



Features

- Surge withstand IEC 61000-4-5 1.2/50 μ s
- 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	$\sqrt{P \cdot R}$

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

Environmental Characteristics

Test	Conditions	Specification
Short Time Overload	10 times rated power for 5 seconds.	$\Delta R \leq \pm(5 \% \pm 0.05 \Omega)$
Solderability	245 ± 3 °C for 2.5 ± 0.5 seconds.	Over 95 % coverage
Resistance to Solder Heat	260 ± 5 °C for 10 ± 1 seconds.	$\Delta R \leq \pm(1 \% + 0.05 \Omega)$
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	$\Delta R \leq \pm(2 \% + 0.05 \Omega)$
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.	$\Delta R \leq \pm(5 \% + 0.05 \Omega)$
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.	$\Delta R \leq \pm(5 \% + 0.05 \Omega)$
Surge	IEC 61000-4-5 1.2/50 μ s exponential.	$\Delta R \leq \pm(5 \% + 0.05 \Omega)$

How to Order

Product Series	WS 3 M 22R0 J
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) $R \geq 100$ ohms: First three digits are significant, fourth digit represents number of zeros to follow (example: 1001 = 1K ohms)
Resistance Tolerance	J = ± 5 %

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

Specifications are subject to change without notice.

The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time. Users should verify actual device performance in their specific applications.

WS Series High Surge Withstand Wirewound Resistor

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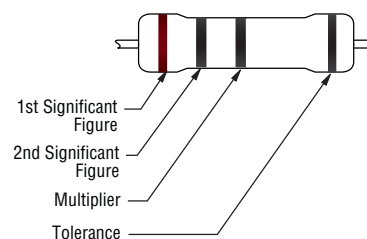
Product Dimensions



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

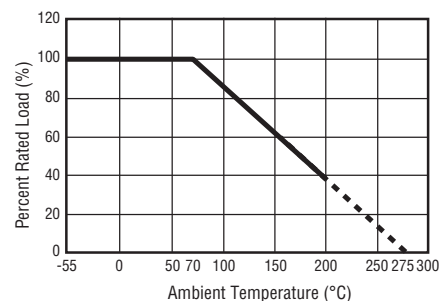
Typical Part Marking

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



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

Power Derating Curve

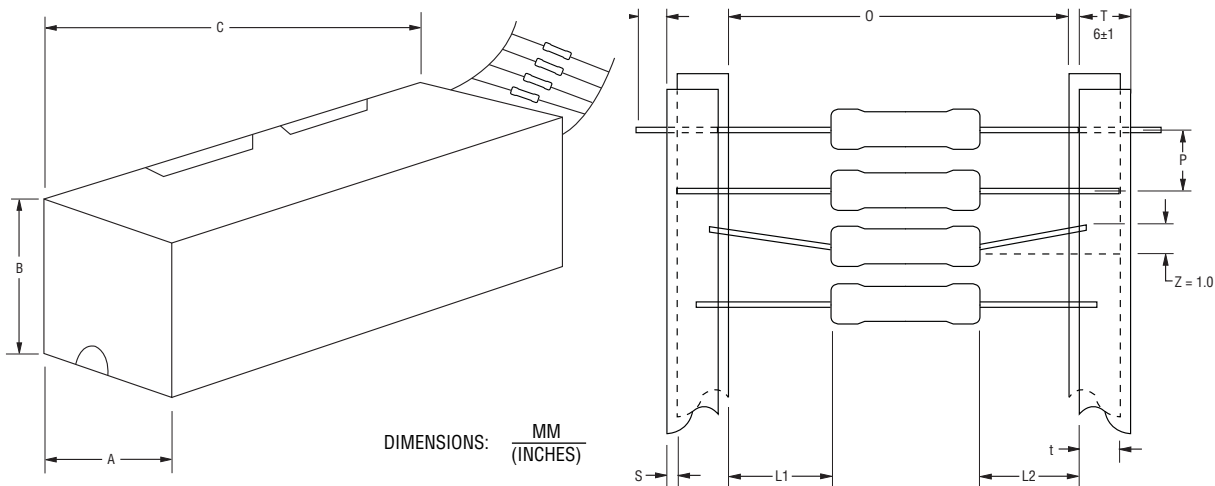


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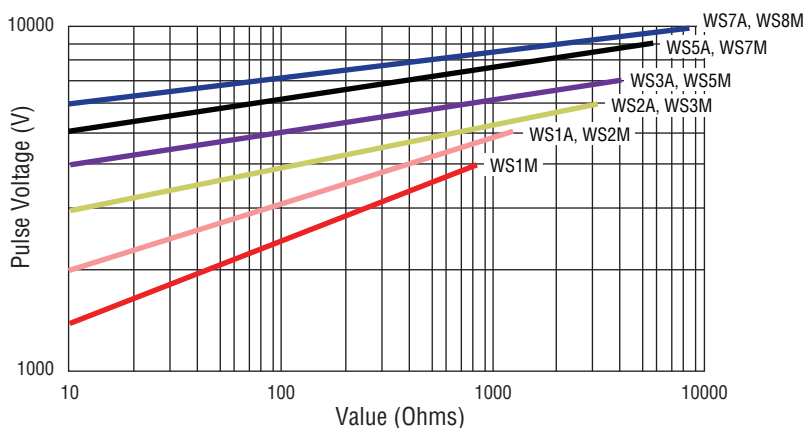
Packaging Specifications



Model	O	P	A	B	C	Pkg. Style	Min. Order Qty. (Pcs.)	Pcs./ Box
WS1M	58 ± 1 (2.283 ± .039)	5 ± 0.3 (.197 ± .112)	75 ± 5 (2.953 ± .197)	70 ± 5 (2.756 ± .197)	255 ± 5 (10.039 ± .197)	Ammo Pack	5,000	1,000 pcs.
WS1A, WS2M	58 ± 1 (2.283 ± .039)	5 ± 0.3 (.197 ± .112)	80 ± 5 (3.150 ± .197)	82 ± 5 (3.228 ± .197)	255 ± 5 (10.039 ± .197)			
WS2A, WS3M	65 ± 5 (2.559 ± .197)	10 ± 0.3 (.393 ± .112)	90 ± 5 (3.543 ± .197)	119 ± 5 (4.685 ± .197)	255 ± 5 (10.039 ± .197)			
WS3A, WS5M	65 ± 5 (2.559 ± .197)	10 ± 0.3 (.393 ± .112)	90 ± 5 (3.543 ± .197)	88 ± 5 (3.465 ± .197)	255 ± 5 (10.039 ± .197)		2,000	500 pcs.
WS5A, WS7M	90 ± 5 (3.543 ± .197)	10 ± 0.3 (.393 ± .112)	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 μ s Pulse Withstanding Curve



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