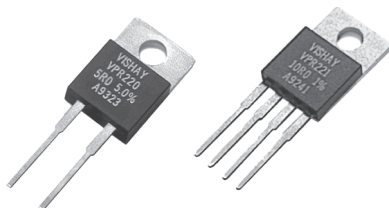


# Bulk Metal® Foil Technology Precision Foil Power Resistors in TO-220 Configuration with TCR of $\pm 2 \text{ ppm/}^\circ\text{C}$ , Tolerance of to $\pm 0.01 \%$ and Power Rating to 8 W



## 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                                    | $\pm 0.01 \%$      | $\pm 2$                    | $\pm 5 \text{ ppm/}^\circ\text{C}$  |
| 25 to < 50                                   | $\pm 0.02 \%$      | $\pm 2$                    | $\pm 7 \text{ ppm/}^\circ\text{C}$  |
| 10 to < 25                                   | $\pm 0.05 \%$      | $\pm 2$                    | $\pm 10 \text{ ppm/}^\circ\text{C}$ |
| 5 to < 10                                    | $\pm 0.1 \%$       | $\pm 2$                    | $\pm 13 \text{ ppm/}^\circ\text{C}$ |

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                                  | $\pm 0.01 \%$      | $\pm 2 \text{ ppm/}^\circ\text{C}$ | $\pm 5 \text{ ppm/}^\circ\text{C}$ |
| 1 to < 10                                    | $\pm 0.02 \%$      | $\pm 2 \text{ ppm/}^\circ\text{C}$ | $\pm 5 \text{ ppm/}^\circ\text{C}$ |
| 0.5 to < 1                                   | $\pm 0.05 \%$      | $\pm 2 \text{ ppm/}^\circ\text{C}$ | $\pm 5 \text{ ppm/}^\circ\text{C}$ |

weight = 1.2 g maximum

### Notes

(1) Lower or high values available upon request

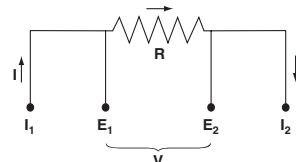
(2) - 55 °C to + 125 °C, + 25 °C Ref.

## FEATURES

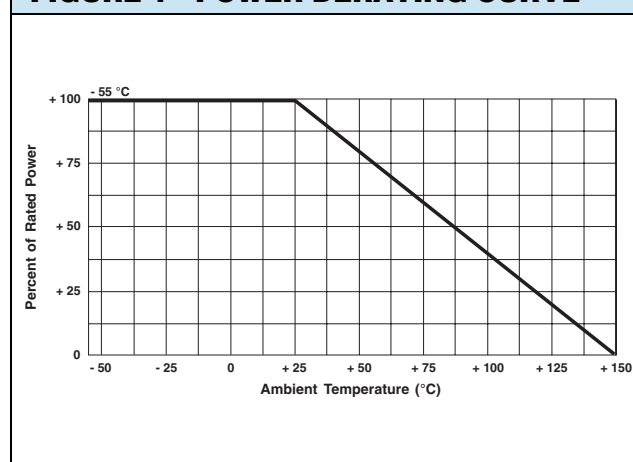
- Temperature coefficient of resistance (TCR):  $\pm 2 \text{ ppm/}^\circ\text{C}$  typical (- 55 °C to + 125 °C, + 25 °C ref.)
- Tolerance: to  $\pm 0.01 \%$  (see tables 1 and 2)
- Electrostatic discharge (ESD): above 25 000 V
- Load life stability:  $\pm 0.005 \%$  (25 °C, 2000 h at rated power)
- 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  $\mu\text{H}$
- Non hot spot design
- Thermal EMF: 0.05  $\mu\text{V/}^\circ\text{C}$  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



