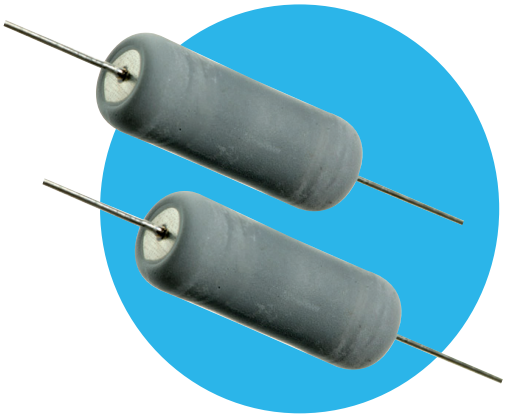
# Wirewound High Surge Resistors



**WHS Series**

- Enhanced surge & pulse energy capacity
- UL94-V0 flameproof protection
- Radial taped form available
- Surface mount ZI-form option
- Non inductive type available

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

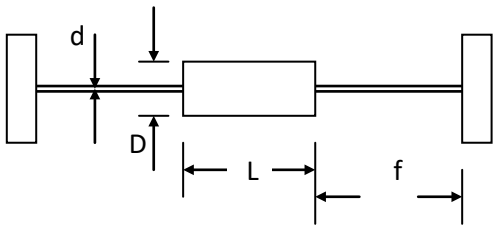
## Electrical Data

| | | WHS2 / WHSP2R | WHS3 | WHS5 | WHS7 | WHS10 | WHS10N* |
|---|---|---|---|---|---|---|---|
| Power rating at 25°C | watts | 2 | 3 | 5 | 7 | 10 | |
| 5s overload rating at 25°C | watts | 10 | 15 | 25 | 35 | 50 | |
| Short pulse performance | | See Pulse Performance graphs | | | | | |
| Resistance range | ohms | 1R0-330R | | | | 2R2-330R | 5R6-100R |
| TCR | ppm/°C | ±200 | | | | | |
| Isolation Voltage | volts | 250 | 350 | 500 | 700 | 1000 | |
| Resistance Tolerance | % | <20R: 5 ≥20R: 1, 2, 5 | | | | | 5% |
| Standard Values | | E24 preferred | | | | | |
| Thermal Impedance | °C/watt | 110 | 82 | 54 | 35 | 25 | |
| Ambient temperature range | °C | -55 to +155 | | | | | |

No Limiting Element Voltage applies to this series; the Rated Voltage is √(P.R).
*Non inductive (Ayrton Perry) winding

## Physical Data

| Dimensions (mm) & Weight (g) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type | L max | D max | f min | d max | PCB mount centres | Min bend radius | Wt. nom |
| WHS2 | 9.0 | 3.6 | 19.80 | 0.81 | 12.70 | 1.2 | 0.50 |
| WHS3 | 14.5 | 5.2 | 24.55 | | 20.30 | | 1.10 |
| WHS5 | 16.5 | 7.0 | 23.55 | | 22.86 | | 1.75 |
| WHS7 | 25.0 | 8.8 | 28.30 | | 31.40 | | 4.40 |
| WHS10 | 51.0 | 10.5 | 26.00 | 1.01 | 55.88 | 1.5 | 8.80 |
| WHS10N | | 11.0 | | | | | 10.50 |




### 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 leadformed if required and packed.

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### 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

### Marking

WHS2, WHSP2R and WHS3 resistors are marked with four colour bands in conformance with IEC62.
The larger sizes are legend marked with type reference, resistance value and tolerance.

