

## Ultra-High Precision Hermetically Sealed Bulk Metal® Foil Technology Resistor with Zero TCR and 0.005 % Tolerance



Any value available within resistance range

Vishay has achieved an essentially zero temperature coefficient resistor in the VHP100 family. This oil filled hermetically sealed device makes unique use of foil on ceramic in such a way that self cancelling responses to temperature are produced by combining equal and opposite effects. This product is sold only in hermetic packages because applications requiring this level of temperature stability require humidity stability as well.

The value of the hermetic enclosure over the molded part is in the long term performance. The hermetic sealing prevents the ingress of moisture and oxygen, while the oil acts as a thermal conductor.

### WINDOW DEFINITION

The TCR of the VHP100 is so small that an additional definition - **window**, has been introduced. The window definition requires that the absolute resistance remain within the stated window over the temperature range specified. The resistance of the VHP100 resistor stays within a 60 ppm window over the entire military temperature range of - 55 °C to + 125 °C (Figures 1 and 3).

A window of 10 ppm is available for the laboratory instrument range (+ 15 °C to + 45 °C); see Figure 4 - type VHP101.

### TRACKING

Tracking of the VHP100 resistor is also vastly superior to conventional precision resistors. Typical  $\pm 5$  ppm/°C precision resistors have a worst-case tracking of 10 ppm/°C (wirewounds) or a difference between resistors of 1000 ppm (10 ppm/°C x 100 °C) when temperature changes from + 25 °C to + 125 °C. For a 3 ppm/°C tracking (Vishay S102C) the difference will be 300 ppm (3 ppm/°C x 100 °C) for the same temperature range. The VHP100 resistors will track to 60 ppm from - 55 °C to + 125 °C, a five-fold improvement over the S102C resistor.

### FEATURES

- Essentially Zero TCR: almost zero resistance/temperature effect
- Absolute Resistance Change (**window**):  
VHP100 < 60 ppm (- 55 °C to + 125 °C)  
VHP101 < 10 ppm (+ 15 °C to + 45 °C)
- Tolerance: to  $\pm 0.005$  %
- No Humidity Effect: Hermetically Sealed<sup>1)</sup> against Moisture
- Load Life Stability<sup>2)</sup>:  $\pm 20$  ppm typical for 2000 hours, 70 °C at 0.3 Watts
- Shelf Life Stability:  $\pm 2$  ppm after at least 10 years
- Resistance Range: 100  $\Omega$  to 150 k $\Omega$  (other values available on request)
- Electrostatic Discharge (ESD) above 25 000 Volts
- Non Inductive, Non Capacitive Design
- Current Noise: < - 40 dB
- Thermal EMF: 0.05  $\mu$ V/°C
- Voltage Coefficient: < 0.1 ppm/V
- Inductance: < 0.08  $\mu$ H
- Non Hot Spot Design
- Hermeticity:  $10^{-7}$  atmospheric cc/seconds max
- Terminal Finishes available: Lead (Pb)-free  
Tin/Lead Alloy

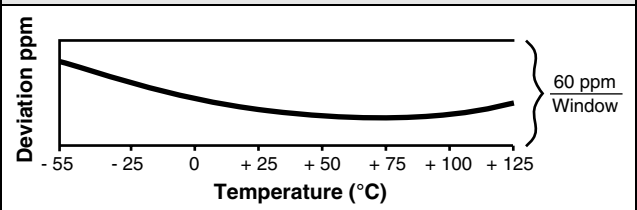


RoHS\*  
COMPLIANT

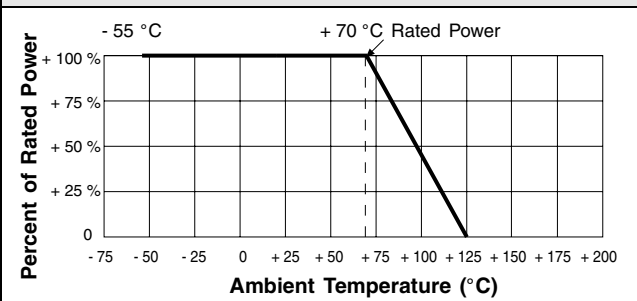
### Notes

1. Oil filled as standard. **Air filled available upon request.**
2. Load-life stability can be considerably improved through in-house oriented tests.

