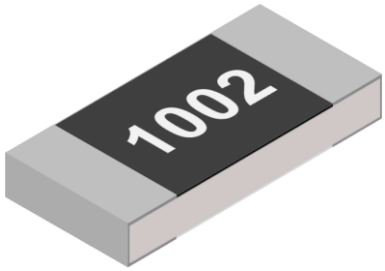
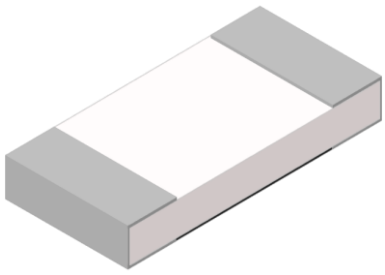
■ Precision Product Thin Film Chip Resistor — TP Series



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 ±0.1%
— Low TCR down to ±5 ppm/℃
— Tight tolerance down to ±0.01 %
— Halogen free and lead free
— RoHS compliant

■ Parts Number Explanation

■ Example:

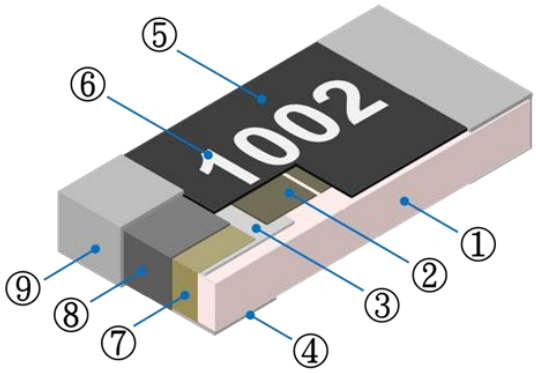
TP	1206	B	10K0	P	05	10	Z
Product Type	**Size (Inch)**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm/℃)**	**Optional**
TP Series Precision Product Thin Film Chip Resistor	0201 0402 0603 0805 1206 1210 2010 2512	T : ±0.01% A : ±0.05% B : ±0.1% C : ±0.25% D : ±0.5% F : ±1.0%	4 digits EX. 22R0 = 22 Ω 100R = 100 Ω 2K20 = 2.2 KΩ 22K0 = 22 KΩ 100K = 100 KΩ 1M00 = 1 MΩ	P : Paper Taping (0603~1210) Q : Paper Taping (0201、0402) E : Embossed Taping	04：4000 05：5000 10：10000	05 : ±5 10 : ±10 15 : ±15 25 : ±25	Z : Default Code

■ Standard Electrical Specifications

Item / Type	Rated Power at 70℃	Max Working Voltage	Max Overload Voltage	T.C.R. (PPM/℃)	Resistance Range					
					T ±0.01%	A ±0.05%	B ±0.1%	C ±0.25%	D ±0.5%	F ±1.0%
TP0201	0.05W	25V	50V	±10, ±15	-	1 KΩ ~ 14.3 KΩ	203 Ω ~ 14.3 KΩ			
				±25	-	49.9 Ω ~ 56 KΩ	10 Ω ~ 82 KΩ			
TP0402	0.063W	50V	100V	±5	49.9 Ω ~ 12 KΩ		20 Ω ~ 12 KΩ			
				±10, ±15	49.9 Ω ~ 56 KΩ		10 Ω ~ 68 KΩ			
				±25			4.7 Ω ~ 220 KΩ			
TP0603	0.1W	75V	150V	±5	49.9 Ω ~ 33 KΩ		20 Ω ~ 33 KΩ			
				±10, ±15	49.9 Ω ~ 220 KΩ		10 Ω ~ 332 KΩ			
				±25			4.7 Ω ~ 1 MΩ			
TP0805	0.125W	150V	300V	±5	49.9 Ω ~ 68 KΩ		20 Ω ~ 68 KΩ			
				±10, ±15	49.9 Ω ~ 332 KΩ		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	49.9 Ω ~ 499 KΩ		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	49.9 Ω ~ 499 KΩ		10 Ω ~ 1 MΩ			
				±25			4.7 Ω ~ 1 MΩ			
TP2010	0.5W			±5	49.9 Ω ~ 100 KΩ		20 Ω ~ 100 KΩ			
				±10, ±15	49.9 Ω ~ 499 KΩ		10 Ω ~ 1 MΩ			
				±25			4.7 Ω ~ 1 MΩ			
TP2512	0.75W			±5	49.9 Ω ~ 100 KΩ		20 Ω ~ 100 KΩ			
				±10, ±15	49.9 Ω ~ 499 KΩ		10 Ω ~ 1 MΩ			
				±25			4.7 Ω ~ 1 MΩ			

