

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



Vishay Foil Resistors manufacture any resistance value within the given resistance range (e.g. 10 Ω or 10.1234 Ω) 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):**
 - ± 0.05 ppm/ $^{\circ}$ C typical (0 $^{\circ}$ C to + 60 $^{\circ}$ C)
 - ± 0.2 ppm/ $^{\circ}$ C typical (- 55 $^{\circ}$ C to + 125 $^{\circ}$ C, + 25 $^{\circ}$ C ref.)
- Tolerance: to ± 0.01 %
- Power coefficient of resistance (PCR) "ΔR due to self heating": 4 ppm/W typical
- Electrostatic discharge (ESD) above 25 000 V
- Load life stability: ± 0.005 % (25 $^{\circ}$ C, 2000 h at rated power)
- Resistance range: 5 Ω to 10 k Ω (Any value available within resistance range e.g. 1K2345)
- Power rating: 8 W chassis mounted (per MIL-PRF-39009)
- Thermal stabilization < 1 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 dB
- Voltage coefficient: < 0.1 ppm/V
- Non inductive: < 0.08 μ H
- Non hot spot design
- Thermal EMF: 0.05 μ V/ $^{\circ}$ 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

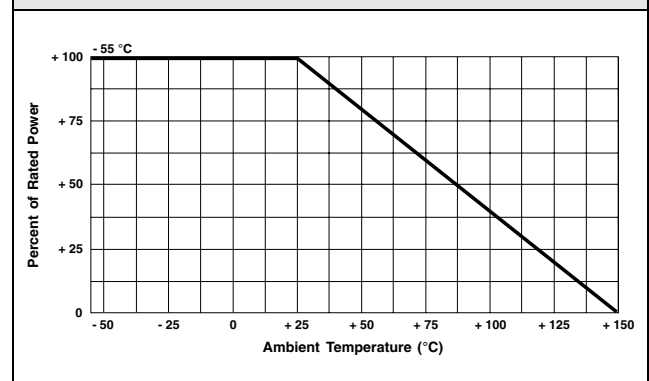


Available
RoHS*
COMPLIANT

RESISTANCE RANGE (Ω)	TIGHTEST RESISTANCE TOLERANCE	TYPICAL TCR AND MAX. SPREAD (ppm/ $^{\circ}$ C)
50 to 10K	± 0.01 %	$\pm 0.2 \pm 2.3$
25 to < 50	± 0.02 %	
10 to < 25	± 0.05 %	
5 to < 10	± 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	$< 0.010 \mu\text{V (rms)}/\text{V}$ of applied voltage ($- 40 \text{ dB}$)
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⁾	$< 0.1 \text{ ppm}/\text{V}$
Operating Temperature Range	$- 55^\circ\text{C}$ 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)

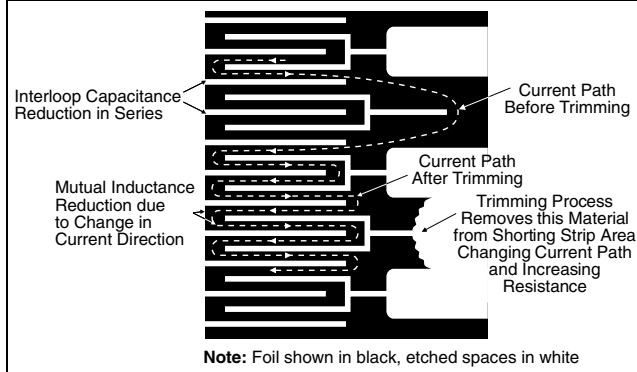


FIGURE 3 - TYPICAL TCR CURVE Z-FOIL

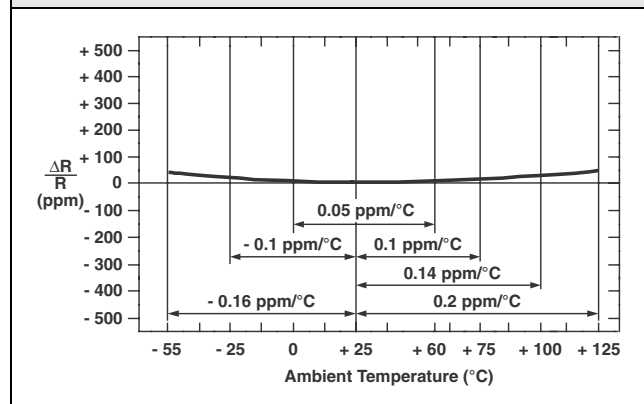


FIGURE 4 - VPR220Z TESTS:
5R, 10 UNITS

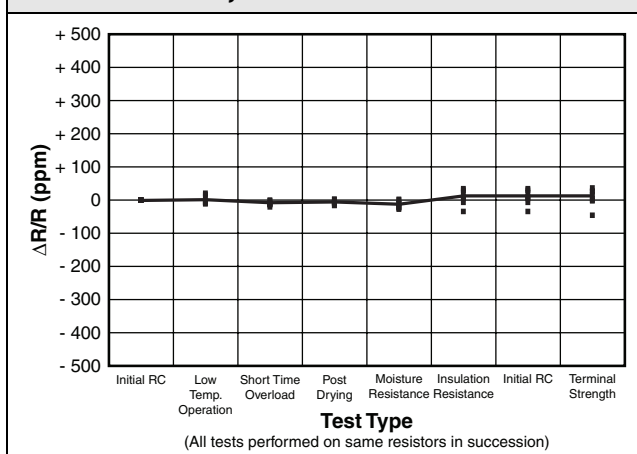
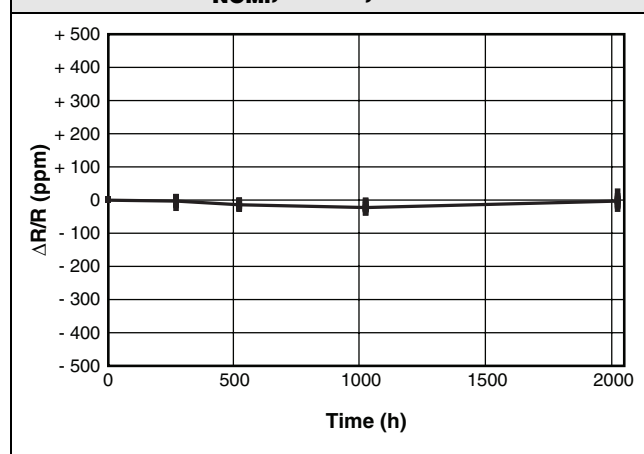


