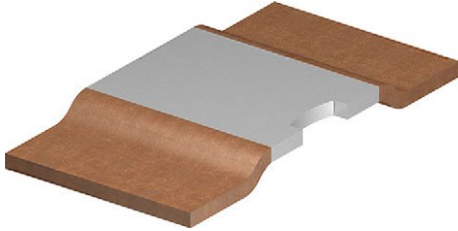


## Power Metal Strip® Resistors, Low Value (Down to 0.0003 Ω), Surface-Mount



### LINKS TO ADDITIONAL RESOURCES



### FEATURES

- Power Metal Strip® all-welded construction is ideal for all types of current sensing, voltage division, and pulse applications
- Solid metal nickel-chrome, manganese-copper, or manganese-copper-tin alloy resistive element with low TCR (< 20 ppm/°C)
- Proprietary processing technique produces extremely low resistance values, down to 0.0003 Ω
- Sulfur resistance by construction that is unaffected by high sulfur environments
- Very low inductance (< 2 nH)
- Low thermal EMF (< 3 μV/°C)
- AEC-Q200 qualified <sup>(1)</sup>
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT

 HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### Notes

- Follow link to Overview of Automotive Grade Products for more details: [www.vishay.com/doc?49924](http://www.vishay.com/doc?49924)
  - “SMD Current Sense: AEC-Q200 vs. Vishay Qualification” technical note: [www.vishay.com/doc?30416](http://www.vishay.com/doc?30416)
- <sup>(1)</sup> Flame retardance test may not be applicable to some resistor technologies

| STANDARD ELECTRICAL SPECIFICATIONS |      |  |   |                |                                |  |                                      |
|------------------------------------|------|--|---|----------------|--------------------------------|--|--------------------------------------|
| GLOBAL MODEL                       | SIZE | POWER RATING<br>$P_{70^\circ\text{C}}$ <sup>(1)</sup><br>W | POWER RATING<br>$P_{100^\circ\text{C}}$ <sup>(2)</sup><br>W | TOLERANCE<br>% | RESISTANCE VALUE<br>RANGE<br>Ω | RESISTANCE VALUES<br>CURRENTLY AVAILABLE <sup>(3)</sup><br>Ω | WEIGHT<br>(typical)<br>g/1000 pieces |
| WSLF2512                           | 2512 | 10.0   | 9.0   | 1.0, 5.0       | 0.3m to 0.5m                   | 0.3m, 0.5m   | 258                                  |
|                                    | 2512 | 6.0  | 4.0   | 1.0, 5.0       | 1m to 2m                       | 1m, 1.3m, 1.5m, 2m   | 212                                  |
|                                    | 2512 | 4.0  | 3.0   | 1.0, 5.0       | 3m                             | 3m   | 267                                  |
|                                    | 2512 | 3.0  | 3.0   | 1.0, 5.0       | 4m                             | 4m   | 267                                  |

### Notes

- Part marking: no part marking on these parts
  - “Thermal Management for Surface-Mount Devices” white paper: [www.vishay.com/doc?30380](http://www.vishay.com/doc?30380)
- <sup>(1)</sup> See Fig. 1 - Ambient Temperature Derating  
<sup>(2)</sup> See Fig. 2 - Terminal Temperature Derating  
<sup>(3)</sup> Other values may be available, contact factory

| GLOBAL PART NUMBER INFORMATION  |   |   |   |  |   |   |                             |   |   |   |   |   |                                      |   |   |  |  |
|---|---|---|---|--|---|---|-----------------------------|---|---|---|---|---|--------------------------------------|---|---|--|--|
| Global Part Numbering: WSLF25121L000FEA (WSLF2512, 0.001 Ω, ± 1 %)<br>(visit <a href="http://www.vishay.net">www.vishay.net</a> Vishay Dale parts numbering manual for all options) |   |   |   |  |   |   |                             |   |   |   |   |   |                                      |   |   |  |  |
| W   | S | L | F | 2  | 5 | 1 | 2                           | 1 | L   | 0 | 0 | 0 | F                                    | E | A |  |  |
| GLOBAL MODEL<br>(8 digits)  |   |   |   | RESISTANCE VALUE<br>(5 digits)                 |   |   | TOLERANCE CODE<br>(1 digit) |   | PACKAGING CODE <sup>(1)</sup><br>(2 digits) |   |   |   | SPECIAL <sup>(2)</sup><br>(2 digits) |   |   |  |  |
| WSLF2512  |   |   |   | L = mΩ<br>L5000 = 0.0005 Ω<br>1L000 = 0.0010 Ω |   |   | F = ± 1.0 %<br>J = ± 5.0 %  |   | EA = lead (Pb)-free, tape / reel            |   |   |   | Reserved for future specials         |   |   |  |  |

