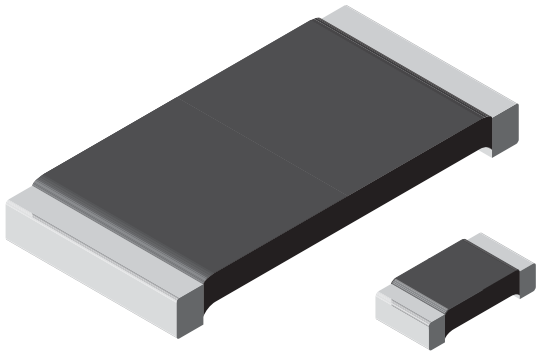
# Power Metal Strip® Resistors, Low Value (down to 0.0005 Ω), Surface Mount



## 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 available (1)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE Available

Pb-free Available

e3

RoHS COMPLIANT

HALOGEN FREE Available

GREEN (5-2008) 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.

(1) Flame retardance test may not be applicable to some resistor technologies.

## STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | SIZE | POWER RATING $P_{70\ °C}$ W | RESISTANCE VALUE RANGE Ω | | WEIGHT (typical) 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 (1) | 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.

(1) 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 www.vishay.net 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 (1) | TOLERANCE CODE | PACKAGING CODE (2) | 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)<br>(up to 2 digits)<br>From **1 to 99** as applicable |

**Notes**

(1) WSL Marking (www.vishay.com/doc?30327)

(2) 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.

| TECHNICAL SPECIFICATIONS | | |
|---|---|---|
| **PARAMETER** | **UNIT** | **WSL RESISTOR CHARACTERISTICS** |
| Component temperature coefficient (including terminal) (1) | 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 (2) | ppm/°C | < 20 |
| Operating temperature range | °C | -65 to +170 |
| Maximum working voltage (3) | V | $(P \times R)^{1/2}$ |

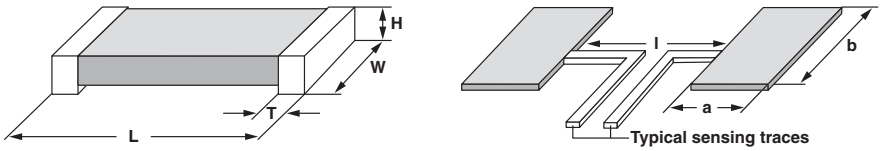
**Notes**

(1) Component TCR - total TCR that includes the TCR effects of the resistor element and the copper terminal.

(2) Element TCR - only applies to the alloy used for the resistor element; refer to item 1 in the construction illustration on the following page.

(3) 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)

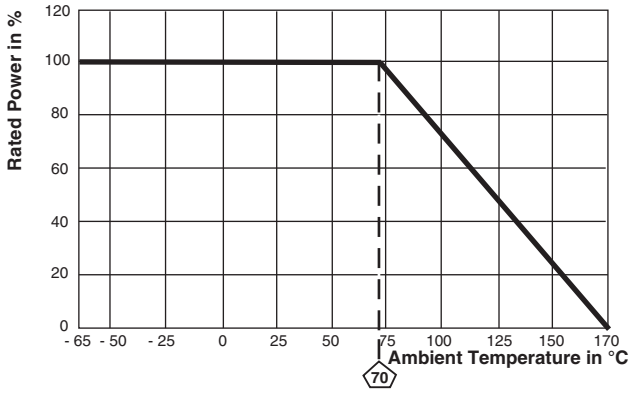



**Note**

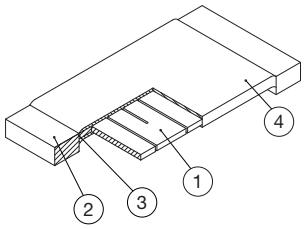
- 3D models available: www.vishay.com/doc?30306.

| 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 (1.52 ± 0.254) | 0.030 ± 0.010 (0.76 ± 0.254) | 0.013 ± 0.005 (0.330 ± 0.127) | 0.015 ± 0.010 (0.381 ± 0.254) | 0.040 (1.01) | 0.040 (1.01) | 0.020 (0.50) |
| WSL0805 | 0.005 to 0.2 | 0.080 ± 0.010 (2.03 ± 0.254) | 0.050 ± 0.010 (1.27 ± 0.254) | 0.013 ± 0.005 (0.330 ± 0.127) | 0.015 ± 0.010 (0.381 ± 0.254) | 0.040 (1.02) | 0.050 (1.27) | 0.020 (0.50) |
| WSL1206 | 0.001 to 0.0019 | 0.126 ± 0.010 (3.20 ± 0.254) | 0.063 ± 0.010 (1.60 ± 0.254) | 0.025 ± 0.010 (0.635 ± 0.254) | 0.041 ± 0.010 (1.04 ± 0.254) | 0.062 (1.57) | 0.070 (1.78) | 0.030 (0.76) |
| | 0.002 to 0.0059 | | | | 0.025 ± 0.010 (0.635 ± 0.254) | | | |
| | 0.006 to 0.20 | | | | 0.020 ± 0.010 (0.508 ± 0.254) | | | |
| WSL2010 | 0.001 to 0.0069 | 0.200 ± 0.010 (5.08 ± 0.254) | 0.100 ± 0.010 (2.54 ± 0.254) | 0.025 ± 0.010 (0.635 ± 0.254) | 0.058 ± 0.010 (1.47 ± 0.254) | 0.093 (2.36) | 0.120 (3.05) | 0.055 (1.40) |
| | 0.007 to 0.5 | | | | 0.020 ± 0.010 (0.508 ± 0.254) | 0.055 (1.40) | 0.120 (3.05) | 0.130 (3.30) |
| WSL2512 | 0.0005 to 0.00099 | 0.250 ± 0.010 (6.35 ± 0.254) | 0.125 ± 0.010 (3.18 ± 0.254) | 0.025 ± 0.010 (0.635 ± 0.254) | 0.107 ± 0.010 (2.72 ± 0.254) | 0.120 (3.05) | 0.145 (3.68) | 0.050 (1.27) |
| | 0.001 to 0.0049 | | | | 0.087 ± 0.010 (2.21 ± 0.254) | | | |
| | 0.005 to 0.0069 | | | | 0.047 ± 0.010 (1.19 ± 0.254) | 0.083 (2.11) | | 0.125 (3.18) |
| | 0.007 to 0.5 | | | | 0.030 ± 0.010 (0.762 ± 0.254) | 0.065 (1.65) | | 0.160 (4.06) |
| WSL2816 | 0.002 to 0.00399 | 0.280 ± 0.010 (7.1 ± 0.254) | 0.165 ± 0.010 (4.2 ± 0.254) | 0.025 ± 0.010 (0.635 ± 0.254) | 0.098 ± 0.010 (2.49 ± 0.254) | 0.096 (2.45) | 0.185 (4.7) | 0.125 (3.20) |
| | 0.004 to 0.1 | | | | 0.062 ± 0.010 (1.57 ± 0.254) | | | |

## DERATING

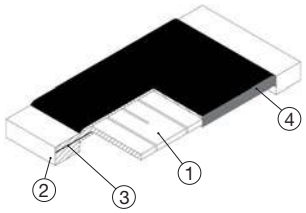



## WELDED CONSTRUCTION 2816, 2512, 2010, 1206




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 | | | | |
|---|---|---|---|---|
| **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 |

**Note**

- Embossed carrier tape per EIA-481.

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