

## 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:

|                                     |  |                     |   |                                  |   |            |   |
|-------------------------------------|--|---------------------|---|----------------------------------|---|------------|---|
| LRE                                 | 0603   | -                   | 2   | F                                | R005  | F          | 5 |
| Type                                | Size (inch)  | Number of Terminals | Rated Power   | Resistance (4 Digits)            | Tolerance                                   | Packaging  |   |
| Metal Alloy Low Resistance Resistor | <ul style="list-style-type: none"> <li>• 0603</li> <li>• 0805</li> <li>• 1206</li> <li>• 0508</li> <li>• 0612</li> </ul> | 2: 2 terminals      | <ul style="list-style-type: none"> <li>• C=0.50W</li> <li>• F=0.33W</li> <li>• E=0.75W</li> <li>• 1=1.00W</li> <li>• A=1.50W</li> </ul> | EX:<br>R005 = 5mΩ<br>R010 = 10mΩ | D=±0.5%<br>F=± 1.0%<br>G=± 2.0%<br>J=± 5.0% | 5=5,000pcs |   |

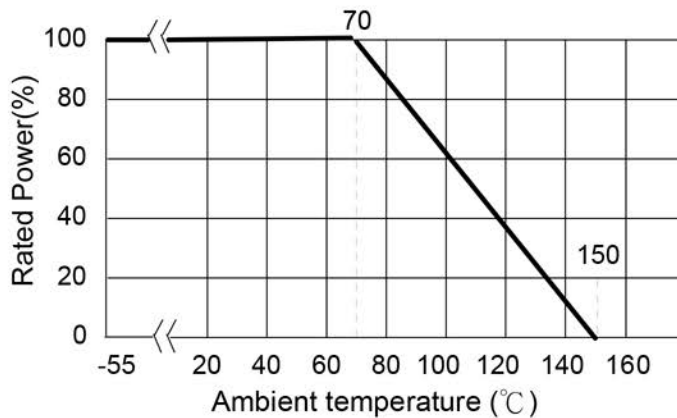
## 3 Product Specifications:

| Type    | # of Terminals | Max. Rating Power | Max. Rating Current | Max. Overload Current | T.C.R. (ppm/°C) | Resistance Range (mΩ) |                               | Operating Temperature Range |
|---------|----------------|-------------------|---------------------|-----------------------|-----------------|-----------------------|-------------------------------|-----------------------------|
|         |                |                   |                     |                       |                 | D (±0.5%)             | F (±1%)<br>G (±2%)<br>J (±5%) |                             |
| LRE0603 | 2              | 0.33W             | 8.1A                | 16.2A                 | ≤±50            | --                    | 5 ≤ R ≤ 75                    | -55~+150°C                  |
|         |                | 0.5W              | 10.0A               | 20.0A                 | ≤±50            | --                    | 5 ≤ R ≤ 10                    |                             |
| LRE0805 | 2              | 0.5W              | 15.8A               | 31.6A                 | ≤100            | --                    | 2 ≤ R < 3                     |                             |
|         |                |                   |                     |                       | ≤±75            | --                    | 3 ≤ R < 5                     |                             |
|         |                | 0.75W             | 19.36A              | 38.72A                | ≤±50            | 5 ≤ R ≤ 70            | 5 ≤ R ≤ 70                    |                             |
|         |                |                   |                     |                       | ≤100            | --                    | 2 ≤ R < 3                     |                             |
| LRE1206 | 2              | 0.5 W             | 15.8A               | 31.6A                 | ≤±75            | ---                   | 2 ≤ R < 4                     |                             |
|         |                |                   |                     |                       | ≤±50            | 10 ≤ R ≤ 75           | 4 ≤ R ≤ 75                    |                             |
|         |                | 1 W               | 22.4A               | 44.8A                 | ≤±75            | 10                    | 4 ≤ R ≤ 10                    |                             |
|         |                |                   |                     |                       | ≤±50            | 22 ≤ R ≤ 75           | 22 ≤ R ≤ 75                   |                             |
| LRE0508 | 2              | 1W                | 22.3A               | 44.6A                 | ≤±50            | --                    | 2 ≤ R ≤ 14                    |                             |
| LRE0612 | 2              | 0.75W             | 27.4A               | 54.8A                 | ≤±125           | --                    | 1                             |                             |
|         |                |                   |                     |                       | ≤±50            | 10~16                 | 2~20                          |                             |
|         |                | 1.00W             | 31.6A               | 63.2A                 | ≤±125           | --                    | 1 ≤ R < 2                     |                             |
|         |                |                   |                     |                       | ≤±50            | 10 ≤ R ≤ 16           | 2 ≤ R ≤ 16                    |                             |
| 1.50W   | 17.3A          | 34.6A             | ≤±50                | ---                   | 5~10            |                       |                               |                             |

