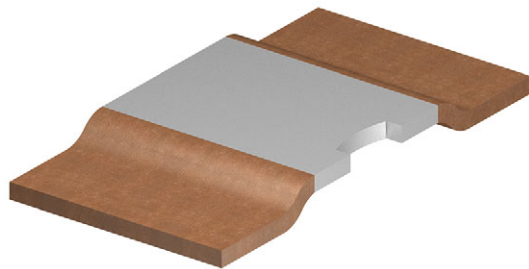


Power Metal Strip® Resistors, Low Value (down to 0.0002 Ω), Surface Mount



DESIGN SUPPORT TOOLS AVAILABLE



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 0.0002 Ω
- Sulfur resistance by construction that is unaffected by high sulfur environments
- Solid metal iron-chrome or manganese-copper alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance 0.5 nH to 5 nH
- Low thermal EMF (< 3 μV/°C)
- AEC-Q200 qualified ⁽¹⁾
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



Notes

- Follow link to Overview of Automotive Grade Products for more details: www.vishay.com/doc?49924
- (1) Flame retardance test may not be applicable to some resistor technologies

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE	POWER RATING $P_{70^{\circ}\text{C}}$ W	TOLERANCE %	RESISTANCE VALUE RANGE Ω	RESISTANCE VALUES CURRENTLY AVAILABLE ⁽¹⁾ Ω	WEIGHT (typical) g/1000 pieces
WSL3921	3921	3.0	1.0, 5.0	0.2m to 4m	0.2m, 0.3m, 0.5m, 0.7m, 1m, 1.5m, 2m, 2.5m, 3m, 4m	281
WSL5931	5931	5.0	1.0, 5.0	0.2m to 3m	0.1m, 0.2m, 0.3m, 0.5m, 1m, 2m, 3m	398

Note

- (1) Other values may be available, contact factory

GLOBAL PART NUMBER INFORMATION

GLOBAL PART NUMBERING: WSL3921L5000FEA (WSL3921, 0.0005 Ω, ± 1 %)
(visit www.vishay.net Vishay Dale parts numbering manual for all options)

W	S	L	3	9	2	1	L	5	0	0	0	F	E	A		
GLOBAL MODEL (7 digits)			RESISTANCE VALUE ⁽¹⁾ (5 digits)			TOLERANCE CODE (1 digit)		PACKAGING CODE ⁽²⁾ (2 digits)				SPECIAL ⁽³⁾ (up to 2 digits)				
WSL3921 WSL5931			L = mΩ L5000 = 0.0005 Ω			F = ± 1.0 % J = ± 5.0 %		EA = lead (Pb)-free, tape/reel EK = lead (Pb)-free, bulk				(dash number) (up to 2 digits) from 1 to 99 as applicable				

Notes

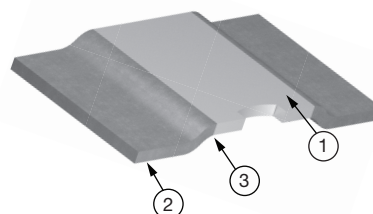
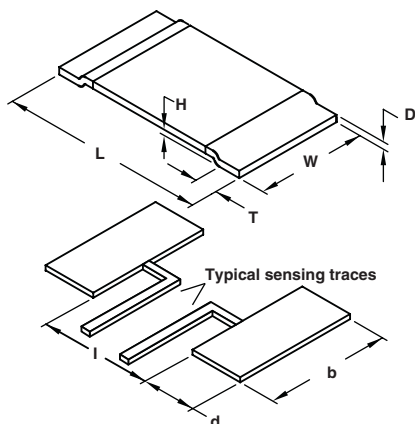
- (1) WSL marking (www.vishay.com/doc?30327)
- (2) Packaging code: EB (lead (Pb)-free) is a non-standard packaging code that designates a 1000 piece reel size. The non-standard packaging code is identical to our standard EA (lead (Pb)-free) packaged code, except that it has a package quantity of 1000 pieces.
- (3) Follow link for customization capabilities: www.vishay.com/doc?48163

