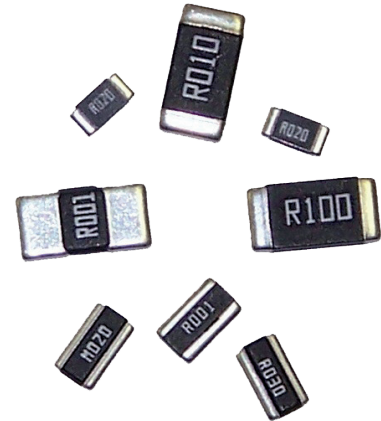


## Low Resistance Metal Alloy Resistor

### LRMA Series

- Resistance range 0.5mΩ to 500mΩ
- High temperature operation to 170°C
- Low thermal EMF version
- High power version
- Current sensing for power electronics
- RoHS compliant & halogen free
- AEC-Q200 qualified



 All parts are Pb-free and comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

### Electrical Data

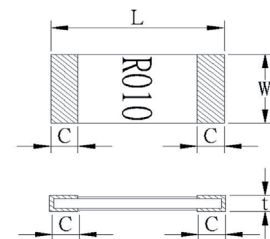
LRMA Version	Size	T (Standard)		P (Power)
		2010	2512	2512
Power rating @70°C	W	1.5	≤R01: 2, >R01: 1	≤R10: 3, >R10: 2
Overload rating (5s)	W	7.5	≤R01: 10, >R01: 5	≤R10: 15, >R10: 10
Resistance range	mΩ	2 to 50	1 to 100	0.5 to 500
Standard values <sup>1</sup>	mΩ	2, 5, 6, 10, 15, 20, 50	1, 1.5, 2, 3, 3.5, 4, 5, 6, 7, 8, 10, 11, 12, 15, 18, 20, 25, 30, 33, 35, 40, 50, 100	0.5, 0.75, 1, 1.1, 1.5, 2, 2.5, 3, 4, 5, 6, 6.8, 7, 8, 9, 10, 11, 12, 13, 15, 18, 20, 22, 25, 27, 30, 33, 39, 40, 45, 47, 50, 57, 60, 68, 70, 75, 80, 85, 90, 100, 120, 130, 140, 150, 180, 200, 220, 240, 250, 270, 280, 300, 330, 390, 400, 500
Resistance tolerance	%	0.5 <sup>1</sup> , 1, 5		
TCR (25 to 125°C)	ppm/°C	≥R01: ±75	>R001 & <R01: ±100, ≤R001: ±275	<R001: ±200 ≥R001: ±50
Ambient temperature	°C	-55 to 170		
Insulation resistance	MΩ	>100		
Element alloy		Cu-Ni		Cu-Ni / Mn-Cu

LRMA Version	Size	M (Low thermal EMF)			N (Inverse)		
		0805	1206	2512	0612	0815	1225
Power rating @70°C	W	0.5	1	≤R01: 2, >R01: 1	1 <sup>2</sup>		3
Overload rating (5s)	W	2.5	5	≤R01: 10, >R01: 5	5		15
Resistance range	mΩ	1 to 25	1 to 50	0.5 to 50	1 to 10	3 to 30	2 to 40
Standard values <sup>1</sup>	mΩ	1, 2, 3, 5, 6, 8, 9, 10, 20, 25	1, 1.2, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 18, 20, 22, 25, 30, 39, 40, 50	0.5, 0.75, 1, 1.5, 2, 3, 5, 10, 20, 25, 30, 40, 50	1, 3, 5, 10	3, 4, 5, 10, 15, 20, 25, 30	2, 3, 4, 5, 10, 15, 20, 25, 30, 40
Resistance tolerance	%	0.5 <sup>1</sup> , 1, 5					
TCR (25 to 125°C)	ppm/°C	±100	±50	≥R01: ±75, >R001 & <R01: ±100 ≤R001: ±275	±100		
Ambient temperature		-55 to 170°C					
Insulation resistance	MΩ	>100					
Element alloy		Mn-Cu			Mn-Cu / Cu-Ni		

Notes: 1. Non-standard values and 0.5% tolerance may be available for high volume requirements. 2. Requires 300mm<sup>2</sup> copper pad & trace area

