

# GR Series\_Low Value

## General Purpose Low Resistance Thick Film Chip Resistors

Version. H



### FEATURE

- High reliability.
- Low resistance value down to 10mΩ.
- RoHS and Halogen-free compliance
- Compatible with reflow and wave soldering type.
- MSL class: MSL 1
- Applications:
  - Home appliances
  - Computer, notebook, workstation, tablet, and peripherals
  - Instruments and meters
  - etc.

### MANUFACTURER PART NO.

For example: GR1206J0R01T5G00-GR1206 5% 10mΩ 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	0R01	T	5	G	00
General Purpose Low Resistance Thick Film Chip Resistors	0402 0603 0805 1206 1210 1812 2010 2512	F=1% J=5%	0R01 <sup>①</sup> =0.01Ω, 10mΩ 0R47=0.47Ω, 470mΩ	T=T/R <sup>②</sup>	4=4K 5=5K A=10K	G=Std. S=P.C. <sup>③</sup>	00=Refer to table as below.

Note: ① R=Radix, 10<sup>0</sup>, Ω

② T/R=Taping in Reel package type

③ P.C.: Personal and Customized.

### CHARACTERISTICS

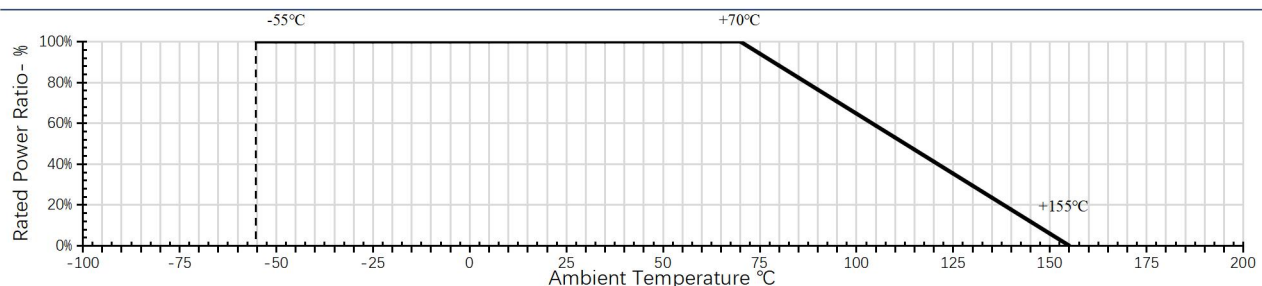
Type	Rated Power	MRC <sup>①</sup>	MOC <sup>②</sup>	DWV <sup>③</sup>	Tolerance	Value Range
GR0402	1/16W	0.79A	1.98A	100V	±1%/±5%	100mΩ ≤ R < 1000mΩ
GR0603	1/10W	3.16A	7.90A	300V	±1%/±5%	10mΩ ≤ R < 1000mΩ
GR0805	1/8W	1.10A	2.79A	500V	±1%/±5%	100mΩ ≤ R < 1000mΩ
	1/4W	5.00A	12.50A	500V	±1%/±5%	10mΩ ≤ R < 100mΩ
GR1206	1/4W	1.58A	3.95A	500V	±1%/±5%	100mΩ ≤ R < 1000mΩ
	1/3W	5.77A	14.43A	500V	±1%/±5%	10mΩ ≤ R < 100mΩ
GR1210	1/2W	7.07A	17.67A	500V	±1%/±5%	10mΩ ≤ R < 1000mΩ
GR1812	3/4W	8.66A	21.65A	500V	±1%/±5%	10mΩ ≤ R < 1000mΩ
GR2010	3/4W	8.66A	21.65A	500V	±1%/±5%	10mΩ ≤ R < 1000mΩ
GR2512	1W	10.00A	25.00A	500V	±1%/±5%	10mΩ ≤ R < 1000mΩ

Note: ① MRC=Max. Rated Current.

② MOC=Max. Overload Current.

③ DWV=Dielectric Withstanding Voltage.

### POWER DERATING CURVE



Note: Operating temperature range is from -55°C to +155°C

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## RATED VOLTAGE

The resistor shall have a Rated Current which would be DC or AC corresponding to the Rated Power, and it can be calculated by formula as below.

