

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:

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

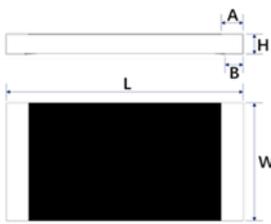
E=Rated voltage(V)

P=Rated power(W)

R=Nominal resistance(Ω)

DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	LC0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
	LC0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	LC0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	LC1206	3.10±0.10	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20

RELIABILITY

Item	Test Method	Acceptable criterion
Temperature Coefficient of Resistance (T.C.R.)	$TCR(PPM/^{\circ}C) = \frac{(R_2 - R_1)}{R_1 \times (T_2 - T_1)} \times 10^6$ 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	0402: ±50ppm/°C 0603: 1Ω ≤ R ≤ 10Ω: ±100ppm/°C 10Ω < R ≤ 1MΩ: ±50ppm/°C 0805: 1Ω ≤ R ≤ 10Ω: ±100ppm/°C 10Ω < R ≤ 1MΩ: ±50ppm/°C 1206: 1Ω ≤ R ≤ 10Ω: ±100ppm/°C 10Ω < R ≤ 1MΩ: ±50ppm/°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	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/s Pressure, maintain 60s± 5S. 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 ≥ 10uA
Short Time Over Load	Apply 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 seconds Reference: IEC 60115-1 8.1.4.2	1% series: ΔR/R=±1.0% 5% series: ΔR/R=±2.0%
Intermittent Overload	Put it in the thermostat, apply 2.5 times rated voltage, 1 second ON, 25 seconds OFF, count 10000 ^{±400} 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%
Resistance to Solvent	Immerse in isopropanol solvent at room temperature (23±5) 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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LC Series

Low TCR Thick Film Chip Resistors

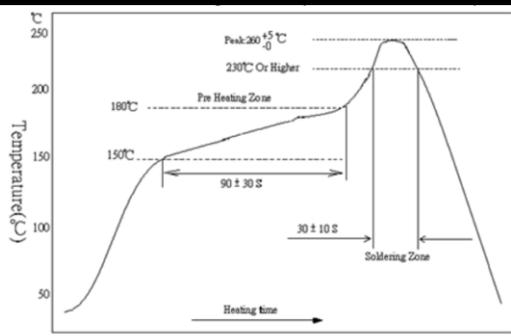
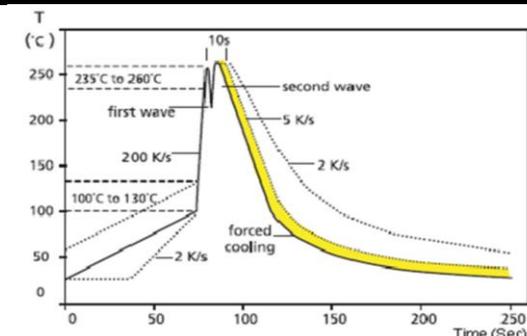
Version. B



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.</p> <p>Reference: IEC 60115-1 11.1.4.3</p>	<p>1. Solder coverage over 95% 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⁺⁵₀ °C for 30⁺¹₀ seconds, remove and wash. Observe the area of solder under a microscope</p> <p>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⁺⁵₀ °C for 10 seconds. Then the resistor is left in the room for 1 hour, then measure the change rate of resistance value</p> <p>Reference: IEC 60115-1 11.2.4.3</p>	ΔR/R=±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</p> <p>Reference: IEC 60115-1 10.1.4</p>	ΔR/R=±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 60s 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>0201, 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	0201, 1206, 1210	2010, 2512	Depth	5mm	3mm	2mm	ΔR/R=±1.0%				
Size	0402, 0603, 0805	0201, 1206, 1210	2010, 2512											
Depth	5mm	3mm	2mm											
Resistance to Dry Heat	<p>Put it in an oven at 155±5°C for 1000⁺⁴⁸₀ hrs., take it out and let it stand for more than 1hr., then measure the change rate of resistance value</p> <p>Reference: IEC 60115-1 7.3</p>	<p>1% series: ΔR/R=±1.0% 5% series: ΔR/R=±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, on for 90 minutes and off for 30 minutes, a total of 1000 hours. Take it out and stand for 60 minutes, and then measure the change rate</p> <p>Reference: IEC 60115-1 10.4</p>	<p>1% series: ΔR/R=±1.0% 5% series: ΔR/R=±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.</p> <p>Reference: IEC 60115-1 7.1</p>	<p>1% series: ΔR/R=±1.0% 5% series: ΔR/R=±3.0%</p>												
Low temperature load test	<p>-55°C unpowered for 1 hour: rated voltage/current for 45 minutes, unpowered for 15 minutes, return to room temperature, take out and stand for 24 hours, then measure the change rate of resistance value.</p> <p>Reference: IEC 60115-1 10.2.4</p>	<p>1% series: ΔR/R=±1.0% 5% series: ΔR/R=±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>0201</td> <td>0402, 0603</td> <td>0805</td> <td>1206, 1210</td> <td>2010, 2512</td> </tr> <tr> <td>Test force</td> <td>2N</td> <td>5N</td> <td>9N</td> <td>25N</td> <td>45N</td> </tr> </table> <p>Reference: IEC 60115-1 9.7</p>	Size	0201	0402, 0603	0805	1206, 1210	2010, 2512	Test force	2N	5N	9N	25N	45N	Without obvious injury
Size	0201	0402, 0603	0805	1206, 1210	2010, 2512									
Test force	2N	5N	9N	25N	45N									

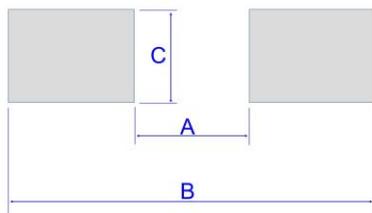
SOLDERING TEMPERATURE

• 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"> • The Max. Temp. is $260 \pm 5^{\circ}\text{C}$ within 10 sec • Reference: J-STD-020D 	<p>Note:</p> <ul style="list-style-type: none"> • Suit for ≥ 0603 size • Manual soldering in $350 \pm 10^{\circ}\text{C}$ 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



Unit: mm

Type	A	B	C
LC0402	0.5	1.5	0.6
LC0603	0.8	2.1	0.9
LC0805	1.2	3.0	1.3
LC1206	2.2	4.2	1.6

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 Cl_2 , H_2S , NH_3 , SO_2 and 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: $25 \pm 5^{\circ}\text{C}$
- Humidity: $60 \pm 15\% \text{RH}$
- 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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