### Physical Data (All dimensions in mm and nominal weight in mg)

Size	L	W	C	t	Wt
0805	2.0 ±0.1	1.25 ±0.1	0.4 ±0.2	0.6 ±0.2	5.5
0805 ≤R002			0.6 ±0.2		
1206 <R002	3.2 ±0.2	1.6 ±0.2	1.1 ±0.3	0.75 ±0.2	18.3
1206 ≥R002			0.5 ±0.3		
0612	1.7 ±0.2	3.2 ±0.2	0.4 ±0.2	0.6 ±0.2	12.9
0815	2.1 ±0.25	3.75 ±0.3	0.5 ±0.2	0.7 ±0.2	14.1
2010	5.0 ±0.2	2.5 ±0.2	0.6 ±0.3	0.6 ±0.2	35.6
2512 <R001	6.4 ±0.2	3.2 ±0.2	2.6 ±0.2	0.65 ±0.25	57 to 63
2512 ≥R001 & ≤R003 <sup>1</sup>			2.0 ±0.2		
2512 >R003 <sup>1</sup>			0.9 ±0.2		
1225	3.2 ±0.3	6.4 ±0.3	0.5 ±0.2	0.9 ±0.2	70



Note 1 - This applies to LRMAT2512 and LRMAM2512. For LRMAP2512 this threshold is R004

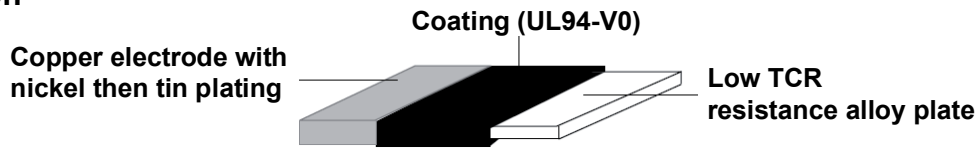
#### General Note

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## Low Resistance Metal Alloy Resistor

### LRMA Series

#### Construction



#### Marking

The components are marked with ohmic value, e.g. "R002" = 2mΩ, "R010" = 10 mΩ. Due to space restrictions, for LRMAM1206-R001, "01" = 1mΩ is used, and for LRMAM0805, "2" = 2mΩ, "010" = 10 mΩ are used.

#### Solvent Resistance

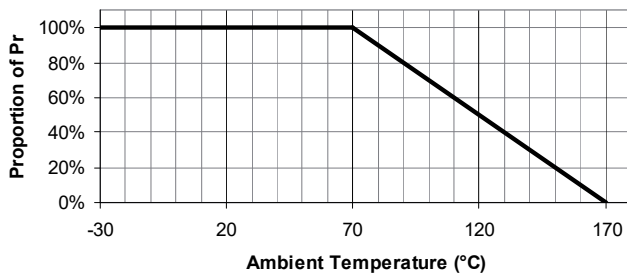
The component is resistant to all normal industrial cleaning solvents suitable for printed circuits.

#### Performance Data

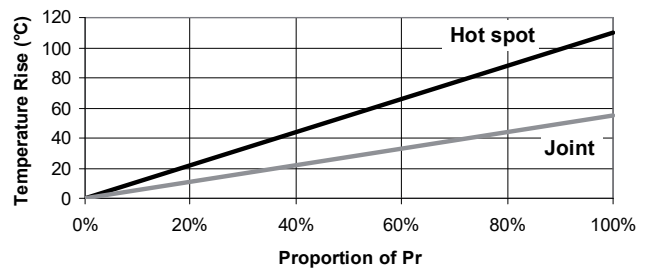
		Maximum (%)	Typical (%)
Load at rated power (cyclic load, 1000 hours at 70°C)	±ΔR	0805: 1.5 Others 1	0.3
Short term overload (5 x rated power for 5s)	±ΔR	0.5	0.15
Humidity (1000 hours, 85°C, 85%RH)	±ΔR	0805: 1 Others 0.5	0.15
Temperature cycle (-40 to +125°C, 1000 cycles, 15 minute dwell)	±ΔR	0805: 1 Others 0.5	0.15
Resistance to solder heat (260°C ±5°C for 20s ±1s)	±ΔR	0.5	0.3
Solderability (245°C ±5°C for 2s ±0.5s)		>95% coverage	
Dry heat (1000 hours at 170°C)	±ΔR	0805: 1.5 Others 0.5	0.3
Low temperature storage (1000 hours at -55°C)	±ΔR	0.5	0.15
Substrate bending (board 1.6mm, fulcrum spacing 90mm, deflection 2mm)	±ΔR	0805: 1 Others 0.5	0.3
Insulation resistance (1 minute @ 100Vdc)		>100M	

