1 Scope:

1.1 This specification is applicable to lead free and halogen free of RoHS for ACM 4 terminals metal alloy low-resistance resistor.

1.2 Ideal for current detection under high current circuit.

1.3 The product is for general electronic purpose.

2 Explanation Of Part Numbers:

ACM 3637 - 4 3 R001 F 1

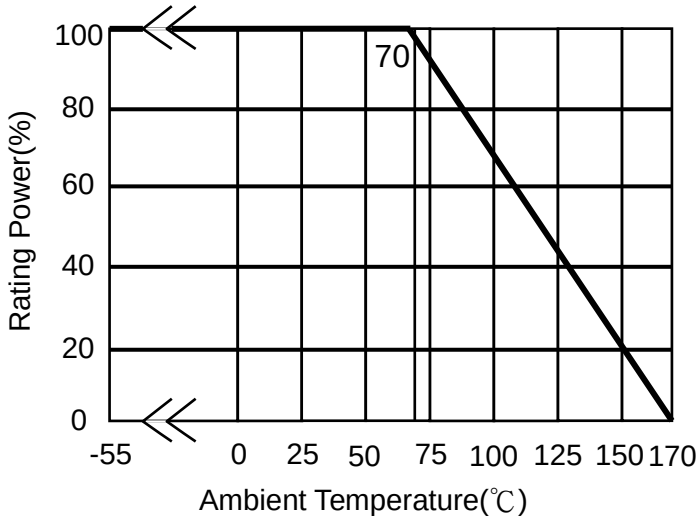
Type	Size (inch)	Number of Terminals	Rated Power	Resistance (4~6 Digits)	Tolerance	Packaging
Metal Alloy Low-Resistance Resistor	• 1225 • 2512 • 3637	4: 4 terminals	• 2=2.0W • 3=3.0W	EX: R0003 = 0.3mΩ R001 = 1mΩ R003 = 3mΩ R010 = 10mΩ	D=± 0.5% F=± 1.0%	1=1,000pcs 2=2,000pcs 4=4,000pcs

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%)	
ACM3637	4	3W	100.00A	233.61A	0.3mΩ~1mΩ: ≦±75 2mΩ~5mΩ: ≦±50	0.3~5	0.3~5	-55~170°C
ACM2512		2W	24.62A	55.05A	3.3mΩ: 6.2mΩ: ≦±50 12mΩ:	3.3 6.2 12	3.3 6.2 12	
		3W	30.15A	67.42A	3.3mΩ: 6.2mΩ: ≦±50 12mΩ:	3.3 6.2 12	3.3 6.2 12	
ACM1225		2W	31.62A	70.71A	2mΩ: ≦±50	2	2	
		3W	38.73A	86.60A	2mΩ: ≦±50	2	2	

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:

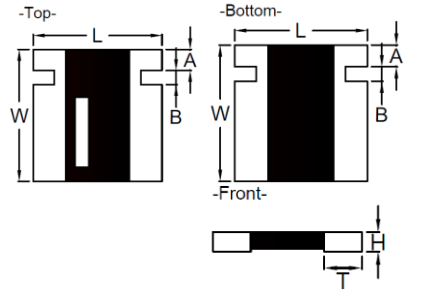
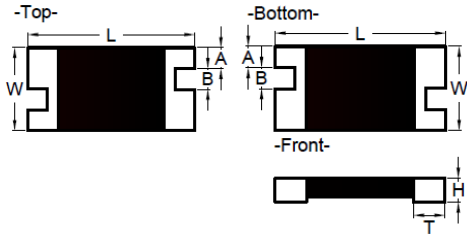
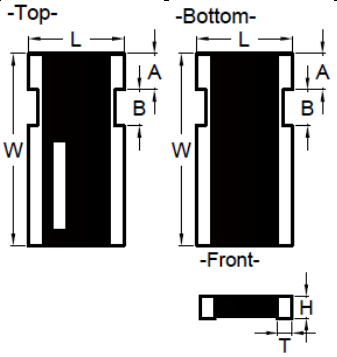
The following equation may be used to determine the DC (Direct Current) or AC (Alternating Current) currents (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards, the highest normal rated power is to be used.

