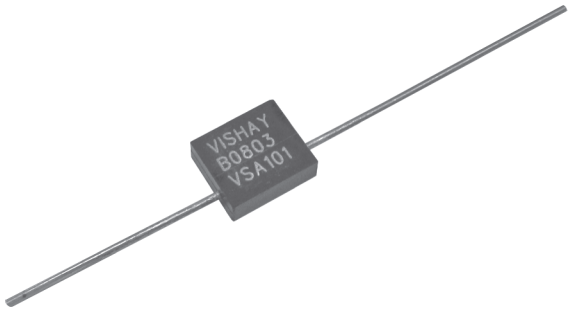
Ultra High Precision Axial Z-Foil Resistor with TCR of ± 0.05 ppm/°C, PCR of 5 ppm at Rated Power, Tolerance of ± 0.005 % and Load Life Stability of ± 0.005 %

INDUSTRY BREAKTHROUGH



INTRODUCTION

The VSA101 Axial Bulk Metal® Z-foil resistor is Vishay's answer to the industry's demand for ultra-high precision resistors with axial terminations.

The Z-foil technology provides a significant reduction of the resistive component's sensitivity to ambient temperature variations (TCR) and applied power changes (PCR). This, along with all the additional Z-foil benefits presented in the features section, allows designers to guarantee the highest degree of stability and accuracy in fixed-resistor applications using solutions based on Vishay's revolutionary Z-foil technology.

Our application engineering department is available to advise and to make recommendations. For non-standard technical requirements and special applications, please contact us.

TABLE 1 - TOLERANCE AND TCR VS. RESISTANCE

VALUE	STANDARD TOLERANCE	TYPICAL TCR AND MAXIMUM SPREAD - 55 °C TO + 125 °C (+ 25 °C REF.)
100 Ω to 100 kΩ	± 0.005 %	± 0.2 ± 1.3 ppm/°C
80 Ω to < 100 Ω	± 0.005 %	± 0.2 ± 1.5 ppm/°C
50 Ω to < 80 Ω	± 0.01 %	± 0.2 ± 1.8 ppm/°C
10 Ω to < 50 Ω	± 0.02 %	± 0.2 ± 2.3 ppm/°C
5 Ω to < 10 Ω	± 0.02 %	± 0.2 ± 2.8 ppm/°C

FEATURES

Pb-free Available

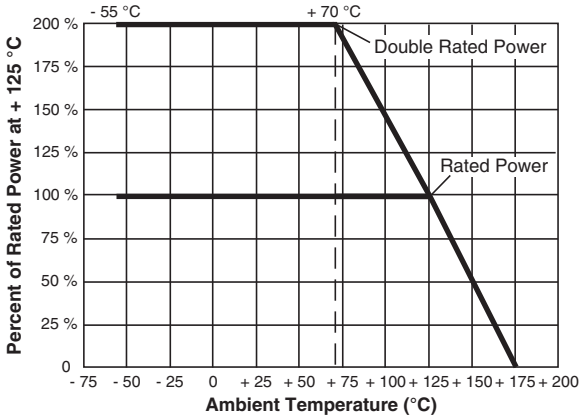
RoHS* COMPLIANT

- Temperature coefficient of resistance (TCR): ± 0.05 ppm/°C typical (0 °C to + 60 °C) ± 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: 0.6 W at 70 °C; 0.3 W at 125 °C
- Resistance tolerance: to ± 0.005 %
- Load life stability: to ± 0.005 % at 70 °C, 2000 h at rated power
- Resistance range: 5 Ω to 100 kΩ
- Vishay Foil resistors are not restricted to standard values, we can supply specific "as required" values at no extra cost or delivery (e.g. 100.1234 Ω vs. 100 Ω)
- Electrostatic discharge (ESD) up to 25 000 V
- Non inductive, non capacitive design
- Rise time: 1.0 ns effectively no ringing
- Current noise: ≤ - 40 dB
- Thermal EMF: 0.1 µV/°C maximum; 0.05 µV/°C typical
- Voltage coefficient: < 0.1 ppm/V
- Non inductive: 0.08 µH
- Terminal finishes available: lead (Pb)-free, tin/lead alloy
- Maximum working voltage: 300 V
- Matched sets are available per request
- For better performances please contact us
- Testing available per EEE-INST002

