

# Wirewound Resistors, Precision Power, Surface Mount



## FEATURES

- All welded construction
- Molded encapsulation
- Wraparound terminations
- Excellent stability at different environmental conditions
- High power ratings (up to 3 W)
- Superior surge capability
- Available in non-inductive styles with Ayrton-Perry winding (WSN in lieu of WSC, maximum resistance is one-half WSC range)
- 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)



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

## STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL           | HISTORICAL MODEL | SIZE | POWER RATING<br>$P_{70^{\circ}\text{C}}$ W | RESISTANCE RANGE<br>$\Omega$ | TOLERANCE<br>$\pm \%$ | WEIGHT (typical)<br>g/1000 pieces | ENCAPSULATION                |
|------------------------|------------------|------|--------------------------------------------|------------------------------|-----------------------|-----------------------------------|------------------------------|
| WSC01/2                | WSC-1/2          | 2012 | 0.5                                        | 0.1 to 4.99                  | 0.5, 1, 5             | 90                                | Epoxy                        |
| WSC0001 <sup>(1)</sup> | WSC-1            | 2515 | 1                                          | 0.1 to 2.77K                 | 0.5, 1, 5             | 165                               | Thermoplastic <sup>(2)</sup> |
| WSC2515                | WSC2515          | 2515 | 1                                          | 0.1 to 2.5K                  | 0.5, 1, 5             | 165                               | Thermoplastic                |
| WSC0002                | WSC-2            | 4527 | 2                                          | 0.1 to 4.92K                 | 0.5, 1, 5             | 760                               | Thermoplastic <sup>(2)</sup> |
| WSC4527                | WSC4527          | 4527 | 2                                          | 0.1 to 4.92K                 | 0.5, 1, 5             | 760                               | Thermoplastic                |
| WSC6927                | WSC6927          | 6927 | 3                                          | 0.1 to 8K                    | 0.5, 1, 5             | 1675                              | Thermoplastic                |

## Notes

- Part marking: 1/2 W - DALE, value; 1 W - model, value, tolerance, date code; 2 W and 3 W - DALE, model, value, tolerance, date code
- Qualified to AEC-Q200 rev. D
- <sup>(1)</sup> As of February 19, 2016, the WSC0001 was obsoleted by PCN-DR-013-2015; the WSC2515 is a drop-in replacement. You may contact your sales representative or submit an inquiry via [ww2bresistors@vishay.com](mailto:ww2bresistors@vishay.com) for supporting information
- <sup>(2)</sup> As of 1/1/2010, the WSC0001 and WSC0002 are molded with thermoplastic in lieu of epoxy. Reference PCN-DR-002-2009 and PCN-DR-003-2009

## TECHNICAL SPECIFICATIONS

| PARAMETER                                               | UNIT            | WSC01/2                                           | WSC2515                                                                                                    | WSC0002                                                                      | WSC4527, WSC6927                                                                                       |
|---------------------------------------------------------|-----------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Temperature coefficient measured from -55 °C to +150 °C | ppm/°C          | ± 50 = 1.0 Ω to 4.99 Ω;<br>± 90 = 0.1 Ω to 0.99 Ω | ± 20 = 26.51 Ω and above;<br>± 50 = 1.0 Ω to 26.5 Ω;<br>± 90 = 0.31 Ω to 0.99 Ω;<br>± 150 = 0.1 Ω to 0.3 Ω | ± 20 = 10.0 Ω and above;<br>± 50 = 1.0 Ω to 9.9 Ω;<br>± 90 = 0.1 Ω to 0.99 Ω | ± 20 = 10 Ω and above;<br>± 50 = 1.0 Ω to 9.9 Ω;<br>± 90 = 0.31 Ω to 0.99 Ω;<br>± 150 = 0.1 Ω to 0.3 Ω |
| Dielectric withstanding voltage                         | V <sub>AC</sub> | > 500                                             |                                                                                                            |                                                                              |                                                                                                        |
| Insulation resistance                                   | Ω               | > 10 <sup>9</sup>                                 |                                                                                                            |                                                                              |                                                                                                        |
| Operating temperature range                             | °C              | -65 to +175                                       | -65 to +275                                                                                                |                                                                              |                                                                                                        |
| Maximum working voltage                                 | V               | (P x R) <sup>1/2</sup>                            |                                                                                                            |                                                                              |                                                                                                        |

