

## 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](http://www.vishay.com/doc?99912)



**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 $\Omega$ | WEIGHT (typical) g/1000 pieces |
|--------------|------|----------------|-----------------------|---------------------------------|--------------------------------|
| WFCP0402     | 0402 | 0.25           | $\pm 1, \pm 2, \pm 5$ | 0.0025 to 0.05                  | 1.1                            |
| WFCP0508     | 0508 | 0.5            | $\pm 1, \pm 2, \pm 5$ | 0.005 to 0.03                   | 6.8                            |
|              | 0508 | 1.0            | $\pm 1, \pm 2, \pm 5$ | 0.001 to 0.004                  | 6.8                            |
| WFCP0603     | 0603 | 0.5            | $\pm 1, \pm 2, \pm 5$ | 0.002 to 0.04                   | 3.3                            |
| WFCP0612     | 0612 | 1.0            | $\pm 1, \pm 2, \pm 5$ | 0.0051 to 0.03                  | 14.7                           |
|              | 0612 | 2.0            | $\pm 1, \pm 2, \pm 5$ | 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) <sup>(1)</sup>                                                      |   |   |   | TOLERANCE CODE (1 digit)                              |   | PACKAGING CODE (3 digits)            |   |   |
| WFCP                    |   |   |   | 0402<br>0508<br>0603<br>0612 |   |   |   | L = m $\Omega$ <sup>(2)</sup><br>R = decimal<br>5L000 = 0.005 $\Omega$<br>R0100 = 0.01 $\Omega$ |   |   |   | F = $\pm 1.0\%$<br>G = $\pm 2.0\%$<br>J = $\pm 5.0\%$ |   | E66 = lead (Pb)-free<br>7" tape/reel |   |   |

#### Notes

<sup>(1)</sup> Resistance values are available per E12 and E24 decades; [www.vishay.com/doc?28372](http://www.vishay.com/doc?28372)

<sup>(2)</sup> Use "L" for resistance values < 0.01  $\Omega$

| TECHNICAL SPECIFICATIONS    |        |                              |                           |                            |                             |
|-----------------------------|--------|------------------------------|---------------------------|----------------------------|-----------------------------|
| PARAMETER                   | UNIT   | RESISTOR CHARACTERISTICS     |                           |                            |                             |
|                             |        | WFCP0402                     | WFCP0508                  | WFCP0603                   | WFCP0612                    |
| Temperature coefficient     | ppm/°C | ± 100 for<br>5.1 mΩ to 50 mΩ | ± 75 for<br>5 mΩ to 30 mΩ | ± 75 for<br>10 mΩ to 40 mΩ | ± 75 for<br>5.1 mΩ to 30 mΩ |
|                             |        | ± 150 for<br>2.5 mΩ to 5 mΩ  | ± 150 for<br>1 mΩ to 4 mΩ | ± 100 for<br>2 mΩ to 9 mΩ  | ± 100 for<br>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)

