

# MELF Resistors

## WRM Series

- **High reliability**
- **Predictable pulse handling capability**
- **Tolerances down to 0.1%**
- **TCR down to 5 ppm/°C**



## Electrical Data

|                           |        | WRM 0102          | WRM 0204                  | WRM 0207        |
|---------------------------|--------|-------------------|---------------------------|-----------------|
| Power rating at 70°C      | watts  | 0.125             | 0.25                      | 0.4             |
| Resistance range          | ohms   | 4R7 - 110K        | R22 – 5M1                 | R22 – 10M       |
| Limiting element voltage  | volts  | 150               | 200                       | 250             |
| TCR                       | ppm/°C | 50                | 5,10,15, 25, 50, 100      | 15, 25, 50, 100 |
| Resistance tolerance      | %      | 1                 | 0.1, 0.25, 0.5, 1.0, 2, 5 |                 |
| Standard values           |        | E24 & E96         |                           |                 |
| Thermal impedance         | k/W    | 250               | 200                       | 140             |
| Ambient temperature range | °C     | -55 to +125       |                           |                 |
| Insulation resistance     | ohms   | >10 <sup>10</sup> |                           |                 |

## Physical Data

| Dimensions (mm) and weight (g) |       |       |        |       |        |  |
|--------------------------------|-------|-------|--------|-------|--------|--|
| Type                           | L max | D max | D1 max | K min | Weight |  |
| WRM 0102                       | 2.2   | 1.35  | 1.3    | 0.3   | 0.01   |  |
| WRM 0204                       | 3.7   | 1.55  | 1.55   | 0.5   | 0.02   |  |
| WRM 0207                       | 6.1   | 2.4   | 2.4    | 0.5   | 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 four bands, three indicating value and one indicating the multiplier. (Note this describes standard marking, but certain values may still be supplied with the addition of a tolerance band following the 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<br>Reference | TCR     | Tolerance |    |            |            |             |             |
|-------------------|---------|-----------|----|------------|------------|-------------|-------------|
|                   |         | 5%        | 2% | 1.0%       | 0.5%       | 0.25%       | 0.1%        |
| <b>WRM0102</b>    | ±50ppm  | –         | –  | 4R7 - 110K | –          | –           | –           |
| <b>WRM0204</b>    | ±100ppm | R22 – R91 | –  | –          | –          | –           | –           |
|                   | ±50ppm  | –         | –  | 1R – 5M1   | 10R – 1M6  | 22R – 332K  | 43R – 332K  |
|                   | ±25ppm  | –         | –  | 4R7 - 500K | 10R – 500K | 22R – 402K  | 43R – 332K  |
|                   | ±15ppm  | –         | –  | –          | 10R – 221K | 22R – 221K  | 43R – 221K  |
|                   | ±10ppm  | –         | –  | –          | –          | 22R – 221K  | 43R – 221K  |
|                   | ±05ppm  | –         | –  | –          | –          | 100R – 100K | 100R – 100K |
| <b>WRM0207</b>    | ±100ppm | R22 – R91 | –  | –          | –          | –           | –           |
|                   | ±50ppm  | –         | –  | 1R-10M     | 10R – 1M6  | –           | –           |
|                   | ±25ppm  | –         | –  | 10R - 1M   | 10R – 680K | 51R1 - 330K | 100R - 100K |
|                   | ±15ppm  | –         | –  | –          | 51R1 - 10K | 51R1 - 10K  | 100R - 10K  |

\* TC 10ppm & 5ppm is specified over the temperature range -10°C to +85°C.

## Performance Data

| Test                         | Results $\Delta R/R \pm$                                                                |                                           |                                                            |
|------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------|
|                              | 0204 & 0207: 75R - 100K                                                                 | 0204 & 0207: 10R - <75R<br>& >100K - 332K | 0102: 4R7 - 110K, 0204 &<br>0207: R22 - <10R & >332K - 10M |
| Short time overload*         | $\leq 0.05\% + 0.01 \Omega$                                                             | $\leq 0.1\% + 0.01 \Omega$                | $\leq 0.25\% + 0.05 \Omega$                                |
| Bending test*                | $\leq 0.05\% + 0.01 \Omega$                                                             | $\leq 0.1\% + 0.01 \Omega$                | $\leq 0.25\% + 0.05 \Omega$                                |
| Resistance to soldering heat | $\leq 0.05\% + 0.01 \Omega$                                                             | $\leq 0.1\% + 0.01 \Omega$                | $\leq 0.25\% + 0.05 \Omega$                                |
| Temperature rapid change     | $\leq 0.05\% + 0.01 \Omega$                                                             | $\leq 0.1\% + 0.01 \Omega$                | $\leq 0.25\% + 0.05 \Omega$                                |
| Endurance*                   |                                                                                         |                                           |                                                            |
| Load life                    | 1000h                                                                                   | $\leq 0.25\% + 0.05 \Omega$               | $\leq 0.25\% + 0.05 \Omega$                                |
|                              | 8000 h                                                                                  | $\leq 0.5\% + 0.05 \Omega$                | $\leq 1.0\% + 0.05 \Omega$                                 |
| Climatic sequence*           | $\leq 0.25\% + 0.05 \Omega$                                                             | $\leq 0.5\% + 0.05 \Omega$                | $\leq 1.0\% + 0.05 \Omega$                                 |
| Damp heat steady state*      | $\leq 0.25\% + 0.05 \Omega$                                                             | $\leq 0.5\% + 0.05 \Omega$                | $\leq 1.0\% + 0.05 \Omega$                                 |
| Current noise                | $< 0.05 \mu V/V$                                                                        | $< 0.25 \mu V/V$                          | $< 3 \mu V/V$                                              |
| Solderability                | Dipped area shall be covered with a smooth<br>and bright solder coating of at least 96% |                                           |                                                            |
| Voltage coefficient          | $< 0.5 \cdot 10^6/V$                                                                    |                                           |                                                            |
| Voltage proof                | No flashover or breakdown                                                               |                                           |                                                            |

