

FEATURE

- High accuracy up to $\pm 0.05\%$
- Narrow TCR to ± 5 PPM/ $^{\circ}\text{C}$
- Total Lead-free without RoHS exemptions (7C-1)
- RoHS complaint
- High stability and reliability
- Compatible with reflow and wave soldering type
- Applications:
 - Communication devices, Smart wears
 - Computer, notebook, workstation, tablet, and peripherals
 - Medical devices
 - Industrial control system
 - etc.

MANUFACTURER PART NO.

For example: TF0805F62RT5E25 - TF0805 $\pm 1\%$ 62 Ω T/R-5000 1/8W 25PPM/ $^{\circ}\text{C}$

Series	Size	Tol.	Nominal Resistance Value	PKG	SPQ	Power	TCR
2 codes	4 codes	1 code	2~5 codes	1 code	1 code	1 code	2 codes
TF	0805	F	62R	T	5	E	25
Thin Film High Accuracy Chip Resistors	0402 0603 0805 1206 1210 2010 2512	A=0.05% B=0.1% C=0.25% D=0.5% F=1%	1R ¹ =1 Ω 4R7=4.7 Ω 4K7 ² =4.7K Ω 100K=100K Ω 2M7 ³ =2.7M Ω	T=T/R ⁴	4=4K 5=5K A=10K	C=1/16W D=1/10W E=1/8W J=1/5W K=1/4W L=1/3W N=1/2W P=3/4W	05=5PPM/ $^{\circ}\text{C}$ 10=10PPM/ $^{\circ}\text{C}$ 25=25PPM/ $^{\circ}\text{C}$ 50=50PPM/ $^{\circ}\text{C}$ 00=Refer to table as below.

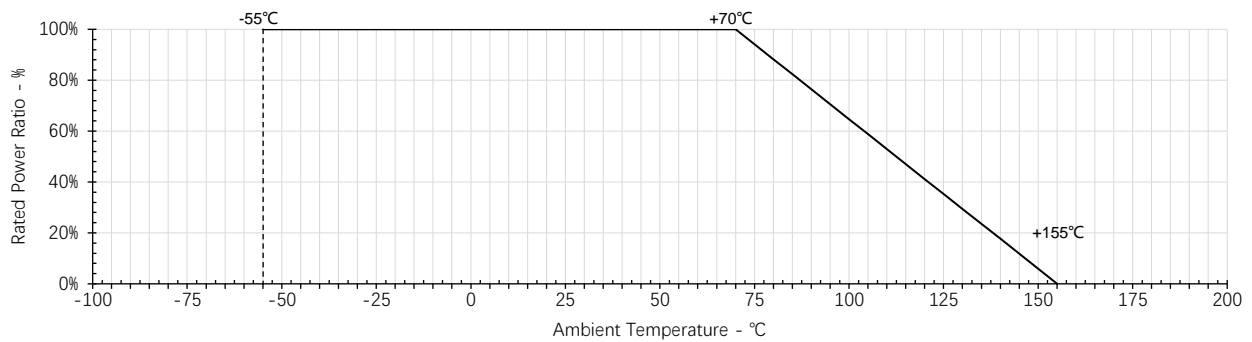
Note: ① R=Radix, 10^0 , Ω ② K=Kilo, 10^3 , K Ω ③ M=Mega, 10^6 , M Ω
④ T/R=Taping in Reel package type ⑤ P.C.=Personal and Customized.

CHARACTERISTICS

Type	Rated Power	MWV ^①	MOV ^②	TCR (PPM/ $^{\circ}\text{C}$)	Resistance Range		
					$\pm 0.05\%$	$\pm 0.1\%$, $\pm 0.25\%$	$\pm 0.5\%$, $\pm 1\%$
TF0402	1/16W	25V	50V	± 5	100 Ω -2K Ω	100 Ω -2K Ω	100 Ω -2K Ω
				± 10	10 Ω -12K Ω	10 Ω -12K Ω	10 Ω -12K Ω
				± 25 , ± 50	10 Ω -330K Ω	10 Ω -330K Ω	10 Ω -330K Ω
TF0603	1/10W	75V	150V	± 5	100 Ω -4K Ω	100 Ω -4K Ω	100 Ω -4K Ω
				± 10	10 Ω -50K Ω	10 Ω -50K Ω	10 Ω -50K Ω
				± 25 , ± 50	10 Ω -1M Ω	1 Ω -1M Ω	1 Ω -1M Ω
TF0805	1/8W	150V	300V	± 5	100 Ω -15K Ω	100 Ω -15K Ω	100 Ω -15K Ω
				± 10	10 Ω -100K Ω	10 Ω -100K Ω	10 Ω -100K Ω
				± 25 , ± 50	4.7 Ω -511K Ω	1 Ω -2M Ω	1 Ω -2M Ω
TF1206	1/4W	200V	400V	± 5	100 Ω -15K Ω	100 Ω -15K Ω	100 Ω -15K Ω
				± 10	10 Ω -200K Ω	10 Ω -200K Ω	10 Ω -200K Ω
				± 25 , ± 50	4.7 Ω -1M Ω	1 Ω -3M Ω	1 Ω -3M Ω
TF1210	1/3W	200V	400V	± 5	100 Ω -15K Ω	100 Ω -15K Ω	100 Ω -15K Ω
				± 10	10 Ω -200K Ω	10 Ω -200K Ω	10 Ω -200K Ω
				± 25 , ± 50	4.7 Ω -1M Ω	1 Ω -3M Ω	1 Ω -3M Ω
TF2010	1/2W	200V	400V	± 5	100 Ω -25K Ω	100 Ω -25K Ω	100 Ω -25K Ω
				± 10	10 Ω -200K Ω	10 Ω -200K Ω	10 Ω -200K Ω
				± 25 , ± 50	4.7 Ω -3M Ω	1 Ω -3M Ω	1 Ω -3M Ω
TF2512	3/4W	200V	400V	± 5	100 Ω -25K Ω	100 Ω -25K Ω	100 Ω -25K Ω
				± 10	10 Ω -200K Ω	10 Ω -200K Ω	10 Ω -200K Ω
				± 25 , ± 50	4.7 Ω -3M Ω	1 Ω -3M Ω	1 Ω -3M Ω