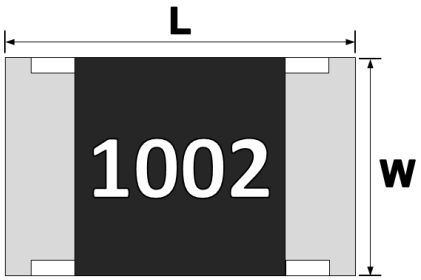
- Operating Temperature Range ：−55℃～＋155℃.
- For non-standard parts, please contact our sales department.

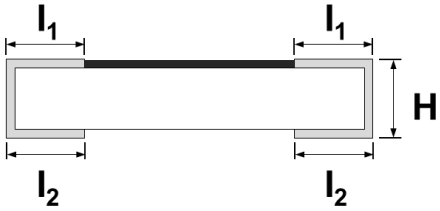
■ Construction



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

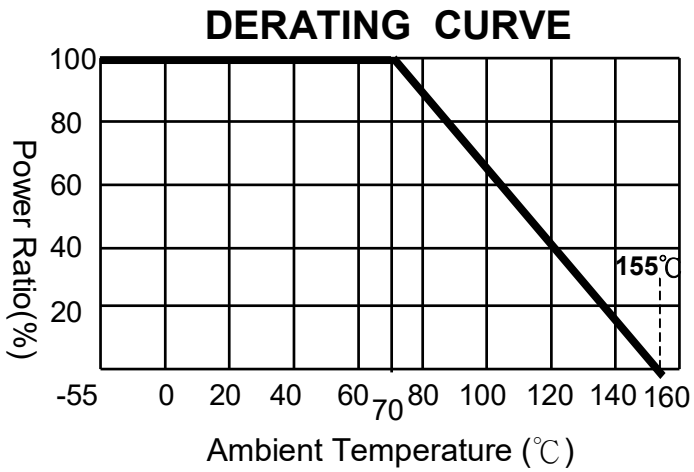
Type	L	W	H	I_1	I_2
TP0201	0.60 ± 0.05	0.30 ± 0.05	0.23 ± 0.05	0.12 ± 0.05	0.15 ± 0.05
TP0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
TP0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TP0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
TP1206	3.10 ± 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

■ 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℃. For operation at ambient temperature in excess of 70℃, the load should be derated in accordance with figure of derating Curve.



■ Rated Voltage

Resistance Range: ≧1Ω

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)

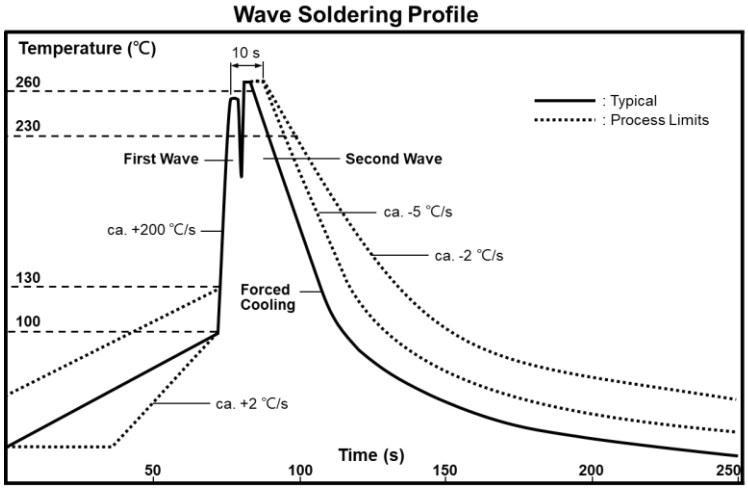
■ Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements	
			0402 ~ 2512	0201
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)	±(0.3%+0.05Ω)
			No Visual damage	
Insulation Resistance	JIS-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)	±(0.3%+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)	±(0.3%+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)	±(0.3%+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)	±(0.3%+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)	±(0.3%+0.05Ω)
Humidity Bias	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(0.1%+0.05Ω)	±(0.3%+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)	±(0.3%+0.05Ω)
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds D： 0201、0402、0603、0805 = 5mm 1206、1210 = 3mm 2010、2512 = 2mm	±(0.1%+0.05Ω)	±(0.3%+0.05Ω)
			No Visual damage	

