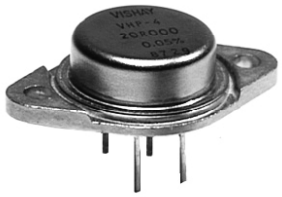
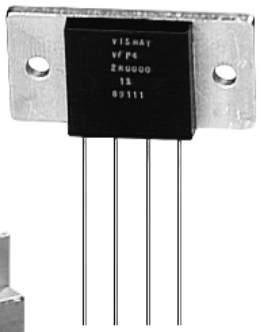
Z-Based Bulk Metal® Foil Technology
Rapid ΔR Stabilization - Low WCR - Low TCR

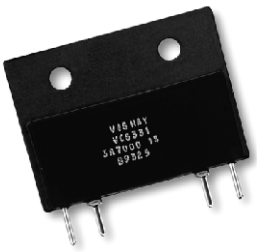


VHP4Z

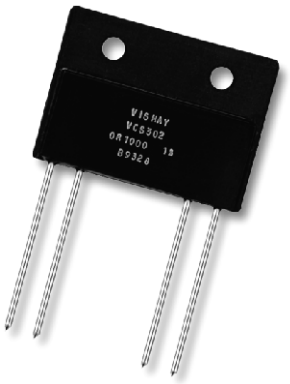


VFP4Z

VPR247Z



VCS331Z



VCS332Z

Product may not be to scale

Rapid ΔR stabilization under transient loads, low wattage coefficient (WCR), and low temperature coefficient (TCR) are features of this new Z Based Bulk Metal® Foil series of Current Sense Resistors.

The series should be selected where rapid .R stabilization and resistance stability under transient power conditions is required. These products achieve optimum performance when mounted on a chassis or cooled heat sink. The Z Based Technology provides extremely low WCR under defined conditions (see Figure 1 and Figure 2). The low absolute TCR provided by the Z Based Technology is measured over the temperature range of - 55 °C to + 125 °C, + 25 °C reference (see Figure 3).

All of these devices utilizing the Z Based Technology are provided with a true 4 terminal Kelvin connection. This is a must for current sensing when the R-value is less than 100 Ω. The VHP4Z and VPR247Z types add the additional benefit of hermeticity. The welded construction and nitrogen backfill provide maximum protection against environmental stresses and insures long term stability. Typical applications for this new series includes electron beam circuitry, electron microscopes, fire control radar display systems, high speed video display, deflection amplifier circuits, constant current power supplies and forced balance electronic scales.

Custom high power designs can be developed for your specific applications.

FEATURES

- Rapid ΔR Stabilization under transient loads (see Figure 1)
- Tenfold improvement of Wattage Coefficient of Resistance (WCR): 4 ppm/W (see Figure 2)
- Low Temperature Coefficient of Resistance: (see Figure 3 and Table 2)
- Thermal Resistance: 6 °C/W
- Power Rating: 10 watts on heat sink[1)] at + 25 °C (see Table 2)
  3 watts in free air at + 25 °C (see Table 2)
- Load Life Stability:
  ± 0.05 % Max ΔR, 10 W on heat sink at + 25 °C, 2000 hours
  ± 0.01 % Max ΔR, 3 W on heat sink at + 25 °C, 2000 hours
  ± 0.05 % Max ΔR, 3 W in free air at + 25 °C, 2000 hours
- Current Noise: < 0.01 µV(RMS)/volt of applied voltage
- Thermal EMF: 0.1 µV/°C maximum, 0.05 µV/°C typical
- Non-Inductive design

NOTE:

1.Heatsink - Aluminum (6" L x 4" W x 2" H x 0.04" THK)