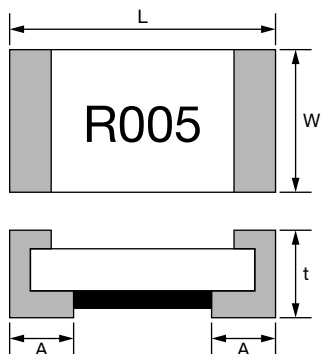


Fig. 1

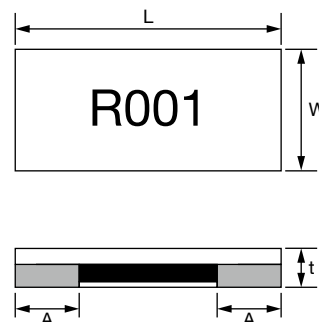


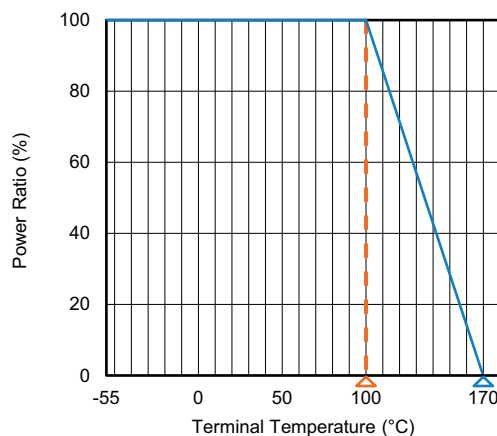
Fig. 2

| TYPE<br>(INCH SIZE) | RESISTANCE<br>RANGE (mΩ) | DIMENSIONS (in millimeters) |             |             |             | DIMENSIONS<br>FIG. |
|---------------------|--------------------------|-----------------------------|-------------|-------------|-------------|--------------------|
|                     |                          | L                           | W           | t           | A           |                    |
| WFCP0402            | 2.5 to 5                 | 1.00 ± 0.1                  | 0.55 ± 0.1  | 0.45 ± 0.10 | 0.45 ± 0.1  | 1                  |
|                     | 5 to 7                   |                             |             |             | 0.35 ± 0.1  | 1                  |
|                     | 8 to 50                  |                             |             |             | 0.25 ± 0.1  | 1                  |
| WFCP0508            | 1 to 4                   | 2.00 ± 0.2                  | 1.35 ± 0.30 | 0.45 ± 0.15 | 0.40 ± 0.25 | 2                  |
|                     | 5 to 30                  | 1.30 ± 0.2                  | 2.0 ± 0.20  | 0.60 ± 0.20 | 0.30 ± 0.2  | 1                  |
| WFCP0603            | 2 to 40                  | 1.60 ± 0.1                  | 0.80 ± 0.1  | 0.55 ± 0.15 | 0.30 ± 0.2  | 1                  |
| WFCP0612            | 1 to 5                   | 1.60 ± 0.2                  | 3.20 ± 0.20 | 0.75 ± 0.25 | 0.30 ± 0.2  | 2                  |
|                     | 5 to 30                  |                             |             | 0.60 ± 0.20 |             | 1                  |

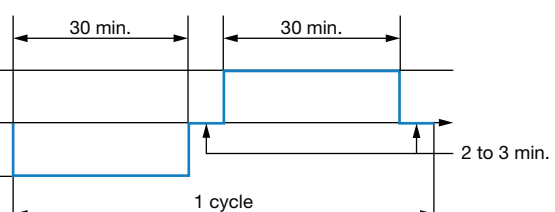
## Note

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

## DERATING

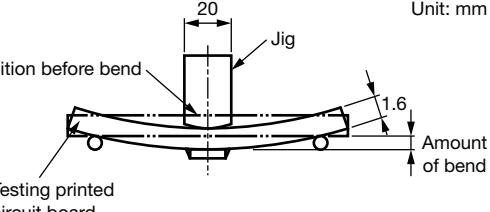


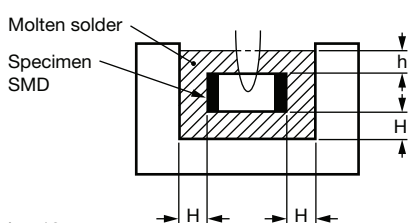
## PERFORMANCES

| ENVIRONMENTAL PERFORMANCE |                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                        |
|---------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| NO.                       | ITEM                                        | TEST CONDITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SPECIFICATION                          |
| 1 <sup>(1)</sup>          | Short time overload                         | 5 times rated power for 5 seconds (JIS-C5202-5.5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $\Delta R: \pm (1 \% + 0.0005 \Omega)$ |
| 2                         | Temperature coefficient of resistance (TCR) | +25 °C / +125 °C (JIS-C5202-5.2)<br>$TCR (ppm/^{\circ}C) = \frac{\Delta R}{R \times \Delta t} \times 10^6$                                                                                                                                                                                                                                                                                                                                                                                                                             | 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 $\pm$ 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)                                                                                                                                                                                                                                                                                  | $\Delta R: \pm (1 \% + 0.0005 \Omega)$ |
| 4                         | High temperature exposure                   | The chip (mounted on board) is exposed in the heat chamber 125 °C $\pm$ 3 °C for 1000 hours. (JIS-C5202-7.2)                                                                                                                                                                                                                                                                                                                                                                                                                           | $\Delta R: \pm (1 \% + 0.0005 \Omega)$ |
| 5                         | Load life                                   | Apply rated power at 70 °C $\pm$ 2 °C for 1000 hours with 1.5 hours ON and 0.5 hour OFF. (JIS-C5202-7.10)                                                                                                                                                                                                                                                                                                                                                                                                                              | $\Delta R: \pm (1 \% + 0.0005 \Omega)$ |
| 6                         | Rapid change of temperature                 | The chip (mounted on board) is exposed, -55 °C $\pm$ 3 °C (30 min.) / +155 °C $\pm$ 2 °C (30 min.) for 5 cycles.<br>The following conditions as the following figure. (JIS-C5202-7.4)<br><br><div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>Ambient temperature</p> <p>+155 (<math>\pm</math> 2) °C</p> <p>+25 (<math>\pm</math> 2) °C</p> <p>-55 (<math>\pm</math> 3) °C</p> </div>  </div> <p>1 cycle</p> | $\Delta R: \pm (1 \% + 0.0005 \Omega)$ |