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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:

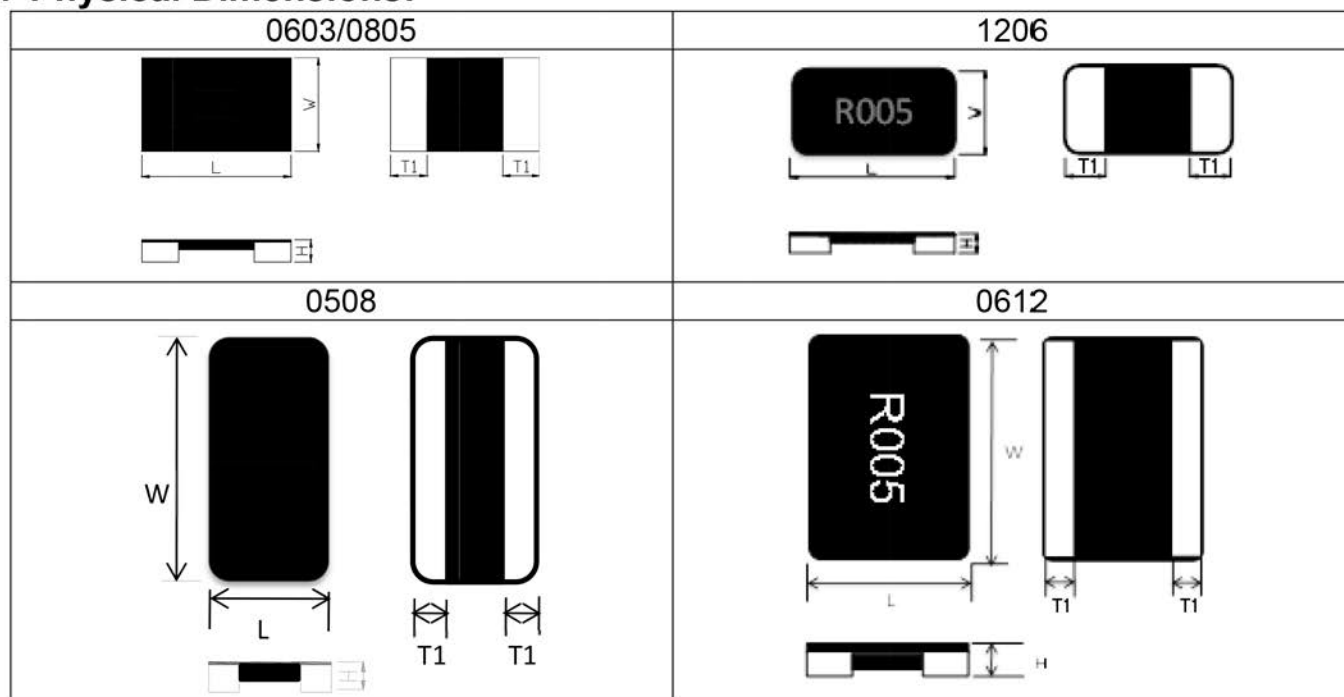
Rated Current: The resistor shall have a DC continuous working current or a RMS(Root Mean Square). AC continuous working current at commercial-line frequency and wave form corresponding to the power rating, as determined from the following:

Remark:

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

I=Rating Current(A)  
P= Rating Power(W)  
R=Resistance(Ω)

