Ultra High Precision Z-Foil Power Resistor in TO-220 Configuration with TCR of ± 0.05 ppm/°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

Pb-free Available

RoHS* COMPLIANT

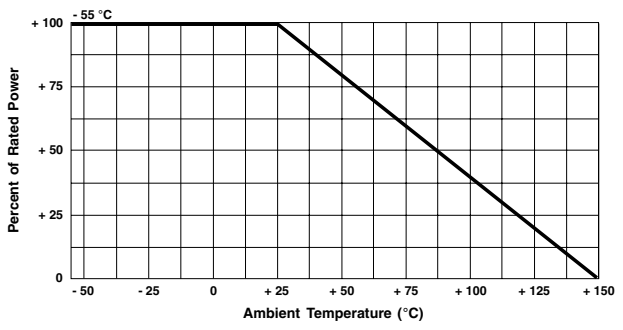
- **Temperature coefficient of resistance (TCR):** ± 0.05 ppm/°C typical (0 °C to + 60 °C) ± 0.2 ppm/°C typical (- 55 °C to + 125 °C, + 25 °C ref.)
- Tolerance: to ± 0.01 %
- Power coefficient of resistance (PCR) "ΔR due to self heating": 4 ppm/W typical
- Electrostatic discharge (ESD) above 25 000 V
- Load life stability: ± 0.005 % (25 °C, 2000 h at rated power)
- Resistance range: 5 Ω to 10 kΩ (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 µH
- Non hot spot design
- Thermal EMF: 0.05 µV/°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

TABLE 1 - VPR220Z (- 55 °C to + 125 °C, + 25 °C Ref.)

RESISTANCE RANGE (Ω)	TIGHTEST RESISTANCE TOLERANCE	TYPICAL TCR AND MAX. SPREAD (ppm/°C)
50 to 10K	± 0.01 %	± 0.2 ± 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

VPR220Z (Z-Foil)

Vishay Foil Resistors

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TABLE 2 - 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[1] on heat sink[2] 1.5 Wor 3 A[1] in free air **Further derating not necessary.**
Current Noise	< 0.010 µV (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 Coefficient[4]	< 0.1 ppm/V
Operating Temperature Range	- 55 °C to + 150 °C
Maximum Working Voltage	300 V. Not to exceed power rating.
Thermal EMF[5]	0.15 µV/°C maximum (lead effect)

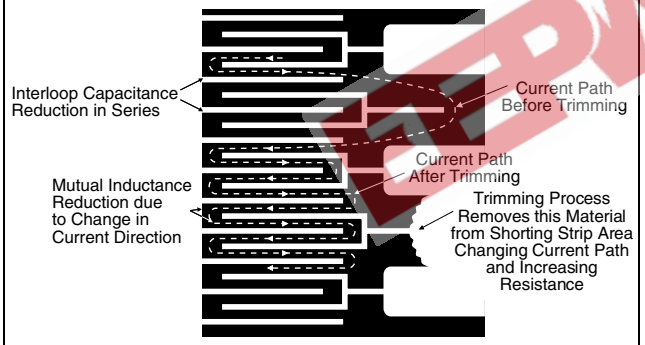
Notes

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. µV/°C relates to EMF due to lead temperature difference.

FIGURE 2 - TRIMMING TO VALUES
(conceptual illustration)



