



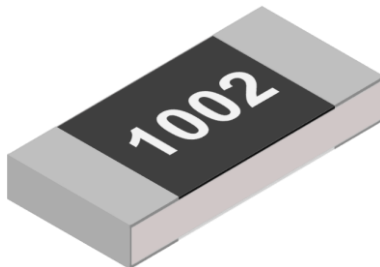
TP Series Precision Product Thin Film Chip Resistor Product Specifications

Document No. S-10-12-61-03

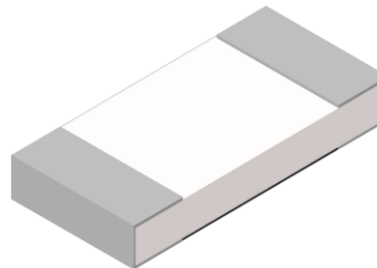
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Precision Product Thin Film Chip Resistor — TP Series



Top view



Bottom view

Applications

- Computer & relative products
- Communication devices
- Measuring instrument
- Converters
- Printing equipment

Features

- Excellent long-term stability
- The variance of reliability test is reduced to $\pm 0.1\%$
- Low TCR down to $\pm 5 \text{ ppm}/^\circ\text{C}$
- Tight tolerance down to $\pm 0.01\%$
- Halogen free and lead free
- RoHS compliant

Parts Number Explanation

Example:

TP	1206	B	10K0	P	05	10	Z
Product Type	Size (Inch)	Tolerance	Resistance	Package	Quantity (PCS)	TCR (ppm/ $^\circ\text{C}$)	Optional
TP Series Precision Product Thin Film Chip Resistor	0402 0603 0805 1206 1210 2010 2512	T : $\pm 0.01\%$ A : $\pm 0.05\%$ B : $\pm 0.1\%$ C : $\pm 0.25\%$ D : $\pm 0.5\%$ F : $\pm 1.0\%$	4 digits EX. 22R0 = 22 Ω 100R = 100 Ω 2K20 = 2.2 K Ω 22K0 = 22 K Ω 100K = 100 K Ω 1M00 = 1 M Ω	P : Paper Taping (0603~1210) Q : Paper Taping (0402) E : Embossed Taping	04 : 4000 05 : 5000 10 : 10000	05 : ± 5 10 : ± 10 15 : ± 15 25 : ± 25	Z : Default Code



TP Series Precision Product Thin Film
Chip Resistor Product Specifications

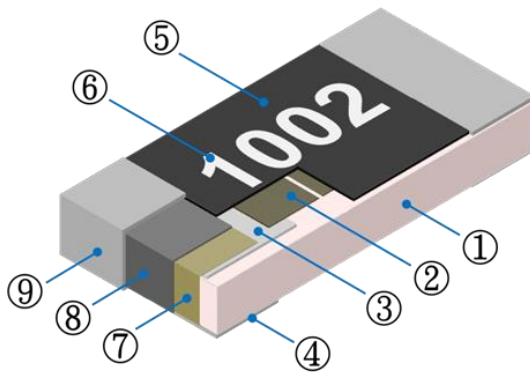
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Standard Electrical Specifications

