| 0.125W | 1206 | TFR06 | | | | 5K Reel |
| 0.165W | 1210 | TFR10 | | | | 5K Reel |
| 0.25W | 1812 | TFR12 | | | | 4K Reel |
| 0.25W | 2010 | TFR20 | | | | 4K Reel |
| 0.5W | 1218 | TFR18 | | | | 4K Reel |
| 0.5W | 2512 | TFR25 | | | | 4K Reel |

Body Marking

TFR02, TFR03, TFR05, TFR06, TFR10
TFR12, TFR20, TFR25

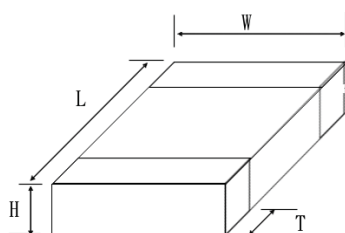


TFR18



DIMENSION

| Power | Size | Type | L | W | H | T1 | T2 |
|--------|------|-------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0.063W | 0402 | TFR02 | 1.00 ± 0.10 | 0.50 ± 0.05 | 0.30 ± 0.05 | 0.20 ± 0.10 | 0.20 ± 0.10 |
| 0.063W | 0603 | TFR03 | 1.60 ± 0.20 | 0.80 ± 0.15 | 0.40 ± 0.10 | 0.30 ± 0.20 | 0.30 ± 0.15 |
| 0.1W | 0805 | TFR05 | 2.00 ± 0.20 | 1.25 ± 0.15 | 0.50 ± 0.15 | 0.35 ± 0.15 | 0.35 ± 0.15 |
| 0.125W | 1206 | TFR06 | 3.20 ± 0.20 | 1.60 ± 0.20 | 0.55 ± 0.15 | 0.45 ± 0.20 | 0.45 ± 0.20 |
| 0.165W | 1210 | TFR10 | 3.20 ± 0.20 | 2.50 ± 0.20 | 0.55 ± 0.15 | 0.50 ± 0.20 | 0.50 ± 0.20 |
| 0.25W | 1812 | TFR12 | 4.50 ± 0.10 | 3.00 ± 0.10 | 0.55 ± 0.05 | 0.55 ± 0.10 | 0.80 ± 0.10 |
| 0.25W | 2010 | TFR20 | 5.00 ± 0.20 | 2.50 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20 | 0.60 ± 0.20 |
| 0.5W | 1218 | TFR18 | 3.10 ± 0.10 | 4.60 ± 0.10 | 0.55 ± 0.05 | 0.45 ± 0.10 | 0.40 ± 0.10 |
| 0.5W | 2512 | TFR25 | 6.30 ± 0.20 | 3.20 ± 0.20 | 0.55 ± 0.10 | 0.60 ± 0.20 | 0.60 ± 0.20 |



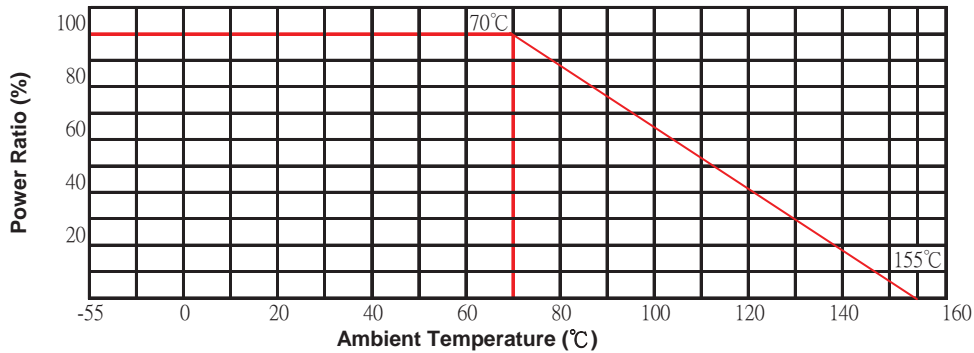
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TFR Series
Thin Film Precision Chip Resistor