Remark:

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

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

4 Physical Dimensions:

ACM3637-4T	ACM2512-4	ACM1225-4
		

Type	# of Terminals	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in inches (millimeters)					
				L	W	A	B	T	H
ACM3637	4	3	0.3~5	0.360±0.010 (9.14±0.254)	0.370±0.010 (9.40±0.254)	0.059±0.010 (1.50±0.254)	0.039±0.010 (1.00±0.254)	0.091±0.010 (2.31±0.254)	0.047±0.010 (1.20±0.254)
ACM2512		2	3.3	0.246±0.010 (6.248±0.254)	0.126±0.010 (3.202±0.254)	0.031±0.010 (0.80±0.254)	0.031±0.010 (0.80±0.254)	0.083±0.010 (2.10±0.254)	0.0346±0.010 (0.880±0.254)
			6.2					0.047±0.010 (1.20±0.254)	
			12						
		3	3.3					0.074±0.010 (1.88±0.254)	
			6.2					0.047±0.010 (1.20±0.254)	
			12						
ACM1225		2 & 3	2	0.126±0.010 (3.20±0.254)	0.250±0.010 (6.35±0.254)	0.048±0.005 (1.21±0.127)	0.048±0.005 (1.21±0.127)	0.020±0.010 (0.51±0.254)	0.040±0.010 (1.02±0.254)

4.1 Material of Alloy

Type	# of Terminals	Watts	Material	Resistance
ACM3637	4	3.0	Copper-Manganese Alloy	0.3mΩ ~ 1mΩ
			Iron-Chromium Aluminum Alloy	2mΩ ~ 5mΩ
ACM2512		2.0	Copper-Manganese Alloy	< 3.5mR
			Iron-Chromium Aluminum Alloy	≧3.5mR
		3.0	Copper-Manganese Alloy	≦3.5mR
			Iron-Chromium Aluminum Alloy	≧3.5mR
ACM1225		2.0	Iron-Chromium Aluminum Alloy	2mΩ
		3.0		

Reliability Performance:

4.2 Electrical Performance:

<table>
<tr><th>Test Item</th><th>Conditions of Test</th><th>Test Limits</th></tr>
<tr><td>Temperature Coefficient of Resistance (TCR)</td><td>• 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</td><td>Refer to Paragraph 3. general specifications</td></tr>
<tr><td>Short Time Overload</td><td>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>
<tr><th>Type</th><th># of Terminals</th><th>Power (W)</th><th># of rated power</th></tr>
<tr><td>ACM3637</td><td rowspan="5">4</td><td>3.0</td><td rowspan="5">5 times</td></tr>
<tr><td rowspan="2">ACM2512</td><td>2.0</td></tr>
<tr><td>3.0</td></tr>
<tr><td rowspan="2">ACM1225</td><td>2.0</td></tr>
<tr><td>3.0</td></tr>
</table>
Refer to JIS C 5201-1 4.13</td><td>ACM3637-4 ≦±0.5%
ACM2512-4 ≦±1.0%
ACM1225-4 ≦±0.5%</td></tr>
</table>

4.3 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

4.4 Environmental Performance:

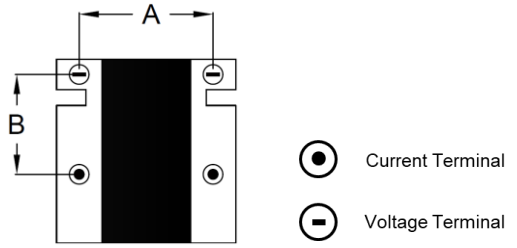
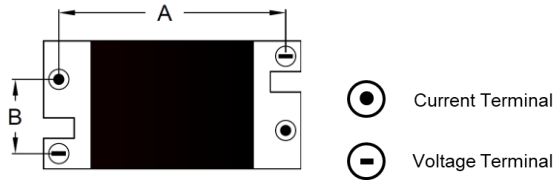
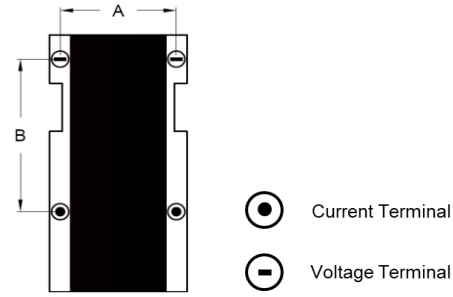
Test Item	Conditions of Test	Test Limits
Low Temperature Exposure (Storage)	Put the tested resistor in chamber under temperature -55±2℃ for 1,000 hours. Then leaving the tested resistor in room temperature for 60 minutes, and measure its resistance variance rate. Refer to JIS-C5201-1 4.23.4	≦±0.5% No 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	≦±0.5% 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 current 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