APPLICATIONS

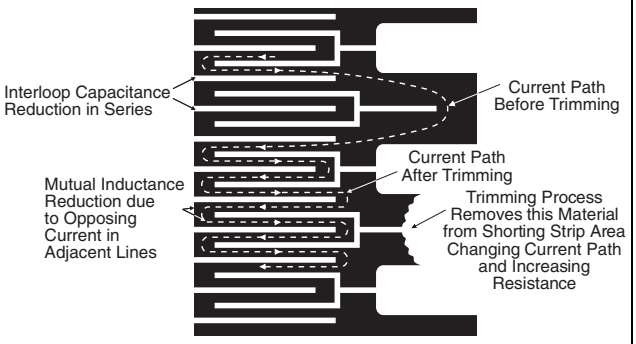
- Precision amplifiers, high precision instrumentation, medical and automatic test equipment
- Laboratory, audio (high end stereo equipment)
- EB applications, military, airborne and space
- Down-hole (high temperature)

FIGURE 1 - POWER DERATING CURVE



* Pb containing terminations are RoHS compliant, exemptions may apply

FIGURE 2 - TRIMMING TO VALUES
(Conceptual Illustration)



Note: Foil shown in black, etched spaces in white

FIGURE 3 - TYPICAL TCR CURVE Z-FOIL

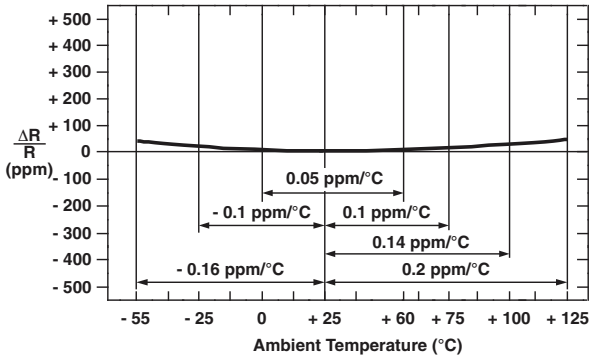
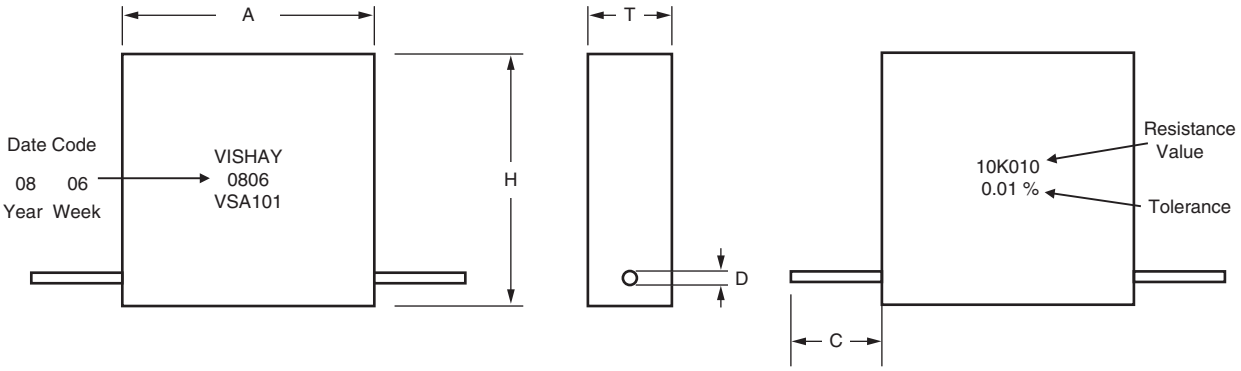


FIGURE 4 - STANDARD IMPRINTING AND DIMENSIONS



BODY						LEAD			
A - LENGTH (MAX.)		T - WIDTH (MAX.)		H - HEIGHT (MAX.)		C - LENGTH (MIN.)		D - DIAMETER	
Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
0.305	7.75	0.102	2.59	0.26	6.60	1.5	38.10	0.025	0.64

