

Bulk Metal® Z-Foil Technology Ultra High-Precision 4-Terminal Power Current Sensing Resistors with TCR as Low as 0.05 ppm/°C, Power up to 10 Watts and Thermal Stabilization of <1s



FEATURES

- Low temperature coefficient of resistance
 - 0.05 ppm/°C typical (0°C to +60°C)
 - 0.2 ppm/°C typical (-55°C to +125°C, +25°C ref.)
- Resistance range: 0R25 to 500R
- Resistance tolerance: to ±0.01%
- Power rating: 10W on heatsink(1) at +25°C; 3W in free air at +25°C
- Load life stability:
 - ±0.005% (50 ppm) typical, 3W on heatsink at +25°C, 2000h
 - ±0.01% (100 ppm) typical, 3W in free air at +25°C, 2000h
 - ± 0.01% typical (100 ppm), 10W on heatsink at +25°C, 2000h
- Rapid ΔR stabilization under transient loads
- Thermal resistance: 6°C/W

Note

(1) Heatsink—aluminum (6" L x 4" W x 2" H x 0.04" THK)

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%

SPECIFICATIONS		
TEST OR CONDITION		PERFORMANCE
Power Coefficient of Resistance (PCR)		4 ppm/W maximum ⁽¹⁾
Temperature Coefficient of Resistance (TCR) (-55°C to +125°C, +25°C Reference)		≥1.0Ω to 500Ω, ±0.2 ±1.8 ppm/°C maximum 0.25Ω to <1.0Ω, ±0.2 ±2.8 ppm/°C maximum
Thermal Resistance		6 °C/W ⁽¹⁾
Power Rating at +25°C	VFP4Z	10W or 3A maximum (heatsink) ⁽²⁾⁽³⁾ 3W or 3A maximum (free air) ⁽³⁾
	VCS331Z, VCS332Z	10W or 5A maximum (heatsink) ⁽²⁾⁽³⁾ 3W or 5A maximum (free air) ⁽³⁾

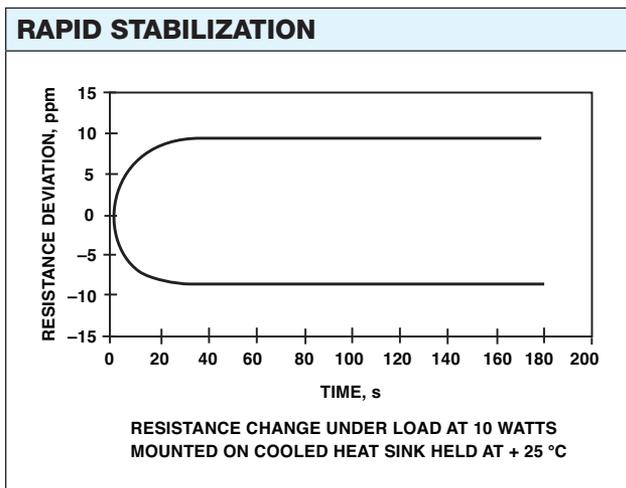
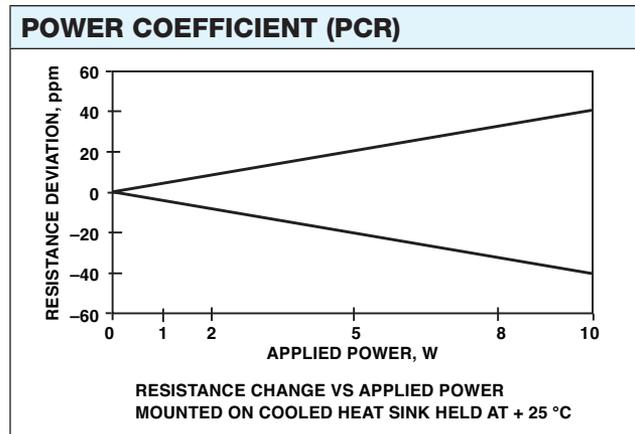
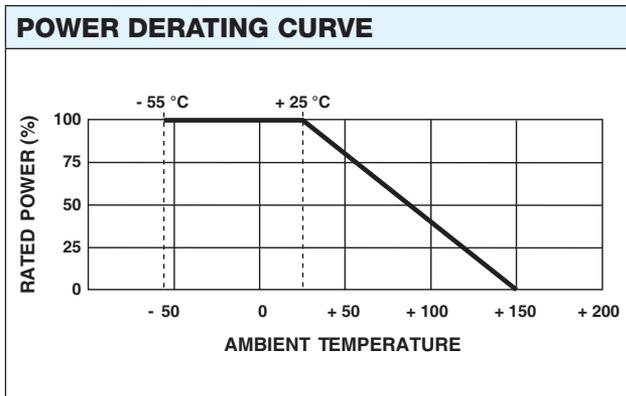
Notes

