

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



## FEATURES

- Ideal for all types of current sensing, voltage division and pulse applications including switching and linear power supplies, instruments, power amplifiers
- Proprietary processing technique produces extremely low resistance values (down to 0.0005 Ω)
- All welded construction
- Solderable terminations
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF (< 3 μV/°C)
- Solid metal nickel-chrome or manganese-copper alloy resistive element with low TCR (< 20 ppm/°C)
- AEC-Q200 qualified available <sup>(1)</sup>
- Material categorization:

For definitions of compliance please see [www.vishay.com/doc?99912](http://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.

<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>(2)</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>(2)</sup> For values above 0.1 Ω derate linearly to 80 % rated power at 0.5 Ω.

## TECHNICAL SPECIFICATIONS

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

## GLOBAL PART NUMBER INFORMATION

Global Part Numbering example: WSL25124L000FTA

W S L 2 5 1 2 4 L 0 0 0 F T A

| GLOBAL MODEL                                                   | RESISTANCE VALUE                                                                                            | TOLERANCE CODE                            | PACKAGING CODE                                                                                                                                                                                                                                                                   | 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 |

Historical Part Numbering example: WSL2512 0.004 Ω 1 % R86

|                  |                  |                |           |
|------------------|------------------|----------------|-----------|
| WSL2512          | 0.004 Ω          | 1 %            | R86       |
| HISTORICAL MODEL | RESISTANCE VALUE | TOLERANCE CODE | PACKAGING |

**DIMENSIONS** in inches (millimeters)


| MODEL   | RESISTANCE RANGE ( $\Omega$ ) | DIMENSIONS                              |                                         |                                          |                                          | SOLDER PAD DIMENSIONS |                 |                 |
|---------|-------------------------------|-----------------------------------------|-----------------------------------------|------------------------------------------|------------------------------------------|-----------------------|-----------------|-----------------|
|         |                               | L                                       | W                                       | H                                        | T                                        | a                     | b               | l               |
| WSL0603 | 0.01 to 0.1                   | 0.060 $\pm$ 0.010<br>(1.52 $\pm$ 0.254) | 0.030 $\pm$ 0.010<br>(0.76 $\pm$ 0.254) | 0.013 $\pm$ 0.005<br>(0.330 $\pm$ 0.127) | 0.015 $\pm$ 0.010<br>(0.381 $\pm$ 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 $\pm$ 0.010<br>(2.03 $\pm$ 0.254) | 0.050 $\pm$ 0.010<br>(1.27 $\pm$ 0.254) | 0.013 $\pm$ 0.005<br>(0.330 $\pm$ 0.127) | 0.015 $\pm$ 0.010<br>(0.381 $\pm$ 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 $\pm$ 0.010<br>(3.20 $\pm$ 0.254) | 0.063 $\pm$ 0.010<br>(1.60 $\pm$ 0.254) | 0.025 $\pm$ 0.010<br>(0.635 $\pm$ 0.254) | 0.041 $\pm$ 0.010<br>(1.04 $\pm$ 0.254)  | 0.062<br>(1.57)       | 0.070<br>(1.78) | 0.030<br>(0.76) |
|         | 0.002 to 0.0059               |                                         |                                         |                                          | 0.025 $\pm$ 0.010<br>(0.635 $\pm$ 0.254) |                       |                 |                 |
|         | 0.006 to 0.20                 |                                         |                                         |                                          | 0.020 $\pm$ 0.010<br>(0.508 $\pm$ 0.254) |                       |                 |                 |
| WSL2010 | 0.001 to 0.0069               | 0.200 $\pm$ 0.010<br>(5.08 $\pm$ 0.254) | 0.100 $\pm$ 0.010<br>(2.54 $\pm$ 0.254) | 0.025 $\pm$ 0.010<br>(0.635 $\pm$ 0.254) | 0.058 $\pm$ 0.010<br>(1.47 $\pm$ 0.254)  | 0.093<br>(2.36)       | 0.120<br>(3.05) | 0.055<br>(1.40) |
|         | 0.007 to 0.5                  |                                         |                                         |                                          | 0.020 $\pm$ 0.010<br>(0.508 $\pm$ 0.254) | 0.055<br>(1.40)       | 0.120<br>(3.05) | 0.130<br>(3.30) |
| WSL2512 | 0.0005 to 0.00099             | 0.250 $\pm$ 0.010<br>(6.35 $\pm$ 0.254) | 0.125 $\pm$ 0.010<br>(3.18 $\pm$ 0.254) | 0.025 $\pm$ 0.010<br>(0.635 $\pm$ 0.254) | 0.107 $\pm$ 0.010<br>(2.72 $\pm$ 0.254)  | 0.120<br>(3.05)       | 0.145<br>(3.68) | 0.050<br>(1.27) |
|         | 0.001 to 0.0049               |                                         |                                         |                                          | 0.087 $\pm$ 0.010<br>(2.21 $\pm$ 0.254)  |                       |                 | 0.125<br>(3.18) |
|         | 0.005 to 0.0069               |                                         |                                         |                                          | 0.047 $\pm$ 0.010<br>(1.19 $\pm$ 0.254)  | 0.083<br>(2.11)       |                 |                 |
|         | 0.007 to 0.5                  |                                         |                                         |                                          | 0.030 $\pm$ 0.010<br>(0.762 $\pm$ 0.254) | 0.065<br>(1.65)       |                 | 0.160<br>(4.06) |
| WSL2816 | 0.002 to 0.00399              | 0.280 $\pm$ 0.010<br>(7.1 $\pm$ 0.254)  | 0.165 $\pm$ 0.010<br>(4.2 $\pm$ 0.254)  | 0.025 $\pm$ 0.010<br>(0.635 $\pm$ 0.254) | 0.098 $\pm$ 0.010<br>(2.49 $\pm$ 0.254)  | 0.096<br>(2.45)       | 0.185<br>(4.7)  | 0.125<br>(3.20) |
|         | 0.004 to 0.1                  |                                         |                                         |                                          | 0.062 $\pm$ 0.010<br>(1.57 $\pm$ 0.254)  |                       |                 |                 |

**DERATING**


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

| 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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