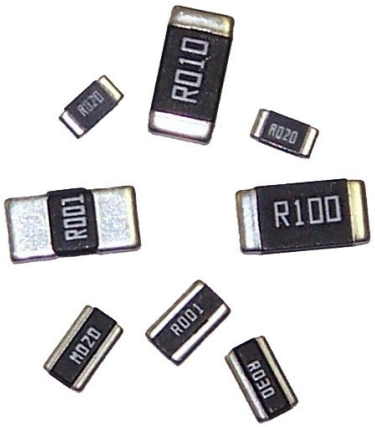
# Low Resistance Metal Alloy Resistors

## LRMA Series




### Features:

- Resistance range 0.5mΩ to 750mΩ
- High temperature operation to 170°C
- Low thermal EMF version
- High power version
- Inverse version
- Current sensing for power electronics
- AEC-Q200 qualified

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

## Electrical Data

| Version T (Standard) | | LRMAT2010 | LRMAT2512 |
|---|---|---|---|
| Power rating @70°C | W | 1.5 | ≤R01: 2, >R01: 1 |
| Overload rating (5s) | W | 7.5 | ≤R01: 10, >R01: 5 |
| Resistance range | mΩ | 2 to 50 | 1 to 100 |
| Standard values [1] | 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 |
| Resistance tolerance | % | 0.5[1], 1, 5 | |
| TCR (25 to 125°C) | ppm/°C | ≥R01: ±75, >R001 & <R01: ±100, ≤R001: ±275 | |
| Ambient temperature | °C | -55 to 170 | |
| Insulation resistance | MΩ | >100 | |
| Element alloy | | Cu-Ni | |

| Version P (Power) | | LRMAP2512 |
|---|---|---|
| Power rating @70°C | W | ≤R10: 3, >R10: 2 |
| Overload rating (5s) | W | ≤R10: 15, >R10: 10 |
| Resistance range | mΩ | 0.5 to 750 |
| Standard values [1] | mΩ | 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, 750 |
| Resistance tolerance | % | 0.5[1], 1, 5 |
| TCR (25 to 125°C) | ppm/°C | ≥R001: ±50, <R001: ±275 |
| Ambient temperature | °C | -55 to 170 |
| Insulation resistance | MΩ | >100 |
| Element alloy | | Cu-Ni / Mn-Cu |

| Version M (Low thermal EMF) | | LRMAM0805 | LRMAM1206 | LRMAM2512 |
|---|---|---|---|---|
| Power rating @70°C | W | 0.5 | 1 | ≤R01: 2, >R01: 1 |
| Overload rating (5s) | W | 2.5 | 5 | ≤R01: 10, >R01: 5 |
| Resistance range | mΩ | 1 to 25 | 1 to 50 | 0.5 to 50 |
| Standard values [1] | mΩ | 1, 2, 3, 5, 6, 8, 9, 10, 20, 25 | 1, 1.2, 2, 2.5, 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, 5, 10, 20, 25, 30, 40, 50 |
| Resistance tolerance | % | 0.5[1], 1, 5 | | |
| TCR (25 to 125°C) | ppm/°C | ±100 | ±50 | ≥R01: ±75, >R001 & <R01: ±100, ≤R001: ±275 |
| Ambient temperature | °C | -55 to 170 | | |
| Insulation resistance | MΩ | >100 | | |
| Element alloy | | Mn-Cu | | |



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## Electrical Data (continued)

