

RALEC 旺詮	Metal Alloy Low-Resistance Resistor Specifications LR2512 and LR2728 (Above 101mΩ)	Document No.	IE-SP-048
		Released Date	2014/03/19
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### 1 Scope:

This specification is applicable to lead free and halogen free for resistance between 101mΩ and 270mΩ by following product:

- LR2512 (both 1.0 Watts and 1.5 Watts);
- LR2728 (3.0 Watts only).

By the way, we are not recommended customer use in "**open frame**" product application.

### 2 Explanation Of Part Numbers:

LR	2512	-	2	1	R101	F	4
Type	Size (inch)	Number of Terminals	Rated Power	Resistance (4~6 Digits)	Tolerance	Packaging	
Metal Alloy Low resistance resistor	<ul style="list-style-type: none"> <li>2512</li> <li>2728</li> </ul>	2 : 2 terminals	<ul style="list-style-type: none"> <li>1=1.0W</li> <li>A=1.5W</li> <li>3=3.0W</li> </ul>	EX. R101=101mΩ	<ul style="list-style-type: none"> <li>D = ±0.5%</li> <li>F = ±1%</li> <li>G = ±2%</li> <li>J = ±5%</li> </ul>	<ul style="list-style-type: none"> <li>1=1,000pcs</li> <li>2=2,000pcs</li> <li>4=4,000pcs</li> </ul>	

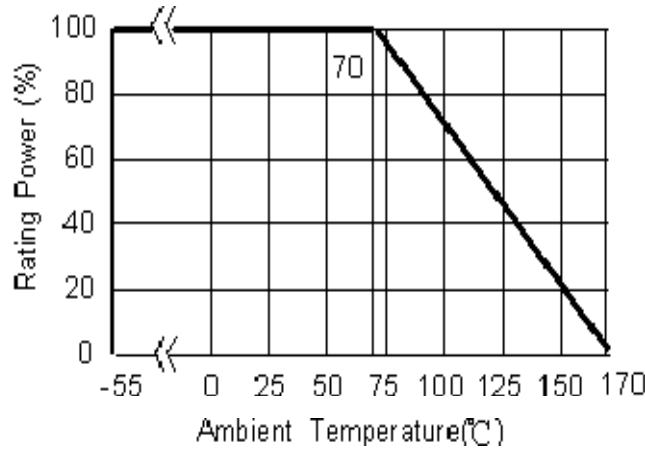
### 3 Product Specifications:

Type	# of Terminals	Max. Rating Power	Max. Rating Current	Max. Overload Current	T.C.R (ppm /°C)	Resistance Range	Operating Temperature Range
						D(±0.5%) · F(±1%) G(±2%) · J(±5%)	
LR2512	2	1.0W	3.15A	7.04A	≤±50	101 ~ 300mΩ	-55~+170°C
		1.5W	3.86A	8.62A		101 ~ 220mΩ	
LR2728		3.0W	5.45A	9.44A	≤±25	101 ~ 200mΩ	

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**3.1 Power Derating Curve: Operating Temperature Range: - 55 ~+170°C**

For resistors operated in ambient temperatures above 70°C , power rating shall be derated in accordance with figure 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:

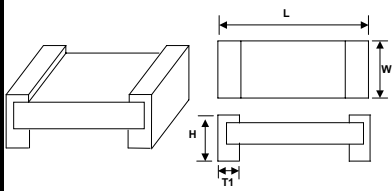
Remark:

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

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

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#### 4 Physical Dimensions:

	TYPE	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)			
				L	W	H	T1
	LR2512	1.0	101~200	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.0254±0.010 (0.645±0.254)	0.034±0.010 (0.868±0.254)
			201~300			0.0236±0.010 (0.600±0.254)	
	LR2512	1.5	101~200	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.0254±0.010 (0.645±0.254)	0.034±0.010 (0.868±0.254)
			201~220			0.0236±0.010 (0.600±0.254)	
	LR2728	3.0	101~200	0.264±0.010 (6.706±0.254)	0.283±0.010 (7.188±0.254)	0.039±0.010 (0.991±0.254)	0.045±0.010 (1.143±0.254)