項目 Item 型別 Type	額定功率 Rated Power at 70°C	最大 工作電壓 Max Working Voltage	最大 過負載電壓 Max Overload Voltage	溫度係數 T.C.R. (PPM/°C)	阻值範圍 Resistance Range					
					T ±0.01%	A ±0.05%	B ±0.1%	C ±0.25%	D ±0.5%	F ±1.0%
TP0402	0.063W	50V	100V	±5	49.9 Ω ~ 12 KΩ	20 Ω ~ 12 KΩ				
				±10, ±15		10 Ω ~ 68 KΩ				
				±25		4.7 Ω ~ 220 KΩ				
TP0603	0.1W	75V	150V	±5	49.9 Ω ~ 30 KΩ	20 Ω ~ 30 KΩ				
				±10, ±15		10 Ω ~ 332 KΩ				
				±25		4.7 Ω ~ 680 KΩ				
TP0805	0.125W	150V	300V	±5	49.9 Ω ~ 50 KΩ	20 Ω ~ 50 KΩ				
				±10, ±15		10 Ω ~ 680 KΩ				
				±25		4.7 Ω ~ 1 MΩ				
TP1206	0.25W	200V	400V	±5	49.9 Ω ~ 100 KΩ	20 Ω ~ 100 KΩ				
				±10, ±15		10 Ω ~ 1 MΩ				
				±25		4.7 Ω ~ 1.5 MΩ				
TP1210	0.25W			±5	49.9 Ω ~ 100 KΩ	20 Ω ~ 100 KΩ				
				±10, ±15		10 Ω ~ 100 KΩ				
				±25		4.7 Ω ~ 1 MΩ				
TP2010	0.5W			±5	49.9 Ω ~ 100 KΩ	20 Ω ~ 100 KΩ				
				±10, ±15		10 Ω ~ 100 KΩ				
				±25		4.7 Ω ~ 1 MΩ				
TP2512	0.75W			±5	49.9 Ω ~ 100 KΩ	20 Ω ~ 100 KΩ				
				±10, ±15		10 Ω ~ 100 KΩ				
				±25		4.7 Ω ~ 1 MΩ				

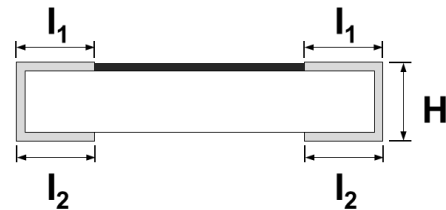
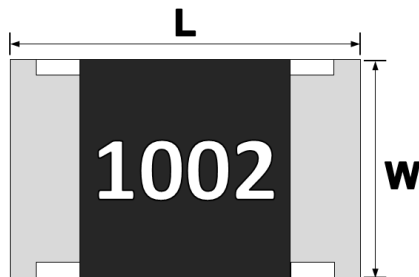
- Operating Temperature Range : -55°C ~ +155°C.
- For non-standard parts, please contact our sales department.

Construction



①	Alumina Substrate	④	Bottom Inner Electrode	⑦	Side Inner Electrode
②	Resistive Layer	⑤	Protective Overcoat	⑧	Nickel Barrier
③	Top Inner Electrode	⑥	Marking	⑨	Solder coating (Sn)

Dimensions



Unit : mm

Type	L	W	H	l_1	l_2
TP0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
TP0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TP0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
TP1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TP1210	3.10 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TP2010	5.00 ± 0.15	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
TP2512	6.30 ± 0.15	3.20 ± 0.15	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20



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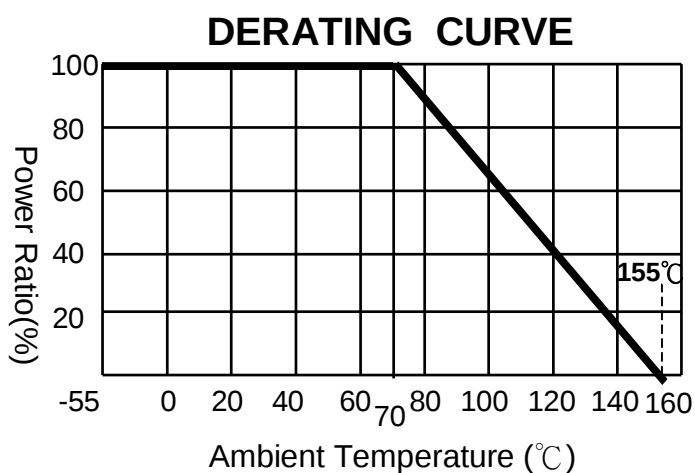
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■ Performance Characteristics

■ Power Derating Curve

The Operating Temperature Range: -55°C ~+155°C.

Power rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.



