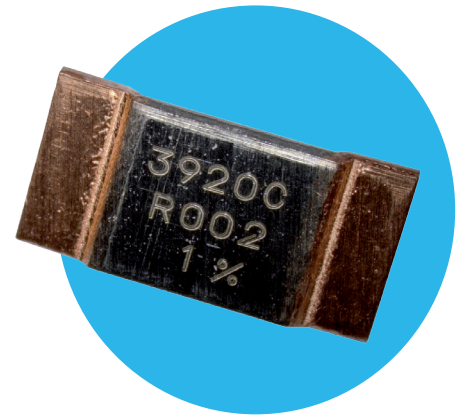


## Low Resistance Metal Alloy Power Resistors



### LRMAP3920

- Resistance range 0.2mΩ to 3mΩ
- Excellent long-term stability
- Standard power rating up to 5W
- Thermal substrate power rating up to 10W
- 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

|                                                 |        | LRMAP3920  |      |     |     |    |    |     |    |    |  |
|-------------------------------------------------|--------|------------|------|-----|-----|----|----|-----|----|----|--|
| Alloy type                                      |        | A          |      | B   |     |    |    | C   |    |    |  |
| Resistance value                                | mΩ     | 0.2        | 0.3  | 0.5 | 0.7 | 1  | 1  | 1.5 | 2  | 3  |  |
| Power rating (standard), $P_{r120}^1$           | W      | 5          |      |     |     | 4  | 5  | 4.5 | 4  | 3  |  |
| Power rating (thermal substrate), $P_{rts70}^2$ | W      | 10         |      |     |     | 7  |    |     |    | 5  |  |
| Overload rating (5s) <sup>1</sup>               | W      | 25         |      |     |     | 20 | 25 | 23  | 20 | 15 |  |
| Continuous pulse energy                         | J      | 11         | 13   | 8   | 6   | 4  | 12 | 9   | 6  | 4  |  |
| Internal thermal impedance, $R_{thi}$           | °C/W   | 2.5        | 4    | 6   | 9   | 12 | 7  | 11  | 14 | 17 |  |
| Resistance tolerance                            | %      | 1          |      |     |     |    |    |     |    |    |  |
| TCR (20 to 60°C)                                | ppm/°C | ±200       | ±150 | ±50 |     |    |    |     |    |    |  |
| Thermal EMF                                     | μV/°C  | <2         |      |     |     |    |    |     |    |    |  |
| Inductance                                      | nH     | <3         |      |     |     |    |    |     |    |    |  |
| Ambient temperature                             | °C     | -55 to 170 |      |     |     |    |    |     |    |    |  |

Note 1: Mounted on FR4 board. See Thermal Data and Mounting section for details.

Note 2: Mounted on thermal substrate. See Thermal Data and Mounting section for details.

### Physical Data

| Dimensions in mm and weight in mg |           |                    |                   |          |           |           |          |            |  |
|-----------------------------------|-----------|--------------------|-------------------|----------|-----------|-----------|----------|------------|--|
| Type                              | L<br>±0.3 | L1<br>+0.2<br>-0.3 | H<br>+0.3<br>-0.2 | A<br>max | D<br>±0.5 | B<br>±0.1 | T<br>nom | Wt.<br>nom |  |
| LRMAP3920A-R0002                  | 10.0      | 4.0                | 5.2               | 0.6      | 2.0       | 0.5       | 1.50     | 694        |  |
| LRMAP3920B-R0003                  |           |                    |                   |          |           |           | 1.43     | 608        |  |
| LRMAP3920B-R0005                  |           |                    |                   |          |           |           | 0.85     | 380        |  |
| LRMAP3920B-R0007                  |           |                    |                   |          |           |           | 0.62     | 271        |  |
| LRMAP3920B-R001                   |           |                    |                   |          |           |           | 0.43     | 188        |  |
| LRMAP3920C-R001                   |           |                    |                   |          |           |           | 1.36     | 542        |  |
| LRMAP3920C-R0015                  |           |                    |                   |          |           |           | 0.90     | 361        |  |
| LRMAP3920C-R002                   |           |                    |                   |          |           |           | 0.67     | 277        |  |
| LRMAP3920C-R003                   |           |                    |                   |          |           |           | 0.45     | 180        |  |

#### Marking

The component is laser marked with “3920”, alloy type, ohmic value and tolerance.

#### Solvent Resistance

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

#### Construction

The component is formed from a continuous band of E-beam welded precision resistive strip. Various alloys are used based on the resistance value.