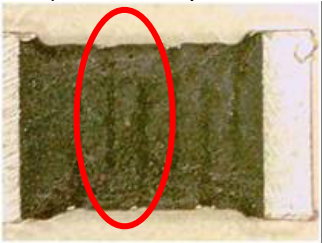
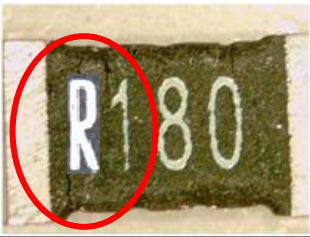

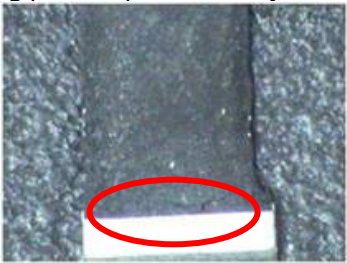

#### 4.1 Material of Alloy:

Type	Watts	Material	Resistance
2512	1.0	Iron-Chromium Aluminium Alloy	All
	1.5		
2728	3.0	Iron-Chromium Aluminium Alloy	All

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**4.2 Appearance:**

The metal alloy need more punch for high resistance product, the high resistance product appearance will be difference with low resistance (below 101mΩ), the main different are listed below:

Illustration of qualified protective layer	Illustration of abnormal protective layer
<p>a. Punch mark is allowed but raw material (substrate) can not exposed</p>  <p>b. Without cracks are found on the protective layer when looking at product under naked eyes at a distance of 30 cm.</p>  <p>c. Dent is allowed at the joining point of protective layer and electrode tip</p>  <p>d. Bulging appearance (bulging degree should not exceed height of electrode tip) is allowed at the joining point of protective layer and electrode tip.</p> 	<p>a. Substance is not to have any fractures that would expose itself</p> 

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## 5 Reliability Performance Test

### 5.1 Electrical Performance:

Test Item	Conditions of Test	Test Limits									
Temperature Coefficient of Resistance (TCR)	<ul style="list-style-type: none"> <li>TCR (ppm/°C) = <math>\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> </ul> Refer to JIS C 5201-1 4.8	Refer to Paragraph 3. general specifications									
Short Time Overload	Applied Overload for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. (Overload condition refer to below): <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Type</th> <th>Power (W)</th> <th># of rated power</th> </tr> </thead> <tbody> <tr> <td>LR2512</td> <td>1.0 &amp; 1.5</td> <td>5 times</td> </tr> <tr> <td>LR2728</td> <td>3.0</td> <td>3 times</td> </tr> </tbody> </table> Refer to JIS C 5201-1 4.13	Type	Power (W)	# of rated power	LR2512	1.0 & 1.5	5 times	LR2728	3.0	3 times	$\leq \pm 0.5\%$ No evidence of mechanical damage
Type	Power (W)	# of rated power									
LR2512	1.0 & 1.5	5 times									
LR2728	3.0	3 times									
Insulation Resistance	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. Refer to JIS-C5201-1 4.6	$\geq 10^9 \Omega$									
Dielectric Withstanding Voltage	Applied 500VAC for 1 minute, and Limit surge current 50 mA (max.) Refer to JIS-C5201-1 4.7	No short or burned on the appearance.									

### 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. Refer to JIS-C5201-1 4.18	$\leq \pm 0.5\%$ No evidence of mechanical damage
Solderability	Add flux into tested resistors, immersion into solder bath in temperature 245±5°C for 3±0.5secs. 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 This motion shall be applied for a period of 4 hours in each 3 mutually perpendicular directions (a total of 12hrs) Refer to JIS-C5201-1 4.22	$\leq \pm 0.5\%$ 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	$\leq \pm 0.5\%$ No evidence of mechanical damage