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

Formula:

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

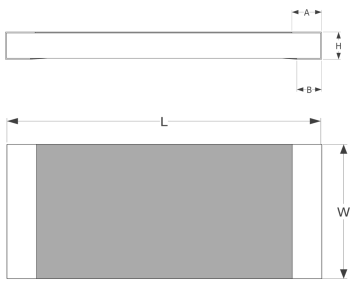
I=Rated current (A)

P=Rated power (W)

R=Nominal resistance (Ω)

## DIMENSIONS

Unit: mm

Figure	Series	L	W	H	A	B
	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±0.10	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> <math>R_1</math>=Value in room temperature  <math>R_2</math>=Value in test temperature -55°C or +125°C  <math>T_1</math>=Room temperature  <math>T_2</math>=Test temperature -55°C or +125°C  Reference: IEC 60115-1 6.2 </p>	<b>0402:</b> 100mΩ ≤ R < 1000mΩ: ±1000PPM/°C <b>0603:</b> 10mΩ ≤ R ≤ 30mΩ: ±1500PPM/°C 30mΩ < R ≤ 50mΩ: ±1000PPM/°C 50mΩ < R < 1000mΩ: ±800PPM/°C <b>0805, 1206, 1210, 1812, 2010, 2512:</b> 10mΩ ≤ R ≤ 15mΩ: ±1500PPM/°C 15mΩ < R ≤ 30mΩ: ±1000PPM/°C 30mΩ < R < 1000mΩ: ±800PPM/°C
Insulation Resistance	Using the parallel clamp method: 100±15V <sub>DC</sub> 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 <sup>9</sup> 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 Overload	Apply 2.5 times of rated current or Max. Overload Current. whichever is less 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)
Intermittent Overload	Put it in the thermostat, apply 2.5 times of rated current, 1 second ON, 25 seconds OFF, count 10000 <sup>+400</sup> <sub>-0</sub> times, 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)
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 measure. Reference: IEC 60115-1 11.3.2 method1	No obvious damage, peeling, swelling phenomenon

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Item	Test Method	Acceptable criterion								
Solderability	Pretreatment: dry heat 155℃, 4H, after taking out, stand at room temperature for 2 hours. Test method B1: Dip the resistance in a tin furnace at 245±5℃ for 5 seconds, then take it out and observe the solder area under a microscope. Method D: 260±5℃, 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℃ is 30±5s. Reference: IEC 60115-1 11.2.4.3& MIL-STD-202 Method 210	△R/R=±(1.0%+0.05Ω)								
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)								
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><tr><td>Size</td><td>0402, 0603, 0805</td><td>1206, 1210</td><td>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	1206, 1210	1812, 2010, 2512	Depth	5mm	3mm	2mm	△R/R=±(1.0%+0.05Ω)
Size	0402, 0603, 0805	1206, 1210	1812, 2010, 2512							
Depth	5mm	3mm	2mm							
Resistance to Dry Heat	Put it in an oven at 155±5℃ for 1000 <sup>+48</sup> <sub>0</sub> 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)								
Loading Life in Moisture	Place it in a constant temperature and humidity box with 40±2℃ and 90~96%RH and apply the rated current (IEC 60115-1 10.4 Table 22) for 1000 hrs. Take it out and stand for 30 minutes before applying rated current for 1 minute, and then measure the change rate. Reference: IEC 60115-1 10.4	1% series: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(3.0%+0.05Ω)								
Load Life	Put in an oven at 70±2℃, apply rated current, 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: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(3.0%+0.05Ω)								
Low temperature load test	-55℃, unpowered, 1 hr.: Rated 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: △R/R=±(1.0%+0.05Ω) 5% series: △R/R=±(2.0%+0.05Ω)								
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><tr><td>Size</td><td>0402</td><td>0603, 0805, 1206, 1210, 1812, 2010, 2512</td></tr><tr><td>Test force</td><td>10N</td><td>18N</td></tr></table> Reference: IEC 60115-1 9.7	Size	0402	0603, 0805, 1206, 1210, 1812, 2010, 2512	Test force	10N	18N	Without visible damage.		
Size	0402	0603, 0805, 1206, 1210, 1812, 2010, 2512								
Test force	10N	18N								

## SOLDERING

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

Lead-free IR Reflow Soldering Profile	Lead-free Double-Wave Soldering Profile
<p>Note:</p> <ul style="list-style-type: none"> <li>• The Max. Temp. is 260+5/-0°C within 10 sec</li> <li>• Reference: J-STD-020D</li> </ul>	<p>Note:</p> <ul style="list-style-type: none"> <li>• Suit for ≥ 0603 size</li> <li>• Manual soldering in 350±10°C within 3 sec</li> </ul>

## SOLDERING PAD

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

Unit: mm

Figure	Type	A	B	C
	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.

