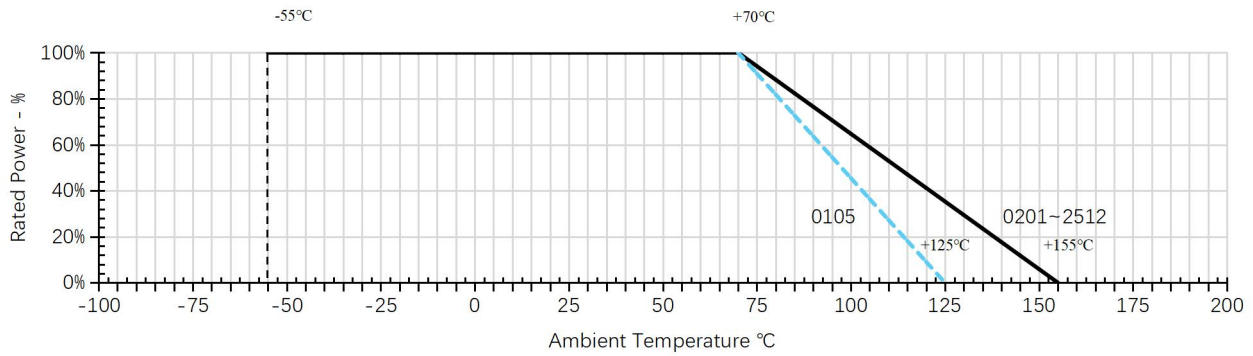
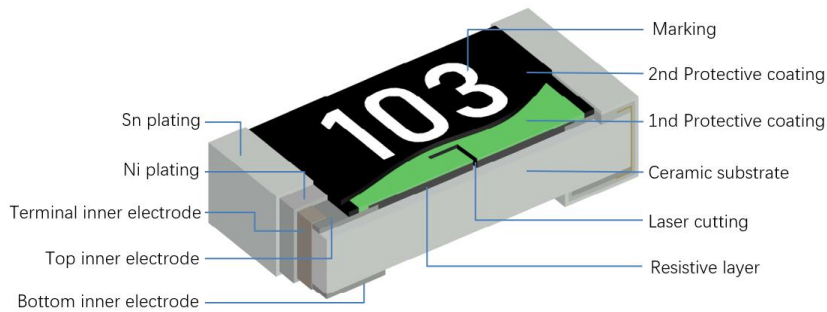


POWER DERATING CURVE



Operating temperature range: 0105 size: from -55°C to +125°C; 0201~2512 size: from -55°C to +155°C.

STRUCTURE GRAPH



RATED VOLTAGE

Resistors should have a Rated Voltage DC or AC corresponding to Rated Power which can be calculated by formula as below.

The Rated Voltage of certain resistance value should be the calculated result or Max. Working Voltage of product series whichever less.

Formula:

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

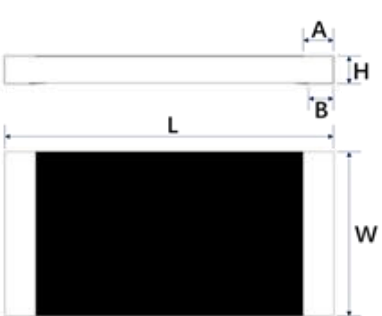
E=Rated voltage(V)

P=Rated power(W)

R=Nominal resistance(Ω)

DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	0105	0.40±0.02	0.20±0.02	0.13±0.02	0.10±0.03	0.10±0.03
	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
	0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	1206	3.10±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
	1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	1812	4.50±0.20	3.20±0.20	0.55±0.20	0.50±0.20	0.50±0.20
	2010	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
	2512	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20

