



## 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 qualified <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 $P_{70\text{ °C}}$ W	RESISTANCE VALUE RANGE Ω <sup>(2)</sup>		WEIGHT (typical) g/1000 pieces
			TOL. ± 0.5 %	TOL. ± 1.0 %	
WSL0603 <sup>(3)</sup>	0603	0.1	0.01 to 0.1	0.01 to 0.1	1.9
WSL0805 <sup>(3)</sup>	0805	0.125	0.005 to 0.2	0.005 to 0.2	4.8
WSL1206 <sup>(3)</sup>	1206	0.25	0.005 to 0.2	0.0005 to 0.2	16.2
WSL2010 <sup>(3)</sup>	2010	0.5	0.004 to 0.5	0.001 to 0.5	38.9
WSL2512 <sup>(3)</sup>	2512	1.0 <sup>(1)</sup>	0.003 to 0.5	0.0005 to 0.5	63.6
WSL2816 <sup>(3)</sup>	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>(1)</sup> For values above 0.1 Ω derate linearly to 80 % rated power at 0.5 Ω
- <sup>(2)</sup> WSL1206 0.0005 Ω to 0.00099 Ω is only available with 2 % tolerance (G tolerance code)
- <sup>(3)</sup> Qualified to AEC-Q200 rev. D

GLOBAL PART NUMBER INFORMATION																
Global Part Numbering Example: <b>WSL25124L000FEA</b> (visit <a href="http://www.vishay.net">www.vishay.net</a> Vishay Dale parts numbering manual for all options)																
W	S	L	2	5	1	2	4	L	0	0	0	F	E	A		
GLOBAL MODEL (7 digits)	RESISTANCE VALUE <sup>(1)</sup> (5 digits)	TOLERANCE CODE (1 digit)	PACKAGING CODE <sup>(2)</sup> (2 digits)				SPECIAL <sup>(3)</sup> (up to 2 digits)									
WSL0603 WSL0805 WSL1206 WSL2010 WSL2512 WSL2816	L = mΩ* R = decimal 5L000 = 0.005 Ω R0100 = 0.01 Ω  * Use "L" for resistance values < 0.01 Ω	D = ± 0.5 % F = ± 1.0 % J = ± 5.0 %	EA = lead (Pb)-free, tape / reel EH = lead (Pb)-free, tape / reel (WSL2816)  TA = tin / lead, tape / reel (R86) TG = tin / lead, tape / reel (RT1, for WSL0603 and WSL0805) TH = tin / lead, tape / reel (RJ9, WSL2816) SB = tin / lead, tape / reel for <a href="#">DLA drawings</a>				(dash number) from 1 to 99 as applicable									

### Notes

- Per PCN-DR-00009-2022-REV-0, WSL marking will be removed effective March 1st, 2023
- <sup>(1)</sup> WSL marking ([www.vishay.com/doc?30327](http://www.vishay.com/doc?30327)); WSL decade values ([www.vishay.com/doc?30117](http://www.vishay.com/doc?30117))
- <sup>(2)</sup> 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
- <sup>(3)</sup> Follow link for customization capabilities: [www.vishay.com/doc?48163](http://www.vishay.com/doc?48163)

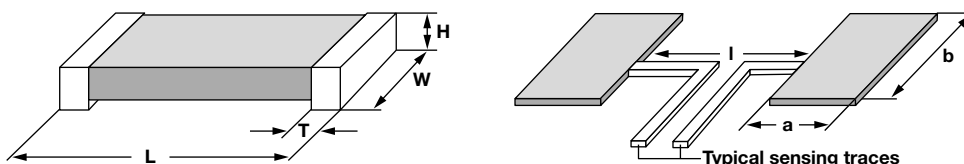


TECHNICAL SPECIFICATIONS						
PARAMETER	UNIT	WSL RESISTOR CHARACTERISTICS				
		WSL0603 <sup>(1)</sup>	WSL0805	WSL1206	WSL2010	WSL2512
Component temperature coefficient (including terminal) <sup>(2)</sup> TCR measured from -55 °C to +155 °C	ppm/°C	± 75 for 50 mΩ to 100 mΩ		± 75 for 7 mΩ to 500 mΩ		
		± 110 for 10 mΩ to 49 mΩ		± 110 for 5 mΩ to 6.9 mΩ		
		-		± 150 for 3 mΩ to 4.9 mΩ		
		-		± 275 for 1 mΩ to 2.9 mΩ		
Element TCR <sup>(3)</sup>	ppm/°C	< 20				
Operating temperature range	°C	-65 to +170				
Maximum working voltage <sup>(4)</sup>	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](http://www.vishay.com/doc?30306)
- Surface mount solder profile recommendations: [www.vishay.com/doc?31052](http://www.vishay.com/doc?31052)

