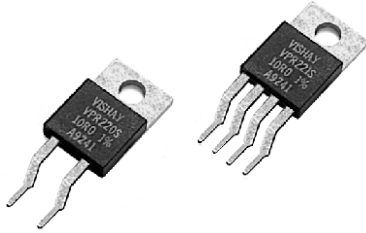




Bulk Metal® Foil Technology Precision Foil Power Surface Mount Resistors in TO-220 Configuration with TCR of ± 2 ppm/°C, Tolerance of to ± 0.01 % and Power Rating to 8 W



Any value at any tolerance within resistance range

Models VPR220S AND VPR221S, made from Vishay 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	± 0.01 %	± 2	± 5 ppm/°C
25 to < 50	± 0.02 %	± 2	± 7 ppm/°C
10 to < 25	± 0.05 %	± 2	± 10 ppm/°C
5 to < 10	± 0.1 %	± 2	± 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 - VPR221S			
RESISTANCE RANGE (Ω) ¹	TIGHTEST TOLERANCE	TYPICAL TCR ²	MAXIMUM TCR ²
10 to < 500	± 0.01 %	± 2	± 5 ppm/°C
1 to < 10	± 0.02 %	± 2	± 5 ppm/°C
0.5 to < 1	± 0.05 %	± 2	± 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.

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

FEATURES

- Temperature coefficient of resistance (TCR): ± 2 ppm/°C typical (- 55 °C to + 125 °C, + 25 °C Ref.)
- Tolerance: to ± 0.01 % (see tables 1 and 2)
- Electrostatic discharge (ESD): above 25 000 V
- Load life stability: ± 0.005 % (25 °C, 2000 h at rated power)
- Resistance range: 0.5 Ω to 10 k Ω
- 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 μ H
- Non hot spot design
- Thermal EMF: 0.05 μ V/°C typical
- Terminal finishes available: lead (Pb)-free tin/lead alloy
- Any value available within resistance range (e.g. 1K234)
- Prototype samples available from 48 h. For more information, please contact foil@vishay.com
- For better performances, please see VPR220SZ and VPR221SZ datasheets



RoHS* COMPLIANT

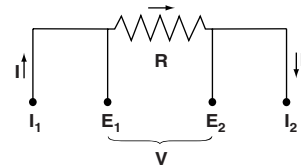
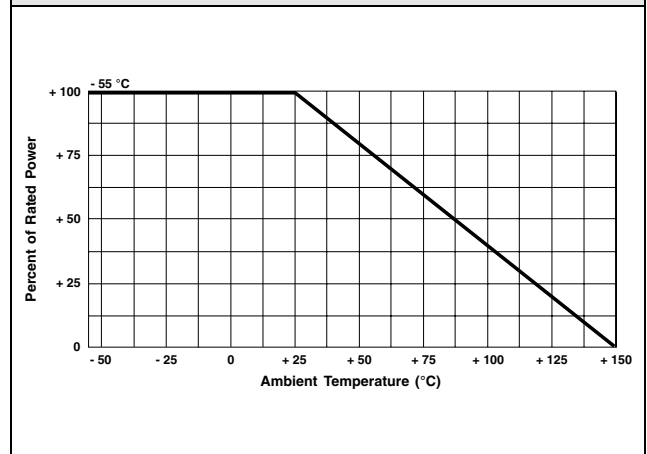


FIGURE 1 - POWER DERATING CURVE



Vishay Foil Resistors Bulk Metal® Foil Technology Precision Foil Power Surface Mount 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

FIGURE 2 - TYPICAL TCR CURVE

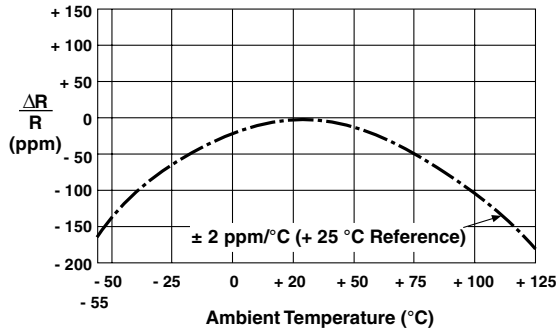


FIGURE 3 - TRIMMING TO VALUES
(Conceptual Illustration)