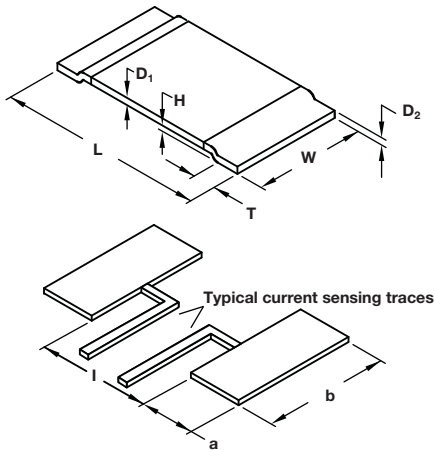
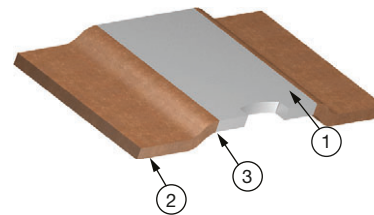
### Notes

- <sup>(1)</sup> Packaging code: EB (lead (Pb)-free) are non-standard packaging codes designating 1000 piece reels. These non-standard packaging codes are identical to our standard EA (lead (Pb)-free), except that they have a package quantity of 1000 pieces
- <sup>(2)</sup> Follow link for customization capabilities: [www.vishay.com/doc?48163](http://www.vishay.com/doc?48163)

| TECHNICAL SPECIFICATIONS  |        |                                      |
|---|--------|--------------------------------------|
| PARAMETER   | UNIT   | WSLF RESISTOR CHARACTERISTICS        |
| Component temperature coefficient (including terminal) <sup>(1)</sup><br>TCR measured from -55 °C to 150 °C | ppm/°C | ± 200 for 0.3 mΩ and 0.5 mΩ          |
|   |        | ± 170 for 1.0 mΩ, 1.3 mΩ, and 1.5 mΩ |
|   |        | ± 70 for 2 mΩ, 3 mΩ, and 4 mΩ        |
| Element TCR <sup>(2)</sup>  | ppm/°C | < 20                                 |
| Operating temperature range   | °C     | -65 to +170                          |
| Maximum working voltage <sup>(3)</sup>  | V      | $(P \times R)^{1/2}$                 |

**Notes**

- Consult factory for detailed TCR performance across full temperature range as performance is resistance value specific
- “Temperature Coefficient of Resistance for Current Sensing” white paper: [www.vishay.com/doc?30405](http://www.vishay.com/doc?30405)
- <sup>(1)</sup> Component TCR - total TCR that includes the TCR effects of the resistor element and the copper terminal
- <sup>(2)</sup> Element TCR - only applies to the alloy used for the resistor element
- <sup>(3)</sup> Maximum working voltage - the WSL is not voltage sensitive, but is limited by power / energy dissipation and is also not ESD sensitive

**DIMENSIONS** in inches (millimeters)

**CONSTRUCTION OUTLINE**


- ① Resistive element: element material used is dependent on resistance value. Refer to Element Material in table)
- ② Terminal: solid copper
- ③ Terminal / element weld

**Notes**

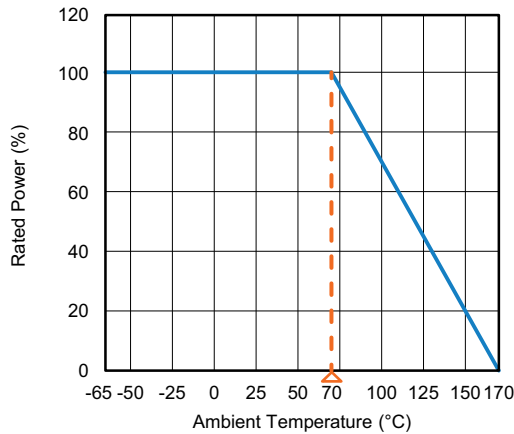
- 3D models available: [www.vishay.com/doc?30335](http://www.vishay.com/doc?30335)
- Surface mount solder profile recommendations: [www.vishay.com/doc?31052](http://www.vishay.com/doc?31052)

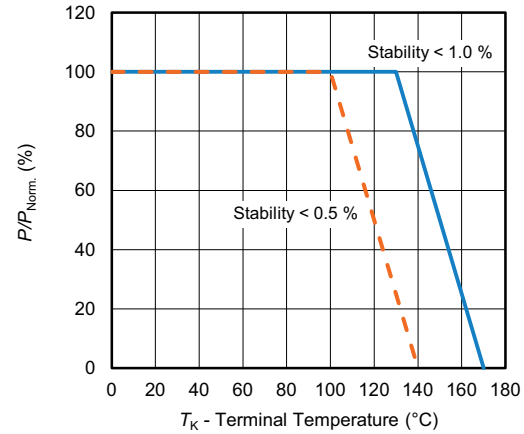
| MODEL    | DIMENSIONS                     |                               |                                  |                               | SOLDER PAD DIMENSIONS |                |                |
|----------|--------------------------------|-------------------------------|----------------------------------|-------------------------------|-----------------------|----------------|----------------|
|          | L                              | W                             | H                                | T                             | a                     | b              | l              |
| WSLF2512 | 0.250 ± 0.006<br>(6.35 ± 0.15) | 0.120 ± 0.008<br>(3.02 ± 0.2) | 0.0138 ± 0.0012<br>(0.35 ± 0.03) | 0.045 - 0.016<br>(1.14 - 0.4) | 0.071<br>(1.80)       | 0.13<br>(3.40) | 0.13<br>(3.40) |