4.5 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 current 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	≦±1.0% No evidence of mechanical damage

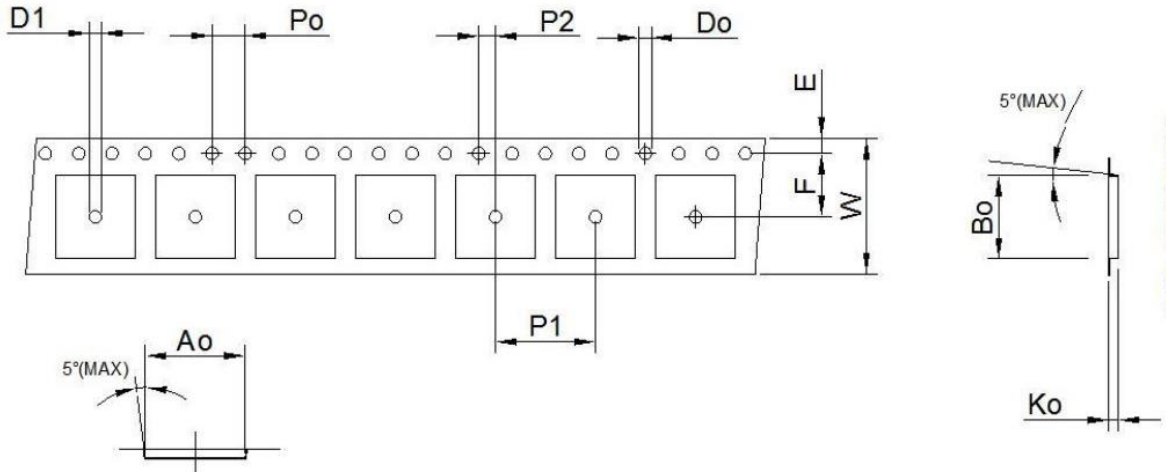
5 Measurement Point :

Unit : mm

Bottom electrode	DIM / Type-Terminals	A	B
	ACM3637-4	6.82±0.10	5.10 ±0.10
	ACM2512-4	5.548±0.10	2.001±0.10
	ACM1225-4	2.7±0.10	3.8±0.10

6 Taping specifications:

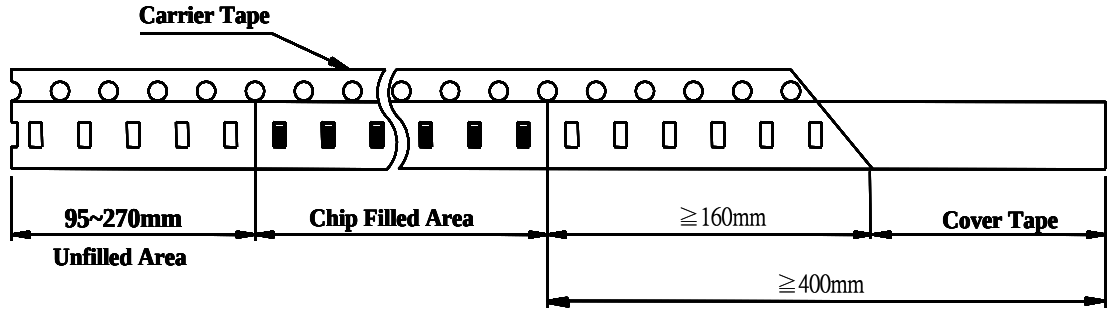
6.1 Tape Dimensions:



Unit: mm

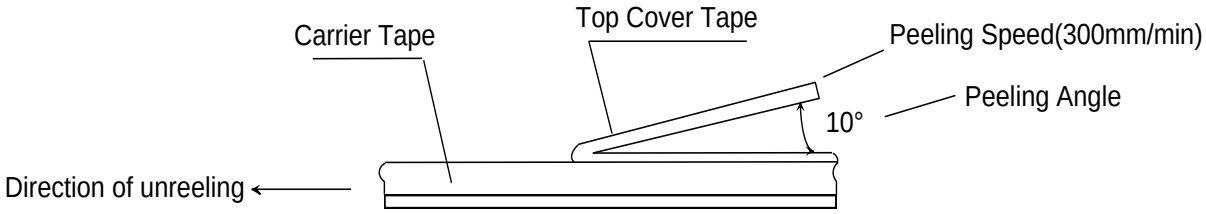
DIM / Type-Terminals	Ao	Bo	W	E	F	Ko	Po	P1	P2	Do	D1
ACM3637-4	9.6±0.1	9.9±0.1	16.0±0.2	1.75±0.1	7.5±0.1	1.5 Max	4.0±0.1	12.0±0.1	2.0±0.1	1.5±0.1	1.5 Max
ACM2512-4	3.5±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.1	1.3±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5±0.1	---
ACM1225-4	3.5±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.1	1.3±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5±0.1	---

6.2 Lead Dimensions:



6.3 Cover Tape Peel off Strength:

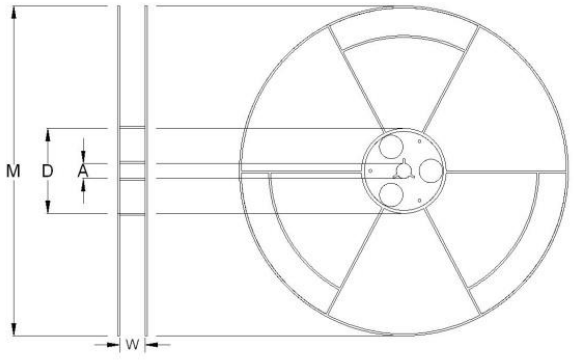
Specification value: 0.3～1.0N(30~100gf)



6.4 Packaging model:

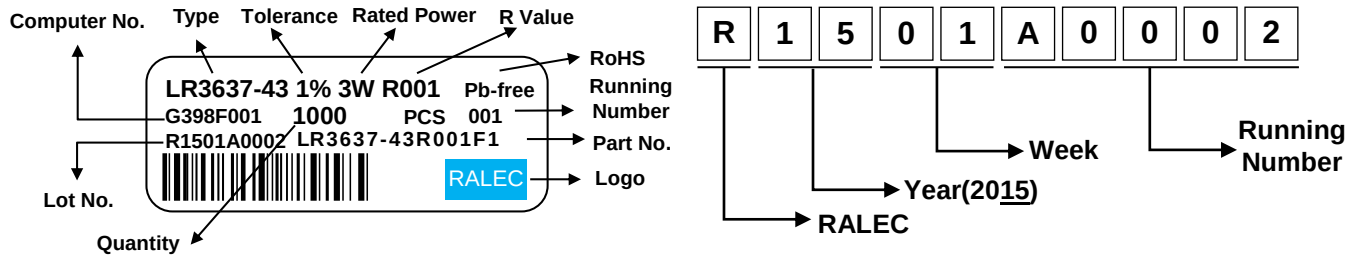
Type	# of Terminals	Tape width	Max. Packaging Quantity (pcs/reel)	
			Embossed Plastic Type	
			4mm pitch	8mm pitch
ACM3637	4	16mm	1000	-----
ACM2512(0.3mΩ)		12mm	-----	2000
ACM2512			4000	-----
ACM1225		12mm	4000	-----

6.5 Reel Dimensions:



Reel Type / Tape	W	M	A	D
7”reel for 16 mm tape	17.4 ± 1.0	178 ± 2.0	13.2 ± 0.5	60.0 ± 1.0
7”reel for 12 mm tape	13.8 ± 0.5	178 ± 2.0	13.5 ± 0.5	80.0 ± 1.0