Note: ① MWV=Max. Working Voltage; ② MOV=Max. Overload Voltage.

POWER DERATING CURVE



Note: Working Temperature within -55°C ~ +155°C.

RATED VOLTAGE

Resistors should have a Rated Voltage DC or AC corresponding to Rated Power which can be calculated by formula as below.

The Rated Voltage of certain resistance value should be the calculated result or Max. Working Voltage of product series whichever lower.

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

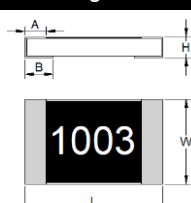
E=Rated voltage(V)

P=Rated power(W)

R=Nominal resistance(Ω)

DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	TF0402	1.00±0.10	0.45±0.10	0.30±0.05	0.20±0.10	0.25±0.10
	TF0603	1.50±0.10	0.80±0.10	0.45±0.10	0.30±0.15	0.30±0.15
	TF0805	1.95±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.15
	TF1206	3.05±0.10	1.50±0.10	0.50±0.10	0.45±0.20	0.35±0.15
	TF1210	3.05±0.10	2.55±0.10	0.55±0.10	0.50±0.20	0.50±0.20
	TF2010	5.00±0.20	2.50±0.20	0.55±0.10	0.60±0.20	0.60±0.20
	TF2512	6.30±0.20	3.20±0.20	0.55±0.10	0.60±0.20	0.60±0.20

RELIABILITY

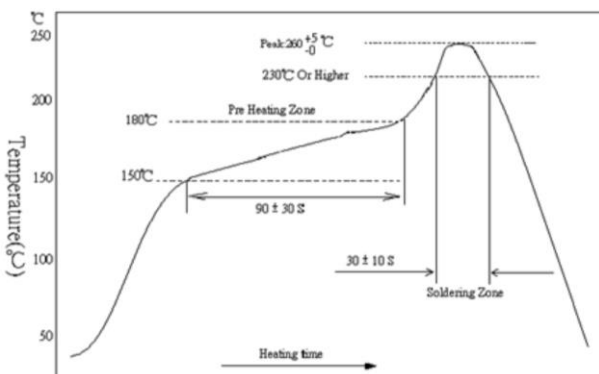
Item	Test Method	Acceptable Criterion
Temperature Coefficient of Resistance (T.C.R.)	$TCR(ppm/°C) = \frac{(R_2 - R_1)}{R_1(T_2 - T_1)} \times 10^6$ R_1 : Resistance value tested at room temperature (Ω) R_2 : Resistance value tested at -55°C or +125°C T_1 : Temperature at room temperature (°C) T_2 : Temperature at -55°C or +125°C Reference: IEC 60115-1 6.2	Details in table CHARACTERISTICS
Short Time Overload	Load 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 seconds. Then measure the resistance value change rate. Reference: IEC 60115-1 8.1.4.2	$\Delta R/R = \pm 0.10\%$
Solderability	Pretreatment: Dry heat +155°C for 4 hours, or with equivalent test method, PCT aging for 4 hours. Then take the specimens out to stabilize at room temperature for 2 hours. Test method: 1. Put the specimens in a tin furnace at 245±3°C for 3 seconds, then take them out and check the soldering appearance by microscope. 2. Reflow soldering test with peak temperature 235°C for 40±5 seconds. Reference: IEC 60115-1 11.1.4.3, IPC-A-610 8.3.2	Soldering coverage must be 95% minimum.

