



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)
- Sulfur resistance by construction that is unaffected by high sulfur environments
- Very low inductance 0.5 nH to 5 nH
- Low thermal EMF (< 3 μV/°C)
- AEC-Q200 qualified ⁽¹⁾
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



LINKS TO ADDITIONAL RESOURCES



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
- “SMD Current Sense: AEC-Q200 vs. Vishay Qualification” technical note: www.vishay.com/doc?30416
- ⁽¹⁾ Flame retardance test may not be applicable to some resistor technologies

| STANDARD ELECTRICAL SPECIFICATIONS | | | | | |
|------------------------------------|------|--|---|---------------|-----------------------------------|
| GLOBAL MODEL | SIZE | POWER RATING $P_{70\text{ }^\circ\text{C}}$ W | RESISTANCE VALUE RANGE Ω ⁽²⁾ | | 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 | 0.0005 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
- “Thermal Management for Surface-Mount Devices” white paper: www.vishay.com/doc?30380
- ⁽¹⁾ For values above 0.1 Ω derate linearly to 80 % rated power at 0.5 Ω
- ⁽²⁾ WSL1206 0.0005 Ω to 0.00099 Ω is only available with 2 % tolerance (G tolerance code)

| 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 (7 digits) | RESISTANCE VALUE ⁽¹⁾ (5 digits) | TOLERANCE CODE (1 digit) | PACKAGING CODE ⁽²⁾ (2 digits) | | | | SPECIAL ⁽³⁾ (up to 2 digits) | | | | | | | |
| WSL0603 WSL0805 WSL1206 WSL2010 WSL2512 WSL2816 | L = mΩ* R = decimal 5L000 = 0.005 Ω R0100 = 0.01 Ω * Use “L” for resistance values < 0.01 Ω | D = ± 0.5 % F = ± 1.0 % J = ± 5.0 % | EA = lead (Pb)-free, tape / reel EH = lead (Pb)-free, tape / reel (WSL2816) TA = tin / lead, tape / reel (R86) TG = tin / lead, tape / reel (RT1, for WSL0603 and WSL0805) TH = tin / lead, tape / reel (RJ9, WSL2816) SB = tin / lead, tape / reel for DLA drawings | | | | (dash number) from 1 to 99 as applicable | | | | | | | |

Notes

- Per PCN-DR-00009-2022-REV-0, WSL marking will be removed effective March 1st, 2023
- ⁽¹⁾ WSL marking (www.vishay.com/doc?30327); WSL decade values (www.vishay.com/doc?30117)
- ⁽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
- ⁽³⁾ Follow link for customization capabilities: www.vishay.com/doc?48163

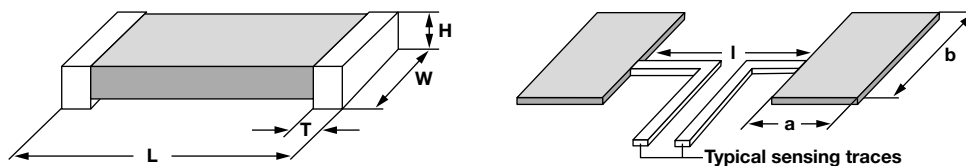


| TECHNICAL SPECIFICATIONS | | | | | | |
|--|--------|---------------------------------------|--------------------------|---------|---------|-------------------|
| PARAMETER | UNIT | WSL RESISTOR CHARACTERISTICS | | | | |
| | | WSL0603 ⁽¹⁾ | WSL0805 | WSL1206 | WSL2010 | WSL2512 WSL2816 |
| Component temperature coefficient (including terminal) ⁽²⁾ TCR measured from -55 °C to +155 °C | ppm/°C | ± 75 for 50 mΩ to 100 mΩ | ± 75 for 7 mΩ to 500 mΩ | | | |
| | | ± 110 for 10 mΩ to 49 mΩ | ± 110 for 5 mΩ to 6.9 mΩ | | | |
| | | - | ± 150 for 3 mΩ to 4.9 mΩ | | | |
| | | - | ± 275 for 1 mΩ to 2.9 mΩ | | | |
| Element TCR ⁽³⁾ | ppm/°C | ± 400 for 0.5 mΩ to 0.99 mΩ | | | | |
| Operating temperature range | °C | < 20 | | | | |
| Maximum working voltage ⁽⁴⁾ | V | -65 to +170 (P x R) ^{1/2} | | | | |

Notes

- “Temperature Coefficient of Resistance for Current Sensing” white paper: www.vishay.com/doc?30405
- (1) Consult factory for detailed TCR performance across temperature range associated with PCN-DR-00003-2020 for WSL0603. TCR performance is improved for +25 °C to +155 °C
- (2) Component TCR - total TCR that includes the TCR effects of the resistor element and the copper terminal
- (3) Element TCR - only applies to the alloy used for the resistor element; refer to item 1 in the construction illustration on the following page
- (4) 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
- Surface mount solder profile recommendations: www.vishay.com/doc?31052

