



# Ultra High Precision Z-Foil Power Current Sensing Resistor with Absolute TCR of $\pm 0.05 \text{ ppm}/^\circ\text{C}$ and Load Life Stability to $\pm 0.005\%$



Product may not  
be to scale

Any value at any tolerance available with resistance range

## INTRODUCTION

VCS232Z is the industry's first device to prove high rated power, excellent load life stability along with low TCR and all in one resistor.

The New Z-Foil Technology provides a significant reduction of the resistive components sensitivity to ambient temperature variations (TCR) and applied power changes (PCR).

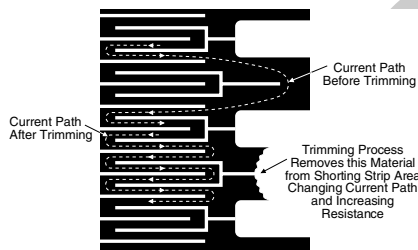
The latest development in Foil resistors technology have reduced the temperature coefficient of Resistance (TCR), to below  $\pm 0.2 \text{ ppm}/^\circ\text{C}$  (part per million per degree centigrade).  $\pm 0.05 \text{ ppm}/^\circ\text{C}$  Absolute TCR removes error due to temperature gradients.

By taking advantage of the overall stability and reliability of Vishay Bulk Metal® Z-Foil resistors, designers can significantly reduce circuit errors and greatly improve overall circuit performances.

Model VCS232Z is a 4 lead kelvin connected device.

Our Application Engineering Department is available to advise and make recommendations for non-standard technical requirements and special applications. Please contact us.

**FIGURE 1 - TRIMMING TO VALUES (CONCEPTUAL ILLUSTRATION)**



NOTE: Foil shown in black, etched spaces in white

## FEATURES

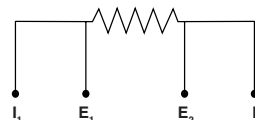
- Temperature Coefficient of Resistance (TCR):  $\pm 0.05 \text{ ppm}/^\circ\text{C}$  (Industrial range)  
 $\pm 0.2 \text{ ppm}/^\circ\text{C}$  (MIL range)
- Resistance Range:  $0.25\Omega$  to  $500\Omega$
- Power Coefficient "ΔR due to self heating": 4 ppm/W typical
- Load Life stability:  $< \pm 0.005\%$  2W at  $25^\circ\text{C}$  for 2000 hours
- Power rating @  $+25^\circ\text{C}$ : 2 Watts
- Tolerance: to  $\pm 0.02\%$
- Electrostatic Discharge (ESD) above 25 000 Volts
- Short Time overload  $\leq \pm 0.005\%$
- Non hot spot design
- Thermal EMF:  $0.05\mu\text{V}/^\circ\text{C}$
- Rise time: 1ns without ringing
- Current Noise  $< -40\text{dB}$
- Non Inductive/Capacitive design
- Voltage Coefficient  $< 0.1 \text{ ppm/V}$
- Thermal Finishes available Lead (Pb)-free  
Tin/Lead Alloy
- Maximum current: 3 Amps
- For better performances please contact us



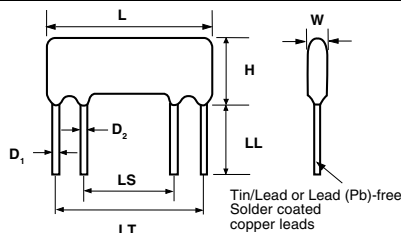
RoHS\*  
COMPLIANT

## APPLICATIONS

- Automatic Test Equipment (ATE)
- High Precision Instrumentation
- Electron Beam application
- Current Sensing applications
- Pulse applications
- Military
- Power amplifier
- Power supplies



**FIGURE 2 - DIMENSIONS** in inches (millimeters)



Dimensions - Maximum Inches (mm) - unless otherwise noted

MODEL	L	H	W	LL (Minimum)	LS $\pm 0.20 (\pm 0.5)$	LT $\pm 0.20 (\pm 0.5)$	D1 (Nominal)	D2 (Nominal)
VCS232Z	1.240 (32.0)	0.512 (13.0)	0.177 (4.50)	0.500 (12.7)	0.688 (17.5)	1.083 (27.5)	0.040 (1.00)	0.032 (0.80)

\* Pb containing terminations are not RoHS compliant, exemptions may apply

### SALES

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# VCS232Z (Z-Foil Technology)