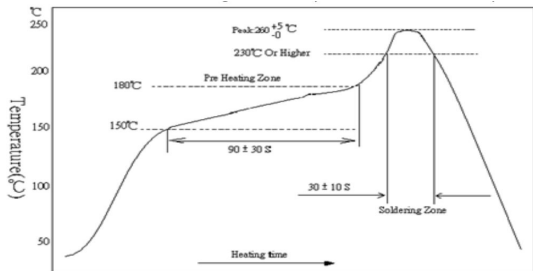
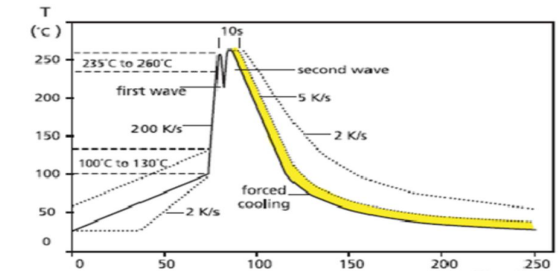
RELIABILITY

Item	Test Method	Acceptable criterion								
Temperature Coefficient of Resistance (T.C.R.)	$TCR(PPM/^{\circ}C) = \frac{(R_2 - R_1)}{R_1 \times (T_2 - T_1)} \times 10^6$ <p> R_1 = Value in room temperature R_2 = Value in test temperature -55°C or +125°C T_1 = Room temperature T_2 = Test temperature -55°C or +125°C Reference: IEC 60115-1 6.2 </p>	GR0105: 1Ω ≤ R < 10Ω: -200~+600PPM/°C 10Ω ≤ R < 100Ω: ±300PPM/°C ≥ 100Ω: ±200PPM/°C GR0201: 1Ω ≤ R ≤ 10Ω: -100~+350PPM/°C > 10Ω: ±200PPM/°C GR0402~2512: 1Ω ≤ R ≤ 10Ω: ±200PPM/°C 10 Ω < R ≤ 10M: ±100PPM/°C 10M < R ≤ 22MΩ: ±200PPM/°C 22M < R ≤ 100MΩ: ±300PPM/°C								
Insulation Resistance	Using the parallel clamp method: 100±15V _{dc} voltage is applied between the electrode and the substrate within 60 seconds. Test the insulation resistance between the terminal and the back of the part. Reference: IEC 60115-1 12.1.3.5	≥ 10 ⁹ Ω								
Dielectric Withstanding Voltage	Apply an alternating current between the electrode and substrate, with the effective value of the maximum overload voltage referring to the DWV characteristics, and maintain the pressure for 60 ± 5 seconds. Reference: IEC 60115-1 12.2.4	Test to confirm if the presence of current or arc breakdown by ≥ 10uA								
Short Time Over Load	Apply 2.5 times of rated voltage or maximum overload voltage (whichever is the smallest) for 5 seconds Reference: IEC 60115-1 8.1.4.2	1% series: ΔR/R=±(1.0%+0.05Ω) 5% series: ΔR/R=±(2.0%+0.05Ω) 0105: ΔR/R=±(2.0%+0.05Ω) Jumper: < 50mΩ								
Intermittent Overload	Put it in the thermostat, apply 2.5 times of rated voltage, 1 second ON, 25 seconds OFF, 10000 ⁺⁴⁰⁰ ₋₀ cycles, take it out and stand for 60 minutes, then measure the change rate of resistance value. Reference: IEC 60115-1 8.4.4	ΔR/R=±(5.0%+0.05Ω) Jumper: < 50mΩ								
Resistance to Solvent	Immerse in isopropanol solvent at room temperature (23±5°C) for 5min, wipe 10 times with a hard toothbrush, repeat 3 times, take out and blow dry for examination Reference: IEC 60115-1 11.3.2 method1	No obvious damage, peeling, swelling phenomenon								
Solderability	Pretreatment: dry heat 155°C, 4H, after take out, stand at room temperature for 2 hours. Test method B1: Dip the resistance in a tin furnace at 245±5°C for 5 seconds, then take it out and observe the solder area under a microscope; Method D: 260±5°C, T=30+5/-0s. Reference: J-STD-002 & IEC 60115-1 11.1.4.3	1. Solder coverage over 95% 2. No more than 5% of the partially exposed substrate, non-wetted plating or ceramic substrate part.								
Resistance to Soldering Heat	Reflow test, time above 217 °C is 60s-150s, time above 250 ± 5°C is 30±5s. Reference: IEC 60115-1 11.2.4.3& MIL-STD-202 Method 210	ΔR/R=±(1.0%+0.05Ω) Jumper: < 50mΩ								
Thermal Shock	High and low temperature test is carried out according to the upper and lower limits of the application temperature of the parts, the residence time of the upper and lower limits of the temperature is 30min, and the temperature conversion time is less than 30s, lasting 500 cycles Reference: IEC 60115-1 10.1.4	ΔR/R=±(1.0%+0.05Ω) Jumper: < 50mΩ								
Solder Joint Endurance Test	The SMD resistance was welded to the test board and bent with the standard pressure block. After standing for 60 sec. under the corresponding deformation condition, the change rate of resistance value of the part was tested. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Size</td> <td style="width: 25%;">0402, 0603, 0805</td> <td style="width: 25%;">0105, 0201, 1206, 1210</td> <td style="width: 35%;">1812, 2010, 2512</td> </tr> <tr> <td>Depth</td> <td>5mm</td> <td>3mm</td> <td>2mm</td> </tr> </table> Reference: IEC 60115-1 9.8.4	Size	0402, 0603, 0805	0105, 0201, 1206, 1210	1812, 2010, 2512	Depth	5mm	3mm	2mm	ΔR/R=±(1.0%+0.05Ω) Jumper: < 50mΩ
Size	0402, 0603, 0805	0105, 0201, 1206, 1210	1812, 2010, 2512							
Depth	5mm	3mm	2mm							
Resistance to Dry Heat	Put it in an oven at 155±5°C for 1000 ⁺⁴⁸ ₋₀ hrs., take it out and let it stand for more than 1hr., then measure the change rate of resistance value Reference: IEC 60115-1 7.3	1% series: ΔR/R=±(1.0%+0.05Ω) 5% series: ΔR/R=±(3.0%+0.05Ω) 0105: ΔR/R=±(3.0%+0.05Ω) Jumper: < 50mΩ								