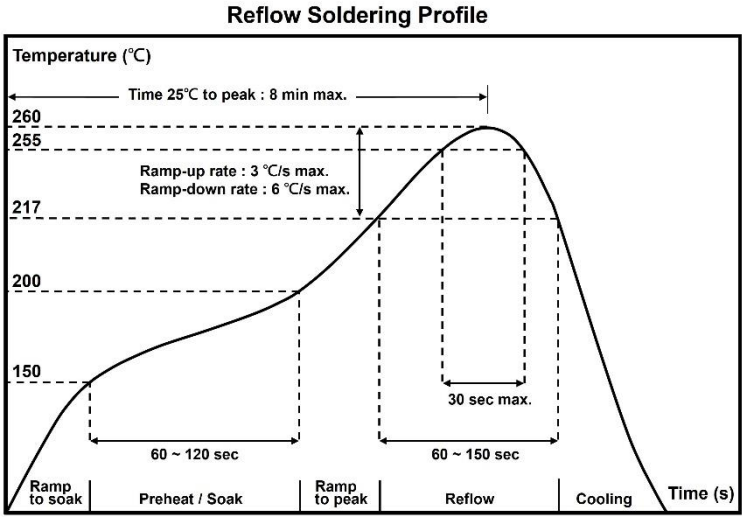
● We can also provide AEC-Q200 test reports if required by customers.

■ Recommended Customer Soldering Parameters

■ Wave solder Temperature condition



■ Solder reflow Temperature condition



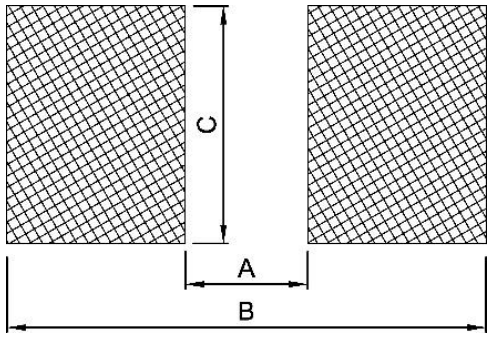
■ Rework temperature（hot air equipment）：350℃, 3~5seconds

■ 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

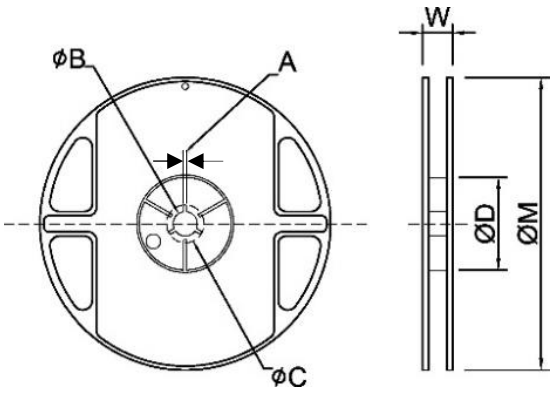


Unit: mm

Item \ Type	0201	0402	0603	0805	1206	1210	2010	2512
A	0.25	0.50	0.80	1.30	2.20	2.00	3.80	4.90
B	0.85	1.60	2.40	2.90	4.20	4.40	6.60	8.10
C	0.35	0.70	1.00	1.40	1.70	2.70	2.70	3.40

■ Packaging Information

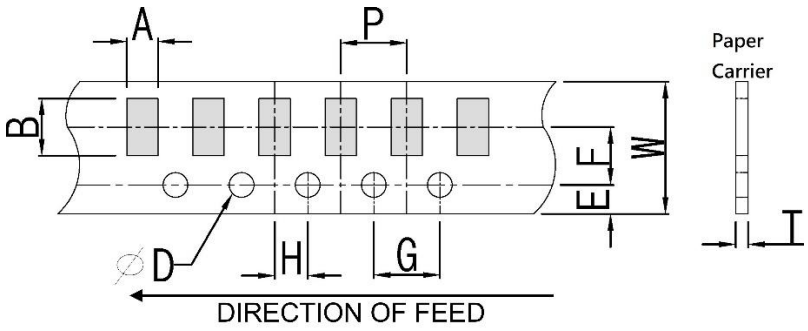
■ Reel Dimensions



Unit: mm

Type	Size		A	ϕB	ϕC	ϕD	W	ϕM
0201/0402	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

