

Bulk Metal® Foil Technology Precision Foil Power Surface Mount Resistors in TO-220 Configuration

with TCR of ± 2 ppm/°C, Tolerance of to $\pm 0.01\%$ and Power Rating to 8 W

FEATURES

- Temperature coefficient of resistance (TCR): ± 2 ppm/°C typical (-55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ Ref.)
- Tolerance: to $\pm 0.01\%$ (see tables 1 and 2)
- Electrostatic discharge (ESD): above 25 000 V
- Load life stability: $\pm 0.005\%$ (25°C , 2000 h at rated power)
- Resistance range: 0.5Ω to $10 \text{ k}\Omega$
- Power rating: 8 W chassis mounted (per MIL-PRF-39009)
- Non inductive, non capacitive design
- Rise time: 1 ns without ringing
- Current noise: < -40 dB
- Voltage coefficient: < 0.1 ppm/V
- Non inductive: $< 0.08 \mu\text{H}$
- Non hot spot design
- Thermal EMF: $0.05 \mu\text{V}/^{\circ}\text{C}$ typical
- Terminal finishes available: lead (Pb)-free; tin/lead alloy
- Any value available within resistance range (e.g., 1K234)
- Prototype samples available. For more information, please contact: foil@vishaypg.com
- For better performances, please see VPR220SZ and VPR221SZ datasheets

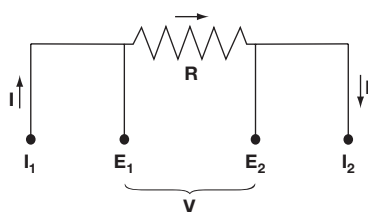
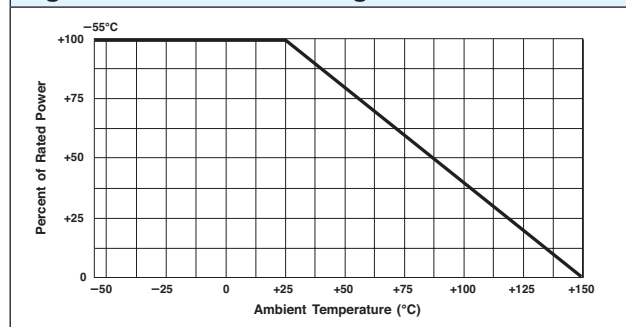
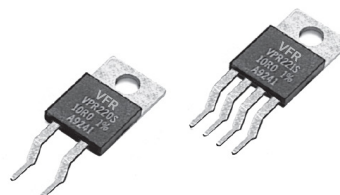


Figure 1 – Power Derating Curve



Note

* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS compliant. Please see the information/tables in this datasheet for details.



Available
RoHS*
COMPLIANT

INTRODUCTION

Any value at any tolerance within resistance range

Models VPR220S AND VPR221S, made from VPG Bulk Metal® foil, offer low TCR, high stability, tight tolerance and fast response time in a small, molded resistor. Model VPR220S is a 2 lead device. Model VPR221S is a 4 lead Kelvin connected device. The 4 leaded version is highly recommended for precision applications requiring ohmic values of 100R or less.

Table 1 – VPR220S

RESISTANCE RANGE (Ω) ⁽¹⁾	TIGHTEST TOLERANCE	TYPICAL TCR ⁽²⁾	MAXIMUM TCR ⁽²⁾
50 to 10K	$\pm 0.01\%$	± 2	± 5 ppm/°C
25 to <50	$\pm 0.02\%$	± 2	± 7 ppm/°C
10 to <25	$\pm 0.05\%$	± 2	± 10 ppm/°C
5 to <10	$\pm 0.1\%$	± 2	± 13 ppm/°C

Notes

Weight = 1 g maximum

⁽¹⁾ Lower or high values available upon request

⁽²⁾ -55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ ref.

Table 2 – VPR221S

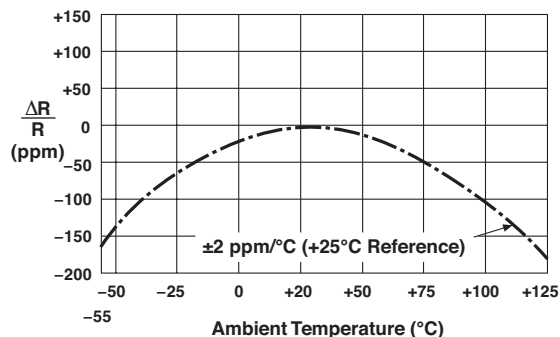
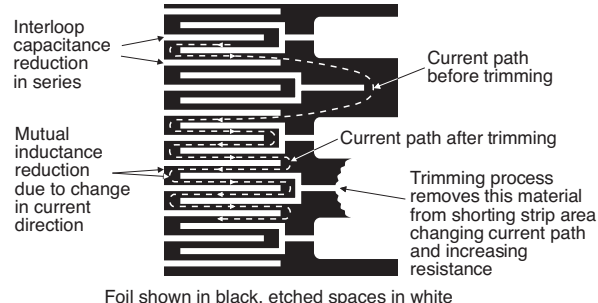
RESISTANCE RANGE (Ω) ⁽¹⁾	TIGHTEST TOLERANCE	TYPICAL TCR ⁽²⁾	MAXIMUM TCR ⁽²⁾
10 to <500	$\pm 0.01\%$	± 2	± 5 ppm/°C
1 to <10	$\pm 0.02\%$	± 2	± 5 ppm/°C
0.5 to <1	$\pm 0.05\%$	± 2	± 5 ppm/°C

Notes

Weight = 1 g maximum

⁽¹⁾ Lower or high values available upon request

⁽²⁾ -55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ ref.

