

RALEC 旺詮	LRH-A2512 Metal Alloy Low-Resistance Resistor Product Specifications (Automotive Grade)	Document No.	IE-SP-121
		Released Date	2018/06/22
		Page No.	1

1 Scope:

- 1.1 This specification is applicable to lead free and halogen free for LRH-A2512 low-inductance metal alloy low-resistance resistor.
- 1.2 Inductance less than 5nH.
- 1.3 This product is for automotive electronic application.
- 1.4 AEC-Q200 qualified, grade 1.

2 Explanation Of Part Numbers:



Type	Application	Size (inch)	Number of Terminals	Rated Power	Resistance (4 Digits)	Tolerance	Packaging
Low-Inductance Metal Alloy Low Resistance Resistor	Automotive Grade	2512	2: 2 terminals	3=3.0W	EX: R003 = 3mΩ	D=± 0.5% F=± 1.0% G=± 2.0% J=± 5.0%	4=4,000pcs

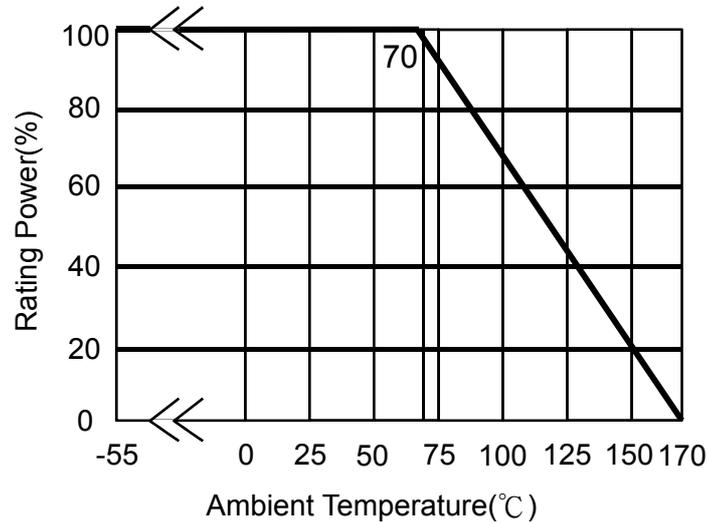
3 Product Specifications:

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%) G (±2%)、J (±5%)	
LRH-A2512	2	3W	31.62A	63.25A	3 mΩ:	≤±150	3	-55~+170°C

RD Written: [Signature]		Checked [Signature]	Approved [Signature]	QA Signing: [Signature]	Remark IT'S NOT UNDER CONTROL FOR PDF FILE PLS NOTE THE VERSION STATED.. Do not copy without permission	Issue Dep. DATA Center. Series No. 60
-----------------------------------	--	-------------------------------	--------------------------------	-----------------------------------	---	---

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

Remark

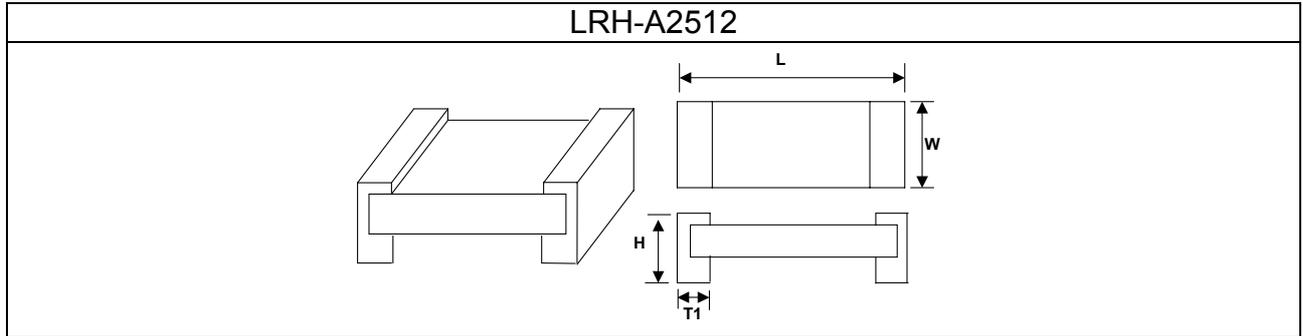
IT'S NOT UNDER CONTROL FOR PDF FILE
PLS NOTE THE VERSION STATED..

