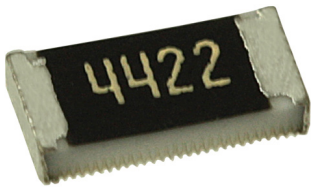
Precision Thin Film Resistors (TFCR Series)



Features:

- RoHS Compliant and Halogen Free
- TCR as low as ±25ppm
- Higher operating frequency with less parasitics
- Noise characteristics superior to standard thick film resistors
- Reference standards of EIA JIS C 5201-1
- Tolerance as low as ±0.1%

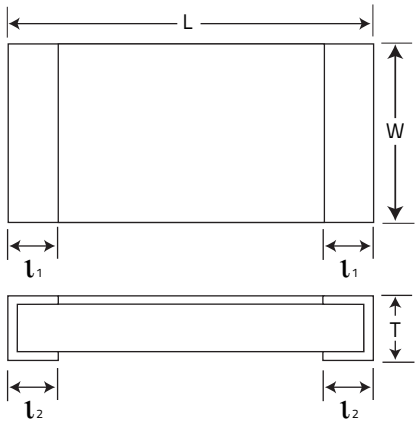
Part Number Structure

TFCR	1206	- 8W	- E	- 1001	B	T	☐
Series	**Size**	**Power Rating**	**TCR**	**Resistance Value**	**Resistance Tolerance**	**Packaging**	**Optional Reel Identifier**
	0201 0402 0603 0805 1206 1210 2010 2512	32W = 0.03W 20W = 0.05W 16W = 0.063W 10W = 0.10W 8W = 0.125W 4W = 0.25W 2W = 0.50W	E = ±25ppm/˚C C = ±50ppm/˚C K = ±100ppm/˚C	1001 = 1KΩ 4 digit code e.g. 4R70 = 4.7Ω 1001 = 1KΩ 2494 = 2.49MΩ	B = ±0.1% C = ±0.25% D = ±0.50% F = ±1%	T = Tape & Reel	Leave blank for standard quantity. Add "-1K" if 1000 piece reel is required

Example P/N: TFCR1206-8W-E-1001BT

Standard temination finish is 100% matte Tin (Sn) over Nickel.

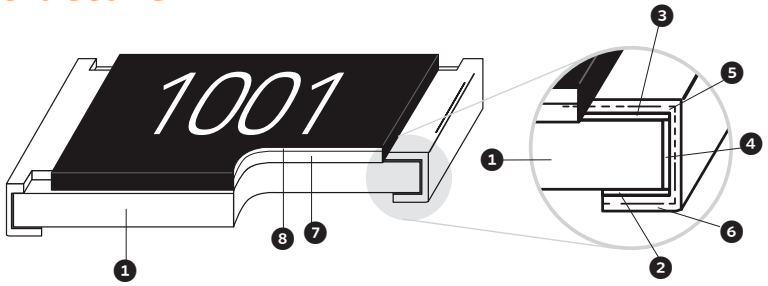
Dimensions



Unit: inches (mm)

