1 Scope:

1.1 This specification is applicable to lead free and halogen free for ACMH-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:

ACMH - A 2512 - 2 3 R003 F 4

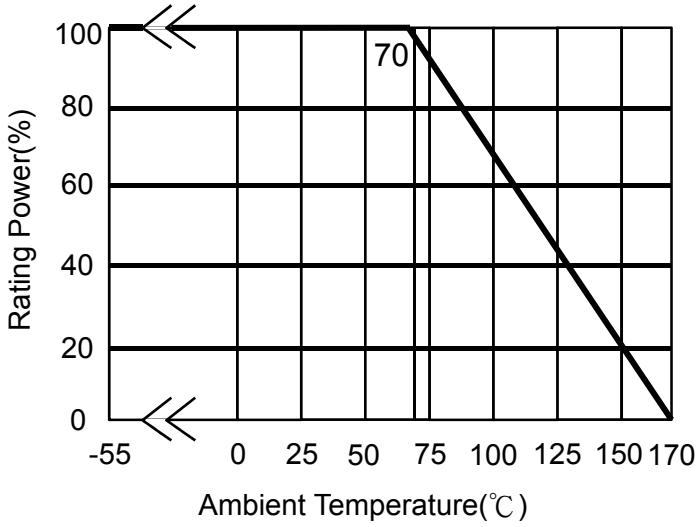
Type	Application	Size (inch)	Number of Terminals	Rated Power	Resistance (4 Digits)	Tolerance	Packaging
Low-Inductance Metal Alloy Low Resistance Resistor	Automotive Grade	2512	2: 2 terminals	3=3.0W	EX: R003 = 3mΩ	D=± 0.5% F=± 1.0% G=± 2.0% J=± 5.0%	4=4,000pcs

3 Product Specifications:

Type	# of Terminals	Max. Rating Power	Max. Rating Current	Max. Overload Current	T.C.R. (ppm/°C)		Resistance Range (mΩ) D (±0.5%)、F (±1%) G (±2%)、J (±5%)	Operating Temperature Range
ACMH-A2512	2	3W	31.62A	63.25A	3 mΩ:	≦±150	3	-55~+170°C

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

For resistors operated in ambient temperatures 70°C, power rating shell 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:

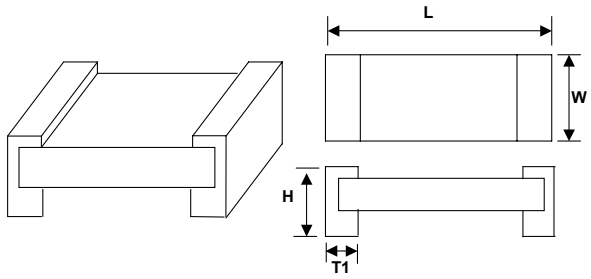
Remark:

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

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

4 Physical Dimensions:

ACMH-A2512



Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)			
			L	W	H	T1
ACMH-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
ACMH-A2512	Manganese-Copper Alloy	3 mΩ

5 Reliability Performance:

5.1 Electrical Performance:

Test Item	Conditions of Test	Test Limits
Temperature Coefficient of Resistance (TCR)	• TCR (ppm/℃) = $\frac{(R2-R1)}{R1\ (T2-T1)}$ X 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): Type / Power (W) / # of rated power ACMH-A2512 / 3 / 4 times Refer to JIS C 5201-1 4.13	≦±2.0% No evidence of mechanical damage
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	≧10^9Ω
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:

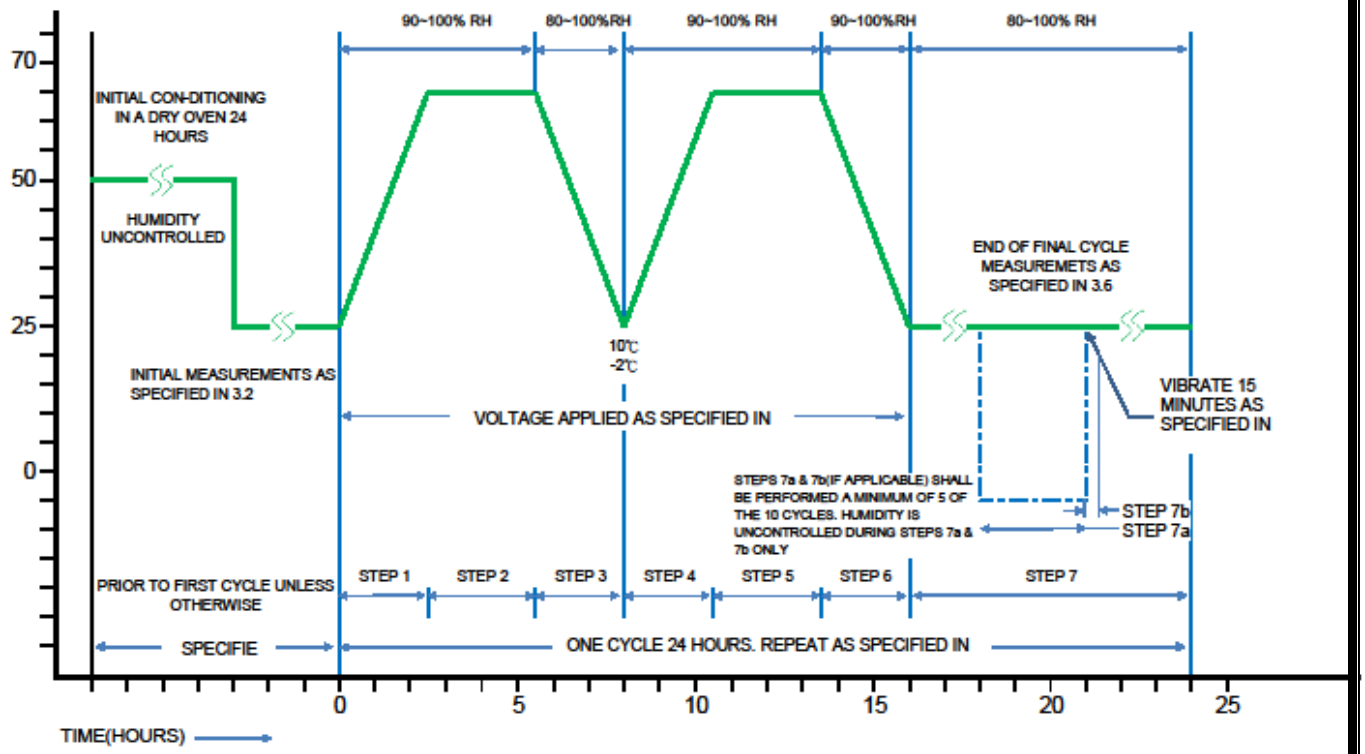
Test Item	Conditions of Test	Test Limits
Resistance to Solder Heat	The tested resistor be immersed 25 mm/sec into molten solder of 260±5℃ for 10±1secs. Then the resistor is left in the room for 1 hour, and measured its resistance variance rate. Refer to JIS-C5201-1 4.18	≦±0.5% No evidence of mechanical damage
Solderability	Add flux into tested resistors, immersion into solder bath in temperature 245±5℃ 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	≦±0.5% No evidence of mechanical damage
Resistance to solvent	The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60secs, then the resistor is left in the room for 48 hrs. Refer to JIS-C5201-1 4.29	≦±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±2℃ 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	≦±0.5% No evidence of mechanical damage
High Temperature Exposure (Storage)	Put tested resistor in chamber under temperature 170±5℃ 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	≦±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. Testing Condition Lowest Temperature: -55 +0/-10℃ Highest Temperature: 150 +10/-0℃ Refer to JIS-C5201-1 4.19	≦±0.5% No evidence of mechanical damage
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	≦±0.5% No evidence of mechanical damage
Bias Humidity	Put the tested resistor in chamber under 85± 5℃and 85± 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	≦±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± 2℃ 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	≦±3.0% No evidence of mechanical damage



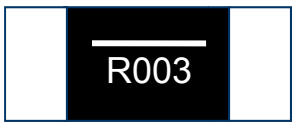
6 Marking Format: (All the products marking are 4 digits)

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.

