

# Metal Film Resistors, Power, Surface Mount


**Note**

\* 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.

**FEATURES**

- Molded encapsulation
- Wraparound compliant terminations eliminate risk of solder fillet cracking
- Solderable terminations
- Excellent stability at different environmental conditions
- High power ratings (up to 2 W)
- 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)


**Note**

<sup>(1)</sup> Flame retardance test may not be applicable to some resistor technologies.

| STANDARD ELECTRICAL SPECIFICATIONS |           |   |                      |                              |   |               |
|------------------------------------|-----------|---|----------------------|------------------------------|---|---------------|
| GLOBAL MODEL                       | SIZE INCH | POWER RATING<br>$P_{70^\circ\text{C}}$<br>W | TOLERANCE<br>$\pm$ % | RESISTANCE RANGE<br>$\Omega$ | TEMPERATURE COEFFICIENT <sup>(4)</sup><br>$\pm$ ppm/ $^\circ\text{C}$ | ENCAPSULATION |
| WSF2012                            | 2012      | 0.5   | 0.5, 1, 5            | 5.0 to 1.43K <sup>(2)</sup>  | 100   | Epoxy         |
| WSF2515                            | 2515      | 1.0   | 0.5, 1, 5            | 10 to 10K                    | 100   | Thermoplastic |
| WSF4527                            | 4527      | 2.0 <sup>(3)</sup>                          | 0.5, 1, 5            | 10 to 100K                   | 100   | Thermoplastic |

| TECHNICAL SPECIFICATIONS        |                  |                      |                      |                                     |
|---------------------------------|------------------|----------------------|----------------------|-------------------------------------|
| PARAMETER                       | UNIT             | WSF2012              | WSF2515              | WSF4527                             |
| Dielectric withstanding voltage | $V_{AC}$         | > 500                | > 500                | > 500                               |
| Insulation resistance           | $\Omega$         | > $10^9$             |                      |                                     |
| Operating temperature range     | $^\circ\text{C}$ | - 65/+ 175           | - 65/+ 175           | - 65/+ 150                          |
| Maximum working voltage         | V                | $(P \times R)^{1/2}$ | $(P \times R)^{1/2}$ | $(P \times R)^{1/2}$ <sup>(3)</sup> |
| Weight/1000 pieces (typical)    | g                | 90                   | 165                  | 760                                 |

**Notes**

- Part marking: 1/2 W - DALE, value; 1 W - model, value, tolerance, date code; 2 W - DALE, model, value, tolerance, date code.
- <sup>(2)</sup> E96 values only.
- <sup>(3)</sup> Resistance values above 31.25 k $\Omega$  are limited to 250 V maximum working voltage.
- <sup>(4)</sup>  $\pm$  50 ppm/ $^\circ\text{C}$  and  $\pm$  25 ppm/ $^\circ\text{C}$  available.

| GLOBAL PART NUMBER INFORMATION   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|
| Global Part Numbering example: <b>WSF25151K500JKTA</b> (preferred numbering format)  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |
| W  | S | F   | 2 | 5   | 1 | 5   | 1 | K   | 5 | 0   | 0 | J | K | T | A |  |  |
| GLOBAL MODEL   |   | VALUE   |   | TOLERANCE   |   | TCR   |   | PACKAGING   |   | SPECIAL   |   |   |   |   |   |  |  |
| WSF2012<br>WSF2515<br>WSF4527  |   | R = Decimal<br>K = Thousand<br>100R0 = 100 $\Omega$<br>1K000 = 1 k $\Omega$ |   | D = $\pm$ 0.5 %<br>F = $\pm$ 1.0 %<br>G = $\pm$ 2.0 %<br>H = $\pm$ 3.0 %<br>J = $\pm$ 5.0 %<br>K = $\pm$ 10 % |   | E = $\pm$ 25 ppm/ $^\circ\text{C}$<br>H = $\pm$ 50 ppm/ $^\circ\text{C}$<br>K = $\pm$ 100 ppm/ $^\circ\text{C}$ |   | EA = Lead (Pb)-free, tape/reel<br>EK = Lead (Pb)-free, bulk<br>TA = Tin/lead, tape/reel (R86)<br>BA = Tin/lead, tape/reel, bulk (B43) |   | (Dash number) (Up to 2 digits) From 1 to 99 as applicable |   |   |   |   |   |  |  |
| Historical Part Numbering example: <b>WSF2515 1.5 kW 5% 100 ppm/<math>^\circ\text{C}</math> R86</b> (will continue to be accepted for tin/lead product only) |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |
| WSF2515  |   | 1.5 k $\Omega$  |   | 5 %   |   | 100 ppm/ $^\circ\text{C}$   |   | R86   |   |   |   |   |   |   |   |  |  |
| HISTORICAL MODEL   |   | RESISTANCE VALUE  |   | TOLERANCE CODE  |   | TEMPERATURE COEFFICIENT   |   | PACKAGING   |   |   |   |   |   |   |   |  |  |

