

# Power Metal Strip® Resistors, Low Value (down to 0.001 Ω), Surface Mount



### FEATURES

- Molded high temperature encapsulation
- 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 0.001 Ω)
- All welded construction
- Solid metal nickel-chrome or manganese-copper alloy resistive element with low TCR (< 20 ppm/°C)
- Solderable terminations
- Very low inductance 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- 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)



### Notes

- \* Lead (Pb)-containing terminations are not RoHS-compliant. Exemptions may apply.
- <sup>(1)</sup> Flame retardance test may not be applicable to some resistor technologies.

### STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | SIZE | POWER RATING<br>$P_{70^{\circ}\text{C}}$<br>W | RESISTANCE VALUE RANGE<br>Ω |              | WEIGHT<br>(typical)<br>g/1000 pieces |
|--------------|------|---|-----------------------------|--------------|--------------------------------------|
|              |      |   | Tol. ± 0.5 %                | Tol. ± 1.0 % |                                      |
| WSR2         | 4527 | 2.0   | 0.005 to 1.0                | 0.001 to 1.0 | 440                                  |
| WSR3         | 4527 | 3.0 <sup>(2)</sup>                            | 0.005 to 0.2                | 0.001 to 0.2 | 440                                  |

### Notes

- Part marking: DALE, model, value, tolerance, date code.
- <sup>(2)</sup> The WSR3 requires a minimum of 1050 sq. mil. circuit traces connecting to the recommended solder pad.

### TECHNICAL SPECIFICATIONS

| PARAMETER                       | UNIT     | WSR2 AND WSR3 RESISTOR CHARACTERISTICS   |
|---------------------------------|----------|--|
| Temperature coefficient         | ppm/°C   | ± 75 for 0.010 Ω to 1.0 Ω; ± 110 for 0.005 Ω to 0.0099 Ω;<br>± 300 for 0.004 Ω to 0.0049 Ω; ± 450 for 0.003 Ω to 0.0039 Ω;<br>± 600 for 0.002 Ω to 0.0029 Ω; ± 750 for 0.001 Ω to 0.0019 Ω |
| Element TCR                     | ppm/°C   | < 20   |
| Dielectric withstanding voltage | $V_{AC}$ | > 500  |
| Insulation resistance           | Ω        | > 10 <sup>9</sup>  |
| Operating temperature range     | °C       | - 65 to + 275  |
| Maximum working voltage         | V        | $(P \times R)^{1/2}$   |

### GLOBAL PART NUMBER INFORMATION

Global Part Numbering example: WSR25L000FEA



| GLOBAL MODEL   | VALUE   | TOLERANCE CODE                            | PACKAGING CODE   | SPECIAL   |
|--|---|---|--|---|
| WSR2<br>WSR3   | L = mΩ*<br>R = Decimal<br>5L000 = 0.005 Ω<br>R0100 = 0.01 Ω<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>EK = Lead (Pb)-free, bulk<br>TA = Tin/lead, tape/reel (R86)<br>BA = Tin/lead, bulk (B43) | (Dash number)<br>(Up to 2 digits)<br>From 1 to 99 as applicable |
| Historical Part Numbering example: WSR2 0.005 Ω 1 % EA |   |   |  |   |
| WSR2   | 0.005 Ω   | 1 %                                       | EA   |   |
| HISTORICAL MODEL                                       | RESISTANCE VALUE  | TOLERANCE CODE                            | PACKAGING CODE   |   |

**DIMENSIONS**


| MODEL | DIMENSIONS in inches (millimeters) |                |                |                |                |
|-------|------------------------------------|----------------|----------------|----------------|----------------|
|       | L                                  | H              | T              | W              | W <sub>1</sub> |
| WSR2  | 0.455 ± 0.032                      | 0.095 ± 0.005  | 0.100 ± 0.010  | 0.275 ± 0.005  | 0.215 ± 0.005  |
| WSR3  | (11.56 ± 0.813)                    | (2.41 ± 0.127) | (2.54 ± 0.254) | (6.98 ± 0.127) | (5.46 ± 0.127) |

| MODEL | SOLDER PAD DIMENSIONS in inches (millimeters) |        |        |
|-------|---|--------|--------|
|       | a   | b      | l      |
| WSR2  | 0.155   | 0.230  | 0.205  |
| WSR3  | (3.94)  | (5.84) | (5.21) |

**DERATING**


| PERFORMANCE               |  |                         |                         |
|---------------------------|--|-------------------------|-------------------------|
| TEST                      | CONDITIONS OF TEST   | TEST LIMITS             |                         |
|                           |  | WSR2                    | WSR3                    |
| Thermal shock             | - 55 °C to + 150 °C, 1000 cycles, 15 min at each extreme       | ± (0.5 % + 0.0005 Ω) ΔR | ± (0.5 % + 0.0005 Ω) ΔR |
| Short time overload       | WSR2: 5 x rated power for 5 s<br>WSR3: 4 x rated power for 5 s | ± (0.5 % + 0.0005 Ω) ΔR | ± (2.0 % + 0.0005 Ω) ΔR |
| Low temperature storage   | - 65 °C for 24 h   | ± (0.5 % + 0.0005 Ω) ΔR | ± (0.5 % + 0.0005 Ω) ΔR |
| High temperature exposure | 1000 h at + 275 °C   | ± (1.0 % + 0.0005 Ω) ΔR | ± (1.0 % + 0.0005 Ω) ΔR |
| Bias humidity             | + 85 °C, 85 % RH, 10 % bias, 1000 h                            | ± (0.5 % + 0.0005 Ω) ΔR | ± (0.5 % + 0.0005 Ω) ΔR |
| Mechanical shock          | 100 g's for 6 ms, 5 pulses                                     | ± (0.5 % + 0.0005 Ω) ΔR | ± (0.5 % + 0.0005 Ω) ΔR |
| Vibration                 | Frequency varied 10 Hz to 2000 Hz in 1 min, 3 directions, 12 h | ± (0.5 % + 0.0005 Ω) ΔR | ± (0.5 % + 0.0005 Ω) ΔR |
| Load life                 | 1000 h at rated power, + 70 °C, 1.5 h "ON", 0.5 h "OFF"        | ± (1.0 % + 0.0005 Ω) ΔR | ± (2.0 % + 0.0005 Ω) ΔR |
| Resistance to solder heat | + 260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence         | ± (0.5 % + 0.0005 Ω) ΔR | ± (0.5 % + 0.0005 Ω) ΔR |
| Moisture resistance       | MIL-STD-202, method 106, 0 % power, 7a and 7b not required     | ± (0.5 % + 0.0005 Ω) ΔR | ± (0.5 % + 0.0005 Ω) ΔR |

| PACKAGING     |                        |            |             |      |
|---------------|------------------------|------------|-------------|------|
| MODEL         | REEL                   |            |             |      |
|               | TAPE WIDTH             | DIAMETER   | PIECES/REEL | CODE |
| WSR2 and WSR3 | 24 mm/embossed plastic | 330 mm/13" | 1500        | EA   |

**Note**

- Embossed Carrier Tape per EIA-481.



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