Item	Test Method	Acceptable criterion								
Loading Life in Moisture	Place it in a constant temperature and humidity box with 40±2°C and 90–96%RH and apply the voltage (IEC 60115-1 10.4 Table 22) for 1000 hrs. Take it out and stand for 30 minutes before applying rated voltage for 1 minute, and then measure the change rate. Reference: IEC 60115-1 10.4	1% series: $\Delta R/R = \pm(1.0\% + 0.05\Omega)$ 5% series: $\Delta R/R = \pm(3.0\% + 0.05\Omega)$ 0105: $\Delta R/R = \pm(3.0\% + 0.05\Omega)$ Jumper: < 100mΩ								
Load Life	Put in an oven at 70±2°C, apply rated voltage, 90 min ON, 30 min OFF, 1000 hrs., take out and stand for more than 60 min, then measure the resistance change rate. Reference: IEC 60115-1 7.1	1% series: $\Delta R/R = \pm(1.0\% + 0.05\Omega)$ 5% series: $\Delta R/R = \pm(3.0\% + 0.05\Omega)$ 0105: $\Delta R/R = \pm(3.0\% + 0.05\Omega)$ Jumper: < 100mΩ								
Low temperature load test	-55°C, unpowered, 1 hr.: Rated voltage/current for 45 minutes, then unpowered within 15 minutes, return to room temperature, take out and stand for 24 hours, then measure the change rate of resistance value. Reference: IEC 60115-1 10.2.4	1% series: $\Delta R/R = \pm(1.0\% + 0.05\Omega)$ 5% series: $\Delta R/R = \pm(2.0\% + 0.05\Omega)$ 0105: $\Delta R/R = \pm(2.0\% + 0.05\Omega)$ Jumper: < 50mΩ								
Shear force test	Weld the part to the PCB. Apply the corresponding test stress from the side of the part with the test terminal for 10s. Check the appearance of the welded end of the part under the stress condition <table border="1" style="margin-left: 20px;"> <tr> <td>Size</td> <td>0201</td> <td>0402</td> <td>0603, 0805, 1206, 1210, 1812, 2010, 2512</td> </tr> <tr> <td>Test force</td> <td>2N</td> <td>10N</td> <td>18N</td> </tr> </table> Reference: IEC 60115-1 9.7	Size	0201	0402	0603, 0805, 1206, 1210, 1812, 2010, 2512	Test force	2N	10N	18N	Without visible damage.
Size	0201	0402	0603, 0805, 1206, 1210, 1812, 2010, 2512							
Test force	2N	10N	18N							