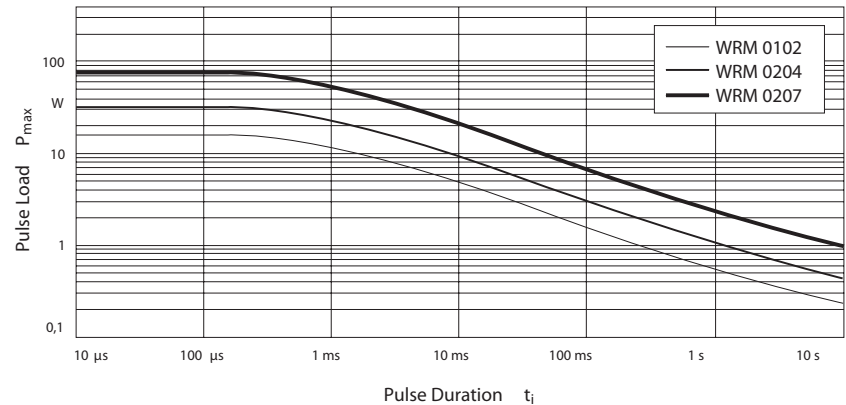
\* Resistors to be mounted on a PC-board according to IEC 115-1, clause 4.27.1

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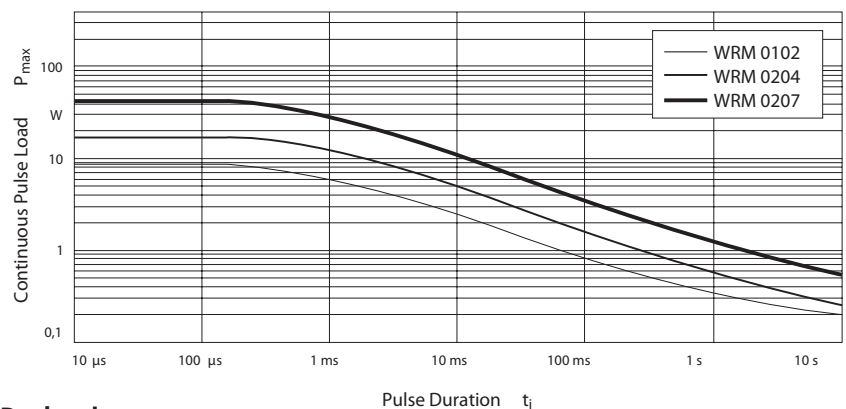
Single Pulse

Maximum Pulse Load



Continuous Pulses

Maximum Pulse Load



Packaging

The WRM 0102 and 0204 resistors are supplied reeled on 8mm blister tape.  
WRM 0207 resistors are supplied on 12mm blister tape.

Packaging complies with the requirements of IEC 286-3.

Ordering Procedure

Example: WRM0204 at 1 kilohm, 1% tolerance and 50ppm/°C TCR on a reel of 3000 pieces -

Type ..... **WRM**   **0204**   **C** - **1K0**   **F**   **I**

Size .....

TCR .....

|   |           |   |          |
|---|-----------|---|----------|
| Z | 100ppm/°C | Y | 15ppm/°C |
| C | 50ppm/°C  | T | 10ppm/°C |
| D | 25ppm/°C  | V | 5ppm/°C  |

Value (use IEC62 code) .....

Tolerance (use IEC62 code) .....

|   |       |   |      |   |    |
|---|-------|---|------|---|----|
| B | 0.1%  | D | 0.5% | G | 2% |
| C | 0.25% | F | 1%   | J | 5% |

Packing .....

|   |      |      |                   |          |
|---|------|------|-------------------|----------|
| I | Tape | 0102 | 3000 / reel (7")  | Standard |
|   |      | 0204 | 3000 / reel (7")* |          |
|   |      | 0207 | 1500 / reel (7")  |          |

\* High precision parts may be supplied on 1000 piece reels – please enquire

**Note:** F or zero-ohm versions order **WRM0204C-R00FI** or **WRM0207C-R00FI**

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