# Metal Foil Current Sense Resistors, Very High Power (to 2 W)


## FEATURES

- Ultra low sensing resistance minimizes power dissipation, improving efficiency
- Wide side terminal construction (0508 and 0612) for lower ESL
- High power to foot print size ratio (2 W in 0612 and 0.5 W in 0508)
- Sulfur resistant
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE GREEN (5-2008)

## APPLICATIONS

- Switching power supply
- Voltage regulation module
- DC/DC converter, adaptor, battery pack, charger
- Pad and cell phone
- Power management

## STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | SIZE | POWER RATING W | TOLERANCE % | RESISTANCE VALUE RANGE Ω | WEIGHT (typical) g/1000 pieces |
|---|---|---|---|---|---|
| WFCP0402 | 0402 | 0.25 | ± 1, ± 2, ± 5 | 0.0025 to 0.05 | 1.1 |
| WFCP0508 | 0508 | 0.5 | ± 1, ± 2, ± 5 | 0.005 to 0.03 | 6.8 |
| | 0508 | 1.0 | ± 1, ± 2, ± 5 | 0.001 to 0.004 | 6.8 |
| WFCP0603 | 0603 | 0.5 | ± 1, ± 2, ± 5 | 0.002 to 0.04 | 3.3 |
| WFCP0612 | 0612 | 1.0 | ± 1, ± 2, ± 5 | 0.0051 to 0.03 | 14.7 |
| | 0612 | 2.0 | ± 1, ± 2, ± 5 | 0.001 to 0.005 | 14.7 |

## GLOBAL PART NUMBER INFORMATION

**Global Part Numbering Example: WFCP1206R0100FE66**

| W | F | C | P | 1 | 2 | 0 | 6 | R | 0 | 1 | 0 | 0 | F | E | 6 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| GLOBAL MODEL (4 digits) | CASE SIZE (EIA) (4 digits) | RESISTANCE VALUE (5 digits) (1) | TOLERANCE CODE (1 digit) | PACKAGING CODE (3 digits) |
|---|---|---|---|---|
| **WFCP** | **0402**<br>**0508**<br>**0603**<br>**0612** | **L** = mΩ (2)<br>**R** = decimal<br>**5L000** = 0.005 Ω<br>**R0100** = 0.01 Ω | **F** = ± 1.0 %<br>**G** = ± 2.0 %<br>**J** = ± 5.0 % | **E66** = lead (Pb)-free 7" tape/reel |

**Notes**

(1) Resistance values are available per E12 and E24 decades; www.vishay.com/doc?28372

(2) Use "L" for resistance values < 0.01 Ω

| TECHNICAL SPECIFICATIONS | | | | | |
|---|---|---|---|---|---|
| PARAMETER | UNIT | RESISTOR CHARACTERISTICS | | | |
| | | WFCP0402 | WFCP0508 | WFCP0603 | WFCP0612 |
| Temperature coefficient | ppm/°C | ± 100 for 5.1 mΩ to 50 mΩ | ± 75 for 5 mΩ to 30 mΩ | ± 75 for 10 mΩ to 40 mΩ | ± 75 for 5.1 mΩ to 30 mΩ |
| | | ± 150 for 2.5 mΩ to 5 mΩ | ± 150 for 1 mΩ to 4 mΩ | ± 100 for 2 mΩ to 9 mΩ | ± 100 for 1 mΩ to 5 mΩ |
| Operating temperature range | °C | -55 to +170 | | | |
| Maximum working voltage | V | $(P \times R)^{1/2}$ | | | |
| Maximum element temperature | °C | 170 | | | |

