

**Application**

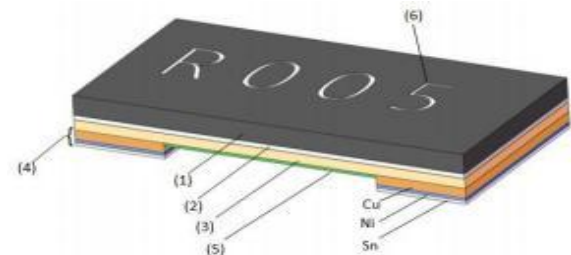
- Computer
- Power supply
- Measuring instrument
- Industrial
- Battery management system
- Automotive

**Features**

- Substrate : Epoxy
- Adhesive : Epoxy
- Resistive element : Cu - alloy
- Terminal electrode : Sn 、 Ni 、 Cu
- Protective coating : Flame-retardant epoxy, meets UL- 94-V0 requirements
- Marking coating : Flame-retardant epoxy, meets UL- 94-V0 requirements (white)

**Features**

- Low Resistance / TCR / EMF(only for MnCu) / Inductance
- Excellent Long term stability
- RoHs compliant and halogen free
- Down size to 0201
- High precision current sensing and voltage division

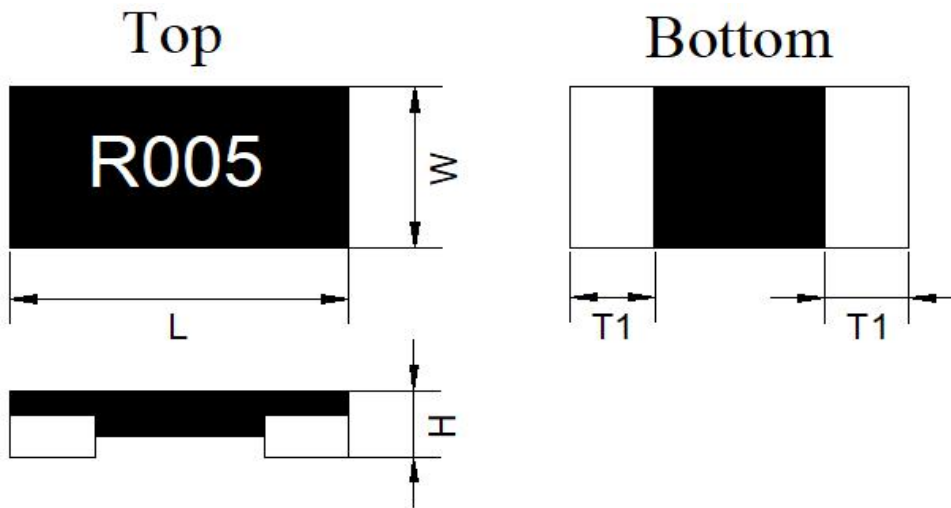


**Part Number Explanation**

<b>1206</b>	<b>ML</b>	<b>10</b>	<b>F</b>	<b>R005</b>	<b>.</b>
<b>Size (Inch)</b>	<b>Product Type</b>	<b>Rated Power</b>	<b>Tolerance</b>	<b>Resistance</b>	<b>Special Definition</b>
0603 0805 1206 0508 0612	ML	02=0.20W 03=0.33W 05=0.50W 10=1.00W 15=1.50W 15=1.50W	D=±0.5% F=±1% G=±2%	2M50=2.5mR R005=5.0mR R020=20.0mR	M