#### General Note

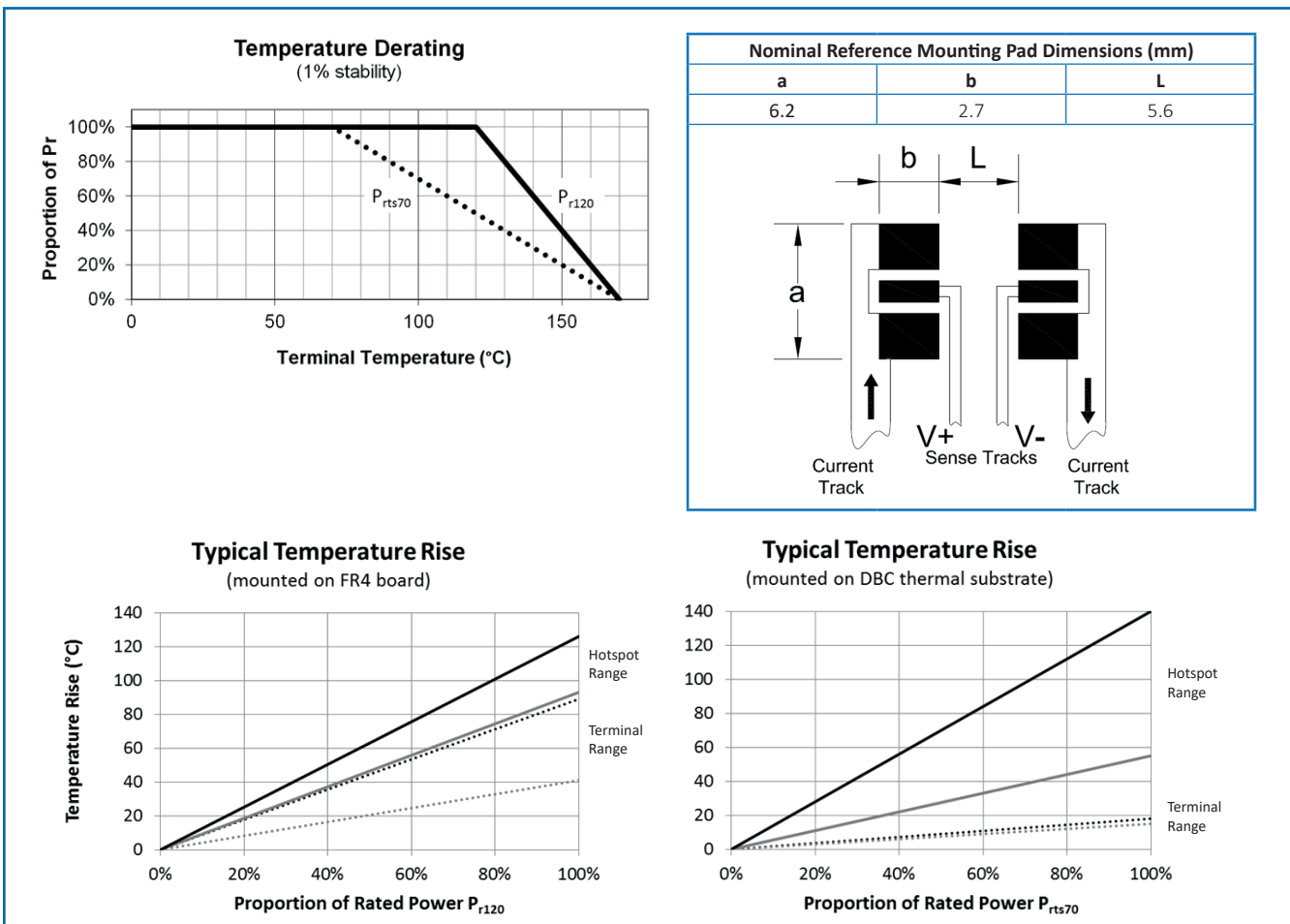
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## Performance Data