**DIMENSIONS**


| MODEL   | DIMENSIONS in inches (millimeters) |                                 |                                 |                                 |                                 |
|---------|------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|         | L                                  | H                               | T                               | W                               | W <sub>1</sub>                  |
| WSF2012 | 0.200 ± 0.020<br>(5.08 ± 0.508)    | 0.096 ± 0.015<br>(2.44 ± 0.381) | 0.040 ± 0.010<br>(1.02 ± 0.254) | 0.125 ± 0.005<br>(3.18 ± 0.127) | 0.050 ± 0.005<br>(1.27 ± 0.127) |
| WSF2515 | 0.250 ± 0.020<br>(6.35 ± 0.508)    | 0.110 ± 0.015<br>(2.79 ± 0.381) | 0.045 ± 0.010<br>(1.14 ± 0.254) | 0.150 ± 0.005<br>(3.81 ± 0.127) | 0.098 ± 0.005<br>(2.49 ± 0.127) |
| WSF4527 | 0.455 ± 0.020<br>(11.56 ± 0.508)   | 0.167 ± 0.010<br>(4.24 ± 0.254) | 0.100 ± 0.010<br>(2.54 ± 0.254) | 0.275 ± 0.005<br>(6.98 ± 0.127) | 0.215 ± 0.005<br>(5.46 ± 0.127) |

| MODEL   | SOLDER PAD DIMENSIONS in inches (millimeters) |              |              |
|---------|---|--------------|--------------|
|         | a   | b            | l            |
| WSF2012 | 0.085 (2.16)                                  | 0.070 (1.78) | 0.080 (2.03) |
| WSF2515 | 0.090 (2.29)                                  | 0.115 (2.92) | 0.120 (3.05) |
| WSF4527 | 0.155 (3.94)                                  | 0.230 (5.94) | 0.205 (5.21) |



| PERFORMANCE               |  |                       |
|---------------------------|--|-----------------------|
| TEST                      | CONDITIONS OF TEST   | TEST LIMITS           |
| Thermal shock             | -55 °C to +150 °C, 1000 cycles, 15 min at each extreme         | ± (1.0 % + 0.05 Ω) ΔR |
| Short time overload       | 5 x rated power for 5 s  | ± (0.5 % + 0.05 Ω) ΔR |
| Low temperature storage   | -65 °C for 24 h  | ± (0.5 % + 0.05 Ω) ΔR |
| High temperature exposure | 1000 h at +175 °C (150 °C for WSF4527)                         | ± (1.0 % + 0.05 Ω) ΔR |
| Bias humidity             | +85 °C, 85 % RH, 10 % Bias, 1000 h                             | ± (0.5 % + 0.05 Ω) ΔR |
| Moisture resistance       | MIL-STD-202 method 106, 0 % power, 7a and 7b not required      | ± (0.5 % + 0.05 Ω) ΔR |
| Mechanical shock          | 100 g's for 6 ms, 5 pulses                                     | ± (0.5 % + 0.05 Ω) ΔR |
| Vibration                 | Frequency varied 10 Hz to 500 Hz in one min, 3 directions, 9 h | ± (0.5 % + 0.05 Ω) ΔR |
| Load life                 | 1000 h at rated power, +70 °C, 1.5 h "ON", 0.5 h "OFF"         | ± (1.0 % + 0.05 Ω) ΔR |
| Resistance to solder heat | +260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence          | ± (0.5 % + 0.05 Ω) ΔR |

| PACKAGING |                        |            |             |       |
|-----------|------------------------|------------|-------------|-------|
| MODEL     | REEL                   |            |             |       |
|           | TAPE WIDTH             | DIAMETER   | PIECES/REEL | CODE  |
| WSF2012   | 12 mm/embossed plastic | 330 mm/13" | 2000        | EA/TA |
| WSF2515   | 16 mm/embossed plastic | 330 mm/13" | 2000        | EA/TA |
| WSF4527   | 24 mm/embossed plastic | 330 mm/13" | 1200        | EA/TA |

**Note**

- Embossed Carrier Tape per EIA-481.



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