**GLOBAL PART NUMBER INFORMATION**

Global Part Numbering Example: WSC2515R7000FEA (visit [www.vishay.net](http://www.vishay.net) Vishay Dale parts numbering manual for all options)

|              |   |                                      |   |                                                                 |   |                                                                                       |   |                                                                                                                                    |   |   |   |                                                                    |   |   |  |  |
|--------------|---|--------------------------------------|---|-----------------------------------------------------------------|---|---------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--------------------------------------------------------------------|---|---|--|--|
| W            | S | C                                    | 2 | 5                                                               | 1 | 5                                                                                     | R | 7                                                                                                                                  | 0 | 0 | 0 | F                                                                  | E | A |  |  |
| GLOBAL MODEL |   | SIZE                                 |   | VALUE <sup>(1)</sup>                                            |   | TOLERANCE                                                                             |   | PACKAGING                                                                                                                          |   |   |   | SPECIAL                                                            |   |   |  |  |
| WSC<br>WSN   |   | 01/2<br>2515<br>0002<br>4527<br>6927 |   | R = decimal<br>K = thousand<br>R7000 = 0.70 Ω<br>1K500 = 1.5 kΩ |   | D = ± 0.5 %<br>F = ± 1.0 %<br>G = ± 2.0 %<br>H = ± 3.0 %<br>J = ± 5.0 %<br>K = ± 10 % |   | 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<br>as applicable |   |   |  |  |

**Notes**

<sup>(1)</sup> WSC / WSN marking ([www.vishay.com/doc?30327](http://www.vishay.com/doc?30327))

- 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

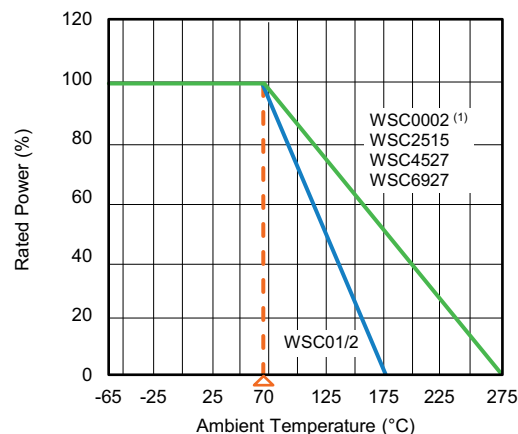
**DIMENSIONS** in inches (millimeters)


| GLOBAL MODEL | DIMENSIONS                       |                                 |                                 |                                 |                                 | SOLDER PAD DIMENSIONS |              |               |
|--------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------|--------------|---------------|
|              | L                                | H                               | T                               | W                               | W <sub>1</sub>                  | a                     | b            | L             |
| WSC01/2      | 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 ± 0.010<br>(1.27 ± 0.254) | 0.085 (2.16)          | 0.070 (1.78) | 0.080 (2.03)  |
| WSC2515      | 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 ± 0.010<br>(2.49 ± 0.254) | 0.090 (2.29)          | 0.115 (2.92) | 0.120 (3.05)  |
| WSC0002      | 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) | 0.155 (3.94)          | 0.230 (5.84) | 0.205 (5.21)  |
| WSC4527      | 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) | 0.155 (3.94)          | 0.230 (5.84) | 0.205 (5.21)  |
| WSC6927      | 0.690 ± 0.032<br>(17.53 ± 0.813) | 0.280 ± 0.015<br>(7.11 ± 0.381) | 0.100 ± 0.010<br>(2.54 ± 0.254) | 0.275 ± 0.005<br>(6.98 ± 0.127) | 0.215 ± 0.015<br>(5.46 ± 0.381) | 0.155 (3.94)          | 0.235 (5.97) | 0.470 (11.94) |

