

GR Series - Low Value

General Purpose Low Resistance Thick Film Chip Resistors

Version. C



FEATURE

- High reliability.
- Low resistance value down to 10mΩ.
- RoHS complaint.
- Compatible with reflow and wave soldering type
- 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	F	0R01	T	5	G	00
General Purpose Low Resistance Thick Film Chip Resistors	0402 0603 0805 1206 1210 2010 2512	F=±1% J=±5%	0R01 ^① =0.01Ω, 10mΩ 0R47=0.47Ω, 470mΩ	T=T/R ^②	4=4K 5=5K	G=Std. S=P.C. ^③	00=Refer to table as below.

Note: ① R=Radix, 10⁰, Ω

② T/R=Taping in Reel package type

③ P.C.=Personal and Customized.

CHARACTERISTICS

Type	Rated Power	MWV ^①	MOV ^②	MRC ^③	MOC ^④	Tolerance	Value Range
GR0402	1/16W	50V	100V	0.79A	1.98A	±1%/±5%	100mΩ ≤ R < 1000mΩ
GR0603	1/10W	75V	150V	3.16A	7.90A	±1%/±5%	10mΩ ≤ R < 1000mΩ
GR0805	1/8W	150V	300V	1.10A	2.79A	±1%/±5%	100mΩ ≤ R < 1000mΩ
	1/4W	150V	300V	5.00A	12.50A	±1%/±5%	10mΩ ≤ R < 100mΩ
GR1206	1/4W	200V	400V	1.58A	3.95A	±1%/±5%	100mΩ ≤ R < 1000mΩ
	1/3W	200V	400V	5.77A	14.43A	±1%/±5%	10mΩ ≤ R < 100mΩ
GR1210	1/2W	200V	500V	7.07A	17.67A	±1%/±5%	10mΩ ≤ R < 1000mΩ
GR2010	3/4W	200V	500V	8.66A	21.65A	±1%/±5%	10mΩ ≤ R < 1000mΩ
GR2512	1W	200V	500V	10.00A	25.00A	±1%/±5%	10mΩ ≤ R < 1000mΩ

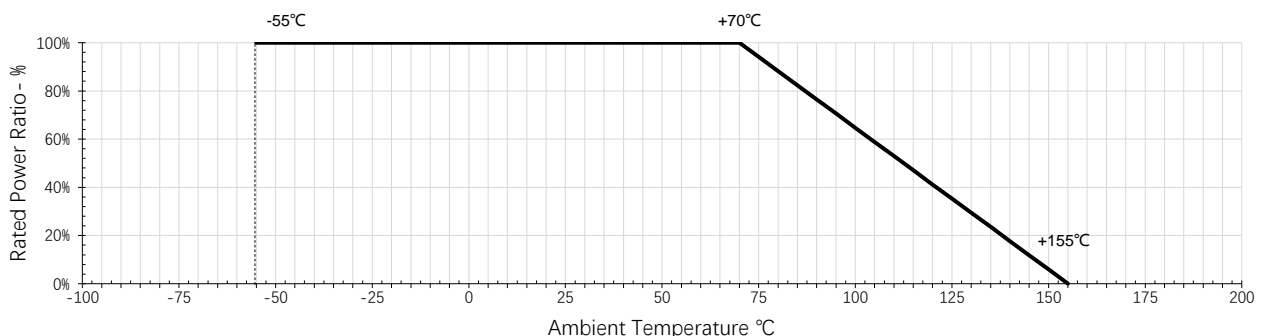
Note: ① MWV=Max. Working Voltage.

② MOV=Max. Overload Voltage.

③ MRC=Max. Rated Current.

④ MOC=Max. Overload Current.

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:

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

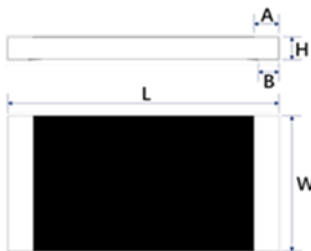
I=Rated current (A)

P=Rated power (W)

R=Nominal resistance (Ω)