**RoHS\***  
COMPLIANT

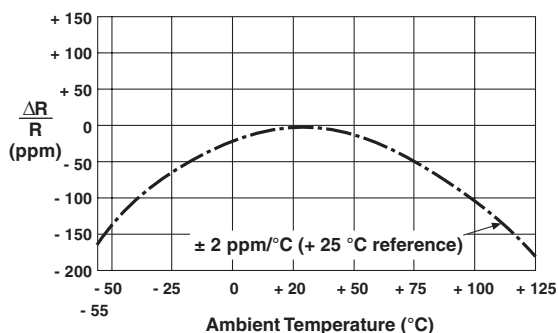


**FIGURE 1 - POWER DERATING CURVE**



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

### FIGURE 2 - TYPICAL TCR CURVE



### TABLE 3 - SPECIFICATIONS

|                                           |                                                       |
|-------------------------------------------|-------------------------------------------------------|
| <b>Load Life Stability at 2000 h</b>      | ± 0.05 % max ΔR under full rated power at + 25 °C     |
| <b>Power Rating at + 25 °C</b>            | 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                        |
| <b>Current Noise</b>                      | < 0.010 μV (rms)/V of applied voltage (- 40 dB)       |
| <b>High Frequency Operation</b>           |                                                       |
| 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                        |
| <b>Voltage Coefficient <sup>(4)</sup></b> | < 0.1 ppm/V                                           |
| <b>Operating Temperature Range</b>        | - 55 °C to + 150 °C                                   |
| <b>Maximum Working Voltage</b>            | 300 V. Not to exceed power rating                     |
| <b>Thermal EMF <sup>(5)</sup></b>         | 0.15 μV/°C maximum (lead effect)                      |

## Notes

(1) Whichever is lower

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

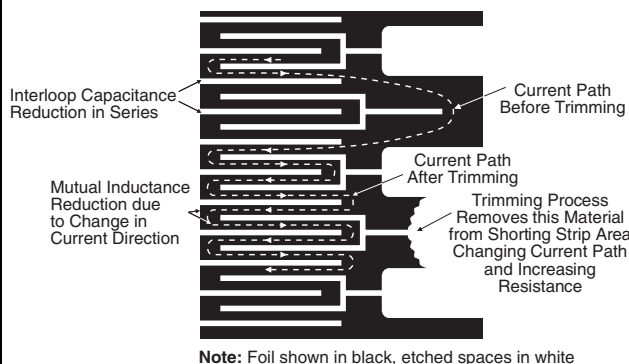
| DIMENSION | INCHES | mm    |
|-----------|--------|-------|
| L         | 6.00   | 152.4 |
| W         | 4.00   | 101.6 |
| H         | 2.00   | 50.8  |
| T         | 0.04   | 1.0   |

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

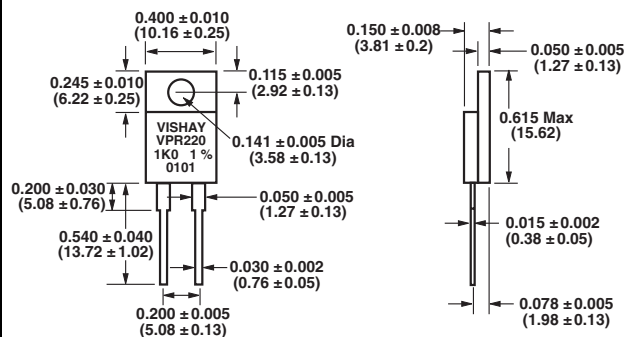
(4) The resolution limit of existing test equipment (within the measurement capability of the equipment, or "essentially zero")

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

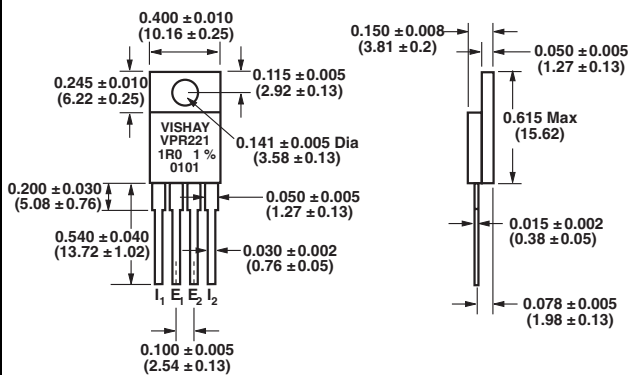
**FIGURE 3 - TRIMMING TO VALUES**  
(conceptual illustration)