**Notes**

- 3D models available: [www.vishay.com/doc?30328](http://www.vishay.com/doc?30328)
- Surface mount solder profile recommendations: [www.vishay.com/doc?31052](http://www.vishay.com/doc?31052)
- Refer to WSC, WSN conversion guide for detailed construction drawings: [www.vishay.com/doc?49616](http://www.vishay.com/doc?49616)
- For WSC2515 0.5 % tolerance parts, W<sub>1</sub> terminal dimension will be 0.090" ± 0.015"

**TEMPERATURE RISE**

**DERATING**

**Note**

- <sup>(1)</sup> As of 1/1/2010, WSC0002 will be molded with thermoplastic and have the higher 275 °C temperature derating

## PULSE CAPABILITY



[www.vishay.com/en/resistors/joulewizard/](http://www.vishay.com/en/resistors/joulewizard/)

### Note

- Pulse capability increases based on the amount of wire for the resistance value and construction. The WSC0002 has greater pulse capability than WSC4527 due to differences in internal construction. The non-inductive WSN has greater pulse capability for the same size WSC because the second layer of wire increases the wire mass available to withstand pulse energy without exceeding temperature limits. Follow pulse graphic link for more information regarding capability

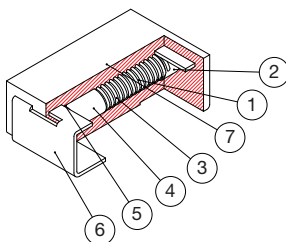
## WELDED CONSTRUCTION

**WSC2515, WSN2515**



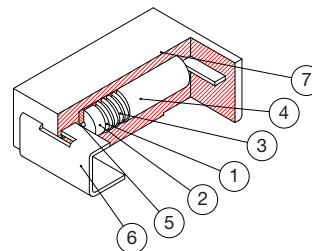
- ① Ceramic core
- ② Resistor end cap
- ③ Resistance wire
- ④ Subassembly coating
- ⑤ Connection - cap to terminal
- ⑥ Plated terminal
- ⑦ LCP mold with laser print

**WSC0002, WSN0002**



- ① Ceramic core
- ② Resistor end cap
- ③ Resistance wire
- ④ Subassembly coating
- ⑤ Connection - cap to leadframe terminal
- ⑥ Plated leadframe terminal
- ⑦ LCP mold with laser print

**WSC4527, WSN4527,  
WSC6927, WSN6927**



- ① Ceramic core
- ② Resistor end cap
- ③ Resistance wire
- ④ Subassembly coating
- ⑤ Connection - cap to axial lead, axial lead to leadframe terminal
- ⑥ Plated terminal
- ⑦ LCP mold with laser print

**COMPARISON OF PULSE CAPACITY** (by series, 2  $\Omega$  at 70  $^{\circ}\text{C}$ )


Energy capacity increases with size with more wire mass to achieve the equivalent resistance value.

WSN has a second layer of wire that provides higher energy capacity than WSC due to increased wire mass.

