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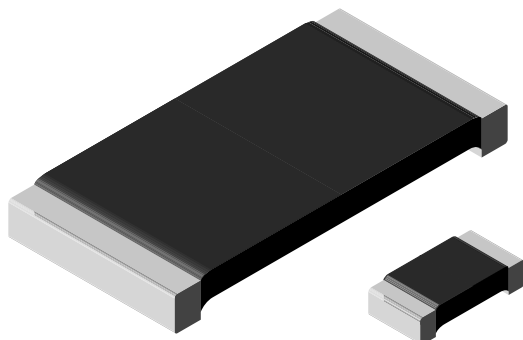


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**WSL**

Vishay Dale

## Power Metal Strip® Resistors, Low Value (down to 0.0005 Ω), Surface Mount



**DESIGN TOOLS** (click logo to get started)



### FEATURES

- All welded construction of the Power Metal Strip® resistors are ideal for all types of current sensing, voltage division and pulse applications
- Proprietary processing technique produces extremely low resistance values (down to 0.0005 Ω)
- Construction is impervious against high sulfur environments (ASTM B 809-95 test method)
- Very low inductance 0.5 nH to 5 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)



**RoHS COMPLIANT**

**HALOGEN FREE**  
Available

**GREEN (S-2008)**  
Available

### Notes

- This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.
- Follow link to Overview of Automotive Grade Products for more details: [www.vishay.com/doc?49924](http://www.vishay.com/doc?49924).
- <sup>(1)</sup> Flame retardance test may not be applicable to some resistor technologies.

| STANDARD ELECTRICAL SPECIFICATIONS |      |  |                          |               |                                   |
|------------------------------------|------|--|--------------------------|---------------|-----------------------------------|
| GLOBAL MODEL                       | SIZE | POWER RATING $P_{70\text{ }^\circ\text{C}}$<br>W | RESISTANCE VALUE RANGE Ω |               | WEIGHT (typical)<br>g/1000 pieces |
|                                    |      |  | Tol. ± 0.5 %             | Tol. ± 1.0 %  |                                   |
| WSL0603                            | 0603 | 0.1  | 0.01 to 0.1              | 0.01 to 0.1   | 1.9                               |
| WSL0805                            | 0805 | 0.125  | 0.005 to 0.2             | 0.005 to 0.2  | 4.8                               |
| WSL1206                            | 1206 | 0.25   | 0.005 to 0.2             | 0.001 to 0.2  | 16.2                              |
| WSL2010                            | 2010 | 0.5  | 0.004 to 0.5             | 0.001 to 0.5  | 38.9                              |
| WSL2512                            | 2512 | 1.0 <sup>(1)</sup>                               | 0.003 to 0.5             | 0.0005 to 0.5 | 63.6                              |
| WSL2816                            | 2816 | 2.0  | 0.003 to 0.1             | 0.002 to 0.1  | 118                               |

### Notes

- Part marking: Value; tolerance: Due to resistor size limitations some resistors will be marked with only the resistance value.
- <sup>(1)</sup> For values above 0.1 Ω derate linearly to 80 % rated power at 0.5 Ω.