GENERAL ELECTRICAL SPECIFICATION

| Type | Size | Power | Maximum Voltage | | T.C.R. (ppm/°C) | Resistance (Ω) | Tolerance | Operating Temp.Range |
|-------|------|--------|-----------------|----------|--------------------|-------------------|-----------|-------------------------|
| | | | Working | Overload | | | | |
| TFR02 | 0402 | 0.063W | 25V | 50V | ±10 | 10~22K | B,C,D,F. | -55°C ~ +155°C |
| | | | | | ±25 | 10~100K | | |
| | | | | | ±50 | | | |
| TFR03 | 0603 | 0.063W | 50V | 100V | ±10 | 20~100K | B,C,D,F. | |
| | | | | | ±25 | 20~332K | | |
| | | | | | ±50 | | | |
| TFR05 | 0805 | 0.1W | 100V | 200V | ±10 | 10~220K | B,C,D,F. | |
| | | | | | ±25 | 10~1M | | |
| | | | | | ±50 | | | |
| TFR06 | 1206 | 0.125W | 150V | 300V | ±10 | 10~499K | B,C,D,F. | |
| | | | | | ±25 | 10~1M | | |
| | | | | | ±50 | | | |
| TFR10 | 1210 | 0.165W | 150V | 300V | ±10 | 120~499K | B,C,D,F. | |
| | | | | | ±25 | 10~1M | | |
| | | | | | ±50 | | | |
| TFR12 | 1812 | 0.25W | 150V | 300V | ±10 | 120~499K | B,C,D,F. | |
| | | | | | ±25 | 10~1M | | |
| | | | | | ±50 | | | |
| TFR20 | 2010 | 0.25W | 150V | 300V | ±10 | 120~499K | B,C,D,F. | |
| | | | | | ±25 | 10~1M | | |
| | | | | | ±50 | | | |
| TFR18 | 1218 | 0.5W | 150V | 300V | ±10 | 120~499K | B,C,D,F. | |
| | | | | | ±25 | 10~1M | | |
| | | | | | ±50 | | | |
| TFR25 | 2512 | 0.5W | 150V | 300V | ±10 | 120~499K | B,C,D,F. | |
| | | | | | ±25 | 10~1M | | |
| | | | | | ±50 | | | |

POWER DERATING CURVE



In case resistors operating ambient temperature in excess of the temperature range -55°C ~+155°C power ratio will be derated in accordance with the figure as shown on the right.



BELIABILITY TEST

| ITEM | TEST METHOD | SPECIFICATION |
|---------------------------------------|---|--|
| Temperature coefficient of Resistance | $TCR(ppm/^{\circ}C) = \frac{(R2-R1)}{R1(T2-T1)} \times 10^6$ R1: Resistance at room temperature R2: Resistance at -55°C ~ +155°C T1: Room Temperature T2: Temperature -55°C ~ +155°C | JIS C 5201-1 CLAUSE 4.8 Refer Ratings |
| Short Time Overload | 2.5 times rated voltage or 2.5 times rated power voltage or MAX overload voltage with ever is less for 5 seconds. | JIS C Short Time Overload 5201-1 clause 4.13 $\pm(0.5\%+0.05\Omega)$ |
| Insulation Resistance | Put the resistor in the fixture, add 100 VDC in \pm terminal for 60 secs. Then Measured the insulation resistance. | JIS C 5201-1 clause 4.6 $\geq 109\Omega$ |
| Terminal Strength | Amount of bend : TFR0402、0603、0805→5mm TFR1206、1210→3mm TFR2010、2512、1218、1812→2mm | JIS C 5201-1 clause 4.33 $\pm(0.5\%+0.05\Omega)$ |
| Resistance to Solvent | Immersed into isopropyl alcohol of 20~25°C for 60±10 secs | JIS C 5201-1 clause 4.29 $\pm(0.5\%+0.05\Omega)$ |
| Resistance to Soldering Heat | Test Temp : 260±5°C Dip time : 10±1 secs. | JIS C 5201-1 clause 4.18 $\pm(0.5\%+0.05\Omega)$ |
| Steam | Put the resistor in the vessel of Temperature 100°C relative humidity 100% for 4 hrs then immerse for 3 secs. In solder at 230±5°C | JIS C 5201-1 clause 4.17 Solder Coverage $\geq 95\%$ |
| Leaching Test | | By SONY SS-00254-9 Solder Coverage $\geq 95\%$ |
| Temperature Cycling | Cycle between -55°C and 125°C, 30mins For 5 cycles. | JIS C 5201-1 clause 4.19 $\pm(0.5\%+0.05\Omega)$ |
| Load Life In Humidity | 40±2°C 90~95%RH, 1000hrs at RCWV, 1.5hrs ON, 0.5hr [OFF]. | JIS C 5201-1 clause 4.24 $\pm(0.5\%+0.05\Omega)$ |
| Load Life | 70°C, 1000hrs at RCWV, 1.5hrs ON, 0.5hrs OFF. | JIS C 5201-1 clause 4.25 $\pm(0.5\%+0.05\Omega)$ |

