

FEATURE

- Tiny and light with thick film technology
- High reliability
- RoHS complaint
- Compatible with reflow and wave soldering type
- MSL class: MSL 1
- Applications
 - Home appliances
 - Telecommunications
 - Smart wears
 - Computer, notebook, workstation, tablet, and peripherals
 - Instruments and meters
 - etc.

MANUFACTURER PART NO.

For example: GR1206J100KT5G00-GR1206 ±5% 100KΩ T/R-5000

Series	Size	Tol.	Nominal Resistance Value	PKG	SPQ	Feature	TCR
2 codes	4 codes	1 code	2~5 codes	1 code	1 code	1 code	2 codes
GR	1206	J	100K	T	5	G	00
General Purpose Thick Film Chip Resistors	0105 0201 0402 0603 0805 1206 1210 1812 2010 2512	D=±0.5% F=±1% J=±5%	0R=Jumper(< 50mΩ) 1R¹=1Ω 4R7²=4.7Ω 4K7³=4.7KΩ 100K=100KΩ 4M⁷=4.7MΩ 22M=22MΩ	T=T/R⁴	4=4K 5=5K A=10K B=15K C=20K D=50K E=60K	G=Std. S=P.C. ^⑤	00=Refer to item RELIABILITY.

Note: ① R=Radix, 10^0 , Ω

② K=Kilo, 10^3 , KΩ

③ M=Mega, 10^6 , MΩ

④ T/R=Taping in Reel Package.

⑤ P.C.=Personal and Customized.

CHARACTERISTICS

Series	Rated Power	MWV ^①	MOV ^②	DWV ^③	Jumper MRC ^④	Jumper MOC ^⑤	Resistance Value Range			
							±0.5%	±1%	±5%	Jumper
GR0105	1/32W	15V	30V	-	0.5A	1A	-	10Ω-10MΩ	1Ω-10MΩ	< 50mΩ
GR0201	1/20W	25V	50V	-	0.5A	1A	-	1Ω-10MΩ	1Ω-10MΩ	< 50mΩ
GR0402	1/16W	50V	100V	100V	1A	2A	1Ω-10MΩ	1Ω-22MΩ	1Ω-22MΩ	< 50mΩ
GR0603	1/10W	75V	150V	300V	1A	2A	1Ω-10MΩ	1Ω-22MΩ	1Ω-100MΩ	< 50mΩ
GR0805	1/8W	150V	300V	500V	2A	5A	1Ω-10MΩ	1Ω-22MΩ	1Ω-100MΩ	< 50mΩ
GR1206	1/4W	200V	400V	500V	2A	10A	1Ω-10MΩ	1Ω-22MΩ	1Ω-100MΩ	< 50mΩ
GR1210	1/2W	200V	500V	500V	2A	10A	1Ω-10MΩ	1Ω-22MΩ	1Ω-100MΩ	< 50mΩ
GR1812	3/4W	200V	500V	500V	2A	10A	1Ω-10MΩ	1Ω-22MΩ	1Ω-100MΩ	< 50mΩ
GR2010	3/4W	200V	500V	500V	2A	10A	1Ω-10MΩ	1Ω-22MΩ	1Ω-100MΩ	< 50mΩ
GR2512	1W	200V	500V	500V	2A	10A	1Ω-10MΩ	1Ω-22MΩ	1Ω-100MΩ	< 50mΩ

Note: ① MWV=Max. Working Voltage.

② MOV=Max. Overload Voltage.