| GLOBAL PART NUMBER INFORMATION   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |  |
|--|---|---|--|---|---|---|---|---|---|---|---|---|---|---|--|--|
| Global Part Numbering example: WSL25124L000FEA (visit <a href="http://www.vishay.net">www.vishay.net</a> Vishay Dale parts numbering manual for all options) |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |  |
| W  | S   | L   | 2  | 5 | 1 | 2 | 4   | L | 0 | 0 | 0 | F | E | A |  |  |
| GLOBAL MODEL   | RESISTANCE VALUE <sup>(1)</sup>   | TOLERANCE CODE                            | PACKAGING CODE <sup>(2)</sup>  |   |   |   | SPECIAL   |   |   |   |   |   |   |   |  |  |
| WSL0603<br>WSL0805<br>WSL1206<br>WSL2010<br>WSL2512<br>WSL2816   | L = mΩ*<br>R = decimal<br>5L000 = 0.005 Ω<br>R0100 = 0.01 Ω<br><br>* Use "L" for resistance values < 0.01 Ω | D = ± 0.5 %<br>F = ± 1.0 %<br>J = ± 5.0 % | EA = lead (Pb)-free, tape / reel<br>EH = lead (Pb)-free, tape / reel (WSL2816)<br>EK = lead (Pb)-free, bulk<br><br>TA = tin/lead, tape / reel (R86)<br>TG = tin/lead, tape / reel (RT1, for WSL0603 and WSL0805)<br>TH = tin / lead, tape / reel (RJ9, WSL2816)<br>BA = tin / lead, bulk (B43) |   |   |   | (Dash number) (up to 2 digits) From 1 to 99 as applicable |   |   |   |   |   |   |   |  |  |

### Notes

- <sup>(1)</sup> WSL Marking ([www.vishay.com/doc?30327](http://www.vishay.com/doc?30327))
- <sup>(2)</sup> Packaging code: EB (lead (Pb)-free) and TB (tin / lead) are non-standard packaging codes designating 1000 piece reels. These non-standard packaging codes are identical to our standard EA (lead (Pb)-free) and TA (tin / lead), except that they have a package quantity of 1000 pieces.



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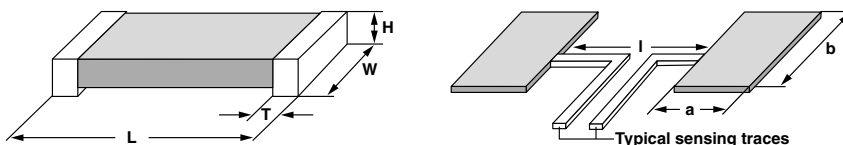
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| TECHNICAL SPECIFICATIONS  |        |   |
|---|--------|---|
| PARAMETER   | UNIT   | WSL RESISTOR CHARACTERISTICS  |
| Component temperature coefficient (including terminal) <sup>(1)</sup> | ppm/°C | ± 75 for 7 mΩ to 0.5 Ω, ± 110 for 5 mΩ to 6.9 mΩ, ± 150 for 3 mΩ to 4.9 mΩ, ± 275 for 1 mΩ to 2.9 mΩ, ± 400 for 0.5 mΩ to 0.99 mΩ |
| Element TCR <sup>(2)</sup>  | ppm/°C | < 20  |
| Operating temperature range   | °C     | -65 to +170   |
| Maximum working voltage <sup>(3)</sup>                                | V      | (P x R) <sup>1/2</sup>  |

**Notes**

- <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; refer to item 1 in the construction illustration on the following page.
- <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)



**Notes**

- 3D models available: [www.vishay.com/doc?30306](http://www.vishay.com/doc?30306).
- Surface mount solder profile recommendations: [www.vishay.com/doc?31052](http://www.vishay.com/doc?31052).