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Item	Test Method	Acceptable Criterion								
Resistance to Soldering Heat	Put the specimens in tin furnace at 260_{-0}^{+5} °C for 10_{-0}^{+1} seconds. Then take them out to stabilize for 1 hour, and measure the resistance value change rate. Reference: IEC 60115-1 11.2.4.3	$\Delta R/R = \pm 0.10\%$								
Leaching	Pretreatment: Dry heat +155°C for 4 hours, or with equivalent test method, PCT aging for 4 hours. Then take the specimens out to stabilize at room temperature for 2 hours. Test method: 1. Put the specimens in a tin furnace at 260_{-0}^{+5} °C for 30_{-0}^{+1} seconds, then take them out and clean. 2. Check the soldering appearance by microscope. Reference: IEC-60068-2-58	Without substrate exposed because of electrode eroded.								
Solder Joint Endurance Test	Put PCBA mounted with the specimens in test machine, press down the PCBA to standard depth with testing block and stabilize for 60 seconds, then measure the resistance value change rate. <table border="1" style="margin-left: 20px;"> <tr> <td>Size</td> <td>0402, 0603, 0805</td> <td>1206, 1210</td> <td>2010, 2512</td> </tr> <tr> <td>Depth</td> <td>5mm</td> <td>3mm</td> <td>2mm</td> </tr> </table> Reference: IEC 60115-1 9.8.4	Size	0402, 0603, 0805	1206, 1210	2010, 2512	Depth	5mm	3mm	2mm	$\Delta R/R = \pm 0.20\%$
Size	0402, 0603, 0805	1206, 1210	2010, 2512							
Depth	5mm	3mm	2mm							
Resistance to Dry Heat	Put the specimens in an oven at $+155 \pm 5$ °C for 1000_{-0}^{+48} hours, then take them out to stabilize for 1 hour minimum, and measure the resistance value change rate. Reference: IEC 60115-1 7.3	$\Delta R/R = \pm 0.20\%$								
Thermal Shock	Put the specimens in test environment at high or low temperature 500 cycles which stabilize for 30 minutes each temperature, and change to another temperature. Test temperature should be set up according to the upper and lower application temperature limits of various series products. Reference: IEC 60115-1 10.1.4	$\Delta R/R = \pm 0.2\%$								
Loading Life in Moisture	Put the specimens applied rated voltage in a constant temperature and humidity champ with $+40 \pm 2$ °C and $93 \pm 3\%$ RH for 1,000 hours. Then take them out to stabilize for 60 minutes minimum, and measure the resistance value change rate. Reference: IEC 60115-1 10.4	$\Delta R/R = \pm 0.2\%$								
Load Life	Put the specimens applied rated voltage in an oven at 70 ± 2 °C for 1,000 hours with cycles which set up with 90 minutes power on and 30 minutes power off, then take them out to stabilize for 60 minutes minimum, and measure the resistance value change rate. Reference: IEC 60115-1 7.1	$\Delta R/R = \pm 0.2\%$								

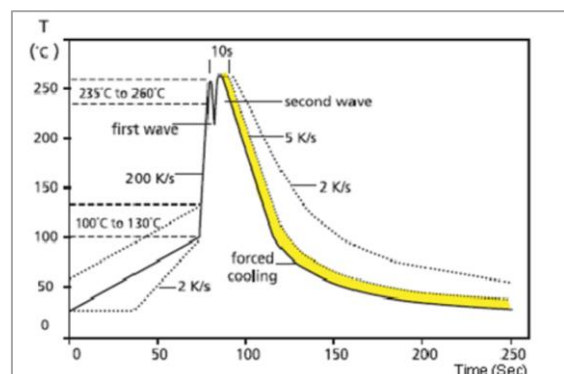
SOLDERING

Lead Free IR Reflow Soldering Profile



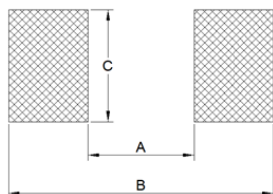
- Top temperature should be under 260_{-0}^{+5} °C for 10 seconds.
- Reference: J-STD-020D

Lead Free Double-Wave Soldering Profile



- Suitable for 0603 above size products
- 350 ± 10 °C for 3 seconds. by soldering iron.

SOLDERING PAD



Unit: mm

Type	A	B	C
TF0402	0.5	1.5	0.6
TF0603	0.8	2.1	0.9
TF0805	1.2	3.0	1.3
TF1206	2.2	4.2	1.6
TF1210	2.2	4.2	2.8
TF2010	3.5	6.1	2.8
TF2512	3.8	8.0	3.5

WORKING ENVIRONMENT

If user intends to use products in special environments or states (including but not limited to the following), it is necessary to approve special characteristics and reliability for the following or other application environments.

- A. High temperature.
- B. Near the sea, or corrosive gas, such as Cl₂, H₂S, NH₃, SO₂ and NO₂, etc.
- C. Unverified liquids, such as water, oil, chemical or organic solvent.
- D. Unverified resin or paint to cover products.
- E. Products should be washed with water soluble cleaner even if non cleaning flux.

STORAGE / CARRY CONDITIONS

- A. Temperature: 25±5°C
- B. Humidity: 60±15%RH
- C. Storage life: 2 years. FIFO
- D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or body may be damaged.

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