- (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

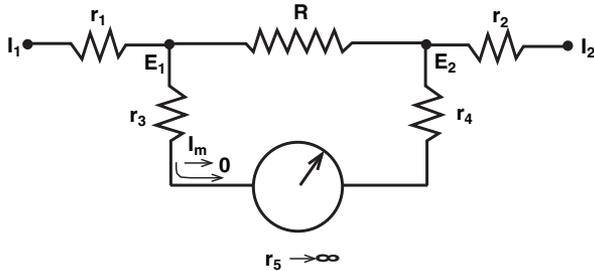
ENVIRONMENTAL PERFORMANCE ⁽¹⁾ (PER MIL-PRF-39009)		
TEST OR CONDITION	TYPICAL ΔR LIMITS	MAXIMUM ΔR LIMITS
Thermal Shock	0.01%	0.02%
Short Time Overload (5 x rated power for 5s)	0.01%	0.02%
Terminal Strength	0.02%	0.05%
High Temperature Exposure (2000h at +150°C)	0.02%	0.05%
Moisture Resistance	0.03%	0.05%
Low Temperature Storage (24h at -55°C)	0.005%	0.01%
Shock (specified pulse)	0.01%	0.02%
Vibration (high frequency)	0.01%	0.02%
Load Life (rated power, +25°C, 2000h)	0.01%	0.02%
Thermal EMF	VFP4Z	0.5 μV/°C maximum (lead effect) 4.0 μV/W maximum (power effect)
	VCS331Z, VCS332Z	0.2 μV/°C max. (E terminal)

Note

(1) ΔR's plus additional 0.0005Ω for measurement error



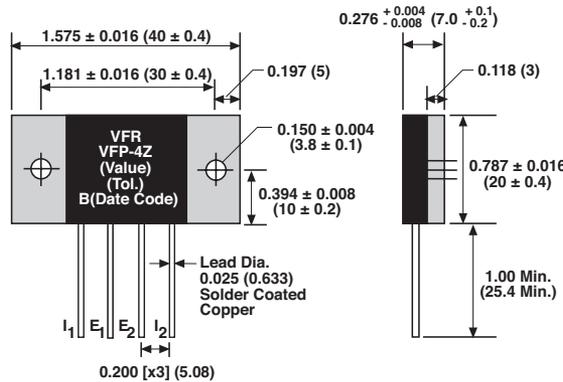
KELVIN CONNECTION



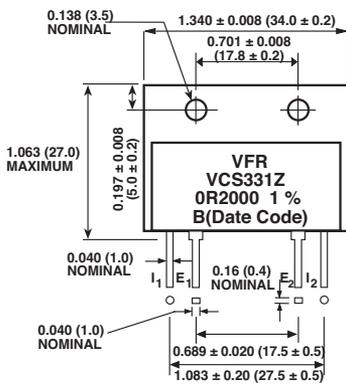
Kelvin, 4-terminal, connections are utilized for these low ohmic value products to measure a precise voltage drop across the resistive element. In these applications the contact resistance, lead resistance, and their TCR effect may be greater than that of the element itself and could cause significant errors if the standard 2-terminal connection is used. This figure 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 their 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.