| MODEL   | RESISTANCE RANGE (Ω) | DIMENSIONS                      |                                 |                                  |                                  | SOLDER PAD DIMENSIONS |                 |                 |                 |                 |
|---------|----------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|-----------------------|-----------------|-----------------|-----------------|-----------------|
|         |                      | L                               | W                               | H                                | T                                | a                     | b               | l               |                 |                 |
| WSL0603 | 0.01 to 0.1          | 0.060 ± 0.010<br>(1.52 ± 0.254) | 0.030 ± 0.010<br>(0.76 ± 0.254) | 0.013 ± 0.005<br>(0.330 ± 0.127) | 0.015 ± 0.010<br>(0.381 ± 0.254) | 0.040<br>(1.01)       | 0.040<br>(1.01) | 0.020<br>(0.50) |                 |                 |
| WSL0805 | 0.005 to 0.2         | 0.080 ± 0.010<br>(2.03 ± 0.254) | 0.050 ± 0.010<br>(1.27 ± 0.254) | 0.013 ± 0.005<br>(0.330 ± 0.127) | 0.015 ± 0.010<br>(0.381 ± 0.254) | 0.040<br>(1.02)       | 0.050<br>(1.27) | 0.020<br>(0.50) |                 |                 |
| WSL1206 | 0.001 to 0.0019      | 0.126 ± 0.010<br>(3.20 ± 0.254) | 0.063 ± 0.010<br>(1.60 ± 0.254) | 0.025 ± 0.010<br>(0.635 ± 0.254) | 0.041 ± 0.010<br>(1.04 ± 0.254)  | 0.062<br>(1.57)       | 0.070<br>(1.78) | 0.030<br>(0.76) |                 |                 |
|         | 0.002 to 0.0059      |                                 |                                 |                                  | 0.025 ± 0.010<br>(0.635 ± 0.254) |                       |                 |                 |                 |                 |
|         | 0.006 to 0.20        |                                 |                                 |                                  | 0.020 ± 0.010<br>(0.508 ± 0.254) |                       |                 |                 |                 |                 |
| WSL2010 | 0.001 to 0.0069      | 0.200 ± 0.010<br>(5.08 ± 0.254) | 0.100 ± 0.010<br>(2.54 ± 0.254) | 0.025 ± 0.010<br>(0.635 ± 0.254) | 0.058 ± 0.010<br>(1.47 ± 0.254)  | 0.093<br>(2.36)       | 0.120<br>(3.05) | 0.055<br>(1.40) |                 |                 |
|         | 0.007 to 0.5         |                                 |                                 |                                  | 0.020 ± 0.010<br>(0.508 ± 0.254) |                       |                 |                 | 0.055<br>(1.40) | 0.130<br>(3.30) |
| WSL2512 | 0.0005 to 0.00099    | 0.250 ± 0.010<br>(6.35 ± 0.254) | 0.125 ± 0.010<br>(3.18 ± 0.254) | 0.025 ± 0.010<br>(0.635 ± 0.254) | 0.107 ± 0.010<br>(2.72 ± 0.254)  | 0.120<br>(3.05)       | 0.145<br>(3.68) | 0.050<br>(1.27) |                 |                 |
|         | 0.001 to 0.0049      |                                 |                                 |                                  | 0.087 ± 0.010<br>(2.21 ± 0.254)  |                       |                 |                 |                 |                 |
|         | 0.005 to 0.0069      |                                 |                                 |                                  | 0.047 ± 0.010<br>(1.19 ± 0.254)  |                       |                 |                 | 0.083<br>(2.11) | 0.125<br>(3.18) |
|         | 0.007 to 0.5         |                                 |                                 |                                  | 0.030 ± 0.010<br>(0.762 ± 0.254) |                       |                 |                 | 0.065<br>(1.65) |                 |
| WSL2816 | 0.002 to 0.00399     | 0.280 ± 0.010<br>(7.1 ± 0.254)  | 0.165 ± 0.010<br>(4.2 ± 0.254)  | 0.025 ± 0.010<br>(0.635 ± 0.254) | 0.098 ± 0.010<br>(2.49 ± 0.254)  | 0.135<br>(3.43)       | 0.185<br>(4.7)  | 0.060<br>(1.52) |                 |                 |
|         | 0.004 to 0.1         |                                 |                                 |                                  | 0.062 ± 0.010<br>(1.57 ± 0.254)  |                       |                 | 0.096<br>(2.45) | 0.125<br>(3.20) |                 |