6.2ACMH-A2512 series:



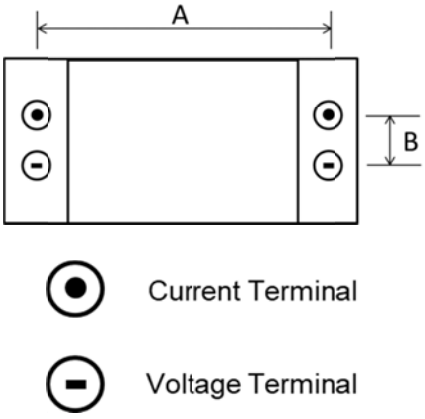
→ Ex. Resistance 3mΩ

6.3 Marking Style:

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

7 Measurement Point：

Bottom electrode

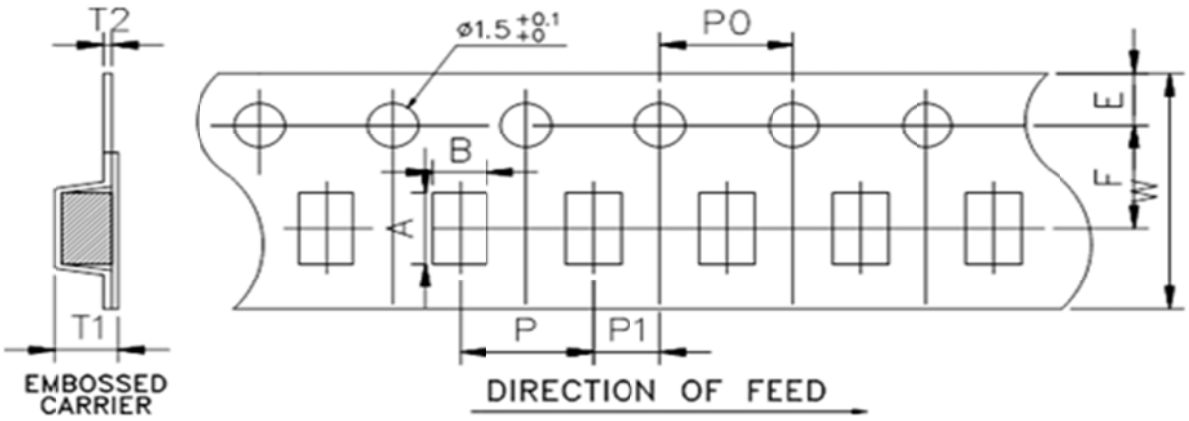


Unit：mm

Type \ DIM	A	B
ACMH- A2512	5.25±0.25	2.25±0.25

8 Taping specifications:

8.1 Tape Dimensions:



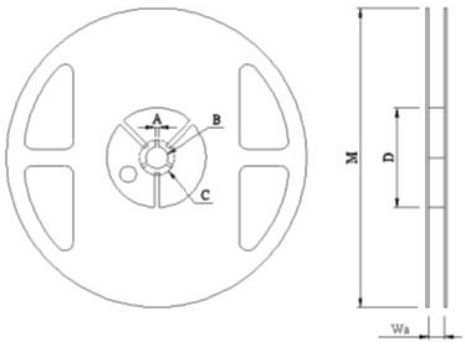
Unit: mm

DIM / Item	A	B	W	E	F	T1	T2	P	P0	10*P0	P1
ACMH-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
ACMH-A2512	12mm	4,000pcs	--	--