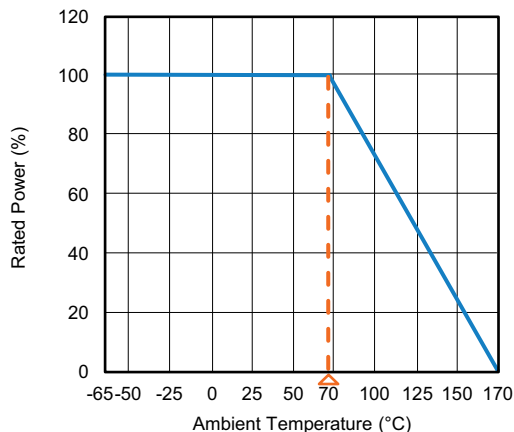
MODEL	RESISTANCE RANGE (Ω)	DIMENSIONS				SOLDER PAD DIMENSIONS				
		L	W	H	T	a	b	l		
WSL0603 <sup>(1)</sup>	0.01 to 0.1	0.060 ± 0.010 (1.52 ± 0.254)	0.030 ± 0.010 (0.76 ± 0.254)	0.016 ± 0.005 (0.406 ± 0.127)	0.015 ± 0.010 (0.381 ± 0.254)	0.040 (1.01)	0.040 (1.01)	0.020 (0.50)		
WSL0805 <sup>(2)</sup>	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)		
WSL1206	0.0005 to 0.00099	0.126 ± 0.010 (3.20 ± 0.254)	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)		
	0.001 to 0.0019				0.086 (2.18)	0.076 (1.93)	0.029 (0.74)			
	0.002 to 0.0059				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 (5.08 ± 0.254)	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				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)	0.145 (3.68)	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)	
WSL2816	0.002 to 0.00399	0.280 ± 0.010 (7.1 ± 0.254)	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 (4.7)	0.060 (1.52)		
	0.004 to 0.1				0.062 ± 0.010 (1.57 ± 0.254)			0.096 (2.45)	0.125 (3.20)	

**Notes**

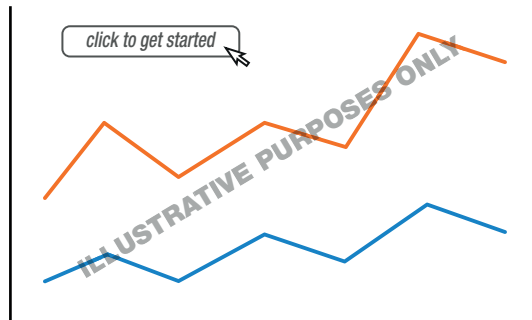
- (1) PCN-DR-00003-2020 changed terminal height for WSL0603 from 0.013" ± 0.005" for clad construction to 0.016" ± 0.005" for welded construction
- (2) PCN-DR-00021-2021-REV-1 changed terminal height for WSL0805 from 0.013" ± 0.005" for clad construction to 0.016" ± 0.005" for welded construction



**DERATING**

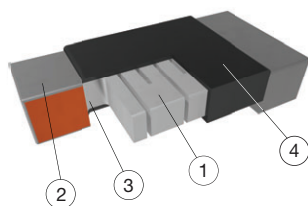


**PULSE CAPABILITY**



[www.vishay.com/resistors/power-metal-strip-calculator](http://www.vishay.com/resistors/power-metal-strip-calculator)

**WELDED CONSTRUCTION**



- ① Resistive element: solid metal nickel-chrome or manganese-copper alloy resistive element with low TCR (< 20 ppm/°C)
- ② Plated terminal: solid copper, 100 % Sn (100 μ" min.) with 100 % Ni (20 μ" min.) under layer finish
- 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; <a href="http://www.vishay.com/resistors/power-metal-strip-calculator/">www.vishay.com/resistors/power-metal-strip-calculator/</a>	± (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)

PACKAGING (1)				
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

**Notes**

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



<b>LINKS TO RELATED DOCUMENTS</b>	
<b>SELECTOR GUIDE</b>	
Overview of Automotive Grade Products	<a href="http://www.vishay.com/doc?49924">www.vishay.com/doc?49924</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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