



**Product Family:** Precision Thin Film Chip Resistor

**Part Number Series:** TF Series



	<p><b>Construction:</b></p> <ul style="list-style-type: none"> <li>• High Purity Alumina Substrate</li> <li>• Ni alloy thin-film resistive element</li> <li>• Wrap around electrodes</li> <li>• 100% matte tin over Ni terminations (RoHS compliant and Pb Free)</li> <li>• AEC-Q200 Qualified Available</li> <li>• Anti-Sulfur</li> </ul>	<p><b>Features:</b></p> <ul style="list-style-type: none"> <li>• 0201, 0402, 0603, 0805, 1206, 1210, 2010, and 2512 case sizes</li> <li>• E24 ~ E192 values</li> <li>• TCR's down to <math>\pm 5</math> ppm/<math>^{\circ}</math>C</li> <li>• Resistance down to <math>4.7\Omega</math> available</li> <li>• High volume production suitable for commercial and special applications</li> </ul>
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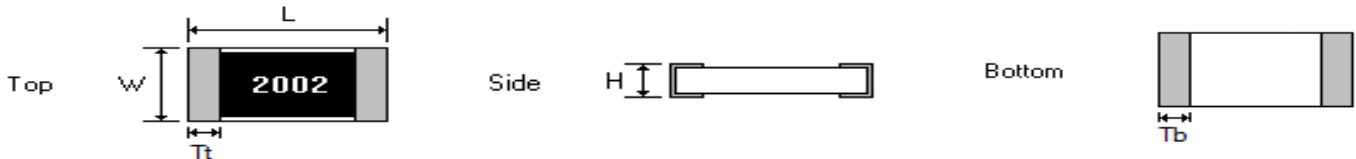
**Description:**

These precision chip resistors offer excellent performance and tolerance in TCR, current noise, and linearity for high frequency circuit applications and other applications requiring precision and stability. High volume manufacturing allows for lower costs for the customer.

**Product Dimensions:**

Dimension	TF0201 (0603)	TF0402 (1005)	TF0603 (1608)	TF0805 (2012)	TF1206 (3216)	TF1210 (2632)	TF 2010 (5025)	TF2512 (6432)
L	0.024 $\pm$ 0.001	0.039 $\pm$ 0.002	0.061 $\pm$ 0.004	0.079 $\pm$ 0.004	0.122 $\pm$ 0.004	0.126 $\pm$ 0.004	0.197 $\pm$ 0.004	0.250 $\pm$ 0.004
W	0.012 $\pm$ 0.001	0.020 $\pm$ 0.002	0.031 $\pm$ 0.004	0.049 $\pm$ 0.004	0.063 $\pm$ 0.004	0.102 $\pm$ 0.006	0.098 $\pm$ 0.006	0.126 $\pm$ 0.006
H	0.009 $\pm$ 0.001	0.012 $\pm$ 0.002	0.018 $\pm$ 0.006	0.020 $\pm$ 0.006	0.022 $\pm$ 0.004	0.022 $\pm$ 0.004	0.022 $\pm$ 0.004	0.022 $\pm$ 0.004
T1	0.006 $\pm$ 0.002	0.010 $\pm$ 0.004	0.012 $\pm$ 0.006	0.016 $\pm$ 0.008	0.016 $\pm$ 0.008	0.020 $\pm$ 0.008	0.024 $\pm$ 0.010	0.035 $\pm$ 0.010
T2	0.004 $\pm$ 0.002	0.006 $\pm$ 0.004	0.010 $\pm$ 0.006	0.010 $\pm$ 0.008	0.016 $\pm$ 0.008	0.020 $\pm$ 0.008	0.024 $\pm$ 0.008	0.024 $\pm$ 0.008

All dimensions are shown in inches, Metric case sizes are shown in parenthesis.



**Part Numbering:** Ex:TF0603LE2002D-T5

Product Designator	Size W x L English	Power	Temp. Coefficient of Resistance (TCR)	Resistance Value	Resistance Tolerance	Automotive Grade	T&R Packaging Quantity
TF	0201 0402 0603 0805 1206 1210 2010 2512	H = Hi Power** L = Normal Power	M = $\pm 5$ ppm/ $^{\circ}$ C Y = $\pm 10$ ppm/ $^{\circ}$ C E = $\pm 25$ ppm/ $^{\circ}$ C Q = $\pm 50$ ppm/ $^{\circ}$ C	For all sizes, use 4 digit code for all values. "R" denotes decimal position as necessary.	T = $\pm 0.01\%$ *** A = $\pm 0.05\%$ *** B = $\pm 0.10\%$ C = $\pm 0.25\%$ D = $\pm 0.50\%$ F = $\pm 1.00\%$	A= Automotive AEC-Q200 Leave Blank for Non AEC-Q200	-T4 = 4,000 PCS* (2010, 2512) -T5 = 5,000 PCS (0603, 0805, 1206, 1210) -T10 = 10,000 PCS (0402) -T15 = 15,000 PCS (0201)

\* Note 1: Tape quantity codes can be left off when ordering or requesting quote. These will be assigned by us based on part/quantity ordered.

