



LOW-OHMIC THICK FILM CHIP FIXED RESISTOR

■ Features

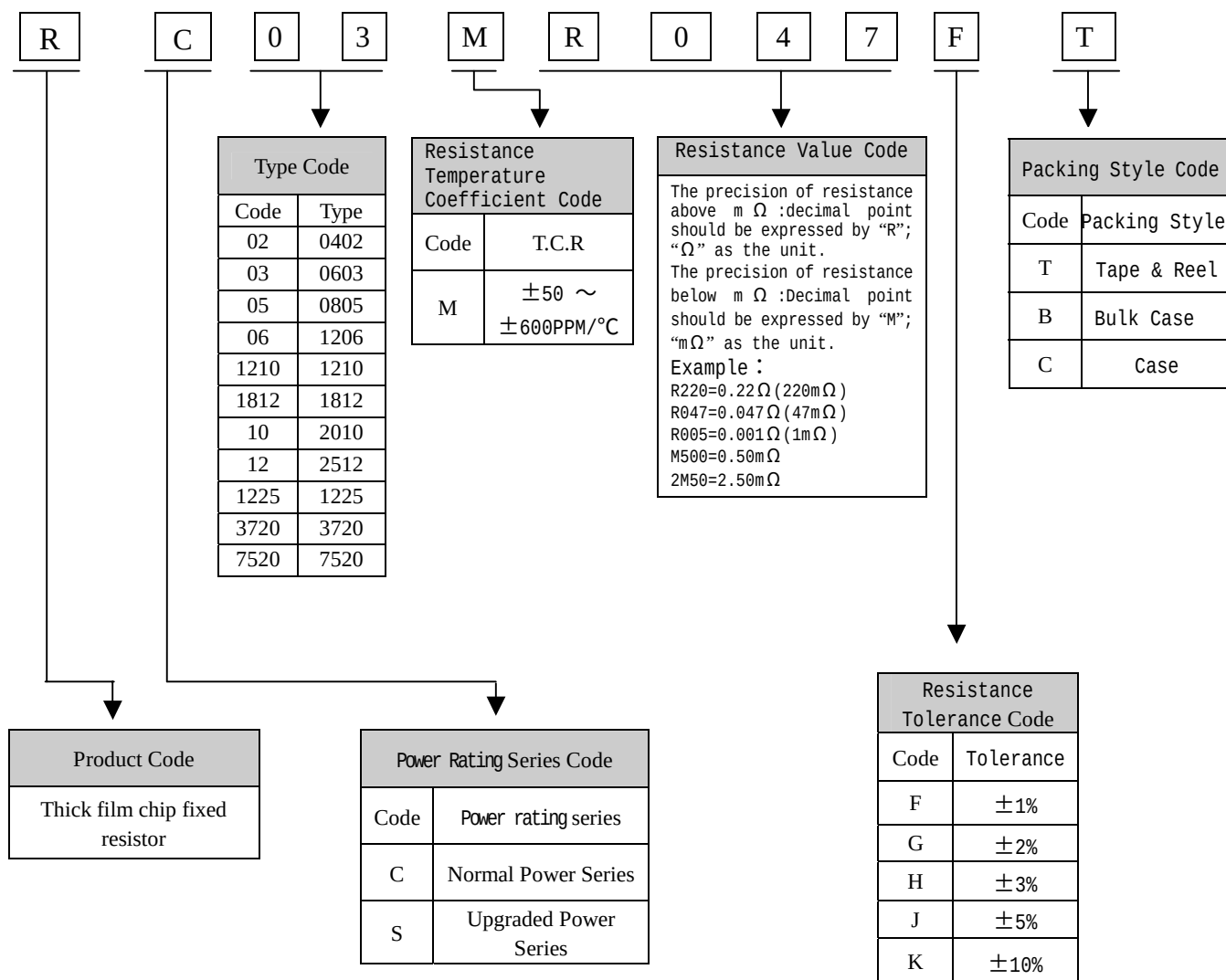
- Resistance Values from 0.5 to 1000m ohms
- Lowest TCR is ± 50 PPM/ $^{\circ}\text{C}$
- Suit for re-flow and wave flow soldering
- Stable electrical capability, high reliability
- Low assembly cost, suit for automatic SMT equipment
- Superior mechanical and frequency characteristics
- Compliant with RoHS Directive



■ Applications

Switching Power Supply、Over Current Protection in Audio Application、Voltage Regulation Module(VRM)、DC-DC Converter、Charger、Automotive Engine Control、Portable Devices etc.

