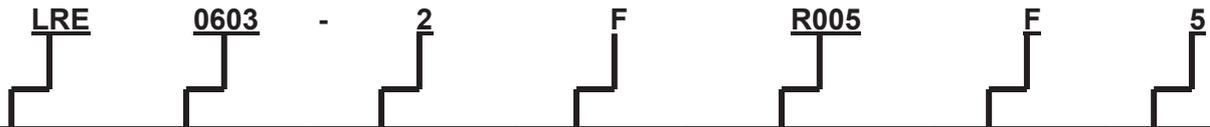


1 Scope:

- 1.1 This specification is applicable to lead free and halogen free for LRE series metal alloy low-resistance resistor.
- 1.2 The product is for general purpose but is compliant for AEC-Q200.

2 Explanation Of Part Numbers:



Type	Size (inch)	Number of Terminals	Rated Power	Resistance (4 Digits)	Tolerance	Packaging
Metal Alloy Low Resistance Resistor	<ul style="list-style-type: none"> ● 0603 ● 0805 ● 1206 	2: 2 terminals	<ul style="list-style-type: none"> ● C=0.5W ● F=0.33W ● 1=1W 	EX: R005 = 5mΩ R010 = 10mΩ	F=± 1.0% G=± 2.0% J=± 5.0%	5=5,000pcs

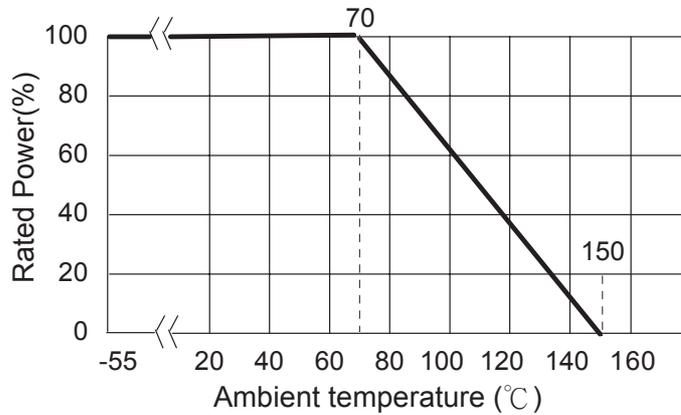
3 Product Specifications:

Type	# of Terminals	Max. Rating Power	Max. Rating Current	Max. Overload Current	T.C.R. (ppm/°C)	Resistance Range (mΩ)	Operating Temperature Range
						F (±1%) G (±2%) J (±5%)	
LRE0603	2	0.33W	8.1A	16.2A	≤±50	5~50	-55~+150°C
LRE0805	2	0.5W	12.9A	25.8A	≤±100	3≤R<5	
					≤±50	5≤R≤50	
LRE1206	2	1 W	15.8A	31.6A	≤±50	4~50	

IE		QA	Sales	Remark	Issue Dep. DATA Center. Series No. 60
Written	Checked	Approved	Signing	Signing	
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3.1 Power Derating Curve: Operating Temperature Range: - 55 ~+150 °C

For resistors operated in ambient temperatures 70°C, power rating shall be derated in accordance with the curve below:



3.2 Rating Current:

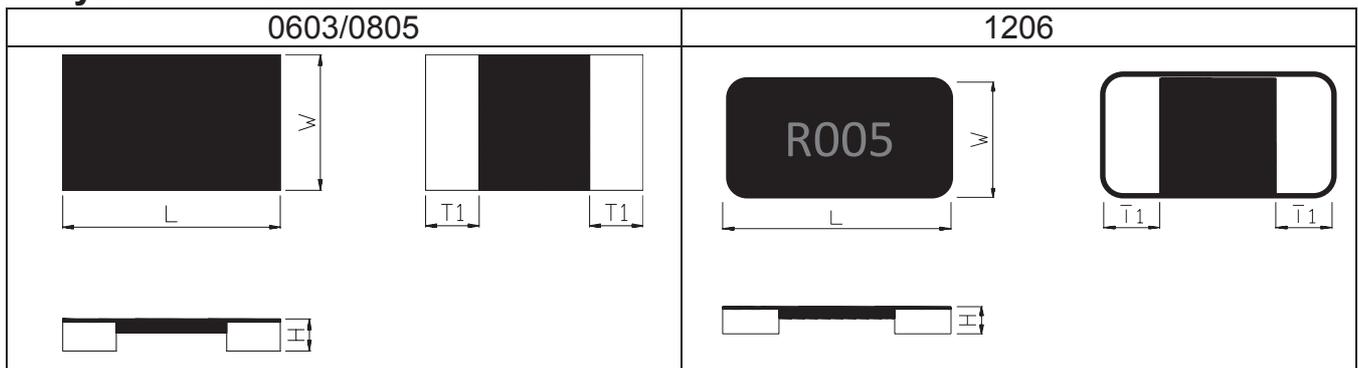
Rated Current: The resistor shall have a DC continuous working current or a RMS(Root Mean Square). AC continuous working current at commercial-line frequency and wave form corresponding to the power rating, as determined from the following:

