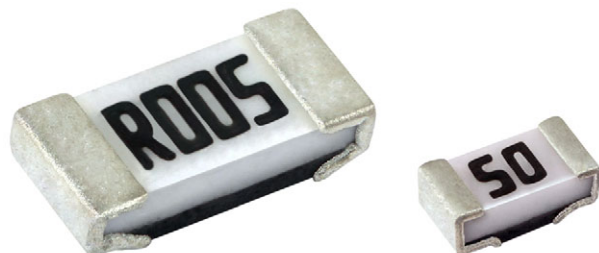


## Metal Foil Current Sense Resistors, Low Value (Down to 0.001 $\Omega$ )



### FEATURES

- Ultra low sensing resistance
- Low TCR (down to 50 ppm/°C)
- Chip size down to 0402, minimizing board space
- 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<br>W | TOLERANCE<br>%        | RESISTANCE<br>VALUE RANGE<br>$\Omega$ | WEIGHT<br>(typical)<br>g/1000 pieces |
|--------------|------|-------------------|-----------------------|---------------------------------------|--------------------------------------|
| WFC0402      | 0402 | 0.125             | $\pm 1, \pm 2, \pm 5$ | 0.003 to 0.05                         | 1.1                                  |
| WFC0603      | 0603 | 0.33              | $\pm 1, \pm 2, \pm 5$ | 0.001 to 0.005                        | 3.3                                  |
|              | 0603 | 0.25              | $\pm 1, \pm 2, \pm 5$ | 0.0051 to 0.03                        | 3.3                                  |
| WFC0805      | 0805 | 0.50              | $\pm 1, \pm 2, \pm 5$ | 0.001 to 0.04                         | 6.8                                  |
| WFC1206      | 1206 | 1.0               | $\pm 1, \pm 2, \pm 5$ | 0.001 to 0.05                         | 17.4                                 |
|              | 1206 | 0.5               | $\pm 1, \pm 2, \pm 5$ | 0.100 to 0.18                         | 17.4                                 |

### GLOBAL PART NUMBER INFORMATION

Global Part Numbering Example: WFC1206R0100FE66

|                            |   |   |                               |   |   |   |                                                                                                 |   |   |   |   |                                                       |   |                                      |   |
|----------------------------|---|---|-------------------------------|---|---|---|-------------------------------------------------------------------------------------------------|---|---|---|---|-------------------------------------------------------|---|--------------------------------------|---|
| W                          | F | C | 1                             | 2 | 0 | 6 | R                                                                                               | 0 | 1 | 0 | 0 | F                                                     | E | 6                                    | 6 |
| GLOBAL MODEL<br>(3 digits) |   |   | CASE SIZE (EIA)<br>(4 digits) |   |   |   | RESISTANCE<br>VALUE<br>(5 digits) <sup>(1)</sup>                                                |   |   |   |   | TOLERANCE<br>CODE <sup>(3)</sup><br>(1 digit)         |   | PACKAGING CODE<br>(3 digits)         |   |
| WFC                        |   |   | 0402<br>0603<br>0805<br>1206  |   |   |   | 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  $\Omega$

<sup>(3)</sup> Please contact factory for 0.5 % availability

| TECHNICAL SPECIFICATIONS    |        |                            |                             |                              |                               |
|-----------------------------|--------|----------------------------|-----------------------------|------------------------------|-------------------------------|
| PARAMETER                   | UNIT   | RESISTOR CHARACTERISTICS   |                             |                              |                               |
|                             |        | WFC0402                    | WFC0603                     | WFC0805                      | WFC1206                       |
| Temperature coefficient     | ppm/°C | -                          | ± 100 for<br>1 mΩ to 5 mΩ   | -                            | -                             |
|                             |        | ± 150 for<br>3 mΩ to 7 mΩ  | ± 150 for<br>5.1 mΩ to 9 mΩ | ± 100 for<br>1 mΩ to 10 mΩ   | ± 100 for<br>1 mΩ to 10 mΩ    |
|                             |        | ± 100 for<br>8 mΩ to 50 mΩ | ± 75 for<br>10 mΩ to 30 mΩ  | ± 50 for<br>10.1 mΩ to 40 mΩ | ± 50 for<br>10.1 mΩ to 180 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)