■ Type Designation



■ Construction and dimension

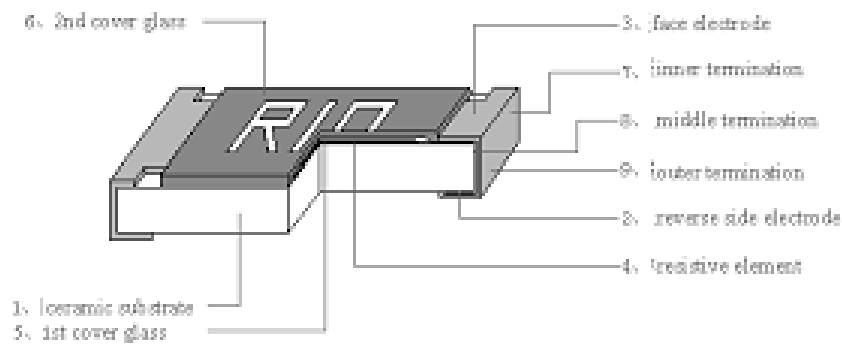


Fig1: Part Figure for Construction 1

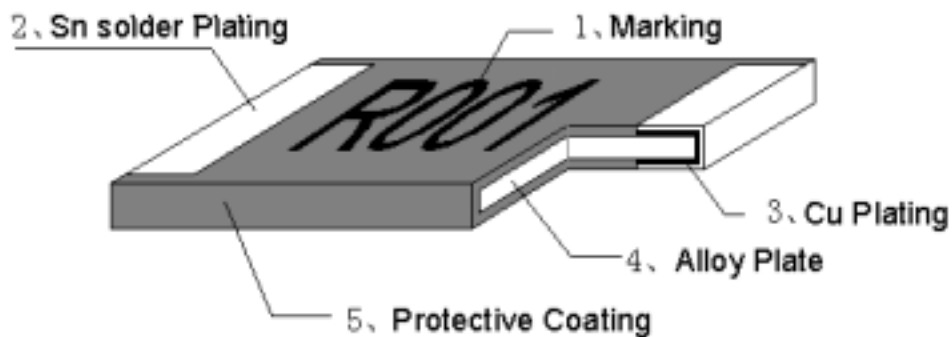


Fig2: Part Figure for Construction 2

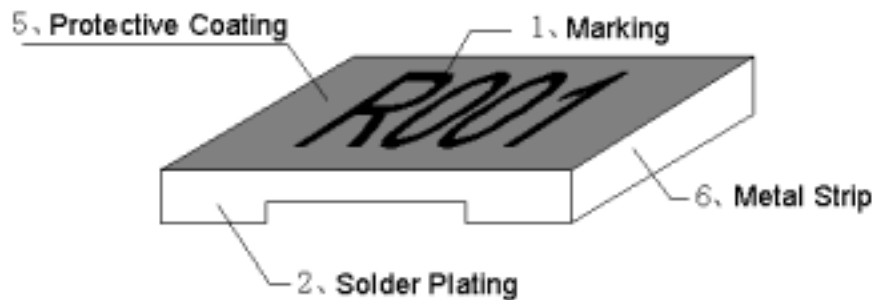


Fig3: Part Figure for Construction 3

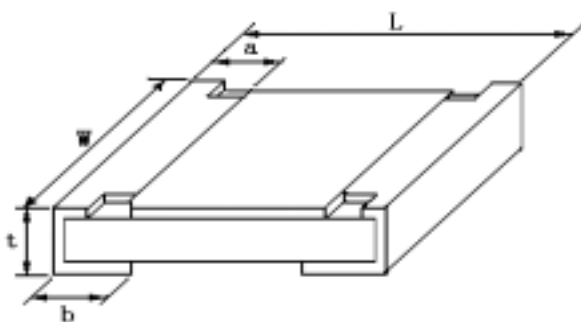


Fig4: Dimension Figure for Construction 1

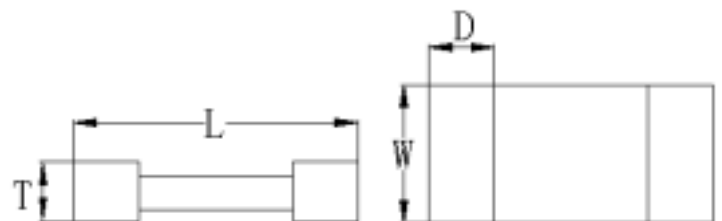


Fig5: Dimension Figure for Construction 2, 3



1、Dimensions for Construction 1

Type	L (mm)	W(mm)	t (mm)	a (mm)	b (mm)
0402	1.00 ± 0.10	0.50 ± 0.10	0.30 ± 0.10	0.20 ± 0.10	0.25 ± 0.10
0603	1.60 ± 0.15	0.80 ± 0.15	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
0805	2.00 ± 0.20	1.25 ± 0.15	0.50 ± 0.10	0.40 ± 0.20	0.40 ± 0.20
1206	3.20 ± 0.20	1.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20
1210	3.20 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20
1812	4.50 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.50 ± 0.20	0.50 ± 0.20
2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
2512	6.40 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
1225	3.10 ± 0.15	6.30 ± 0.15	0.90 ± 0.15	0.60 ± 0.30	0.55 ± 0.25
3720	2.00 ± 0.20	3.75 ± 0.20	0.60 ± 0.10	0.40 ± 0.20	0.40 ± 0.20