Size	L	W	T	l1	l2
0201	0.023 ± 0.001 (0.60 ± 0.03)	0.011 ± 0.001 (0.30 ± 0.03)	0.009 ± 0.001 (0.23 ± 0.03)	0.003 ± 0.002 (0.10 ± 0.05)	0.006 ± 0.002 (0.15 ± 0.05)
0402	0.040 ± 0.002 (1.0 ± 0.05)	0.019 ± 0.002 (0.5 ± 0.05)	0.012 ± 0.002 (0.30 ± 0.05)	0.008 ± 0.004 (0.2 ± 0.10)	0.008 ± 0.004 (0.2 ± 0.10)
0603	0.061 ± 0.004 (1.55 ± 0.10)	0.031 ± 0.004 (0.8 ± 0.1)	0.018 ± 0.004 (0.45 ± 0.10)	0.012 ± 0.008 (0.30 ± 0.20)	0.012 ± 0.008 (0.30 ± 0.20)
0805	0.079 ± 0.006 (2.0 ± 0.15)	0.049± 0.006 (1.25 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.012 ± 0.008 (0.30 ± 0.20)	0.016 ± 0.010 (0.40 ± 0.25)
1206	0.120 ± 0.006 (3.05 ± 0.15)	0.061 ± 0.006 (1.55 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.017 ± 0.008 (0.42 ± 0.20)	0.014 ± 0.010 (0.35 ± 0.25)
1210	0.122 ± 0.006 (3.10 ± 0.15)	0.094 ± 0.006 (2.40 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.016 ± 0.008 (0.40 ± 0.20)	0.022 ± 0.010 (0.55 ± 0.25)
2010	0.193 ± 0.006 (4.90 ± 0.15)	0.094 ± 0.006 (2.40 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.024 ± 0.012 (0.60 ± 0.30)	0.020 ± 0.010 (0.50 ± 0.25)
2512	0.248 ± 0.006 (6.30 ± 0.15)	0.122 ± 0.006 (3.10 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.024 ± 0.012 (0.60 ± 0.30)	0.020 ± 0.010 (0.50 ± 0.25)

Structure



1	Alumina Substrate	5	Nickel Plating
2	Backside Electrode	6	Tin Plating
3	Top Electrode	7	Resistive layer
4	Edge Electrode	8	Overcoat

Precision Thin Film Resistors (TFCR Series)

Electrical Specifications and Range

	Size	0201		0402	0603		0805		1206		1210	2010	2512
	Power Rating at 70°C (W)	0.03W (1/32W)	0.05W (1/20W)	0.063W (1/16W)	0.063W (1/16W)	0.10W (1/10W)	0.10W (1/10W)	0.125W (1/8W)	0.125W (1/8W)	0.25W (1/4W)	0.25W (1/4W)	0.25W (1/4W)	0.50W (1/2W)
	Max. Working Voltage	15V		25V	50V		100V		150V		150V	150V	150V
	Max. Overload Voltage	30V		50V	100V		200V		300V		300V	300V	300V
	Operating Temp. Range	-55°C to +125°C		-55°C to +155°C	-55°C to +155°C		-55°C to +155°C		-55°C to +155°C		-55°C to +155°C	-55°C to +155°C	-55°C to +155°C
Tolerance	TCR	Resistance Range		Resistance Range	Resistance Range		Resistance Range		Resistance Range		Resistance Range	Resistance Range	Resistance Range
±0.1% (B)	±25ppm	100Ω - 10KΩ	-	10Ω - 511KΩ	4.7Ω - 1MΩ		4.7Ω - 2MΩ	4.7Ω - 1MΩ	4.7Ω - 2.49MΩ	4.7Ω - 1MΩ	4.7Ω - 2.49MΩ	4.7Ω - 3MΩ	4.7Ω - 3MΩ
	±50ppm	100Ω - 10KΩ	-	10Ω - 511KΩ	4.7Ω - 1MΩ		4.7Ω - 2MΩ	4.7Ω - 1MΩ	4.7Ω - 2.49MΩ	4.7Ω - 1MΩ	4.7Ω - 2.49MΩ	4.7Ω - 3MΩ	4.7Ω - 3MΩ
	±100ppm	100Ω - 10KΩ	-	10Ω - 511KΩ	4.7Ω - 1MΩ		4.7Ω - 2MΩ	4.7Ω - 1MΩ	4.7Ω - 2.49MΩ	4.7Ω - 1MΩ	4.7Ω - 2.49MΩ	4.7Ω - 3MΩ	4.7Ω - 3MΩ
±0.25% (C)	±25ppm	100Ω - 10KΩ	-	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
	±50ppm	100Ω - 10KΩ	-	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
	±100ppm	100Ω - 10KΩ	-	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
±0.5% (D)	±25ppm	-	27Ω - 4.99KΩ	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
	±50ppm	49.9Ω-33KΩ	27Ω - 10KΩ	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
	±100ppm	49.9Ω-33KΩ	27Ω - 10KΩ	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
±1% (F)	±25ppm	-	27Ω - 4.99KΩ	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
	±50ppm	49.9Ω-33KΩ	27Ω - 10KΩ	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ
	±100ppm	49.9Ω-33KΩ	27Ω - 10KΩ	4.7Ω - 511KΩ	1Ω - 1MΩ	4.7Ω - 1MΩ	1Ω - 2MΩ	1Ω - 1MΩ	1Ω - 2.49MΩ	4.7Ω - 1MΩ	1Ω - 2.49MΩ	1Ω - 3MΩ	1Ω - 3MΩ

