

Ultra High Precision Z-Foil Power Resistor in TO-220 Configuration with TCR of $\pm 0.05 \text{ ppm/}^\circ\text{C}$, Tolerance to $\pm 0.01 \%$ and Power Rating to 8 W



Vishay Foil Resistors manufacture any resistance value within the given resistance range (e.g. 10Ω or 10.1234Ω) without influencing cost or lead time

Model VPR220Z, made from Vishay Bulk Metal® Z-foil, offers very low TCR, high stability, tight tolerance, low PCR and fast response time in a small molded resistor.

The Z-foil technology provides a significant reduction of the resistive components sensitivity to ambient temperature variations and applied power changes. Designers now can guarantee a high degree of stability and accuracy in fixed resistor applications using solutions based on Vishay's revolutionary Z-foil technology.

Our application engineering department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact us.

FEATURES

- **Temperature coefficient of resistance (TCR):**
 $\pm 0.05 \text{ ppm/}^\circ\text{C}$ typical (0°C to $+60^\circ\text{C}$)
 $\pm 0.2 \text{ ppm/}^\circ\text{C}$ typical (-55°C to $+125^\circ\text{C}$, $+25^\circ\text{C}$ ref.)
- Tolerance: to $\pm 0.01 \%$
- Power coefficient of resistance (PCR) "ΔR due to self heating": 4 ppm/W typical
- Electrostatic discharge (ESD) above $25\,000 \text{ V}$
- Load life stability: $\pm 0.005 \%$ (25°C , 2000 h at rated power)
- Resistance range: 5Ω to $10 \text{ k}\Omega$ (Any value available within resistance range e.g. $1\text{K}2345$)
- Power rating: 8 W chassis mounted (per MIL-PRF-39009)
- Thermal stabilization $< 1 \text{ s}$
- Rise time: 1 ns without ringing
- Optimized for military and space applications according to EEE-INST-002 screening and MIL-PRF 39009
- Non inductive, non capacitive design
- Current noise: $< -40 \text{ dB}$
- Voltage coefficient: $< 0.1 \text{ ppm/V}$
- 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
- Also available in a surface mount version, the VPR220SZ
- Prototype samples available from 72 h . For more information, please contact foil@vishay.com
- For higher performances please contact us



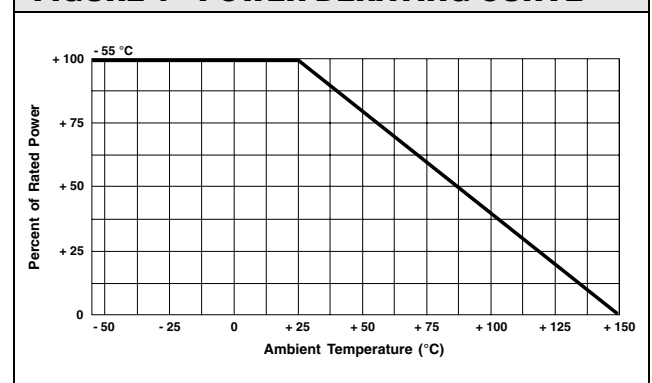
Available
RoHS*
COMPLIANT

TABLE 1 - VPR220Z (-55°C to $+125^\circ\text{C}$, $+25^\circ\text{C}$ Ref.)

RESISTANCE RANGE (Ω)	TIGHTEST RESISTANCE TOLERANCE	TYPICAL TCR AND MAX. SPREAD ($\text{ppm/}^\circ\text{C}$)
50 to 10K	$\pm 0.01 \%$	$\pm 0.2 \pm 2.3$
25 to < 50	$\pm 0.02 \%$	
10 to < 25	$\pm 0.05 \%$	
5 to < 10	$\pm 0.1 \%$	

Weight = 1 g maximum

FIGURE 1 - POWER DERATING CURVE



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

TABLE 2 - SPECIFICATIONS

Load Life Stability at 2000 h	$\pm 0.05 \%$ max. ΔR under full rated power at $+25^\circ\text{C}$
Power Rating at $+25^\circ\text{C}$	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	$< 0.010 \mu\text{V (rms)/V}$ of applied voltage (-40 dB)
High Frequency Operation Rise time Inductance ³⁾ (L) Capacitance (C)	1 ns 0.1 μH maximum: 0.03 μH typical 1.0 pF maximum: 0.5 pF typical
Voltage Coefficient⁴⁾	$< 0.1 \text{ ppm/V}$
Operating Temperature Range	-55°C to $+150^\circ\text{C}$
Maximum Working Voltage	300 V. Not to exceed power rating.
Thermal EMF⁵⁾	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-PRF-39009:
- | 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 2 - TRIMMING TO VALUES
(conceptual illustration)

