

**Ultra High Precision Z-Foil Resistor with TCR of $\pm 0.05\text{ppm}/^\circ\text{C}$,
Tolerance of $\pm 0.005\%$ and Load Life Stability of $\pm 0.005\%$**



Any value at any tolerance available within resistance range

INTRODUCTION

The **Z201** (3.81mm lead spacing) and **Z201L** (5.08mm lead spacing) Bulk Metal® Foil resistors represent an industry breakthrough. This is the 3rd in a series of ultra-precision resistors since the first Bulk Metal® Foil resistor was introduced by Vishay in 1962. Each represents an improvement on the earlier model. The TCR slope of the Z201 is 0.2ppm/°C (MIL range) and is an order of magnitude better than the original S102C. The Bulk Metal® Foil resistor is the ultimate choice in the most demanding analog applications.

The Z-Foil technology provides a significant reduction of the resistive components sensitivity to ambient temperature variations (TCR) and applied power changes (PCR). Designers now can guarantee a high degree of stability and accuracy in fixed-resistor applications using solutions based on Vishay's revolutionary 'Z-based' foil technology.

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

FEATURES

- **Low Temperature Coefficient of Resistance (TCR): 0.05ppm/°C Typical, Instrument Range: 0°C to +60°C**
- **Low Power Coefficient of Resistance (PCR): 5ppm at rated power**
- **Load Life Stability: to $\pm 0.005\%$ at 70°C, 2000hrs**
- **Tight Tolerance: to $\pm 0.005\%$**
- **Drop in replacement for S102C/K**
- Resistance Range: 10 Ω to 100K Ω ^ahigher or lower values of resistance are available
- Rated Power: 0.6W at 70°C
0.3W at 125°C
- Current Noise: 0.01 μV/V (RMS): - 40dB
- Thermal EMF: 0.1 μV/°C Max
0.05 μV/°C Typical
- Rise/Decay Time: 1.0 ns without ringing
- Low Voltage Coefficient: < 0.1ppm/V
- Non Inductive: 0.08μH
- Maximum Working Voltage: 300V
- Terminal Finishes Available:
RoHS Compliant (Sn 100%)
Tin/Lead Alloy (Sn 60%, Pb 40%)
- Matched sets are available per request
- For better performances please contact us

TABLE 2 - Z201 SPECIFICATIONS

Stability Load Life at 2000 Hrs	$\pm 0.005\%$ Max ΔR @ 0.1W/+ 70°C $\pm 0.015\%$ Max ΔR @ 0.3W/+ 125°C
Load Life at 10000 Hrs	$\pm 0.01\%$ Max ΔR @ 0.05W/+ 125°C $\pm 0.05\%$ Max ΔR @ 0.3W/+ 125°C
Shelf Life Stability	$\pm 0.0025\%$ Max ΔR after 1 year $\pm 0.005\%$ Max ΔR after 3 years

APPLICATIONS

- Precision Amplifiers, High Precision Instrumentation, Medical and Automatic Test Equipment
- Laboratory, Audio (High End Stereo Equipment)
- EB Applications, Military, Airborne and Space
- Down-hole (High Temperature)

TABLE 1 - TOLERANCE AND TCR VERSUS RESISTANCE

VALUE (Ω)	STANDARD TOLERANCE (%)	TYPICAL TCR AND MAXIMUM SPREAD (ppm/°C) MILITARY RANGE: - 55°C to + 125°C (+ 25°C Ref.)
100Ω to 100KΩ	$\pm 0.005\%$	$\pm 0.2 \pm 0.6$ ppm/°C
80Ω to < 100Ω	$\pm 0.005\%$	$\pm 0.2 \pm 0.8$ ppm/°C
50Ω to < 80Ω	$\pm 0.01\%$	$\pm 0.2 \pm 1$ ppm/°C
25Ω to < 50Ω	$\pm 0.01\%$	$\pm 0.2 \pm 1.3$ ppm/°C
10Ω to < 25Ω	$\pm 0.02\%$	$\pm 0.2 \pm 1.6$ ppm/°C

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FIGURE 2 - POWER DERATING CURVE

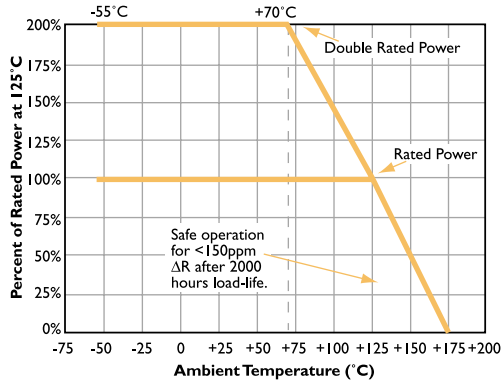


FIGURE 3 - TYPICAL TCR CURVE Z-FOIL

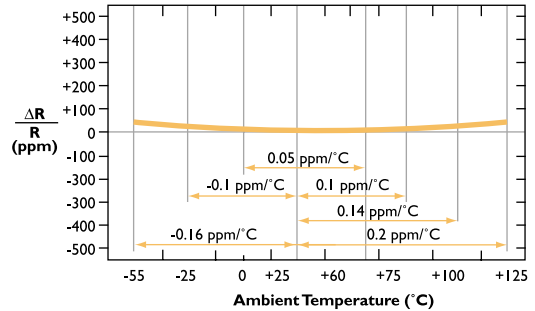
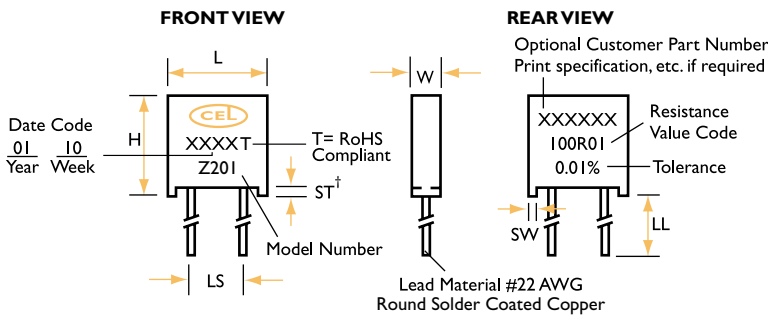