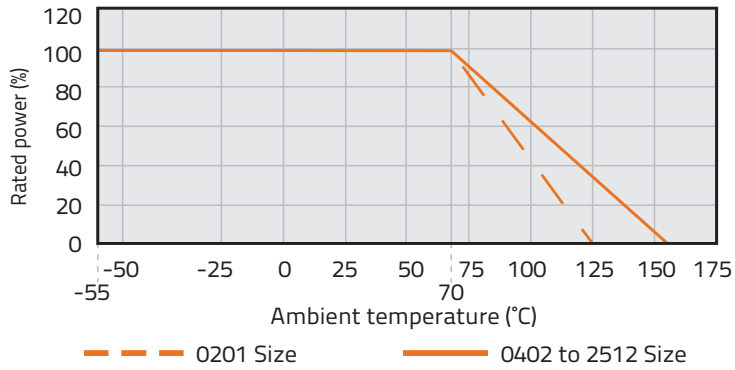
NOTE: Max Working Voltage is listed above or √(P*R), whichever is lower. Max overload Voltage is listed above or 2.5*√(P*R), whichever is lower.

Marking Code

E-24 values for 0603 size maybe marked with the standard 3 digit marking code.
E-96 values for 0805 size and larger, will be marked with standard 4 digit marking code.
E-24 values for 0603 size and larger, will be marked with standard 3 digit marking code.
0603 - E-96 values will be marked with a standard 3 digit alpha numeric code
(Please see page 61 for alpha numeric codes).

Note: 0201 and 0402 cannot be marked.

Derating Curve



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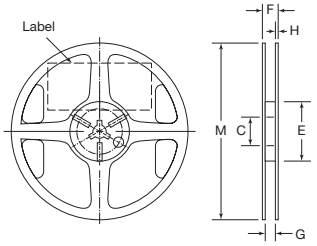
Reel Specifications

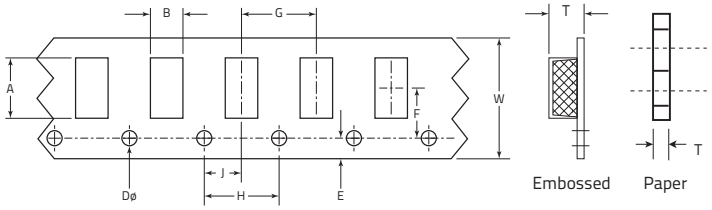


Unit: mm (inch)

C	E	F	G	H	M
13.0 ± 0.2 (0.51 ± 0.008)	60.0 ± 1.0 (2.36 ± 0.03)	11.4 ± 1.0 (0.45 ± 0.04)	9.0 ± .3 (0.35 ± 0.012)	1.5 ± .3 (0.06 ± 0.012)	180 ± 2.0 (7.09 ± 0.08)

Minimum of 30 empty pockets at the beginning of reel, 65 minimum empty pockets at the end.