8.3 Reel Dimensions:



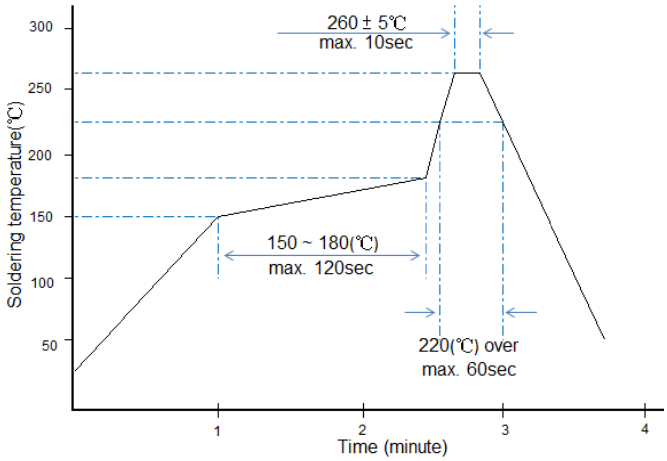
Unit: mm

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

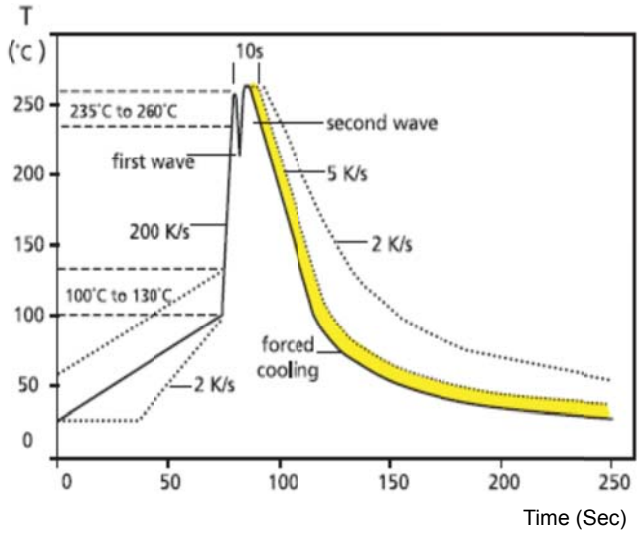
9 Technical note (This is for recommendation, please customer perform adjustment according to actual application)

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

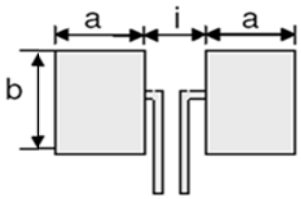
Typical values (solid line)

Process limits (dotted line)

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

9.2 Recommend Land Pattern:

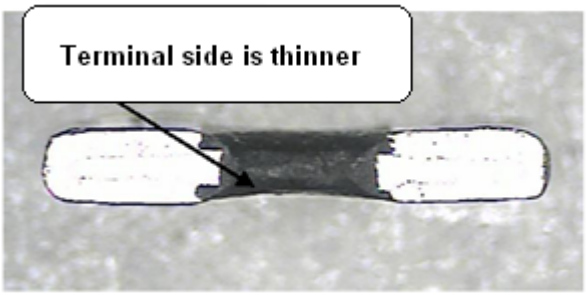
When a component is soldered, the resistance after soldering changes slightly depending on the size of the soldering area and the amount of soldering. When designing a circuit, it is necessary to consider the effect of a decrease or increase in its resistance.

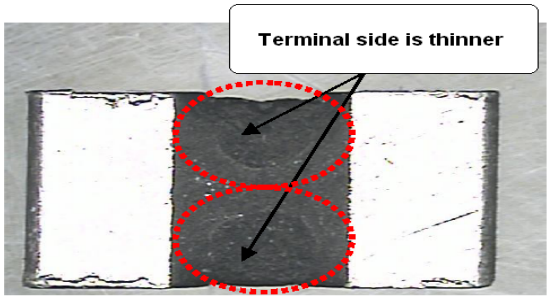


Type	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters		
			a	b	i
ACMH-A2512	3	3	2.11	3.68	3.18

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)

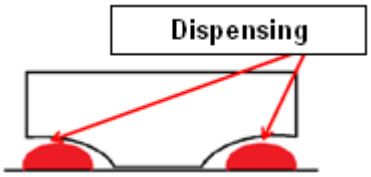


Photo 1

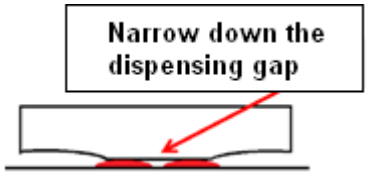


Photo 2

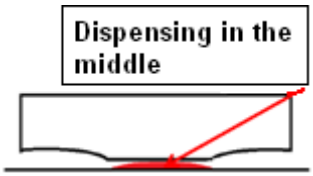


Photo 3

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.

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 resister will be overloaded. There might be machinery damage due to the climbing temperature.

(d) If the resister 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℃, 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)

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