## DIMENSIONS in inches (millimeters)

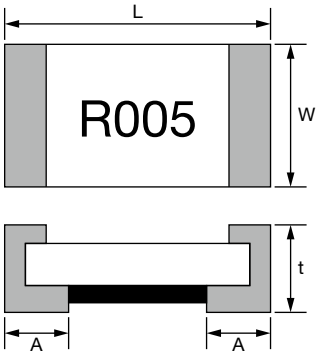



Fig. 1

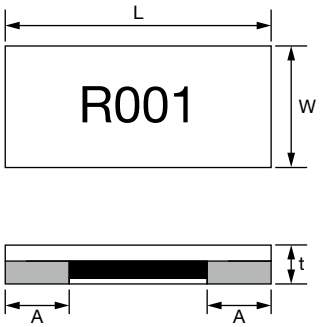


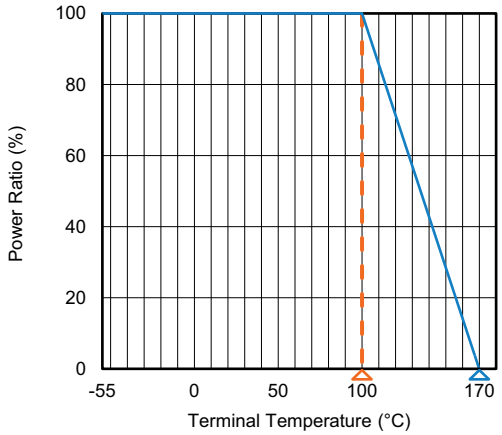

Fig. 2

| TYPE (INCH SIZE) | RESISTANCE RANGE (mΩ) | DIMENSIONS (in millimeters) | | | | DIMENSIONS FIG. |
|---|---|---|---|---|---|---|
| | | L | W | t | A | |
| WFCP0402 | 2.5 to 3 | 1.00 ± 0.15 | 0.55 ± 0.15 | 0.40 ± 0.15 | 0.35 ± 0.15 | 2 |
| | 3.1 to 8 | | | 0.45 ± 0.15 | | 1 |
| | 8.1 to 50 | | | | 0.25 ± 0.15 | 1 |
| WFCP0508 | 1 to 5 | 1.35 ± 0.30 | 2.00 ± 0.20 | 0.45 ± 0.15 | 0.40 ± 0.25 | 2 |
| | 5.1 to 30 | 1.30 ± 0.20 | | 0.60 ± 0.20 | 0.30 ± 0.25 | 1 |
| WFCP0603 | 2 to 9.9 | 1.60 ± 0.15 | 0.80 ± 0.15 | 0.55 ± 0.15 | 0.55 ± 0.20 | 1 |
| | 10 to 40 | | | | 0.35 ± 0.20 | 1 |
| WFCP0612 | 1 to 5 | 1.60 ± 0.20 | 3.20 ± 0.20 | 0.75 ± 0.25 | 0.30 ± 0.25 | 2 |
| | 5.1 to 30 | | | 0.60 ± 0.20 | | 1 |

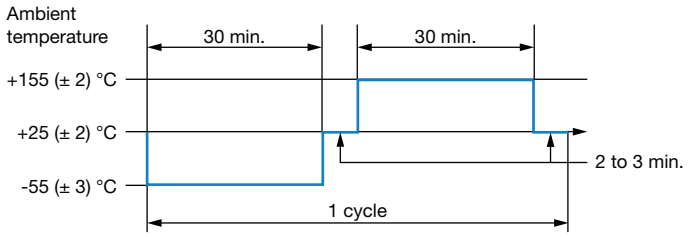
**Note**

- 0402 has no marking; 0508, 0603, and 0612 marking shows two digits for resistance

