

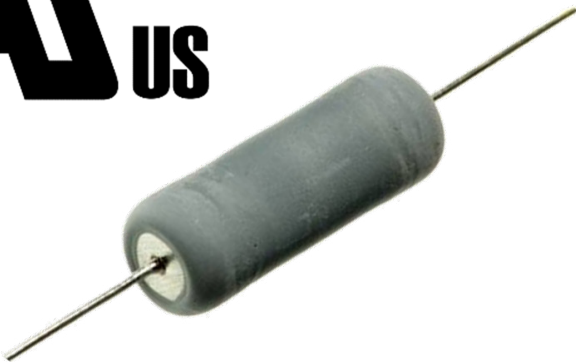
Wirewound High Surge UL Recognised Fusible Resistors

WHS-UL Series



Features

- Enhanced surge & pulse energy capacity
- UL1412 recognised fusible resistor (UL file E234469)
- Failsafe fusing at 120 / 240Vrms
- UL94-V0 flameproof coating
- Leadform options including surface mountable



All Pb-free parts comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

Electrical Data

		WHS2UL	WHS3UL	WHS5UL
Power rating at 25°C	W	2	3	5
5s overload rating at 25°C	W	10	15	25
Short pulse performance		See pulse performance graphs		
Resistance range	ohms	10R- 100R		
Resistance tolerance	%	<20R: 5 ≥20R: 1, 2, 5		
TCR	ppm/°C	±200		
Isolation voltage of insulation	V	250	350	500
Standard values		E24 preferred		
Thermal impedance	°C/W	110	82	54
Ambient temperature range	°C	-55 to +155		

Physical Data

Dimensions (mm) & weight (g)									
Type	L max	D max	F min	d nom	PCB mount centres	Min bend radius	Wt. nom		
WHS2UL	9.0	3.8	19.8	0.8	12.5	1.2	0.5		
WHS3UL	14.5	5.8	24.6		20.0		1.1		
WHS5UL	16.5	7.2	23.6		22.0		1.75		

Construction

A high purity ceramic substrate is assembled with interference fit end caps to which are welded the terminations. The resistive element is wound on the substrate and welded to the caps. Flameproof silicone cement coating is applied prior to marking with indelible ink. The components are then lead-formed if required and packed.

Terminations

Material: Hot tin dipped copper wire

Strength: The terminations meet the requirements of IEC 68.2.21

Solderability: The terminations meet the requirements of IEC 115-1 Clause 4.17.3.2

General Note

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Solvent Resistance

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

Marking

WHS2UL and WHS3UL resistors are marked with four colour bands in conformance with IEC62. WHS5UL resistors are legend marked with type reference, resistance value and tolerance.

Flammability

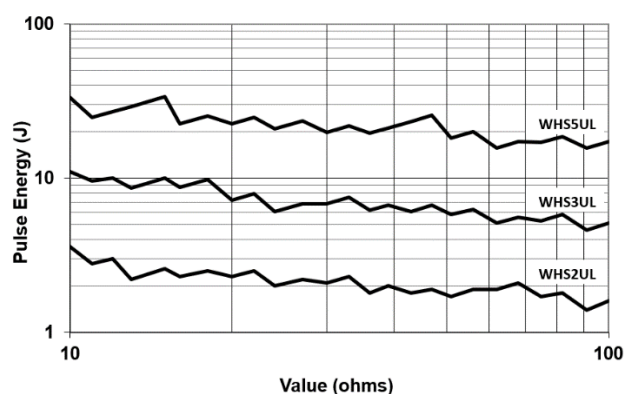
The resistor coating will not burn or emit incandescent particles under any condition of applied temperature or power overload.

Performance Data

		Maximum	Typical
Load at rated power: 1000 hours @25°C	±ΔR%	5	3
Dry heat: 1000 hours @ 200°C	±ΔR%	5	3
Short term overload: 5 x rated power for 5s	±ΔR%	5	1
Derating from rated power @25°C		Zero at 280°C (See Thermal Performance graphs).	
Climatic	±ΔR%	5	2
Climatic category		55/200/56	
TRC & vibration	±ΔR%	5	1
Robustness & solder heat	±ΔR%	5	1
Long term damp heat	±ΔR%	5	1

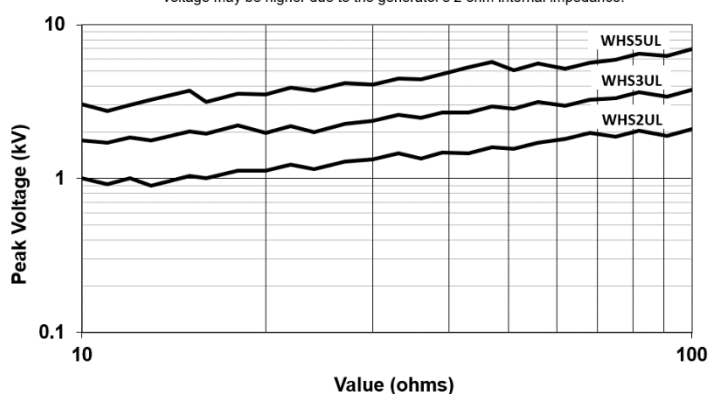
Pulse Performance

Surge / Pulse Energy Capacity
(single or low repetition rate, ΔR<5%)



1.2/50μs Peak Voltage Limit
(10 pulses at 30s intervals, ΔR<5%)

Note the voltage shown is the nett voltage across the resistor. The generator open circuit voltage may be higher due to the generator's 2 ohm internal impedance.



