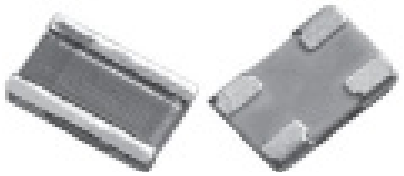
Texas Components Corporation

USA Manufacturer of **Bulk Metal® Foil*** Precision Resistors

VCS1625Z

Bulk Metal® Z-Foil Current Sense Resistor

for **Surface Mount** Applications



Note: actual color may vary

Ultra High Precision; Ultra Low Temperature Coefficient of Resistance (TCR)

Tight Tolerance, Low Temperature Power Coefficient of Resistance (PCR), and Low Voltage Coefficient of Resistance (VCR)

Resistors made with Bulk Metal® Foil are known for their unique combination of unmatched performance in all 10 major technical areas:

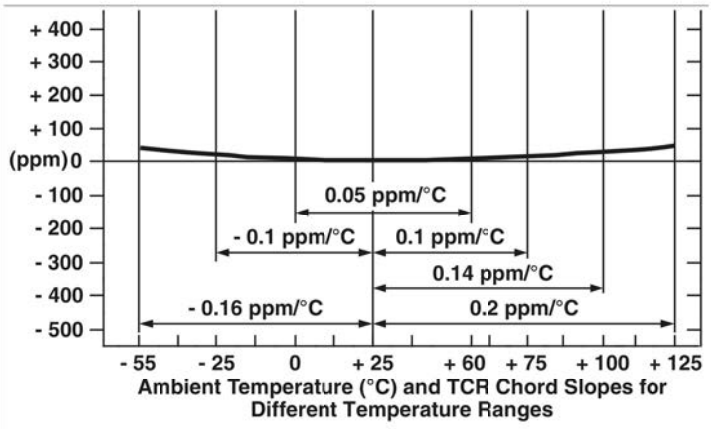
Temperature Coefficient of Resistance (TCR)	Tolerance
Power Coefficient of Resistance (PCR)	Thermal Stabilization
Voltage Coefficient of Resistance (VCR)	Load Life Stability
Thermal Electromotive Force (EMF)	Response Time
Electrostatic Discharge (ESD)	Noise

Bulk Metal® Z-Foil technology out-performs all other resistor technologies available today for applications that require ultra high precision and ultra high stability. The new Z-Foil technology provides a significant reduction of the resistive element's sensitivity to changes of temperature due to ambient temperature variations (temperature coefficient or TCR) and to self heating when power is applied (power coefficient or PCR). Designers can now guarantee a high degree of stability and accuracy in fixed-resistor applications! The model **VCS1625Z is a surface mount chip resistor designed with 4 pads for Kelvin connection**. With Bulk Metal® Z-foil as the resistance element, the VCS1625Z provides performance capabilities far greater than other resistor technologies can supply in a product of comparable size. This small device dissipates heat almost entirely through the pads so surface mount users are encouraged to be generous with the board's pads and traces. Our application engineering department is available to advise or make recommendations for non-standard technical requirements and special applications, please contact us.

Table 1 - Best Available Characteristics of Different Resistor Technologies

Technology	Temperature Coefficient of Resistance (TCR) -55ºC to +125ºC, +25ºC ref.	Initial Tolerance	End of Life Tolerance	Load Life Stability at +70ºC, Rated Power at 2000 Hours and then at 10,000 Hours	ESD (V)	Thermal Stabilization	Noise (dB)
Bulk Metal® Z-Foil	± < 1 ppm/°C	From 0.001%	< 0.05%	0.005% (50 ppm) 0.01% (100 ppm)	25,000V	< 1 second	**-42db**
Thin Film	±5 ppm/°C	From 0.05%	< 0.4%	0.05% (500 ppm) 0.15% (1500 ppm)	2,500V	> minutes	-20db
Thick Film	±50 ppm/°C	From 0.5%	< 5%	0.5% (5000 ppm) 2% (20,000 ppm)	2,000V	> minutes	+20db
Wirewound	±3 ppm/°C	From 0.005%	< 0.5%	0.05% (500 ppm) 0.15% (1500 ppm)	25,000V	> minutes	-35db

FIGURE 1 – Z-FOIL RESISTANCE/TEMPERATURE CURVE (Statistical/Typical)



Note: The TCR values for < 100Ω become more influenced by the lead/termination composition and result in a greater effectivedeviation from this curve for the resistor itself.