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



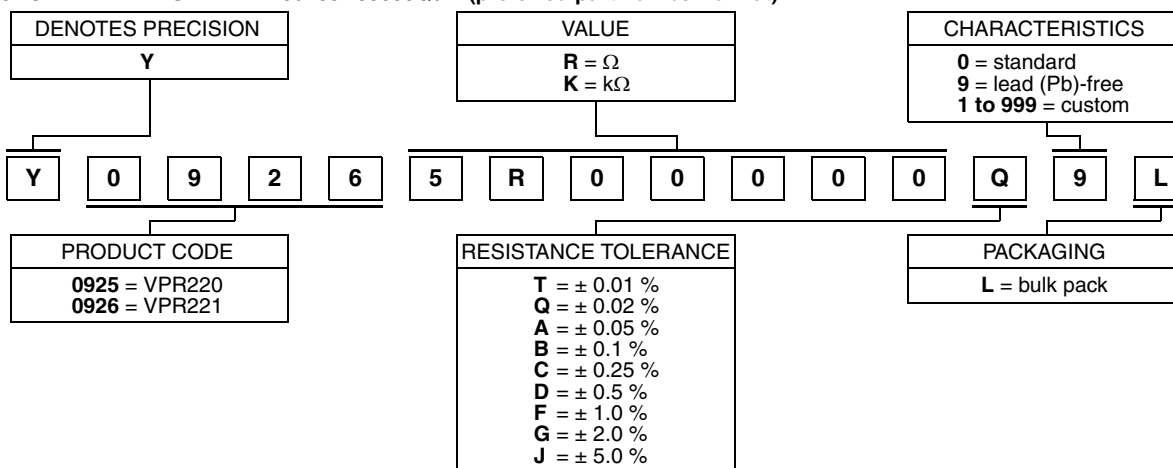
**FIGURE 5 - VPR221 DIMENSIONS**  
in inches (millimeters)



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

**TABLE 4 - GLOBAL PART NUMBER INFORMATION <sup>(1)</sup>**

**NEW GLOBAL PART NUMBER: Y09265R0000Q9L (preferred part number format)**



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

TYPE: VPR221

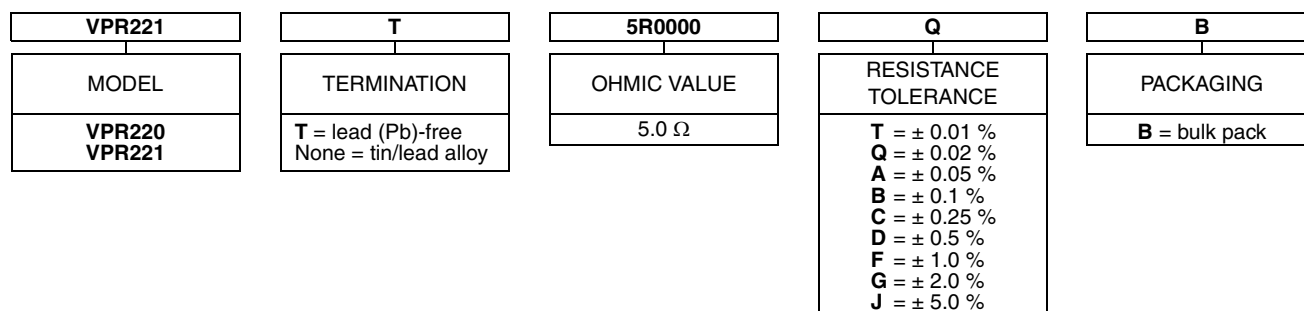
VALUE:  $5.0\ \Omega$

ABSOLUTE TOLERANCE:  $\pm 0.02\%$

TERMINATION: lead (Pb)-free

PACKAGING: bulk

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



**Note**

<sup>(1)</sup> For non-standard requests, please contact application engineering

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