FEATURE

- High accuracy up to ±0.05%
- Narrow TCR to ±5 PPM/℃
- Total Lead-free without RoHS exemptions (7C-1)
- RoHS complaint
- High stability and reliability
- Superior anti-sulfur performance.
- 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 ±1% 62Ω T/R-5000 1/8W 25PPM/℃

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]=1Ω 4R7=4.7Ω 4K7[2]=4.7KΩ 100K=100KΩ 2M7[3]=2.7MΩ	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/℃ 10=10PPM/℃ 25=25PPM/℃ 50=50PPM/℃ 00=Refer to table as below.

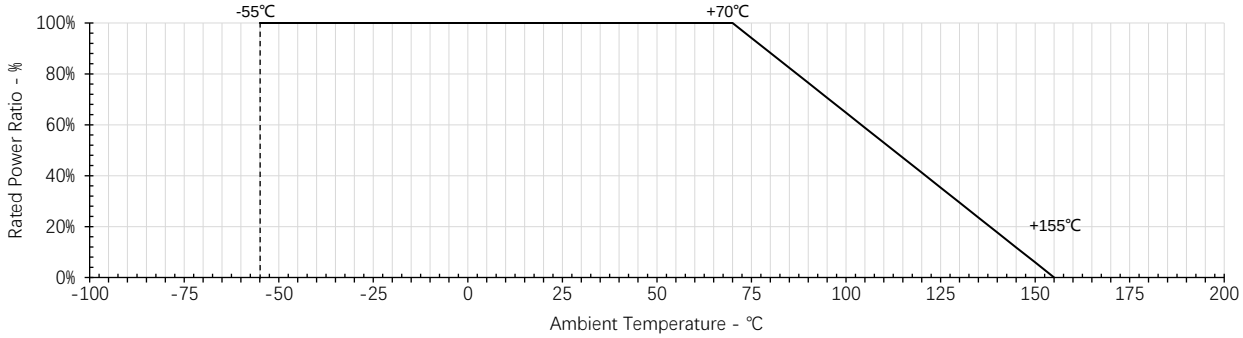
Note: ① R=Radix, 10^0, Ω ② K=Kilo, 10^3, KΩ ③ M=Mega, 10^6, MΩ
④ T/R=Taping in Reel package type ⑤ P.C.=Personal and Customized.

CHARACTERISTICS

Type	Rated Power	MWV[1]	MOV[2]	TCR (PPM/℃)	Resistance Range		
					±0.05%	±0.1%, ±0.25%	±0.5%,±1%
TF0402	1/16W	25V	50V	±5	100Ω-2KΩ	100Ω-2KΩ	100Ω-2KΩ
				±10	10Ω-12KΩ	10Ω-12KΩ	10Ω-12KΩ
				±25, ±50	10Ω-330KΩ	10Ω-330KΩ	10Ω-330KΩ
TF0603	1/10W	75V	150V	±5	100Ω-4KΩ	100Ω-4KΩ	100Ω-4KΩ
				±10	10Ω-50KΩ	10Ω-50KΩ	10Ω-50KΩ
				±25, ±50	10Ω-1MΩ	1Ω-1MΩ	1Ω-1MΩ
TF0805	1/8W	150V	300V	±5	100Ω-15KΩ	100Ω-15KΩ	100Ω-15KΩ
				±10	10Ω-100KΩ	10Ω-100KΩ	10Ω-100KΩ
				±25, ±50	4.7Ω-511KΩ	1Ω-2MΩ	1Ω-2MΩ
TF1206	1/4W	200V	400V	±5	100Ω-15KΩ	100Ω-15KΩ	100Ω-15KΩ
				±10	10Ω-200KΩ	10Ω-200KΩ	10Ω-200KΩ
				±25, ±50	4.7Ω-1MΩ	1Ω-3MΩ	1Ω-3MΩ
TF1210	1/3W	200V	400V	±5	100Ω-15KΩ	100Ω-15KΩ	100Ω-15KΩ
				±10	10Ω-200KΩ	10Ω-200KΩ	10Ω-200KΩ
				±25, ±50	4.7Ω-1MΩ	1Ω-3MΩ	1Ω-3MΩ
TF2010	1/2W	200V	400V	±5	100Ω-25KΩ	100Ω-25KΩ	100Ω-25KΩ
				±10	10Ω-200KΩ	10Ω-200KΩ	10Ω-200KΩ
				±25, ±50	4.7Ω-3MΩ	1Ω-3MΩ	1Ω-3MΩ
TF2512	3/4W	200V	400V	±5	100Ω-25KΩ	100Ω-25KΩ	100Ω-25KΩ
				±10	10Ω-200KΩ	10Ω-200KΩ	10Ω-200KΩ
				±25, ±50	4.7Ω-3MΩ	1Ω-3MΩ	1Ω-3MΩ

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

POWER DERATING CURVE



Note: Working Temperature within -55℃ ~ +155℃.