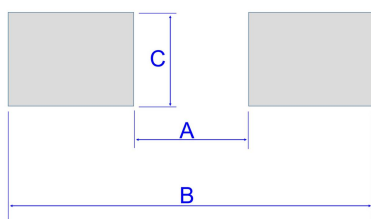
SOLDERING TEMPERATURE

- Recommendation only. Please adjust it according to the actual application

Lead-free IR Reflow Soldering Profile	Lead-free Double-Wave Soldering Profile
	
Note: <ul style="list-style-type: none"> • The Max. Temp. is 260⁺⁵₀°C within 10 sec • Reference: J-STD-020D 	Note: <ul style="list-style-type: none"> • Suit for ≥ 0603 size • Manual soldering in 350±10°C within 3 sec.

SOLDERING PAD

Resistance value would be lower than nominal value because of joint with soldering material, so designing circuit should adjust the pad size



Type	Unit: mm		
	A	B	C
0105	0.2	0.5	0.2
0201	0.3	1.0	0.4
0402	0.5	1.5	0.6
0603	0.8	2.1	0.9
0805	1.2	3.0	1.3
1206	2.2	4.2	1.6
1210	2.2	4.2	2.8
1812	3.1	5.9	3.0
2010	3.5	6.1	2.8
2512	3.8	8.0	3.5

WORKING ENVIRONMENT

If user intends to use products in special environments or states (including but not limited to the following), it is necessary to approve special characteristics and reliability for the following or other application environments.

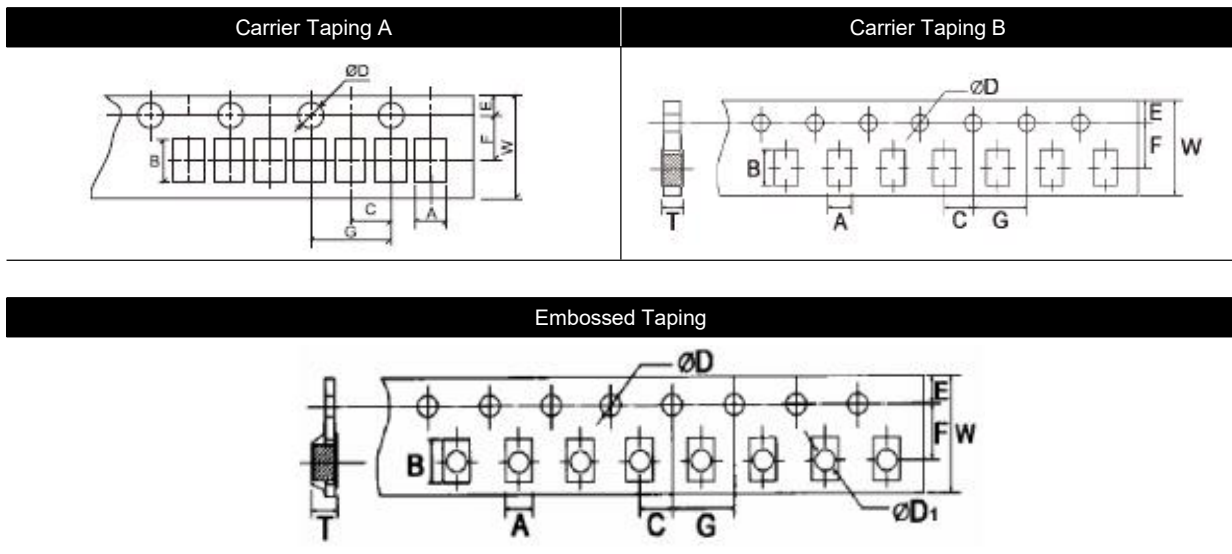
- A. High temperature, high moisture.
- B. Near the sea, or corrosive gas, such as Cl₂, H₂S, NH₃, SO₂ and NO₂, etc.
- C. Unverified liquids, such as water, oil, chemical or organic solvent.
- D. Unverified resin or paint to cover products.
- E. Products should be washed with water soluble cleaner even if non cleaning flux.

