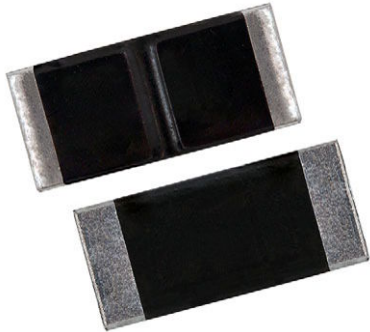




# Power Metal Plate™ Current Sense Resistors, Low Value (10 mΩ to 500 mΩ), Surface-Mount, High Power



## FEATURES

- 2010 and 2512 size package
- 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 (10 mΩ to 500 mΩ)
- Solid metal manganese-copper and nickel-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 <sup>(1)</sup>
- PATENT(S): [www.vishay.com/patents](http://www.vishay.com/patents)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

## LINKS TO ADDITIONAL RESOURCES



### Notes

- Follow link to Overview of Automotive Grade Products for more details: [www.vishay.com/doc?49924](http://www.vishay.com/doc?49924)
- “SMD Current Sense: AEC-Q200 vs. Vishay Qualification” technical note: [www.vishay.com/doc?30416](http://www.vishay.com/doc?30416)
- (1) Flame retardance test may not be applicable to some resistor technologies

## STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE	POWER RATING <sup>(1)</sup> W	TOLERANCE %	RESISTANCE VALUE RANGE Ω	WEIGHT (typical) g/1000 pieces
WFMA2010	2010	3.0 at 70 °C	± 1.0	0.010 to 0.0329	32
WFMA2010	2010	2.0 at 110 °C	± 1.0	0.010 to 0.0329	32
WFMB2010	2010	3.0 at 70 °C	± 1.0	0.033 to 0.500	32
WFMB2010	2010	2.0 at 110 °C	± 1.0	0.033 to 0.500	32
WFMA2512	2512	4.0 at 70 °C	± 1.0	0.010 to 0.0329	41
WFMA2512	2512	3.0 at 95 °C	± 1.0	0.010 to 0.0329	41
WFMB2512	2512	4.0 at 70 °C	± 1.0	0.033 to 0.500	41
WFMB2512	2512	3.0 at 95 °C	± 1.0	0.033 to 0.500	41

### Notes

- “Thermal Management for Surface-Mount Devices” white paper: [www.vishay.com/doc?30380](http://www.vishay.com/doc?30380)
- (1) Terminal temperature

## GLOBAL PART NUMBER INFORMATION

Global Part Numbering Example: WFMB2512R5000FEA

W	F	M	B	2	5	1	2	R	5	0	0	0	F	E	A		
GLOBAL MODEL (3 digits)			ELEMENT MATERIAL (1 digit)	CASE SIZE (4 digits)				RESISTANCE VALUE <sup>(1)</sup> (5 digits)			TOLERANCE CODE (1 digit)	PACKAGING CODE <sup>(2)</sup> (2 digits)		SPECIAL <sup>(3)</sup> (2 digits)			
WFMA			A = CuMn B = NiCrAl	2010 2512				R = decimal R0100 = 0.01 Ω			F = ± 1.0 % J = ± 5.0 %	EA = lead (Pb)-free, tape / reel		Dash numbers 1 thru 99 as applicable			

### Notes

- (1) Power Metal Plate™ 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))
- (2) Packaging code: EB (lead (Pb)-free) is a non-standard packaging code designating 1000 piece reels. This non-standard packaging code is identical to our standard EA (lead (Pb)-free), except that it has a package quantity of 1000 pieces
- (3) Follow link for customization capabilities: [www.vishay.com/doc?48614](http://www.vishay.com/doc?48614)

**PATENT(S):** [www.vishay.com/patents](http://www.vishay.com/patents)

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

TECHNICAL SPECIFICATIONS				
PARAMETER	UNIT	MODEL	RESISTOR CHARACTERISTICS	
			2010	2512
Temperature coefficient (20 °C to 60 °C) (element only) <sup>(1)</sup>	ppm/°C	All	< 20	
Operating temperature range	°C	All	-65 to +170	
Maximum working voltage <sup>(3)</sup>	V	All	$(P \times R)^{1/2}$	
Maximum terminal temperature	°C	All	110	95
Temperature coefficient (-55 °C to +150 °C) (including terminals) <sup>(2)</sup>	ppm/°C	WFMA	± 110	± 110
		WFMB	± 50	± 50
Temperature coefficient (20 °C to 60 °C) (including terminals) <sup>(2)</sup>	ppm/°C	WFMA	± 30	± 40
		WFMB	± 20	± 20

