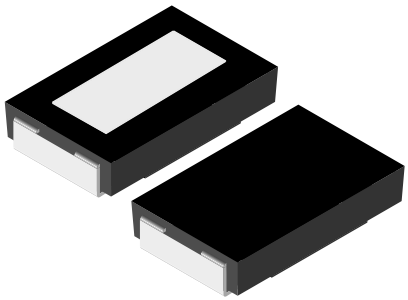
Power Metal Strip® Resistors, Low Value (Down to 0.001 Ω), Surface Mount



FEATURES

- Molded high temperature encapsulation
- 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 (down to 0.001 Ω)
- Sulfur resistance by construction that is unaffected by high sulfur environments
- Solid metal nickel-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)
- Integral heat sink not utilized for resistance values less than 0.0075 Ω
- AEC-Q200 qualified (1)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free Available

RoHS* Available

HALOGEN FREE Available

GREEN (5-2008) Available

LINKS TO ADDITIONAL RESOURCES

3D Models | Design Tools | Calculators

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

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

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SIZE	POWER RATING $P_{70\,°C}$ W	RESISTANCE VALUE RANGE Ω		WEIGHT (typical) g/1000 pieces
			TOL. ± 0.5 %	TOL. ± 1.0 %	
WSR5	4527	5.0 (1)	0.01 to 0.3	0.001 to 0.3	476

Notes

- Qualified to AEC-Q200 rev. D
- Part marking: DALE, model, value, tolerance, date code

(1) The WSR5 is rated at 5 W with terminal temperature maintained ≤ 120 °C

GLOBAL PART NUMBER INFORMATION

Global Part Numbering Example: WSR5R0100FEA (preferred part numbering format)
(visit www.vishay.net Vishay Dale parts numbering manual for all options)

W	S	R	5	R	0	1	0	0	F	E	A		

GLOBAL MODEL	RESISTANCE VALUE (1)	TOLERANCE CODE	PACKAGING CODE (2)	SPECIAL (3)
WSR5	**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 **EK** = lead (Pb)-free, bulk **TA** = tin / lead, tape / reel (R86) **BA** = tin / lead, bulk (B43)	(dash number) (up to 2 digits) from **1 to 99** as applicable

Notes

(1) WSR marking (www.vishay.com/doc?30327)

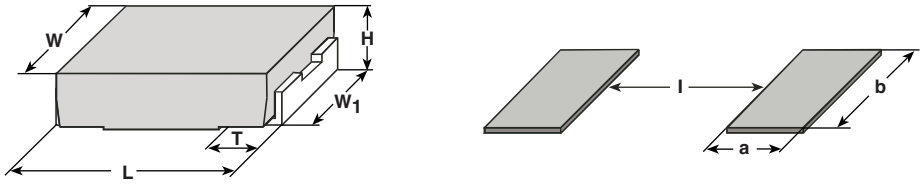
(2) Packaging code: EB (lead (Pb)-free) and TB (tin / lead) are non-standard packaging codes designating 1000 piece reels. These non-standard packaging codes are identical to our standard EA (lead (Pb)-free) and TA (tin / lead), except that they have a package quantity of 1000 pieces

(3) Follow link for customization capabilities: www.vishay.com/doc?48163

For technical questions, contact: ww2bresistors@vishay.com

TECHNICAL SPECIFICATIONS		
PARAMETER	**UNIT**	**WSR5 RESISTOR CHARACTERISTICS**
Temperature coefficient measured from -55 °C to +150 °C	ppm/°C	± 75 for 0.01 Ω to 0.3 Ω
		± 110 for 0.005 Ω to 0.0099 Ω
		± 300 for 0.004 Ω to 0.0049 Ω
		± 450 for 0.003 Ω to 0.0039 Ω
		± 600 for 0.002 Ω to 0.0029 Ω
		± 750 for 0.001 Ω to 0.0019 Ω
Element TCR	ppm/°C	< 20
Dielectric withstanding voltage	V_{AC}	> 500
Insulation resistance	Ω	> 10^9
Operating temperature range	°C	-65 to +275
Maximum working voltage	V	$(P \times R)^{1/2}$

DIMENSIONS in inches (millimeters)