Issue Dep.**DATA Center.**

Do not copy without permission

Series No. **60**

4 Physical Dimensions:



Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)			
			L	W	H	T1
LRH-A2512	3	3	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.0254±0.010 (0.645±0.254)	0.044±0.010 (1.118±0.254)

4.1 Material of Alloy

Type	Material	Resistance
LRH-A2512	Manganese-Copper Alloy	3 mΩ

Remark

IT'S NOT UNDER CONTROL FOR PDF FILE
PLS NOTE THE VERSION STATED..

Issue Dep.**DATA Center.**

Do not copy without permission

Series No. **60**

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	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>LRH-A2512</td> <td>3</td> <td>4 times</td> </tr> </tbody> </table> Refer to JIS C 5201-1 4.13	Type	Power (W)	# of rated power	LRH-A2512	3	4 times	$\leq \pm 2.0\%$ No evidence of mechanical damage
Type	Power (W)	# of rated power						
LRH-A2512	3	4 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:

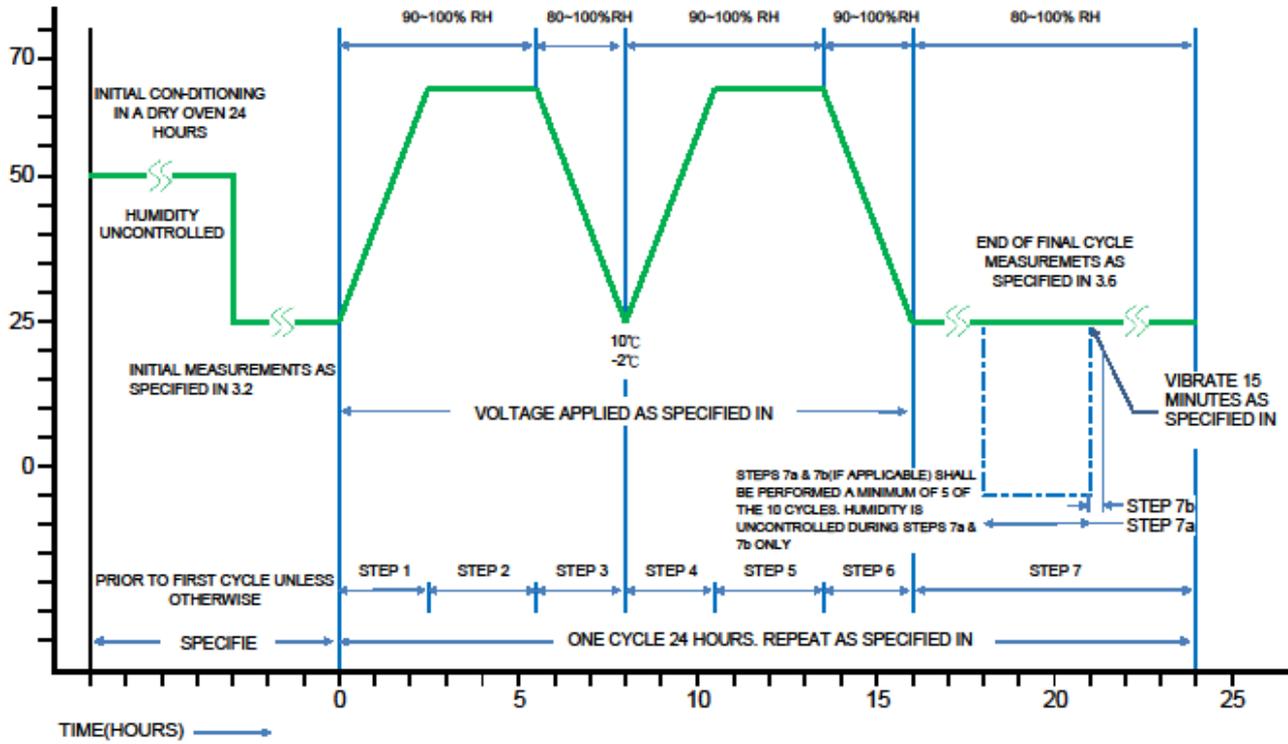
Test Item	Conditions of Test	Test Limits
Resistance to Solder Heat	The tested resistor be immersed 25 mm/sec into molten solder of 260±5°C for 10±1secs. Then the resistor is left in the room for 1 hour, and measured its resistance variance rate. Refer to JIS-C5201-1 4.18	$\leq \pm 0.5\%$ No evidence 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