■ Rated Voltage

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:

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

V = Rated voltage (V)

P = Rated power (W)

R = Nominal resistance (Ω)



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■ Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25 / -55℃ and 25℃ /+125℃, 25℃ is the reference temperature	Refer to Standard Electrical Specifications
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	2.5 times RCWV or Max. Overload voltage whichever is less for 5 seconds.	±(0.1%+0.05Ω) No Visual damage
Insulation Resistance	JJIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply 100VDC for 1 minute.	≥10GΩ
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5℃ for 3 seconds.	>95% Coverage No Visual damage
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5℃ for 10 seconds.	±(0.1%+0.05Ω) No Visual damage
Leaching	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1	260±5℃ for 30 seconds.	>95% Coverage No Visual damage
Rapid Change of Temperature	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55℃ to +155℃, 300 cycles	±(0.2%+0.05Ω) No Visual damage
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 155±5℃ for 1000 hours.	±(0.2%+0.05Ω)
Resistance to Solvent	JIS-C-5201-1 4.29	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60 secs. Then the resistor is left in the room for 48 hrs.	±(0.1%+0.05Ω) No Visual damage
Damp Heat with Load	JIS-C-5201-1 4.24 IEC-60115-1 4.24	40±2℃, 90~95% R.H. RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"	±(0.1%+0.05Ω)
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85℃ / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.1%+0.05Ω)
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2℃, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .	±(0.1%+0.05Ω)
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D : 0402、0603、0805 = 5mm 1206、1210 = 3mm 2010、2512 = 2mm	±(0.1%+0.05Ω) No Visual damage

- We can also provide AEC-Q200 test reports if required by customers.

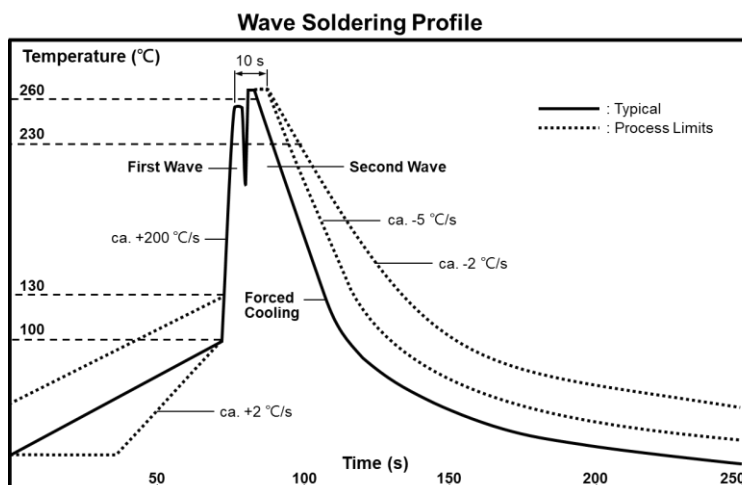


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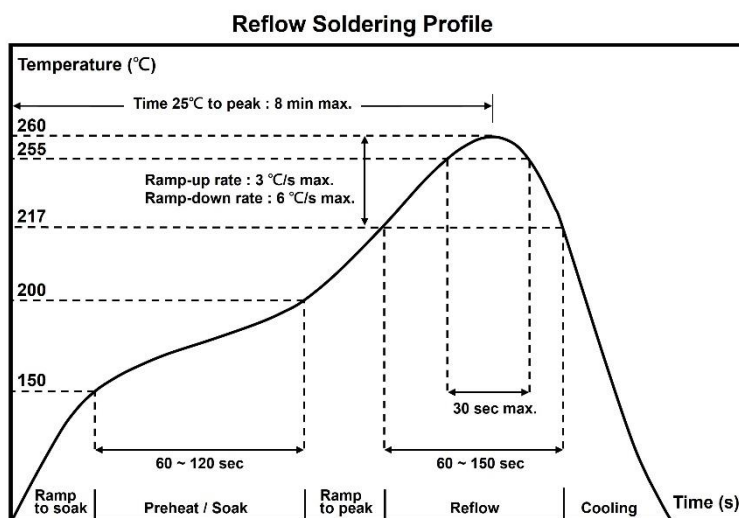
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Recommended Customer Soldering Parameters

Wave solder Temperature condition



Solder reflow Temperature condition



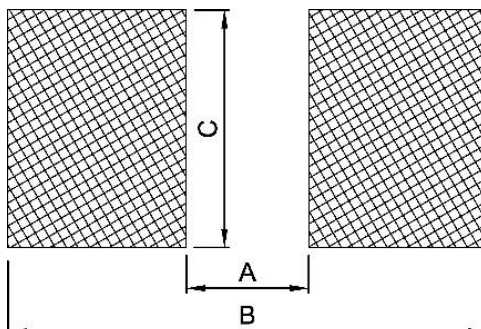
Rework temperature (hot air equipment) : 350°C, 3~5seconds

Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

Recommend Land Pattern Design

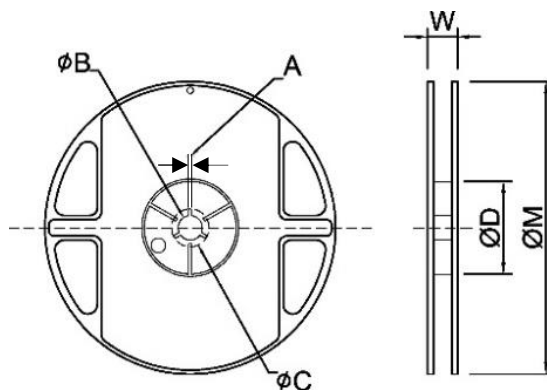


Unit: mm

Item \ Type	0402	0603	0805	1206	1210	2010	2512
A	0.50	0.80	1.30	2.20	2.00	3.80	4.90
B	1.60	2.40	2.90	4.20	4.40	6.60	8.10
C	0.70	1.00	1.40	1.70	2.70	2.70	3.40

Packaging Information

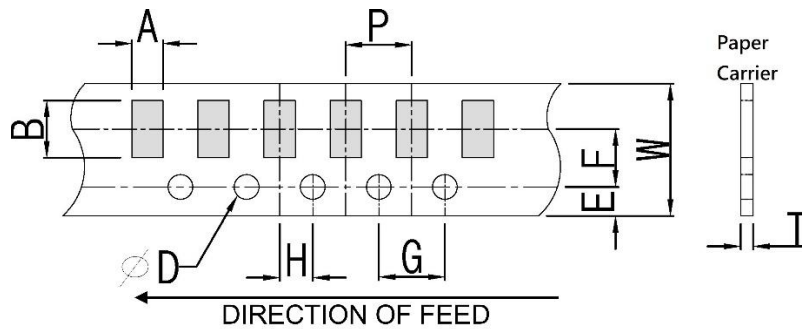
Reel Dimensions



Unit: mm

Type	Size	A	ϕB	ϕC	ϕD	W	ϕM
0402	7" 10K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
0603/0805/1206/1210	7" 5K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
2010/2512	7" 4K/Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0

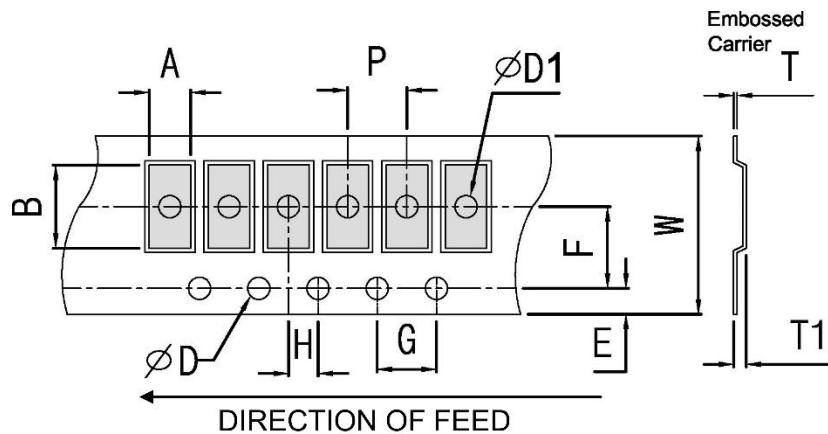
■ Paper Tape Dimensions



Unit: mm

Type	A	B	W	E	F	G	H	T	ϕD	P
0402	0.70 ± 0.10	1.20 ± 0.10	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	0.45 ± 0.10	$1.50^{+0.10}_{-0}$	2.0 ± 0.10
0603	1.05 ± 0.20	1.80 ± 0.20	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	0.60 ± 0.10		4.0 ± 0.10
0805	1.55 ± 0.20	2.30 ± 0.20	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	0.75 ± 0.10		
1206	1.90 ± 0.20	3.50 ± 0.20	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	0.75 ± 0.10		
1210	2.85 ± 0.20	3.50 ± 0.20	8.0 ± 0.20	1.75 ± 0.10	3.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	0.75 ± 0.10		

