Upgrade for Higher Current to WSLP and for Zero Ohm Jumper to WSL-9



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WSL

RoHS

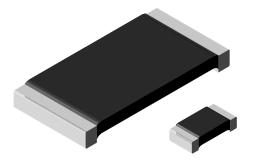
HALOGEN

FREE

GREEN

(5-2008)

Power Metal Strip[®] Resistors, Low Value (Down to 0.0005 Ω), Surface-Mount



LINKS TO ADDITIONAL RESOURCES



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

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

| STANDARD ELECTRICAL SPECIFICATIONS | | | | | | |
|------------------------------------|------|---------------------|---------------|------------------|---------------|--|
| GLOBAL | SIZE | POWER RATING P70 °C | RESISTANCE VA | WEIGHT (typical) | | |
| MODEL | | w | TOL. ± 0.5 % | TOL. ± 1.0 % | g/1000 pieces | |
| 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

Qualified to AEC-Q200 rev. D

 $^{(1)}$ 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 | GLOBAL PART NUMBER INFORMATION | | | | | | | |
|---|---|--------------------------------------|--|--|--|--|--|--|
| Global Part Numbering Example: WSL25124L000FEA (visit www.vishay.net Vishay Dale parts numbering manual for all opt W S L 2 5 1 2 4 L 0 0 F E A I | | | | | | | | |
| | | | | | | | | |
| 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 | $\mathbf{L} = \mathbf{m}\Omega^*$ $\mathbf{R} = \operatorname{decimal}$ | $D = \pm 0.5 \%$ $F = \pm 1.0 \%$ | EA = lead (Pb)-free, tape / reel EH = lead (Pb)-free, tape / reel (WSL2816) | (dash number) from 1 to 99 as | | | | |
| WSL1206 5L000 = 0.005 Ω WSL2010 R0100 = 0.01 Ω WSL2512 * Use "L" for resistance values < 0.01 Ω | | J = ± 5.0 % | $\begin{tabular}{lllllllllllllllllllllllllllllllllll$ | applicable | | | | |

Notes

Per PCN-DR-00009-2022-REV-0, WSL marking will be removed effective March 1st, 2023

⁽¹⁾ WSL marking (<u>www.vishay.com/doc?30327</u>); WSL decade values (<u>www.vishay.com/doc?30117</u>)

(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



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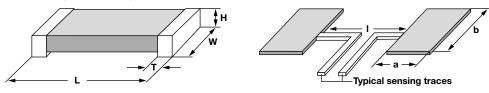
WSL

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

Notes

- (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: <u>www.vishay.com/doc?31052</u>

| MODEL | RESISTANCE | DIMENSIONS | | | | SOLDER PAD DIMENSIONS | | |
|-------------|-------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|-----------------------|--------------------------------------|-----------------|
| MODEL | RANGE (Ω) | L | W | Н | Т | а | b | |
| 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) |
| | 0.0005 to 0.00099 | | 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) |
| WSL1206 | 0.001 to 0.0019 | 0.126 ± 0.010 | | | | 0.086 (2.18) | 0.076 (1.93) | 0.029 (0.74) |
| W3L1200 | 0.002 to 0.0059 | (3.20 ± 0.254) | | | 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 | 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 | (5.08 ± 0.254) | | | 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) | 5) 0.145 33 (3.68) 1) 55 | 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 | 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 | 0.060 (1.52) |
| | 0.004 to 0.1 | (7.1 ± 0.254) | | | 0.062 ± 0.010 (1.57 ± 0.254) | 0.096 (2.45) | (4.7) | 0.125 (3.20) |

Notes

(1) PCN-DR-00003-2020 changed terminal height for WSL0603 from $0.013" \pm 0.005"$ for clad construction to $0.016" \pm 0.005"$ for welded

(2) PCN-DR-00021-2021-REV-1 changed terminal height for WSL0805 from 0.013" ± 0.005" for clad construction to 0.016" ± 0.005" for welded construction

Revision: 23-Nov-2023 2 For technical questions, contact: www Document Number: 30100

For technical questions, contact: <u>ww2bresistors@vishay.com</u>

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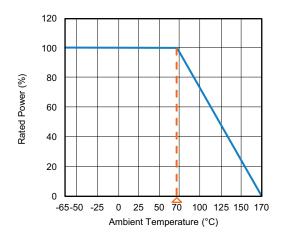
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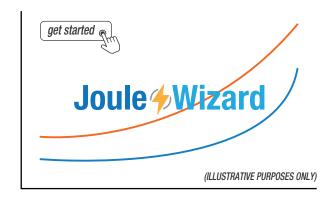
WSL

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DERATING

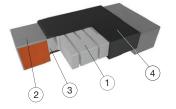


PULSE CAPABILITY



www.vishay.com/en/resistors/joulewizard/

WELDED CONSTRUCTION



- 1 Resistive element: solid metal nickel-chrome or manganese-copper alloy resistive element with low TCR (< 20 ppm/°C)
- (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/en/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) | | |

Note

 Contact <u>ww2bresistors@vishay.com</u> for application specific performance requirements or qualification data. Typical performance is better than stated test limits

| PACKAGING ⁽¹⁾ | | | | | | | | |
|--------------------------|--------------------------|-------------|-------------|------|--|--|--|--|
| MODEL | | REEL | | | | | | |
| WODEL | 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 <u>www.vishay.com/doc?20051</u>

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Upgrade for Higher Current to WSLP and for Zero Ohm Jumper to WSL-9



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| SELECTOR GUIDE | | | | | |
| Overview of Automotive Grade Products <u>www.vishay.com/doc?49924</u> | | | | | |
| TECHNICAL NOTES | | | | | |
| SMD Current Sense: AEC-Q200 vs. Vishay Qualification www.vishay.com/doc?30416 | | | | | |
| MIL-PRF vs. AEC-Q200: Do You Know What You Are Getting? www.vishay.com/doc?11000 | | | | | |
| WHITE PAPER | | | | | |
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