\*\* Note 2: TCR of  $\pm 5$ ppm (M) and  $\pm 10$ ppm (Y) are only offered in the H Power Code. TCR of  $\pm 25$ ppm (E) and  $\pm 50$ ppm (Q) are offered in both L and H Power Code, see electrical specifications for power specifications for power ratings

\*\*\* Note 3: Confirm availability of  $\pm 0.01\%$  &  $\pm 0.05\%$  tolerance with TFT prior to ordering.

**Electrical Specifications:**

Type	TF0201			TF0402				TF0603			
English Size	0201			0402				0603			
Power (watts)	1/32	1/20		1/16		1/10		1/16	1/10		
Tolerance% (code)	±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T)										
Resistance Range (Ω)	27~12K	27~22K	100~12K	10~255K	10~20K	10~10K	10~100K	4.7~1M	4.7~680K	4.7~100K	4.7~50K
Resistance Offering	E-24 + E-192 Values										
TCR ppm/°C (code)	±25 (E)	±50 (Q)	±50 (Q) ±25 (E)	±50 (Q) ±25 (E)	±10 (Y)	±5 (M)	±50 (Q) ±25 (E)	±50 (Q) ±25 (E)	±10 (Y)	±5 (M)	
Max Operating Voltage	15V			50V	25V		50V	50V	75V		
Operating Temp. Range	-55°C ~ 155°C De-rating @ 70°C										
Packaging	15,000 pcs/reel			10,000 pcs/reel				5,000 pcs/reel			

Type	TF0805				TF1206				
English Size	0805				1206				
Power (watts)	1/10	1/8		1/8		1/4			
Tolerance% (code)	±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T)								
Resistance Range (Ω)	4.7~2M	4.7~1M	4.7~200K	4.7~100K	4.7~2.49M		4.7~1M	4.7~300K	4.7~150K
Resistance Offering	E-24 + E-192 Values								
TCR ppm/°C (code)	±50 (Q) ±25 (E)	±50 (Q) ±25 (E)	±10 (Y)	±5 (M)	±50 (Q) ±25 (E)		±10 (Y)	±5 (M)	
Max Operating Voltage	100V	150V	100V		200V				
Operating Temp. Range	-55°C ~ 155°C De-rating @ 70°C								
Packaging	5,000 pcs/reel								

Type	TF1210				TF2010			
English Size	1210				2010			
Power (watts)	1/4		2/5		1/2		3/4	
Tolerance% (code)	±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T)							
Resistance Range (Ω)	4.7~2.49M	4.7~400K	4.7~150K	10~1M	4.7~3M	4.7~900K	4.7~360K	10~1.5M
Resistance Offering	E-24 + E-192 Values							
TCR ppm/°C (code)	±50 (Q) ±25 (E)	±10 (Y)	±5 (M)	±50 (Q) ±25 (E)	±50 (Q) ±25 (E)	±10 (Y)	±5 (M)	±50 (Q) ±25 (E)
Max Operating Voltage	200V							
Operating Temp. Range	-55°C ~ 155°C De-rating @ 70°C							
Packaging	5,000 pcs/reel				4,000 pcs/reel			

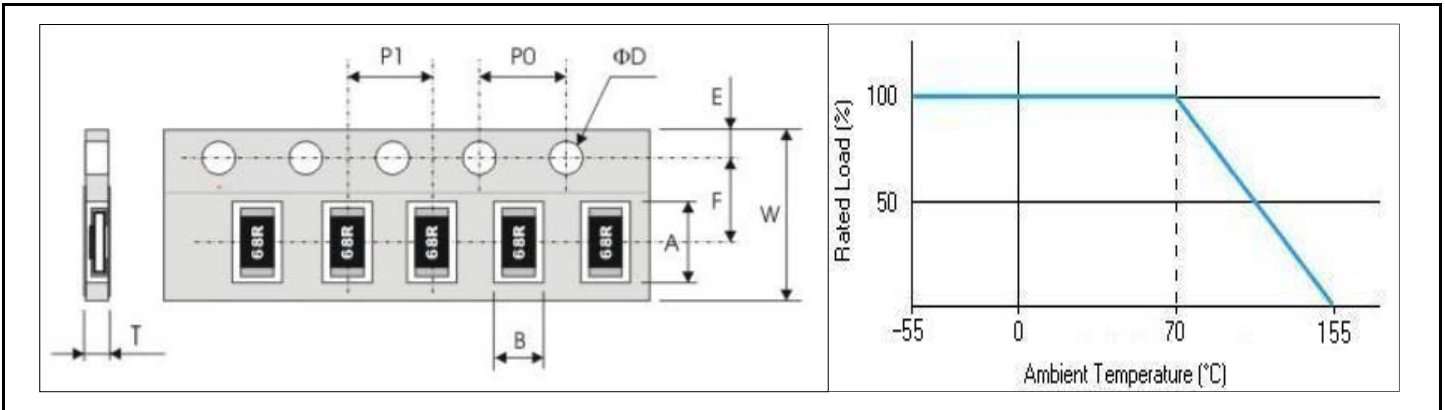
Type	TF2512				
English Size	2512				
Power (watts)	3/4			1	
Tolerance% (code)	±1.0 (F) ±0.5(D) ±0.25 (C) ±0.1(B) ±0.05(A) ±0.01(T)				
Resistance Range (Ω)	4.7~3M	4.7~1.5M		4.7~600K	10~1.5M
Resistance Offering	E-24 + E-192 Values				
TCR ppm/°C (code)	±50 (Q) ±25 (E)	±10 (Y)		±5 (M)	±50 (Q) ±25 (E)
Max Operating Voltage	200V				
Operating Temp. Range	-55°C ~ 155°C De-rating @ 70°C				
Packaging	4,000 pcs/reel				

