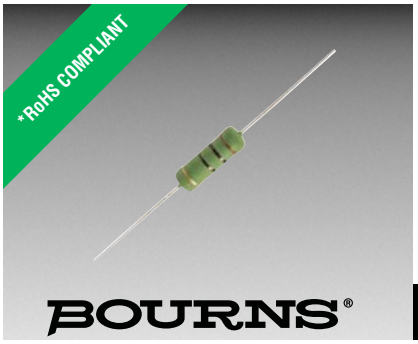

Features

- Surge withstand IEC 61000-4-5 1.2/50 µs
- Low thermal resistant ceramic core
- E24 resistance values
- RoHS compliant*
- Wide power range (1~8 W)
- Coating material meets UL 94V-0 requirements

Applications

- Smart meters
- Renewable energy
- Industrial
- Power supplies/chargers
- Lighting
- Instruments/gauges
- White goods

WS Series High Surge Withstand Wirewound Resistor

Electrical Characteristics

Resistance Range ..... See Popular Resistance Values Table
Power Rating @ 70 °C
- WS1M, WS1A ..... 1 W
- WS2M, WS2A ..... 2 W
- WS3M, WS3A ..... 3 W
- WS5M, WS5A ..... 5 W
- WS7M, WS7A ..... 7 W
- WS8M ..... 8 W

Tolerance ..... 5 %
Operating Temperature ..... -55 °C to +200 °C
Temperature Coefficient ..... ±200 ppm/°C
Maximum Voltage ..... $\sqrt{P*R}$

Popular Resistance Values

Code	R Value
15R0	15 Ω
20R0	20 Ω
22R0	22 Ω
33R0	33 Ω
47R0	47 Ω

Code	R Value
68R0	68 Ω
1500	150 Ω
1001	1K Ω
3301	3.3K Ω

Other E24 resistance values available upon request.

Physical Characteristics

Resistor ..... Low thermal resistant ceramic core
Lead Wire ..... Tin-plated copper wire
Coating Material ..... Meets UL 94V-0 requirements

How to Order

WS 3 M 22R0 J

Product Series
- WS = Wirewound, High Surge Withstand

Power Rating
- 1 = 1 Watt
- 2 = 2 Watts
- 3 = 3 Watts
- 5 = 5 Watts
- 7 = 7 Watts
- 8 = 8 Watts

Pin Style
- A = Axial Standard Version
- M = Axial Miniaturized Version

Resistance Code
- R<100 ohms: "R" represents decimal point (example: 22R0 = 22 ohms)
- R≥100 ohms: First three digits are significant, fourth digit represents number of zeros to follow (example: 1001 = 1K ohms)

Resistance Tolerance
- J = ±5 %

Environmental Characteristics

Test	Conditions	Specification
Short Time Overload	10 times rated power for 5 seconds.	ΔR≤±(5 % ± 0.05 Ω)
Solderability	245 ±3 °C for 2.5 ±0.5 seconds.	Over 95 % coverage
Resistance to Solder Heat	260 ±5 °C for 10 ± 1 seconds.	ΔR≤±(1 % + 0.05 Ω)
Temperature Cycle	5 cycles, -55 °C ±3 °C for 30 minutes, Room temperature for 15 minutes, +155 ±2°C for 30 minutes, Room temperature for 15 minutes	ΔR≤±(2 % + 0.05 Ω)
Dielectric Strength	Test voltage >500 Vrms for >1 minute.	Pass
Insulation Resistance	Test voltage >500 Vrms for 1 minute.	$>10^9$ Ω
Load Life Humidity	Rated continuous voltage for 1000 hours, 1.5 hours ON and 0.5 hours OFF at 90~95 % relative humidity and test temperature of 40 °C ±2 °C.	ΔR≤ ±(5 % + 0.05 Ω)
Load Life	Rated continuous voltage for 1000 hours, 1.5 hours ON and 0.5 hours OFF at a test temperature of 70 °C ±2 °C. 1000 hours at rated power.	ΔR≤±(5 % + 0.05 Ω)
Surge	IEC 61000-4-5 1.2/50 µs exponential.	ΔR≤ ±(5 % + 0.05 Ω)

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

WS Series High Surge Withstand Wirewound Resistor

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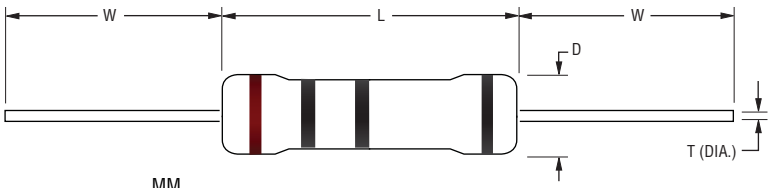
Product Dimensions