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	$\leq \pm 3.0\%$ 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>$-55 +0/-10^{\circ}\text{C}$</td> </tr> <tr> <td>Highest Temperature</td> <td>$150 +10/-0^{\circ}\text{C}$</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 under $85\pm 5^{\circ}\text{C}$ and $85\pm 5\%$ 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	$\leq \pm 0.5\%$ 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	$\leq \pm 3.0\%$ No evidence of mechanical damage



Remark

IT'S NOT UNDER CONTROL FOR PDF FILE
PLS NOTE THE VERSION STATED..

Issue Dep. DATA Center.

Do not copy without permission

Series No. **60**

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

6.1 Product resistance is indicated by using two marking notation styles:

“R” designates the decimal location in ohms, e.g.

- For 3mΩ the product marking is R003.

6.2 LRH-A2512 series:



6.3 Marking Style:

Type \ Marking	R	m	1	2	3	4	5	6	7	8	9	0
LRH-A2512	R	m	1	2	3	4	5	6	7	8	9	0

7 Measurement Point :

Bottom electrode		Unit : mm	
Type	DIM	A	B
LRH-A2512		5.25±0.25	2.25±0.25

Current Terminal
 Voltage Terminal

Remark

IT'S NOT UNDER CONTROL FOR PDF FILE
PLS NOTE THE VERSION STATED..

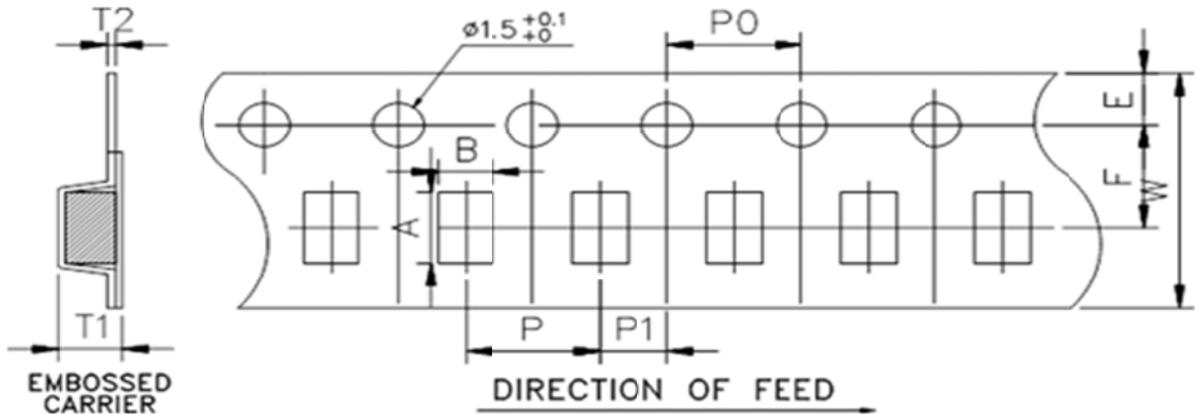
Issue Dep. DATA Center.