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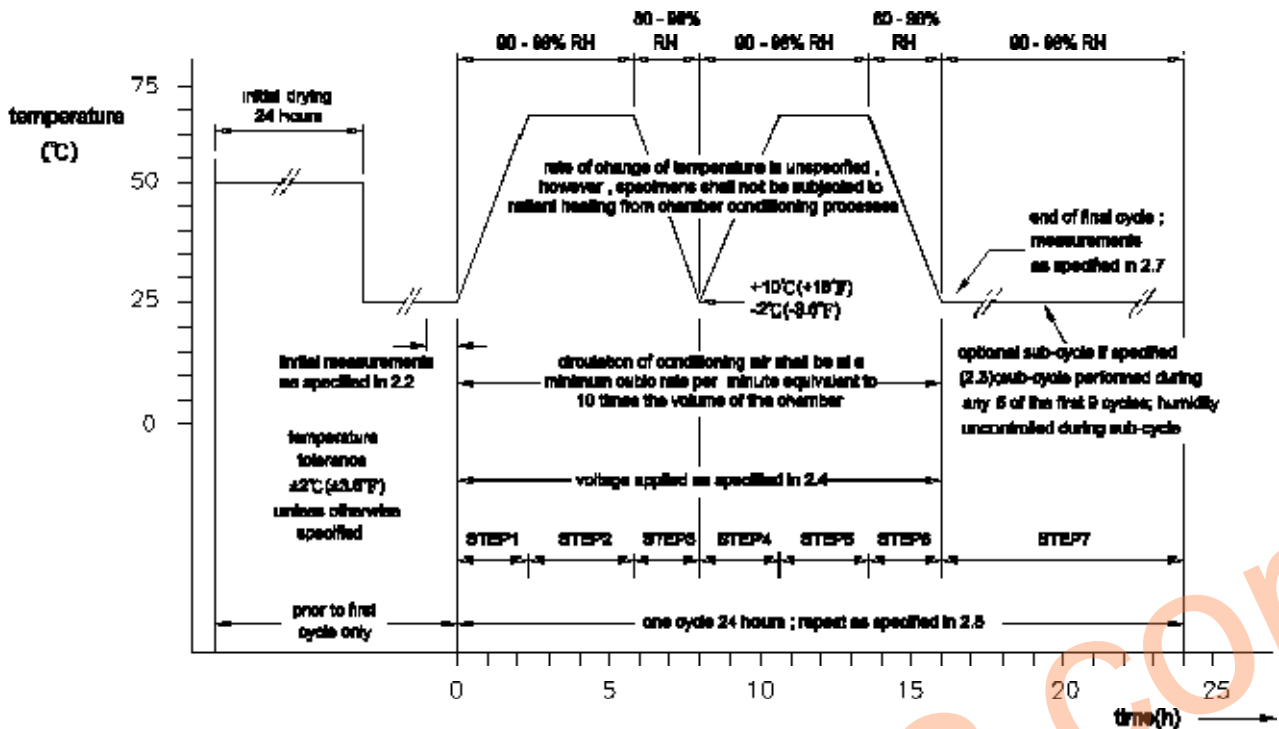
### 5.3 Environmental Performance:

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 $170\pm 5^{\circ}\text{C}$ 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><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> Refer to JIS-C5201-1 4.19	Testing Condition		Lowest Temperature	$-55 +0/-10^{\circ}\text{C}$	Highest Temperature	$150 +10/-0^{\circ}\text{C}$	$\leq \pm 0.5\%$ 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. Refer to MIL-STD 202 Method 106	$\leq \pm 0.5\%$ No evidence of mechanical damage						
Bias Humidity	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						

### 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	$\leq \pm 1.0\%$

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<Figure 1>

**6 Marking (All the products marking are 4 digits)**

**6.1 LR2512:**

《EX》 Marking → R101 = 101mΩ



**6.2 LR2728:**

《EX》 Marking → R101 = 101mΩ



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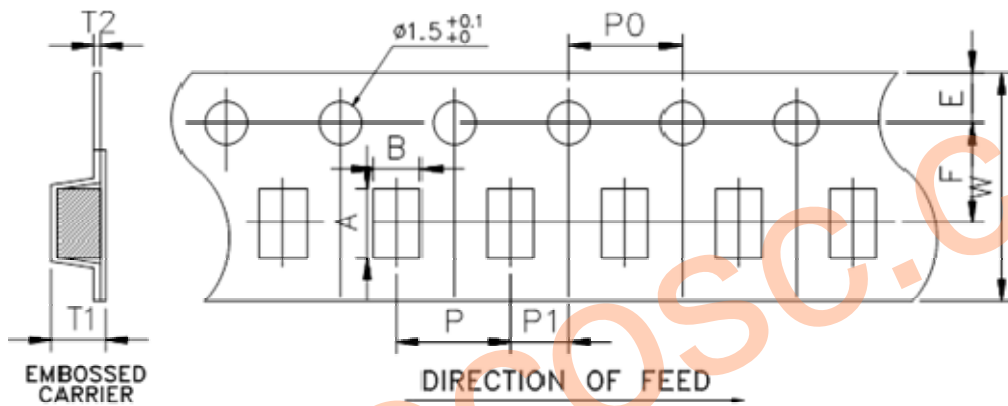
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**6.3 Marking Style**