Lower resistance values have higher pulse capacity due to larger diameter wire.

| PERFORMANCE               |                                                                                                                                                                                               |                          |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| TEST                      | CONDITIONS OF TEST                                                                                                                                                                            | TEST LIMITS              |
| Thermal shock             | -55 $^{\circ}\text{C}$ to +150 $^{\circ}\text{C}$ , 1000 cycles, 15 min at each extreme                                                                                                       | $\pm 0.5\% + 0.05\Omega$ |
| Short time overload       | 5 x rated power for 5 s<br><a href="http://www.vishay.com/en/resistors/SMD-wirewound-pulse-capability-calculator/">www.vishay.com/en/resistors/SMD-wirewound-pulse-capability-calculator/</a> | $\pm 0.2\% + 0.05\Omega$ |
| Low temperature storage   | -65 $^{\circ}\text{C}$ for 24 h                                                                                                                                                               | $\pm 0.2\% + 0.05\Omega$ |
| High temperature exposure | 2000 h at +275 $^{\circ}\text{C}$ (WSC01/2 and WSN01/2 at 175 $^{\circ}\text{C}$ )                                                                                                            | $\pm 2.0\% + 0.05\Omega$ |
| Bias humidity             | +85 $^{\circ}\text{C}$ , 85 % RH, 10 % bias, 1000 h                                                                                                                                           | $\pm 0.2\% + 0.05\Omega$ |
| Mechanical shock          | 100 g's for 6 ms, 5 pulses                                                                                                                                                                    | $\pm 0.1\% + 0.05\Omega$ |
| Vibration                 | Frequency varied 10 Hz to 500 Hz in 1 min, 3 directions, 9 h                                                                                                                                  | $\pm 0.1\% + 0.05\Omega$ |
| Load life                 | 1000 h at rated power, +70 $^{\circ}\text{C}$ , 1.5 h "ON", 0.5 h "OFF"                                                                                                                       | $\pm 1.0\% + 0.05\Omega$ |
| Resistance to solder heat | +260 $^{\circ}\text{C}$ solder, 10 s to 12 s dwell, 25 mm/s emergence                                                                                                                         | $\pm 0.5\% + 0.05\Omega$ |

| PACKAGING        |                          |              |             |         |
|------------------|--------------------------|--------------|-------------|---------|
| MODEL            | REEL                     |              |             |         |
|                  | TAPE WIDTH               | DIAMETER     | PIECES/REEL | CODE    |
| WSC01/2          | 12 mm / embossed plastic | 330 mm / 13" | 2000        | EA / TA |
| WSC2515          | 16 mm / embossed plastic | 330 mm / 13" | 2000        | EA / TA |
| WSC0002, WSC4527 | 24 mm / embossed plastic | 330 mm / 13" | 1200        | EA / TA |
| WSC6927          | 32 mm / embossed plastic | 330 mm / 13" | 725         | EA / TA |

**Notes**

- Embossed carrier tape per EIA-481
- Additional packaging details at [www.vishay.com/doc?20051](http://www.vishay.com/doc?20051)

| LINKS TO RELATED DOCUMENTS                                |                                                                        |
|-----------------------------------------------------------|------------------------------------------------------------------------|
| <b>SELECTOR GUIDE</b>                                     |                                                                        |
| Overview of Automotive Grade Products                     | <a href="http://www.vishay.com/doc?49924">www.vishay.com/doc?49924</a> |
| <b>CONVERSION GUIDE</b>                                   |                                                                        |
| WSC/WSN Wirewound Surface-Mount Resistors                 | <a href="http://www.vishay.com/doc?49616">www.vishay.com/doc?49616</a> |
| <b>TECHNICAL NOTES</b>                                    |                                                                        |
| SMD Current Sense: AEC-Q200 vs. Vishay Qualification      | <a href="http://www.vishay.com/doc?30416">www.vishay.com/doc?30416</a> |
| MIL-PRF vs. AEC-Q200: Do You Know What You Are Getting?   | <a href="http://www.vishay.com/doc?11000">www.vishay.com/doc?11000</a> |
| <b>WHITE PAPER</b>                                        |                                                                        |
| Thermal Management for Surface-Mount Devices              | <a href="http://www.vishay.com/doc?30380">www.vishay.com/doc?30380</a> |
| Temperature Coefficient of Resistance for Current Sensing | <a href="http://www.vishay.com/doc?30405">www.vishay.com/doc?30405</a> |



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