

Metal Foil on Ceramic Chip Resistors

MFC Series

Features:

- Small size down to 0402
- Tolerance to 0.5%
- TCR to $\pm 50\text{ppm}/^\circ\text{C}$
- High power density
- AEC-Q200 qualified



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

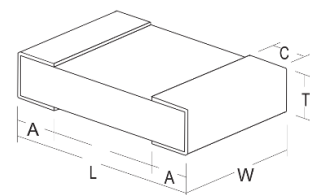
Electrical Data

| | | 0402 | 0603 | 0805 | 1206 | 2010 | 2512 |
|----------------------|--------|--|------------------------|-----------------------|------|--|------|
| Power rating at 70°C | W | 0.25 | 0.5 | 0.75 | 1 | 1.5 ¹ | 2 |
| Overload rating 5s | W | 1.25 | 2.5 | 3.75 | 5 | 7.5 ² | 8 |
| Resistance range | mΩ | 10 - 50 | 5 - 100 | 3 - 100 | | 2 - 100 | |
| Resistance tolerance | % | < R03; 1, 2, 5 ≥R03; 0.5, 1, 2, 5 | | | | | |
| TCR (-55 to +125°C) | ppm/°C | 100 | <R01; 200 ≥R01; 100 | <R01; 100 ≥R01; 50 | | R002; 200 >R002 & <R01; 100 ≥R01; 50 | |
| Standard values | | E24 plus integer milliohm values below R01 preferred | | | | | |
| Ambient temperature | °C | -55 to +170 | | | | | |

Note 1: 1W below R01 Note 2: 5W below R01

Physical Data

| Dimensions in mm and weight in mg | | | | | | | | | |
|-----------------------------------|-------|------------|------------|--------|------------|-----------|-----------|----------|------|
| | Value | L | W | T max. | A | C | Wt. nom. | | |
| 0402 | All | 1.05 ±0.1 | 0.55 ±0.1 | 0.55 | 0.27 ±0.1 | - | 0.8 - 1.1 | | |
| | | | | | | | | | |
| 0603 | 5 - 9 | 1.6 ±0.2 | 0.8 ±0.2 | 0.85 | 0.35 ±0.2 | ≤0.6 | 2.9 - 3.2 | | |
| | ≥10 | 1.7 ±0.15 | 1 +0.15 | 0.77 | 0.35 ±0.25 | | | | |
| 0805 | 3 - 4 | 2 ±0.2 | 1.25 ±0.15 | 0.85 | 0.7 ±0.3 | 0.4 ±0.25 | 7.1 - 8.1 | | |
| | 5 - 9 | | | | 0.4 ±0.3 | | | | |
| | ≥10 | 2.15 ±0.15 | 1.4 ±0.15 | | 0.4 ±0.25 | | | | |
| 1206 | 3 - 4 | 3.2 ±0.2 | 1.6 ±0.2 | 0.9 | 0.9 ±0.3 | 0.5 ±0.3 | 13 - 13.2 | | |
| | 5 - 9 | | | | 0.5 ±0.3 | | | | |
| | ≥10 | 3.2 ±0.15 | 1.7 ±0.15 | | 0.5 ±0.25 | | | | |
| 2010 | 2 | 5 ±0.2 | 2.5 ±0.2 | 0.95 | 1.8 ±0.3 | 0.6 ±0.3 | 33.2 | | |
| | 3 | | | | 1.6 ±0.3 | | | | |
| | 4 - 5 | | | | 1.3 ±0.3 | | | | |
| | 5 - 9 | | | | 0.8 ±0.3 | | | | |
| | ≥10 | | | | | 0.85 | | 0.6 ±0.3 | |
| 2512 | 2 | 6.4 ±0.2 | 3.2 ±0.2 | 0.95 | 2.3 ±0.3 | 0.9 ±0.3 | 43 - 46 | | |
| | 3 | | | | 1.9 ±0.3 | | | | |
| | 4 | | | | 1.7 ±0.3 | | | | |
| | 5 - 6 | | | | 1.2 ±0.3 | | | | |
| | 7 | | | | 1.1 ±0.3 | | | | |
| | 8 - 9 | | | | 0.9 ±0.3 | | | | |
| | ≥10 | | | | | | | | 0.85 |



Construction

Metal foil resistor material is bonded onto an alumina substrate and connected to wraparound terminations with nickel barrier and 100% Sn finish. Protection and marking are applied and each resistor is measured immediately before packing into tape.

Marking

MFC parts larger than 0402 are marked indicating ohmic value. Where possible "R" is used to indicate the decimal point location but if it is omitted, the value is in milliohms. MFC0603 is marked with 3 characters, e.g. "R01" = 10mΩ, "047" = 47mΩ. Larger sizes are marked with 4 characters, e.g. "R010" = 10mΩ, "R047" = 47mΩ. Reels are marked with type, value, tolerance, date code and quantity.