### Solvent Resistance

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

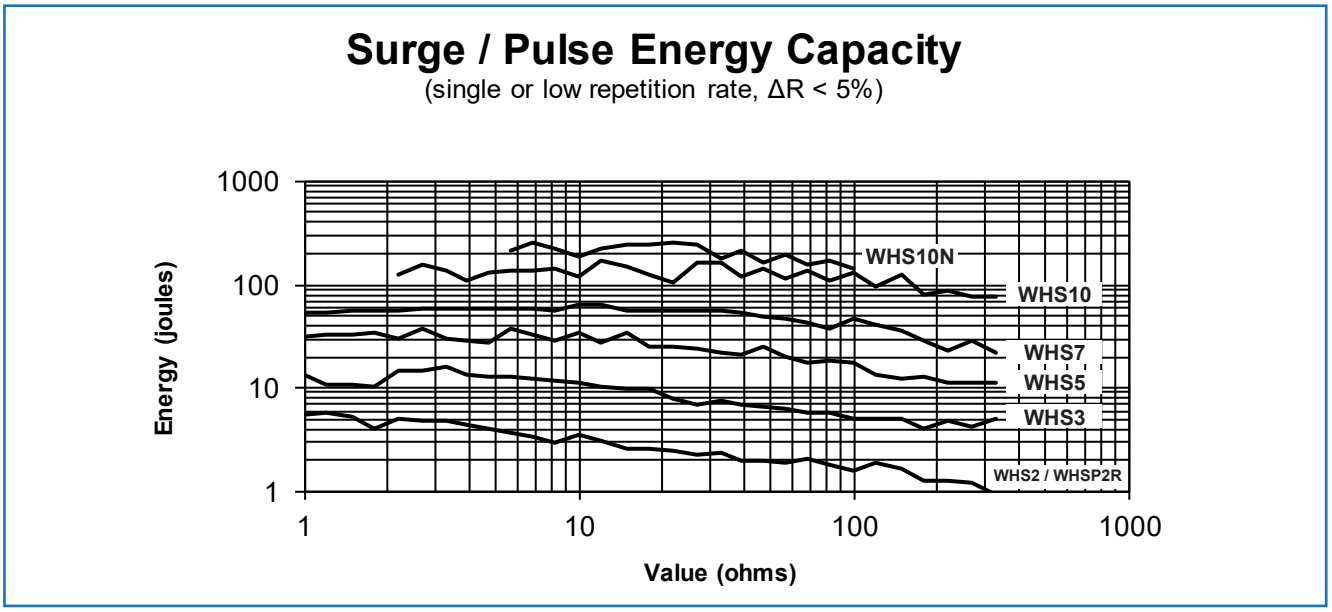
### Flammability

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: 1000hrs @ 25°C | ΔR% | 5 +0.001Ω | 3 |
| Dry heat: 1000hrs @ 200°C | ΔR% | 5 +0.001Ω | 3 |
| Short term overload | ΔR% | 5 +0.001Ω | 1 |
| Derating from rated power @25°C | | Zero at 280°C (See Thermal Performance graph). | |
| Climatic | ΔR% | 5 +0.001Ω | 2 |
| Climatic category | | 55/200/56 | |
| TRC & Vibration | ΔR% | 5 +0.001Ω | 1 |
| Robustness & solder heat | ΔR% | 5 +0.001Ω | 1 |
| Long term damp heat (56 days) | ΔR% | 5 +0.001Ω | 1 |

## Pulse Performance

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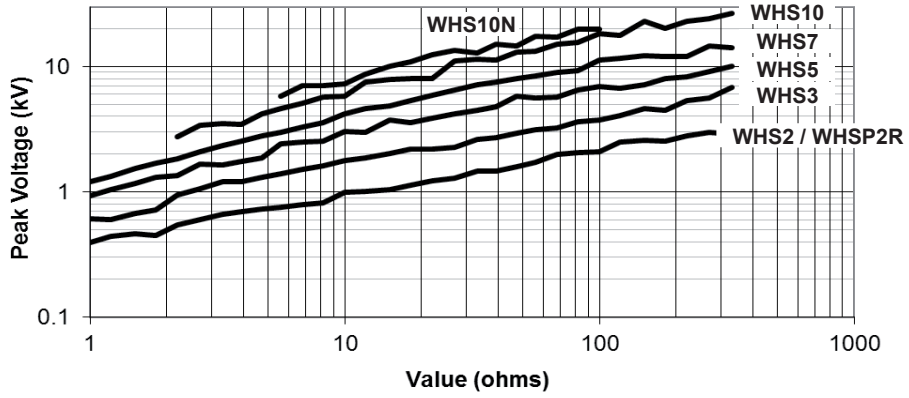
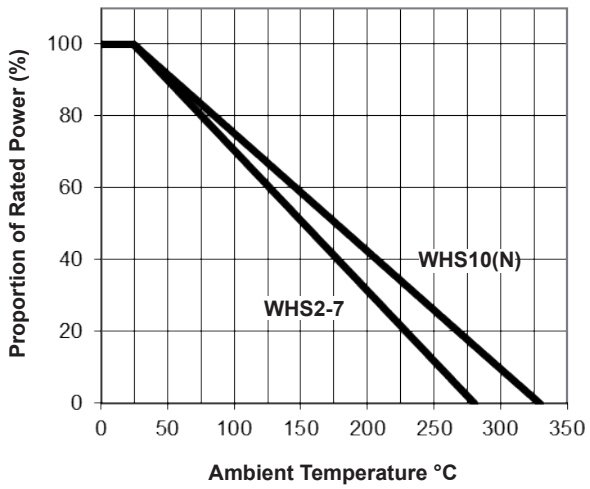
## 1.2/50µs Peak Voltage Limit

(10 pulses at 30s intervals, ΔR < 5%)
Note the voltage shown is the nett voltage across the resistor. At low values, the generator open circuit voltage will be higher due to the generator's 2 ohm internal impedance.