**FIGURE 1 - A TYPICAL VHP100 RESISTANCE TEMPERATURE CURVE**

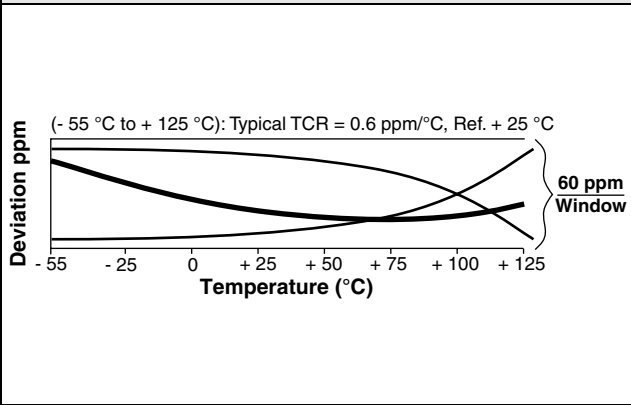


**FIGURE 2 - POWER DERATING CURVE**

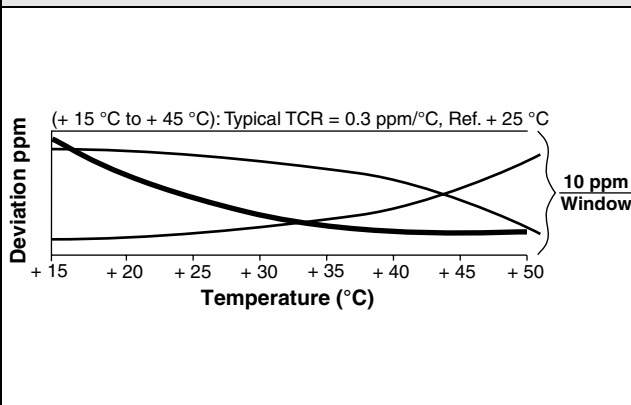


\* Pb containing terminations are not RoHS compliant, exemptions may apply

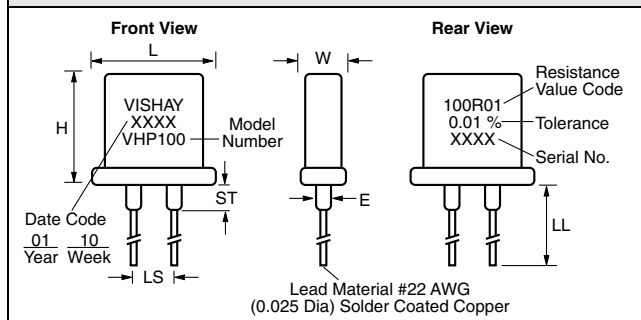
**FIGURE 3 - TYPICAL CURVES WITHIN THE 60 ppm WINDOW, VHP100 TCR FOR MIL RANGE**



**FIGURE 4 - TYPICAL CURVES WITHIN 10 ppm WINDOW, VHP101 LABORATORY INSTRUMENT RANGE**



**FIGURE 5 - STANDARD PRINTING**



TOLERANCE	RESISTANCE SPECIFIED IN SIGNIFICANT DIGITS
± 1.0 %	3
± 0.1 %	4
± 0.01 %	5
± 0.005 %	6

**Note**  
The number of significant digits of resistance accuracy to be printed on the resistor should be in accordance with the specified tolerance

**TABLE 1 - VHP100 SERIES DIMENSIONS**

		INCHES	mm
VHP100	W	0.185 ± 0.020	4.70 ± 0.51
	L	0.435 ± 0.020	11.05 ± 0.51
VHP101	H	0.430 ± 0.020	10.92 ± 0.51
	LL	1.000 ± 0.125	25.4 ± 3.18
	LS <sup>1)</sup>	0.150 ± 0.010	3.81 ± 0.25
	ST	0.100 Maximum	2.54 Maximum
	E	0.070 Maximum	1.78 Maximum