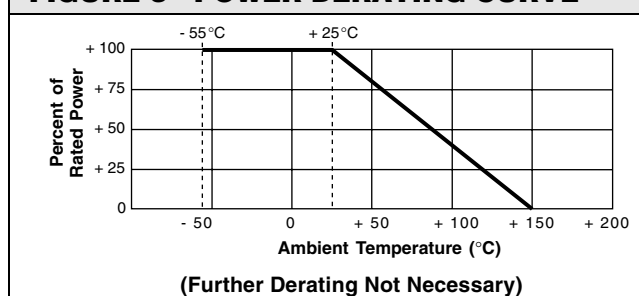
Vishay Foil Resistors Ultra High Precision Z-Foil Power Current Sensing Resistor with Absolute TCR of  $\pm 0.05 \text{ ppm/}^\circ\text{C}$  and Load Life Stability to  $\pm 0.005\%$

**TABLE 1 - PERFORMANCES\***

TEST OR CONDITION	TYPICAL $\Delta R$	MAXIMUM $\Delta R$
Low temperature storage 24 hours @ - 55°C	$\pm 0.002\%$ (20 ppm)	$\pm 0.005\%$ (50 ppm)
Short time overload 6.25 x rated power	$\pm 0.002\%$ (20 ppm)	$\pm 0.005\%$ (50 ppm)
DWV	$\pm 0.002\%$ (20 ppm)	$\pm 0.005\%$ (50 ppm)
Moisture resistance	$\pm 0.01\%$ (100 ppm)	$\pm 0.02\%$ (200 ppm)
Terminal Strength	$\pm 0.002\%$ (20 ppm)	$\pm 0.005\%$ (50 ppm)
Load life (2 Watt, + 25°C, 2000 hours)	$\pm 0.005\%$ (50 ppm)	$\pm 0.01\%$ (100 ppm)
High temperature exposure 2000 hours @ + 150°C	$\pm 0.01\%$ (100 ppm)	$\pm 0.02\%$ (200 ppm)

\* Measurement error 0.0005R

**FIGURE 3 - POWER DERATING CURVE**



**TABLE 2 - VCS232Z**

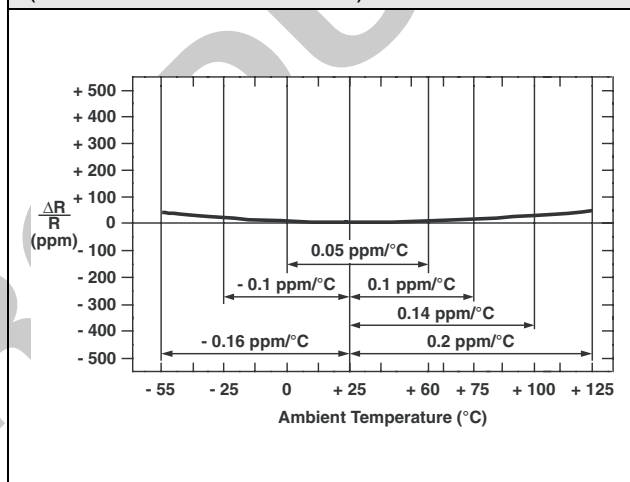
RESISTANCE RANGE ( $\Omega$ )	TIGHTEST RESISTANCE TOLERANCE	TYPICAL TCR AND MAX. SPREAD (ppm/°C)*
0.25 to < 10	$\pm 0.05\%$	$\pm 0.2 \text{ ppm/}^\circ\text{C} \pm 2.8 \text{ ppm/}^\circ\text{C}$
10 to 500	$\pm 0.02\%$	$\pm 0.2 \text{ ppm/}^\circ\text{C} \pm 1.8 \text{ ppm/}^\circ\text{C}$

Weight = 1.2 gms Maximum

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

Contact Applications Engineering for other available values

**FIGURE 4 - TYPICAL TCR CURVE Z-FOIL**  
(for more details see table 2)



**TABLE 3 - ORDERING INFORMATION**

MODEL	RESISTANCE VALUE			TERMINATION	ABSOLUTE TCR	ABSOLUTE TOLERANCE	PACKAGING
VCS232Z	RESISTANCE RANGE	LETTER DESIGNATOR	MULTIPLIER FACTOR	T = Lead (Pb)-free none = Tin/Lead Alloy	TCR0.2	Q = 0.02% A = 0.05% B = 0.1% C = 0.25% D = 0.5% F = 1%	B = Bulk
	0.25 $\Omega$ to < 500 $\Omega$	R	X 1.0				
	Example: 249R00 = 249 $\Omega$						

\* Specify the resistance value for each resistor of the network - even if all values are the same.

Example:

VCS232ZT1R0000TCR0.2AB

Model: VCS232Z (Z-Foil)

Value: R1 = 1 $\Omega$

Termination: Lead (Pb)-free

TCR0.2: 0.2 ppm/°C typical refers to any value in the resistance range

Tolerance: Absolute = 0.05%

Packaging: Bulk Pack

SALES

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