

## Power Metal Strip® Current Sense Resistors, Low Value (0.3 mΩ to 3 mΩ), Surface-Mount, High Power



### LINKS TO ADDITIONAL RESOURCES



### FEATURES

- Ideal for all types of current sensing and pulse applications including switching and linear power supplies, instruments, power amplifiers, shunts, power inverters, and battery management
- Proprietary processing technique produces low resistance values (0.3 mΩ to 3 mΩ)
- Solid metal manganese-copper and iron-chromium-aluminum alloy resistive element with low TCR (< 20 ppm/°C)
- Very low inductance 0.5 nH to 5 nH
- Low thermal EMF (< 3 μV/°C)
- Sulfur resistance by construction that is unaffected by high sulfur environments
- AEC-Q200 qualified rev. E
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS  
COMPLIANT  
HALOGEN  
FREE**

STANDARD ELECTRICAL SPECIFICATIONS						
GLOBAL MODEL	SIZE	POWER RATING $P_{70^\circ\text{C}}$ <sup>(1)</sup> W	POWER RATING $P_{100^\circ\text{C}}$ <sup>(2)</sup> W	TOLERANCE %	RESISTANCE VALUE RANGE Ω	WEIGHT (typical) g/1000 pieces
WSLF1206	1206	5.0	3.0	± 1, ± 5	0.3m	45
	1206	5.0	3.0	± 1, ± 5	0.5m	30
	1206	4.0	2.0	± 1, ± 5	1m	26
	1206	4.0	2.0	± 1, ± 5	2m	34
	1206	4.0	2.0	± 1, ± 5	3m	28

### Notes

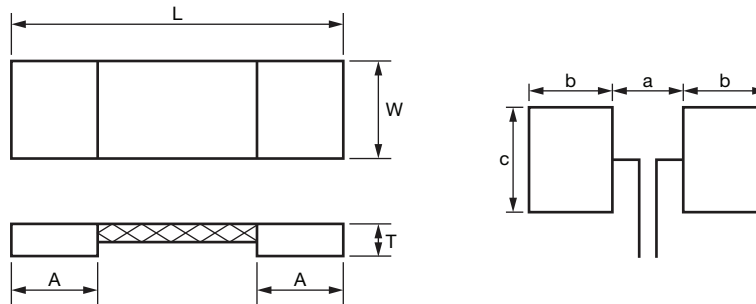
- Part marking: no part marking on these parts
- “Thermal Management for Surface-Mount Devices” white paper: [www.vishay.com/doc?30380](http://www.vishay.com/doc?30380)
- (1) See Fig. 1 - Ambient Temperature Derating
- (2) See Fig. 2 - Terminal Temperature Derating
- (3) Other values may be available, contact factory

GLOBAL PART NUMBER INFORMATION															
Global Part Numbering Example: WSLF1206L5000FE66															
W	S	L	F	1	2	0	6	L	5	0	0	0	F	E	6
GLOBAL MODEL			CASE SIZE			RESISTANCE VALUE			TOLERANCE CODE			PACKAGING CODE			
WSLF			1206			L = mΩ L5000 = 0.0005 Ω			F = ± 1.0 % J = ± 5.0 %			E6 = lead (Pb)-free, tape/reel			

TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	WSLF1206 RESISTOR CHARACTERISTICS
Temperature coefficient (-65 °C to +170 °C) (complete resistor) <sup>(1)</sup>	ppm/°C	± 275 for 0.3 mΩ
		± 200 for 0.5 mΩ
		± 100 for 1 mΩ
		± 75 for 2 mΩ to 3 mΩ
Temperature coefficient (20 °C to 60 °C) (only element material) <sup>(2)</sup>	ppm/°C	± 20
Operating temperature range	°C	-55 to +170
Maximum working voltage <sup>(3)</sup>	V	$(P \times R)^{1/2}$

**Notes**

- Consult factory for detailed TCR performance across full temperature range as performance is resistance value specific
- “Temperature Coefficient of Resistance for Current Sensing” white paper: [www.vishay.com/doc?30405](http://www.vishay.com/doc?30405)
- (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
- (3) Maximum working voltage - the WSL is not voltage sensitive, but is limited by power / energy dissipation and is also not ESD sensitive

