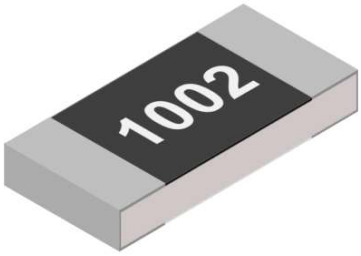
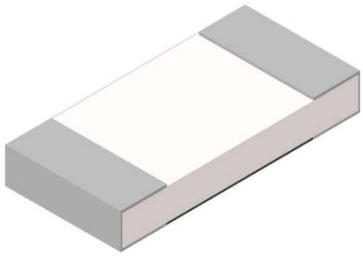
Precision Product Thin Film Chip Resistor — TP Series



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:

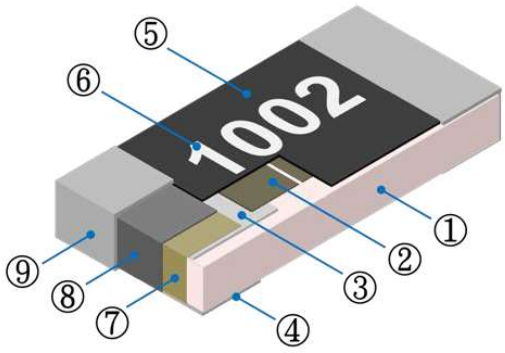
TP	1206	B	10K0	P	05	10	Z
Product Type	**Size (Inch)**	**Tolerance**	**Resistance**	**Package**	**Quantity (PCS)**	**TCR (ppm/℃)**	**Optional**
TP Series Precision Product Thin Film Chip Resistor	0402 0603 0805 1206 1210 2010 2512	T : ±0.01% A : ±0.05% B : ±0.1% C : ±0.25% D : ±0.5% F : ±1.0%	4 digits 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 (0402) E : Embossed Taping	04 : 4000 05 : 5000 10 : 10000	05 : ±5 10 : ±10 15 : ±15 25 : ±25	Z : Default Code

Standard Electrical Specifications

項目 Item / 型別 Type	額定功率 Rated Power at 70℃	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/℃)	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			

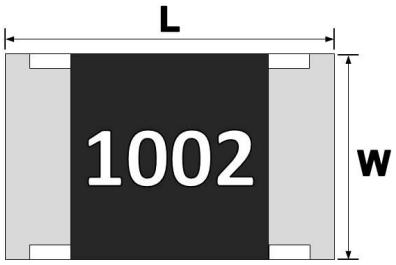
- Operating Temperature Range ：−55℃～＋155℃.
- For non-standard parts, please contact our sales department.

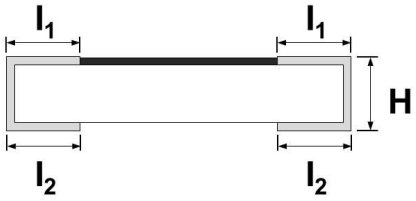
Construction



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

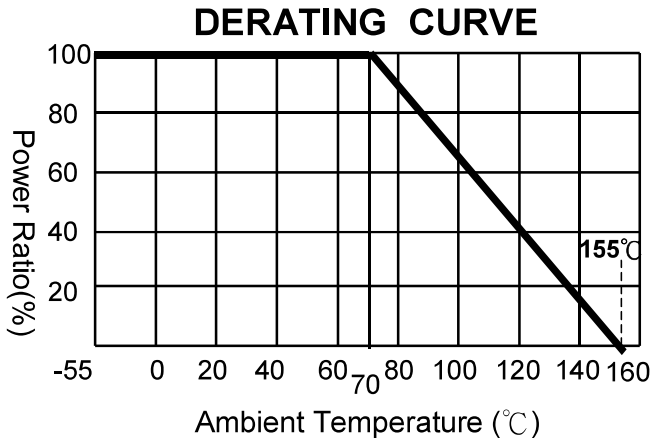
TYPE	L	W	H	l_1	l_2
TP0402	1.00 ± 0.10	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10
TP0603	1.60 ± 0.15	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
TP0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.35 ± 0.20	0.40 ± 0.20
TP1206	3.10 ± 0.15	1.60 ± 0.15	0.55 ± 0.10	0.45 ± 0.20	0.50 ± 0.20
TP1210	3.10 ± 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