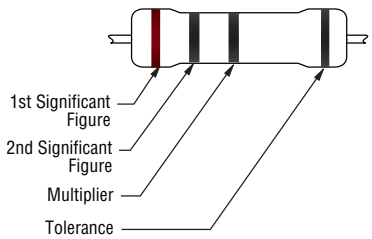


DIMENSIONS: MM / (INCHES)

Model	Dimensions			
	L*	D	W	T
WS1M	9.5 ± 1.0 (.374 ± .004)	4.5 ± 1.0 (.177 ± .004)	28.0 ± 3.0 (1.102 ± .118)	0.65 ± 0.05 (.026 ± .002)
WS1A	11.5 ± 1.0 (.453 ± .004)	5.0 ± 1.0 (.197 ± .004)	28.0 ± 3.0 (1.102 ± .118)	0.65 ± 0.05 (.026 ± .002)
WS2M	11.5 ± 1.0 (.453 ± .004)	5.0 ± 1.0 (.197 ± .004)	28.0 ± 3.0 (1.102 ± .118)	0.65 ± 0.05 (.026 ± .002)
WS2A	15.5 ± 1.0 (.610 ± .004)	5.5 ± 1.0 (.217 ± .004)	28.0 ± 3.0 (1.102 ± .118)	0.75 ± 0.05 (.030 ± .002)
WS3M	15.5 ± 1.0 (.610 ± .004)	5.5 ± 1.0 (.217 ± .004)	28.0 ± 3.0 (1.102 ± .118)	0.75 ± 0.05 (.030 ± .002)
WS3A	17.5 ± 1.0 (.689 ± .004)	6.5 ± 1.0 (.256 ± .004)	28.0 ± 3.0 (1.102 ± .118)	0.75 ± 0.05 (.030 ± .002)
WS5M	17.5 ± 1.0 (.689 ± .004)	6.5 ± 1.0 (.256 ± .004)	28.0 ± 3.0 (1.102 ± .118)	0.75 ± 0.05 (.030 ± .002)
WS5A	24.5 ± 1.0 (.965 ± .004)	8.5 ± 1.0 (.335 ± .004)	38.0 ± 3.0 (1.496 ± .118)	0.75 ± 0.05 (.030 ± .002)
WS7M	24.5 ± 1.0 (.965 ± .004)	8.5 ± 1.0 (.335 ± .004)	38.0 ± 3.0 (1.496 ± .118)	0.75 ± 0.05 (.030 ± .002)
WS7A	29.5 ± 1.0 (1.161 ± .004)	8.5 ± 1.0 (.335 ± .004)	38.0 ± 3.0 (1.496 ± .118)	0.75 ± 0.05 (.030 ± .002)
WS8M	29.5 ± 1.0 (1.161 ± .004)	8.5 ± 1.0 (.335 ± .004)	38.0 ± 3.0 (1.496 ± .118)	0.75 ± 0.05 (.030 ± .002)

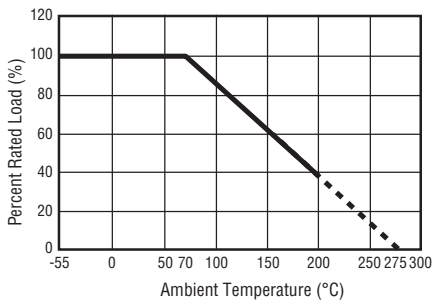
Typical Part Marking

Resistors shall be marked with color coding. Colors shall be in accordance with JIS C 0802.

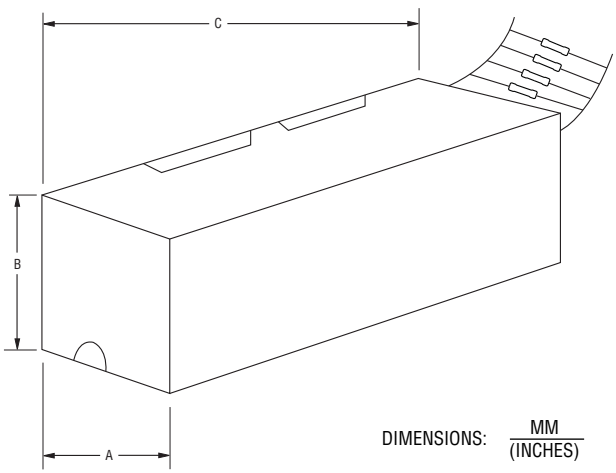


Color	1st Band	2nd Band	Multi-plier	Tol.
Black	0	0	1 Ω	
Brown	1	1	10 Ω	±1 %
Red	2	2	100 Ω	±2 %
Orange	3	3	1K Ω	
Yellow	4	4	10K Ω	
Green	5	5	100K Ω	±0.5 %
Blue	6	6	1M Ω	±0.25 %
Violet	7	7	10M Ω	±0.10 %
Grey	8	8		±0.05 %
White	9	9		
Gold			0.1 Ω	±5 %
Silver			0.01 Ω	±10 %