Do not copy without permission

Series No. **60**

8 Taping specifications:

8.1 Tape Dimensions:



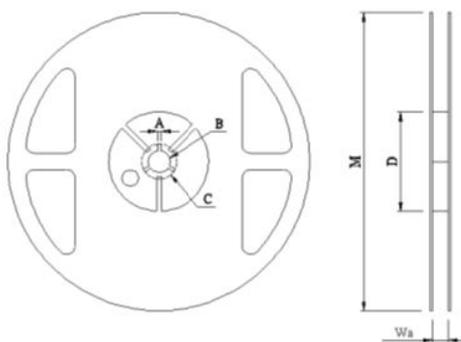
Unit: mm

DIM	A	B	W	E	F	T1	T2	P	P0	10*P0	P1
LRH-A2512	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

8.2 Packaging model:

Type	Tape width	Max. Packaging Quantity (pcs/reel)		
		Embossed Plastic Type		
		4mm pitch	8mm pitch	12mm pitch
LRH-A2512	12mm	4,000pcs	--	--

8.3 Reel Dimensions:



Unit: mm

Reel Type / Tape	W	M	A	B	C	D
7" reel for 12 mm tape	16.20 ± 0.5	178 ± 1.0	2.5 ± 0.5	13.5 ± 0.5	17.7 ± 0.5	60.0 ± 1.0

Remark

IT'S NOT UNDER CONTROL FOR PDF FILE
PLS NOTE THE VERSION STATED..

Issue Dep. DATA Center.

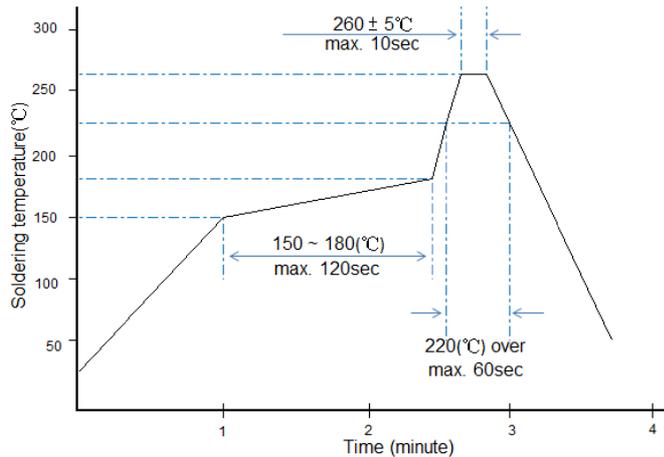
Do not copy without permission

Series No. **60**

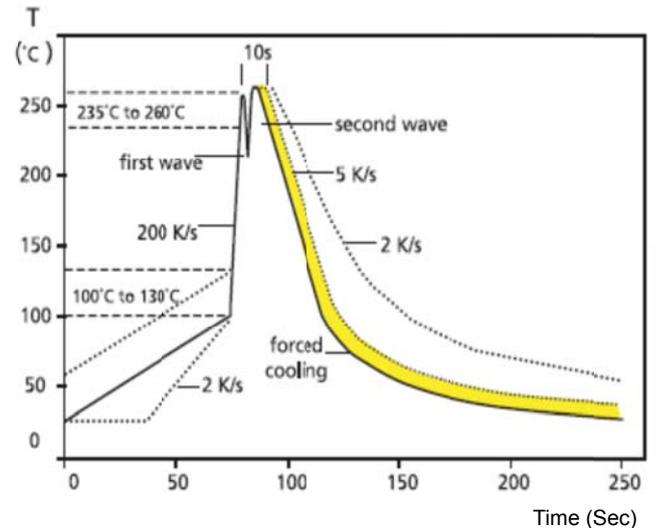
9 Technical note (This is for recommendation, please customer perform adjustment according to actual application)

9.1 Recommend soldering method:

9.1.1 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

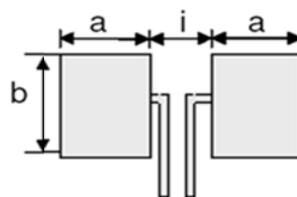
Typical values (solid line)

Process limits (dotted line)

9.1.2 Soldering Iron: temperature 350°C ± 10°C , dwell time shall be less than 3 sec.

9.2 Recommend Land Pattern:

When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.



Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters		
			a	b	i
LRH-A2512	3	3	2.11	3.68	3.18

Remark

IT'S NOT UNDER CONTROL FOR PDF FILE
PLS NOTE THE VERSION STATED..

Issue Dep. DATA Center.

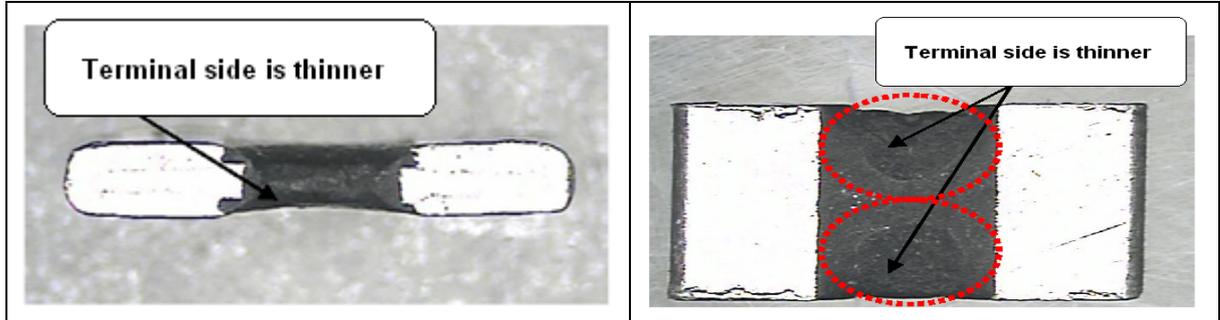
Do not copy without permission

Series No. **60**

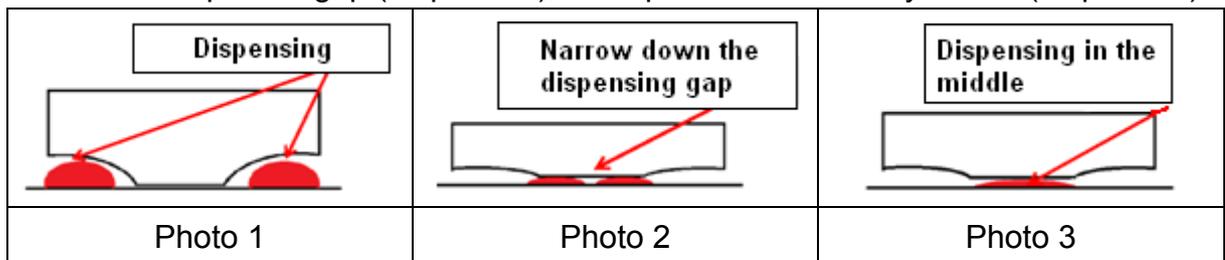
RALEC 旺詮	LRH-A2512 Metal Alloy Low-Resistance Resistor Product Specifications (Automotive Grade)	Document No.	IE-SP-121
		Released Date	2018/06/22
		Page No.	10

9.3 Recommend dispensing method

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



9.3.2 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)



9.4 Automobile Electronic Application:

This specification is for automobile electronic use. RALEC will take no responsibility if any damage, cost or loss occurs when the product has been used in any special circumstances.

9.5 Environment Precautions:

If consumer intends to use our company product in special environment or condition (including but not limited to those mentioned below), then will need to make individual recognition of product features and reliability accordingly.

- (a) Used in high temperature and humidity environment
- (b) Exposed to sea breeze or other corrosive gas, such as Cl₂、H₂S、NH₃、SO₂ and NO₂.
- (c) Used in non-verified liquids including water, oil, chemical and organic solvents.
- (d) Using non-verified resin or other coating material to seal or coat our Company product.

After soldering, it is necessary to use water-soluble detergents to clean residual solder fluxes, even though no-clean fluxes are recommended.