**Reliability Specifications:**

Test	Test Method	Specification
Short Time Overload	Applied voltage: 2.5X rated voltage or 2X maximum operating voltage, whichever is less. Test duration: 5 seconds	±0.2% +0.05Ω TCR=50PPM &25PPM ±0.1% +0.05Ω TCR=10PPM &5PPM
Load Life	Test Temperature: 70°C Applied voltage: rated voltage Test period: 1000 hours with power cycling as follows: 90 min. power ON/30 min. power OFF,	±0.5% +0.05Ω TCR=50PPM &25PPM ±0.25% +0.05Ω TCR=10PPM &5PPM
Moisture Load Life	Test Condition: 40°C/95% RH Applied voltage: rated voltage Test period: 1000 hours with power cycling as follows: 90 min. power ON/30 min. power OFF	±0.5% +0.05Ω TCR=50PPM &25PPM ±0.25% +0.05Ω TCR=10PPM &5PPM
Temperature Cycle	Repeat 5 cycles as follows: -55°C(30 min.) / Room temp (2 min) / +125°C(30 min.) / Room temp (2 min)	±0.2% +0.05Ω TCR=50PPM &25PPM ±0.1% +0.05Ω TCR=10PPM &5PPM

**Tape Specifications:**

**Derating Curve:**



**Tape Dimensions (mm):**

Part Size	Type	A	B	W	D	E	F	P0	ΦD	T
TF0201	Paper	0.67 ±0.05	0.37±0.05	8.00±0.30	3.50 ±0.05	1.75 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50 +0.1/-0.0	0.45±0.05
TF0402	Paper	1.20 ±0.10	0.7±0.10	8.00±0.30	3.50 ±0.05	1.75 ±0.10	2.00±0.10	4.00 ±0.10	1.50 +0.1/-0.0	0.40±0.05
TF0603	Paper	1.90 ±0.20	1.10±0.20	8.00±0.30	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	4.00 ±0.10	1.50 +0.1/-0.0	0.65±0.05
TF0805	Paper	2.40 ±0.20	1.65±0.20	8.00±0.30	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	4.00 ±0.10	1.50 +0.1/-0.0	Max. 1.0
TF1206	Paper	3.60 ±0.20	2.00±0.20	8.00±0.30	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	4.00 ±0.10	1.50 +0.1/-0.0	Max. 1.0
TF1210	Paper	3.60 ±0.20	3.00±0.20	8.00±0.30	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	4.00 ±0.10	1.50 +0.1/-0.0	Max. 1.0
TF2010	Plastic	5.50 ±0.20	2.80±0.20	12.00±0.30	5.50 ±0.10	1.75 ±0.10	4.00 ±0.10	4.00 ±0.10	1.50 +0.1/-0.0	Max. 1.2
TF2512	Plastic	6.90 ±0.20	3.60±0.20	12.00±0.30	5.50 ±0.10	1.75 ±0.10	4.00 ±0.10	4.00 ±0.10	1.50 +0.1/-0.0	Max. 1.2

**Storage and Handling Conditions:**

All cover tapes used are ESD resistant and have a shelf life up to one year. If a shelf life extension is needed, products should be tested for solderability.

Products should be stored as listed below:

- Temperature: 5°C ~ 40°C
- Humidity: 20% ~ 70% relative humidity
- Do not expose products to direct sunlight, excessive shock, or vibration
- Products should be stored on a shelf and should avoid exposure to moisture
- Do not store products in a corrosive environment with elements such as chloride gas, acid, sulfides, etc.