STANDARD IMPRINTING AND DIMENSIONS in inches (millimeters)

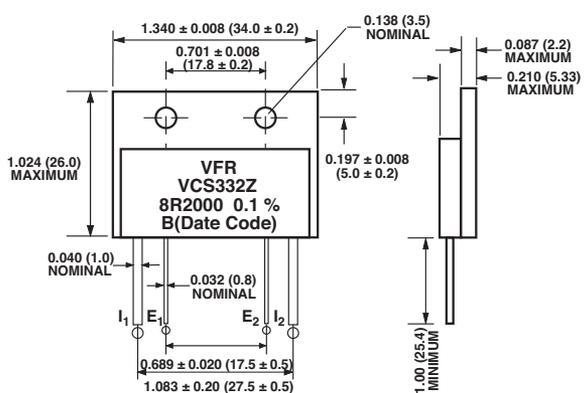
VFP4Z



VCS331Z



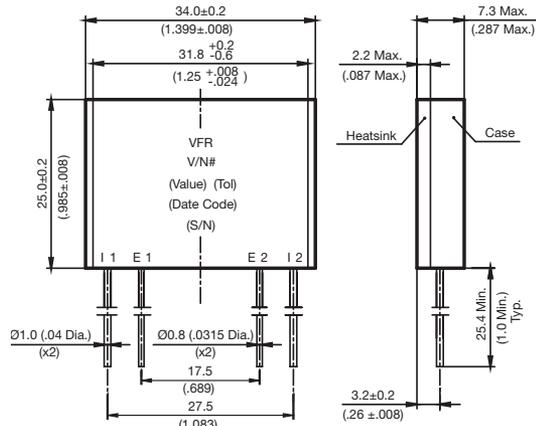
VCS332Z



EXAMPLES OF DIFFERENT CONFIGURATIONS

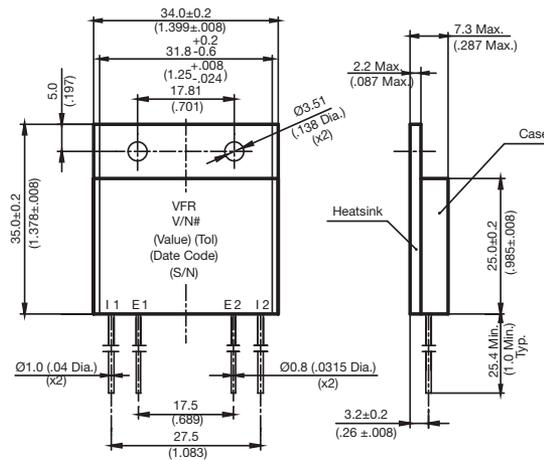
For your specific requirements please contact Application Engineering Department.

Example 1 – Three-chip configuration; heat sink without mounting holes



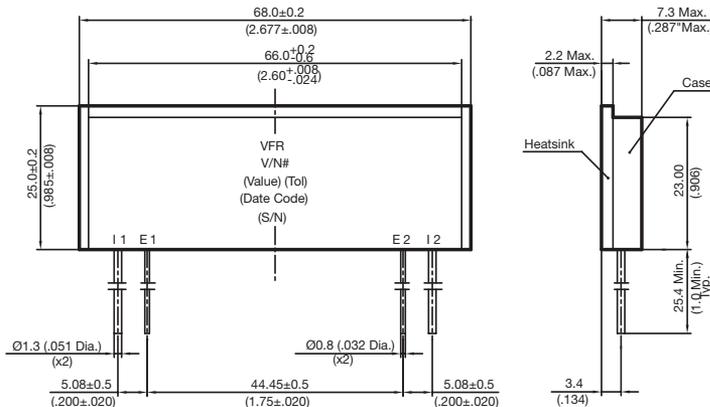
- Notes:**
1. Leads: Tinned Copper
 - Current Leads: Ø1.0 (.04 Dia.) x 2.
 - Voltage Leads: Ø0.8 (.315 Dia.) x 2.
 2. All Dimensions are in mm (inches).
 3. Tolerances: If not otherwise stated ±0.2 (±.00)