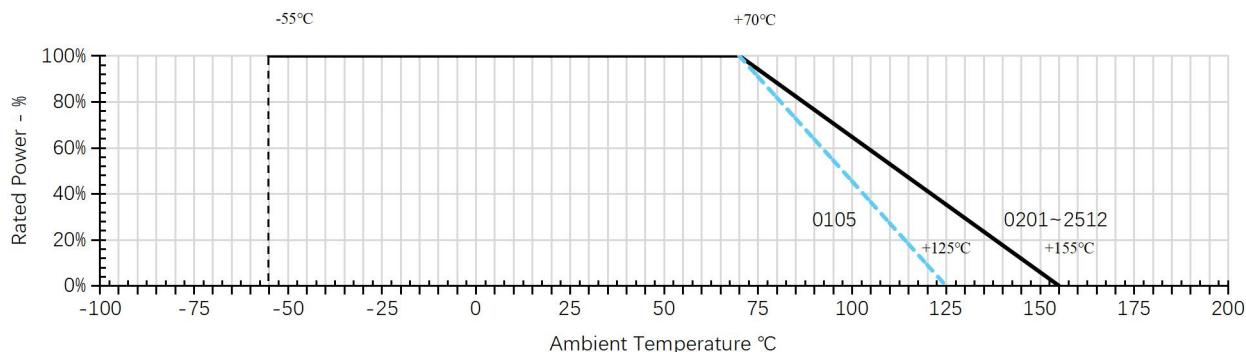
③ DWV=Dielectric Withstanding Voltage

④ MRC=Max. Rated Current

⑤ MOC=Max. Overload Current

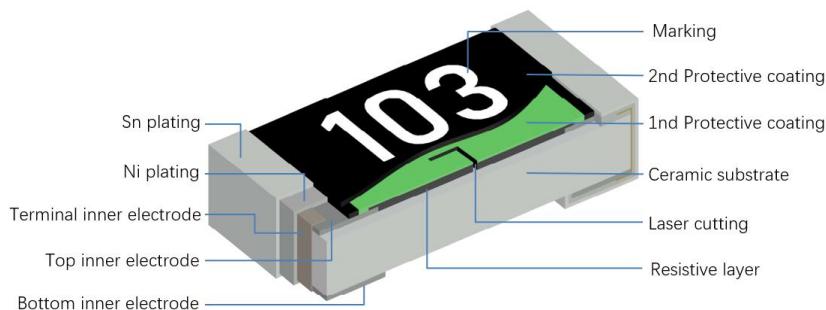
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POWER DERATING CURVE



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:

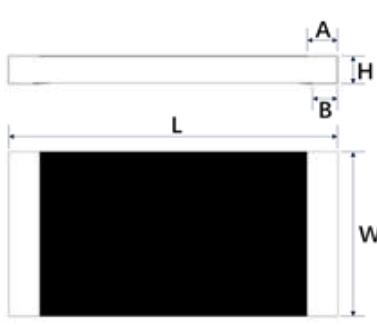
$$E = \sqrt{P \times R}$$

E=Rated voltage(V)

P=Rated power(W)

R=Nominal resistance(Ω)

DIMENSIONS

Figure	Type	Unit: mm				
		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

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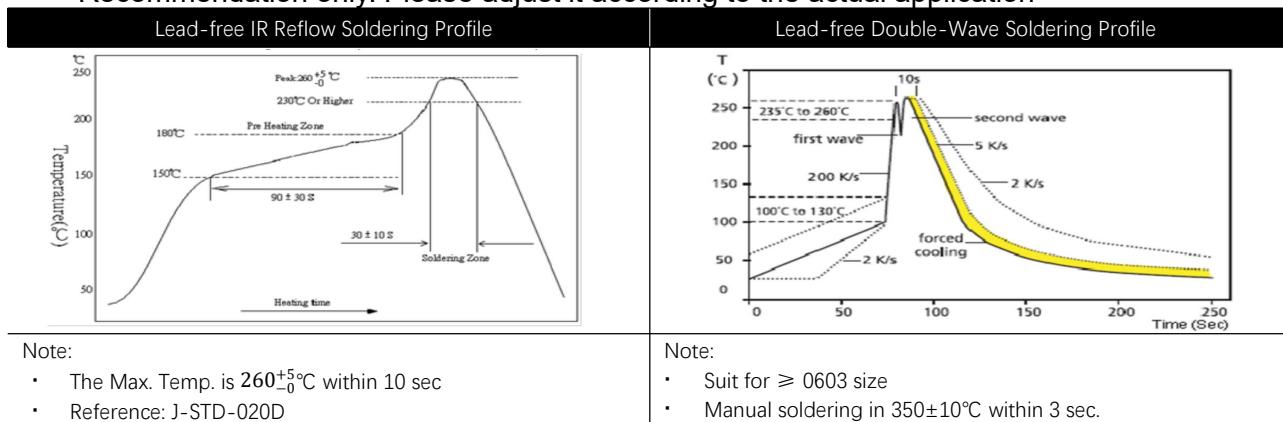
RELIABILITY

