

## 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

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.

## 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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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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