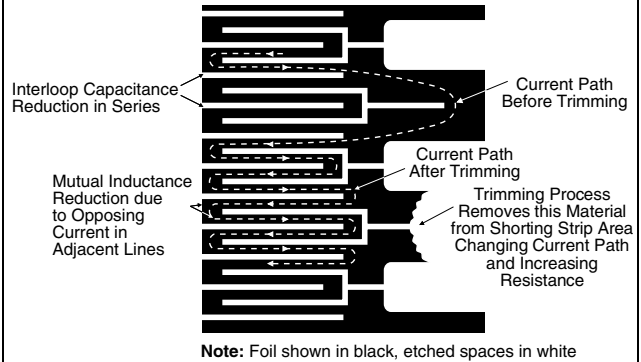


TABLE 3 - SPECIFICATIONS

Load Life Stability at 2000 h	$\pm 0.05 \%$ max. ΔR under full rated power at $+ 25 \text{ }^\circ\text{C}$
Power Rating at $+ 25 \text{ }^\circ\text{C}$	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	$< 0.010 \text{ } \mu\text{V}$ (rms)/V of applied voltage (- 40 dB)
High Frequency Operation	
Rise time	1 ns without ringing
Inductance ³⁾ (L)	0.1 μH maximum: 0.03 μH typical
Capacitance (C)	1.0 pF maximum: 0.5 pF typical
Voltage Coefficient ⁴⁾	$< 0.1 \text{ ppm/V}$
Operating Temperature Range	$- 55 \text{ }^\circ\text{C}$ to $+ 150 \text{ }^\circ\text{C}$
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:

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



Bulk Metal® Foil Technology Precision Foil Power Surface Mount 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

FIGURE 4 - VPR220S AND VPR221S FORMING DIMENSIONS in inches (millimeters)

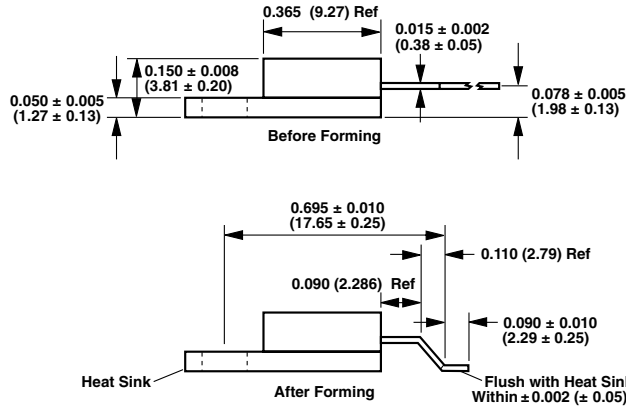


FIGURE 5 - VPR220S DIMENSIONS in inches (millimeters)

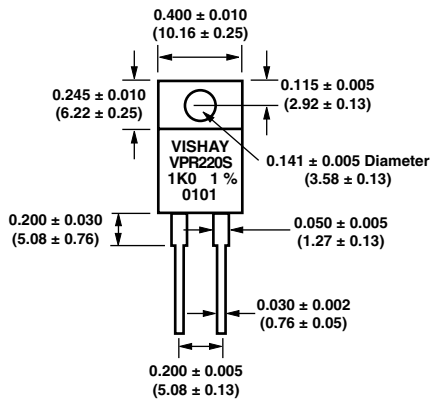


FIGURE 7 - VPR221S DIMENSIONS in inches (millimeters)

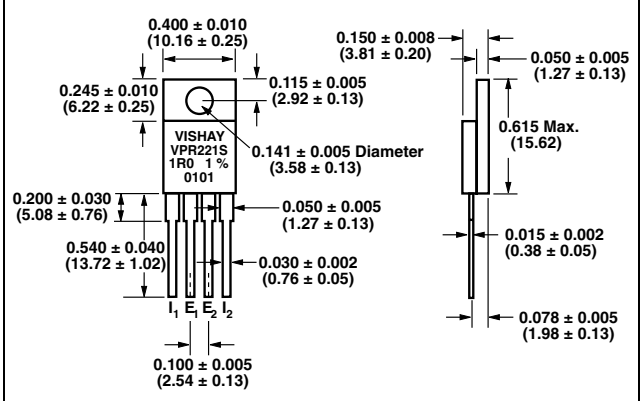


FIGURE 6 - VPR220S LAND PATTERN DIMENSIONS in inches (millimeters)

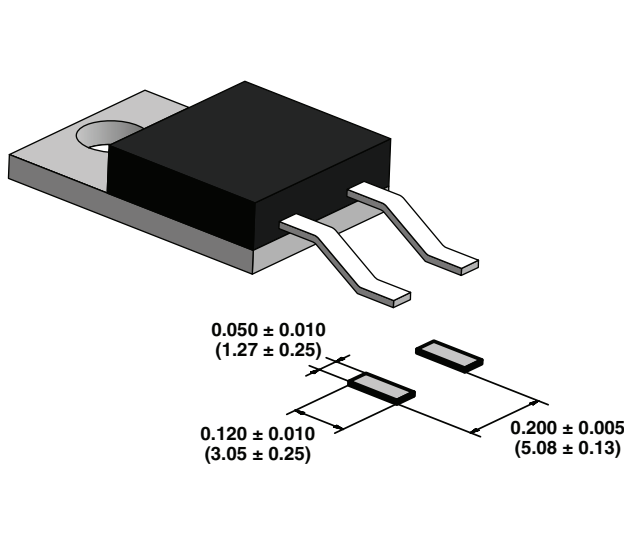
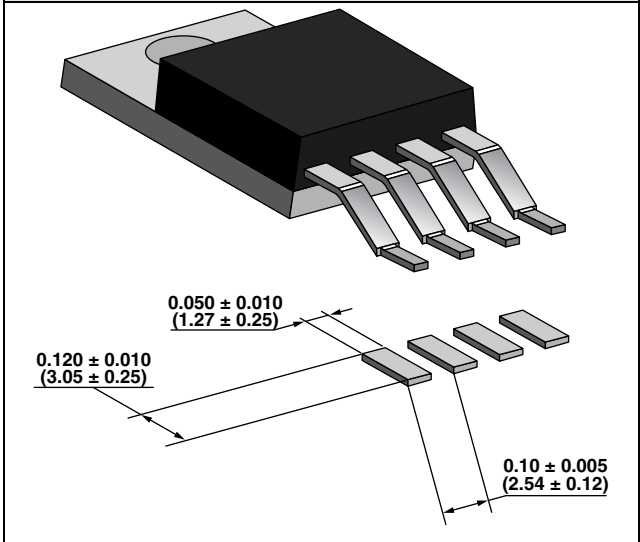


