

## High Power MELF Resistors

### WRM-HP Series

- AEC-Q200 qualified
- High power up to 1W
- Tolerance down to  $\pm 0.1\%$
- TCR down to  $\pm 15\text{ppm}/^\circ\text{C}$
- High pulse handling capability



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

### Electrical Data

|                           |        | WRM0204HP            | WRM0207HP       |
|---------------------------|--------|----------------------|-----------------|
| Power rating at 70°C      | watts  | 0.4                  | 1               |
| Resistance range          | ohms   | R10 – 1M0            |                 |
| Limiting element voltage  | volts  | 200                  | 350             |
| Maximum overload voltage  | volts  | 400                  | 700             |
| TCR                       | ppm/°C | 15, 25, 50, 100      | 15, 25, 50, 100 |
| Resistance tolerance      | %      | 0.1, 0.25, 0.5, 1, 5 |                 |
| Standard values           |        | E24 & E96            |                 |
| Thermal impedance         | °C /W  | 200                  | 140             |
| Ambient temperature range | °C     | -55 to +155          |                 |
| Insulation resistance     | ohms   | $>10^{10}$           |                 |
| Voltage proof             | volts  | 284                  | 497             |

### Physical Data

| Dimensions (mm) and weight (g) |       |       |        |       |                    |        |
|--------------------------------|-------|-------|--------|-------|--------------------|--------|
| Type                           | L max | D max | D1 max | K min | L <sup>1</sup> min | Weight |
| WRM 0204HP                     | 3.7   | 1.55  | 1.55   | 0.7   | 1.5                | 0.02   |
| WRM 0207HP                     | 6.1   | 2.4   | 2.4    | 1.2   | 2.9                | 0.08   |

### Construction

A metal film is deposited onto a high dissipation ceramic former to which tin plated terminating caps are fitted.

The resistor is adjusted to value by a helical cut in the film and the body is protected by a lacquer coating.

### Marking

Resistance values are colour coded with three or four bands, indicating value and multiplier.

### Terminations

**Material** Plated steel cap.

**Solderability** The pure tin finish produces ageing free contacts on which low melting solders can be used. Dipped area shall be covered with a smooth and bright solder coating after 3 seconds immersion at 215°C.

### Solvent Resistance

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuit boards.

### General Note

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## TCR and Tolerance Range

| Type      | TCR ( $\pm$ ppm/ $^{\circ}$ C) | Tolerance ( $\pm$ %) |            |           |      |           |
|-----------|--------------------------------|----------------------|------------|-----------|------|-----------|
|           |                                | 5                    | 1          | 0.5       | 0.25 | 0.1       |
| WRM0204HP | $\pm$ 100                      | OR1 – 1M0            |            | –         | –    | –         |
|           | $\pm$ 50                       | OR2 – 1M0            |            | 1R0 – 1M0 |      | 10R – 1M0 |
|           | $\pm$ 25                       | –                    | 10R – 1M0  |           |      |           |
|           | $\pm$ 15                       | –                    | 10R – 300K |           |      |           |
| WRM0207HP | $\pm$ 100                      | OR1 – 1M0            |            | –         | –    | –         |
|           | $\pm$ 50                       | OR2 – 1M0            |            | 1R0 – 1M0 |      | 10R – 1M0 |
|           | $\pm$ 25                       | –                    | 10R – 1M0  |           |      |           |
|           | $\pm$ 15                       | –                    | 10R – 300K |           |      |           |

## Performance Data

|   |                   | Maximum                   |
|---|-------------------|---------------------------|
| Short time overload: 5s at lesser of 6.25 x rated power or 2 x LEV  | $\pm$ $\Delta$ R% | 0.15                      |
| Biased humidity: 1000hrs 85 $^{\circ}$ C/85%RH 10% of rated power   | $\pm$ $\Delta$ R% | 0.15                      |
| Surge test: IEC 60115-1, 10/700 $\mu$ s at lesser of $\sqrt{P_{70-R}}$ & 2 x LEV  | $\pm$ $\Delta$ R% | 0.15                      |
| High temperature exposure: 1000hrs at 155 $^{\circ}$ C  | $\pm$ $\Delta$ R% | 0.3                       |
| Bending test: 2mm deflection for 60s  | $\pm$ $\Delta$ R% | 0.05                      |
| Resistance to soldering heat: 260 $\pm$ 5 $^{\circ}$ C for 10s  | $\pm$ $\Delta$ R% | 0.15                      |
| Temperature rapid change: 1000cycles-55/125 $^{\circ}$ C  | $\pm$ $\Delta$ R% | 0.2                       |
| Endurance: 1000hrs rated power at 70 $^{\circ}$ C<br>(For endurance at 8000hrs multiply stability by 2,<br>for endurance at 225,000hrs multiply stability by 6) | $\pm$ $\Delta$ R% | 0.25                      |
| Mechanical shock: half-sine waveform, peak 100g, duration 6ms   | $\pm$ $\Delta$ R% | 0.1                       |
| Vibration: 5g for 20min, 12 cycles each of 3 orientations, 10-2000Hz  | $\pm$ $\Delta$ R% | 0.15                      |
| ESD: 2kV human body model   | $\pm$ $\Delta$ R% | 0.5                       |
| Solderability: 245 $\pm$ 5 $^{\circ}$ C for 3s  |                   | >95% coverage             |
| Voltage proof: 1.42 x LEV   |                   | No breakdown or flashover |

## Pulse & Thermal Performance

Single Pulse: 50 rectangular pulses applied at 60s intervals such that mean power is <10% of rated power. Maximum permitted change  $\pm$ 1%.

Continuous Pulses: Continuous rectangular pulses applied at intervals such that mean power is equal to the rated power. Maximum permitted change  $\pm$ 1%.



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WRM-HP Series



Lightning Surge Performance

Resistors are tested in accordance with IEC 60115-1 using both 1.2/50µs and 10/700µs pulse shapes. 10 pulses are applied. The limit of acceptance is a shift in resistance of less than 0.5% from the initial value.



Ordering Procedure

Example: WRM0204HPC-2K49FT3 (WRM0204HP, 50ppm/°C, 2.49 kilohms ±1%, Pb-free)



| 1<br>Type | 2<br>TCR       | 3<br>Value   | 4<br>Tolerance | 5<br>Packing |      |                |
|-----------|----------------|--|----------------|--------------|------|----------------|
| WRM0204HP | Y = ±15ppm/°C  | 3/4 characters<br>R = ohms<br>K = kilohms<br>M = megohms | B = ±0.1%      | T3           | 0204 | 3000 / 7" reel |
| WRM0207HP | D = ±25ppm/°C  |  | C = ±0.25%     | T2           | 0207 | 2000 / 7" reel |
|           | C = ±50ppm/°C  |  | F = ±1%        |              |      |                |
|           | Z = ±100ppm/°C |  | J = ±5%        |              |      |                |

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