- High temperature, high moisture.
- Near the sea, or corrosive gas, such as  $\text{Cl}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$ ,  $\text{SO}_2$  and  $\text{NO}_2$ , etc.
- Unverified liquids, such as water, oil, chemical or organic solvent.
- Unverified resin or paint to cover products.
- Products should be washed with water soluble cleaner even if non cleaning flux.

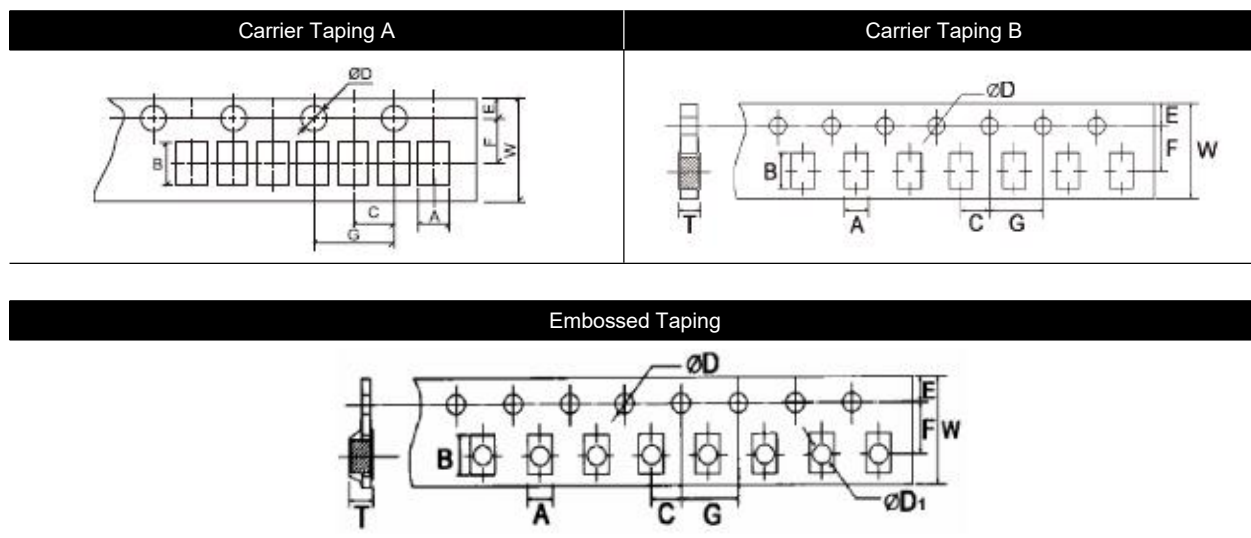
## STORAGE / CARRY CONDITIONS

- Temperature: 25±5°C
- Humidity: 60±15%RH
- Storage life: 2 years. FIFO
- 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.

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## TAPING

### A. Taping drawing



### B. Taping Dimensions

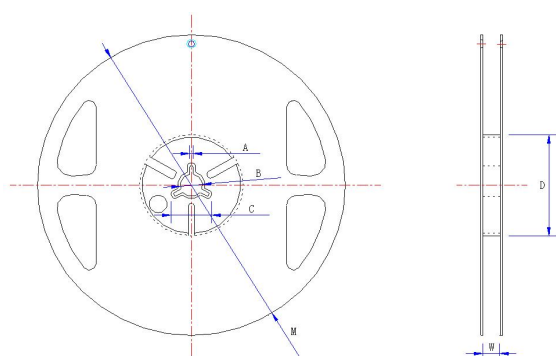
Unit: mm

Type or Size		A±0.2	B±0.2	C±0.05	$\varnothing D_{-0}^{+0.1}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Carrier Taping A	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
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. Process Label (Ref.)



B. Customer Label (Ref.)

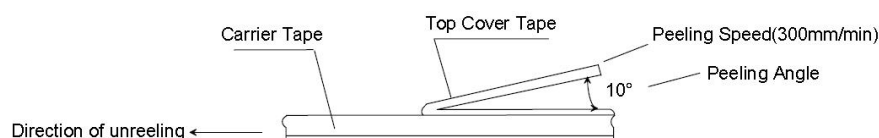


## PACKING BOX

- 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.

## TAPING UNREEL DIRECTION

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	0402	0603 and above
Adhesive force limit	10~40gf	10~70gf

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- Continued use of the products by the user after the Terms update shall constitute deemed acceptance of the new Terms.

#### 6. Effectiveness:

- This disclaimer does not exclude liability for personal injury caused by intentional misconduct or gross negligence, or other liabilities prohibited from exclusion by law.

## Version. H

## VERSION HISTORY

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