7520	2.00 ± 0.20	7.50 ± 0.30	0.60 ± 0.10	0.40 ± 0.20	0.40 ± 0.20

2、Dimensions for Construction 2

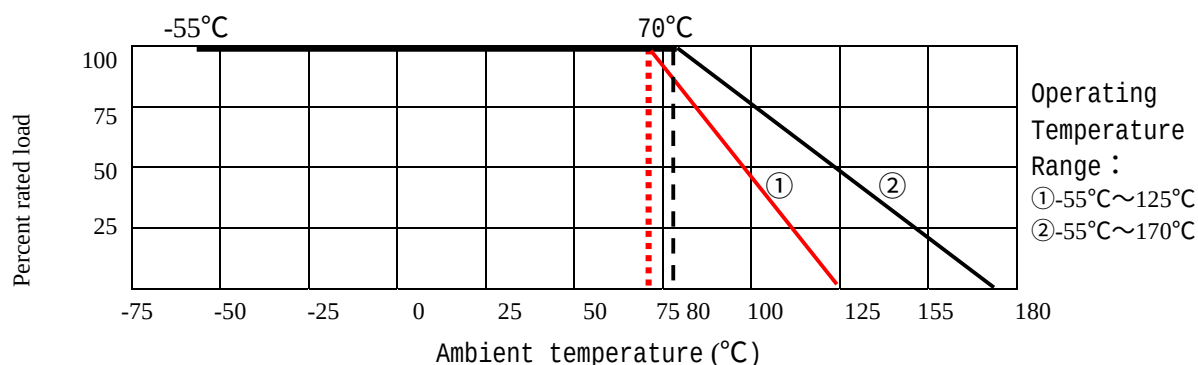
Type	Resistance(mΩ)	L (mm)	W(mm)	T (mm)	D (mm)
RC12□M50□	0.50	6.35 ± 0.25	3.18 ± 0.25	1.40 ± 0.20	1.30 ± 0.30
RC12□M75□	0.75	6.35 ± 0.25	3.18 ± 0.25	1.00 ± 0.20	1.30 ± 0.30
RC12□R001□	1.00	6.35 ± 0.25	3.18 ± 0.25	0.80 ± 0.20	1.30 ± 0.30
RC12□1M50□	1.50	6.35 ± 0.25	3.18 ± 0.25	0.65 ± 0.20	1.30 ± 0.30
RC12□R002□	2.00	6.35 ± 0.25	3.18 ± 0.25	0.50 ± 0.20	1.30 ± 0.30
RC12□2M50□	2.50	6.35 ± 0.25	3.18 ± 0.25	1.00 ± 0.20	1.30 ± 0.30
RC12□R003□	3.00	6.35 ± 0.25	3.18 ± 0.25	0.70 ± 0.20	1.30 ± 0.30
RC12□3M50□	3.50	6.35 ± 0.25	3.18 ± 0.25	0.71 ± 0.20	1.30 ± 0.30
RC12□R004□	4.00	6.35 ± 0.25	3.18 ± 0.25	0.60 ± 0.20	1.30 ± 0.30
RC12□4M50□	4.50	6.35 ± 0.25	3.18 ± 0.25	0.58 ± 0.20	1.30 ± 0.30
RC12□R005□	5.00	6.35 ± 0.25	3.18 ± 0.25	0.50 ± 0.20	1.30 ± 0.30
RC12□5M50□	5.50	6.35 ± 0.25	3.18 ± 0.25	0.47 ± 0.20	1.30 ± 0.30
RC12□R006□	6.00	6.35 ± 0.25	3.18 ± 0.25	0.50 ± 0.20	1.30 ± 0.30
RC12□6M50□	6.50	6.35 ± 0.25	3.18 ± 0.25	0.47 ± 0.20	1.30 ± 0.30
RC12□R007□	7.00	6.35 ± 0.25	3.18 ± 0.25	0.45 ± 0.20	1.30 ± 0.30
RC12□R010□	10.0	6.50 ± 0.25	3.20 ± 0.25	0.80 ± 0.20	1.90 ± 0.30