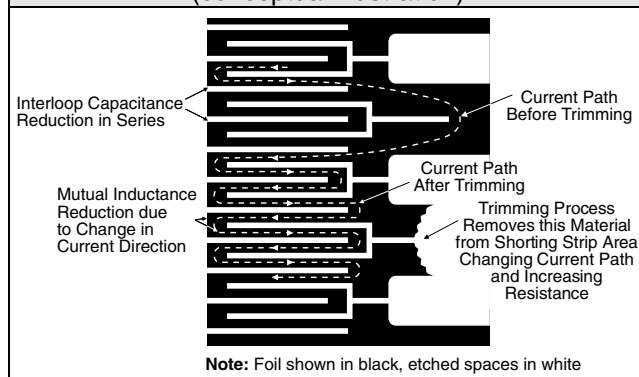


FIGURE 3 - TYPICAL TCR CURVE Z-FOIL

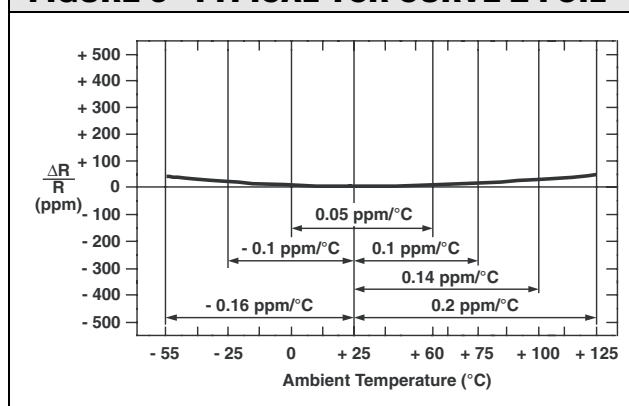


FIGURE 4 - VPR220Z TESTS:
5R, 10 UNITS

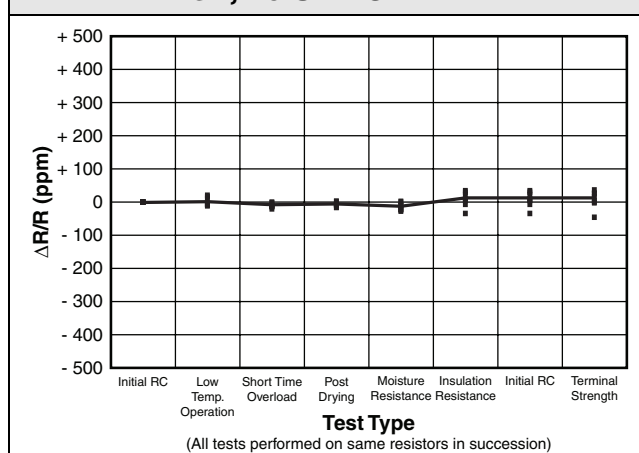
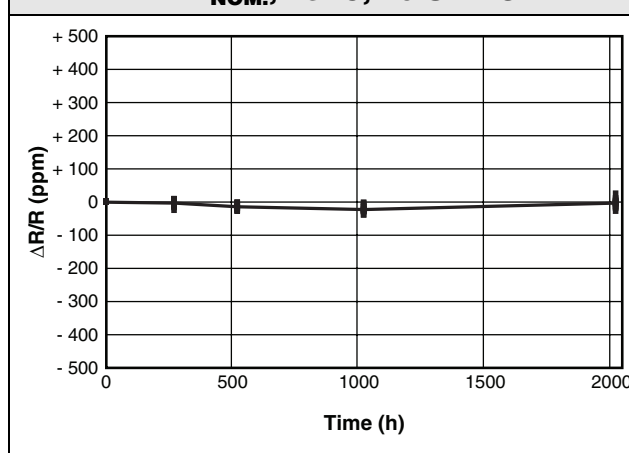


FIGURE 5 - VPR220Z LOAD LIFE, 10 kΩ
P_{NOM.}, 25 °C, 20 UNITS



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Tolerance to ± 0.01 % and Power Rating to 8 W

Vishay Foil Resistors

FIGURE 6 - VPR220Z FORMING DIMENSIONS in inches (millimeters)