TZSD FEATURES & SPECIFICATIONS

- **Temperature coefficient of resistance (TCR):** ± 0.05 ppm/°C typical (0 °C to +60 °C, +25 °C ref) ± 0.2 ppm/°C typical (-55 °C to +125 °C, +25 °C ref)
- **Power coefficient of resistance** (ΔR due to self heating)**:** ± 5 ppm at rated power
- **Rated power:** 0.5 W rms at +70 °C (on FR4 PCB)
- **Current rating:** 5 amps max
- **Resistance tolerance:** to ± 0.2%
- **Exceptional load life stability:** ± 0.02 % at +70 °C, 2000 h at rated power
- **Resistance range:** 0.3Ω to 10Ω (for lower or higher values, please contact us)
- **Bulk Metal® Foil resistors are not restricted to standard values**; specific custom values can be supplied at no extra cost (e.g. 1.2345Ω vs 1Ω)
- **Electrostatic discharge (ESD):** at least to 25 kV
- **Short time overload:** ≤ 0.005 %
- **Capacitance:** 0.5 pF typical; 1.0 pF max (non-capacitive design)
- **Rise time:** 1.0 ns, effectively no ringing
- **Current noise:** 0.010 µV (rms)/Volt of Applied Voltage (< -40 dB)
- **Thermal EMF:** 0.05 µV/°C typical (0.10 µV/°C max)
- **Voltage coefficient:** < 0.1 ppm/V
- **Thermal stabilization time:** < 1.0 sec (nominal value achieved within 10 ppm of steady state value)
- **Inductance:** < 0.08 µH typical; 0.1 µH maximum (non-inductive design)
- **Hot-spot free** design
- **Terminal Finish:** tin/lead alloy; Pb free (RoHS-compliant); or gold plated
- **Fast delivery of custom made units:** Typical lead time is 2-4 weeks, but expedited delivery in less than 1 week is possible even for custom values

*Bulk Metal® Foil is a registered trademark of Vishay Precision Group (VPG)

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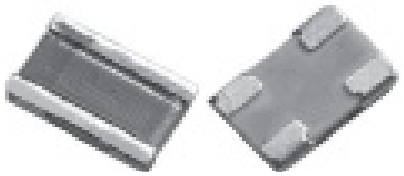

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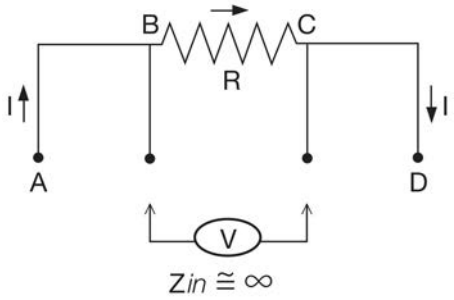
SCHEMATIC



APPLICATIONS

- Current sensing
- Instrumentation amplifiers
- Bridge networks
- Differential amplifiers
- Ratio arms in bridge circuits
- Military
- Medical test equipment
- Automated Test Equipment (ATE)
- Airborne (including heads-up displays)
- Electron beam recording equipment
- Electron Microscopes
- Forced balance electronic scales
- Applications requiring superior frequency stability
- Other high precision instrumentation

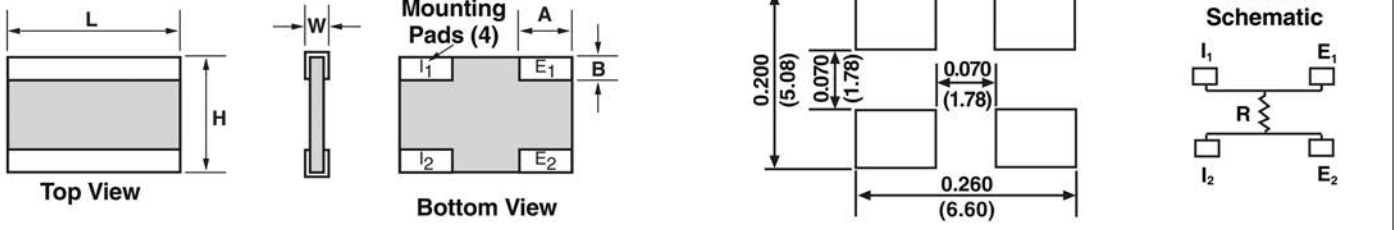
TABLE 2 – TCR BY RESISTANCE RANGE

RESISTANCE VALUE (Ω)*	TYPICAL TCR (& MAX SPREAD)
0.3Ω to 10Ω	± 0.2 (± 2.8) (ppm/°C)

TABLE 3 – AVAILABLE TOLERANCES BY RESISTANCE RANGE

RESISTANCE VALUE (Ω)	AVAILABLE TOLERANCE (%)	CODE
2Ω to 10Ω	±0.25%	C
0.3Ω to 10Ω	±0.5%	D
0.3Ω to 10Ω	±1.0%	F

TABLE 4 - DIMENSIONS, LAND PATTERN, and RECOMMENDED MOUNTING



	Inches	Millimeters
L	0.250 ± 0.010	6.35 ± 0.25
H	0.160 ± 0.010	4.06 ± 0.25
W	0.040 maximum	1.02 maximum
A	0.080 ± 0.005	2.03 ± 0.13
B	0.040 ± 0.010	1.02 ± 0.25