3、Dimensions for Construction 3

Type	Resistance(mΩ)	L (mm)	W(mm)	T (mm)	D (mm)
RC12□□□□□□	11~20	6.35 ± 0.25	3.18 ± 0.35	0.60 ± 0.20	1.93 ± 0.75



Derating Curve



For resistors operated in ambient over 70°C/80°C, rated load (power rating) shall be derated in accordance with the above figure.

Curve ① is suitable for the product of Construction 1

Curve ② is suitable for the product of Construction 2、3

Ratings

Item Type	Power Rating		Resistance Tolerance	Resistance (mΩ)	TCR (PPM/°C)	Operating Temperature Rang	Remark
	Normal Power Series	Upgraded Power Series					
0402	1/16W	\	±1%, ±2%, ±5%	50~100 101~500 501~976	±400 ±300 ±200	-55°C~+125°C	product characteristics are refer to Characteristics 1
0603	1/16W	1/10W	±1%, ±2%, ±5%	20~50 51~100 101~500 501~976	±600 ±400 ±300 ±200		
0805	1/10W	1/8W	±1%, ±2%, ±5%	20~50 51~100 101~500 501~976	±600 ±400 ±300 ±200		
1206	1/8W	1/4W	±1%, ±2%, ±5%	10~20 21~50 51~500 501~976	±600 ±400 ±300 ±200		
2010	1/2W	\		51~500 501~976	±300 ±200		
2512	1W	\		501~976	±200		
1225	\	3W	±5%	3~5	±600		
			±2%,	6~9	±600		
			±1%, ±2%, ±5%	10~49	±600		
				50~200	±200		
3720	\	1W	±1%, ±2%, ±5%	10~500	±300		
7520	\	2W	±1%, ±2%, ±5%	1~500	±300		

Note : Rating Voltage $V = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$,

Rating Current $I = \sqrt{\text{Power Rating} / \text{Resistance Value}}$



■ Low TCR Series Ratings

Type	Item	Power Rating at 80°C	Resistance Tolerance	Resistance (mΩ)	TCR (PPM/°C)	Operating Temperature Rang	remark
	RS06K□□□□	1/4W	±1%, ±2%, ±5%	100~1000	±100	-55°C~+125°C	product characteristics are refer to Characteristics 1
	RS10K□□□□	1/2W		100~1000	±100		
				100~1000	±100		
	RC12K□□□□	1W	±1%, ±3%, ±5%	0.5~2.0	50	-55°C~+170°C	product characteristics are refer to Characteristics 2
				2.5~3.0	150		
				4.0~5.5	100		
				6.0~7.0	75		
				10	100		
				11~20	50		

