

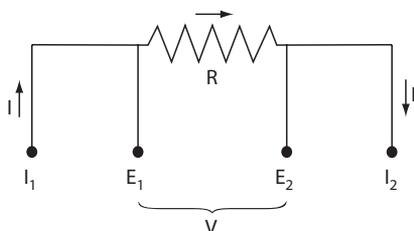
Ultra High Precision Z-Foil Power Resistor in TO-220 Configuration with TCR of ± 0.05 ppm/°C, PCR of 4 ppm/W and Load Life Stability of $\pm 0.005\%$ (50 ppm)

FEATURES

- 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 $\pm 0.01\%$
- Power coefficient “ ΔR due to self heating”
4 ppm/W typical
- Rated power: 8 W chassis mounted (MIL-PRF-39009)
- Load life stability: to $\pm 0.005\%$ at 25°C for 2000 hours,
at 1.5 W
- Resistance range: 0.5 Ω to 500 Ω
- Short time overload $\leq 0.001\%$ (10 ppm)



RoHS*
COMPLIANT



TCR and Tolerance

| RESISTANCE RANGE (Ω) | TIGHTEST RESISTANCE TOLERANCE | TYPICAL TCR AND MAX. SPREAD ⁽¹⁾ |
|-------------------------------|-------------------------------|--|
| 0.5 to <1 | $\pm 0.05\%$ | ± 0.2 ppm/°C ± 2.8 ppm/°C |
| 1 to <10 | $\pm 0.02\%$ | ± 0.2 ppm/°C ± 2.3 ppm/°C |
| 10 to 500 | $\pm 0.01\%$ | ± 0.2 ppm/°C ± 1.8 ppm/°C |

Notes

⁽¹⁾ MIL-Range (-55°C to +125°C, +25°C Ref.)

Contact Applications Engineering for other available values

Specifications

| | |
|--|--|
| Power Rating at +25°C | 8 W or 3 A ⁽²⁾ on heat sink ⁽³⁾ , 1.5 W in free air. Further derating not necessary. |
| Current Noise | $< 0.010 \mu\text{V}_{\text{RMS}}/\text{V}$ of applied voltage (-40 dB) |
| High Frequency Operation Rise Time Inductance ⁽⁴⁾ (L) Capacitance (C) | 0.2 ns at 1 W 0.1 μH maximum: 0.03 μH typical ⁽¹⁾ 1.0 pF maximum: 0.5 pF typical ⁽¹⁾ |
| Voltage Coefficient⁽⁵⁾ | < 0.1 ppm/V |
| Operating Temperature Range | -55°C to +150°C |
| Maximum Working Voltage | 300 V, Not to exceed power rating |
| Thermal EMF⁽⁶⁾ | 0.15 $\mu\text{V}/\text{°C}$ maximum (lead effect) |
| Weight | 1.2 g maximum |

Notes

⁽¹⁾ Maximum is 1.0% A.Q.L. standard for all specifications except TCR.

⁽²⁾ Whichever is lower.

⁽³⁾ Heat sink chassis dimensions are requirements per MIL-R-39009/1B: (see table on the right)

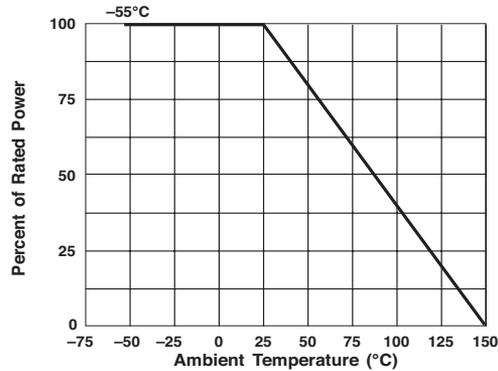
⁽⁴⁾ Inductance (L) mainly due to the leads.

⁽⁵⁾ The resolution limit of existing test requirement (within the measurement capability of the equipment, “essentially zero”).

⁽⁶⁾ $\mu\text{V}/\text{°C}$ relates to EMF due to lead temperature difference.

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

Power Derating Curve



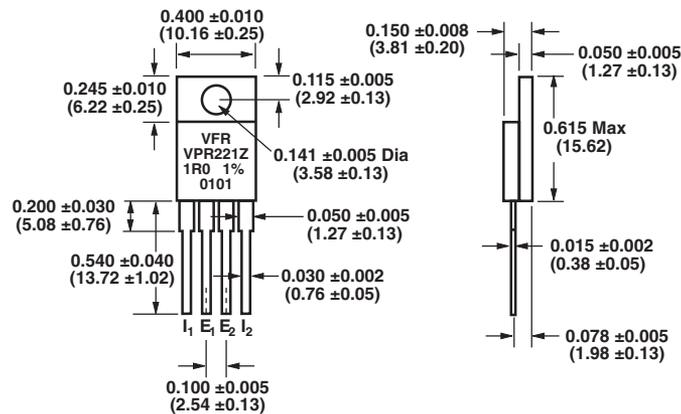
Performance Specifications⁽¹⁾ MIL-PRF 39009

