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Vishay Dale

AUTOMOTIVE GRADE

COMPLIANT

HALOGEN FREE

**GREEN** 

# Power Metal Strip<sup>®</sup> Resistors, High Power (7 W), Low Value (Down to 0.001 $\Omega$ ), Surface Mount



### **LINKS TO ADDITIONAL RESOURCES**









#### **FEATURES**

- Improved thermal management incorporated into design
- 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
- Sulfur resistance by construction that is unaffected by high sulfur environments
- Very low inductance (< 5 nH)</li>
- Solid metal nickel-chrome or manganesecopper alloy resistive element with low TCR (< 20 ppm/°C)</li>
- Low thermal EMF (< 3 µV/°C)</li>
- AEC-Q200 qualified (1)
- PATENT(S): www.vishay.com/patents
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912"><u>www.vishay.com/doc?99912</u></a>

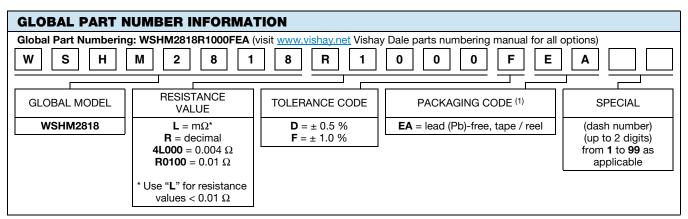
#### Note

(1) Flame retardance test may not be applicable to some resistor technologies

STANDARD ELECTRICAL SPECIFICATIONS					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		WEIGHT (typical)			
		w	TOL. ± 0.5 %	TOL ± 1.0 %	g/1000 pieces
WSHM2818	2818	7 (1)	0.010 to 0.1	0.001 to 0.1	167.8
WSHM2818	2818	6	0.101 to 0.2	0.101 to 0.2	167.8

### Notes

- Qualified to AEC-Q200 rev. D
- (1) The WSHM2818 is rated at 7 W with maximum surface temperature of 180 °C

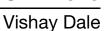


### Notes

- SMD Power Metal Strip Marking (www.vishav.com/doc?30327)
- (1) 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

PATENT(S): <a href="https://www.vishay.com/patents">www.vishay.com/patents</a>

This Vishay product is protected by one or more United States and international patents.





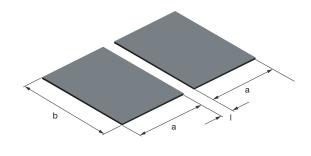
TECHNICAL SPECIFICATIONS				
PARAMETER	UNIT	RESISTOR CHARACTERISTICS		
		$\pm$ 250 $^{(4)}$ for 1 m $\Omega$ to 1.99 m $\Omega$		
Component temperature coefficient (including terminal) (1)	ppm/°C	$\pm$ 200 $^{(4)}$ for 2 m $\Omega$ to 5.99 m $\Omega$		
		$\pm$ 75 $^{(4)}$ for 6 m $\Omega$ to 200 m $\Omega$		
Element TCR (2)	ppm/°C	< 20		
Inductance	nH	< 5		
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 WSHM is not voltage sensitive, but is limited by power / energy dissipation and is also not ESD sensitive
- (4) Typical TCR is positive, for more details contact factory
- Refer to table "Links to Related Documents" for TCR white paper

### **DIMENSIONS** in inches (millimeters)



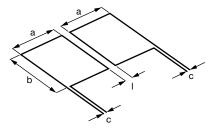


### Notes

- 3D models available: www.vishay.com/doc?30324
- Surface mount solder profile recommendations: www.vishay.com/doc?31052

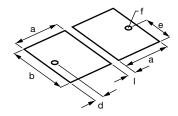
	RESISTANCE		DIMEN	DIMENSIONS			SOLDER PAD DIMENSIONS		
MODEL	RANGE $\Omega$	L	w	Н	Т	а	b	1	
WSHM2818	0.001 to 0.2	0.280 ± 0.010 (7.1 ± 0.25)	0.180 ± 0.010 (4.6 ± 0.25)	$0.059 \pm 0.010$ (1.50 ± 0.25)	0.125 ± 0.010 (3.18 ± 0.25)	0.143 (3.63)	0.210 (5.33)	0.024 (0.61)	

# **TYPICAL SENSING LAYOUT**



а	b	С	1
0.143	0.210	0.020	0.024
(3.63)	(5.33)	(0.51)	(0.61)

# **SENSING WITH VIA LAYOUT** (best performance)



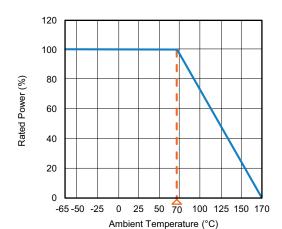
а	b	d	е	f	I
0.143	0.210	0.026	0.105	Ø 0.020	0.024
(3.63)	(5.33)	(0.66)	(2.67)	(0.50)	(0.61)

### Note

 Sensing locations are based on the construction of the part; terminals are wrapped from the outside to underneath. These options place the sensing location nearest the temperature stable resistance element, which minimizes contact resistance and optimizes TCR



# **DERATING**

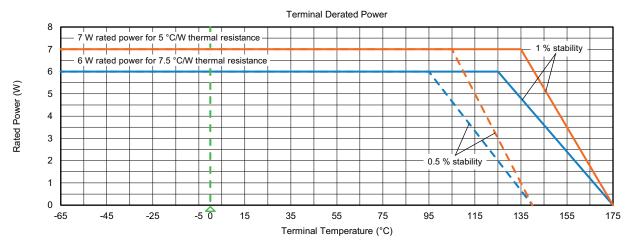


### **PULSE CAPABILITY**

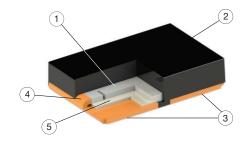


www.vishay.com/en/resistors/joulewizard/

# **TERMINAL TEMPERATURE DERATING**



# **WELDED CONSTRUCTION**



- 1 Resistive element
- 2 Molding material
- 3 Terminations
- 4 Terminal / element weld
- 5 Insert



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PERFORMANCE				
TEST	CONDITIONS OF TEST	TEST LIMITS		
Thermal shock	-55 °C to +150 °C, 2000 cycles, 15 min at each extreme	± 0.5 %		
Short time overload	Refer to link for short time overload performance and pulse capability; www.vishay.com/en/resistors/power-metal-strip-calculator/	± 1.0 %		
Low temperature operation	-65 °C for 24 h	± 0.5 %		
High temperature exposure	2000 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	2000 h at 70 °C, 1.5 h "ON", 0.5 h "OFF"	± 1.0 %		
Resistance to solder heat	+260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence	± 0.5 %		
Moisture resistance	MIL-STD-202, method 106, 0 % power, 7b not required	± 0.5 %		

### Note

• Contact <a href="ww2bresistors@vishay.com">ww2bresistors@vishay.com</a> for application specific performance requirements or qualification data. Typical performance is better than stated test limits

PACKAGING					
MODEL	REEL				
MODEL	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE	
WSHM2818	16 mm/embossed plastic	330 mm / 13"	3500	EA	

# Notes

- Embossed carrier tape per EIA-481
- Additional packaging details at <u>www.vishay.com/doc?20051</u>

ADDITIONAL RESOURCES	
<u>Video</u> : Power Metal Strip Short Time Overload	www.vishay.com/en/videos/resistors/short-time-overload-wshm2818/

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



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