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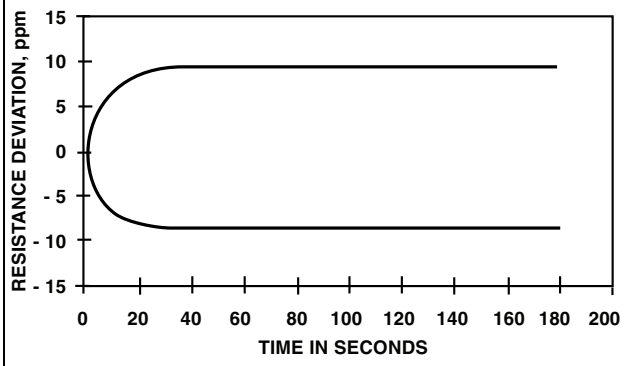
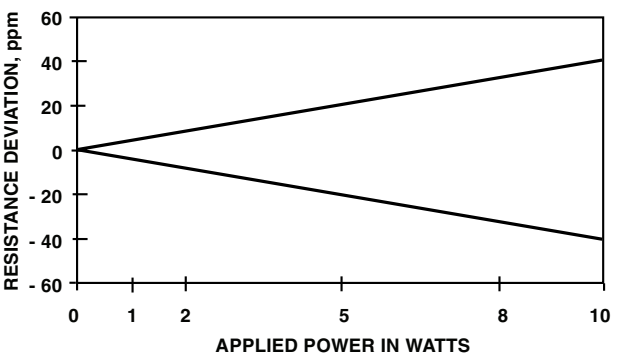
FIGURE 1 - RAPID STABILIZATION



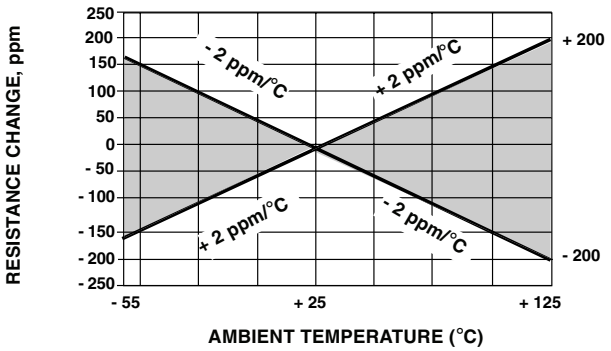
RESISTANCE CHANGE UNDER LOAD AT 10 WATTS
MOUNTED ON COOLED HEAT SINK HELD AT + 25 °C

FIGURE 2 - POWER COEFFICIENT (WCR)



RESISTANCE CHANGE VS APPLIED POWER
MOUNTED ON COOLED HEAT SINK HELD AT + 25 °C

FIGURE 3 - TEMPERATURE COEFFICIENT RESISTANCE



NO LOAD APPLIED

FIGURE 4 - POWER DERATING CURVE

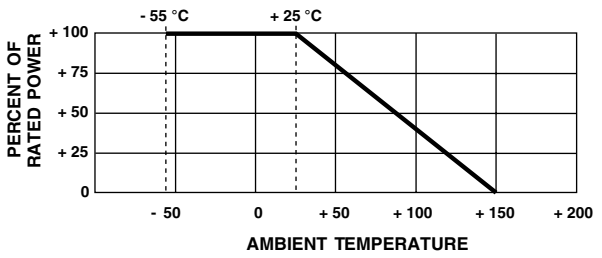
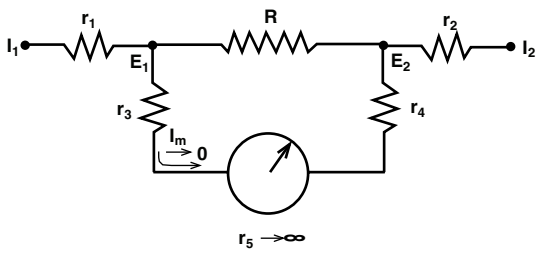