Note : Rating Voltage $V = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$,
Rating Current $I = \sqrt{\text{Power Rating} / \text{Resistance Value}}$

■ Characteristics 1

Item	Specifications	Test Methods (JIS C 5202)
Bending Strength	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.005\Omega)$	Duration: 10s ± 1s Bending Distance: 0402、0603、0805、1206、1210、1225 : 3mm ; 1812、2010、2512、3720、2520 : 1mm
T.C.R	within specified T.C.R	Measure between -55°C~+125°C
Temperature Cycling	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.005\Omega)$	-55°C (30min) ~normal temperature (5min) ~125°C (30min) 5 cycles
Short Time Overload	No mechanical damage $\Delta R \leq \pm (2.0\%R + 0.005\Omega)$	2.5×Rated Current for 5 seconds
Steady state humidity	No mechanical damage $\Delta R \leq \pm (3.0\%R + 0.005\Omega)$	40°C ± 2°C 90~95%RH 1000h
Load Life	No mechanical damage $\Delta R \leq \pm (3.0\%R + 0.005\Omega)$	70°C ± 2°C, 1000h, Rated voltage 1.5h on/0.5h off
Endurance at upper temperature	No mechanical damage $\Delta R \leq \pm (3.0\%R + 0.005\Omega)$	125°C ± 2°C 1000h



Continue to the former list :

Resistance to Solvent	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.005\Omega)$	Dip in chloroethylene for $10h \pm 1h$.
Insulation Resistance	1000M Ω Min	Apply DC 100V between substrate and termination for 1 minute, then check insulation resistance .
Resistance to Soldering Heat	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.005\Omega)$	$270^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 10s $\pm 1s$
Solder-ability	95% Cover Min	$240^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 2s $\pm 0.5s$
Adhesion	No mechanical damage	Applying 5N 10s $\pm 1s$

■ Characteristics 2

Item	Specifications (Low TCR)	Test Methods
T.C.R	within specified T.C.R	$-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$ (MLT-STD-202F-Method)
Thermal Shock	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.5m\Omega)$	$-55^{\circ}\text{C} \sim 150^{\circ}\text{C}$ 100cycles
Short Time Overload	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.5m\Omega)$	2.5× Rated Current or Max Overload Current, whichever is lower, for 5 seconds (JIS C 5202)
Resistance to Soldering Heat	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.5m\Omega)$	$260^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 10s $\pm 1s$ (MLT-STD-202F-Method)
Load Life	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.5m\Omega)$	$70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 1000h Rated voltage 1.5h on/0.5h off (MLT-STD-202F-Method)
Solder-ability	95% Cover Min	$235^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 2s $\pm 0.5s$ (MLT-STD-202F-Method)
Resistance to Dry Heat	No mechanical damage $\Delta R \leq \pm (1.0\%R + 0.5m\Omega)$	$+155^{\circ}\text{C}$, 96h (JIS C 5202)

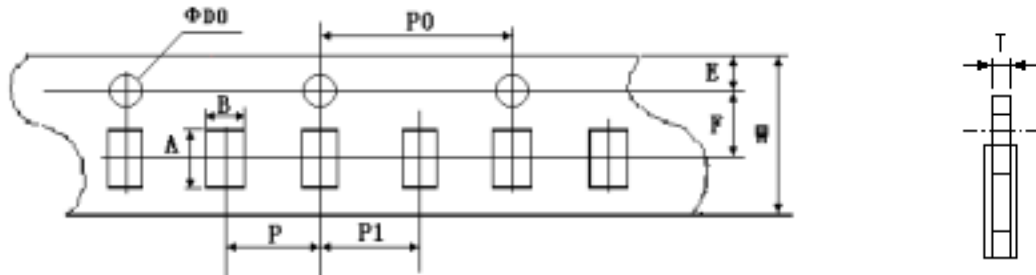


■Packaging

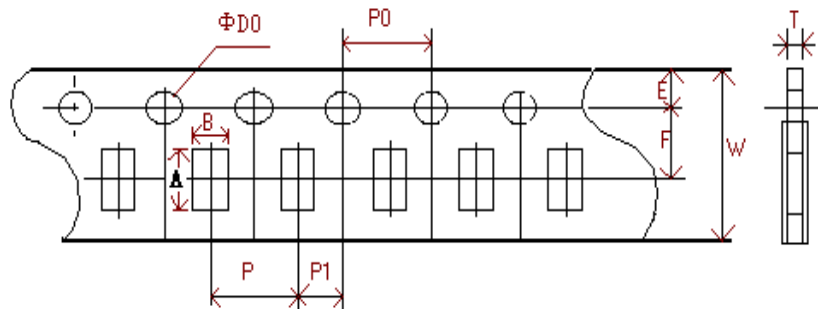
● Tape and reel

* Paper taping

0402 :