General Note

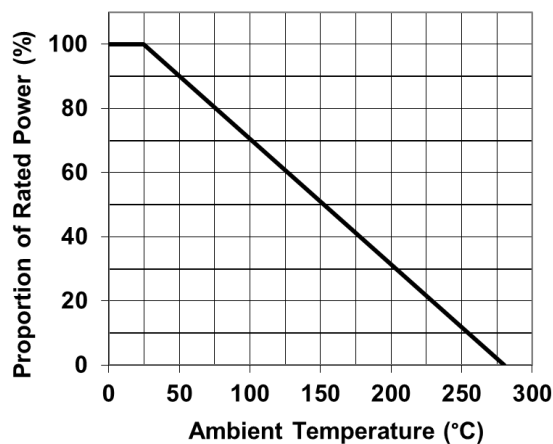
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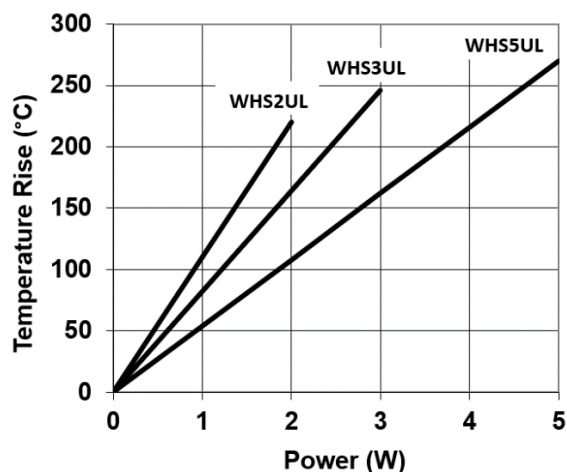
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Thermal Performance

Derating Curve

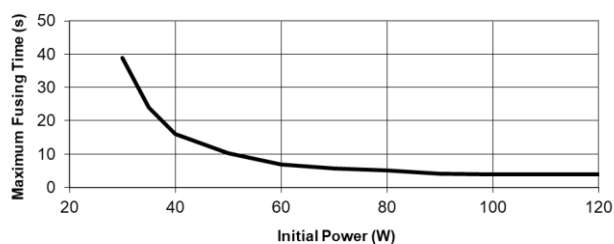


Body Temperature Rise

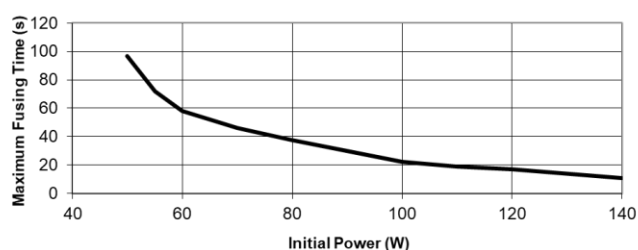


Fusing Performance

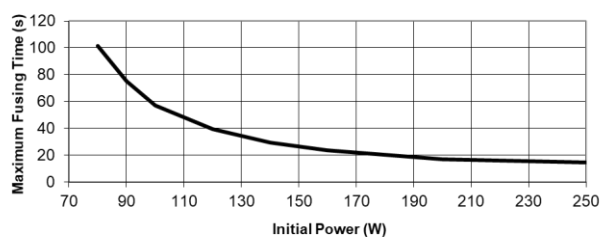
WHS2UL Fusing Characteristic



WHS3UL Fusing Characteristic



WHS5UL Fusing Characteristic



Notes

1. Typical fusing times are around 1/3 of the maximum figures.
2. After fusing the resistance value is >100 times the initial nominal value, provided the initial power is at least 20 x rated power.
3. Suitable for fusing at voltages up to 264Vrms.

General Note

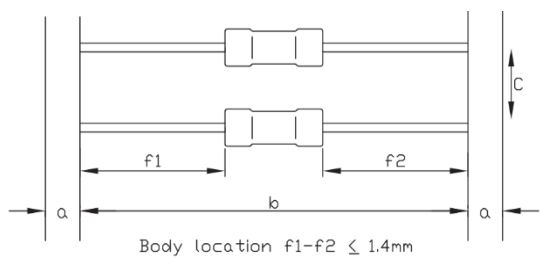
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Packaging

The standard packaging for axial WHS-UL is taped. The critical dimensions are shown below. The component wires will not protrude beyond the outside edge of the tapes. Taped product is then packed into boxes or onto reels. See Ordering Procedure for quantities.