TABLE 2 - VSA101 SPECIFICATIONS

Stability	
Load life at 2000 h	± 0.005 % max. ΔR at 0.1 W/+ 70 °C ± 0.015 % max. ΔR at 0.3 W/+ 125 °C
Load life at 10 000 h	± 0.01 % max. ΔR at 0.05 W/+ 125 °C ± 0.05 % max. ΔR at 0.3 W/+ 125 °C

TABLE 3 - ENVIRONMENTAL PERFORMANCE COMPARISON			
	MIL-PRF-55182 CHAR J	VISHAY VSA101	
		MAXIMUM ΔR	TYPICAL ΔR
Test Group I Thermal shock Short time overload	 ± 0.2 % ± 0.2 %	 ± 0.01 % (100 ppm) ± 0.01 % (100 ppm)	 ± 0.002 % (20 ppm) ± 0.003 % (30 ppm)
Test Group II Resistance temperature Characteristic Low temperature storage Low temperature operation Terminal strength	 ± 25 ppm/°C ± 0.15 % ± 0.15 % ± 0.2 %	 see Table 1 ± 0.01 % (100 ppm) ± 0.01 % (100 ppm) ± 0.01 % (100 ppm)	 ± 0.05 ppm/°C (0 °C to + 60 °C) ± 0.002 % (20 ppm) ± 0.002 % (20 ppm) ± 0.002 % (20 ppm)
Test Group III DWV Resistance to solder heat Moisture resistance	 ± 0.15 % ± 0.1 % ± 0.4 %	 ± 0.01 % (100 ppm) ± 0.01 % (100 ppm) ± 0.05 % (500 ppm)	 ± 0.002 % (20 ppm) ± 0.005 % (50 ppm) ± 0.01 % (100 ppm)
Test Group IV Shock Vibration	 ± 0.2 % ± 0.2 %	 ± 0.01 % (100 ppm) ± 0.01 % (100 ppm)	 ± 0.002 % (20 ppm) ± 0.002 % (20 ppm)
Test Group V Life test at 0.3 W/+ 125 °C 2000 h 10 000 h	 ± 0.5 % ± 2.0 %	 ± 0.015 % (150 ppm) ± 0.05 % (500 ppm)	 ± 0.01 % (100 ppm) ± 0.03 % (300 ppm)
Test Group Va Life test at 0.6 W (2 x rated power)/+ 70 °C, 2000 h	 ± 0.5 %	 ± 0.015 % (150 ppm)	 ± 0.01 % (100 ppm)
Test Group VI High temperature exposure	 ± 2.0 %	 ± 0.1 % (1000 ppm)	 ± 0.05 % (500 ppm)
Test Group VII Voltage coefficient	 0.005 %/V	 < 0.00001 %/V	 < 0.00001 %/V

STANDARD MEASUREMENT (at room temperature)

Standard Test Conditions:

- Temperature: + 23 °C ± 2 °C
- Relative humidity: 35 to 65 % RH
- Lead test point: 0.5" (12.7 mm) from resistor body

