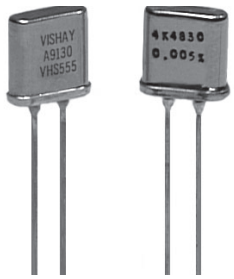
Bulk Metal® Foil Technology
Hermetically Sealed Resistors, Aerospace



Product may not be to scale

The "VHZ" series of resistors is the hermetic version of the molded "Z" series devices. Hermetic sealing eliminates the ingress of both oxygen, which degrades resistors over long periods, and moisture which degrades resistors more quickly. These parts are made with glass to metal seal enclosures employing Kovar eyelets which allow the copper leads to pass through the enclosure to minimize the thermal EMF from the lead junctions. Rubber fill between the metal housing and resistance element acts both as a mechanical damper and thermal transfer path.

VH102Z is the hermetically-sealed counterpart of the Z201 high-performance molded resistors. VHZ555 is the hermetically-sealed version of the Z555, MIL style RNC90Z.

FEATURES

- VH102Z Series
  Nominal Temperature Coefficient of Resistance:
  ± 0.2ppm/°C MIL Range (see table 2)
- VHZ555 Temperature Coefficient of Resistance:
  ± 2ppm/°C (– 55°C to + 125°C);
- Selected TCR Tracking: to 0.5ppm/°C (matched sets)
- Load-Life Stability: ± 0.0025% maximum ΔR at 0.1 watt, + 60°C, 2,000 hours (VHZ555)
- Power Rating: 0.6 Watts at + 70°C; 0.3 Watts at + 125°C
- Resistance Tolerance (Initial Resistance Accuracy):
  ± 0.005% tightest to ± 1.0% loosest
- Resistance Range:
  VH102Z: 100R to 100K
  VHZ555: 4R99 to 121K

THROUGH HOLE

TABLE 1 - MODEL SELECTION

MODEL NUMBER	RESISTANCE RANGE (Ω)	STANDARD RESISTANCE TOLERANCE[1] %		MAXIMUM WORKING VOLTAGE[2]	AMBIENT POWER RATING[3] ††		AVERAGE WEIGHT (GRAMS)	DIMENSIONS		
		TIGHTEST	LOOSEST		at + 70°C	at + 125°C			INCHES	mm
VH102Z	100R to 100K	± 0.005	± 1.0 ± 1.0 ± 1.0	300	0.6 W	0.3 W	1.4	W L H	0.185 Maximum 0.435 Maximum 0.430 Maximum**	4.70 Maximum 11.05 Maximum 10.92 Maximum
VHZ555	30.1 to 121K 20 to < 30.1 4.99 to < 20	± 0.005 ± 0.01 ± 0.05	± 1.0 ± 1.0 ± 1.0					LL LS ST	1 ± 0.125 0.150 ± 0.010[4] 0.095 Maximum	25.4 ± 3.18 3.81 ± 0.25 2.41 Maximum

**0.375H available.

FIGURE 1 - STANDARD IMPRINTING AND DIMENSIONS

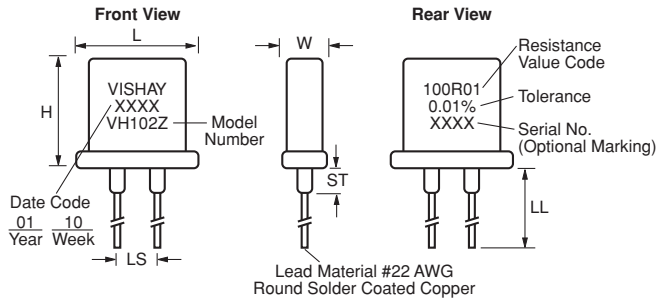
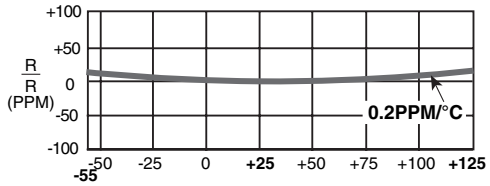


TABLE 2 - "HZ" SERIES SPECIFICATIONS[5]

TEMPERATURE COEFFICIENT OF RESISTANCE	
Nominal TCR[6] (- 55°C to + 125°C)  The TCR is obtained by the process capability and does not rely on a selection process. It does not vary from lot to lot nor by ohmic values.	0.2ppm/°C
VH102Z Maximum TCR (- 55°C to + 125°C, + 25°C - ref)	± 0.8ppm/°C
VHZ555 Maximum TCR (- 55°C to + 125°C, + 25°C - ref)	± 3ppm/°C for values 4R99 to 25R ± 2.5ppm/°C for values 25R to 80R ± 2ppm/°C for values > 80R
Selected[7] TCR Tracking[8] (closest spread)	0.5ppm/°C
Stability[9] Load Life at 2,000 hours. Load Life at 10,000 hours.	VH102Z / VHZ555 ± 0.025% / ± 0.015% at 0.3W/+ 125°C ± 0.005% / ± 0.0025 at 0.1W/+ 80°C ± 0.02% / ± 0.01% at 0.05W/+ 125°C
Shelf Life Stability	± 5ppm (0.0005%) Maximum ΔR after 1 year ±10ppm (0.001%) Maximum ΔR after 3 years
Current Noise	< 0.010μV (RMS)/Volt of applied voltage (– 40dB)
High Frequency Operation Rise/Decay Time Inductance (L)[10] Capacitance (C)	 1.0 ns at 1KΩ 0.1μH maximum; 0.08μH typical 1.0pF maximum; 0.5pF typical
Voltage Coefficient	< 0.1ppm/V[11]
Thermal EMF[12]	0.1μV/°C Maximum; 0.05μV/°C Typical 1μV/watt
Hermeticity	10^{-7} Atmospheric cc/sec Maximum

NOTES:

1. Standard Resistance Tolerance: ± 0.005%; ± 0.01%; ± 0.02%; ± 0.05%; ± 0.1%; ± 0.25%; ± 0.5%; ± 1.0%.

2. Not to exceed power rating of resistor.

3. See Figure 2 below.

4. 0.200" (5.08 mm) lead spacing available for VH102Z, specify VH102ZL.

