

## Bulk Metal® Foil Technology Precision Foil Power Resistors in TO-220 Configuration with TCR of $\pm 2$ ppm/°C, Tolerance of to $\pm 0.01$ % and Power Rating to 8 W



### Any value at any tolerance within resistance range

Models VPR220 AND VPR221, made from Vishay Bulk Metal® Foil, offer low TCR, high stability, tight tolerance and fast response time in a small, molded resistor. Model VPR220 is a 2 lead device. Model VPR221 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 - VPR220			
RESISTANCE RANGE ( $\Omega$ ) <sup>(1)</sup>	TIGHTEST TOLERANCE	TYPICAL TCR <sup>(2)</sup>	MAXIMUM TCR <sup>(2)</sup>
50 to 10K	$\pm 0.01$ %	$\pm 2$	$\pm 5$ ppm/°C
25 to < 50	$\pm 0.02$ %	$\pm 2$	$\pm 7$ ppm/°C
10 to < 25	$\pm 0.05$ %	$\pm 2$	$\pm 10$ ppm/°C
5 to < 10	$\pm 0.1$ %	$\pm 2$	$\pm 13$ ppm/°C

weight = 1 g maximum

#### Notes

- (1) Lower or high values available upon request  
(2) - 55 °C to + 125 °C, + 25 °C ref.

TABLE 2 - VPR221			
RESISTANCE RANGE ( $\Omega$ ) <sup>(1)</sup>	TIGHTEST TOLERANCE	TYPICAL TCR <sup>(2)</sup>	MAXIMUM TCR <sup>(2)</sup>
10 to < 500	$\pm 0.01$ %	$\pm 2$ ppm/°C	$\pm 5$ ppm/°C
1 to < 10	$\pm 0.02$ %	$\pm 2$ ppm/°C	$\pm 5$ ppm/°C
0.5 to < 1	$\pm 0.05$ %	$\pm 2$ ppm/°C	$\pm 5$ ppm/°C

weight = 1.2 g maximum

#### Notes

- (1) Lower or high values available upon request  
(2) - 55 °C to + 125 °C, + 25 °C Ref.

### FEATURES

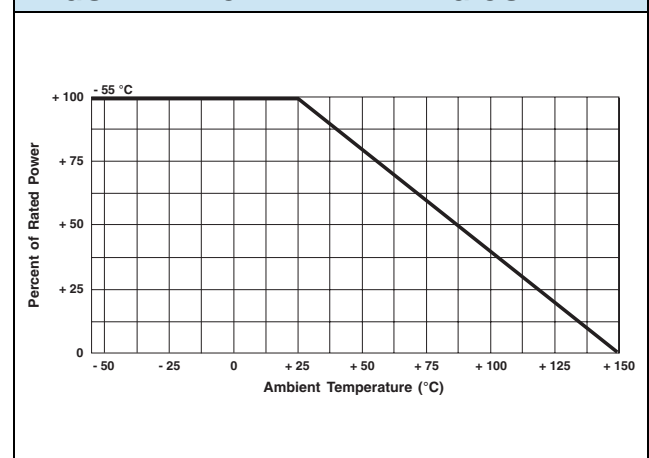
- Temperature coefficient of resistance (TCR):  $\pm 2$  ppm/°C typical (- 55 °C to + 125 °C, + 25 °C ref.)
- Tolerance: to  $\pm 0.01$  % (see tables 1 and 2)
- Electrostatic discharge (ESD): above 25 000 V
- Load life stability:  $\pm 0.005$  % (25 °C, 2000 h at rated power)
- Resistance range: 0.5  $\Omega$  to 10 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  $\mu$ H
- Non hot spot design
- Thermal EMF: 0.05  $\mu$ V/°C typical
- Terminal finishes available: lead (Pb)-free or tin/lead alloy
- Any value available within resistance range (e.g. 1K234)
- Prototype samples available from 48 h. For more information, please contact [foil@vishaypg.com](mailto:foil@vishaypg.com)
- For better performances, please see VPR220Z and VPR221Z datasheets
- Compliant to RoHS directive 2002/95/EC



Available  
RoHS\*  
COMPLIANT



FIGURE 1 - POWER DERATING CURVE



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

**FIGURE 2 - TYPICAL TCR CURVE**



**TABLE 3 - SPECIFICATIONS**

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

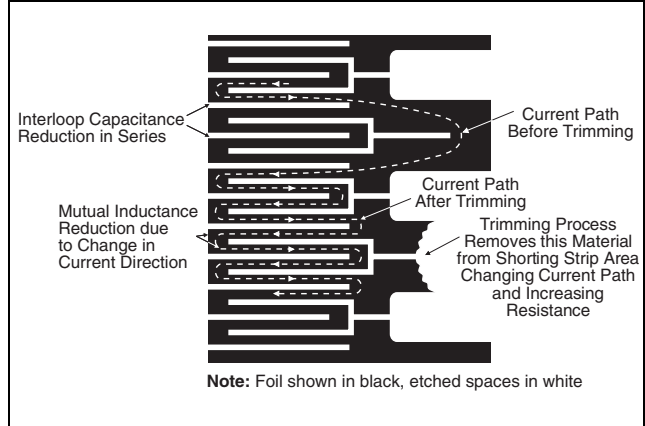
**Notes**

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

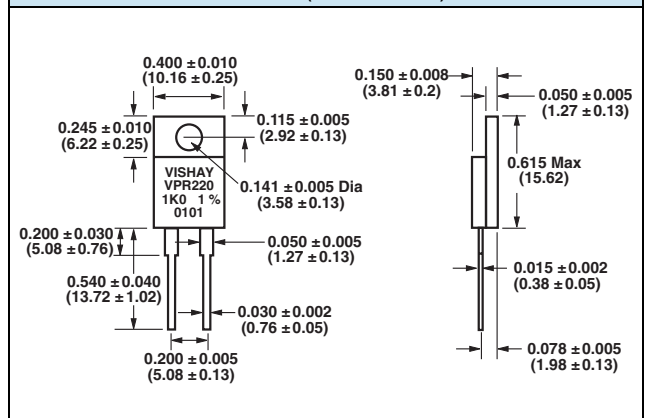
DIMENSION	INCHES	mm
L	6.00	152.4
W	4.00	101.6
H	2.00	50.8
T	0.04	1.0