FIGURE 4 - STANDARD IMPRINTING AND DIMENSIONS



†The standoffs shall be so located as to give a lead clearance of 0.25mm minimum between the resistor body and the printed circuit board when the standoffs are seated on the printed circuit board. This is to allow for proper cleaning of flux and other contaminants from the unit after all soldering processes.

Model	Dim	LS	W	L	H	ST	SW	LL
Z 201	mm	3.81 ± 0.13	2.67 ± 0.25	7.62 ± 0.25	8.28 ± 0.25	0.254 min	1.02 ± 0.13	25.4 ± 3.18
Z 201 L	mm	5.08 ± 0.13	2.49 max	7.49 max	8.00 max	0.254 min	1.02 ± 0.13	25.4 ± 3.18

TABLE 3 - ORDERING INFORMATION

Specify Charcroft Z Series resistors as follows:

Example:

Z201
MODEL NO.

T = RoHS compliant
None = Tin/Lead alloy
TERMINATION

250R00
RESISTANCE VALUE

V = ± 0.005%
T = ± 0.01%
Q = ± 0.02%
A = ± 0.05%
B = ± 0.1%
C = ± 0.25%
D = ± 0.5%
F = ± 1.0%
TOLERANCE

TR = Tape & Reel
None = Bulk (loose)
PACKAGING

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
10Ω to <1KΩ
1KΩ to 100KΩ

LETTER DESIGNATOR
R
K

MULTIPLIER FACTOR
× 1
× 10³

EXAMPLE
100R01 = 100.01Ω
5K2310 = 5,231Ω

For example: Z201 T 250R00 V - Model: Z201 Version, Termination: RoHS compliant; Value: 250 Ω, Tolerance: 0.005 % Packaging: Bulk

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TABLE 4 - ENVIRONMENTAL PERFORMANCE COMPARISON

	MIL-PRF-55182 CHAR J	CHARCROFT Z201	
		MAXIMUM ΔR	TYPICAL ΔR
Test Group I Thermal Shock Overload	$\pm 0.2\%$ $\pm 0.2\%$	$\pm 0.01\%$ $\pm 0.01\%$	$\pm 0.002\%$ $\pm 0.003\%$
Test Group II Resistance Temperature Characteristic Low Temp Storage Low Temp Operation Terminal Strength	$\pm 25\text{ppm}/^\circ\text{C}$ $\pm 0.15\%$ $\pm 0.15\%$ $\pm 0.2\%$	See Table I $\pm 0.01\%$ $\pm 0.01\%$ $\pm 0.01\%$	$\pm 0.05\text{ ppm}/^\circ\text{C}$ (Instrument Range) $\pm 0.005\%$ $\pm 0.005\%$ $\pm 0.002\%$
Test Group III DWV Resistance to Solder Heat Moisture Resistance	$\pm 0.15\%$ $\pm 0.1\%$ $\pm 0.4\%$	$\pm 0.01\%$ $\pm 0.01\%$ $\pm 0.05\%$	$\pm 0.002\%$ $\pm 0.005\%$ $\pm 0.015\%$
Test Group IV Shock Vibration	$\pm 0.2\%$ $\pm 0.2\%$	$\pm 0.01\%$ $\pm 0.01\%$	$\pm 0.002\%$ $\pm 0.002\%$
Test Group V Life Test @ 0.3 W/+125°C 2,000 Hours 10,000 Hours	$\pm 0.5\%$ $\pm 2.0\%$	$\pm 0.015\%$ $\pm 0.05\%$	$\pm 0.01\%$ $\pm 0.03\%$
Test Group Va Life Test at 0.6W (2 x Rated Power) /+70°C, 2000 hrs	$\pm 0.5\%$	$\pm 0.015\%$	$\pm 0.01\%$
Test Group VI High Temperature Exposure	$\pm 2.0\%$	$\pm 0.1\%$	$\pm 0.05\%$
Test Group VII Voltage Coefficient	0.005%/V	< 0.00001%/V	< 0.00001%/V

STANDARD MEASUREMENT (at room temperature)

Standard Test Conditions:

- Temperature: $+ 23^\circ\text{C} \pm 2^\circ\text{C}$
- Relative humidity: 35 to 65% RH
- Lead test point: 12.7mm from resistor body

IMPROVED PERFORMANCE TESTING

The preceding information is based on product directly off the production line. Improved performance (meaning increased time stability with load and other stresses) is available through factory conducted "Improved Performance Testing". The test routine is usually

tailored to the users stability objectives and product that has been screened can be brought down to a potential load life drift of less than 50ppm. For example, the data sheet "7 Technical Reasons to Specify BMF Resistive Components" shows the drift characteristics of standard product.

Various screen test routines are available and all anticipated stresses must be taken into account before settling on one specific test routine. Our Applications Engineering Department is available to discuss and recommend appropriate routines given the full spectrum of anticipated stresses and stability requirements.