Note: Foil shown in black, etched spaces in white

FIGURE 3 - TYPICAL TCR CURVE Z-FOIL

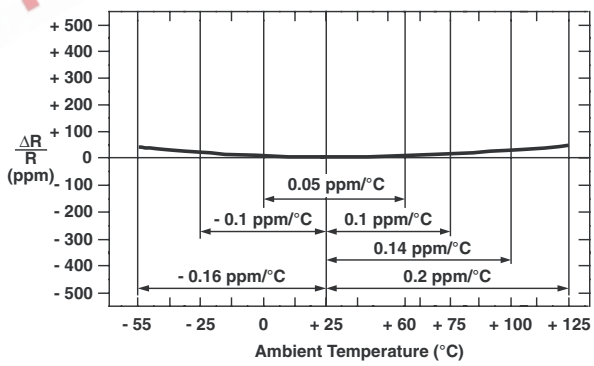
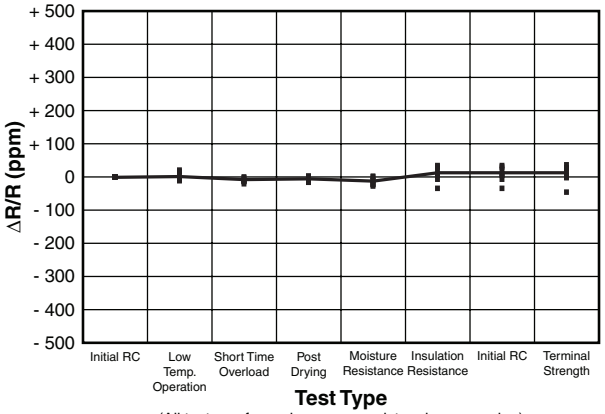
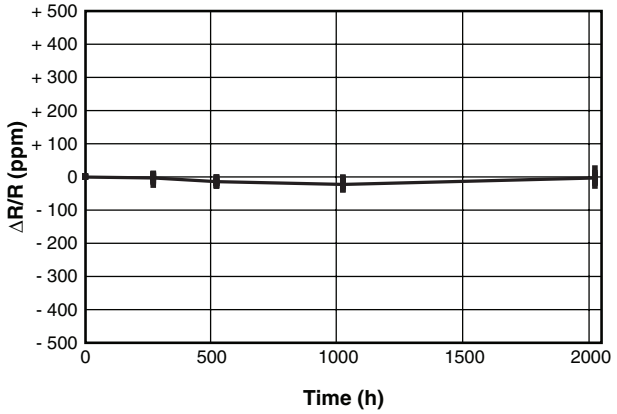


FIGURE 4 - VPR220Z TESTS: 5R, 10 UNITS



(All tests performed on same resistors in succession)

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



For any questions, contact: foil@vishay.com

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FIGURE 6 - VPR220Z FORMING DIMENSIONS in inches (millimeters)

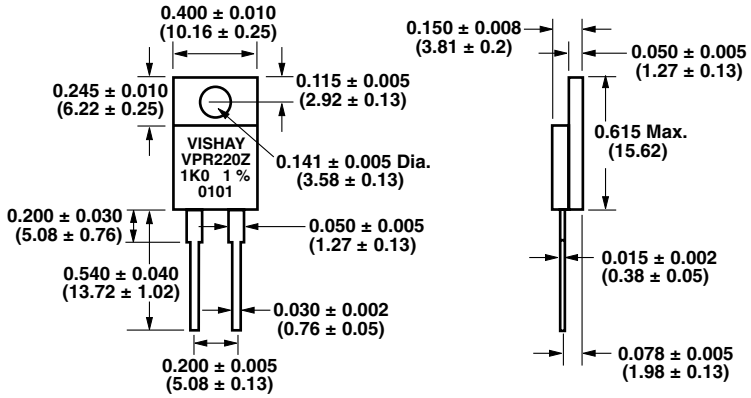

TABLE 3 - GLOBAL PART NUMBER INFORMATION

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

DENOTES PRECISION					VALUE							AER*		
Y					R = Ω K = kΩ							**0** = standard **9** = lead (Pb)-free **1 - 999** = custom		
Y	1	6	2	2	3	5	0	R	6	5	0	Q	9	L
PRODUCT CODE					RESISTANCE TOLERANCE							PACKAGING		
1622 = VPR220Z					**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 % **G** = ± 2.0 % **J** = ± 5.0 %							**L** = bulk pack		

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)

VPR220Z	**T**	**350R65**	**Q**	**B**
MODEL	TERMINATION	OHMIC VALUE	RESISTANCE TOLERANCE	PACKAGING
VPR220Z	**T** = lead (Pb)-free None = tin/lead alloy	350.65 Ω	**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 % **G** = ± 2.0 % **J** = ± 5.0 %	**B** = bulk pack

Note

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

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