#### Thermal Performance & Mounting

Temperature Derating

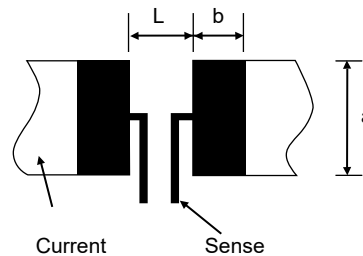


Typical Temperature Rise



#### Reference Pad Dimensions (mm)

Size	a	b	L
0612	3.8	0.7	0.7
0805	1.4	1.15	1.2
1206 <math>\leq R002</math>	1.8	2.3	1.0
1206 >math>\geq R002</math>	1.8	1.7	1.6
0815	7.9	1.5	0.9
2010	3.4	1.5	3.5
2512 <math>\leq R003^1</math>	4.0	3.1	1.3
2512 >math>\geq R003^1</math>	4.0	2.1	4.1
1225	7.0	1.0	2.3



The temperature rise shown is highly dependent on mounting conditions. Reference conditions assume 20μ copper with thermal vias to multiple layers. The self-heating in the current tracks should be kept negligible, or allowed for by temperature derating.

Note 1 - This applies to LRMAT2512 and LRMAM2512. For LRMAT2512 this threshold is R004

Standard 4-terminal probe pitches for measuring unmounted parts are 2.8 x 1.7mm (0612), 0.4 x 1.83mm (0805), 0.4 x 2.8mm (1206), 1.2 x 4.5mm (2010), 1.5 x 5.8mm (2512), and 5.4 x 3.4mm (1225). All probe location tolerances ±0.02mm.

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### Packaging

Size	Tape	A	B	W	F	E	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	ϕD <sub>0</sub>	t	ϕA	ϕB	ϕC	Wr	Tr
0805	Paper	1.6 ±0.15	2.4 ±0.2	8.0 ±0.2	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.1	4.0 ±0.1	1.5 +0.1/-0	0.84 ±0.1	178 ±2	60 ±1	13 ±1	9 ±1	11.4 ±1
0612, 1206	Paper	2.0 ±0.15	3.6 ±0.2	8.0 ±0.2	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	1.5 +0.1/-0	0.84 ±0.1	178 ±2	60 ±1	13 ±1	9 ±1	11.5 ±1
0815	Emboss	2.6 ±0.2	4.5 ±0.2	12 ±0.2	5.5 ±0.1	1.75 ±0.1	4.0 ±0.1	2.0 ±0.2	4.0 ±0.1	1.55 ±0.05	1.1 ±0.1	178 ±2	60 ±1	13 ±1	13 ±1	15.4 ±2
2010	Emboss	2.8 ±0.2	5.3 ±0.2	12 ±0.05	5.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.05	1.5 +0.1/-0	0.85 ±0.15	178 ±2	60 ±1	13 ±1	13 ±1	15.4 ±2
2512 1225	Emboss	3.6 ±0.2	6.9 ±0.2	12 ±0.2	5.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.05	1.5 +0.1/-0	0.85 ±0.15	178 ±2	60 ±1	13 ±1	13 ±1	15.4 ±2

### Storage

**Conditions:** 5°C to 35°C and 40% to 75%RH

**Shelf life:** 2 years from manufacture

### Processing

LRMA series resistors are suitable for both wave and IR reflow soldering. The recommended reflow profile for Pb-free SAC305 alloy (Sn 96.5%, Ag 3%, Cu 0.5%) soldering is as follows:

**Pre-heat:** 60s to 120s at 150°C to 180°C

**Soldering:** 20s to 40s at ≥230°C

**Peak:** 5s at 255°C to 260°C

### Ordering Procedure

**Example:** LRMAM2512-R01FT4 (LRMA2512, low thermal EMF, 10 milliohms ±1%, Pb-free)



1	2	3	4	5	6
Type	Version	Size	Value	Tolerance	Packing
LRMA	T	Standard	0612	3 to 6	D = ±0.5%
	P	Power	0805	characters	F = ±1%
	M	Low thermal EMF	1206	R = ohms	J = ±5%
	N	Inverse	0815		
		2010			
		2512			
		1225			

Note 1: For values which require all 6 characters, e.g. R00075, the hyphen is omitted.

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