Remark:

- a. I: Rating Current.(A)
- b. P: Rating Power.(W)
- c. R: Resistance.(Ω)

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

4 Physical Dimensions:



Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)			
			L	W	H	T1
LRE0603	0.33	5 ~ 50	0.063±0.008 (1.60±0.20)	0.031±0.008 (0.80±0.20)	0.012+0.002/-0.004 (0.30+0.05/-0.10)	0.012±0.006 (0.30±0.15)
LRE0805	0.5	3 ~ 50	0.08±0.008 (2.032±0.20)	0.05±0.008 (1.270±0.20)	0.012+0.002/-0.004 (0.30+0.05/-0.10)	0.014±0.008 (0.35±0.20)
LRE1206	1	4 ~50	0.126±0.008 (3.20±0.20)	0.063±0.008 (1.60±0.20)	0.016±0.008 (0.40±0.20)	0.012±0.006 (0.30±0.15)

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5 Reliability Performance:

5.1 Electrical Performance:

Test Item	Conditions of Test	Test Limits												
Temperature Coefficient of Resistance (TCR)	<ul style="list-style-type: none"> TCR (ppm/°C) = $\frac{(R2-R1)}{R1 (T2-T1)} \times 10^6$ R1: resistance of room temperature R2: resistance of 150 °C T1: Room temperature T2: Temperature at 150 °C Refer to JIS C 5201-1 4.8 	Refer to Paragraph 3. general specifications												
Short Time Overload	<p>Applied Overload for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Overload condition refer to below):</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Power (W)</th> <th># of rated power</th> </tr> </thead> <tbody> <tr> <td>LRE0603</td> <td>0.33</td> <td>4 times</td> </tr> <tr> <td>LRE0805</td> <td>0.5</td> <td>4 times</td> </tr> <tr> <td>LRE1206</td> <td>1</td> <td>4 times</td> </tr> </tbody> </table> <p>Refer to JIS C 5201-1 4.13</p>	Type	Power (W)	# of rated power	LRE0603	0.33	4 times	LRE0805	0.5	4 times	LRE1206	1	4 times	<p>≤ ±0.5%</p> <p>No evidence of mechanical damage</p>
Type	Power (W)	# of rated power												
LRE0603	0.33	4 times												
LRE0805	0.5	4 times												
LRE1206	1	4 times												
Insulation Resistance	<p>Put the resistor in the fixture, add 100 VDC in +, - terminal for 60secs then measured the insulation resistance between electrodes and insulating enclosure or between electrodes and base material.</p> <p>Refer to JIS-C5201-1 4.6</p>	≥ 10 ⁹ Ω												
Dielectric Withstanding Voltage	<p>Applied 500VAC for 1 minute, and Limit surge current 50 mA (max.)</p> <p>Refer to JIS-C5201-1 4.7</p>	No short or burned on the appearance.												

5.2 Mechanical /Constructional Performance:

Test Item	Conditions of Test	Test Limits
Resistance to Solder Heat	<p>The tested resistor be immersed 25 mm/sec into molten solder of 260±5°C for 10±1secs. Then the resistor is left in the room for 1 hour, and measured its resistance variance rate.</p> <p>Refer to JIS-C5201-1 4.18</p>	<p>≤ ±0.5%</p> <p>No evidence of mechanical damage</p>
Solderability	<p>Add flux into tested resistors, immersion into solder bath in temperature 245±5°C for 3±0.5secs.</p> <p>Refer to JIS-C5201-1 4.17</p>	Solder coverage over 95%
Vibration	<p>The resistor shall be mounted by its terminal leads to the supporting terminals on the solid table. The entire frequency range :from 10 Hz to 55 Hz and return to 10 Hz, shall be transferred in 1 min. Amplitude : 1.5mm This motion shall be applied for a period of 4 hours in each 3 mutually perpendicular directions (a total of 12hrs)</p> <p>Refer to JIS-C5201-1 4.22</p>	<p>≤ ±0.5%</p> <p>No evidence of mechanical damage</p>
Resistance to solvent	<p>The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60secs, then the resistor is left in the room for 48 hrs.</p> <p>Refer to JIS-C5201-1 4.29</p>	<p>≤ ±0.5%</p> <p>No evidence of mechanical damage</p>