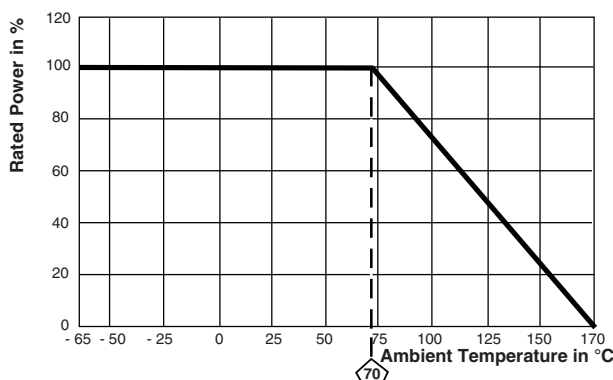


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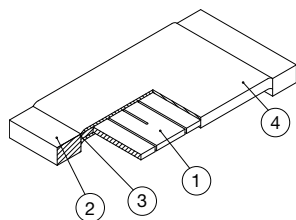
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**DERATING**

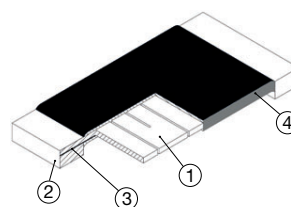


**WELDED CONSTRUCTION 2816, 2512, 2010, 1206**



- 1) Resistive element: solid metal nickel-chrome or manganese-copper alloy resistive element with low TCR (< 20 ppm/°C)
- 2) Plated terminal
- 3) Terminal / element weld
- 4) Silicone coating with ink print

**CLAD CONSTRUCTION 0805 and 0603**



- 1) Resistive element: Ni-Cr
- 2) Terminal: Solid copper, 100 % Sn (100 μ" min.) with 100 % Ni (20 μ" min.) under layer finish
- 3) Terminal to element weld
- 4) High temperature encapsulant: "siliconized polyester" coating material

| PERFORMANCE               |  |                    |
|---------------------------|--|--------------------|
| TEST                      | CONDITIONS OF TEST   | TEST LIMITS        |
| Thermal shock             | -55 °C to +150 °C, 1000 cycles, 15 min at each extreme         | ± 0.5 % + 0.0005 Ω |
| Short time overload       | 5 x rated power for 5 s  | ± 0.5 % + 0.0005 Ω |
| Low temperature operation | -65 °C for 24 h  | ± 0.5 % + 0.0005 Ω |
| High temperature exposure | 1000 h at + 170 °C   | ± 1.0 % + 0.0005 Ω |
| Bias humidity             | +85 °C, 85 % RH, 10 % bias, 1000 h                             | ± 0.5 % + 0.0005 Ω |
| Mechanical shock          | 100 g's for 6 ms, 5 pulses                                     | ± 0.5 % + 0.0005 Ω |
| Vibration                 | Frequency varied 10 Hz to 2000 Hz in 1 min, 3 directions, 12 h | ± 0.5 % + 0.0005 Ω |
| Load life                 | 1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"        | ± 1.0 % + 0.0005 Ω |
| Resistance to solder heat | +260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence          | ± 0.5 % + 0.0005 Ω |
| Moisture resistance       | MIL-STD-202, method 106, 0 % power, 7a and 7b not required     | ± 0.5 % + 0.0005 Ω |

| PACKAGING (1) |                        |           |             |      |
|---------------|------------------------|-----------|-------------|------|
| MODEL         | REEL                   |           |             |      |
|               | TAPE WIDTH             | DIAMETER  | PIECES/REEL | CODE |
| WSL0603       | 8 mm/punched paper     | 178 mm/7" | 5000        | EA   |
| WSL0805       | 8 mm/punched paper     | 178 mm/7" | 5000        | EA   |
| WSL1206       | 8 mm/embossed plastic  | 178 mm/7" | 4000        | EA   |
| WSL2010       | 12 mm/embossed plastic | 178 mm/7" | 4000        | EA   |
| WSL2512       | 12 mm/embossed plastic | 178 mm/7" | 2000        | EA   |
| WSL2816       | 12 mm/embossed plastic | 178 mm/7" | 2000        | EH   |

**Notes**

- Embossed carrier tape per EIA-481.
- (1) Additional packaging details at [www.vishay.com/doc?20051](http://www.vishay.com/doc?20051).



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