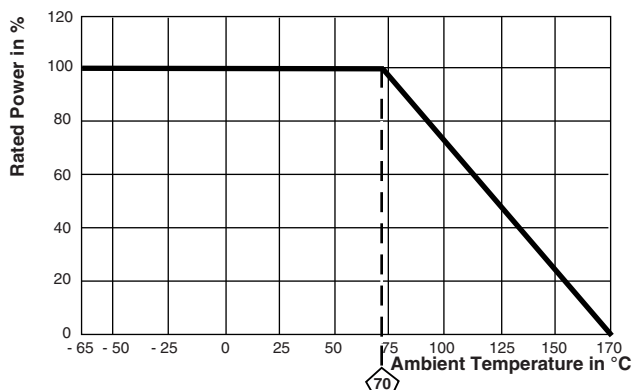
| MODEL | RESISTANCE RANGE (Ω) | DIMENSIONS | | | | SOLDER PAD DIMENSIONS | | | |
|------------------------|----------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|-----------------------|-----------------|-----------------|-----------------|
| | | L | W | H | T | a | b | I | |
| WSL0603 ⁽¹⁾ | 0.01 to 0.1 | 0.060 ± 0.010 (1.52 ± 0.254) | 0.030 ± 0.010 (0.76 ± 0.254) | 0.016 ± 0.005 (0.406 ± 0.127) | 0.015 ± 0.010 (0.381 ± 0.254) | 0.040 (1.01) | 0.040 (1.01) | 0.020 (0.50) | |
| WSL0805 ⁽²⁾ | 0.005 to 0.2 | 0.080 ± 0.010 (2.03 ± 0.254) | 0.050 ± 0.010 (1.27 ± 0.254) | 0.016 ± 0.005 (0.406 ± 0.127) | 0.015 ± 0.010 (0.381 ± 0.254) | 0.040 (1.02) | 0.050 (1.27) | 0.020 (0.50) | |
| WSL1206 | 0.0005 to 0.00099 | 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) | 0.089 (2.26) | 0.076 (1.93) | 0.023 (0.58) | |
| | 0.001 to 0.0019 | | | | 0.086 (2.18) | 0.076 (1.93) | 0.029 (0.74) | | |
| | 0.002 to 0.0059 | | | | 0.025 ± 0.010 (0.635 ± 0.254) | 0.070 (1.78) | 0.076 (1.93) | 0.061 (1.55) | |
| | 0.006 to 0.20 | | | | 0.020 ± 0.010 (0.508 ± 0.254) | 0.065 (1.65) | 0.076 (1.93) | 0.071 (1.80) | |
| 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) | | | 0.125 (3.18) | |
| | 0.005 to 0.0069 | | | | 0.047 ± 0.010 (1.19 ± 0.254) | | | 0.083 (2.11) | 0.160 (4.06) |
| | 0.007 to 0.5 | | | | 0.030 ± 0.010 (0.762 ± 0.254) | | | 0.065 (1.65) | 0.125 (3.18) |
| 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) | 0.135 (3.43) | 0.185 (4.7) | 0.060 (1.52) | |
| | 0.004 to 0.1 | | | | 0.062 ± 0.010 (1.57 ± 0.254) | | | 0.096 (2.45) | 0.125 (3.20) |

Notes

- (1) PCN-DR-00003-2020 changed terminal height for WSL0603 from 0.013" ± 0.005" for clad construction to 0.016" ± 0.005" for welded construction
- (2) PCN-DR-00021-2021-REV-1 changed terminal height for WSLP0805 from 0.013" ± 0.005" for clad construction to 0.016" ± 0.005" for welded construction



DERATING

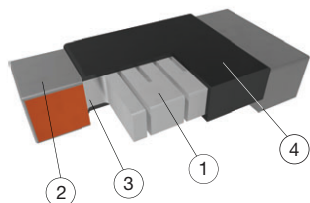


PULSE CAPABILITY



www.vishay.com/resistors/power-metal-strip-calculator

WELDED CONSTRUCTION



- ① Resistive element: solid metal nickel-chrome or manganese-copper alloy resistive element with low TCR (< 20 ppm/°C)
- ② Plated terminal: solid copper, 100 % Sn (100 μ" min.) with 100 % Ni (20 μ" min.) under layer finish
- ③ Terminal / element weld
- ④ Silicone coating with ink print

| 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 | Refer to link for short time overload performance and pulse capability; www.vishay.com/resistors/power-metal-strip-calculator/ | ± (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



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