6.6 Label:

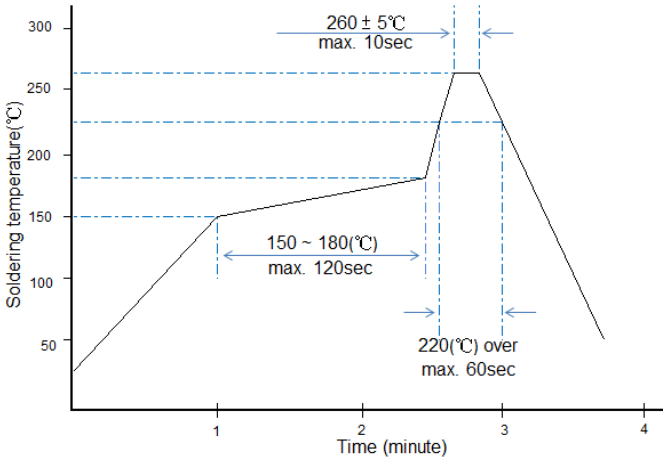


8 Technical application note (This is for recommendation, please customer perform adjustment according to actual application)

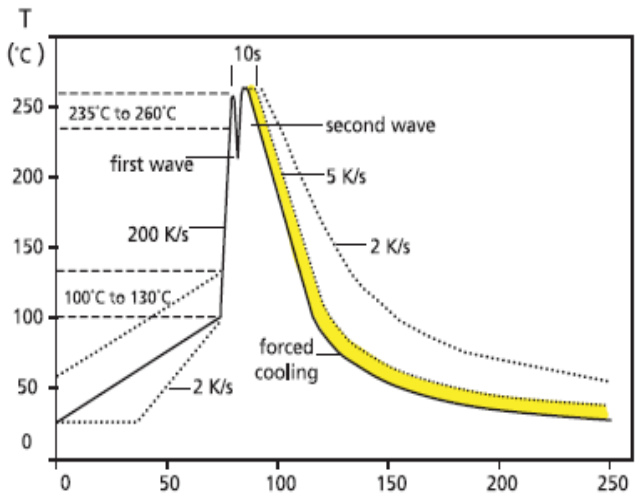
8.1 Recommend soldering method:

8.1.1 Typical examples of soldering processes that provides reliable joints without any damage are given in below:

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



Recommended IR Reflow Soldering Profile



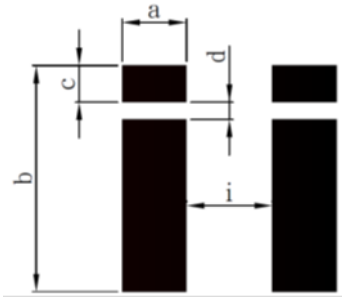
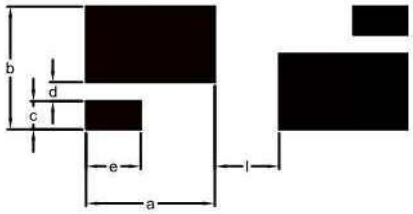
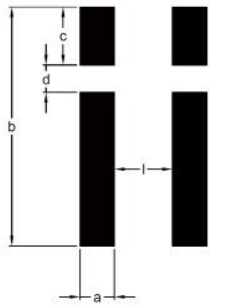
Recommended double-wave Soldering Profile

Typical values (solid line)

Process limits (dotted line)

8.2 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.

ACM3637-4	ACM2512 -4	ACM1225-4
		

Type	# of Terminals	Maximum Power Rating (Watts)	Resistance Range (mΩ)	Dimensions - in millimeters					
				a	b	c	d	e	i
ACM3637	4	3	0.3~5	2.95	9.90	1.68	0.60	---	4.50
ACM2512		2 & 3	3.3	2.60	3.68	1.14	0.53	1.39	2.17
			6.2	2.10					3.17
			12.0						
ACM1225		2 & 3	2.0	1.00	7.00	1.70	0.80	---	1.70

8.3 The characteristic of Fe/Cr/Al alloy material:

Because of including magnetism, inductor will be generated under high frequency circuit then to cause value shift and influence customer application. If there is related application shall be noted especially or discuss with original factory.

8.4 Environment Precautions:

This specification product is for general electronic use, RALEC will not be responsible for any damage, cost or loss caused by using this specification product in any special environment. If other applications need to confirm with RALEC.

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

8.5 Momentary Overload Precautions:

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

8.6 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 it's fail-safe design to ensure the system safety.

9 Storage and transportation requirement:

9.1 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。

9.2 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.

9.3 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.

10 Attachments

10.1 Document Revise Record (QA-QR-027)

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