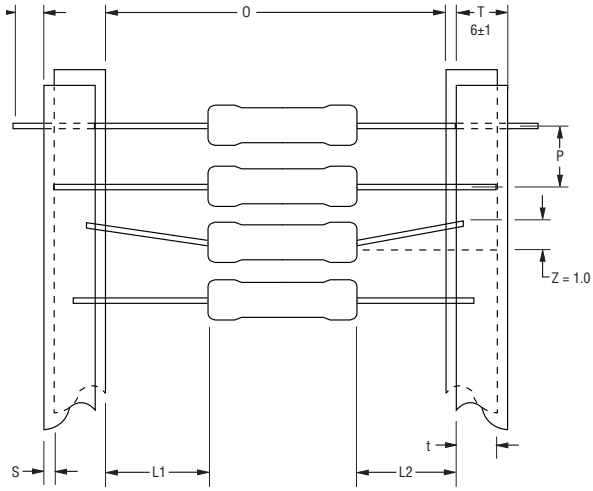
Power Derating Curve



Packaging Specifications



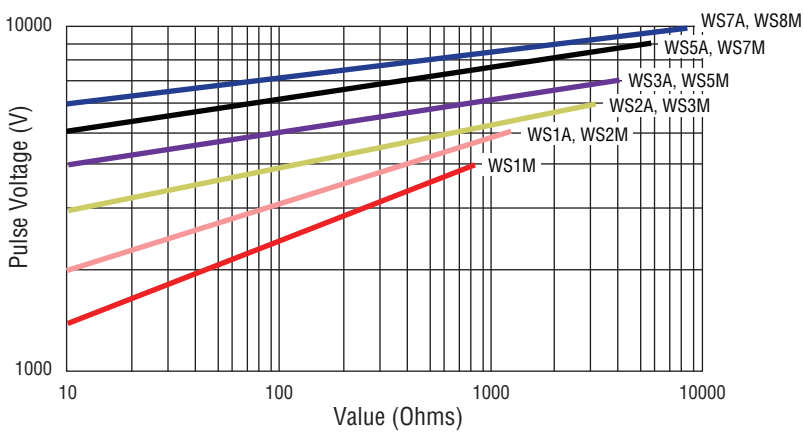
DIMENSIONS: MM / (INCHES)



Model	O	P	A	B	C	Pkg. Style	Min. Order Qty. (Pcs.)	Pcs./ Box
WS1M	58 ± 1 (2.283 ± .039)	5 ± 0.3 (.197 ± .012)	75 ± 5 (2.953 ± .197)	70 ± 5 (2.756 ± .197)	255 ± 5 (10.039 ± .197)	Ammo Pack	5,000	1,000
WS1A, WS2M	58 ± 1 (2.283 ± .039)	5 ± 0.3 (.197 ± .012)	80 ± 5 (3.150 ± .197)	82 ± 5 (3.228 ± .197)	255 ± 5 (10.039 ± .197)			
WS2A, WS3M	65 ± 5 (2.559 ± .197)	10 ± 0.5 (.394 ± .020)	90 ± 5 (3.543 ± .197)	119 ± 5 (4.685 ± .197)	255 ± 5 (10.039 ± .197)			
WS3A, WS5M	65 ± 5 (2.559 ± .197)	10 ± 0.5 (.394 ± .020)	90 ± 5 (3.543 ± .197)	88 ± 5 (3.465 ± .197)	255 ± 5 (10.039 ± .197)		2,000	500
WS5A, WS7M	90 ± 5 (3.543 ± .197)	10 ± 0.5 (.394 ± .020)	115 ± 5 (4.528 ± .197)	124 ± 5 (4.882 ± .197)	500 ± 5 (19.685 ± .197)			

For WS7A and WS8M packaging specifications, please contact factory.

Surge Performance - 1.2/50 μs Pulse Withstanding Curve



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08/15