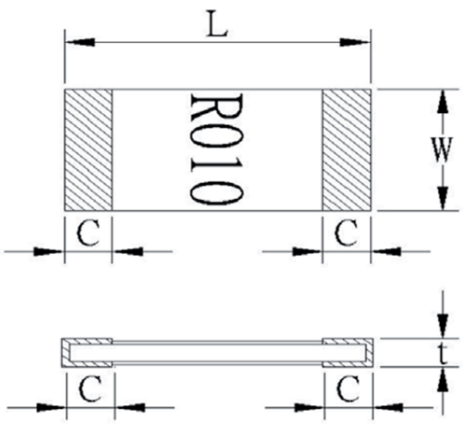
| Version N (Inverse) | | LRMAN0612 | LRMAN0815 | LRMAN1225 |
|---|---|---|---|---|
| Power rating @70°C | W | 1[2] | | 3 |
| Overload rating (5s) | W | 5 | | 15 |
| Resistance range | mΩ | 1 to 10 | 1 to 30 | 2 to 40 |
| Standard values [1] | mΩ | 1, 3, 5, 10 | 1, 2, 3, 4, 5, 6, 8, 10, 15, 20, 25, 30 | 2, 3, 4, 5, 10, 15, 20, 25, 30, 40 |
| Resistance tolerance | % | 0.5[1], 1, 5 | | |
| TCR (25 to 125°C) | ppm/°C | ±100 | | |
| Ambient temperature | °C | -55 to 170 | | |
| Insulation resistance | MΩ | >100 | | |
| Element alloy | | Cu-Ni / Mn-Cu | | |

Notes: 1. Non-standard values and 0.5% tolerance may be available for high volume requirements.
2. Requires 300mm² copper pad & trace area.

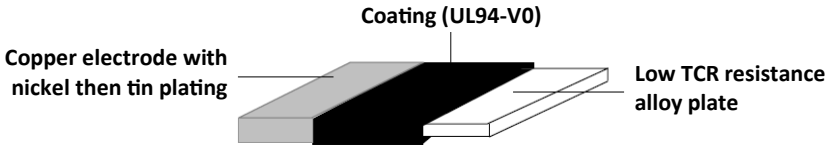
## Physical Data

**Dimensions in mm and weight in mg** Tolerances ±0.2mm unless stated

| Type | Value (mΩ) | L | W | C | t | Wt. nom. |
|---|---|---|---|---|---|---|
| LRMAT2010 | All | 5 | 2.5 | 0.6 ±0.3 | 0.6 | 36 |
| LRMAT2512 | <1 | 6.4 | 3.2 | 2.6 | 0.6 | 62 |
| | ≥1 & ≤3 | | | 2.2 | | |
| | >3 | | | 0.9 | | |
| LRMAP2512 | <1 | | | 2.6 | 0.9 | 57 |
| | ≥1 & ≤4 | | | 2.2 | | |
| | >4 | | | 0.9 | | |
| LRMAM0805 | ≤2 | 2 ±0.1 | 1.25 ±0.1 | 0.6 | 0.6 | 5.5 |
| | >2 | | | 0.4 | | |
| LRMAM1206 | <2 | 3.2 | 1.6 | 1.1 ±0.3 | 0.75 | 18 |
| | ≥2 | | | 0.5 ±0.3 | 0.6 | |
| LRMAM2512 | <1 | 6.4 | 3.2 | 2.6 | 0.6 | 62 |
| | ≥1 & ≤3 | | | 2.2 | | |
| | >3 | | | 0.9 | | |
| LRMAN0612 | All | 1.7 | 3.2 | 0.4 | 0.6 | 13 |
| LRMAN0815 | All | 2.3 | 3.75 ±0.3 | 0.5 | 0.7 | 14 |
| LRMAN1225 | All | 3.2 ±0.3 | 6.4 ±0.3 | 0.5 | 0.9 | 70 |




### Construction




### Marking

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

### Solvent Resistance

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



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# Low Resistance Metal Alloy Resistors