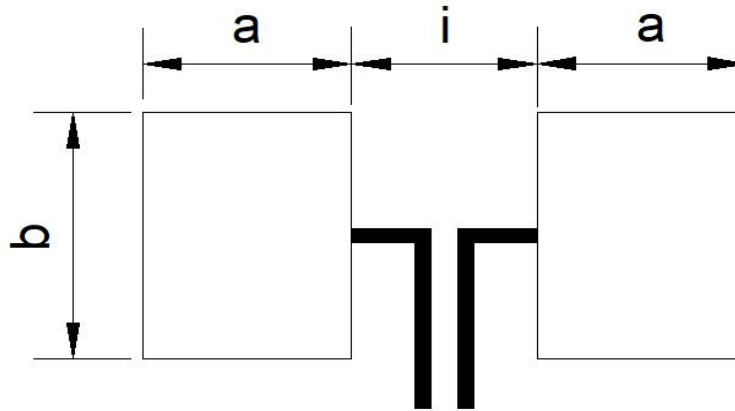
**Standard Electrical Specifications**

Type	Rating Power at 70°C	T.C.R (ppm/°C)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)	Material	Operating Temperature Range (°C)
					1.0% (F)		
0201ML	0.2W	±200	4.47A	7.07A	10 & 20	MnCu	-55~+125
0402ML	0.33W	±150	11.48A	18.16A	2.5,3		-55~+155
		±100	8.12A	12.84A	5~25		
0603ML	0.33W	±150	12.84A	20.31A	2		
		±100	11.49A	18.16A	2.5~5		
		±75	7.41A	11.72A	6~20		
0805ML	0.5W	±150	22.36A	35.35A	1		
		±100	18.25A	28.86A	1.5		
		±75	15.81A	25.00A	2~5		
		±50	9.12A	14.43A	6~20		
1206ML	1W	±75	31.62A	50A	1~4		
		±50	14.14A	22.36A	5~20		
0508ML	1W	±150	22.36A	35.35A	1		
		±150	18.25A	28.86A	1.5		
		±100	15.81A	25.00A	2~5		
0612ML	1W	±50	31.62A	50A	1~5		

**Type Dimension**

**Standard Electrical Dimension**

Unit: mm

Type	Power Rating	Resistance Range (mΩ)	L	W	H	T <sub>1</sub>
0201ML	0.2W	10,20	0.60±0.15	0.30±0.15	0.25±0.10	0.15±0.10
0402ML	0.33W	2.5, 3	1.00±0.15	0.55±0.15	0.30±0.10	0.30±0.10
		5~25				0.23±0.10
0603ML	0.33W	2	1.60±0.25	0.80±0.25	0.40±0.25	0.45±0.20
		2.5, 3				0.35±0.20
		4~20				0.30±0.20
0805ML	0.5W	1	2.00±0.25	1.30±0.25	0.50±0.25	0.65±0.20
		1.5			0.40±0.25	0.65±0.20
		2~20				0.50±0.20
1206ML	1W	1,1.5	3.20±0.25	1.60±0.25	0.40±0.25	1.05±0.35
		2~10				0.85±0.35
		11~20				0.60±0.35
0508ML	1W	1	1.25±0.25	2.00±0.25	0.40±0.15	0.38±0.20
		1.5~5	1.25±0.25	2.00±0.25	0.40±0.15	0.32±0.20
0612ML	1W	1~5	1.60±0.25	3.20±0.25	0.45Max.	0.30±0.35