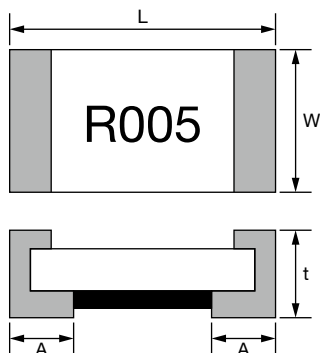


Fig. 1

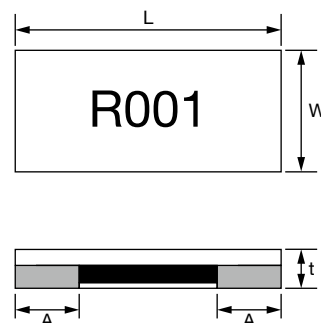


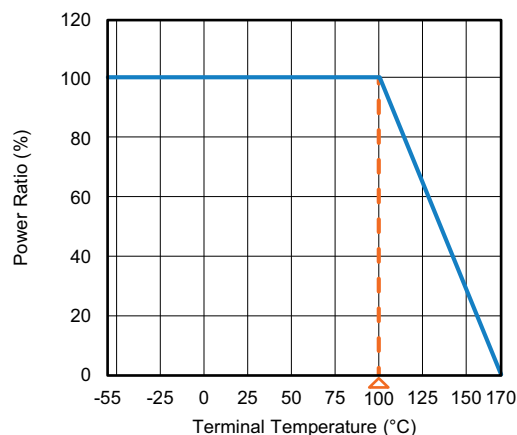
Fig. 2

| TYPE<br>(INCH SIZE) | RESISTANCE<br>RANGE (mΩ) | DIMENSIONS (in millimeters) |             |             |             | DIMENSIONS FIG. |
|---------------------|--------------------------|-----------------------------|-------------|-------------|-------------|-----------------|
|                     |                          | L                           | W           | t           | A           |                 |
| WFC0402             | 3 to 7                   | 1.00 ± 0.10                 | 0.55 ± 0.10 | 0.45 ± 0.10 | 0.35 ± 0.10 | 1               |
|                     | 7.1 to 50                |                             |             |             | 0.25 ± 0.10 | 1               |
| WFC0603             | 1 to 5                   | 1.60 ± 0.10                 | 0.95 ± 0.25 | 0.60 ± 0.25 | 0.55 ± 0.20 | 2               |
|                     | 5.1 to 30                |                             | 0.80 ± 0.10 | 0.55 ± 0.15 | 0.30 ± 0.20 | 1               |
| WFC0805             | 1 to 5                   | 2.10 ± 0.20                 | 1.40 ± 0.20 | 0.60 max.   | 0.60 ± 0.20 | 2               |
|                     | 5.1 to 40                | 2.00 ± 0.20                 | 1.30 ± 0.15 | 0.70 ± 0.15 | 0.45 ± 0.20 | 1               |
| WFC1206             | 1 to 3                   | 3.10 ± 0.20                 | 1.55 ± 0.20 | 0.75 ± 0.25 | 1.30 ± 0.20 | 2               |
|                     | 3.1 to 180               |                             |             | 0.80 ± 0.15 | 0.55 ± 0.20 | 1               |

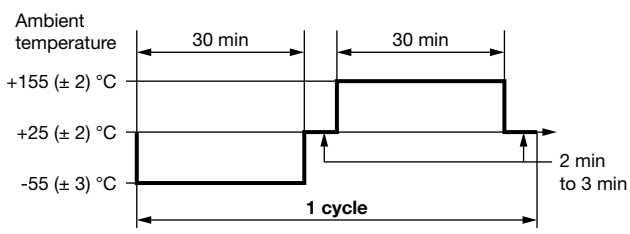
### Note

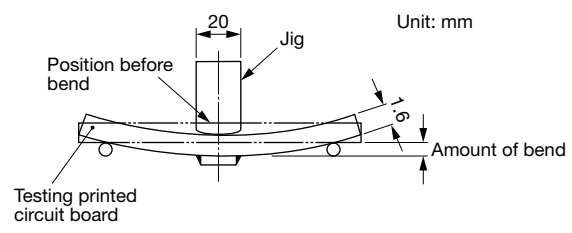
- 0402 has no marking; 0603, 0805, 1206 marking shows two digits for resistance

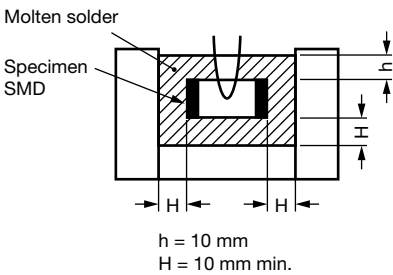
## DERATING



## PERFORMANCES

| ENVIRONMENTAL PERFORMANCE |                                             |                                                                                                                                                                                                                                                                                  |                                        |
|---------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| NO.                       | ITEM                                        | TEST CONDITION                                                                                                                                                                                                                                                                   | SPECIFICATION                          |
| 1                         | 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> | $\Delta R: \pm (1 \% + 0.0005 \Omega)$ |

| 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> | $\Delta R: \pm (1 \% + 0.0005 \Omega)$                                                    |
| 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. |