## DERATING

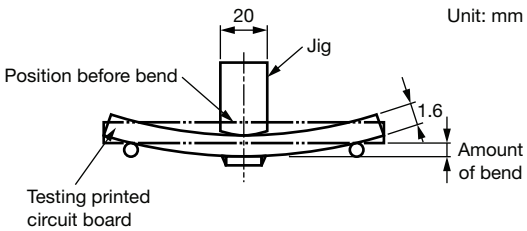


## PERFORMANCES

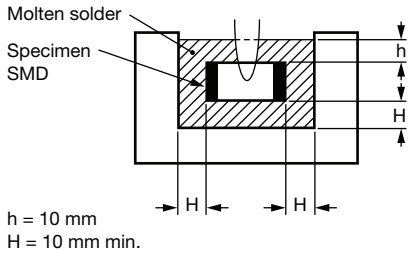
| ENVIRONMENTAL PERFORMANCE | | | |
|---|---|---|---|
| **NO.** | **ITEM** | **TEST CONDITION** | **SPECIFICATION** |
| 1 (1) | Short time overload | 5 times rated power for 5 seconds (JIS-C5202-5.5) | $\Delta R$: ± (1 % + 0.0005 Ω) |
| 2 | Temperature coefficient of resistance (TCR) | +25 °C / +125 °C (JIS-C5202-5.2)<br>$TCR\ (ppm/°C) = \frac{\Delta R}{R \times \Delta t} \times 10^6$ | Refer to Electrical Specification |
| 3 | Damp heat with load | The specimens shall be placed in a chamber and subjected to a relative humidity of 90 % to 95 % and a temperature of 40 °C ± 2 °C for the period of 1000 hours with applying rated power 1.5 hours ON and 0.5 hour OFF. (MIL-STD-202, method 103) | $\Delta R$: ± (1 % + 0.0005 Ω) |
| 4 | High temperature exposure | The chip (mounted on board) is exposed in the heat chamber 125 °C ± 3 °C for 1000 hours. (JIS-C5202-7.2) | $\Delta R$: ± (1 % + 0.0005 Ω) |
| 5 | Load life | Apply rated power at 70 °C ± 2 °C for 1000 hours with 1.5 hours ON and 0.5 hour OFF. (JIS-C5202-7.10) | $\Delta R$: ± (1 % + 0.0005 Ω) |
| 6 | Rapid change of temperature | The chip (mounted on board) is exposed, -55 °C ± 3 °C (30 min.) / +155 °C ± 2 °C (30 min.) for 5 cycles. The following conditions as the following figure. (JIS-C5202-7.4)   | $\Delta R$: ± (1 % + 0.0005 Ω) |

**Note**

(1) WFCP0612 short term overload is 3 times for 5 seconds

| FUNCTION PERFORMANCE | | | |
|---|---|---|---|
| **NO.** | **ITEM** | **TEST CONDITION** | **SPECIFICATION** |
| 1 | Bending strength | Mount the chip to test substrate. Apply pressure in direction of arrow unit band width reaches 2 mm (+0.2 / -0 mm) illustrated in the figure below and hold for 10 s ± 1 s. (JIS-C5202-6.1)   | $\Delta R$: ± (1 % + 0.0005 Ω) |
| 2 | Solvent resistance | Complete immersion of specimens in isopropyl alcohol for 3 (+5, -0) min. 25 °C ± 5 °C. (MIL-STD-202, method 215) | Verify marking permanency. (not required for laser etched parts or parts with no marking) |
| 3 | Resistance to solder heat | The specimen chip shall be immersed into the flux specified in the solder bath 260 °C ± 5 °C for 10 s ± 1 s. (MIL-STD-202, method 210) | $\Delta R$: ± (1 % + 0.0005 Ω) |

## FUNCTION PERFORMANCE

| NO. | ITEM | TEST CONDITION | SPECIFICATION |
|---|---|---|---|
| 4 | Solderability | The specimen chip shall be immersed into the flux specified in the solder bath 235 °C ± 5 °C for 2 s ± 0.5 s. It shall be immersed to a point 10 mm from its root. (Sn96.5 / Ag3.0 / Cu0.5) (JIS-C5 202-6.11)   | Solder shall be covered 95 % or more of the electrode area. |

**Notes**

- The surface temperature of component should below 100 °C
- 0.5 W with total solder pad trace size of 100 $mm^2$
- 1.0 W with total solder pad trace size of 150 $mm^2$
- 2.0 W with total solder pad trace size of 300 $mm^2$
- 3.0 W with total solder pad trace size of 450 $mm^2$