### Note

<sup>(1)</sup> 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 $\pm$ 1 s. (JIS-C5202-6.1)<br><br><div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>Unit: mm</p> <p>20</p> <p>Jig</p> <p>Position before bend</p> <p>Testing printed circuit board</p> </div>  </div> | $\Delta R: \pm (1 \% + 0.0005 \Omega)$                                                    |
| 2                    | Solvent resistance        | Complete immersion of specimens in isopropyl alcohol for 3 (+5, -0) min. 25 °C $\pm$ 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 $\pm$ 5 °C for 10 s $\pm$ 1 s. (MIL-STD-202, method 210)                                                                                                                                                                                                                                                                                                                                                      | $\Delta R: \pm (1 \% + 0.0005 \Omega)$                                                    |

| FUNCTION PERFORMANCE |               |                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             |
|----------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| NO.                  | ITEM          | TEST CONDITION                                                                                                                                                                                                                                                                                                                                                                                                      | SPECIFICATION                                               |
| 4                    | Solderability | <p>The specimen chip shall be immersed into the flux specified in the solder bath <math>235^{\circ}\text{C} \pm 5^{\circ}\text{C}</math> for <math>2 \text{ s} \pm 0.5 \text{ s}</math>. It shall be immersed to a point 10 mm from its root. (Sn96.5 / Ag3.0 / Cu0.5) (JIS-C5 202-6.11)</p>  <p>h = 10 mm<br/>H = 10 mm min.</p> | Solder shall be covered 95 % or more of the electrode area. |

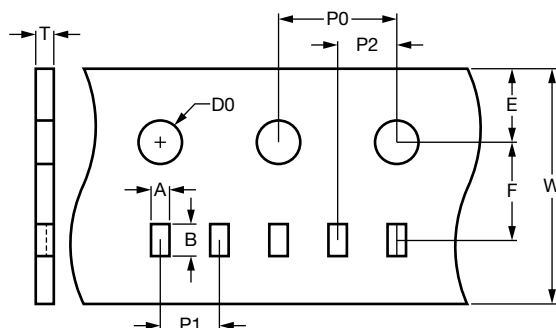
**Notes**

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

| 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 | $0.7 \pm 0.05$                      | $1.2 \pm 0.05$ | $1.75 \pm 0.1$ | $3.5 \pm 0.05$ | $8.0 \pm 0.2$ | $4.0 \pm 0.1$ | $2.0 \pm 0.1$ | $2.0 \pm 0.05$ | $1.55 \pm 0.05$ | $0.6 \pm 0.1$  |
| WFCP0508 | $1.6 \pm 0.1$                       | $2.4 \pm 0.1$  | $1.75 \pm 0.1$ | $3.5 \pm 0.05$ | $8.0 \pm 0.2$ | $4.0 \pm 0.1$ | $4.0 \pm 0.1$ | $2.0 \pm 0.05$ | $1.55 \pm 0.05$ | $0.97 \pm 0.1$ |
| WFCP0603 | $1.1 \pm 0.1$                       | $1.8 \pm 0.1$  | $1.75 \pm 0.1$ | $3.5 \pm 0.05$ | $8.0 \pm 0.2$ | $4.0 \pm 0.1$ | $4.0 \pm 0.1$ | $2.0 \pm 0.05$ | $1.55 \pm 0.05$ | $0.70 \pm 0.1$ |
| WFCP0612 | $2.0 \pm 0.1$                       | $3.6 \pm 0.1$  | $1.75 \pm 0.1$ | $3.5 \pm 0.05$ | $8.0 \pm 0.2$ | $4.0 \pm 0.1$ | $4.0 \pm 0.1$ | $2.0 \pm 0.05$ | $1.55 \pm 0.05$ | $0.97 \pm 0.1$ |

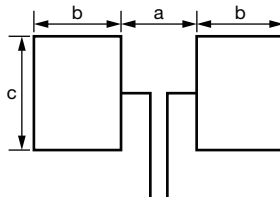
**Notes**

- Embossed carrier tape per EIA (EIAJ)
- Additional packaging details at [www.vishay.com/doc?20051](http://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](http://www.vishay.com/doc?31052)



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