**DIMENSIONS**

**Note**

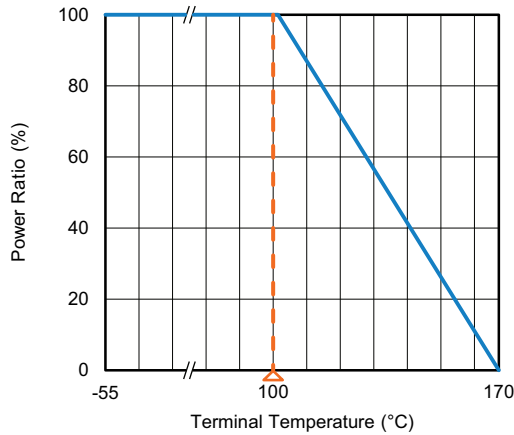
- Surface mount solder profile recommendations: [www.vishay.com/doc?31052](http://www.vishay.com/doc?31052)

GLOBAL MODEL	RESISTANCE VALUE (mΩ)	DIMENSIONS				SOLDER PAD DIMENSIONS		
		L	W	T	A	a	b	c
WSLF1206	0.3	0.126 ± 0.008 (3.2 ± 0.2)	0.065 ± 0.008 (1.65 ± 0.2)	0.047 ± 0.006 (1.20 ± 0.15)	0.031 ± 0.008 (0.80 ± 0.2)	0.061 (1.55)	0.051 (1.30)	0.074 (1.88)
	0.5			0.035 ± 0.006 (0.90 ± 0.15)				
	1			0.033 ± 0.006 (0.85 ± 0.15)				
	2			0.031 ± 0.006 (0.80 ± 0.15)				
	3							

**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

GLOBAL MODEL	RESISTANCE VALUE (mΩ)	THERMAL RESISTANCE (°C/W)	ELEMENT MATERIAL
WSLF1206	0.3	1.7	MnCuSn
	0.5	4.9	MnCu
	1	10	MnCu
	2	14	FeCrAl
	3	20	FeCrAl

**DERATING - TERMINAL TEMPERATURE**

 Fig. 1 -  $P_{100\text{ }^\circ\text{C}}$  Rated Power of Standard Electrical Specification Table (Example L5000)

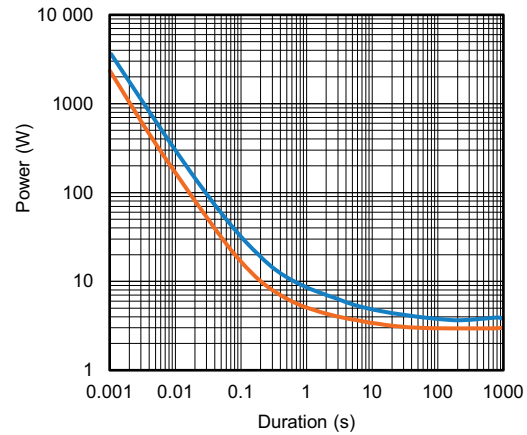
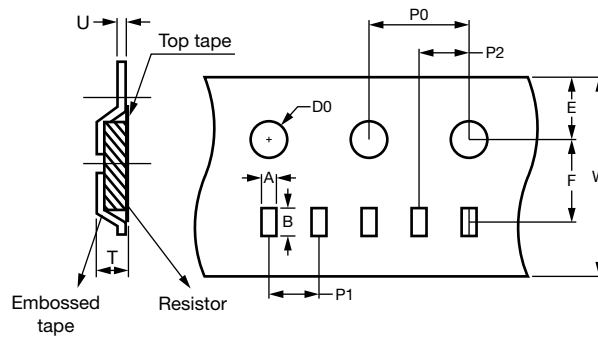
**PULSE CAPABILITY**


Fig. 2 - Pulsed Power Characteristics

**Note**

- The curve is valid for resistance value 0.3 mΩ to 1 mΩ. Other pulsed power characteristics on request