**Note**  
1. For 0.200 lead spacing, specify VHP102 (60 ppm) or VHP103 (10 ppm).

**TABLE 2 - VHP100 SPECIFICATIONS**

<b>Resistance Range</b>	100 Ω to 150 kΩ
<b>Tolerance at + 25 °C</b>	± 0.005 % to ± 1.0 %
<b>Power</b>	0.3 W at + 70 °C (see figure 2)
<b>Load Life Stability<sup>1)</sup></b> (for 2000 hours)	0.3 W at + 70 °C; ± 0.015 % (150 ppm) Maximum ΔR 0.15 W at + 125 °C; ± 0.015 % (150 ppm) Maximum ΔR
<b>Shelf-Life Stability</b>	± 0.0002 % (2 ppm) after 10 years
<b>Thermal EMF</b> Due to temperature difference between leads Due to self-heating at 0.1 W	0.05 μV/°C 0 to 1 μV
<b>High Frequency Operation</b> Rise/Decay Time Inductance (L) Capacitance (C)	1.0 ns for 1 kΩ without ringing 0.1 μH Maximum; 0.08 μH typical 1.0 pF Maximum; 0.5 pF typical
<b>Maximum Working Voltage</b>	300 V
<b>Voltage Coefficient</b>	< 0.1 ppm/V
<b>Current Noise</b>	< 0.010 μV (rms)/V (- 40 dB)
<b>Hermeticity</b>	10 <sup>-7</sup> atmospheric cc/seconds maximum

**Note**

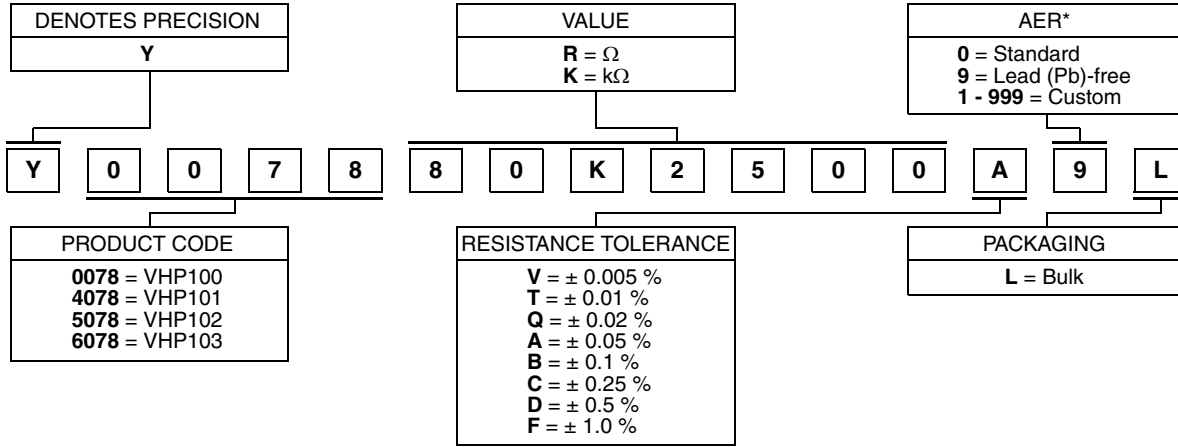
1. Load/life stability is considerably improved by reducing the temperature, power, or through in-house oriented tests



Ultra-High Precision Hermetically Sealed Bulk Metal® Foil Vishay Foil Resistors  
 Technology Resistor with Zero TCR and 0.005 % Tolerance

**TABLE 3 - GLOBAL PART NUMBER INFORMATION**

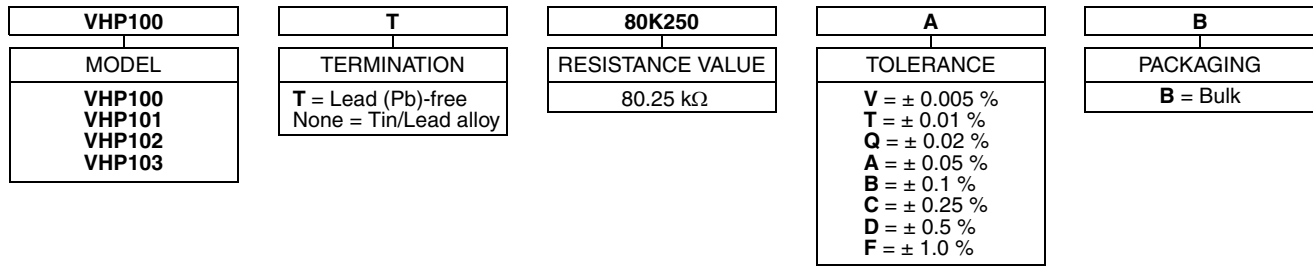
NEW GLOBAL PART NUMBER: Y007880K2500A9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y0078 80K2500 A 9 L:

TYPE: VHP100  
 VALUE: 80.25 kΩ  
 ABSOLUTE TOLERANCE: ± 0.05 %  
 TERMINATION: Lead (Pb)-free  
 PACKAGING: Bulk

HISTORICAL PART NUMBER: VHP100T 80K250 A B (will continue to be used)



**Note**

\* For non-standard requests, please contact Application Engineering.



## Disclaimer

All product specifications and data are subject to change without notice.

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