## 4 Physical Dimensions:



| Type    | Maximum Power Rating (Watts) | Resistance Range (mΩ) | Dimensions - in inches (millimeters) |                            |  |                            |
|---------|------------------------------|-----------------------|--------------------------------------|----------------------------|--|----------------------------|
|         |                              |                       | L                                    | W                          | H  | T1                         |
| LRE0603 | 0.33                         | 5 ~ 75                | 0.063±0.008<br>(1.60±0.20)           | 0.031±0.008<br>(0.80±0.20) | 0.012 <sup>+0.002</sup> <sub>-0.004</sub><br>(0.30 <sup>+0.05</sup> <sub>-0.10</sub> ) | 0.012±0.006<br>(0.30±0.15) |
|         | 0.5                          | 5 ~ 10                |                                      |                            |  |                            |
| LRE0805 | 0.5&0.75                     | 2                     | 0.08±0.008<br>(2.032±0.20)           | 0.05±0.008<br>(1.270±0.20) | 0.014 <sup>+0.002</sup> <sub>-0.004</sub><br>(0.35 <sup>+0.05</sup> <sub>-0.10</sub> ) | 0.02±0.006<br>(0.50±0.15)  |
|         | 0.5                          | 3 ~ 70                | 0.08±0.008<br>(2.032±0.20)           | 0.05±0.008<br>(1.270±0.20) | 0.012 <sup>+0.002</sup> <sub>-0.004</sub><br>(0.30 <sup>+0.05</sup> <sub>-0.10</sub> ) | 0.014±0.008<br>(0.35±0.20) |
|         | 0.75                         | 3 ~ 10                |                                      |                            |  |                            |
| LRE1206 | 0.5&1                        | 2 ~ 3                 | 0.126±0.008<br>(3.20±0.20)           | 0.063±0.008<br>(1.60±0.20) | 0.016±0.008<br>(0.40±0.20)   | 0.031±0.01<br>(0.8±0.25)   |
|         |                              | 4 ~ 75                |                                      |                            |  | 0.014±0.008<br>(0.35±0.20) |
| LRE0508 | 1                            | 2 ~ 14                | 0.05±0.008<br>(1.270±0.20)           | 0.08±0.008<br>(2.032±0.20) | 0.012±0.004<br>(0.30±0.10)   | 0.014±0.006<br>(0.35±0.15) |
| LRE0612 | 0.75                         | 1 ~ 20                | 0.063±0.008<br>(1.60±0.20)           | 0.126±0.008<br>(3.20±0.20) | 0.012 <sup>+0.002</sup> <sub>-0.004</sub><br>(0.30 <sup>+0.05</sup> <sub>-0.10</sub> ) | 0.012±0.006<br>(0.30±0.15) |
|         | 1.0                          | 1 ~ 16                |                                      |                            |  |                            |
|         | 1.5                          | 5 ~ 10                |                                      |                            |  |                            |

## 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"> <li>• <math>TCR (ppm/^{\circ}C) = \frac{(R2-R1)}{R1 (T2-T1)} \times 10^6</math></li> <li>• R1: resistance of room temperature</li> <li>• R2: resistance of 150 °C</li> <li>• T1: Room temperature</li> <li>• T2: Temperature at 150 °C</li> <li>• Refer to JIS C 5201-1 4.8</li> </ul>   | 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 / 0.5</td> <td>4 times</td> </tr> <tr> <td>LRE0805</td> <td>0.5 / 0.75</td> <td>4 times</td> </tr> <tr> <td>LRE1206</td> <td>0.5 / 1</td> <td>4 times</td> </tr> <tr> <td>LRE0508</td> <td>1</td> <td>4 times</td> </tr> <tr> <td>LRE0612</td> <td>0.75 / 1 / 1.5</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 / 0.5 | 4 times | LRE0805 | 0.5 / 0.75 | 4 times | LRE1206 | 0.5 / 1 | 4 times | LRE0508 | 1 | 4 times | LRE0612 | 0.75 / 1 / 1.5 | 4 times | <p><math>\leq \pm 0.5\%</math></p> <p>No evidence of mechanical damage</p> |
| Type  | Power (W)   | # of rated power                             |           |                  |         |            |         |         |            |         |         |         |         |         |   |         |         |                |         |  |
| LRE0603                                     | 0.33 / 0.5  | 4 times                                      |           |                  |         |            |         |         |            |         |         |         |         |         |   |         |         |                |         |  |
| LRE0805                                     | 0.5 / 0.75  | 4 times                                      |           |                  |         |            |         |         |            |         |         |         |         |         |   |         |         |                |         |  |
| LRE1206                                     | 0.5 / 1   | 4 times                                      |           |                  |         |            |         |         |            |         |         |         |         |         |   |         |         |                |         |  |
| LRE0508                                     | 1   | 4 times                                      |           |                  |         |            |         |         |            |         |         |         |         |         |   |         |         |                |         |  |
| LRE0612                                     | 0.75 / 1 / 1.5  | 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>  | $\geq 10^9 \Omega$                           |           |                  |         |            |         |         |            |         |         |         |         |         |   |         |         |                |         |  |
| Dielectric Withstanding Voltage             | <p>Applied 500VAC for 1 minute, and Limit surge current 10 mA (max.)</p> <p>Refer to JIS-C5201-1 4.7</p>  | No short or burned on the appearance.        |           |                  |         |            |         |         |            |         |         |         |         |         |   |         |         |                |         |  |