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	RESISTOR CHARACTERISTICS	
		WSL3921	WSL5931
Component temperature coefficient (including terminal) ⁽¹⁾ TCR measured from -55 °C to 150 °C	ppm/°C	± 175 for 0.2 mΩ to 0.7 mΩ	± 225 for 0.2 mΩ
		± 75 for 1 mΩ to 4 mΩ	± 175 for 0.3 mΩ and 0.5 mΩ
Element TCR ⁽²⁾	ppm/°C	< 20	
Operating temperature range	°C	-65 to +170	
Maximum working voltage ⁽³⁾	V	$(P \times R)^{1/2}$	

Notes

- (1) Component TCR - total TCR that includes the TCR effects of the resistor element and the copper terminal
(2) Element TCR - only applies to the alloy used for the resistor element; refer to item 1 in the construction illustration on the following page
(3) 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)


- 1) Resistive element: Fe-Cr
(element material used is dependent on resistance value)
2) Terminal: Solid copper
3) Terminal / element weld

Notes

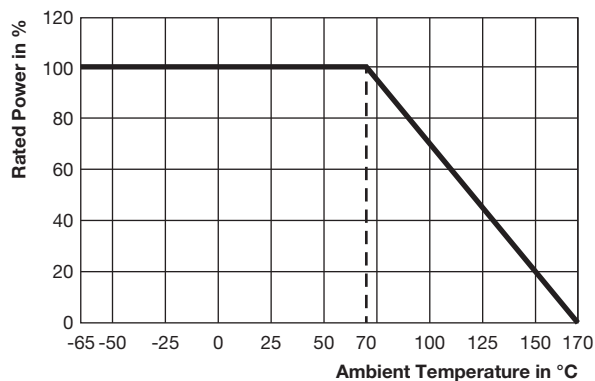
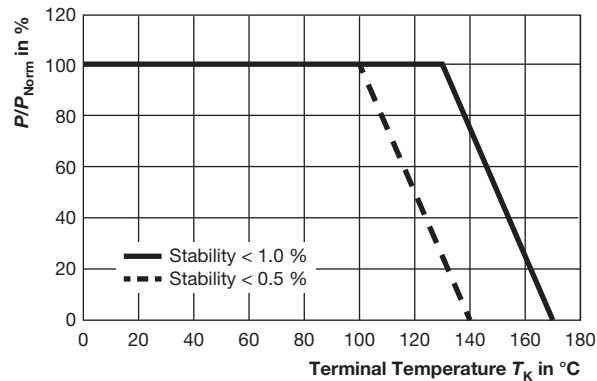
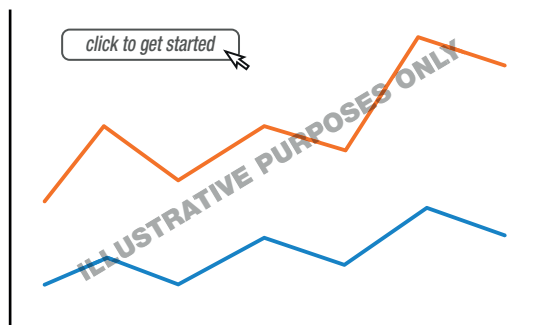
- 3D models available: 3921 model www.vishay.com/doc?30315; 5931 model www.vishay.com/doc?30317
- Surface mount solder profile recommendations: www.vishay.com/doc?31052

MODEL	DIMENSIONS in inches (millimeters)				SOLDER PAD DIMENSIONS in inches (millimeters)		
	L	W	H	T	d	b	I
WSL3921	0.394 ± 0.010 (10.0 ± 0.254)	0.205 ± 0.010 (5.20 ± 0.254)	0.020 (0.5)	0.080 ± 0.010 (2.00 ± 0.254)	0.106 ± 0.010 (2.70 ± 0.254)	0.244 ± 0.010 (6.20 ± 0.254)	0.220 ± 0.005 (5.60 ± 0.13)
WSL5931	0.591 ± 0.010 (15.0 ± 0.254)	0.305 ± 0.010 (7.75 ± 0.254)	0.020 (0.5)	0.157 ± 0.010 (4.00 ± 0.254)	0.205 ± 0.010 (5.20 ± 0.254)	0.344 ± 0.010 (8.75 ± 0.254)	0.220 ± 0.005 (5.60 ± 0.13)