Notes

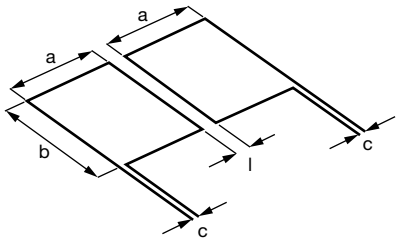
- 3D models available: www.vishay.com/doc?30342
- Surface mount solder profile recommendations: www.vishay.com/doc?31052

MODEL	DIMENSIONS					SOLDER PAD DIMENSIONS		
	L	H	T	W	W_1	a	b	l
WSR5	0.455 ± 0.032 (11.56 ± 0.813)	0.095 ± 0.005 (2.41 ± 0.127)	0.100 ± 0.010 (2.54 ± 0.254)	0.275 ± 0.005 (6.98 ± 0.127)	0.215 ± 0.005 (5.46 ± 0.127)	0.155 (3.94)	0.230 (5.84)	0.205 (5.21)

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

TYPICAL SENSING LAYOUT

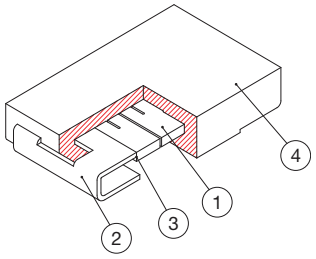


a	b	c	l
0.155 (3.94)	0.230 (5.84)	0.020 (0.51)	0.205 (5.21)

CONSTRUCTION

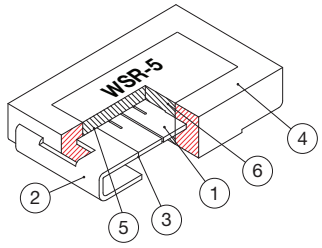
All Resistance Values

1. Resistive element
2. Plated copper terminal
3. Terminal / element weld
4. High temperature LCP mold compound

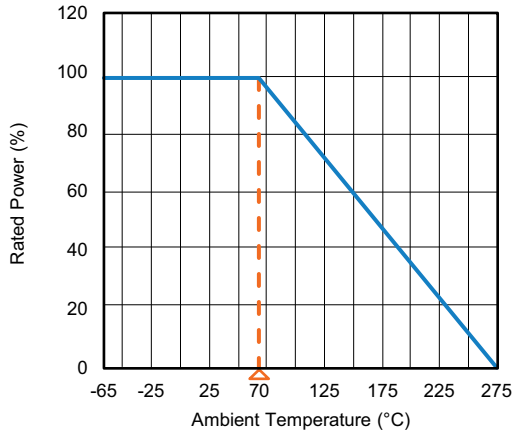


≥ 0.0075 W Includes Heat Spreader

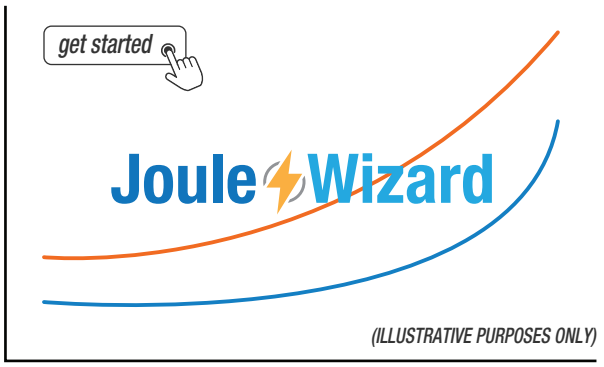
5. Thermally conductive adhesive
6. Heat spreader



DERATING



PULSE CAPABILITY



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

PERFORMANCES		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal shock	-55 °C to +150 °C, 1000 cycles, 15 min at each extreme	± 0.5 %
Short time overload	3 x rated power for 5 s	± 2.0 %
Low temperature storage	-65 °C for 24 h	± 0.5 %
High temperature exposure	1000 h at + 275 °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	± 2.0 %
Resistance to solder heat	260 ± 3 °C 10 s to 12 s dwell, 25 mm/s emergence	± 0.5 %
Moisture resistance	MIL-STD-202, method 106, 0 % power, 7a and 7b not required	± 0.5 %

PACKAGING (1)				
MODEL	REEL			
	TAPE WIDTH	DIAMETER	PIECES/REEL	CODE
WSR5	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

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	www.vishay.com/doc?30380
Temperature Coefficient of Resistance for Current Sensing	www.vishay.com/doc?30405

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