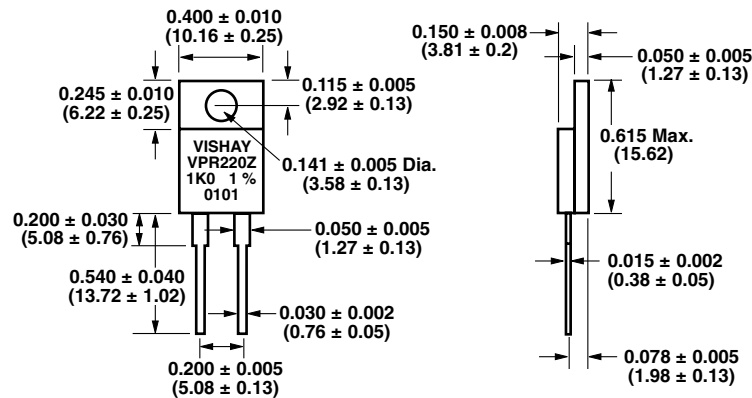
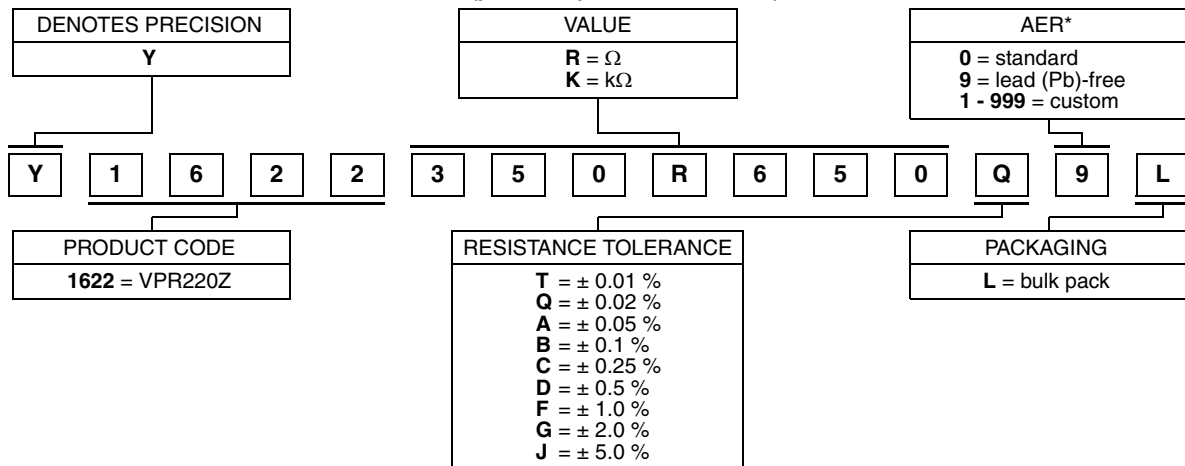


TABLE 3 - GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBER: Y1622350R650Q9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1622 350R650 Q 9 L:

TYPE: VPR220Z

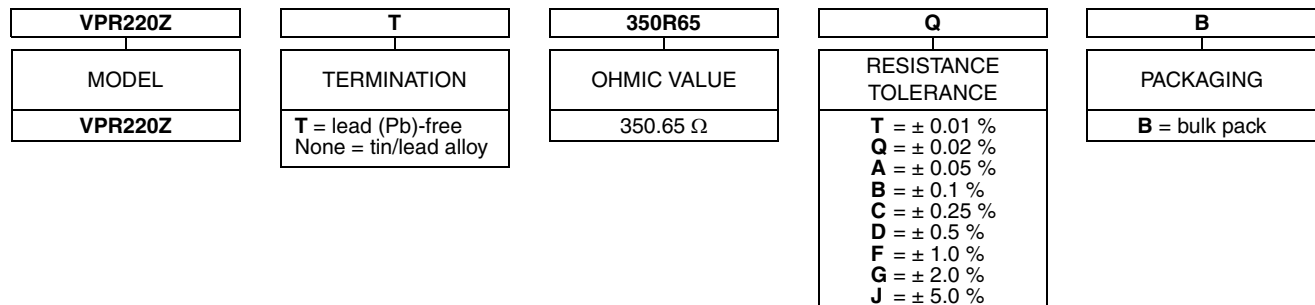
VALUE: 350.65 Ω

ABSOLUTE TOLERANCE: $\pm 0.02\%$

TERMINATION: lead (Pb)-free

PACKAGING: bulk pack

HISTORICAL PART NUMBER: VPR220ZT 350R65 Q B (will continue to be used)



Note

* For non-standard requests, please contact application engineering.



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