0603、0805、1206、1210 :



unit: mm

Type	A	B	W	F	E
0402	1.20 ± 0.1	0.70 ± 0.1	8.0 ± 0.20	3.5 ± 0.05	1.75 ± 0.1
0603	1.85 ± 0.1	1.10 ± 0.1	8.0 ± 0.20	3.5 ± 0.05	1.75 ± 0.1
0805	2.35 ± 0.1	1.65 ± 0.1	8.0 ± 0.20	3.5 ± 0.05	1.75 ± 0.1
1206	3.50 ± 0.2	1.90 ± 0.2	8.0 ± 0.20	3.5 ± 0.05	1.75 ± 0.1
1210	3.50 ± 0.2	2.80 ± 0.2	8.0 ± 0.20	3.5 ± 0.05	1.75 ± 0.1

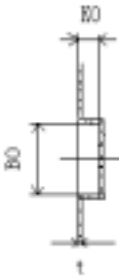
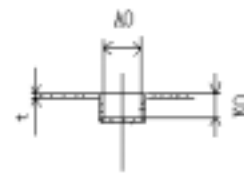
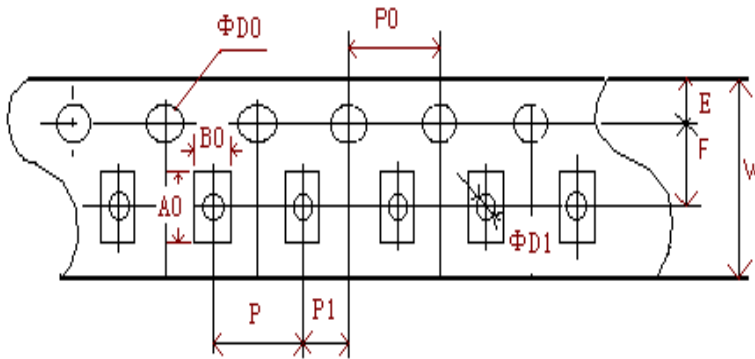
unit: mm

Type	P	P0	P1	ΦD0	T
0402	2.0 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	1.5 ± 0.1	0.6Max
0603	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 ± 0.1	0.60 ± 0.1
0805	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 ± 0.1	0.75 ± 0.1
1206	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 ± 0.1	0.75 ± 0.1
1210	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.5 ± 0.1	0.75 ± 0.1



● Embossed tapping

1812、2010、2512、1225、3720、7520



unit: mm

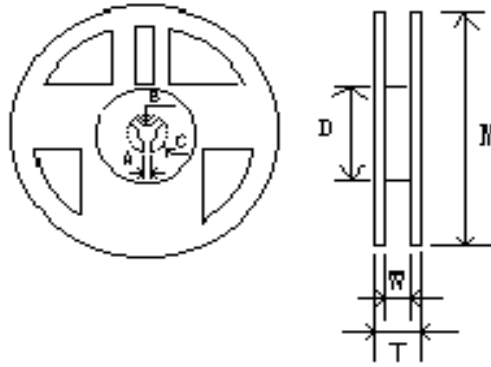
Type		A0	B0	W	F	E	t	remark
1812		4.80 ± 0.10	3.40 ± 0.10	12.00 ± 0.10	5.50 ± 0.10	1.75 ± 0.10	0.25 ± 0.05	
2010		5.45 ± 0.10	2.77 ± 0.10	12.00 ± 0.10	5.50 ± 0.10	1.75 ± 0.10	0.24 ± 0.05	
2512		6.73 ± 0.10	3.40 ± 0.10	12.00 ± 0.10	5.50 ± 0.10	1.75 ± 0.10	0.24 ± 0.05	Construction 1
2512	0.50mΩ	6.70 ± 0.10	3.40 ± 0.10	12.00 ± 0.10	5.50 ± 0.10	1.75 ± 0.10	\	Construction 2, 3
	0.75mΩ	6.80 ± 0.20	3.50 ± 0.10	12.00 ± 0.10	5.50 ± 0.10	1.75 ± 0.10	\	
	1~20mΩ	6.70 ± 0.10	3.40 ± 0.10	12.00 ± 0.10	5.50 ± 0.10	1.75 ± 0.10	\	
1225		6.68 ± 0.10	3.38 ± 0.10	12.00 ± 0.30	5.50 ± 0.10	1.75 ± 0.10	\	
3720		4.45 ± 0.20	2.50 ± 0.20	12.00 ± 0.30	5.50 ± 0.05	1.75 ± 0.01	\	
7520		8.30 ± 0.20	2.50 ± 0.20	16.00 ± 0.30	7.80 ± 0.05	1.75 ± 0.01	\	