5. Maximum is 1.0% A.Q.L. standard for all specifications except TCR. (For TCR information see notes 6 -8.) Typical is a designers reference which represents that 85% of the units supplied, over a long period of time, will be at least the figure shown or better.

6. Vishay Nominal TCR is defined as the chord slopes of the relative change of resistance/temperature, expressed in ppm (parts per million), called (RT) curve from 0°C to + 25°C and + 25°C to + 60°C ("Instrument" Range); and from – 55°C to + 25°C and + 25°C to + 125°C ("Military" Range). These specifications and the definition of Nominal TCR apply to all resistance values including low-value resistors.

7. Selected TCR Tracking is available for specially ordered lots of resistors. The selected TCR tracking can be 3, 2, 1 and as close as 0.5ppm/°C throughout the full temperature range.

8 TCR tracking is a measure of the similarity of resistance value change in two or more resistors which are undergoing the same temperature changes. Tracking could be expressed as the difference in the temperature coefficients of the resistors, expressed in ppm/°C as $(\Delta R_1/R_1 - \Delta R_2/R_2) \times 10^{-6}/\Delta T°C$. When a number of resistors are referenced to a nominal TCR, the spread or envelope around the nominal would be the difference. If the spread is ± 1.5ppm/°C about a nominal, the tracking, as defined above, will be 3ppm/°C.

9. Load life ΔR Maximum can be reduced through in-house procedures.

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

11. The resolution limit of existing test equipment (within the measurement capability of the equipment, or "essentially zero.")

12. μV/°C relates to EMF due to lead temperature difference and μV/watt due to power applied to the resistor.

THROUGH HOLE

FIGURE 2 - POWER DERATING CURVE

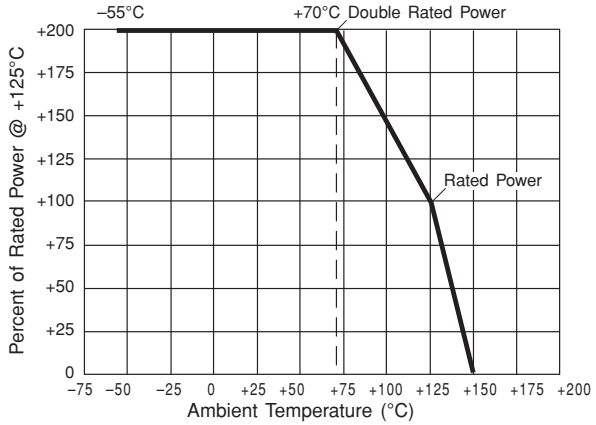


TABLE 3 - ENVIRONMENTAL PERFORMANCE COMPARISON

	MIL-PRF-55182/9 CHARACTERISTIC Y MAXIMUM ΔR	VH102Z TYPICAL[5] ΔR	VHZ555 TYPICAL[5] ΔR
Test Group I			
Thermal Shock	± 0.05%	± 0.002%	± 0.002%
Overload	± 0.05%	± 0.003%	± 0.003%
Test Group II			
Resistance Temp Char.	± 5ppm/°C	See Table 2	See Table 2
Temp Storage	± 0.05%	± 0.005%	± 0.0025
Low Temp Operation	± 0.05%	± 0.005%	± 0.005%
Terminal Strength	± 0.02%	± 0.002%	± 0.002%
Test Group III			
DWV	± 0.02%	± 0.005%	± 0.002%
Insulation Resistance	10^4MΩ	40 x 10^5MΩ	40 x 10^5MΩ
Resistance to Solder Heat	± 0.02%	± 0.002%	± 0.002%
Moisture Resistance	± 0.05%	± 0.005%	± 0.005%
Test Group IV			
Shock	± 0.01%	± 0.002%	± 0.002%
Vibration	± 0.02%	± 0.002%	± 0.002%
Test Group V			
Life Test @ 0.3 W/+ 125°C			
2,000 Hours	± 0.05%	± 0.03%	± 0.01%
10,000 Hours	± 0.5%	± 0.05%	± 0.02%
Test Group Va			
+ 70°C Power Rating	± 0.05%	± 0.02%	± 0.02%
Test Group VI			
High Temp Exposure	± 0.05%	± 0.05%	± 0.04%
Test Group VII			
Voltage Coefficient	0.0005%/V	< 0.00001%/V	< 0.00001%/V

See previous page for numbered footnotes.

TABLE 4 - ORDERING INFORMATION

Please specify Vishay VH102Z and VHZ555 resistors as follows: (See Imprinting Illustration and Table 1, 1st page in this data sheet, for further details).

Example: **VH102Z** (MODEL NO.) **100R01** (RESISTANCE VALUE) **0.01%** (TOLERANCE)

Resistance Value, in ohms, is expressed by a series of 6 characters, 5 of which represent significant digits while the 6th is a dual purpose letter that designates both the multiplier and the location of the comma or decimal.

RESISTANCE RANGE**	LETTER DESIGNATOR	MULTIPLIER FACTOR	EXAMPLE
100Ω to < 1KΩ	R	x 1	100R01 = 100.01Ω
1KΩ to < 100KΩ	K	x 10^3	15K231 = 15.231Ω

**Resistance Range limit for VHZ555: 4R99 to 121K.

SALES
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