Example 2 – Three-chip configuration; heat sink with mounting holes



- Notes:**
1. Leads: Tinned Copper
 - Current Leads: Ø1.0 (.04 Dia.) x 2.
 - Voltage Leads: Ø0.8 (.0315 Dia.) x 2.
 2. All Dimensions are in mm (inches).
 3. Tolerances: If not otherwise stated ±0.2 (±.008).

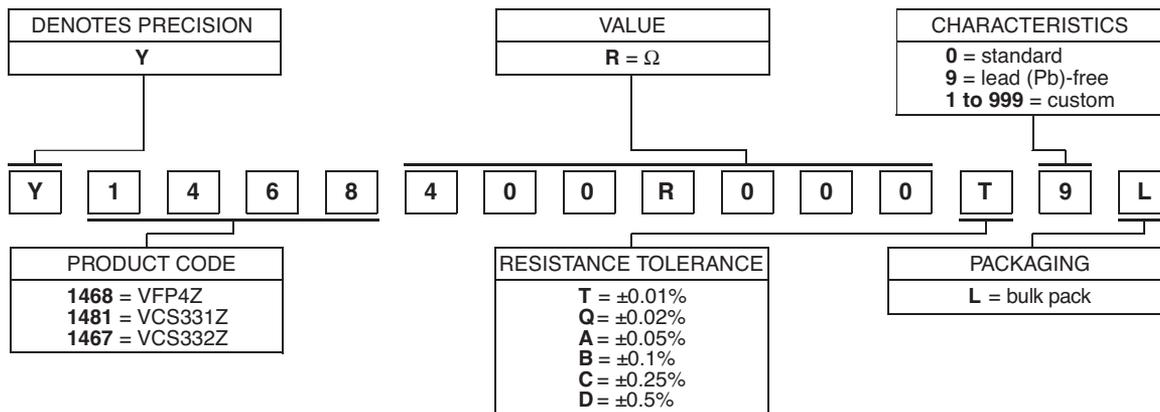
Example 3 – Six-chip configuration; heat sink without mounting holes



- Notes:**
1. Leads: Tinned Copper
 - Current Leads: Ø1.3 (.051 Dia.) x 2.
 - Voltage Leads: Ø0.8 (.032 Dia.) x 2.
 2. All Dimensions are in mm (inches).
 3. Tolerances: If not otherwise stated ±0.2 (±.008).

GLOBAL PART NUMBER INFORMATION ⁽¹⁾

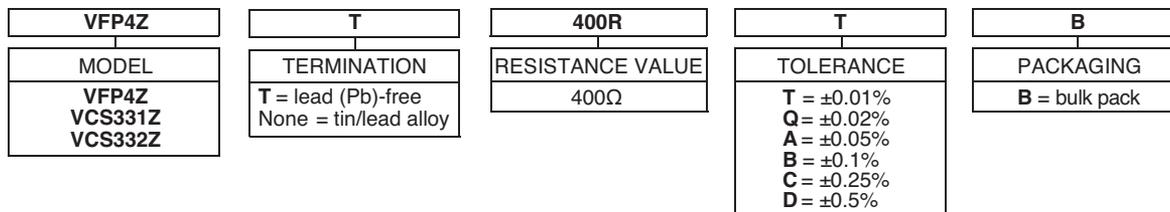
NEW GLOBAL PART NUMBER: Y1468400R000T9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1468 400R000 T 9 L:

TYPE: VFP4Z
 VALUE: 400Ω
 ABSOLUTE TOLERANCE: ±0.01%
 TERMINATION: lead (Pb)-free
 PACKAGING: bulk

HISTORICAL PART NUMBER: VFP4Z 400R T B (will continue to be used)



Note

(1) For non-standard requests, please contact application engineering