Item	Test Method	Acceptable criterion								
Temperature Coefficient of Resistance (T.C.R.)	$\text{TCR(PPM/}^{\circ}\text{C)} = \frac{(R_2 - R_1)}{R_1 \times (T_2 - T_1)} \times 10^6$ <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 10Ω < R ≤ 10MΩ: ±100PPM/°C 10MΩ < R ≤ 22MΩ: ±200PPM/°C 22MΩ < 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: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(2.0%+0.05Ω) 0105: △R/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	△R/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	△R/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	△R/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="padding: 2px;">Size</td> <td style="padding: 2px;">0402, 0603, 0805</td> <td style="padding: 2px;">0105, 0201, 1206, 1210</td> <td style="padding: 2px;">1812, 2010, 2512</td> </tr> <tr> <td style="padding: 2px;">Depth</td> <td style="padding: 2px;">5mm</td> <td style="padding: 2px;">3mm</td> <td style="padding: 2px;">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	△R/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: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(3.0%+0.05Ω) 0105: △R/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 $40\pm2^\circ\text{C}$ 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: $< 100\text{m}\Omega$								
Load Life	Put in an oven at $70\pm2^\circ\text{C}$, 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: $< 100\text{m}\Omega$								
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: $< 50\text{m}\Omega$								
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: auto; margin-right: auto;"><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							

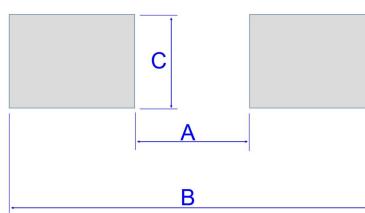
SOLDERING TEMPERATURE

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



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	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.

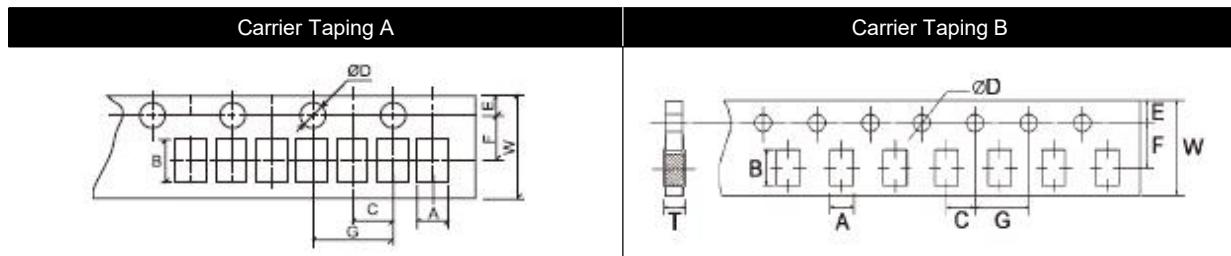
- A. High temperature, high moisture.
- B. Near the sea, or corrosive gas, such as Cl₂, H₂S, NH₃, SO₂ and NO₂, etc.
- C. Unverified liquids, such as water, oil, chemical or organic solvent.
- D. Unverified resin or paint to cover products.
- E. Products should be washed with water soluble cleaner even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

STORAGE / CARRY CONDITIONS

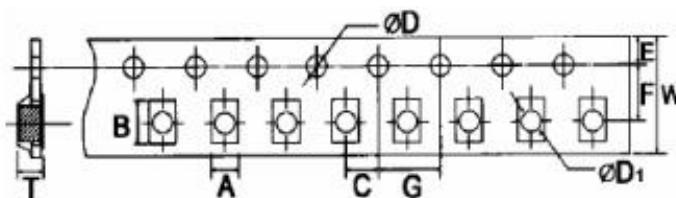
- A. Temperature: 25±5°C
- B. Humidity: 60±15%RH
- C. Storage life: 0105/0201 size: 1 year; ≥0402 size: 2 years. FIFO.
- D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or body may be damaged.