FIGURE 8 - VPR221S LAND PATTERN DIMENSIONS in inches (millimeters)



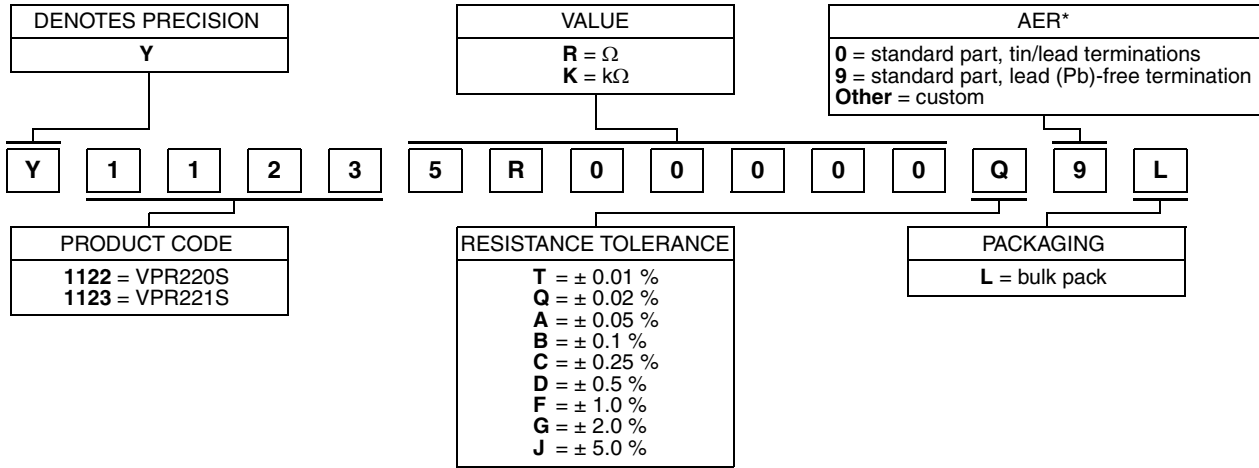
VPR220S, VPR221S



Vishay Foil Resistors Bulk Metal[®] Foil Technology Precision Foil Power Surface Mount 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

TABLE 4 - GLOBAL PART NUMBER INFORMATION

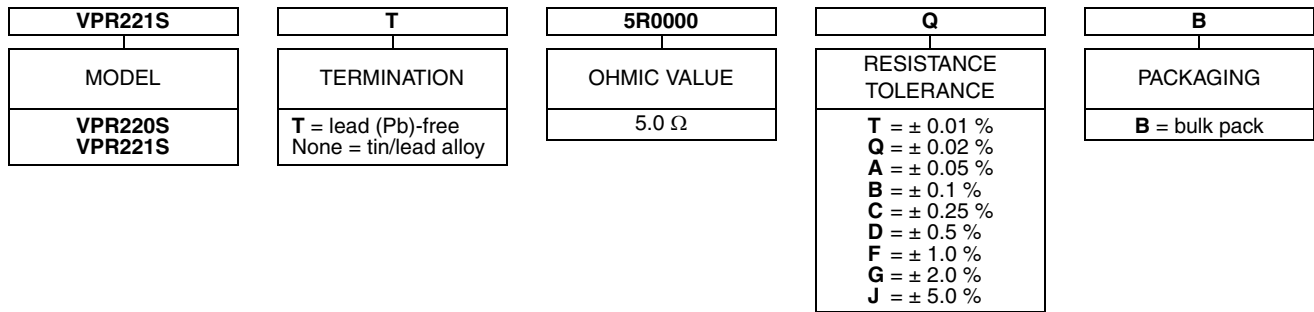
NEW GLOBAL PART NUMBER: Y11235R00000Q9L (preferred part number format)



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

TYPE: VPR221S
 VALUE: 5.0 Ω
 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



Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.