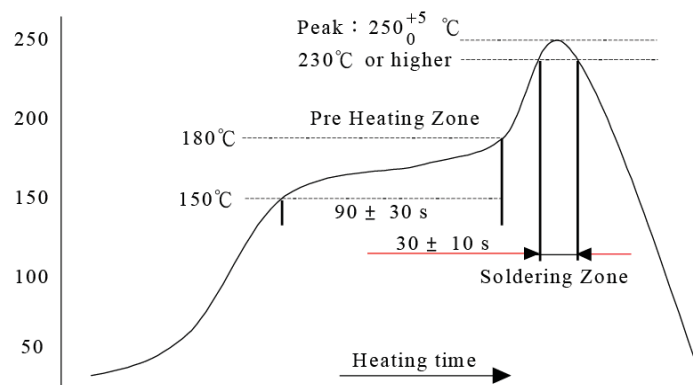
VOLTAGE RATING OR CURRENT RATING

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:

$E = \text{Rated voltage}(V)$ $E = \sqrt{R \times P}$ $P = \text{Power rating}(W)$ $R = \text{Nominal resistance}(\Omega)$

SOLDERING PROFILE



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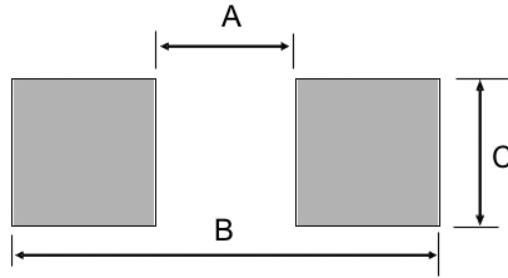
TFR Series
Thin Film Precision Chip Resistor

RECOMMEND LAND PATTERN DESIGN (For Reflow Soldering)



THIN FILM PRECISION CHIP RESISTORS

Unit: mm

| Type | TFR02 | TFR03 | TFR05 | TFR06 | TFR10 | TFR20 | TFR18 | TFR25 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Dim. | 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 | 4.24 | 4.24 | 8.10 |
| C | 0.70 | 1.00 | 1.40 | 1.70 | 2.70 | 4.50 | 4.50 | 3.40 |



PACKAGE SPECIFICATION

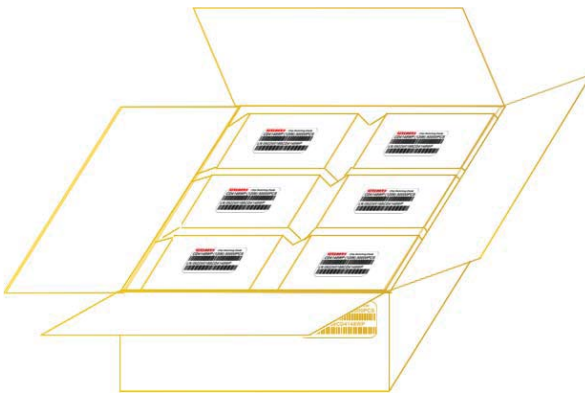
| Power | Size | Type | Quantity(ea) | | |   品質承諾標誌 QUALITY COMMITMENT |
|--------|------|-------|--------------------|----------|----------|---|
| | | | Paper Reel Tape | In Box | Carton | |
| 0.063W | 0402 | TFR02 | 10,000 Pcs 7" Reel | 100K pcs | 600K pcs | |
| 0.063W | 0603 | TFR03 | 5,000 Pcs 7" Reel | 50K pcs | 300K pcs | |
| 0.1W | 0805 | TFR05 | 5,000 Pcs 7" Reel | 50K pcs | 300K pcs | |
| 0.125W | 1206 | TFR06 | 5,000 Pcs 7" Reel | 50K pcs | 300K pcs | |
| 0.165W | 1210 | TFR10 | 4,000 Pcs 7" Reel | 40K pcs | 240K pcs | |
| 0.25W | 1812 | TFR12 | 4,000 Pcs 7" Reel | 40K pcs | 240K pcs | |
| 0.25W | 2010 | TFR20 | 4,000 Pcs 7" Reel | 40K pcs | 240K pcs | |
| 0.5W | 1218 | TFR18 | 4,000 Pcs 7" Reel | 40K pcs | 240K pcs | |
| 0.5W | 2512 | TFR25 | 4,000 Pcs 7" Reel | 40K pcs | 240K pcs | |



Paper Reel Tape



Reel Tape Label



Carton Pack



In Box