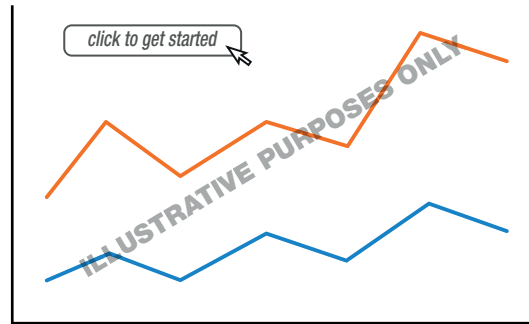
| GLOBAL MODEL | RESISTANCE VALUE (mΩ) | THERMAL RESISTANCE (°C/W) | THICKNESS in inches (millimeters) |                | ELEMENT MATERIAL |
|--------------|-----------------------|---------------------------|-----------------------------------|----------------|------------------|
|              |                       |                           | D <sub>1</sub>                    | D <sub>2</sub> |                  |
| WSLF2512     | 0.3                   | 3.8                       | 0.040 (1.02)                      | 0.040 (1.02)   | Mn-Cu-Sn         |
|              | 0.5                   | 6.7                       | 0.033 (0.84)                      | 0.033 (0.84)   | Mn-Cu            |
|              | 1.0                   | 12.1                      | 0.017 (0.43)                      | 0.017 (0.43)   | Mn-Cu            |
|              | 1.3                   | 14.6                      | 0.013 (0.33)                      | 0.013 (0.33)   | Mn-Cu            |
|              | 1.5                   | 14.5                      | 0.011 (0.28)                      | 0.011 (0.28)   | Mn-Cu            |
|              | 2.0                   | 17.1                      | 0.028 (0.71)                      | 0.028 (0.71)   | Ni-Cr            |
|              | 3.0                   | 18.2                      | 0.019 (0.48)                      | 0.019 (0.48)   | Ni-Cr            |
|              | 4.0                   | 18.5                      | 0.014 (0.36)                      | 0.014 (0.36)   | Ni-Cr            |

**Note**

- <sup>(1)</sup> The full power rating of Power Metal Strip resistors are dependent upon the ability of the circuit board to dissipate the heat energy created in the resistance element. It is recommended to follow common design practices for power semiconductors that ensure the junction temperature is maintained within thermal limits by using large pad surfaces, thermal vias, heavier copper weights, internal layers as well as other thermal spreading features. The thermal resistance values provided function in the same manner as junction to terminal temperature

**DERATING- AMBIENT TEMPERATURE**

 Fig. 1 -  $P_{70\text{ }^\circ\text{C}}$  of Standard Electrical Specification Table

**DERATING - TERMINAL TEMPERATURE**

 Fig. 2 -  $P_{100\text{ }^\circ\text{C}}$  Rated Power of Standard Electrical Specification Table (Example L5000)

**PULSE CAPABILITY**

[www.vishay.com/resistors/power-metal-strip-calculator](http://www.vishay.com/resistors/power-metal-strip-calculator)

| PERFORMANCE               |  |             |
|---------------------------|--|-------------|
| TEST                      | CONDITIONS OF TEST   | TEST LIMITS |
| Thermal shock             | -55 °C to +150 °C, 2000 cycles, 15 min at each extreme         | ± 0.5 %     |
| Short time overload       | 5 x rated power for 5 s  | ± 0.5 %     |
| Low temperature storage   | -65 °C for 24 h  | ± 0.1 %     |
| High temperature exposure | 2000 h at +170 °C  | ± 1.0 %     |
| Bias humidity             | +85 °C, 85 % RH, 10 % bias, 1000 h                             | ± 0.5 %     |
| Mechanical shock          | 100 g's for 6 ms, 5 pulses                                     | ± 0.2 %     |
| Vibration                 | Frequency varied 10 Hz to 2000 Hz in 1 min, 3 directions, 12 h | ± 0.2 %     |
| Load life                 | 2000 h at +70 °C, 1.5 h "ON", 0.5 h "OFF"                      | ± 1.0 %     |
| Resistance to solder heat | +260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence          | ± 0.5 %     |
| Moisture resistance       | MIL-STD-202, method 106, 0 % power, 7a and 7b not required     | ± 0.1 %     |

**Note**

- Contact [ww2bresistors@vishay.com](mailto:ww2bresistors@vishay.com) for application specific performance requirements. Typical performance is better than stated test limits

| PACKAGING (1) |                          |              |             |      |
|---------------|--------------------------|--------------|-------------|------|
| MODEL         | REEL                     |              |             |      |
|               | TAPE WIDTH               | DIAMETER     | PIECES/REEL | CODE |
| WSLF2512      | 12 mm / embossed plastic | 330 mm / 13" | 4000        | EA   |

**Notes**

- Embossed carrier tape per EIA-481
- (1) Additional packaging details at [www.vishay.com/doc?220051](http://www.vishay.com/doc?220051)



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