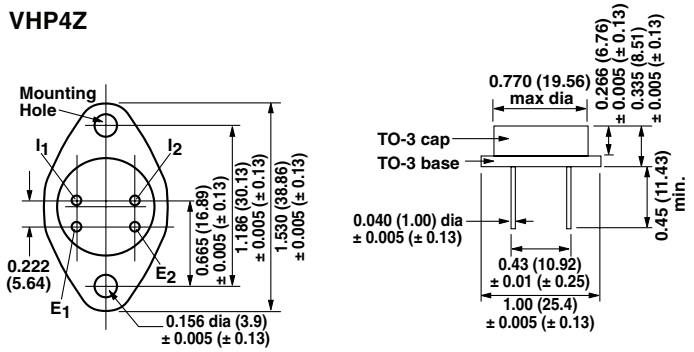
FIGURE 5 - KELVIN CONNECTION



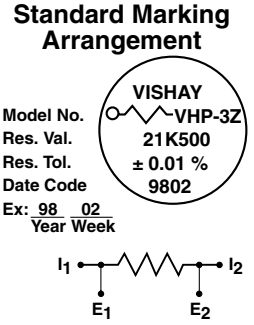
Kelvin, 4-terminal, connections are utilized for these low ohmic value products to measure a precise voltage drop across the resistive element. In these applications the contact resistance, lead resistance, and their TCR effect may be greater than that of the element itself and could cause significant errors if the standard 2-terminal connection is used. Figure 5 shows a high impedance measurement system where r_5 approaches infinity and I_m approaches zero resulting in negligible IR drop through r_3 and r_4 which negates their lead resistance and TCR effect. With the voltage sense leads E_1 and E_2 inside of r_1 and r_2 the resistance and TCR effect of the current leads, I_1 and I_2 are negated and only the resistance and TCR of the element R are sensed. This method of measurement is essential for precise current sensing.