DIMENSIONS

Unit: mm



Series	L	W	H	A	B
GR0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
GR0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
GR0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
GR1206	3.10±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
GR1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
GR2010	5.00±0.10	2.50±0.20	0.55±0.10	0.60±0.25	0.50±0.20
GR2512	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$^{\circ}$C or +125$^{\circ}$C T_1=Room temperature T_2=Test temperature -55$^{\circ}$C or +125$^{\circ}$C Reference: IEC 60115-1 6.2 </p>	<p>0402: 100mΩ \leq R < 1000mΩ: \pm1000PPM/$^{\circ}$C</p> <p>0603: 10mΩ \leq R \leq 30mΩ: \pm1500PPM/$^{\circ}$C 30mΩ < R \leq 50mΩ: \pm1000PPM/$^{\circ}$C 50mΩ < R < 1000mΩ: \pm800PPM/$^{\circ}$C</p> <p>0805, 1206, 1210, 2010, 2512: 10mΩ \leq R \leq 15mΩ: \pm1500PPM/$^{\circ}$C 15mΩ < R \leq 30mΩ: \pm1000PPM/$^{\circ}$C 30mΩ < R < 1000mΩ: \pm800PPM/$^{\circ}$C</p>
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	$\geq 10^9 \Omega$
Dielectric Withstanding Voltage	An alternating current with an effective value of the maximum overload voltage is applied between the electrode and the substrate at a rate of approximately 100V/sec. Pressure, maintain 60±5 sec. The test voltage reference to the DWV in characteristics. Reference: IEC 60115-1 12.2.4	Test to confirm if the presence of current or arc breakdown by $\geq 10\mu$ A
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: $\Delta R/R = \pm 1.0\%$ 5% series: $\Delta R/R = \pm 2.0\%$
Intermittent Overload	Put it in the thermostat, apply 2.5 times of rated voltage, 1 second ON, 25 seconds OFF, 10000 $_{-0}^{+400}$ cycles, take it out and stand for 60 minutes, then measure the change rate of resistance value. Reference: IEC 60115-1 8.4.4	$\Delta R/R = \pm 5.0\%$
Resistance to Solvent	Immerse in isopropanol solvent at room temperature (23±5 $^{\circ}$ 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

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Item	Test Method	Acceptable criterion										
Solderability	<p>Pretreatment: dry heat 155°C, 4 hrs. or PCT aging for 4 hrs. (equivalent), after take out, stand at room temperature for 2 hrs.</p> <p>Test method: 1. Dip the resistance in a tin furnace at 245±3°C for 3 seconds, then take it out and observe the solder area under a microscope; 2. Reflow soldering test, Peak Temperature: 235°C, T=40±5 sec. Reference: IEC 60115-1 11.1.4.3</p>	<p>1. Solder coverage over 95%</p> <p>2. No welding refusal phenomenon, side soldering height is greater than 1/2 of the height</p>										
Leaching	<p>Pretreatment: dry heat 155°C, 4 hrs. or PCT aging for 4 hrs. (equivalent), after take out, stand at room temperature for 2 hrs.</p> <p>dip in a tin furnace at 260±5°C for 30±1 seconds, remove and wash. Observe the area of solder under a microscope Reference: IEC-60068-2-58</p>	No electrode is eroded to expose the substrate phenomenon										
Resistance to Soldering Heat	<p>The tested resistor be immersed into molten solder of 260±5°C for 10 seconds. Then the resistor is left in the room for 1 hr., then measure the change rate of resistance value Reference: IEC 60115-1 11.2.4.3</p>	$\Delta R/R = \pm 1.0\%$										
Thermal Shock	<p>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</p>	$\Delta R/R = \pm 1.0\%$										
Solder Joint Endurance Test	<p>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.</p> <table border="1"> <tr> <td>Size</td> <td>0402, 0603, 0805</td> <td>1206, 1210</td> <td>2010, 2512</td> </tr> <tr> <td>Depth</td> <td>5mm</td> <td>3mm</td> <td>2mm</td> </tr> </table> <p>Reference: IEC 60115-1 9.8.4</p>	Size	0402, 0603, 0805	1206, 1210	2010, 2512	Depth	5mm	3mm	2mm	$\Delta R/R = \pm 1.0\%$		
Size	0402, 0603, 0805	1206, 1210	2010, 2512									
Depth	5mm	3mm	2mm									
Resistance to Dry Heat	<p>Put it in an oven at 155±5°C for 1000±48 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</p>	<p>1% series: $\Delta R/R = \pm 1.0\%$</p> <p>5% series: $\Delta R/R = \pm 3.0\%$</p>										
Loading Life in Moisture	<p>Place it in a constant temperature and humidity box with 40±2°C and 90~95%RH and apply the rated voltage with 90 minutes ON and 30 minutes OFF, 1000 hrs. Take it out and stand for 60 minutes, and then measure the change rate Reference: IEC 60115-1 10.4</p>	<p>1% series: $\Delta R/R = \pm 1.0\%$</p> <p>5% series: $\Delta R/R = \pm 3.0\%$</p>										
Load Life	<p>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</p>	<p>1% series: $\Delta R/R = \pm 1.0\%$</p> <p>5% series: $\Delta R/R = \pm 3.0\%$</p>										
Low temperature load test	<p>-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</p>	<p>1% series: $\Delta R/R = \pm 1.0\%$</p> <p>5% series: $\Delta R/R = \pm 2.0\%$</p>										
Shear force test	<p>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</p> <table border="1"> <tr> <td>Size</td> <td>0402, 0603</td> <td>0805</td> <td>1206, 1210</td> <td>2010, 2512</td> </tr> <tr> <td>Test force</td> <td>5N</td> <td>9N</td> <td>25N</td> <td>45N</td> </tr> </table> <p>Reference: IEC 60115-1 9.7</p>	Size	0402, 0603	0805	1206, 1210	2010, 2512	Test force	5N	9N	25N	45N	Without obvious damage.
Size	0402, 0603	0805	1206, 1210	2010, 2512								
Test force	5N	9N	25N	45N								