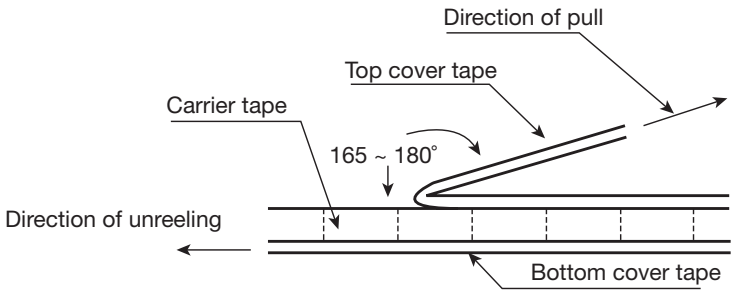
Tape Specifications



All dimensions in mm.

Tape	Size (inches)	A	B	W	E	F	T	G	H	J	Dø
Paper	0201	0.70 ±0.05	0.40 ±0.05	8.0 ±0.10	1.75 ±0.05	3.50 ±0.05	0.42 ±0.02	2.00 ±0.05	4.00 ±0.10	2.00 ±0.05	1.55 ±0.03
	0402	1.16 ±0.10	0.70 ±0.10	8.0 ±0.10	1.75 ±0.05	3.50 ±0.05	0.40 ±0.03	2.00 ±0.05	4.00 ±0.10	2.00 ±0.05	1.55 ±0.05
	0603	1.90 ±0.10	1.10 ±0.05	8.0 ±0.10	1.75 ±0.05	3.50 ±0.05	0.60 ±0.03	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.55 ±0.05
	0805	2.37 ±0.20	1.60 ±0.05	8.0 ±0.10	1.75 ±0.05	3.50 ±0.05	0.75 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.55 ±0.05
	1206	3.55 ±0.05	2.00 ±0.05	8.0 ±0.10	1.75 ±0.05	3.50 ±0.05	0.75 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.55 ±0.05
	1210	3.40 ±0.05	2.75 ±0.05	8.0 ±0.10	1.75 ±0.05	3.50 ±0.05	0.75 ±0.05	4.00 ±0.10	4.00 ±0.05	2.00 ±0.05	1.60 ±0.10
Embossed	2010	5.45 ±0.10	2.85 ±0.10	12.00 ±0.10	1.75 ±0.10	5.50 ±0.05	1.00 +0.20, -0	4.00 ±0.10	4.00 ±0.05	2.00 ±0.05	1.50 +0.1, -0
	2512	6.65 ±0.10	3.40 ±0.10	12.00 ±0.10	1.75 ±0.10	5.50 ±0.05	1.00 +.02.0, -0	4.00 ±0.10	4.00 ±0.05	2.00 ±0.05	1.50 +0.1, -0

Peel Back Force and Direction Diagram



Peel back force and direction of peel back angle should follow EIA481-1-A. Peel back force should be between 0.1N – 1.3N and peel back angle of 165˚ – 180˚.

Environmental Characteristics

Item	Requirment	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+125/+25°C
Short Time Overload	ΔR±2%	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	>1000 MΩ	Apply 100VDC for 1 minute
Endurance	ΔR±0.2%	70±2°C RCWV for 1000 hrs with 1.5 hrs 'ON" and 0.5 hrs 'OFF"
	>7KΩ ΔR±0.5%	
Damp Heat with Load	ΔR±0.3%	40±2°C 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs 'ON" and 0.5 hrs 'OFF"
Bending Strength	ΔR±2%	Bending amplitude 3mm for 10 seconds
Solderability	95% min coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±2%	260±5°C for 10 seconds
Dielectric Withstanding Voltage	By Type	Max. Overload Voltage for 1 minute
Thermal Shock	ΔR±0.25%	-55°C~150°C 100 cycles
Low Temperature Operation	ΔR±0.2%	1 hour -65°C followed by 45 minutes of RCWV

RCWV(Rated continuous working voltage) = √(P*R) or Max operating voltage whichever is lower

Reference Standards: MIL-STD-202, JIS-C 5201-1
Storage Temperature:25±3°C; Humidity <80% RH

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