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)

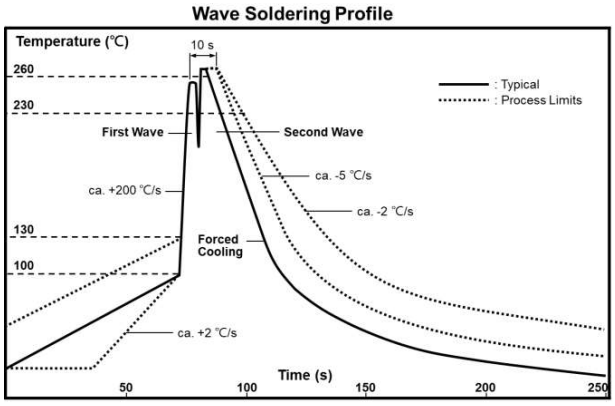
Reliability Tests and Requirements

Test Item	Test Method	Procedure	Requirements
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°C / 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

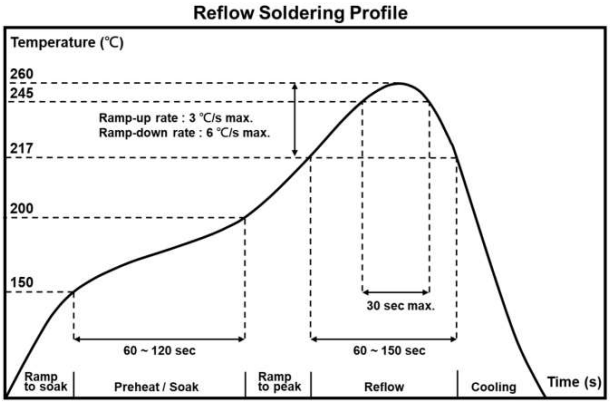
● We can also provide AEC-Q200 test reports if required by customers.

Recommended Customer Soldering Parameters

Wave solder Temperature condition



Solder reflow Temperature condition



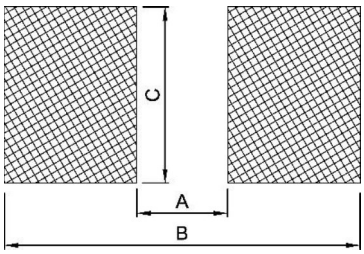
Rework temperature（hot air equipment）：350℃, 3~5seconds

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	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

Marking

0402: no marking

0603: 3 digits code

0805~2512: 4 digits code

No marking on 0402 type

3 digits code for 0603 type

- **Standard E96 Values and 0603 Resistance Codes**

R-Value	100	102	105	107	110	113	115	118	121	124	127	130	133	137	140	143	147	150	154	158	162	165	169	174
Code	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
R-Value	178	182	187	191	196	200	205	210	215	221	226	232	237	243	249	255	261	267	274	280	287	294	301	309
Code	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
R-Value	316	324	332	340	348	357	365	374	383	392	402	412	422	432	442	453	464	475	487	499	511	523	536	549
Code	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
R-Value	562	576	590	604	619	634	649	665	681	698	715	732	750	768	787	806	825	845	866	887	909	931	953	976
Code	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96

- **E96 Multiplier Code**

Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^{-1}	10^{-2}	10^{-3}

1. 0603 3 digits coding formula for E96 values as following:

CODING FORMULA

XX X — XX: Resistance Code; X: Multiplier Code

Example: 10.2KΩ = 102 x 10^2Ω = **02C** (02 = 102, C = 10^2)

33.2Ω = 332 x 10^{-1}Ω = **51X** (51 = 332, X = 10^{-1})

E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91

2. 0603 3 digits for E24 values

Examples:

Resistance	33Ω	470Ω	5.6KΩ	62KΩ
3 digits code	330	471	562	623

("R"= decimal point)

3. 0603 E192 values have no marking code.

4 digits code for 0805 ~ 2512 type

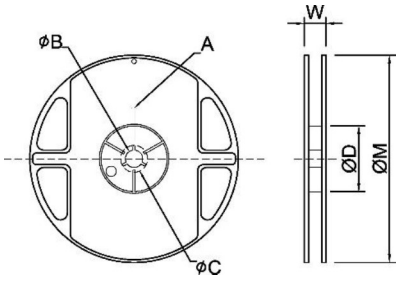
First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point.