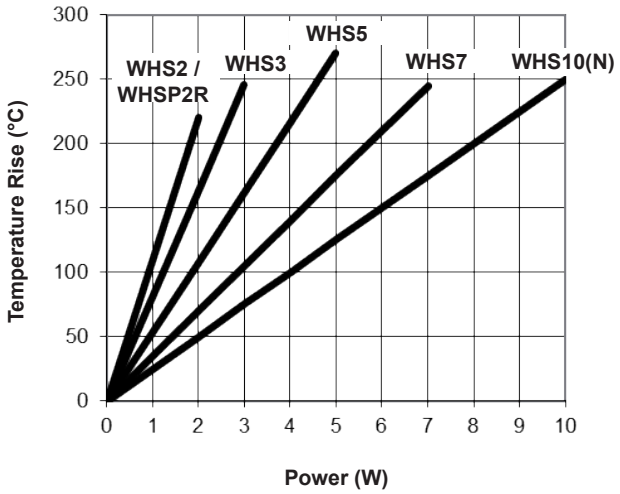



# Thermal Performance

### Derating Curve




### Body Temperature Rise




### 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. WHS2, WHS3, WHS5 resistors can also be supplied with goalpost or lancet pre-formed leads. Hairpin form is available on WHS2 and WHS3 only.

   WHS2, WHS3, and WHS5 are also available in an SMD format with ZI formed leads and packed in blister tape.
   For details see https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/Datasheets/ZI-form.pdf.

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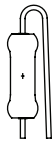
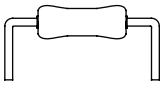
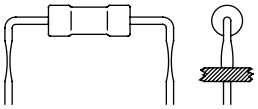
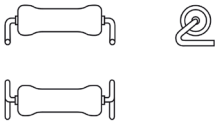
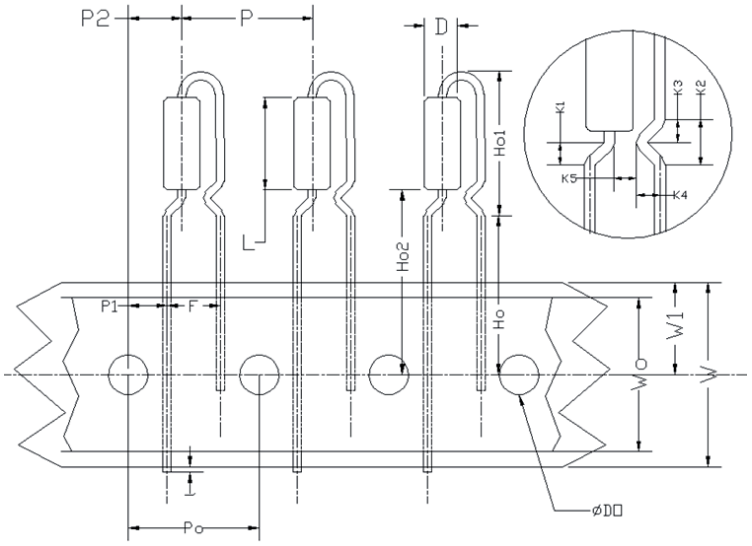
| Hairpin | Goalpost | Lancet | ZI-form |
|---|---|---|---|
|  |  |  |  |

Also a 2W and 3W radial taped version is available as shown below

| Radial Taped Dimensions (mm) | | | |
|---|---|---|---|
| Dimension | Notation | WHSP2R* | WHS3R |
| Component body length | L | 10.0 Max | 14.5 Max |
| Component body diameter | D | 4.0 Max | 5.8 Max |
| Terminal lead diameter | d | 0.8 Nom | |
| Component pitch | P | 12.7±0.5 | 12.7±1.0 |
| Hole pitch | Po | 12.7±0.2 | 12.7±0.3 |
| Component to hole offset | P1 | 3.85±0.3 | 3.85±0.7 |
| | P2 | 5.85±0.5 | 6.35±1.3 |
| Lead pitch | F | 5.0 +0.75 -0.34 | 5.0±1.0 |
| Width of backing strip | W | 18.0±0.3 | 18.0±1.0 |
| Position of hole | W1 | 9.0±0.25 | 9.0±0.5 |
| Diameter of hole | Do | 4.0±0.3 | |
| Height to lead form | Ho | 16.0±0.3 | 17.0±1.0 |
| Height from lead form | Ho1 | 17.0 Max | 23.0 Max |
| Height to resistor | Ho2 | 18.0 Min | |
| Width of adhesive tape | W0 | 15.0±0.5 | |
| Length of protrusion | I | <2.5 | |
| 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 |