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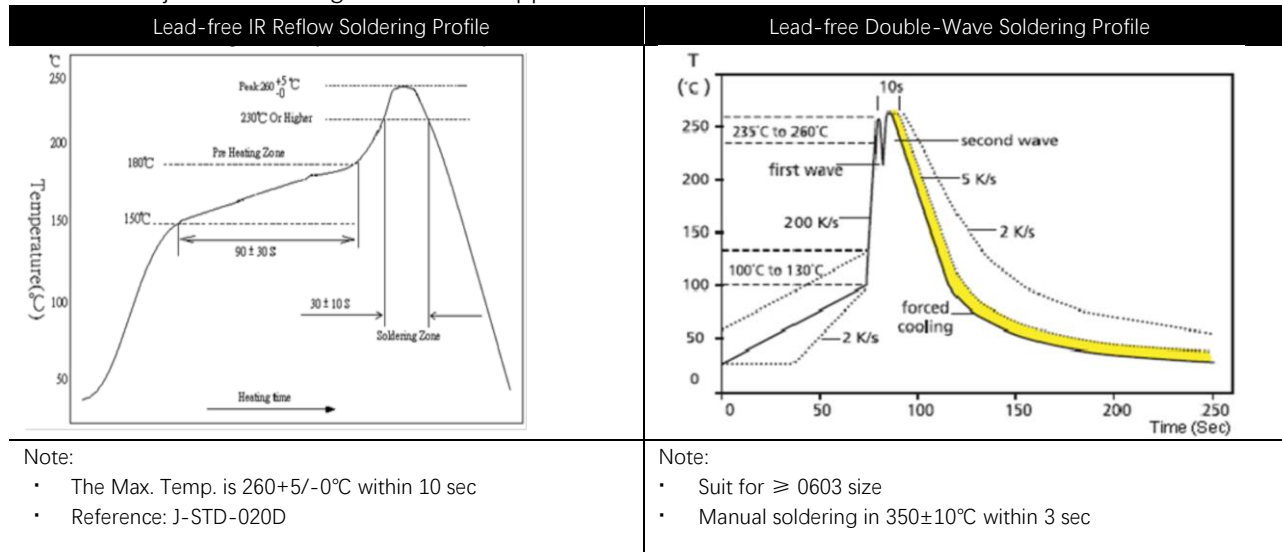
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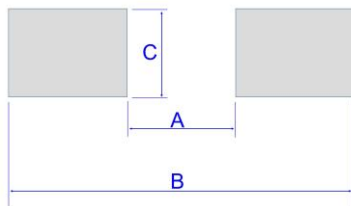
SOLDERING TEMPERATURE

- 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



Unit: mm

Type	A	B	C
GR0402	0.5	1.5	0.6
GR0603	0.8	2.1	0.9
GR0805	1.2	3.0	1.3
GR1206	2.2	4.2	1.6
GR1210	2.2	4.2	2.8
GR2010	3.5	6.1	2.8
GR2512	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 Cl₂, H₂S, NH₃, SO₂ and NO₂, 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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