unit: mm

Type		P	P0	P1	ΦD0	ΦD1	K0	remark
1812		4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.10	1.50 ± 0.10	1.00 ± 0.10	
2010		4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.50 ± 0.10	0.84 ± 0.10	
2512		4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.50 ± 0.10	0.81 ± 0.10	Construction 1
2512	0.50mΩ	4.00 ± 0.10	4.00 ± 0.05	2.00 ± 0.05	1.50 ± 0.10	1.40 Min	1.40 ± 0.10	Construction 2, 3
	0.75mΩ	4.00 ± 0.10	4.00 ± 0.05	2.00 ± 0.05	1.50 ± 0.10	1.40 Min	1.35 ± 0.10	
	1~20mΩ	4.00 ± 0.10	4.00 ± 0.05	2.00 ± 0.05	1.50 ± 0.10	1.40 Min	0.80 ± 0.10	
1225		4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	1.40 Min	1.45 ± 0.20	
3720		4.00 ± 0.10	4.00 ± 0.05	2.00 ± 0.05	1.50 ± 0.10	1.40 Min	1.50 ± 0.10	
7520		4.00 ± 0.10	4.00 ± 0.05	2.00 ± 0.05	1.50 ± 0.10	1.40 Min	1.50 ± 0.10	



* Reel

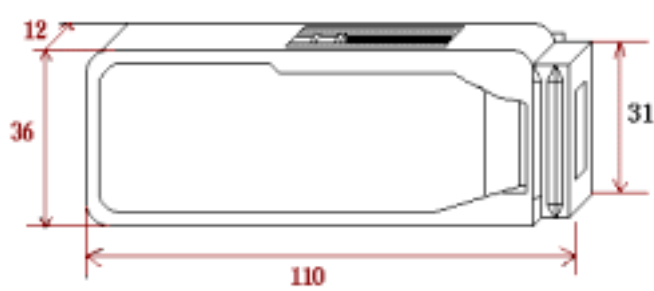


unit: mm

Type	M	W	T	A	B	C	D
0402	178 ±2.0	9.5 ±1.0	12.5 ±1.5	2.0 ±0.5	13.0 ±0.5	21.0 ±0.5	58.0 ±2.0
0603							
0805							
1206							
1210							
1812	178 ±2.0	13.0 ±0.5	15.5 ±1.5	2.0 ±0.5	13.0 ±0.5	21.0 ±0.5	57.0
2010							±2.0
2512							
1225		13.2±1.5	16.0±0.2				60.2 ±0.5
3720							
7520		17.0±0.5	19.0±1.0				

● Bulk case

unit:mm



● Packaging quantity

Packaging style	Tape and reel				Bulk case							Bulk			
Type	0402	0603 0805 1206 1210	1812 2010 2512	1225 3720 7520	0402	0603	0805	1206	1210 2010	1812 2512	1225 3720 7520	0402	0603 0805 1206	1210 1812 2010 2512	1225 3720 7520
Quantity (PCS)	10000	5000	4000	2000	50000	25000	10000	5000	1500	1000	500	≤50000	≤10000	≤4000	≤1000