* Although body dimensions differ slightly, WHSP2R Performance and Electrical Data are identical to those of WHS2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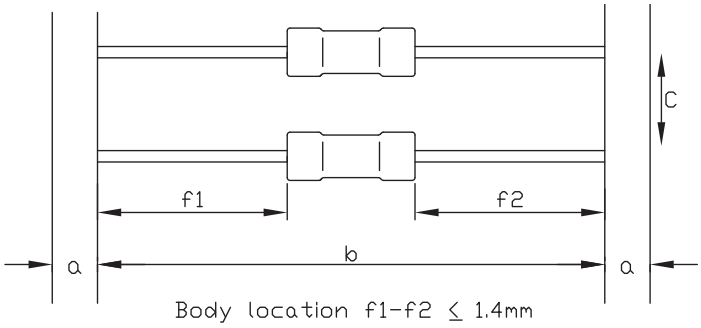
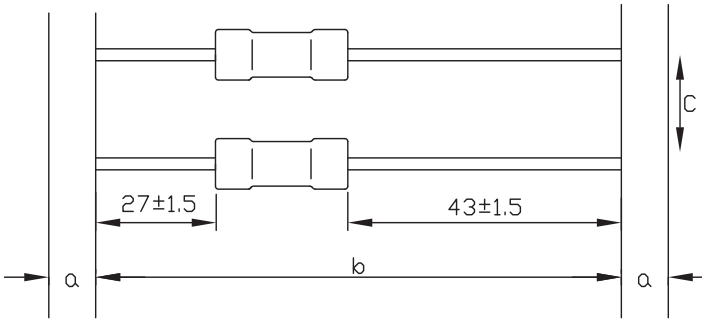
## Packaging

The standard packaging for WHS 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 details. Alternative packaging is available by request. Pre-formed resistors are supplied loose packed in plastic bags or boxes.

| Dimensions mm | a | b | c |
|---|---|---|---|
| WHS2 | 6 | 52 | 5 |
| WHS3 | 6 | 67 | 10 |
| WHS5 | 6 | 63 | 10 |
| WHS7 | 6 | 85 | 10 |
| WHS10 | 9 | 105 | 10 |
| WHS10N | 9 | 105 | 20 |




| Dimensions mm | a | b | c |
|---|---|---|---|
| WHS7U | 6 | 95 | 10 |




# Ordering Procedure

Example: WHS2-100RJA25 (WHS2, 100 ohms ±5%, Pb-free)

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

| 1 Type | 2 Variant | 3 Value | 4 Tolerance | 5 Packing | | |
|---|---|---|---|---|---|---|
| WHS2 | U = unequal lead length (WHS7 only) | 3/4 characters | F = ±1% | A25 | WHS2 | Ammo pack, 2500/box |
| WHS3 | | R = ohms | G = ±2% | A1 | WHS3 | Ammo pack, 1000/box |
| WHS5 | | | J = ±5% | T075 | WHS5 | Tape & reel, 750/reel |
| WHS7 | N = non-inductive (WHS10 only) | | | T07 | WHS7(U) | Tape & reel, 700/reel |
| WHS10 | | | | A02 | WHS10 | Ammo pack, 200/box |
| | | | | A01 | WHS10N | Ammo pack, 100/box |

**Example: WHSP2R-100RJT15** (WHSP2R radially formed & taped, 100 ohms ±5%, Pb-free)

| W | H | S | P | 2 | R | - | 1 | 0 | 0 | R | J | T | 1 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 2 | | 3 | | | 4 | 5 | | | |

| 1 Type | 2 Leadforming | 3 Value | 4 Tolerance | 5 Packing | | | |
|---|---|---|---|---|---|---|---|
| WHSP2 | R = Radial taped | 3/4 characters R = ohms | F = ±1% | T15 | WHSP2R | Tape & reel | 1500/reel |
| WHS3 | | | G = ±2% | A2 | WHS3R | Ammo pack | 2000/box |
| | | | J = ±5% | T1 | | Tape & reel | 1000/reel |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