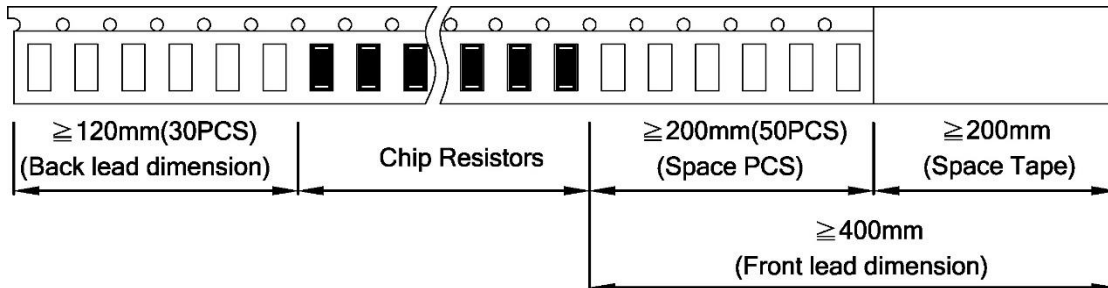
■ Plastic Embossed Tape Dimensions



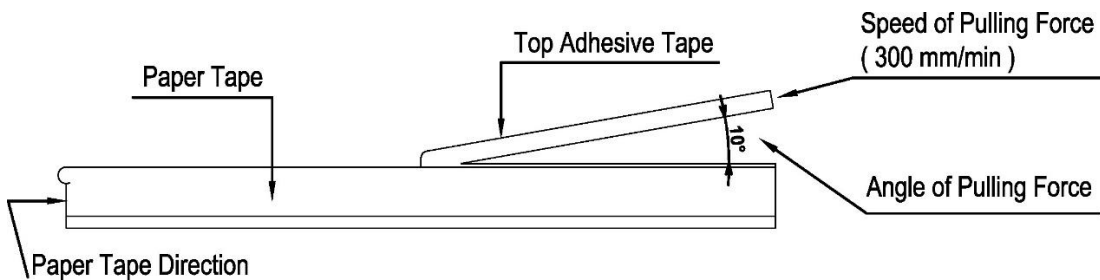
Unit: mm

Type	A	B	W	E	F	G	H	T	ϕD	$\phi D1$	T1	P
2010	2.80 ± 0.20	5.60 ± 0.20	12 ± 0.10	1.75 ± 0.10	5.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	0.23 ± 0.10	$1.50^{+0.10}_{-0}$	1.50 ± 0.10	0.85 ± 0.15	4.0 ± 0.10
2512	3.40 ± 0.20	6.70 ± 0.20	12 ± 0.10	1.75 ± 0.10	5.5 ± 0.05	4.0 ± 0.10	2.0 ± 0.05	0.23 ± 0.10		1.50 ± 0.10	0.85 ± 0.15	

■ Front & Back Lead Dimensions

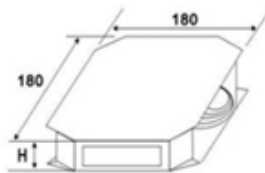


■ Top Adhesive Peel Off Strength : 10~70g

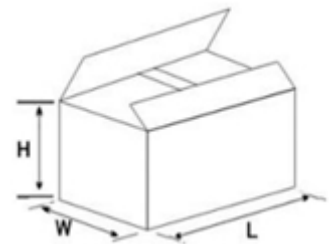


■ Package

Inner Box Size	
Reel	Size H(mm)
1	13
2	24
3	36
5	60
10	113



External Box Size			
Contain (Kpcs)	Length (mm)	Width (mm)	Height (mm)
25K	180	180	60
50K	180	180	110
150K	430	200	200
300K	400	400	200



■ Storage Data :

Storage time at the environment temp: $25 \pm 5^\circ\text{C}$ & humidity: $60 \pm 20\%$ is valid for two years.