TAPING SPECIFICATIONS

- A. Taping drawing



Embossed Taping



- B. Taping Dimensions

unit: mm

Type or Size		A±0.2	B±0.2	C±0.05	ØD ^{+0.1}	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

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GR Series

General Purpose Thick Film Chip Resistors

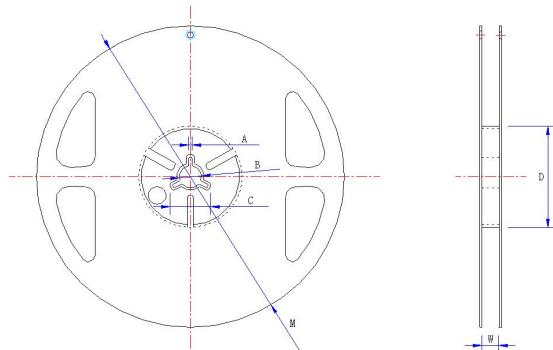
Version. H



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
	1812	3.50	4.80	2.00	1.50	1.50	1.75	5.50	4.00	12.00
	2512	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00

REEL SPECIFICATION

A. Reel drawing



B. Reel dimension

unit: mm

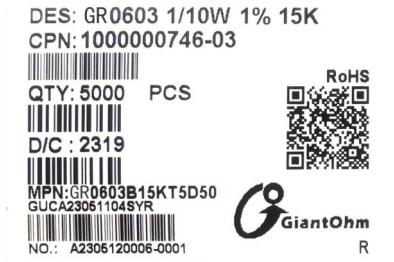
Type	SPQ PCS/RI.	A ± 0.5	B ± 0.5	C ± 0.5	D ± 1	M ± 2	W ± 1
0105	20,000	2.0	13.0	21.0	60.0	178.0	10.0
0201	15,000	2.0	13.0	21.0	60.0	178.0	10.0
0402	10,000	2.0	13.0	21.0	60.0	178.0	10.0
0603	5,000	2.0	13.0	21.0	60.0	178.0	10.0
0805	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1206	5,000	2.0	13.0	21.0	60.0	178.0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



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PACKING BOX

A. Packing Type

Taping in reel / Bulk in plastic bag.

B. Inner box

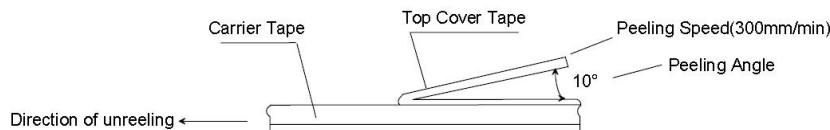
The inner box has several capacities hold 1 reel, 2 reels, 3 reels, 4 reels, 5 reels and 10 reels.

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 unreeeling 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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VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2022/05/25	-	First version
B	2022/10/31	Reliability	Updated test items, test methods and acceptable criterion.
C	2023/01/31	Characteristics	0402~2512 size, Resistance Value range extended to 22MΩ
D	2023/02/03	Full	Add 1812 size
E	2023/04/27	Full	Add 0105 size 0603~2512 size, Resistance Value range extended to 100MΩ
F	2023/07/21	Reliability	Updated test items, test methods.
G	2023/12/26	Full	Add Packing Specifications.
H	2024/05/13	Full	Add Jumper Description in MPN Add Jumper test acceptable criterion. Add Moisture sensitivity level description.