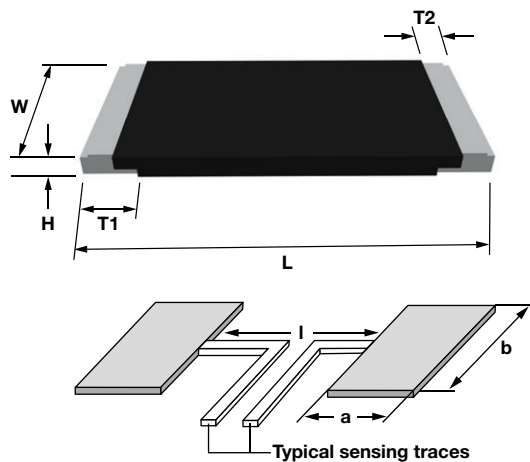
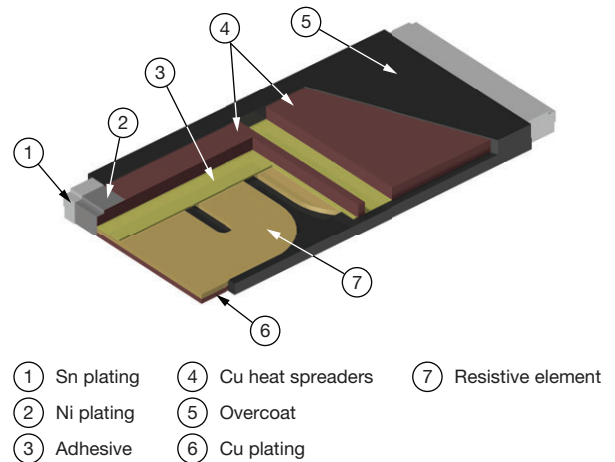
**Notes**

- “Temperature Coefficient of Resistance for Current Sensing” white paper: [www.vishay.com/doc?30405](http://www.vishay.com/doc?30405)

<sup>(1)</sup> Element TCR - only applies to the alloy used for the resistor element

<sup>(2)</sup> Component TCR - total TCR that includes the TCR effects of the resistor element and the copper terminal

<sup>(3)</sup> Maximum working voltage - the WFM is not voltage sensitive, but is limited by power / energy dissipation and is also not ESD sensitive

**DIMENSIONS**

**CONSTRUCTION OUTLINE (1)**

**Notes**

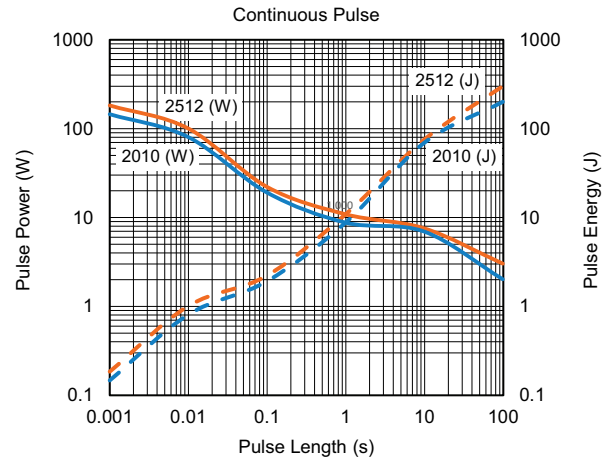
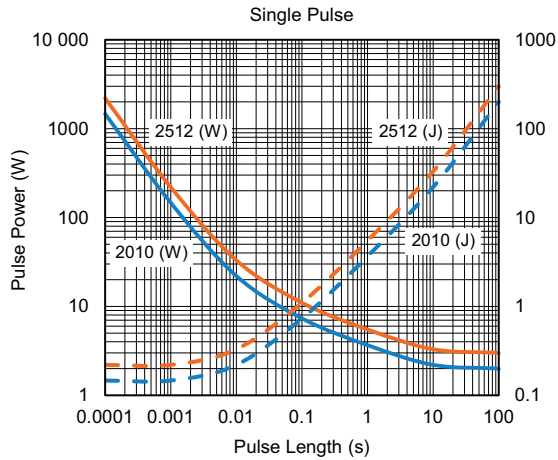
- 3D models available: [www.vishay.com/doc?30401](http://www.vishay.com/doc?30401)