**Recommend Land Pattern Design**

**Standard Electrical Dimension**

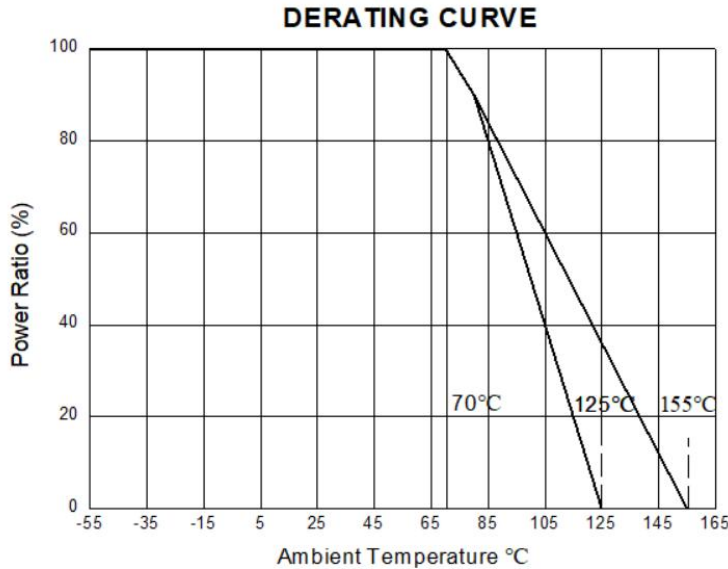
Unit: mm

Type	Resistance Range (mΩ)	a	b	i
0201-0.2W	10,20	0.20	0.33	0.25
0402-0.33W	2.5, 3	0.60	0.60	0.35
	5~25	0.60	0.60	0.40
0603-0.33W	2	1.41	0.92	0.38
	2.5, 3	1.35	0.92	0.50
	4~20	1.30	0.92	0.60
0805-0.5W	1	1.08	1.55	0.55
	1.5	1.05	1.55	0.60
	2~20	0.85	1.40	1.00
1206-1W	1	1.63	1.70	0.65
	1.5	1.43	1.70	0.85
	2~20	1.35	1.70	1.20
0508-1W	1	0.90	2.30	0.40
	1.5~5	0.85	2.30	0.60
0612-1W	1~5	0.80	3.50	0.80

Power Derating Curve

The Operating Temperature Range: -55°C ~+155°C(0402~1206). -55°C ~+125°C(0201)

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below



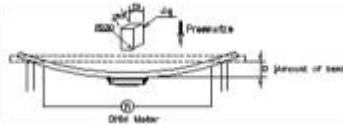
Rating Current

The following equation may be used to determine the DC (Direct Current) or AC (Alternating Current) (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards (paragraph 5), the highest normal rated power is to be used

$$I = \sqrt{P/R}$$

- I= Rating current (A)
- P= Rating Power (W)
- R= Resistance(Ω)

**Reliability Test and Requirement**

NO.	Item	Test Method	Test Condition	Specification
1	Temperature Coefficient of Resistance ( T.C.R )	JIS C 5201-1 clause 4.8	T.C.R. (ppm/°C) = $\frac{(R2-R1)}{R1(T2-T1)} \times 10^6$ R1: resistance at room temperature (T1) R2: resistance at 125°C (T2)	Refer to Electrical Specification
2	Short Time Overload	JIS C 5201-1 clause 4.13	4.0 times of rated power for 5 sec	ΔR : ±1%
3	High Temperature Exposure	JIS C 5201-1 clause 4.23.2	1,000hrs at +155 °C±2°C(0402~1206) 1,000hrs at +125 °C±2°C(0201)	ΔR : ±1%
4	Low Temperature Storage	JIS C 5201-1 clause 4.23.4	-55°C±2°C for 1000hrs	ΔR : ±1%
5	Load Life	JIS C 5201-1 clause 4.25	Apply rated power at 70±2°C for 1000 hours with 1.5hrs ON and 0.5hrs off	ΔR : ±1%
6	Soldering Heat	JIS C 5201-1 clause 4.18	260±5°C for 10±1 sec	ΔR : ±1%
7	Temperature Cycling	JIS C 5201-1 clause 4.19	-55°C to +155°C, 100 cycles(0402~1206) -55°C to +125°C, 100 cycles(0201)	ΔR : ±1%
8	Solderability	JIS C 5201-1 clause 4.17	245±5°C for 3±0.5 sec	Covered area > 95%
9	Bending Strength	JIS C 5201-1 clause 4.33	Chips mounted on a 90mm PCB(FR4) 2 mm bending Bending time: 60±1 seconds 	ΔR : ±1%

## Marking Format

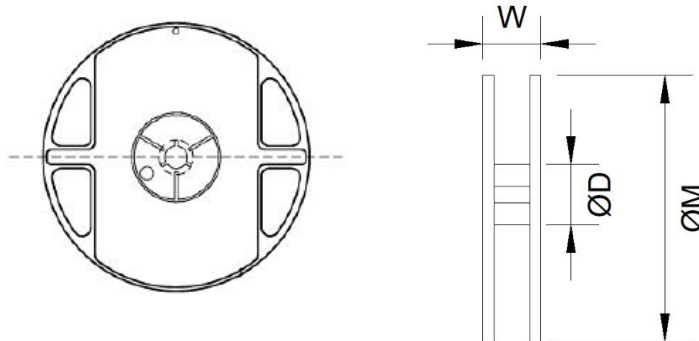
- 0201/0402/0603 type no marking
  
- 0805/0508 type products marking are 3 digits.  
 “M” designates the decimal location in milli-ohms  
 e.g. 10mΩ the product marking is 010.  
     1.5mΩ the product marking is 1M5.
  