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### 5.2 Mechanical /Constructional Performance:

| Test Item                 | Conditions of Test  | Test Limits                                |
|---------------------------|---|--|
| Resistance to Solder Heat | 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.<br>Refer to JIS-C5201-1 4.18   | ≤±0.5%<br>No evidence of mechanical damage |
| Solderability             | Add flux into tested resistors, immersion into solder bath in temperature 245±5°C for 3±0.5secs.<br>Refer to JIS-C5201-1 4.17   | Solder coverage over 95%                   |
| Vibration                 | 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<br>This motion shall be applied for a period of 4 hours in each 3 mutually perpendicular directions (a total of 12hrs)<br>Refer to JIS-C5201-1 4.22 | ≤±0.5%<br>No evidence of mechanical damage |
| Resistance to solvent     | 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. Refer to JIS-C5201-1 4.29   | ≤±0.5%<br>No evidence of mechanical damage |

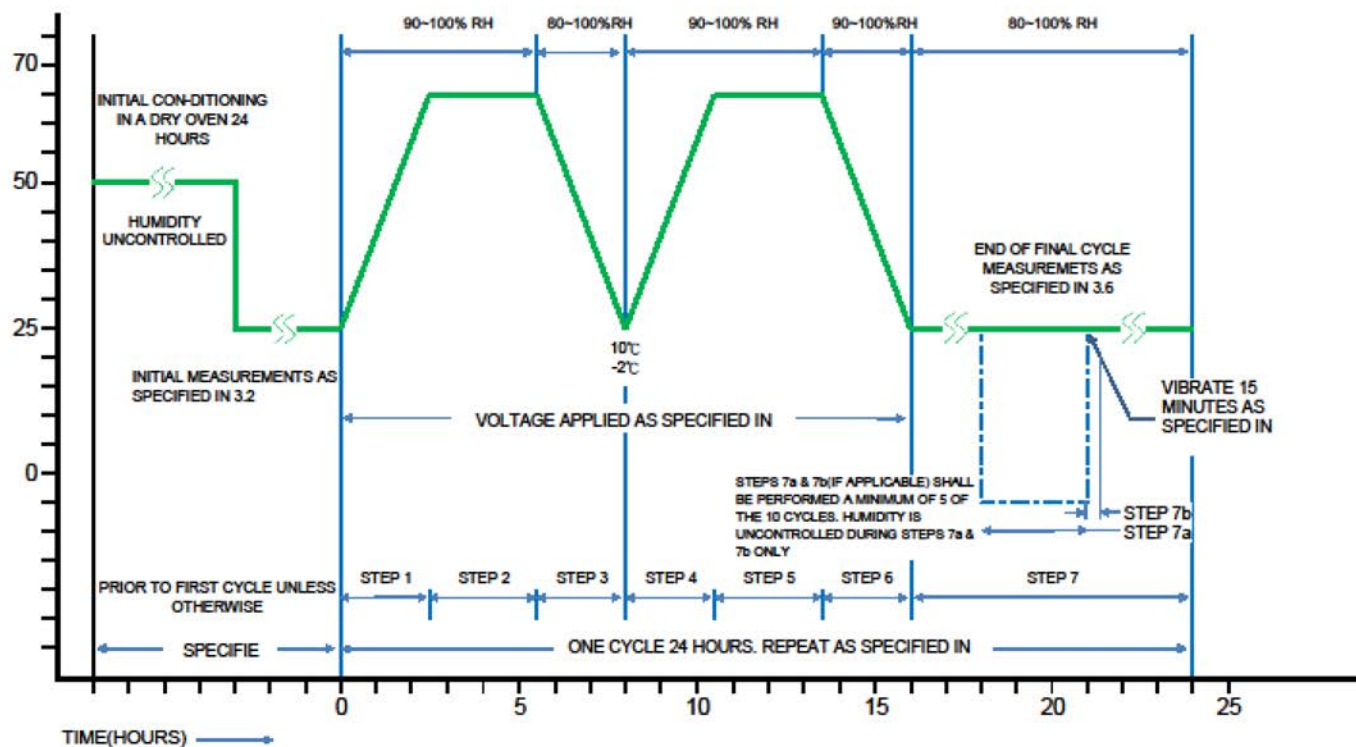


## 5.3 Environmental Performance:

| 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.<br>Refer to JIS-C5201-1 4.23.4   | $\leq \pm 0.5\%$<br>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.<br>Refer to JIS-C5201-1 4.23.2   | $\leq \pm 1.0\%$<br>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.<br><table border="1" data-bbox="359 793 949 890"> <thead> <tr> <th colspan="2">Testing Condition</th> </tr> </thead> <tbody> <tr> <td>Lowest Temperature</td> <td><math>-55 +0/-10^{\circ}\text{C}</math></td> </tr> <tr> <td>Highest Temperature</td> <td><math>150 +10/-0^{\circ}\text{C}</math></td> </tr> </tbody> </table><br>Refer to JIS-C5201-1 4.19 | Testing Condition                                    |  | Lowest Temperature | $-55 +0/-10^{\circ}\text{C}$ | Highest Temperature | $150 +10/-0^{\circ}\text{C}$ | $\leq \pm 1.0\%$<br>No evidence of mechanical damage |
| Testing Condition                              |  |  |  |                    |                              |                     |                              |  |
| Lowest Temperature                             | $-55 +0/-10^{\circ}\text{C}$   |  |  |                    |                              |                     |                              |  |
| Highest Temperature                            | $150 +10/-0^{\circ}\text{C}$   |  |  |                    |                              |                     |                              |  |
| 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.<br>Refer to MIL-STD 202 Method 106  | $\leq \pm 0.5\%$<br>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.<br>Refer to JIS-C5201-1 4.24  | $\leq \pm 1.0\%$<br>No evidence of mechanical damage |  |                    |                              |                     |                              |  |

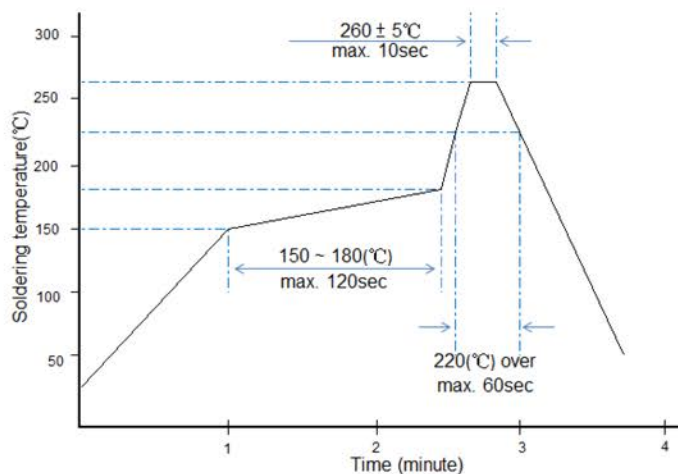
## 5.4 Operational Life Endurance:

| 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.<br>Refer to JIS-C5201-1 4.25 | $\leq \pm 1.0\%$<br>No evidence of mechanical damage |



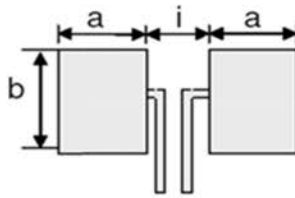
## 6 Recommend Soldering Conditions:

- 6.1 This product is applicable to IR-reflow process only
- 6.2 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  
MEET J-STD-020D