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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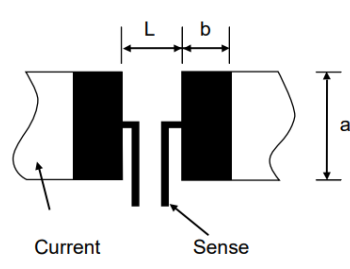
MFC Series

Solvent Resistance

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

Mounting Recommendations

| Size | Value (mΩ) | L (mm) | a (mm) | b (mm) | t (μm) |
|------|------------|--------|--------|--------|--------|
| 0402 | 10 - 50 | 0.5 | 0.6 | 0.5 | 35 |
| 0603 | 5 - 9 | 0.6 | 1 | 1.1 | |
| | 10 - 100 | 0.5 | 0.9 | 1 | |
| 0805 | 3 - 4 | 0.5 | 1.4 | 1.4 | 70 |
| | 5 - 9 | 0.8 | | 1.2 | |
| | 10 - 100 | | 1.3 | 1.3 | |
| 1206 | 3 - 4 | 0.8 | 1.8 | 1.8 | 105 |
| | 5 - 9 | 1.8 | | 1.3 | |
| | 10 - 100 | 1.5 | 1.7 | 1.4 | |
| 2010 | 2 | 1 | 2.9 | 2.7 | |
| | 3 - 9 | 1.6 | | 2.4 | |
| | 10 - 100 | 2.7 | | 1.8 | |
| 2512 | 2 - 4 | 1 | 3.4 | 3.5 | |
| | 5 - 100 | 3.8 | | 2.1 | |

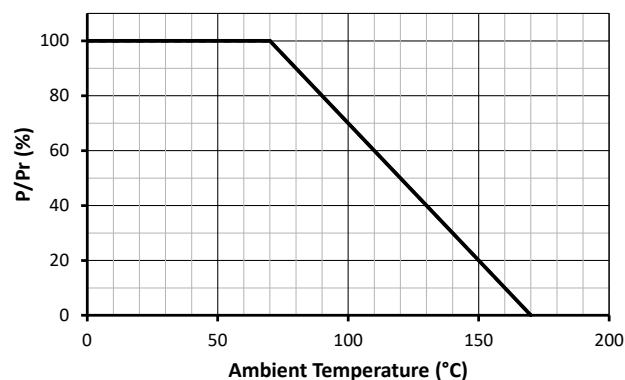


t = PCB copper thickness

Performance Data

| Test | | | | Maximum |
|---------------------------|------------------------|--|-----------------|---------------|
| Load life | MIL-STD-202 Method 108 | 1000 hours, steady state, $T_A=125^\circ\text{C}$, de-rated power | $\pm\Delta R\%$ | 1 |
| Short term overload | IEC-60115-1 4.13 | $P_r < 2W$; $5 \times P_r$ for 5s, $P_r = 2W$; $4 \times P_r$ for 5s | $\pm\Delta R\%$ | 1 |
| Biased humidity | MIL-STD-202 Method 103 | 1000 hours, 85°C , 85%RH, 10% of P_r | $\pm\Delta R\%$ | 1 |
| High temperature exposure | MIL-STD-202 Method 108 | 1000 hours, 155°C | $\pm\Delta R\%$ | 1 |
| Low temperature operation | IEC-60115-1 4.36 | -55°C , 45 mins P_r , 15 mins no load | $\pm\Delta R\%$ | 1 |
| Temperature rapid change | IEC-60115-1 4.19 | -55°C to $+155^\circ\text{C}$, 5 cycles | $\pm\Delta R\%$ | 1 |
| Voltage proof | IEC-60115-1 4.7 | 1.42 x max operating voltage for 1 minute | $\pm\Delta R\%$ | No breakdown |
| Board flex | JIS-C-521-1 4.33 | 3mm deflection for 5 seconds | $\pm\Delta R\%$ | 1 |
| Solderability | IEC-60115-1 4.17 | $245 \pm 5^\circ\text{C}$ for 3 seconds | | >95% coverage |
| Resistance to solder heat | IEC-60115-1 4.18 | $260 \pm 5^\circ\text{C}$ for 10 seconds | $\pm\Delta R\%$ | 1 |
| Resistance to solvents | MIL-STD-202 Method 215 | Aqueous wash OKEM or equivalent. No banned solvents. | | No damage |

Temperature De-rating



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Packaging

MFC0402 is packed on 8mm paper tape at 2mm component pitch. MFC0603, 0805 & 1206 are packed on 8mm paper tape at 4mm component pitch. MFC2010 & 2512 are packed on 12mm plastic tape at 4mm component pitch. All sizes are on 178mm diameter reels.

For full details of packaging dimensions see:

<https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Application-Note/PS001-Packing-of-General-Purpose-Chip-Resistors.pdf>

Ordering Procedure

Example: MFC0603-R015FT5 (0603, 15 milliohms $\pm 1\%$, Pb-free)

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M | F | C | 0 | 6 | 0 | 3 | - | R | 0 | 1 | 5 | F | T | 5 |
| 1 | | | 2 | | | 3 | | | 4 | 5 | | | | |

| 1 | 2 | 3 | 4 | 5 | | |
|------|------|-----------------------------------|-----------------|---------|--------------|-------------|
| Type | Size | Value | Tolerance | Packing | | |
| MFC | 0402 | E24 3/4 characters R = ohms | D = $\pm 0.5\%$ | T10 | 0402 | 10,000/reel |
| | 0603 | | F = $\pm 1\%$ | T5 | 0603 to 1206 | 5000/reel |
| | 0805 | | G = $\pm 2\%$ | T4 | 2010, 2512 | 4000/reel |
| | 1206 | | J = $\pm 5\%$ | | | |
| | 2010 | | | | | |
| | 2512 | | | | | |