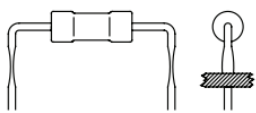
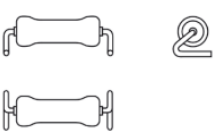
Dimensions (mm)	a	b	c	
WHS2UL	6	52	5	
WHS3UL	6	67	10	
WHS5UL	6	63	10	

Application Notes

1. If the resistors are to dissipate full rated power, it is recommended that the terminations should not be soldered closer than 4mm from the body.
2. Due to operating temperature limits imposed by some PCB materials, derating may be necessary. The surface temperature rise at the centre of the body is shown under Thermal Performance.
3. For the purposes of UL approval, the following points should be observed:
 - 3.1 To protect against fire under all conditions of overload, a positive clearance of at least 13mm should be provided between the resistor body and any combustible materials.
 - 3.2 A positive clearance of 13mm should be provided between the resistor body or terminations and uninsulated parts of opposite polarity or uninsulated dead metal parts.
 - 3.3 Limited Short Circuit testing should be performed in the complete appliance.

Leadforming Options

1. WHS-UL resistors can be supplied with goalpost or lancet pre-formed leads. Hairpin form is also available on WHS2UL and WHS3UL only. For dimensions and ordering details see: <https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/ApplicationNotes/TN008-resistors-Leadform-Capability.pdf>.
2. WHS-UL resistors are also available in an SMD format with ZI formed leads, packed in blister tape. For dimensions and ordering details see: <https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/Datasheets/ZI-form.pdf>

Hairpin	Goalpost	Lancet	ZI-form
			

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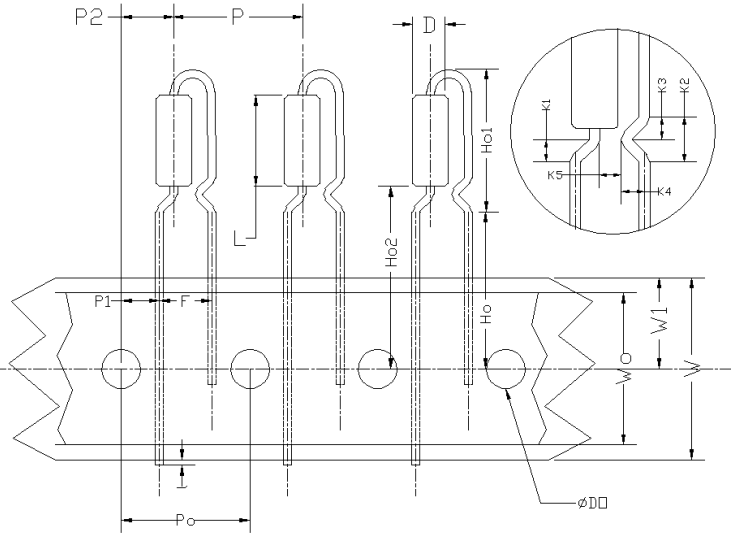
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3. A radial taped version is also available for WHS3UL only as shown below.

Radial Taped Dimensions (mm)		
Dimension	Notation	WHS3ULR
Component body length	L	14.5 max
Component body diameter	D	5.8 max
Terminal lead diameter	d	0.8 nom
Component pitch	P	12.7±1.0
Hole pitch	Po	12.7±0.3
Component to hole offset	P1	3.85±0.7
	P2	6.35±1.3
Lead pitch	F	5.0±1.0
Width of backing strip	W	18.0±1.0
Position of hole	W1	9.0±0.5
Diameter of hole	Do	4.0±0.3
Height to lead form	Ho	17.0±1.0
Height from lead form	Ho1	23.0 max
Height to resistor	Ho2	18.0 min
Width of adhesive tape	W0	15.0±0.5
Length of protrusion	l	2.5 max
Form dimensions	K1	2.0±0.3
	K2	3.0±0.5
	K3	1.5±0.25
	K4	1.0±0.2
	K5	2.0 min



The technical drawing illustrates the WHS3ULR radial taped resistor. It shows a side view with dimensions: P2, P, D, Ho1, Ho2, Ho, P1, F, W1, W0, Do, and l. A circular inset provides a detailed view of the lead form with dimensions K1, K2, K3, K4, and K5. The drawing also shows the resistor body with a diameter of 5.8 max and a length of 14.5 max.

Ordering Procedure

Example: WHS2UL-100RJA25 (WHS2UL, 100 ohms ±5%, Pb-free)

W	H	S	2	U	L	-	1	0	0	R	J	A	2	5
1					2	3			4	5				

1 Type	2 Leadforming	3 Value	4 Tolerance	5 Packing	
WHS2UL	Omit for axial	3/4 characters R = ohms	F = ±1%	A25	WHS2UL Ammo pack, 2500/box
WHS3UL	R = Radial taped		G = ±2%	A1	WHS3UL Ammo pack, 1000/box
WHS5UL	(WHS3UL only)		J = ±5%	T075	WHS5UL Tape & reel, 750/reel

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