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5.3 Environmental Performance:

Test Item	Conditions of Test	Test Limits						
Low Temperature Exposure (Storage)	Put the tested resistor in chamber under temperature $-55\pm 2^{\circ}\text{C}$ for 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.23.4	$\leq \pm 0.5\%$ No evidence of mechanical damage						
High Temperature Exposure (Storage)	Put tested resistor in chamber under temperature $150\pm 5^{\circ}\text{C}$ for 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes , and measure its resistance variance rate. Refer to JIS-C5201-1 4.23.2	$\leq \pm 1.0\%$ No evidence of mechanical damage						
Temperature Cycling (Rapid Temperature Change)	Put the tested resistor in the chamber under the temperature cycling which shown in the following table shall be repeated 1,000 times consecutively. Then leaving the tested resistor in the room temperature for 60 minutes, and measure its resistance variance rate. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Testing Condition</th> </tr> </thead> <tbody> <tr> <td>Lowest Temperature</td> <td>$-55 \pm 0/-10^{\circ}\text{C}$</td> </tr> <tr> <td>Highest Temperature</td> <td>$150 \pm 10/-0^{\circ}\text{C}$</td> </tr> </tbody> </table> Refer to JIS-C5201-1 4.19	Testing Condition		Lowest Temperature	$-55 \pm 0/-10^{\circ}\text{C}$	Highest Temperature	$150 \pm 10/-0^{\circ}\text{C}$	$\leq \pm 1.0\%$ No evidence of mechanical damage
Testing Condition								
Lowest Temperature	$-55 \pm 0/-10^{\circ}\text{C}$							
Highest Temperature	$150 \pm 10/-0^{\circ}\text{C}$							
Moisture Resistance (Climatic Sequence)	Put the tested resistor in chamber and subject to 10 cycles of damp heat and without power. Each one of which consists of the steps 1 to 7 (Figure 1). Then leaving the tested resistor in room temperature for 24 hr, and measure its resistance variance rate. Refer to MIL-STD 202 Method 106	$\leq \pm 0.5\%$ No evidence of mechanical damage						
Bias Humidity	Put the tested resistor in chamber under $85\pm 5^{\circ}\text{C}$ and $85\pm 5\% \text{RH}$ with 10% bias and load the rated voltage for 90 minutes on, 30 minutes off, total 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.24	$\leq \pm 1.0\%$ No evidence of mechanical damage						

5.4 Operational Life Endurance:

Test Item	Conditions of Test	Test Limits
Load Life	Put the tested resistor in chamber under temperature $70\pm 2^{\circ}\text{C}$ and load the rated voltage for 90 minutes on 30 minutes off, total 1000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.25	$\leq \pm 1.0\%$ No evidence of mechanical damage