Remark	IT'S NOT UNDER CONTROL FOR PDF FILE PLS NOTE THE VERSION STATED..	Issue Dep. DATA Center.
	Do not copy without permission	Series No. 60

RALEC 旺詮	LRH-A2512 Metal Alloy Low-Resistance Resistor Product Specifications (Automotive Grade)	Document No.	IE-SP-121
		Released Date	2018/06/22
		Page No.	11

9.6 Momentary Overload Precautions:

The product might be out of function when momentary overloaded. Please make sure to avoid momentary overloading while using and preserving .

9.7 Operation and Processing Precautions:

- (a) Avoid damage to the edge of resistor and protective layer caused by mechanical stress.
- (b) Handle with care when printing circuit board (PCB) is divided or fixed on support body, because bending of printing circuit board (PCB) mounting will make mechanical stress for resistors.
- (c) Make sure the power rating is under the limit when using the resistor. When power rating is over the limit, the resistor will be overloaded. There might be machinery damage due to the climbing temperature.
- (d) If the resistor will be exposed under massive impact load (shock wave) in a short period of time, the working environment must be set up well before use.
- (e) Please make evaluation and confirmation when the product is well used in your company and have a through consideration of its fail-safe design to ensure the system safety.

10 Storage and transportation requirement:

- 10.1 The temperature condition must be controlled at 25±5°C, the R.H. must be controlled at 60±15%. The stock can maintain quality level in two years .
- 10.2 Please avoid the mentioned harsh environment below when storing to ensure product performance and its' weldability. Places exposed to sea breeze or other corrosive gas, such as Cl2 、 H2S 、 NH3 、 SO2 and NO2.
- 10.3 When the product is moved and stored, please ensure the correct orientation of the box. Do not drop or squeeze the box. Otherwise, the electrode or the body of the product may be damaged.

11 Attachments

- 11.1 Document Revise Record (QA-QR-027)

Remark	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> IT'S NOT UNDER CONTROL FOR PDF FILE PLS NOTE THE VERSION STATED.. </div>	Issue Dep. DATA Center.
	Do not copy without permission	Series No. 60

RALEC 旺詮	LRH-A2512 Metal Alloy Low-Resistance Resistor Product Specifications (Automotive Grade)	Document No.	IE-SP-121
		Released Date	2018/06/22
		Page No.	12

Legal disclaimer

Ralec, its distributors and agents (collectively, "Ralec"), hereby disclaims any and all liabilities for any errors, inaccuracies or incompleteness contained in any product related information, including but not limited to product specifications, datasheets, pictures and/or graphics. Ralec may make changes, modifications and/or improvements to product related information at any time and without notice.

Ralec makes no representation, warranty, and/or guarantee about the fitness of its products for any particular purpose or the continuing production of any of its products. To the maximum extent permitted by law, Ralec disclaims (i) any and all liability arising out of the application or use of any Ralec product, (ii) any and all liability, including without limitation liability for any loss of profits or for direct, indirect, special, punitive, consequential or incidental damages arising out of or related to Ralec products, and (iii) any and all implied warranties, including warranties of fitness for a particular purpose, non-infringement and merchantability.

Ralec defined this product is for automotive electronic use , not design for any application for medical life-saving or life support equipment, or any application which may inflict casualties if Ralec product failure occurred. Any and all technical advice furnished by Ralec with reference to the use of Ralec products are given free of charge and Ralec assumes no obligation or liability for the advice given or results obtained, and all such advice are given and accepted at buyer's risk. Buyer shall assume all risk and liability for the results obtained by the use of any Ralec products in combination with other articles or material or in the practice of any process, regardless of any oral or written technical statement made by Ralec with respect to the use of such products by way of technical advice or otherwise. Further, buyer represents and warrants that it has the experience and capacity of determining the correct product for its intended application.

Information provided here is intended to indicate product specifications only. Ralec reserves all the rights for revising this content without further notification, as long as products are unchanged. Any product change will be announced by ECN.

Remark	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> IT'S NOT UNDER CONTROL FOR PDF FILE PLS NOTE THE VERSION STATED.. </div>	Issue Dep. DATA Center.
	Do not copy without permission	Series No. 60