Figure 2 – Typical TCR Curve**Figure 3 – Trimming to Values****Note**

To acquire a precision resistance value, the Bulk Metal® Foil chip is trimmed by selectively removing built-in “shorting bars.” To increase the resistance in known increments, marked areas are cut, producing progressively smaller increases in resistance. This method reduces the effect of “hot spots” and improves the long-term stability of Bulk Metal® Foil resistors.

Table 3 – Specifications

Load Life Stability at 2000 h	$\pm 0.05\%$ max. ΔR under full rated power at +25°C
Power Rating at +25°C	8 W or 3 A ⁽¹⁾ on heat sink ⁽²⁾
	1.5 W or 3 A ⁽¹⁾ in free air
	Further derating not necessary
Current Noise	$< 0.010 \mu\text{V}_{\text{RMS}}/\text{V}$ of applied voltage (–40 dB)
High Frequency Operation Rise time Inductance ⁽³⁾ (L) Capacitance (C)	1 ns without ringing 0.1 μH maximum: 0.03 μH typical 1.0 pF maximum: 0.5 pF typical
Voltage Coefficient⁽⁴⁾	$< 0.1 \text{ ppm/V}$
Operating Temperature Range	–55°C to +150°C
Maximum Working Voltage	300 V. Not to exceed power rating
Thermal EMF⁽⁵⁾	0.15 $\mu\text{V/}^\circ\text{C}$ maximum (lead effect)

Notes

⁽¹⁾ Whichever is lower

⁽²⁾ Heat sink chassis dimensions and requirements per MIL-R-39009/1B:

	INCHES	MILLIMETERS
L	6.00	152.4
W	4.00	101.6
H	2.00	50.8
T	0.04	1.0

⁽³⁾ Inductance (L) due mainly to the leads

⁽⁴⁾ The resolution limit of existing test equipment (within the measurement capability of the equipment, or “essentially zero”)

⁽⁵⁾ $\mu\text{V/}^\circ\text{C}$ relates to EMF due to lead temperature difference

Figure 4 – VPR220S and VPR221S Forming Dimensions in inches (millimeters)

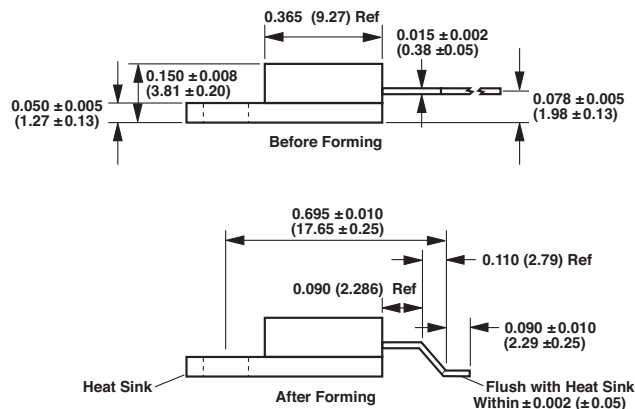


Figure 5 – VPR220S Dimensions in inches (millimeters)

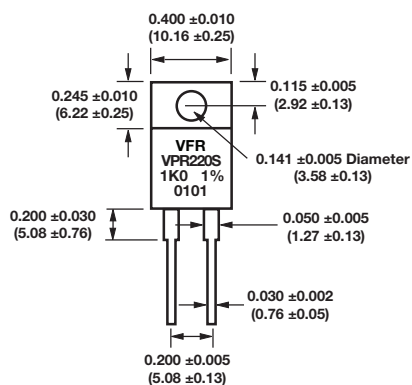


Figure 7 – VPR221S Dimensions in inches (millimeters)

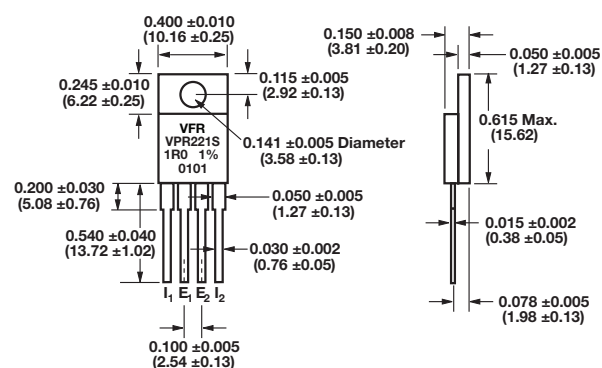


Figure 6 – VPR220S Land Pattern Dimensions in inches (millimeters)