Examples:

Resistance	49.9Ω	100Ω	1.1KΩ	10KΩ	33.2KΩ	1 MΩ
4 digits code	49R9	1000	1101	1002	3322	1004

Packaging Information

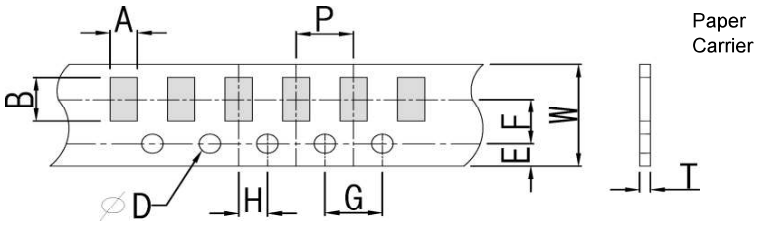
Reel Dimensions



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

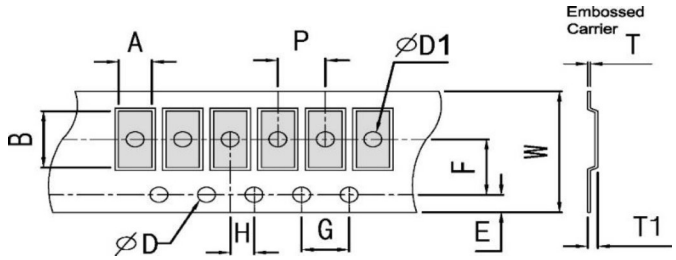
Paper Tape Dimensions



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		

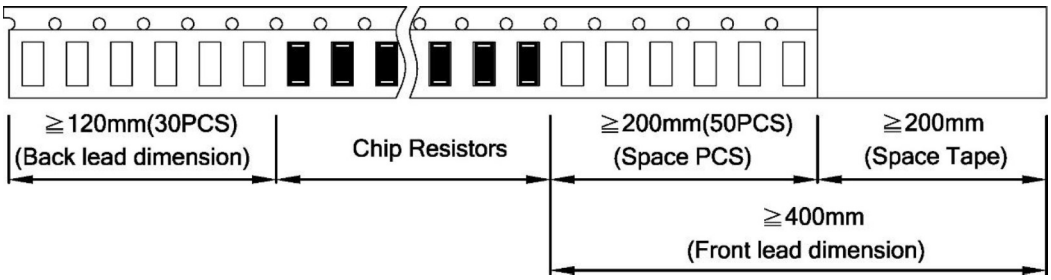
Plastic Embossed Tape Dimensions



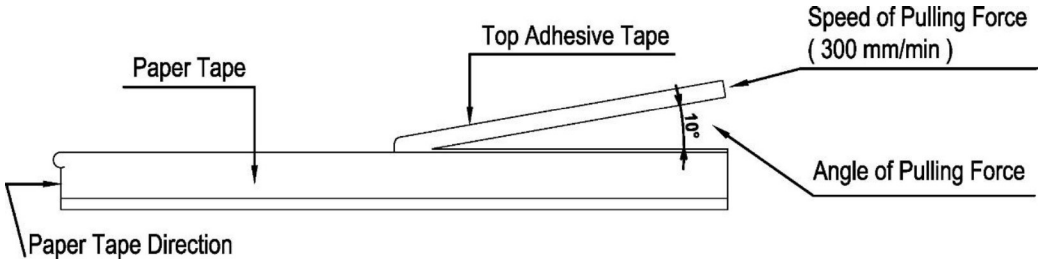
Unit: mm

Type	A	B	W	E	F	G	H	T	ΦD	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

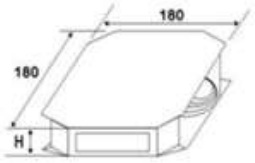


■ Top Adhesive Peel Off Strength：10~70g

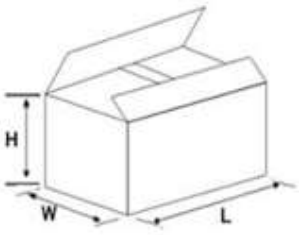


■ Package

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 one year from the date of delivery.

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