Marking Type	R	m	1	2	3	4	5	6	7	8	9	0
LR2512 LR2728	R	m	1	2	3	4	5	6	7	8	9	0

**7aping Specifications**

**7.1 Tape Dimension:**



DIM Item	A	B	W	E	F	T1	T2	P	P0	10*P0	P1
LR2512	6.75±0.10	3.50±0.10	12.0±0.15	1.75±0.10	5.5±0.10	1.30±0.10	0.20±0.05	4.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10
LR2728	7.15±0.10	7.70±0.10	12.0±0.15	1.75±0.10	5.5±0.10	1.45±0.10	0.25±0.05	12.0±0.10	4.0±0.10	40.0±0.20	2.0±0.10

**7.2 Packaging model:**

Type	Tape width	Max. Packaging Quantity (pcs/reel)	
		Embossed Plastic Type	
		4mm pitch	12mm pitch
LR2512	12mm	4,000pcs	--
LR2728		--	1,000pcs

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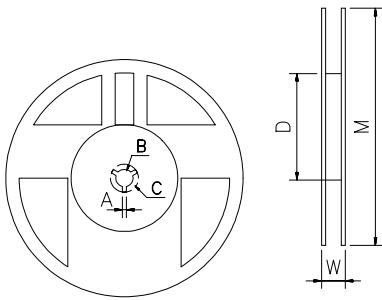
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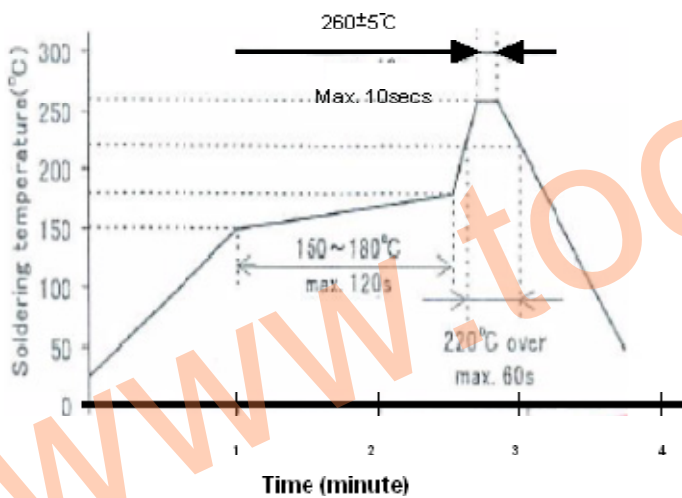
**7.3 Reel Dimensions:**



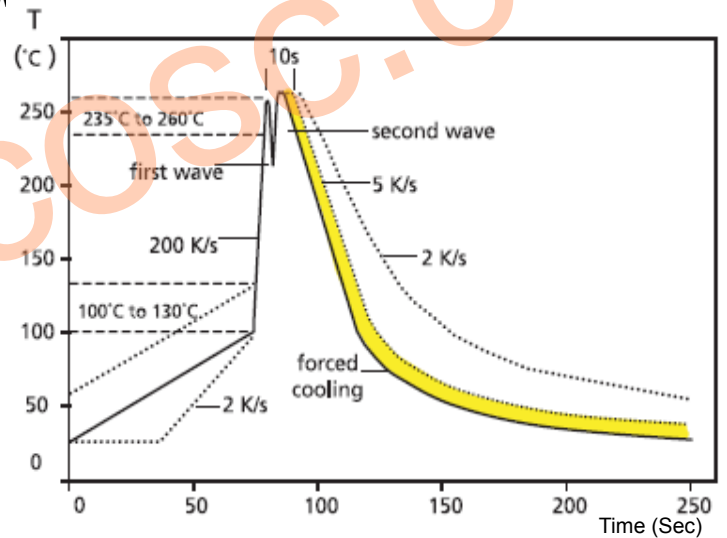
Reel Type/ Tape	W	M	A	B	C	D
7" reel for 12 mm tape	16.2 ±0.5	178 ±1.0	2.5 ±0.5	13.5 ±0.5	17.7 ±0.5	60.0 ±0.5

