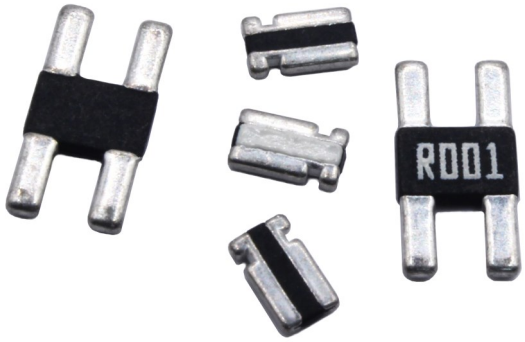
Low Resistance Metal Alloy Kelvin Resistors

LRMAK



Features:

- 4 separate contacts for true Kelvin connection
- Inverse (long side) terminations
- Compact footprint
- Resistance range 0.5mΩ to 5mΩ
- Tolerance to 0.5%
- Power rating up to 2W

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

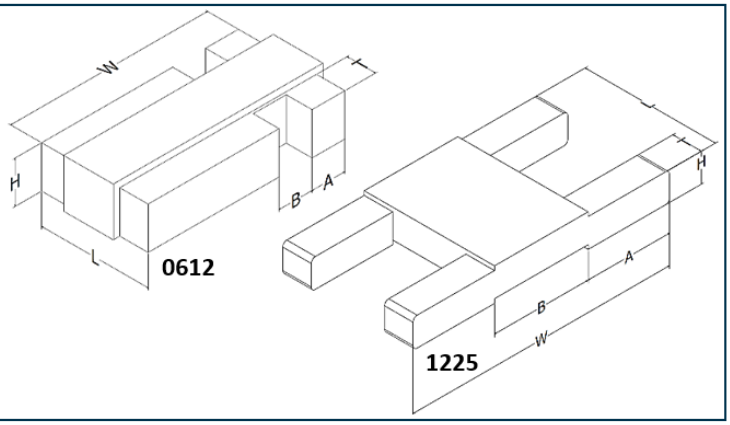
Electrical Data

		0612	1225
Power rating at 70°C	W	1	2
Resistance range	mΩ	0.5 to 5	1 to 3
Standard values		L50, L75, 1L0, 2L0, 3L0, 5L0	1L0, 3L0
Resistance tolerance	%	1, 5	0.5, 1, 5
TCR (25 to 125°C)	ppm/°C	≥R003: ±150 <R003: ±200	100
Ambient temperature range	°C	-55 to 170	
Insulation resistance	MΩ	>100	

Physical Data

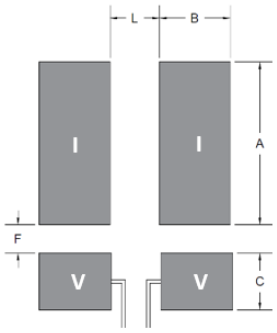
Dimensions in mm and weight in mg
All tolerances ±0.2mm unless otherwise stated.

Size	L	W	H	T	A	B	Wt. nom.
0612	1.65	3.05 ±0.25	0.65	0.4 ±0.25	0.51 ±0.13	0.51 ±0.13	18
1225	3.2	6.4	0.7	2	0.7	1.4	61



Recommended Pad Dimensions in mm All tolerances ±0.1mm.

Size	A	B	C	L	F
0612	2.3	1	0.8	0.7	0.4
1225	2.6	1.5	2.6	1.4	2.3



Cu thickness to be 3oz (105µm)

Construction

LRMAK is formed from a metal alloy plate with the central body covered by an insulating overcoat. The four terminations are plated with nickel and matt tin.

Marking

0612 parts are unmarked. 1225 parts are legend marked with 4 characters, e.g. R001.