GLOBAL MODEL	RESISTANCE VALUE (mΩ)	TYPICAL THERMAL RESISTANCE (°C/W) ⁽¹⁾	"D" THICKNESS (INCHES)	ELEMENT MATERIAL
WSL3921	0.2	2.7	0.0560	Mn-Cu-Sn
WSL3921	0.3	3.8	0.0510	Mn-Cu
WSL3921	0.5	5.8	0.0300	Mn-Cu
WSL3921	0.7	6.3	0.0205	Mn-Cu
WSL3921	1.0	10.9	0.0150	Mn-Cu
WSL3921	1.5	8.3	0.0360	Fe-Cr
WSL3921	2.0	12.0	0.0270	Fe-Cr
WSL3921	3.0	20.7	0.0170	Fe-Cr
WSL3921	4.0	22.8	0.0130	Fe-Cr
WSL5931	0.2	2.4	0.0485	Mn-Cu
WSL5931	0.3	3.5	0.0300	Mn-Cu
WSL5931	0.5	5.7	0.0180	Mn-Cu
WSL5931	1.0	7.2	0.0330	Fe-Cr
WSL5931	2.0	13.2	0.0155	Fe-Cr
WSL5931	3.0	19.3	0.0105	Fe-Cr

Note

- (1) The full power rating of Power Metal Strip resistors are dependent upon the ability of the circuit board to dissipate the heat energy created in the resistance element. It is recommended to follow common design practices for power semiconductors that ensure the junction temperature is maintained within thermal limits by using large pad surfaces, thermal vias, heavier copper weights, internal layers as well as other thermal spreading features. The Thermal resistance values provided function in the same manner as junction to terminal temperature


DERATING - AMBIENT TEMPERATURE

DERATING - TERMINAL TEMPERATURE

PULSE CAPABILITY

www.vishay.com/resistors/power-metal-strip-calculator

PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal shock	-55 °C to +150 °C, 1000 cycles, 15 min at each extreme	± 1.0 %
Short time overload	5x rated power for 5 s	± 0.5 %
Low temperature storage	-65 °C for 24 h	± 0.5 %
High temperature exposure	1000 h at +170 °C	± 1.0 %
Bias humidity	+85 °C, 85 % RH, 10 % bias, 1000 h	± 0.5 %
Mechanical shock	100 g's for 6 ms, 5 pulses	± 0.5 %
Vibration	Frequency varied 10 Hz to 2000 Hz in 1 min, 3 directions, 12 h	± 0.5 %
Load life	1000 h at +70 °C, 1.5 h "ON", 0.5 h "OFF"	± 1.0 %
Resistance to solder heat	3x at 250 °C ± 5 °C for 30 s ± 5 s	± 0.5 %
Moisture resistance	MIL-STD-202, method 106, 0 % power, 7a and 7b not required	± 0.5 %

PACKAGING				
MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSL3921	16 mm/embossed plastic	330 mm/13"	3000	EA
WSL5931	24 mm/embossed plastic	330 mm/13"	1500	EA

Notes

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



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<u>WSL59311L000FEA</u>	<u>WSL59312L000FEA</u>	<u>WSL59313L000FEA</u>	<u>WSL5931L2000FEA</u>	<u>WSL5931L3000FEA</u>
<u>WSL5931L5000FEA</u>	<u>WSL3921L3000FEK</u>	<u>WSL39214L000FEA</u>	<u>WSL3921L3000FEB</u>	<u>WSL3921L5000FEB</u>
<u>WSL39211L000FEB</u>	<u>WSL39212L000FEB</u>	<u>WSL39213L000FEB</u>	<u>WSL39214L000FEB</u>	<u>WSL5931L2000FEB</u>
<u>WSL5931L3000FEB</u>	<u>WSL5931L5000FEB</u>	<u>WSL59311L000FEB</u>	<u>WSL59312L000FEB</u>	<u>WSL59313L000FEB</u>
<u>WSL39211L000FEK</u>	<u>WSL39214L000FEK</u>	<u>WSL3921L5000FEK</u>	<u>WSL39212L000FEK</u>	<u>WSL39213L000FEK</u>
<u>WSL5931L3000FEK</u>	<u>WSL5931L5000FEK</u>	<u>WSL59311L000FEK</u>	<u>WSL59312L000FEK</u>	<u>WSL59313L000FEK</u>
<u>WSL3921L2000FEA</u>	<u>WSL39213L300FEA</u>			