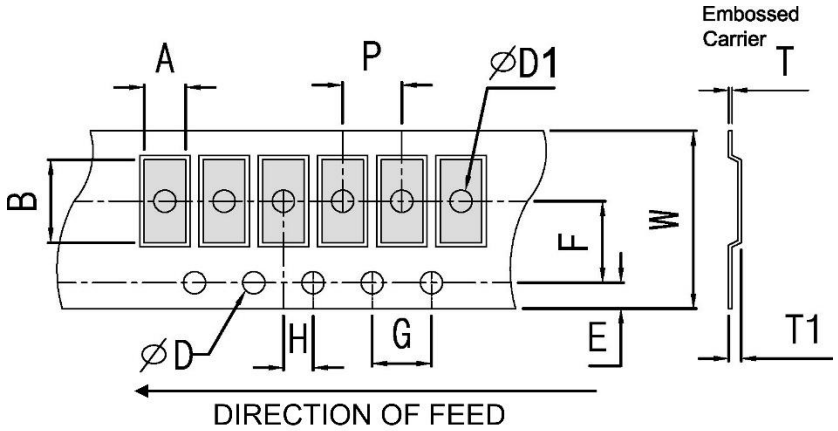
■ Paper Tape Dimensions



Unit: mm

Type	A	B	W	E	F	G	H	T	ΦD	P
0201	0.40±0.05	0.70±0.05	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
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		
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		

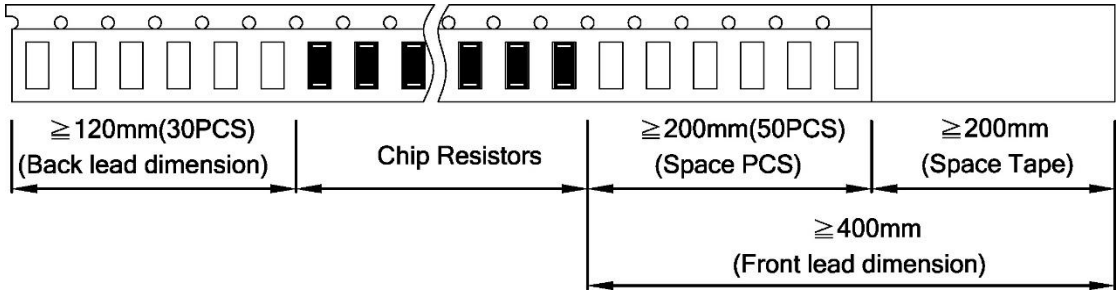
■ Plastic Embossed Tape Dimensions



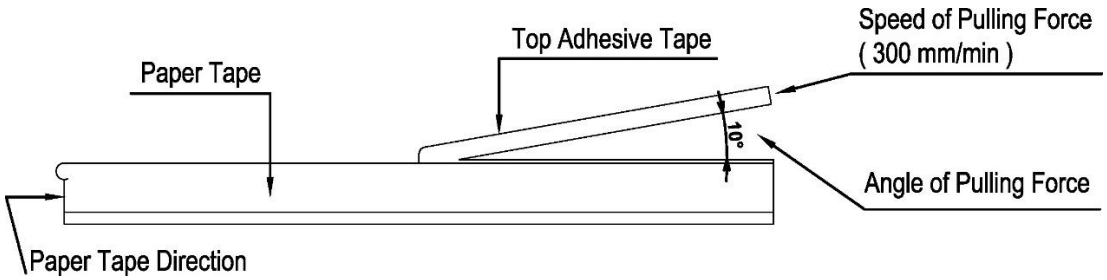
Unit: mm

Type	A	B	W	E	F	G	H	T	ΦD	ΦD1	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

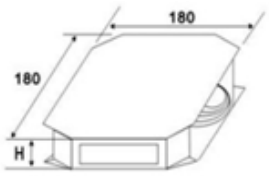


■ Top Adhesive Peel Off Strength：10~70g

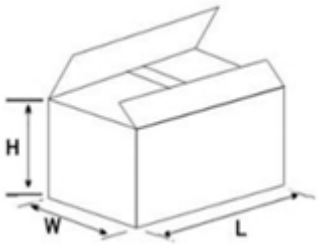


■ Package

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±5℃& humidity: 60±20% is valid for two years.