| Test                      | Method                                      | ±DR%         |         |
|---------------------------|---------------------------------------------|--------------|---------|
|                           |                                             | Typical      | Maximum |
| Load Life                 | 1000 hours, cyclic load at $P_{r120}$       | 0.5          | 1.0     |
| Short Term Overload       | 5 seconds, 5 x $P_{r120}$                   | 0.1          | 0.5     |
| High Temperature Exposure | 1000 hours, 170°C                           | 0.3          | 1.0     |
| Temperature Cycle         | 1000 cycles, -55 to +125°C, 15 minute dwell | 0.1          | 0.5     |
| Low Temperature Storage   | 1000 hours, -55°C                           | 0.1          | 0.2     |
| Biased Humidity           | 1000 hours, 85°C, 85%RH                     | 0.2          | 1.0     |
| Moisture Resistance       | MIL-STD-202 method 106                      | 0.1          | 0.2     |
| Vibration                 | MIL-STD-202 Method 204                      | 0.1          | 0.2     |
| Mechanical Shock          | MIL-STD-202 Method 213                      | 0.1          | 0.5     |
| Board Flex                | AEC Q200-005                                | No damage    |         |
| Terminal Strength         | AEC Q200-006                                | No damage    |         |
| Resistance to Solder Heat | MIL-STD-202 Method 210                      | 0.3          | 0.5     |
| Solderability             | J-STD-002                                   | 95% coverage |         |
| Resistance to Solvents    | MIL-STD-202 Method 215                      | No damage    |         |

## Thermal Data & Mounting



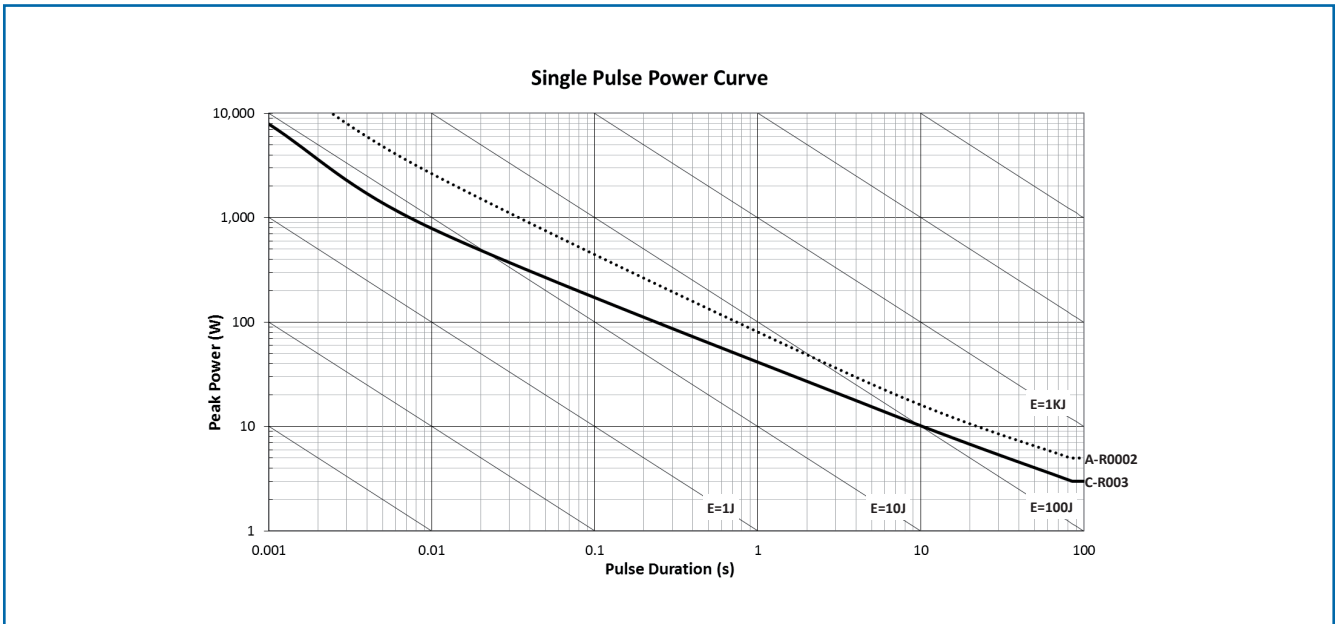
FR4 board details: 102x51mm, high  $T_g$  FR4 board with 70 $\mu$ m (2 ounce) inner and outer Cu planes or similar substrate, such that terminal temperature is maintained at  $\leq 120^\circ\text{C}$ .

Thermal substrate details: DBC or similar thermal substrate, such that terminal temperature is maintained at  $\leq 70^\circ\text{C}$ .