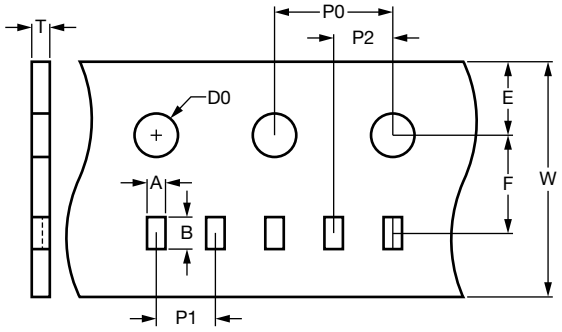
## TAPE PACKAGING SPECIFICATIONS

| MODEL | REEL | | |
|---|---|---|---|
| | TAPE WIDTH | DIAMETER | PIECES / REEL |
| WFCP0402 | Embossed paper tape | 178 mm / 7" | 10 000 |
| WFCP0508<br>WFCP0603<br>WFCP0612 | Embossed paper tape | 178 mm / 7" | 5000 |

**Note**

- Embossed carrier tape per EIA (EIAJ)

## PAPER TAPE SPECIFICATIONS




| TYPE | CARRIER DIMENSIONS (in millimeters) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | E | F | W | P0 | P1 | P2 | D0 | T |
| WFCP0402 | 0.7 ± 0.05 | 1.2 ± 0.05 | 1.75 ± 0.1 | 3.5 ± 0.05 | 8.0 ± 0.2 | 4.0 ± 0.1 | 2.0 ± 0.1 | 2.0 ± 0.05 | 1.55 ± 0.05 | 0.6 ± 0.1 |
| WFCP0508 | 1.6 ± 0.1 | 2.4 ± 0.1 | 1.75 ± 0.1 | 3.5 ± 0.05 | 8.0 ± 0.2 | 4.0 ± 0.1 | 4.0 ± 0.1 | 2.0 ± 0.05 | 1.55 ± 0.05 | 0.97 ± 0.1 |
| WFCP0603 | 1.1 ± 0.1 | 1.8 ± 0.1 | 1.75 ± 0.1 | 3.5 ± 0.05 | 8.0 ± 0.2 | 4.0 ± 0.1 | 4.0 ± 0.1 | 2.0 ± 0.05 | 1.55 ± 0.05 | 0.70 ± 0.1 |
| WFCP0612 | 2.0 ± 0.1 | 3.6 ± 0.1 | 1.75 ± 0.1 | 3.5 ± 0.05 | 8.0 ± 0.2 | 4.0 ± 0.1 | 4.0 ± 0.1 | 2.0 ± 0.05 | 1.55 ± 0.05 | 0.97 ± 0.1 |

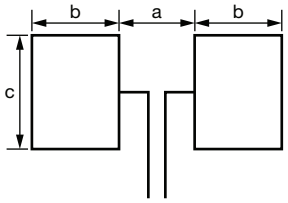
**Notes**

- Embossed carrier tape per EIA (EIAJ)
- Additional packaging details at www.vishay.com/doc?20051

## STORAGE CONDITIONS

Temperature: 5 °C to 35 °C, humidity: 40 % to 75 %

## RECOMMENDED SOLDER PAD LAYOUT




| TYPE | PAD LAYOUT DIMENSIONS (in millimeters) | | |
|---|---|---|---|
| | a | b | c |
| 0402 (8 mΩ to 50 mΩ) | 0.50 | 0.50 | 0.60 |
| 0402 (2.5 mΩ to 7 mΩ) | 0.30 | 0.60 | 0.60 |
| 0508 (1 mΩ to 30 mΩ) | 0.50 | 1.30 | 2.60 |
| 0603 (2 mΩ to 9 mΩ) | 0.60 | 0.90 | 1.00 |
| 0603 (9.1 mΩ to 40 mΩ) | 0.90 | 0.70 | 1.00 |
| 0612 (5.1 mΩ to 30 mΩ) | 0.60 | 1.30 | 3.60 |
| 0612 (1 mΩ to 5 mΩ) | 0.60 | 1.30 | 3.80 |

**Note**

- Recommend to use the steel plate which thickness > 100 µm to avoid the insufficient solder height

## SOLDERING RECOMMENDATIONS

- Peak reflow temperatures and durations:
  - IR reflow peak = 260 °C max. for 10 s
  - Wave solder = 260 °C max. for 10 s
- Compatible with lead and lead (Pb)-free solder reflow processes
- Recommended IR reflow profile for surface mount devices: www.vishay.com/doc?31052

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