- (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) μV/°C relates to EMF due to lead temperature difference

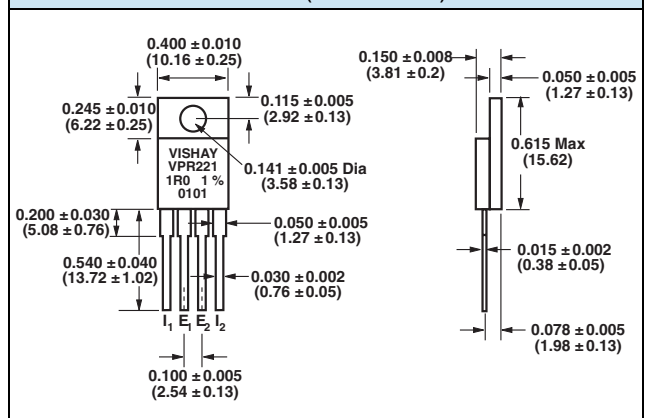
**FIGURE 3 - TRIMMING TO VALUES**  
(conceptual illustration)



**FIGURE 4 - VPR220 DIMENSIONS**  
in inches (millimeters)



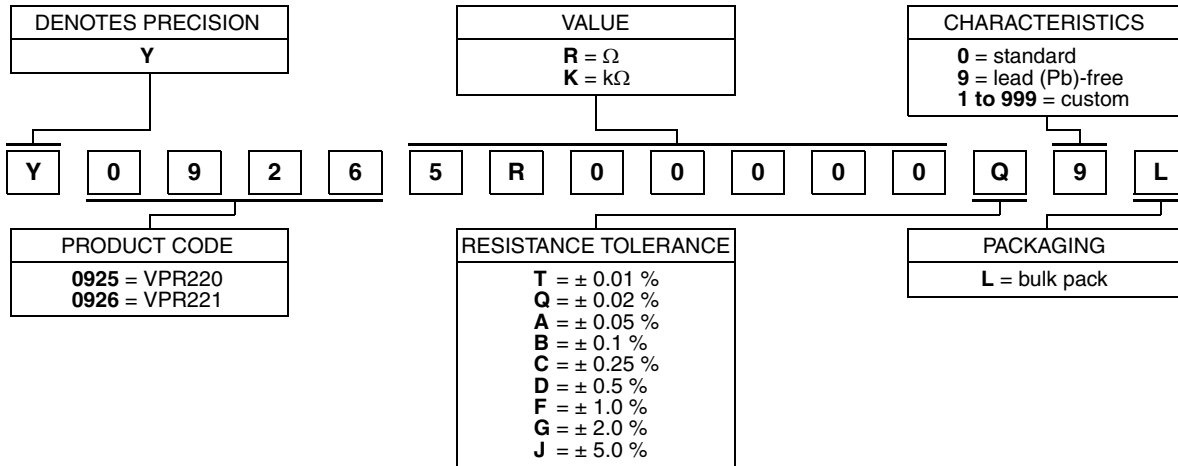
**FIGURE 5 - VPR221 DIMENSIONS**  
in inches (millimeters)



Surface mount versions of these products are available. See datasheets for VPR220S, VPR 221S.

**TABLE 4 - GLOBAL PART NUMBER INFORMATION (1)**

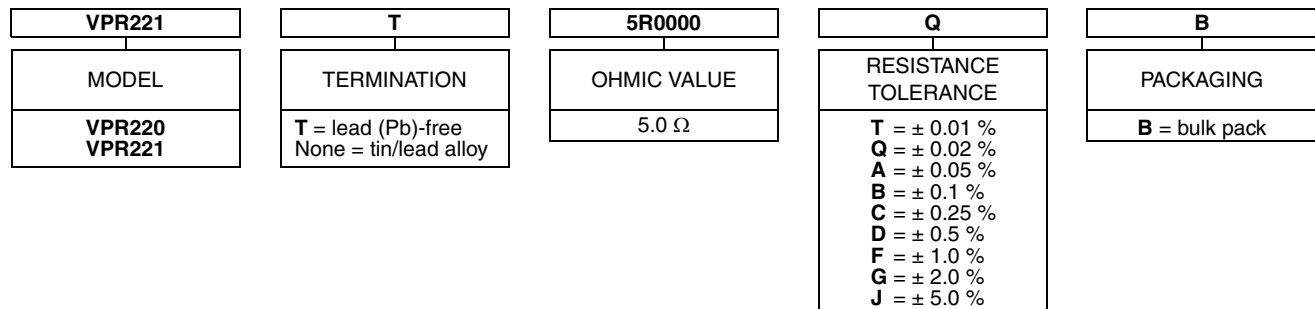
NEW GLOBAL PART NUMBER: Y09265R00000Q9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y0926 5R00000 Q 9 L:

TYPE: VPR221  
VALUE: 5.0  $\Omega$   
ABSOLUTE TOLERANCE:  $\pm 0.02\%$   
TERMINATION: lead (Pb)-free  
PACKAGING: bulk

HISTORICAL PART NUMBER: VPR221T 5R0000 Q B (will continue to be used)



**Note**

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



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