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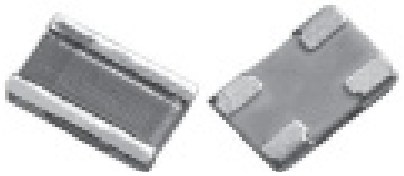

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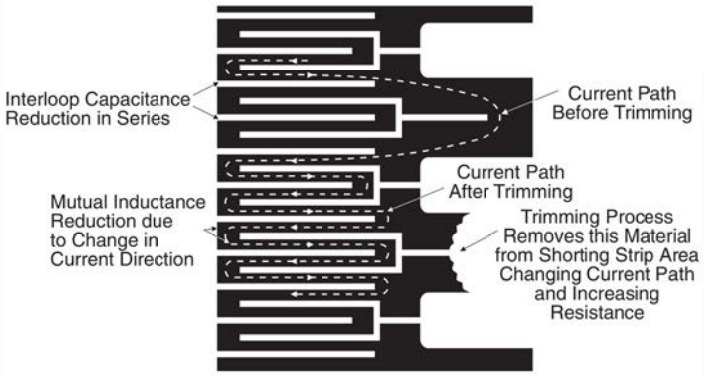
FIGURE 2 - TRIMMING TO SPECIFIC VALUES

(a conceptual illustration of Bulk Metal® Foil)



Note: Foil shown in black, etched spaces in white

To achieve a precise resistance value, the Bulk Metal® Foil chip is **adjusted by selectively removing built-in "shorting bars"**. To increase the resistance in known increments, marked areas are cut, producing progressively smaller increases in resistance. **This method reduces** the effect of **"hot spots"** and **improves the long term stability of the resistor.**

FIGURE 3 - POWER DERATING CURVE

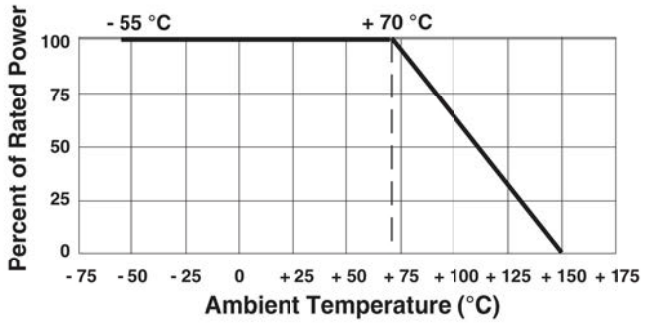


TABLE 6 – ESD TEST RESULTS

Volts	ΔR (%)		
	Thick Film	Thin Film	Bulk Metal® Foil
2500	-2.7	97	< 0.005
3000	-4.2	366	< 0.005
3500	-6.2	Open	< 0.005
4000	-7.4	Open	< 0.005
4500	-8.6	Open	< 0.005

ELECTROSTATIC DISCHARGE (ESD)

ESD can be categorized into three types of damages:

Parametric Failure - occurs when the ESD event alters one or more device parameters (resistance in the case of resistors), causing it to shift from its required tolerance. This failure does not directly pertain to functionality; thus a parametric failure may be present while the device is still functional.

Catastrophic Damage - occurs when the ESD event causes the device to immediately stop functioning. This may occur after one or a number of ESD events with diverse causes, such as human body discharge or the mere presence of an electrostatic field.

Latent Damage - occurs when the ESD event causes moderate damage to the device, which is not noticeable, as the device appears to be functioning correctly. However, the load life of the device has been dramatically reduced, and further degradation caused by operating stresses may cause the device to fail during service. Latent damage is the source for greatest concern, since it is very difficult to detect by re-measurement or by visual inspection, because damage may have occurred under the external coating.

TABLE 5 – HOW TO ORDER THE CORRECT PART NUMBER

MODEL	RESISTANCE VALUE	TOLERANCE (See Table 3)		TERMINATIONS (FINISH)	PACKAGING
VCS1625Z	0.3Ω to 10Ω (R = Ω) Always given as 6 characters	0.25% 0.5% 1.0%	C D F	Tin/Lead (Std) = B Lead (Pb) Free = S Pb Free Gold Plated = G	T= tape & reel W= waffle pack
A 0.55 ohm resistor, tolerance of 0.5%, with lead free terminations, and tape & reel would be ordered as: **VCS1625Z-0R5500-DST**					
A 5.34 ohm resistor, tolerance of 0.25%, with standard terminations, and waffle pack would be ordered as: **VCS1625Z-5R3400-CBW**					

(Note: Due to limited surface space, the value and tolerance are not printed on the VCS1625Z)

For more information about this subject or this product line, please contact us at resistorinfo@texascomponents.com. You can also "Follow" Texas Components and Bulk Metal® Foil Resistors on Twitter @TexasComponents and/or "Like" Texas Components on Facebook.

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