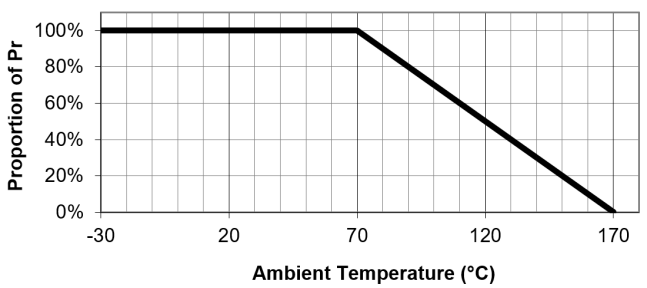
## LRMA Series

## Performance Data

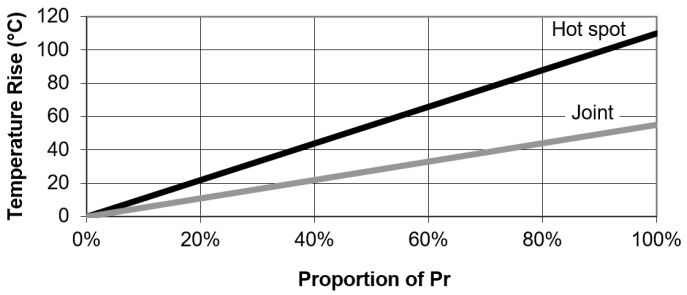
| Test | Methods | Size: | Maximum 0805 | Maximum Others | Typical All |
|---|---|---|---|---|---|
| Load at rated power | Cyclic load, 1000 hours at 70°C | ±ΔR% | 1.5 | 1 | 0.3 |
| Short term overload | 5x rated power for 5s | ±ΔR% | 0.5 | | 0.15 |
| Humidity | 1000 hours, 85°C, 85%RH | ±ΔR% | 1 | 0.5 | 0.15 |
| Temperature cycle | -40 to +125°C, 1000 cycles, 15-minute dwell | ±ΔR% | 1 | 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, 170°C | ±ΔR% | 1.5 | 0.5 | 0.3 |
| Low temperature storage | 1000 hours, -55°C | ±ΔR% | 0.5 | | 0.15 |
| Substrate bending | Board 1.6mm, fulcrum spacing 90mm, deflection 2mm | ±ΔR% | 1 | 0.5 | 0.3 |
| Insulation resistance | 1 minute, 100Vdc | | >100M | | |
| Sulphur resistance | ASTM B-809-95 (modified) 1000 hours, 105°C dry, visual inspection x10 | | Pass | | |

## Thermal Performance & Mounting

**Temperature Derating**



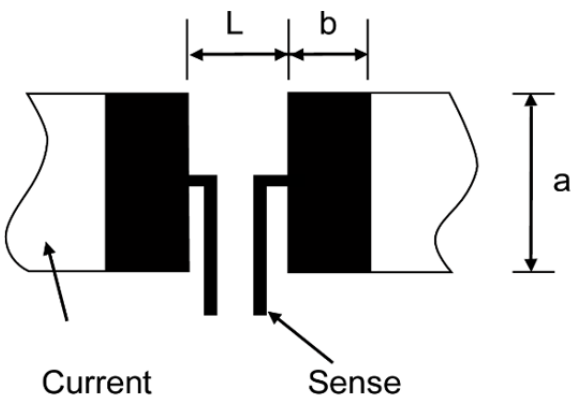

**Typical Temperature Rise**




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

### Reference Pad Dimensions (mm)

| Type | Value (mΩ) | a | b | L |
|---|---|---|---|---|
| LRMAT2010 | All | 3.4 | 1.5 | 3.5 |
| LRMAT2512 | ≤3 | 4 | 3.1 | 1.3 |
| | >3 | | 2.1 | 4.1 |
| LRMAP2512 | ≤4 | 4 | 3.1 | 1.3 |
| | >4 | | 2.1 | 4.1 |
| LRMAM0805 | All | 1.4 | 1.15 | 1.2 |
| LRMAM1206 | <2 | 1.8 | 2.3 | 1 |
| | ≥2 | | 1.7 | 1.6 |
| LRMAM2512 | ≤3 | 4 | 3.1 | 1.3 |
| | >3 | | 2.1 | 4.1 |
| LRMAN0612 | All | 3.8 | 0.7 | 0.7 |
| LRMAN0815 | ≤10 | 4.2 | 0.8 | 1.2 |
| | >10 | | 1.5 | 0.9 |
| LRMAN1225 | All | 7 | 1 | 2.3 |




### Measurement Probe Positions

Standard 4-terminal probe pitches for measuring unmounted parts are 2 x 1.2mm (0612), 0.8 x 1.5mm (0805), 1.1 x 2.5mm (1206), 2.2x 4.6mm (2010), 2.2 x 5.4mm (2512), and 5.4 x 2.3mm (1225). All probe location tolerances ±0.02mm. These resistors are designed to have the correct ohmic value when mounted on a PCB. Probed measurements may read higher values and mounting offsets may need to be established to account for this, especially with sub-milliohm values.