| TEST OR CONDITION | MIL-PRF 39009 | TYPICAL ΔR | MAXIMUM ΔR |
|--|---------------------|------------------|---------------------|
| Low temperature storage 24 hours at -55°C | ±0.3%+0.01 Ω | ±0.001% (10 ppm) | ±0.002% (20 ppm) |
| Dielectric withstanding voltage 300 VAC at Atm | ±0.2%+0.01 Ω | ±0.001% (10 ppm) | ±0.002% (20 ppm) |
| Dielectric withstanding voltage 200 VAC at Brm | ±0.2%+0.01 Ω | ±0.001% (10 ppm) | ±0.002% (20 ppm) |
| Insulation resistance | >10 ⁴ MΩ | - | >10 ⁴ MΩ |
| Low temperature operation | ±0.3%+0.01 Ω | ±0.002% (20 ppm) | ±0.008% (80 ppm) |
| Short time overload 5 × rated power for 5 seconds (in air) | ±0.3%+0.01 Ω | ±0.001% (10 ppm) | ±0.002% (20 ppm) |
| Moisture resistance +65°C to -10°C, 90 to 98 Rh, 10 days | ±0.5%+0.01 Ω | ±0.005% (50 ppm) | ±0.015% (150 ppm) |
| Terminal Strength | ±0.2%+0.01 Ω | ±0.001% (10 ppm) | ±0.002% (20 ppm) |
| Load life 8 W at +25°C, 2000 hours with heat sink | ±1.0%+0.01 Ω | ±0.005% (50 ppm) | ±0.015% (150 ppm) |
| Load life 1.5 W at +25°C for 2000 hours in free air | ±1.0%+0.01 Ω | ±0.005% (50 ppm) | ±0.015% (150 ppm) |
| High temperature exposure +150°C | ±1.0%+0.05 Ω | ±0.005% (50 ppm) | ±0.01% (100 ppm) |

Note

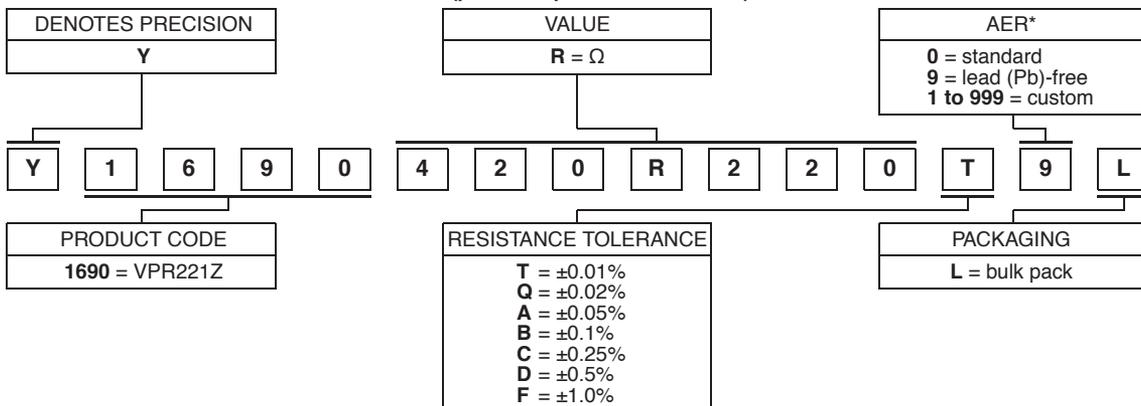
⁽¹⁾ Measurement error ±0.001 Ω

VPR221Z Dimensions In Inches (Millimeters)



Global Part Number Information

NEW GLOBAL PART NUMBER: Y1690420R220T9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1690 420R220 T 9 L:

TYPE: VPR221Z

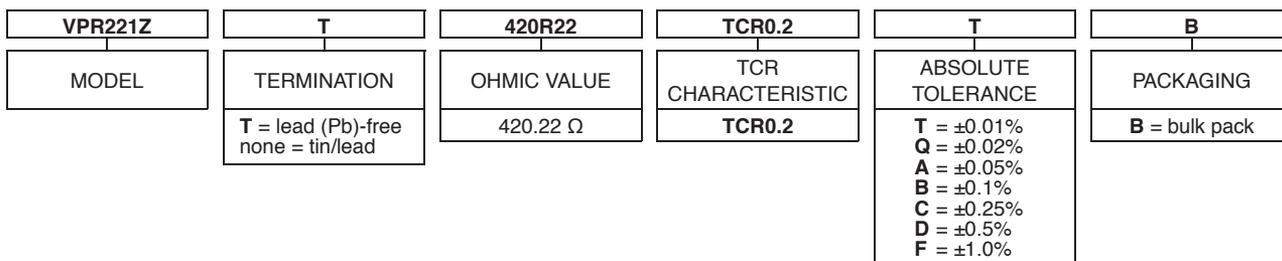
VALUE: 420.22 Ω

ABSOLUTE TOLERANCE: ±0.01%

TERMINATION: Lead (Pb)-free

PACKAGING: Bulk Pack

HISTORICAL PART NUMBER: VPR221Z T 420R22 TCR0.2 T B (will continue to be used)



Note

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