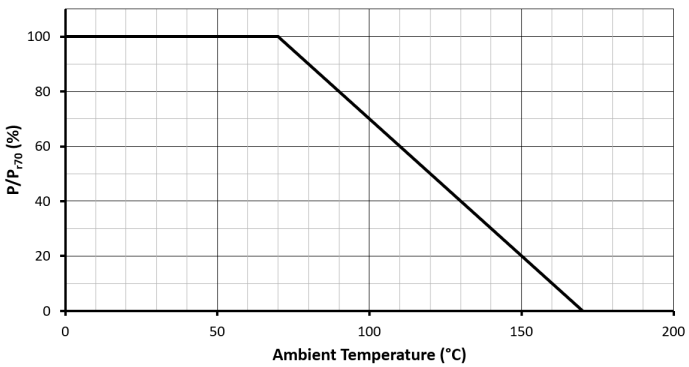
Solvent Resistance

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

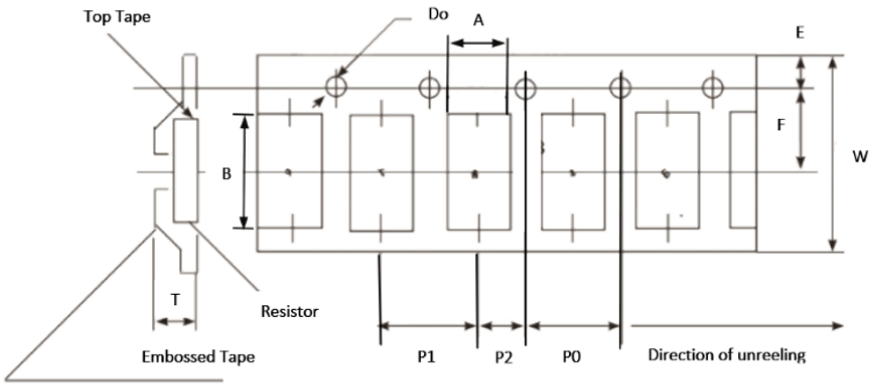
Performance Data

Test	Methods	Reference	ΔR max
High Temperature Exposure	T=125°C, 1000hrs, measurement at 24hrs after test conclusion.	AEC-Q200 Rev D - Test 3 MIL-STD-202 - Method 108	±1.0%
Temperature Cycling	1000 Cycles (-55°C to 125°C), measurements at 24hrs after test conclusion.	AEC-Q200 Rev D - Test 4 JESD22 - Method JA-104	±1.0%
Short Time Overload	5 x Rated power for 5s	IEC60115-1 4.13	±0.5%
Moisture Resistance	T=24 hours/cycle, 10 cycles. Notes: Steps 7a & b not required. Unpowered.	AEC-Q200 Rev D - Test 6 MIL-STD-202 - Method 106	±1.0%
Biased Humidity	10% Rated power at 85°C, RH:85%, 1000hrs, measurement at 24hrs after test conclusion.	AEC-Q200 Rev D - Test 7 MIL-STD-202 - Method 103	±1.0%
Operational Life	1000hrs, TA=125°C at 45% rated power. Measurement at 24±4 hours after test conclusion.	AEC-Q200 Rev D - Test 8 MIL-STD-202 – Method 108	±2.0%
Resistance to Solvents	A: Isopropyl Alcohol: Mineral spirits = 1:3 B: Terpene Defluxer (Bioact EC-7R) C: Deionized Water: Propylene Glycol Monomethyl Ether: Monoethanolamine = 42:1:1	AEC-Q200 Rev D - Test 12 MIL-STD-202 – Method 215	No damage to protection or marking
Resistance to Solder Heat	T=260 ± 5°C solder, 10 ± 1 sec dwell	AEC-Q200 Rev D - Test 15 MIL-STD-202 – Method 210	±0.5%
Mechanical Shock	100g's, normal duration is 6ms, half sine shock pulse.	AEC-Q200 Rev D - Test 13 MIL-STD-202 – Method 213	±0.5%
Resistance to Vibration	5g's for 20 minutes, 12 cycles, 10-2000Hz.	AEC-Q200 Rev D - Test 14 MIL-STD-202 – Method 204	±0.5%
Board Flex	Minimum 2mm deflection, 60 secs.	AEC-Q200 Rev D - Test 21 AEC-Q200-005	±0.5%
Flammability	V-0 or V-1 are acceptable, electrical test not required.	AEC-Q200 Rev D – Test 20 UL-94	V-0
ESD	Verify the voltage setting at 500V	AEC-Q200 Rev D - Test 17 MIL-STD-202-002	±1.0%
Solderability	Method B, aging 4 hours at 155°C dry heat. Lead-free solder bath and 235 ± 3°C. Dipping time 3 ± 0.5 seconds.	AEC-Q200 Rev D - Test 18 J-STD-002	95% area coverage
Terminal Strength	Force of 1.8kg for 60 seconds.	AEC-Q200 Rev D - Test 22 AEC-Q200-006	±1.0%

Temperature Derating



Packaging



All dimensions in mm — All tolerances ±0.1mm unless otherwise stated.

Size	A	B	W	E	F	P_0	P_1	P_2	D_0	T	Reel dia.	Qty.
0612	1.77	3.4	8	1.75	3.5 ±0.05	4	4	2	1.5 ±0.15	1.26 ±0.15	178	4000
1225	3.6 ±0.2	6.9 ±0.2	12 ±0.2		5.5 ±0.05					0.85 ±0.15		

Storage

LRMAK series resistors have MSL level 1 and should be stored at temperatures between 5 and 35°C and humidity between 40 and 75%.

Soldering

LRMAK series resistors are suitable for IR reflow soldering. To avoid discoloration, reflow in nitrogen is recommended, but reflow in air is also possible. The recommended reflow profile for Pb-free soldering using SAC alloy (Sn 96.5%, Ag 3%, Cu 0.5%) is as below.

Pre-heat: 60 to 120s at 150 to 200°C
Ramp-up rate: 3°C/s max.
Soldering: 60s to 150s above 217°C
Peak temperature: 260°C
Peak duration: 10s within 5°C of peak
Ramp-down rate: -6°C/s max.
Time from ambient to peak: 8 mins max.
Reflow cycles: ≤3

Ordering Procedure

Example: LRMAK0612-L50FT4 (0.5 milliohm ±1%, Pb-free)

L	R	M	A	K	0	6	1	2	-	L	5	0	F	T	4
1					2					3			4	5	

1 Type	2 Size	3 Value	4 Tolerance	5 Packing
LRMAK	0612	3 characters	D = ±0.5%	T4 = plastic tape, 4000/reel
	1225	L = milliohms	F = ±1%	
			J = ±5%	