FIGURE 6 - STANDARD IMPRINTING AND DIMENSIONS

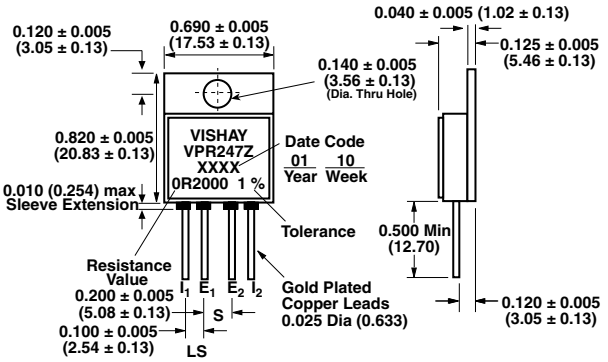
VHP4Z



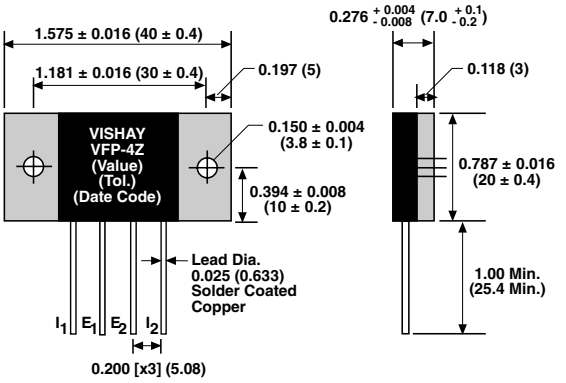
Standard Marking Arrangement



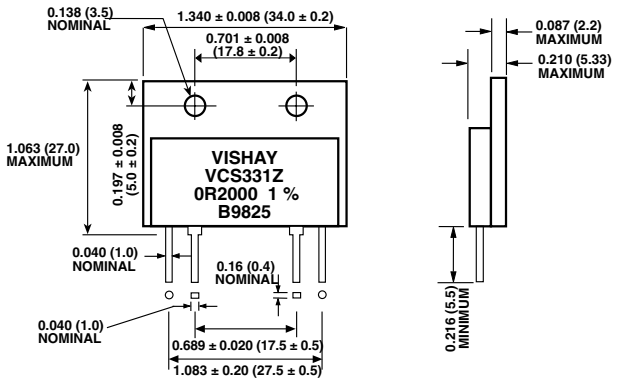
VPR247Z



VFP4Z



VCS331Z



VCS332Z

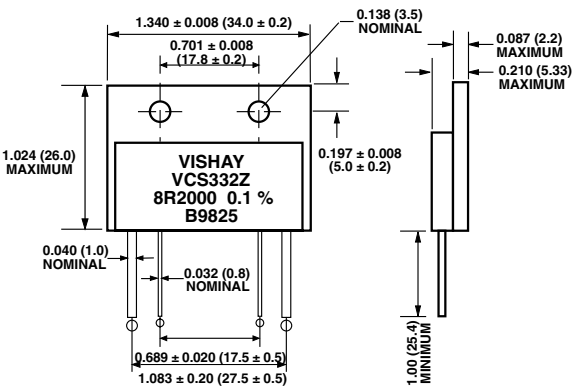


TABLE 1 - RESISTANCE VALUE VS TOLERANCE

RESISTANCE RANGE (Ω)	STANDARD TOLERANCE (%)
10 to 500	± 0.01 %
5 to < 10	± 0.02 %
2 to < 5	± 0.05 %
1 to < 2	± 0.10 %
0.5 to < 1	± 0.25 %
0.25 to < 0.5	± 0.50 %

TABLE 2 - SPECIFICATIONS

TEST OR CONDITION		PERFORMANCE
Wattage Coefficient of Resistance (WCR)		4 ppm/Watt Maximum[1)]
Temperature Coefficient of Resistance (TCR) **(- 55 °C to + 125 °C, + 25 °C Reference)**		≥ 1.0 Ω to 500 Ω, ± 2 ppm/°C Maximum 0R25 to < 1.0 Ω, ± 3 ppm/°C Maximum
Thermal Resistance		6 °C/Watt[1)]
Maximum Ambient Temperature		
	Rated Power	+ 25 °C
	Zero Power	+ 150 °C
Power Rating at + 25 °C	**VHP4Z** **VPR247Z** **VFP4Z**	10 Watts or 3 Amps Maximum (Heat Sink)[2), 3)] 3 Watts or 3 Amps Maximum (Free Air)[3)]
	VCS331Z **VCS332Z**	10 Watts or 5 Amps Maximum (Heat Sink)[2),3)] 3 Watts or 5 Amps Maximum (Free Air)[3)]
Load Life Stability		± 0.05 % Max ΔR, 10 W on heat sink at + 25 °C, 2000 hours ± 0.01 % Max ΔR, 3 W on heat sink at + 25 °C, 2000 hours ± 0.05 % Max ΔR, 3 W in free air at + 25 °C, 2000 hours
Inductance		0.1 µH Maximum; 0.08 µH Typical
Voltage Coefficient		< 0.1 ppm/V
Current Noise		< 0.010 µV(RMS)/Volt of applied voltage (- 40 dB)

NOTES:

1. Mounted on a cooled heat sink held at + 25°C
2. Heatsink - Aluminum (6" L x 4" W x 2" H x 0.04" THK)
3. Whichever is lower

TABLE 3 - ORDERING INFORMATION

Please specify Vishay VHP4Z, VPR247Z, VFP4Z, VCS331Z, VCS332Z series resistors as follows:

MODEL NO.	RESISTANCE VALUE			TOLERANCE
VHP4Z	**RESISTANCE RANGE**	**LETTER DESIGNATOR**	**MULTIPLIER FACTOR**	0.01 %
	0.25 to < 500 Ω	R	x 1	
	Example: 100R01 = 100.01 Ω			

Resistance Value, in Ω, is expressed by a series of 6 characters, 5 of which represent significant digits while the 6th is a dual purpose letter that designates both the multiplier and the location of the comma or decimal.

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