IMPROVED PERFORMANCE TESTING

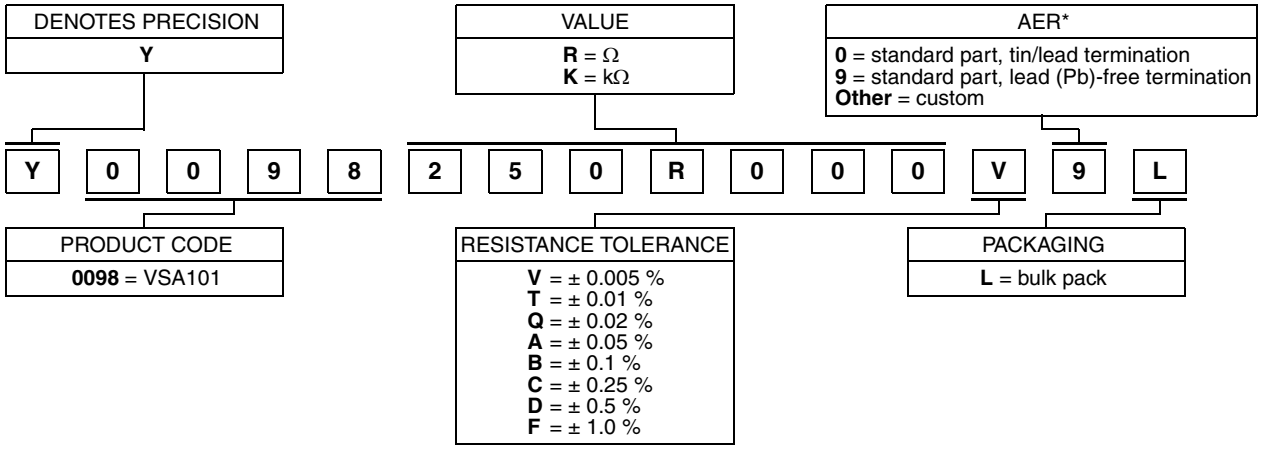
The preceding information is based on product directly off the production line. Improved performance (meaning increased time stability with load and other stresses) is available through factory conducted “Improved Performance Testing”. The test routine is usually tailored to the user’s stability objectives. A screened product can be brought down to a potential load life drift of less than 50 ppm.

For example, the data sheet “7 Technical Reasons to Specify BMF Resistive Components” shows the drift characteristics of a 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.

TABLE 4 - GLOBAL PART NUMBER INFORMATION

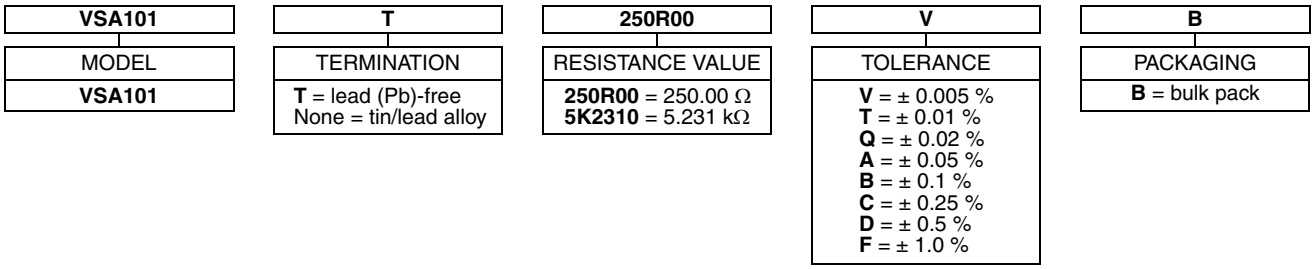
NEW GLOBAL PART NUMBER: Y0098250R000V9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y0098 250R000 V 9 L:

TYPE: VSA101
VALUE: 250.0 Ω
ABSOLUTE TOLERANCE: ± 0.005 %
TERMINATION: lead (Pb)-free
PACKAGING: bulk pack

HISTORICAL PART NUMBER: VSA101 T 250R00 V B (will continue to be used)



Note

* Application engineering release: for non-standard requests, please contact application engineering.

Disclaimer

ALL PRODUCTS, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Vishay Precision Group, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay Precision Group”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

The product specifications do not expand or otherwise modify Vishay Precision Group’s terms and conditions of purchase, including but not limited to, the warranty expressed therein.

Vishay Precision Group makes no warranty, representation or guarantee other than as set forth in the terms and conditions of purchase. **To the maximum extent permitted by applicable law, Vishay Precision Group disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.**

Information provided in datasheets and/or specifications may vary from actual results in different applications and performance may vary over time. Statements regarding the suitability of products for certain types of applications are based on Vishay Precision Group’s knowledge of typical requirements that are often placed on Vishay Precision Group products. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application.

No license, express, implied, or otherwise, to any intellectual property rights is granted by this document, or by any conduct of Vishay Precision Group.

The products shown herein are not designed for use in life-saving or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay Precision Group products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay Precision Group for any damages arising or resulting from such use or sale. Please contact authorized Vishay Precision Group personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.