- 1206/0612 type products marking are 4 digits.  
 “R” designates the decimal location in ohms  
 e.g. 1mΩ the product marking is R001.  
     20mΩ the product marking is R020 .  
 “M”designates the decimal location in milli-ohms  
 e.g. 0.25mΩ the product marking is 0M25.  
     0.5mΩ the product marking is 0M50 .  
     5.5mΩ the product marking is 5M50 .
  
- The criteria to distinguishing the mark on the surface of products are that characters can be identified.
  
- Jumper NO Marking

## Packing Quantity

TYPE	PCS/Reel
0201ML	10,000
0402ML	10,000
0603ML	5,000
0805ML	5,000
1206ML	5,000
0508ML	5,000
0612ML	5,000

Reel Dimensions

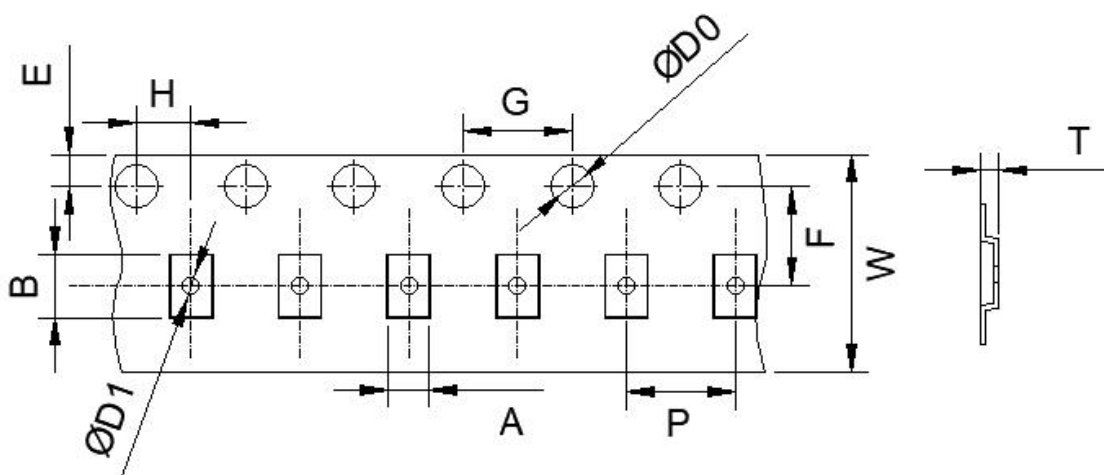
Unit: mm



TYPE	$\phi D$	W	$\phi M$
0201ML	60±2	9.0±1	178±5
0402ML			
0603ML			
0805ML			
1206ML			
0508ML			
0612ML			

Carrier Dimensions

Unit: mm





Item	W	P	E	F	ΦD	G	H	A	B	T
										Standard
0201ML	8.0±0.30	2.0±0.10	1.75±0.10	3.5±0.10	1.50 <sup>+0.1</sup> <sub>0</sub>	4.0±0.10	2.0±0.10	0.40±0.20	0.70±0.20	0.45±0.05
0402ML								0.65±0.20	1.10±0.20	0.42±0.05
0603ML		4.0±0.10						0.98±0.20	1.85±0.20	0.60±0.10
0805ML								1.55±0.20	2.30±0.20	0.60±0.20
1206ML								2.05±0.20	3.65±0.20	
0508ML								1.55±0.20	2.30±0.20	
0612ML		2.05±0.20						3.65±0.20		

### Peeling Strength of Top Cover Tape

Peeling Strength: 0.1-1.0 N (10 - 100gf).

### Storage Requirement

Temperature : 5~35°C, Humidity: 60±20%

When the product is finally discarded, it can be treated as general electronic waste, and raw material compositions of CSR can be referred to MSDS.