PERFORMANCES			
DESCRIPTION	AEC TEST NUMBER	TEST CONDITIONS	LIMIT
High temperature exposure	3	MIL-STD-202 Method 108; 1000 h at +170 °C, no power. Measurement at 24 h ± 4 h after test conclusion	± (1.0 %)
Temperature cycling	4	JESD22 Method JA-104; 1000 cycles (-55 °C to +155 °C) Measurement at 24 h ± 4 h after test conclusion. 15 min. dwell time at each temperature extreme. 1 min maximum transition time	± (1.0 %)
Moisture resistance	6	MIL-STD-202 Method 106; t = 24 h/cycle. Note: Steps 7a and 7b not required, 0 % power, 65 °C	± (1.0 %)
Biased humidity	7	MIL-STD-202 Method 103; 1000 h at 85 °C / 85 % RH. 10 % of operating power. Measurement 24 h ± 4 h after test conclusion	± (1.0 %)
Operational life	8	MIL-STD-202 Method 108; 1000 h test; Condition D; 1.5 h "ON", 0.5 h "OFF"; terminal temperature +100 °C at rated power. Measurement 24 h ± 4 h after test conclusion	± (1.0 %)
Physical dimension	10	JESD22 Method JB-100; verify physical dimensions to the applicable device detail specification. Note: user(s) and suppliers spec. Electrical test not required.	See datasheet
Mechanical shock	13	MIL-STD-202 Method 213; Figure 1 of Method 213. Condition C.	± (1.0 %)
Vibration	14	MIL-STD-202 Method 204; 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10 Hz to 2000 Hz. Verify transfer load using a laser vibrometer or other adequate measuring device.	± (1.0 %)
Resistance to solder heat	15	The specimen chip shall be immersed into the flux specified in the solder bath 260 °C ± 5 °C for 10 s ± 1 s (MIL-STD-202, Method 210)	± (1.0 %)
ESD	17	AEC-Q200-002 or 25 kV HBM	± (1.0 %)
Functional solderability	18.F1	J-STD-002; Method S1 lead (Pb)-free; 4 h at +155 °C dry heat; max. reflow temp. +260 °C; no electrical test; 50 x mag.	> 95 % coverage
Functional solderability	18.F2	J-STD-002; Method S Sn-Pb; 4 h at +155 °C dry heat; max. reflow temp +230 °C; no electrical test; 50 x mag.	> 95 % coverage
Electrical characterization	19	RTC at -65 °C and 170 °C	Refer to Technical Specifications table
Electrical characterization	19	User spec.; RTC tested at -55 °C, -40 °C, -15 °C, +5 °C, +45 °C, +65 °C, +85 °C, +105 °C, +125 °C, +150 °C, +170 °C. Tref +25 °C	± 175 ppm/°C
Board flex	21	AEC-Q200-005; 60 s minimum holding time	± (1.0 %)
Terminal strength (SMD)	22	AEC-Q200-006; must meet specification, and no evidence of cracking or shearing	± (1.0 %)
Low temperature storage	26	MIL-PRF-26 paragraph 4.7.12; -65 °C; measurement at 24 h and continued for 1000 h	± (0.5 %)
Short time overload	25	MIL-PRF-55342 paragraph 4.8.6; 5 x rated power for 5 s	± (1.0 %)

**PAPER TAPE SPECIFICATIONS**


TYPE	CARRIER DIMENSIONS (in millimeters)										
	A	B	E	F	W	P0	P1	P2	D0	T (REF.)	U (REF.)
WSLF1206	2.0 ± 0.1	3.6 ± 0.1	1.75 ± 0.1	5.5 ± 0.05	12.0 ± 0.2	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	1.50 ± 0.05	1.2 ± 0.2	0.25 ± 0.05

PACKAGING				
MODEL	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSLF1206	Embossed paper tape	178 mm / 7"	3000	E66

**Note**

- Embossed carrier tape per EIA (EIAJ)

LINKS TO RELATED DOCUMENTS	
WHITE PAPER	
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>



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.