## 7 Recommend Land Pattern:



| Type    | Maximum Power Rating (Watts) | Resistance Range (mΩ) | Dimensions - in inches (millimeters) |      |      |
|---------|------------------------------|-----------------------|--------------------------------------|------|------|
|         |                              |                       | a                                    | b    | i    |
| LRE0603 | 0.33 & 0.5                   | 5 ~ 75                | 1.00                                 | 1.27 | 0.50 |
| LRE0805 | 0.5                          | 2 ~ 70                | 1.45                                 | 1.78 | 0.66 |
|         | 0.75                         | 2 ~ 10                | 1.45                                 | 1.78 | 0.66 |
| LRE1206 | 0.50 & 1.00                  | 2 ~ 3                 | 1.65                                 | 2.18 | 0.90 |
|         |                              | 4 ~ 75                |                                      |      | 1.00 |
| LRE0508 | 1.00                         | 2 ~ 14                | 1.45                                 | 2.20 | 0.50 |
| LRE0612 | 0.75                         | 1 ~ 20                | 1.65                                 | 3.50 | 0.50 |
|         | 1.00                         | 1 ~ 16                |                                      |      |      |
|         | 1.50                         | 5 ~ 10                |                                      |      |      |

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

8.1 LRE0603、LRE0805、LRE0508 No Marking.

8.2 LRE1206、LRE0612 series:

《EX》 Marking → R005 = 5mΩ



## 9 Plating Thickness:

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

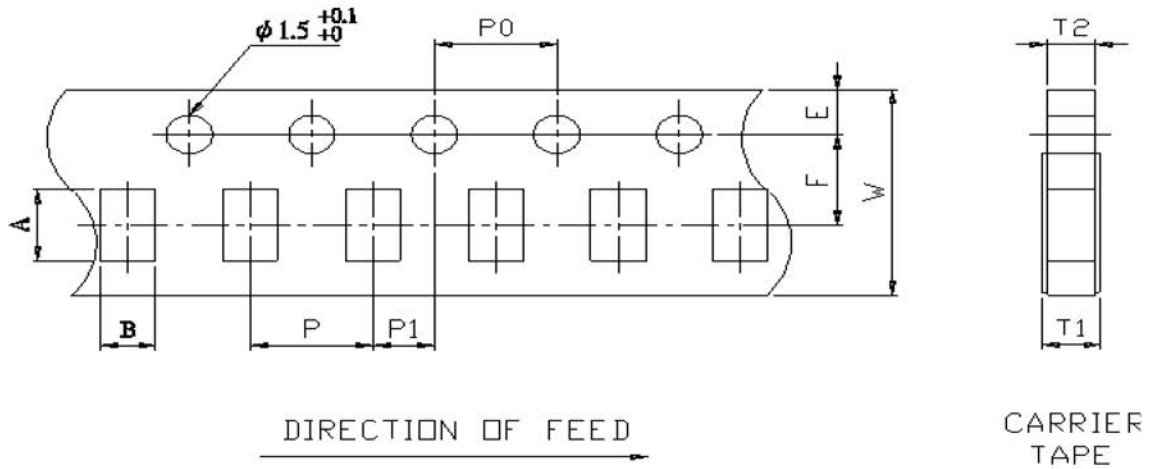
9.2 Sn(Tin) :  $\geq 3 \mu\text{m}$

9.3 Sn(Tin) : Matte Sn



## 10 Taping specifications:

### 10.1 Tape Dimensions:



Unit: mm

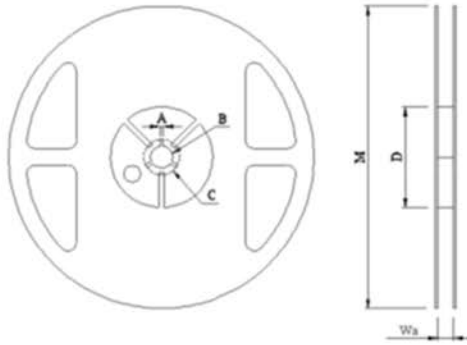
| DIM<br>Item | A         | B         | W        | E         | F        | T1          | T2        | P        | P0       | 10*P0     | P1       |
|-------------|-----------|-----------|----------|-----------|----------|-------------|-----------|----------|----------|-----------|----------|
| LRE0603     | 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 |
| LRE0508     | 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 |
| LRE0612     | 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                           |
| LRE0508 | 8 mm       | 5,000pcs                           |
| LRE0612 | 8 mm       | 5,000pcs                           |

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## 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 |

## 11 Attachments:

11.1 Document Revise Record (QA-QR-027)