**8 Technical note (This is for recommendation, please customer perform adjustment according to actual application)**

8.1 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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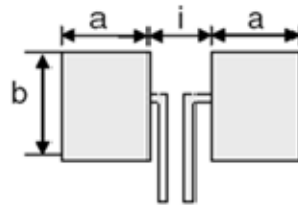
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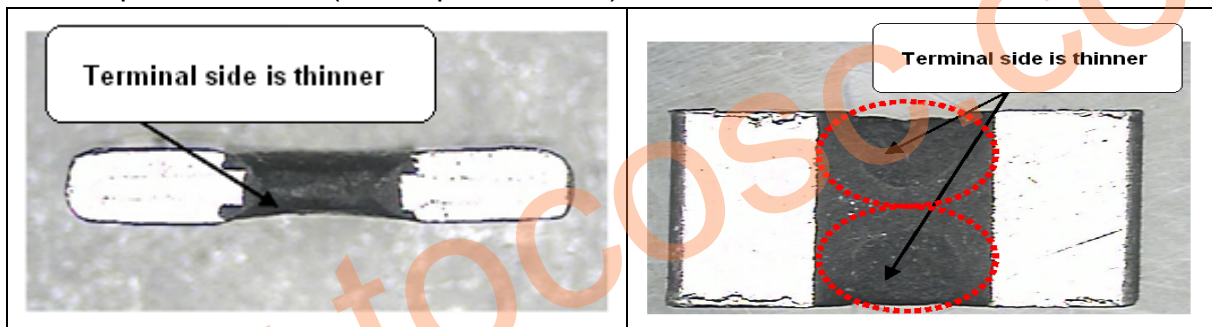
### 8.2 Recommend Land Pattern:



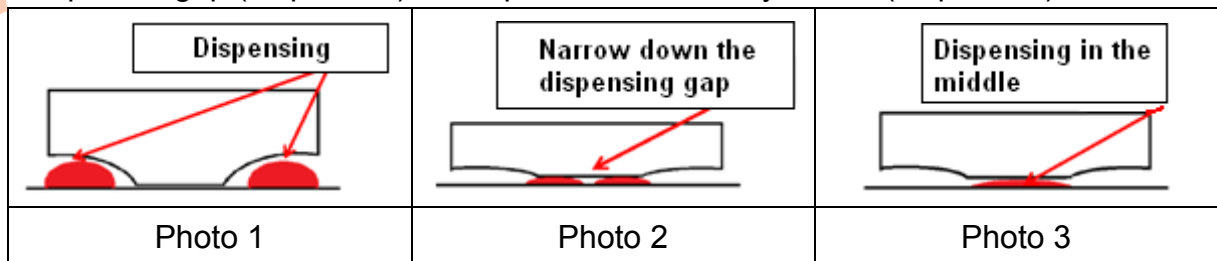
Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)		
			a	b	i
LR2512	1.0 & 1.5	101 ~ 300	0.083 (2.11)	0.145 (3.68)	0.125 (3.18)
LR2728	3.0	101 ~ 200	0.108 (2.75)	0.308 (7.82)	0.138 (3.51)

### 8.3 Recommend dispensing method

8.3.1 The structure of RALEC metal alloy resistor that both side of main body would be thinner due to process factor (as the photo below).



8.3.2 When customer performs wave solder process shall take note on the dispensing gap. If the gap between two dispensing is over, the red-glue will not adhesive the resistor body and be dropped out (as photo 1). Therefore, we suggest customer to narrow down the dispenser gap (as photo 2), or dispenser on the body center (as photo 3)



## 9 Attachments

9.1 Document Revise Record

(QA-QR-027)

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