RATED VOLTAGE

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

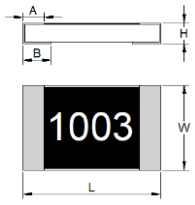
The Rated Voltage of certain resistance value should be the calculated result or Max. Working Voltage of product series whichever lower.

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

E=Rated voltage(V)
P=Rated power(W)
R=Nominal resistance(Ω)

DIMENSIONS

Unit: mm

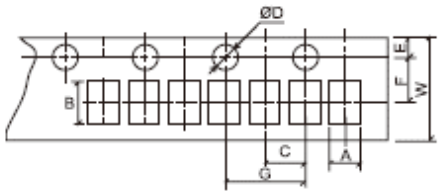
Figure	Type	L	W	H	A	B
	TF0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
	TF0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	TF0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.20
	TF1206	3.10±0.15	1.55±0.15	0.55±0.10	0.40±0.20	0.45±0.20
	TF1210	3.10±0.10	2.60±0.20	0.55±0.10	0.40±0.20	0.45±0.20
	TF2010	5.00±0.10	2.50±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	TF2512	6.35±0.10	3.20±0.20	0.55±0.10	0.50±0.25	0.50±0.20

PACKING

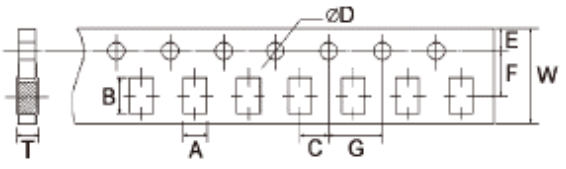
- Taping

Unit: mm

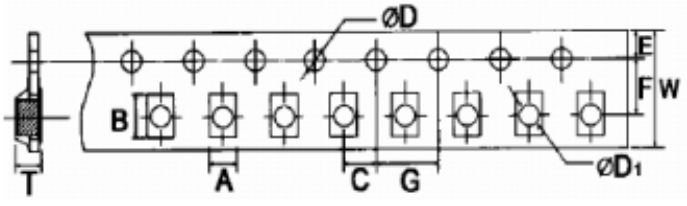
Carrier Taping A



Carrier Taping B



Embossed Taping

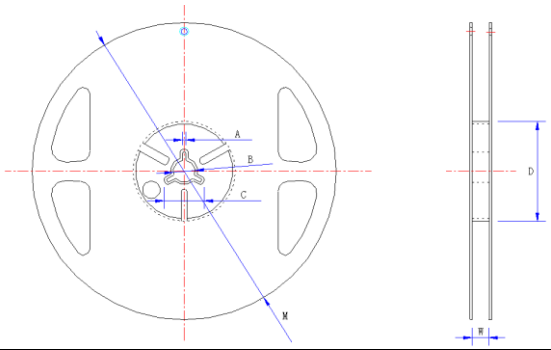


- Taping Dimensions

Type or Size		A±0.2	B±0.2	C±0.05	$\text{ØD}^{+0.1}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Carrier Taping A	0402	0.67±0.1	1.17±0.1	2.0	1.5	1.75	3.5	4.0	8.0	0.47
	0603	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
Carrier Taping B	0805	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1206	1.90	3.45	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1210	2.85	3.50	2.0	1.5	1.75	3.5	4.0	8.0	0.81

Type or Size		A±0.2	B±0.2	C±0.05	$\text{ØD}^{+0.1}_{-0}$	$\text{ØD}^{+0.25}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Embossed Taping	2010	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
	1812	3.50	4.80	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
	2512	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00

- Reel



Type	SPQ PCS/Rl.	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
0402	10,000	2.0	13.0	21.0	60.0	178.0	10.0
0603	5,000	2.0	13.0	21.0	60.0	178.0	10.0
0805	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1206	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1210	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1812	4,000	2.0	13.0	21.0	60.0	178.0	13.8
2010	4,000	2.0	13.0	21.0	60.0	178.0	13.8
2512	4,000	2.0	13.0	21.0	60.0	178.0	13.8