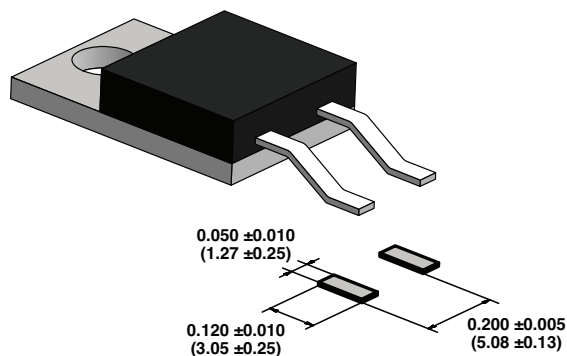


Figure 8 – VPR221S Land Pattern Dimensions in inches (millimeters)

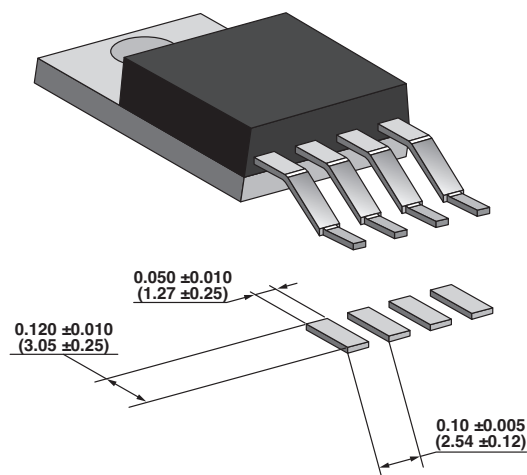
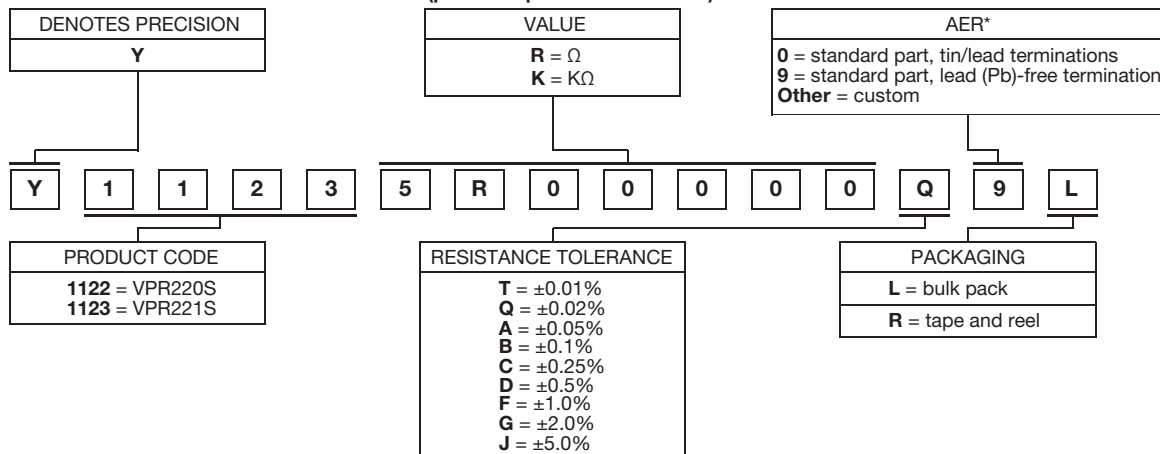


Table 2 – Global Part Number Information
NEW GLOBAL PART NUMBER: Y11235R00000Q9L (preferred part number format)


FOR EXAMPLE: ABOVE GLOBAL ORDER Y1123 5R00000 Q 9 L:

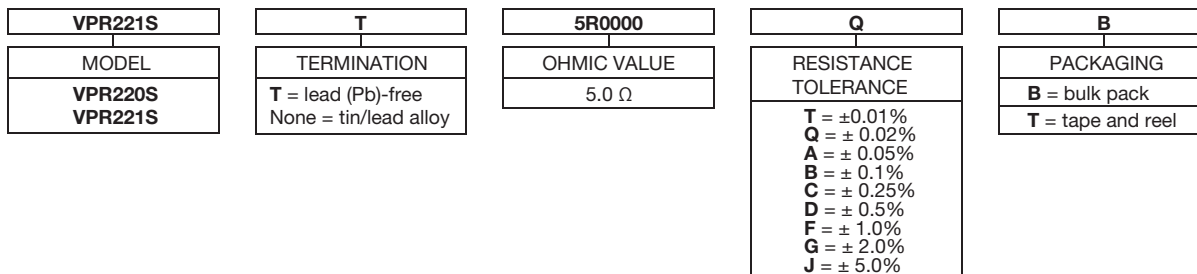
TYPE: VPR221S

 VALUE: 5.0Ω

 ABSOLUTE TOLERANCE: $\pm 0.02\%$

TERMINATION: lead (Pb)-free

PACKAGING: bulk pack

HISTORICAL PART NUMBER: VPR221ST 5R0000 Q B (will continue to be used)
**Note**

* Application engineering release: for non-standard requests, please contact application engineering