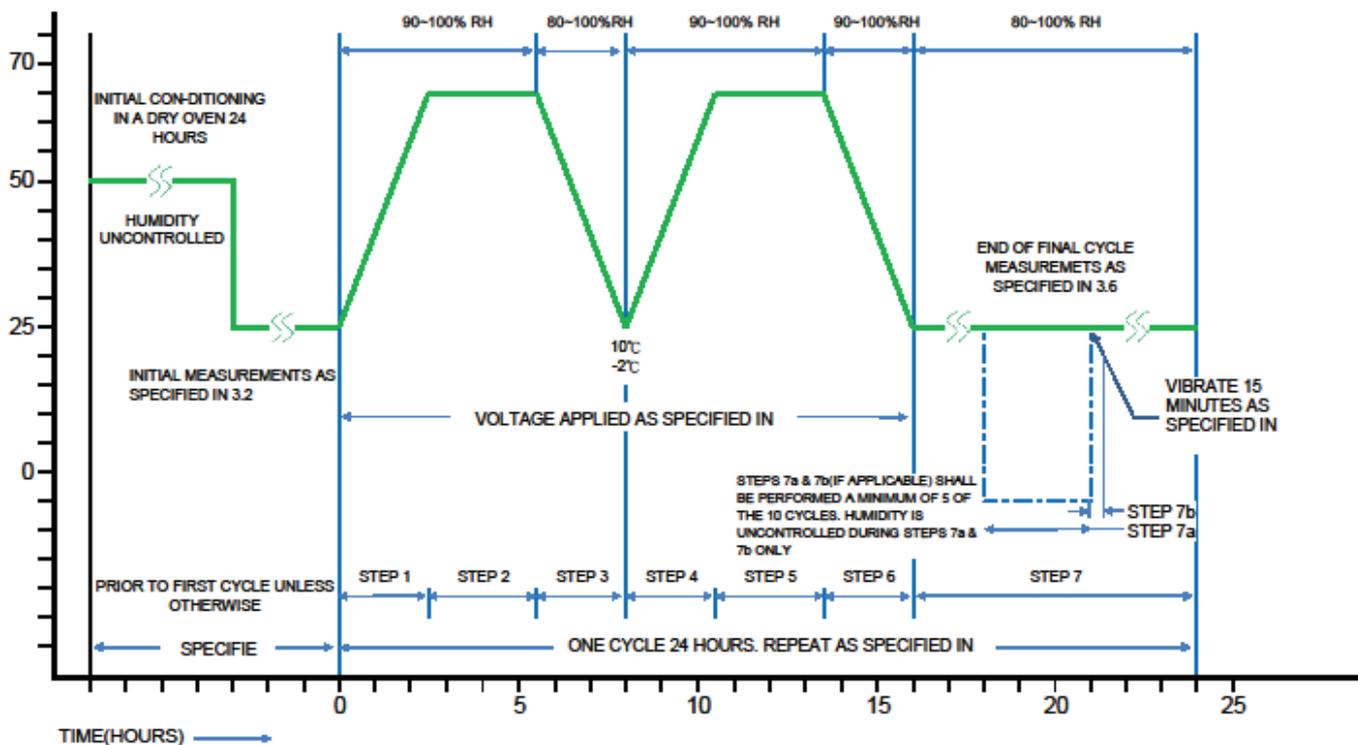
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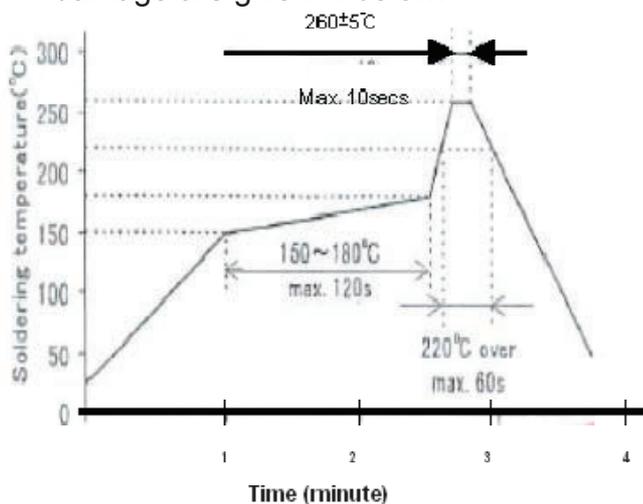
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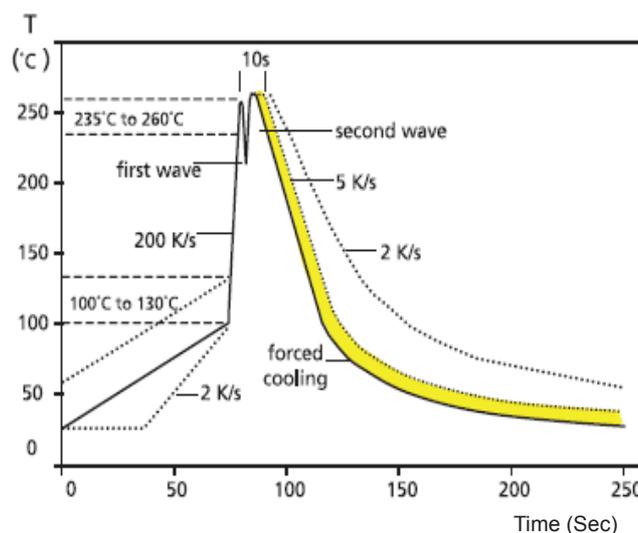


6 Recommend Soldering Conditions:

6.1 Surface-mount components are tested for solderability at a temperature of 245 °C for 3 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in below:



Recommended IR Reflow Soldering Profile



Recommended double-wave Soldering Profile
Typical values (solid line)
Process limits (dotted line)

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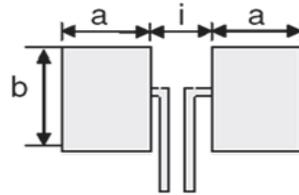
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7 Recommend Land Pattern:



Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)		
			a	b	i
LRE0603	0.33	5 ~ 50	1.00	1.27	0.50
LRE0805	0.5	3 ~ 50	1.80	2.18	0.66
LRE1206	1	4 ~ 50	1.65	2.18	1.00

8 Marking Format: (All the products marking are 4 digits)

8.1 LRE0603、LRE0805 No Marking.

8.2 LRE1206 series:

《EX》 Marking→R005 = 5mΩ



9 Plating Thickness:

9.1 Ni : $\geq 2 \mu\text{m}$

9.2 Sn(Tin) : $\geq 3 \mu\text{m}$

9.3 Sn(Tin) : Matte Sn

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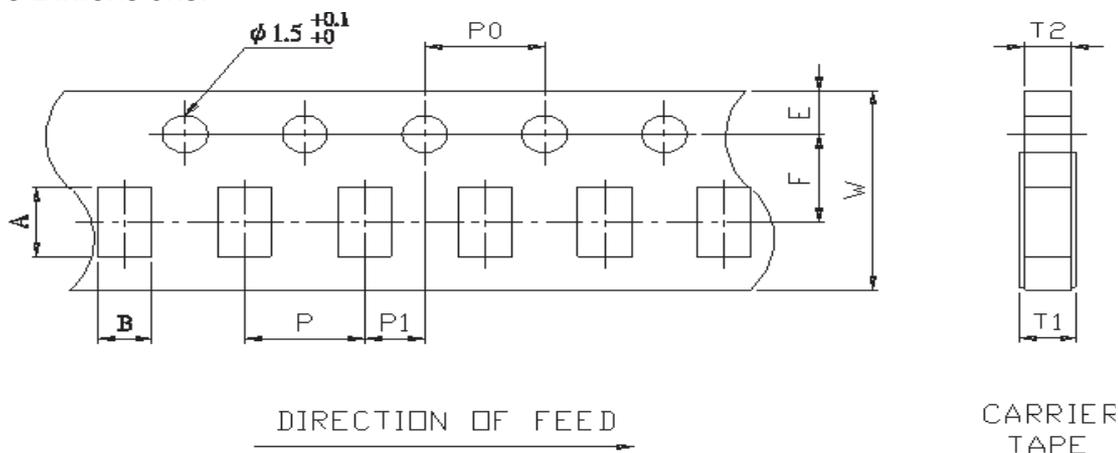
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10 Taping specifications:

10.1 Tape Dimensions:



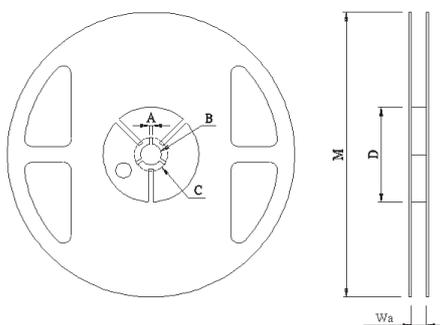
Unit: mm

DIM Item	A	B	W	E	F	T1	T2	P	P0	10*P0	P1
LRE0603	1.80±0.10	1.00±0.10	8.0±0.20	1.75±0.10	3.5±0.05	0.40+0.2/-0	0.40±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
LRE0805	2.30±0.10	1.55±0.10	8.0±0.20	1.75±0.10	3.5±0.05	0.40+0.2/-0	0.40±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05
LRE1206	3.50±0.20	1.90±0.20	8.0±0.20	1.75±0.10	3.5±0.05	0.60+0.2/-0	0.60±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.05

10.2 Packaging model:

Type	Tape width	Max. Packaging Quantity (pcs/reel)
		4 mm pitch
LRE0603	8 mm	5,000pcs
LRE0805	8 mm	5,000pcs
LRE1206	8 mm	5,000pcs

10.3 Reel Dimensions:



Unit: mm

Reel Type / Tape	W	M	A	B	C	D
7" reel for 8 mm tape	12.00± 0.5	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 1.0

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		Released Date	2015/06/12
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11 Attachments:

11.1 Document Revise Record (QA-QR-027)

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