FIGURE 5 - VPR220Z LOAD LIFE, 10 kΩ
P_{NOM.}, 25 °C, 20 UNITS





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Vishay Foil Resistors

FIGURE 6 - VPR220Z FORMING DIMENSIONS in inches (millimeters)

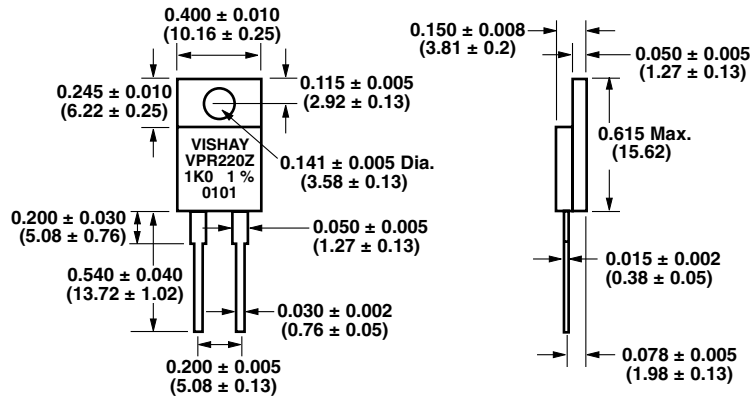
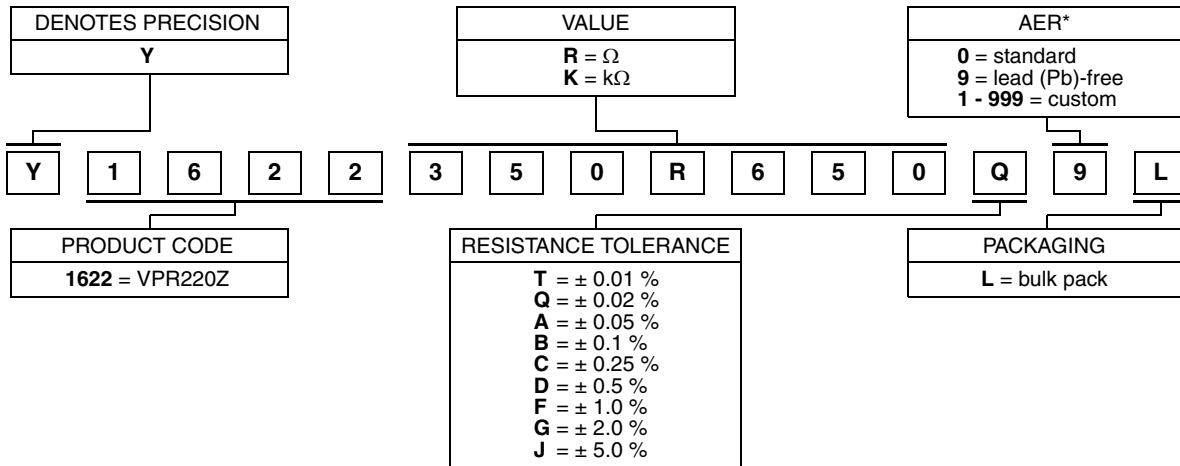


TABLE 3 - GLOBAL PART NUMBER INFORMATION

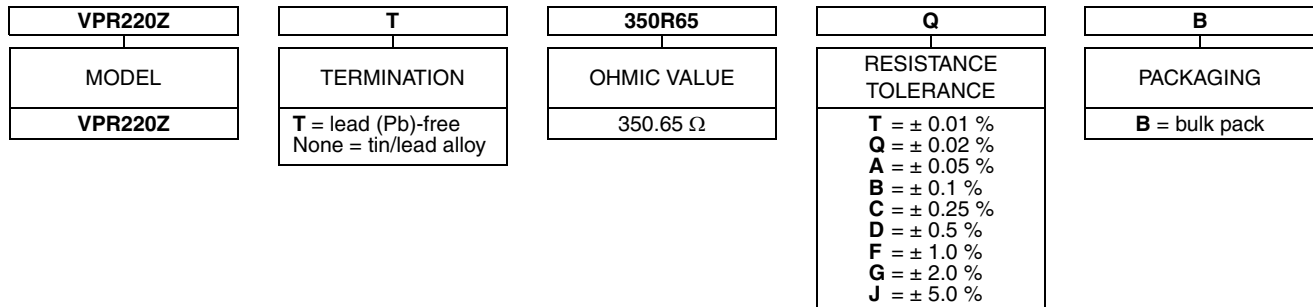
NEW GLOBAL PART NUMBER: Y1622350R650Q9L (preferred part number format)



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

TYPE: VPR220Z
 VALUE: 350.65 Ω
 ABSOLUTE TOLERANCE: ± 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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