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

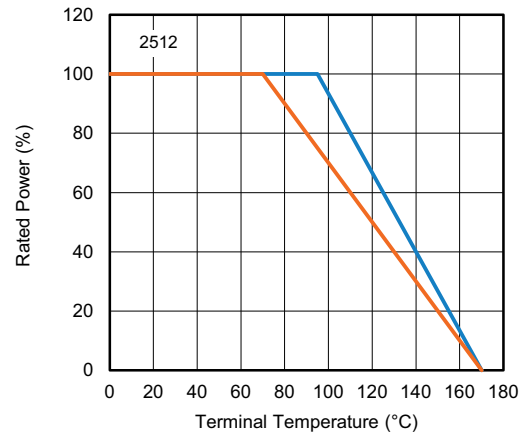
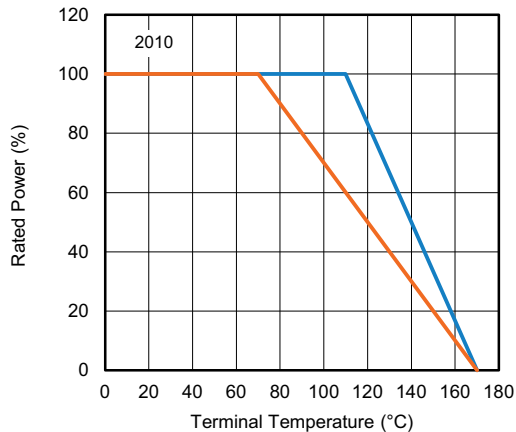
<sup>(1)</sup> For construction advantages and performance details refer to “Did You Know?”: [www.vishay.com/doc?48567](http://www.vishay.com/doc?48567)

CASE SIZE	RESISTANCE RANGE (mΩ)	DIMENSIONS in inches (millimeters)					SOLDER PAD DIMENSIONS in inches (millimeters)		
		L	W	H	T1	T2	a	b	l
2010	10 to 500	0.200 ± 0.008 (5.08 ± 0.20)	0.100 ± 0.008 (2.54 ± 0.20)	0.020 ± 0.006 (0.50 ± 0.15)	0.028 ± 0.008 (0.70 ± 0.20)	0.016 ± 0.006 (0.40 ± 0.15)	0.049 (1.25)	0.118 (3.00)	0.138 (3.50)
2512	10 to 500	0.250 ± 0.012 (6.35 ± 0.30)	0.125 ± 0.008 (3.18 ± 0.20)	0.020 ± 0.006 (0.50 ± 0.15)	0.035 ± 0.008 (0.90 ± 0.20)	0.020 ± 0.008 (0.50 ± 0.20)	0.061 (1.55)	0.142 (3.60)	0.173 (4.40)

PRODUCT	RESISTANCE RANGE (Ω)	THERMAL RESISTANCE (°C/W)	ALLOY
WFMA2010	0.01 to 0.0329	< 30	Mn-Cu
WFMB2010	0.033 to 0.5	< 55	Ni-Cr
WFMA2512	0.01 to 0.0329	< 25	Mn-Cu
WFMB2512	0.033 to 0.5	< 40	Ni-Cr

**PULSE ENERGY AND POWER VS. TIME**

**Notes**

- Data is valid for 33 mΩ. Other resistance values require separate testing
- Continuous pulse chart is tested using a square wave pulse of 10 % duty cycle, not exceeding 0.5 % resistance change

**DERATING - TERMINAL TEMPERATURE**


<b>PERFORMANCE</b>				
<b>TEST</b>	<b>CONDITIONS OF TEST</b>	<b>TEST LIMITS</b>	<b>TYPICAL PERFORMANCE <sup>(1)</sup></b>	
			<b>CuMn</b>	<b>NiCr</b>
Thermal shock	-55 °C to +150 °C, 2000 cycles, 15 min at each extreme	± 0.5 %	-0.3 %	+0.15 %
Low temperature storage	-65 °C for 24 h	± 0.1 %	± 0.5 %	+0.05 %
High temperature exposure	2000 h at +170 °C	± 1.0 %	-0.18 %	+0.15 %
Bias humidity	+85 °C, 85 % RH, 10 % power, 1000 h	± 0.5 %	+0.1 %	+0.05 %
Mechanical shock	100 g's for 6 ms, 5 pulses	± 0.2 %	± 0.5 %	± 0.5 %
Vibration	Frequency varied 10 Hz to 2000 Hz in 1 min, 3 directions, 12 h	± 0.2 %	± 0.5 %	± 0.5 %
Load life	2000 h at maximum terminal temperature at rated power	± 0.7 %	-0.1 %	+0.1 %
Resistance to solder heat	+260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence	± 0.3 %	+0.15 %	± 0.5 %
Moisture resistance	MIL-STD-202, method 106, 0 % power, 7b not required	± 0.3 %	+0.1 %	+0.05 %

**Note**

<sup>(1)</sup> Typical performance is based on summary statistics from qualification data. Performance may vary based on application operating conditions



PACKAGING				
MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WFMA2010	12 mm / embossed plastic	178 mm / 7"	4000	EA
WFMB2010	12 mm / embossed plastic	178 mm / 7"	4000	EA
WFMA2512	12 mm / embossed plastic	178 mm / 7"	2000	EA
WFMB2512	12 mm / embossed plastic	178 mm / 7"	2000	EA

**Notes**

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



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