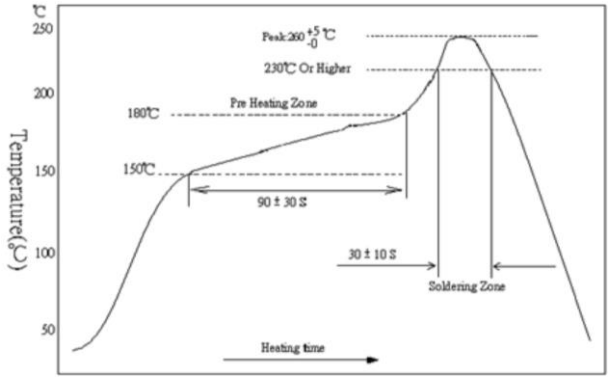
RELIABILITY

Item	Test Method	Acceptable Criterion
Temperature Coefficient of Resistance (T.C.R.)	TCR(ppm/℃)=$\frac{(R_2-R_1)}{R_1(T_2-T_1)}\times10^6$ R_1: Resistance value tested at room temperature (Ω) R_2: Resistance value tested at-55℃ or +125℃ T_1: Temperature at room temperature (℃) T_2: Temperature at-55℃ or +125℃ 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	△R/R=±0.10%
Solderability	Pretreatment: Dry heat +155℃ 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℃ for 3 seconds, then take them out and check the soldering appearance by microscope. 2. Reflow soldering test with peak temperature 235℃ for 40± 5 seconds. Reference: IEC 60115-1 11.1.4.3, IPC-A-610 8.3.2	Soldering coverage must be 95% minimum.

Item	Test Method	Acceptable Criterion
Resistance to Soldering Heat	Put the specimens in tin furnace at 260^{+5}_{-0}℃ for 10^{+1}_{-0} 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	△R/R=±0.10%
Leaching	Pretreatment: Dry heat +155℃ 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^{+5}_{-0}℃ for 30^{+1}_{-0} 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. Size: 0402, 0603, 0805 | 1206, 1210 | 2010, 2512 Depth: 5mm | 3mm | 2mm Reference: IEC 60115-1 9.8.4	△R/R=±0.20%
Resistance to Dry Heat	Put the specimens in an oven at +155±5℃ for 1000^{+48}_{-0} hours, then take them out to stabilize for 1 hour minimum, and measure the resistance value change rate. Reference: IEC 60115-1 7.3	△R/R=±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	△R/R=±0.2%
Loading Life in Moisture	Put the specimens applied rated voltage in a constant temperature and humidity champ with +40±2℃ and 93±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	△R/R=±0.2%
Load Life	Put the specimens applied rated voltage in an oven at 70±2℃ 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	△R/R=±0.2%
Sulfide test 1	Sulfur vapor test, 90℃, dry sulfur powder, unpowered, 750 hours or 1000 hours. Reference: ASTM-809-95, EIA-977	△R/R=±1.0%
Sulfide test 2	Cutting oil with sulfur powder with a specific gravity of 96.5:3.5,105℃, 500 hours. Customer requirements	△R/R=±2%

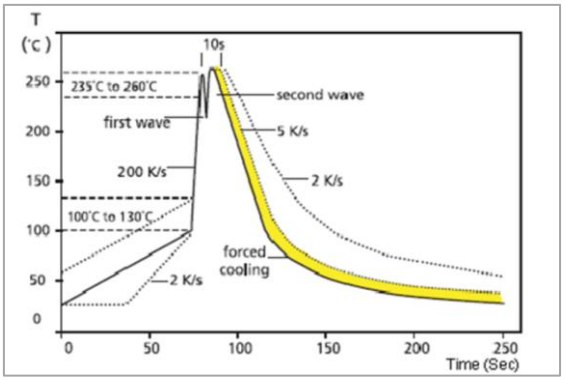
SOLDERING

Lead Free IR Reflow Soldering Profile



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

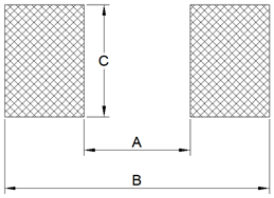
Lead Free Double-Wave Soldering Profile



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

SOLDERING PAD

Unit: mm

Figure	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 Cl_2, H_2S, NH_3, SO_2 and NO_2, 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℃
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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VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2022/05/06	-	First version
B	2022/10/31	Reliability	Update test items, test method and acceptable criterion.
C	2022/11/24	Characteristics	Update items, Add Packing
D	2023/11/20	Feature, Reliability	Add anti-sulfur description and test items.