

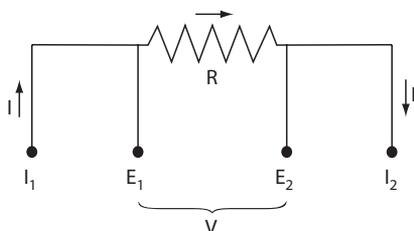
## Ultra High Precision Z-Foil Power Resistor in TO-220 Configuration with TCR of $\pm 0.05$ ppm/°C, PCR of 4 ppm/W and Load Life Stability of $\pm 0.005\%$ (50 ppm)

### FEATURES

- Temperature coefficient of resistance (TCR):  
 $\pm 0.05$  ppm/°C typical (0°C to +60°C)  
 $\pm 0.2$  ppm/°C typical (-55°C to +125°C, +25°C ref.)
- Tolerance: to  $\pm 0.01\%$
- Power coefficient “ $\Delta R$  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  $\Omega$  to 500  $\Omega$
- Short time overload  $\leq 0.001\%$  (10 ppm)



**RoHS\***  
COMPLIANT



### TCR and Tolerance

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

### Notes

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

Contact Applications Engineering for other available values

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

### Notes

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

<sup>(2)</sup> Whichever is lower.

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

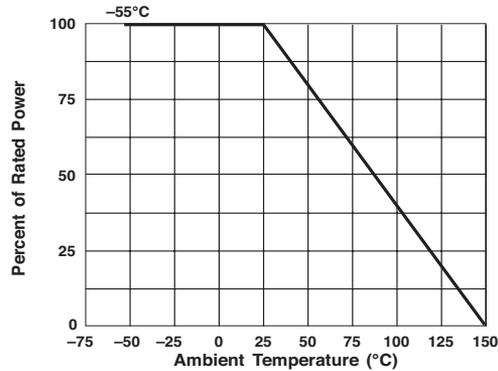
<sup>(4)</sup> Inductance (L) mainly due to the leads.

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

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

	INCHES	MILLIMETERS
<b>L</b>	6.00	152.4
<b>W</b>	4.00	101.6
<b>H</b>	2.00	50.8
<b>T</b>	0.04	1.0

**Power Derating Curve**



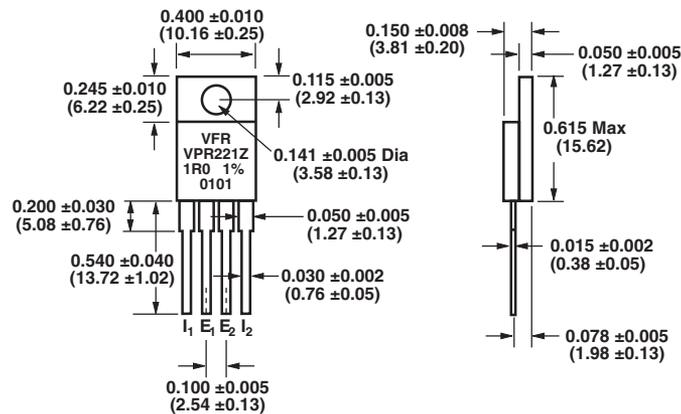
**Performance Specifications<sup>(1)</sup> MIL-PRF 39009**

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 <sup>4</sup> MΩ	-	>10 <sup>4</sup> 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**

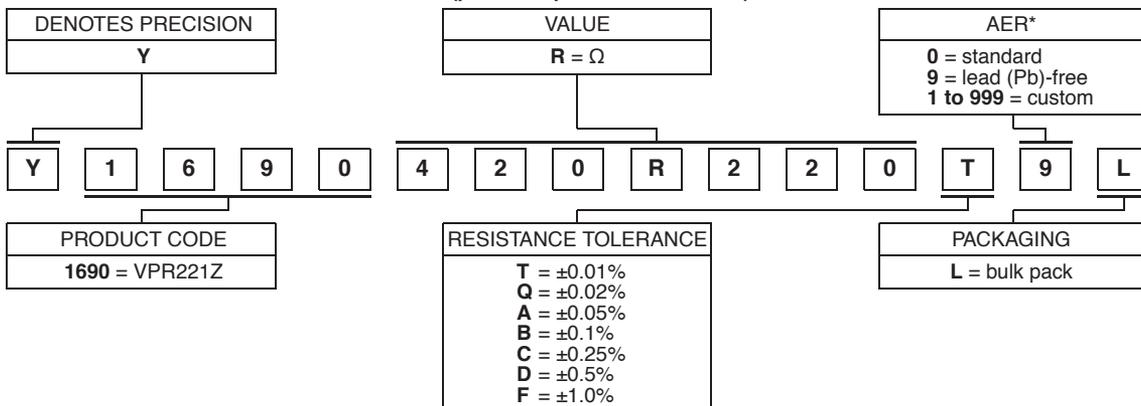
<sup>(1)</sup> Measurement error ±0.001 Ω

**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

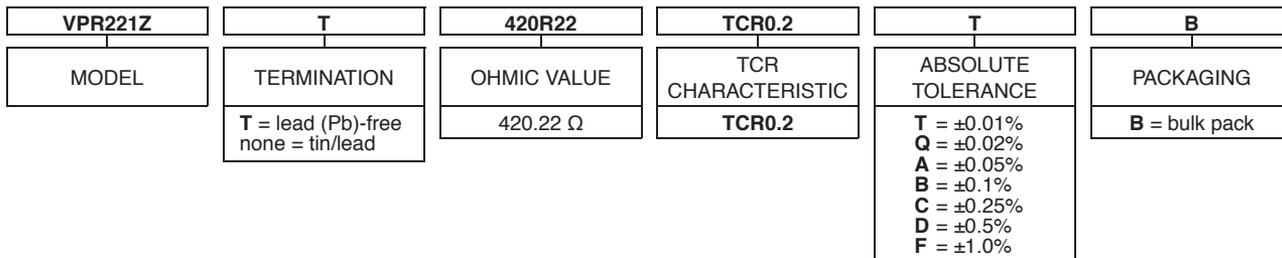
VALUE: 420.22 Ω

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.