STORAGE / CARRY CONDITIONS

- A. Temperature: 25±5°C
- B. Humidity: 60±15%RH
- C. Storage life: 0105/0201 size: 1 year; ≥0402 size: 2 years. FIFO.
- D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or body may be damaged.

TAPING SPECIFICATIONS

- A. Taping drawing



- B. Taping Dimensions

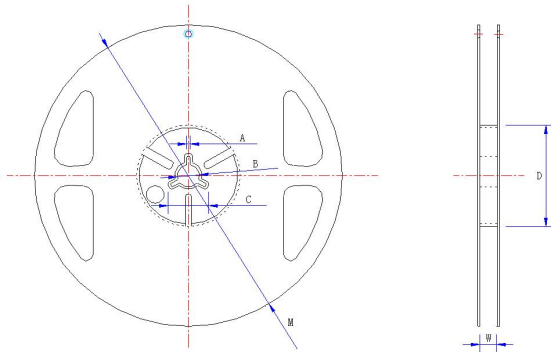
unit: mm

Type or Size	A±0.2	B±0.2	C±0.05	ØD ^{+0.1} ₀	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1	
Carrier Taping A	0105	0.24±0.05	0.45±0.05	2.0	1.5	1.75	3.5	4.0	8.0	0.40
	0201	0.40±0.05	0.70±0.05	2.0	1.5	1.75	3.5	4.0	8.0	0.47
	0402	0.67±0.1	1.17±0.1	2.0	1.5	1.75	3.5	4.0	8.0	0.47
Carrier Taping B	0603	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
	0805	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1206	1.90	3.45	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1210	2.85	3.50	2.0	1.5	1.75	3.5	4.0	8.0	0.81

Type or Size		A±0.2	B±0.2	C±0.05	$\varnothing D_{-0}^{+0.1}$	$\varnothing D_{-0}^{+0.25}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Embossed Taping	2010	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
	1812	3.50	4.80	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
	2512	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00

REEL SPECIFICATION

A. Reel drawing



B. Reel dimension

unit: mm

Type	SPQ PCS/RI.	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
0105	20,000	2.0	13.0	21.0	60.0	178.0	10.0
0201	15,000	2.0	13.0	21.0	60.0	178.0	10.0
0402	10,000	2.0	13.0	21.0	60.0	178.0	10.0
0603	5,000	2.0	13.0	21.0	60.0	178.0	10.0
0805	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1206	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1210	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1812	4,000	2.0	13.0	21.0	60.0	178.0	13.8
2010	4,000	2.0	13.0	21.0	60.0	178.0	13.8
2512	4,000	2.0	13.0	21.0	60.0	178.0	13.8

LABEL SPECIFICATION

A. Produce Label (Ref.)



B. Customer Label (Ref.)



PACKING BOX

A. Packing Type

Taping in reel / Bulk in plastic bag.

B. Inner box

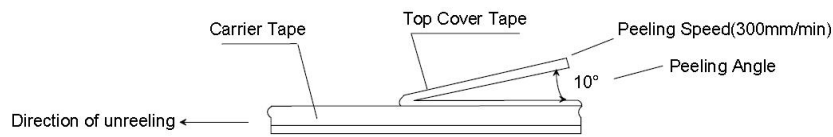
The inner box has several capacities hold 1 reel, 2 reels, 3 reels, 4 reels, 5 reels and 10 reels.

C. Out box

The out box has two capacities hold 6- or 8-pieces inner box.

NOTE OF COVER TAPE PEEL OFF

A. Figure of cover tape peel off.



B. Please keep peeling speed under 300mm per minute.

C. Please keep the angle between cover tape and direction of unreeling narrower than 10 degree.

D. There is limit of adhesive force between cover tape and carrier tape or embossed tape shown as following table.

Size of chip resistors	0105, 0201	0402	0603 and above
Adhesive force limit	6~30gf	10~40gf	10~70gf

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