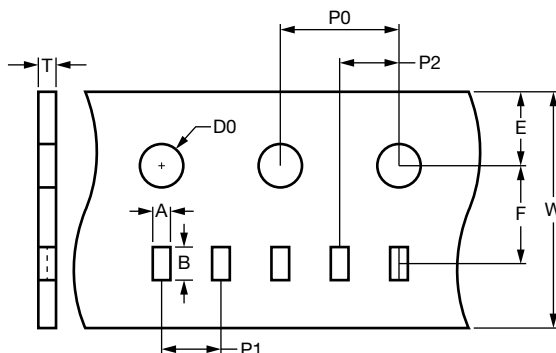
**Notes**

- 0.5 W with total solder pad trace size of 100 mm<sup>2</sup>. The surface temperature of component should below 100 °C
- 1.0 W with total solder pad trace size of 100 mm<sup>2</sup>. The surface temperature of component should below 100 °C

| TAPE PACKAGING SPECIFICATIONS   |                     |             |             |
|---------------------------------|---------------------|-------------|-------------|
| MODEL                           | REEL                |             |             |
|                                 | TAPE WIDTH          | DIAMETER    | PIECES/REEL |
| WFC0402                         | Embossed paper tape | 178 mm / 7" | 10 000      |
| WFC0603,<br>WFC0805,<br>WFC1206 | Embossed paper tape | 178 mm / 7" | 5000        |

**Note**

- Embossed carrier tape per EIA (EIAJ)

**PAPER TAPE SPECIFICATIONS**


| TYPE    | RESISTANCE RANGE | CARRIER DIMENSIONS (in millimeters) |            |            |            |           |           |           |            |             |            |
|---------|------------------|-------------------------------------|------------|------------|------------|-----------|-----------|-----------|------------|-------------|------------|
|         |                  | A                                   | B          | E          | F          | W         | P0        | P1        | P2         | D0          | T          |
| WFC0402 | 3 mΩ to 50 mΩ    | 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  |
| WFC0603 | 1 mΩ to 5 mΩ     | 1.4 ± 0.1                           | 1.9 ± 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 | 0.75 ± 0.1 |
| WFC0603 | 5.1 mΩ to 30 mΩ  | 1.1 ± 0.1                           | 1.9 ± 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 |
| WFC0805 | 1 mΩ to 5 mΩ     | 2.4 ± 0.1                           | 1.9 ± 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 | 0.75 ± 0.1 |
| WFC0805 | 5.1 mΩ to 40 mΩ  | 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 |
| WFC1206 | 1 mΩ to 3 mΩ     | 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 | 0.87 ± 0.1 |
| WFC1206 | 3.1 mΩ to 180 mΩ | 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 |

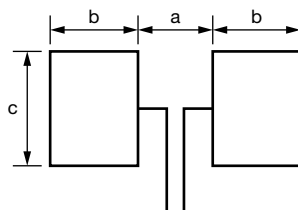
**Notes**

- Embossed carrier tape per EIA (EIAJ)
- Additional packaging details at [www.vishay.com/doc?20051](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 (3 mΩ to 7 mΩ)     | 0.30                                   | 0.60 | 0.60 |
| 0402 (7.1 mΩ to 50 mΩ)  | 0.50                                   | 0.50 | 0.60 |
| 0603 (1 mΩ to 5 mΩ)     | 0.30                                   | 1.10 | 1.50 |
| 0603 (5.1 mΩ to 9 mΩ)   | 0.60                                   | 0.90 | 1.00 |
| 0603 (9.1 mΩ to 30 mΩ)  | 0.90                                   | 0.70 | 1.00 |
| 0805 (1 mΩ to 5 mΩ)     | 0.80                                   | 1.60 | 1.45 |
| 0805 (5.1 mΩ to 40 mΩ)  | 1.20                                   | 1.20 | 1.40 |
| 1206 (1 mΩ to 3 mΩ)     | 0.40                                   | 1.80 | 2.20 |
| 1206 (3.1 mΩ to 180 mΩ) | 2.20                                   | 1.30 | 1.80 |

### 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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