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## Pulse and Overload Performance



## Measurement

Resistance testing for the LRMAP3920 is performed on the underside of the copper contacts using the following method.

|                                      |                          |                                                            |
|--------------------------------------|--------------------------|------------------------------------------------------------|
| Measurement current                  | ≥1.5mΩ: 1A<br><1.5mΩ: 3A | <p>4-terminal ohm meter</p> <p>Resistor contact probes</p> |
| Probe spacing along component length | 8.80mm                   |                                                            |
| Probe spacing across component width | 2.44mm                   |                                                            |
| Probe tip diameter                   | ≤0.5mm                   |                                                            |

## Processing

LRMAP3920 series resistors are suitable for IR reflow soldering. The recommended reflow profile for Pb-free soldering, for example using SAC387 alloy (Sn 95.5%, Ag 3.8%, Cu 0.7%), is as follows:

- Pre-heat:** 30s to 45s at 180°C
- Soldering:** 20s to 40s at 250°C
- Peak:** 260°C

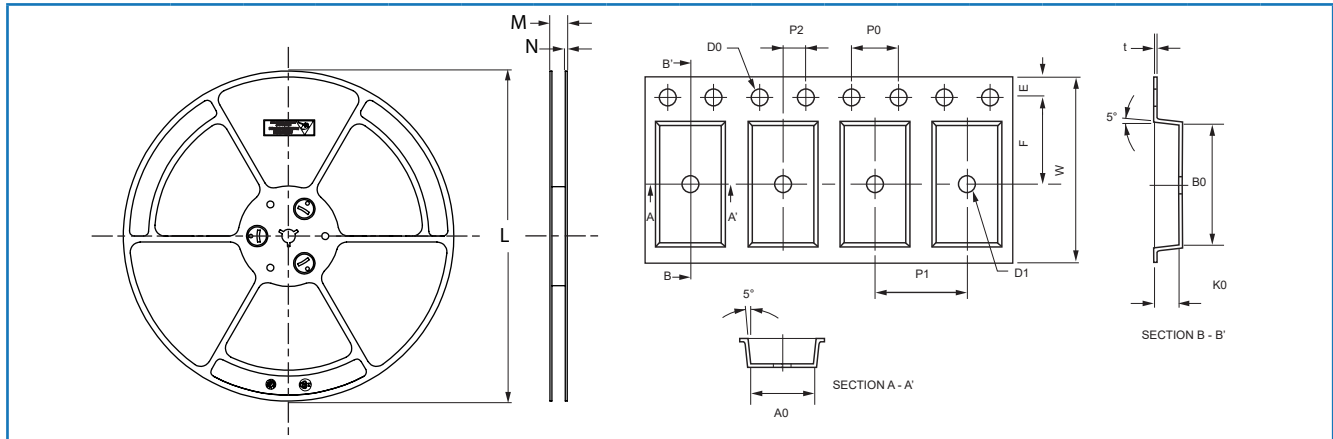
### General Note

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LRMAP3920

## Packaging

LRMAP3920 resistors are packed in 16mm plastic tape, 3000 pieces per reel.

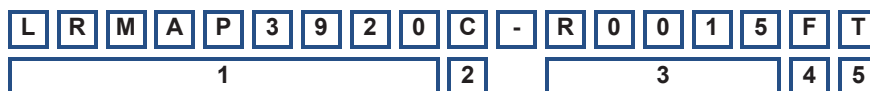


All dimensions in mm

| LRMAP3920 Type                                | L     | M     | N               | W               | E     | F     | D0             | D1             | P0    | P1    | P2    | P0x10 | t               | A0              | B0    | K0    |
|-----------------------------------------------|-------|-------|-----------------|-----------------|-------|-------|----------------|----------------|-------|-------|-------|-------|-----------------|-----------------|-------|-------|
|                                               | ±1.00 | ±1.00 | +0.30/<br>-0.10 | +0.30/<br>-0.05 | ±0.10 | +0.10 | +0.10/<br>-0.0 | +0.10/<br>-0.0 | ±0.10 | ±0.10 | ±0.10 | ±0.20 | +0.15/<br>-0.10 | +0.15/<br>-0.10 | ±0.13 | ±0.10 |
| (B)-R001<br>(B)-R0007<br>(C)-R002<br>(C)-R003 | 330   | 21.4  | 2.0             | 16.00           | 1.75  | 7.50  | 1.50           | 1.50           | 4.00  | 8.00  | 2.00  | 40.00 | 0.30            | 5.55            | 10.47 | 1.25  |
| All remaining values                          |       |       |                 |                 |       |       |                |                |       |       |       |       |                 |                 |       | 2.20  |

## Ordering Procedure

Example: LRMAP3920C-R0015FT (1.5 milliohms ±1%, Pb-free)



| 1<br>Type | 2<br>Alloy | 3<br>Value       | 4<br>Tolerance | 5<br>Packing                  |
|-----------|------------|------------------|----------------|-------------------------------|
| LRMAP3920 | A          | 4 / 5 characters | F = ±1%        | T = Plastic tape<br>3000/reel |
|           | B          | R = ohms         |                |                               |
|           | C          |                  |                |                               |

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