General Note
TT Electronics reserves the right to make changes in product specification without notice or liability.
All information is subject to TT Electronics' own data and is considered accurate at time of going to print.



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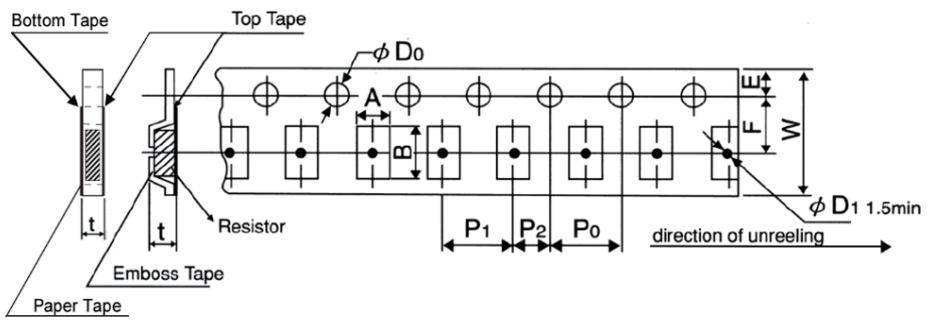
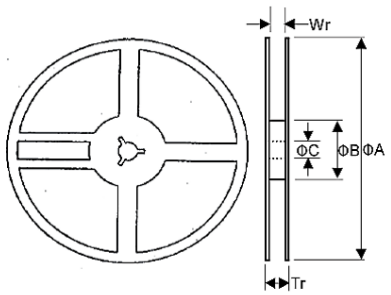
## Packaging




All dimensions in mm

| Size | Tape | A | B | W | F | E | $P_1$ | $P_2$ | $P_0$ | $\Phi D_0$ | t | ΦA | ΦB | ΦC | Wr | Tr | Qty |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 ±0.2 | 4.0 ±0.1 | 1.5 +0.1 /-0 | 0.84 ±0.1 | 178 ±2 | 60 ±1 | 13 ±1 | 9 ±1 | 11.4 ±1.1 | 5000 |
| 1206/0612 | | 2.0 ±0.15 | 3.6 ±0.2 | | | | | | | | | | | | | | |
| 0815 | Embossed plastic | 2.6 ±0.2 | 4.5 ±0.2 | 12 ±0.2 | 5.5 ±0.1 | | | | | | 1.1 ±0.1 | | | | 13 ±1 | 15.4 ±2 | 4000 |
| 2010 | | 2.8 ±0.2 | 5.3 ±0.2 | | | | | | | | 0.85 ±0.15 | | | | | | |
| 2512/1225 | | 3.6 ±0.2 | 6.9 ±0.2 | | | | | | | | | | | | | | |

### 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** (LRMA with low thermal EMF, 2512, 10 milliohms ±1%, Pb-free)

| L | R | M | A | M | 2 | 5 | 1 | 2 | -[1] | R | 0 | 1 | | | | F | T | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | 2 | 3 | | | | | 4 | | | | | | 5 | 6 | |

| 1 Series | 2 Version | | 3 Size | 4 Value | 5 Tolerance | 6 Packing | | |
|---|---|---|---|---|---|---|---|---|
| LRMA | T | Standard | 0612 | 3 to 6 characters R = ohms | D = ±0.5% | Tape & reel | | |
| | P | Power | 0805 | | F = ±1% | T5 | 0612, 0805, 1206 | 5000/reel |
| | M | Low thermal EMF | 0815 | | J = ±5% | T4 | 0815, 1225, 2010, 2512 | 4000/reel |
| | N | Inverse | 1206 | | | | | |
| | | | 1225 | | | | | |
| | | | 2010 | | | | | |
| | | | 2512 | | | | | |

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



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