

Vishay Foil Resistors

Ultra High Precision Foil Wraparound Surface Mount Chip Resistor with TCR of ± 0.05 ppm/°C and Power Coefficient of 5 ppm at Rated Power and Load Life Stability of ± 0.005 % (50 ppm)



INTRODUCTION

Top View

VSMP Series is the industry's first device to provide high rated power, excellent load life stability along with extremely low TCR all in one resistor.

One of the most important parameters influencing stability is the temperature coefficient of resistance (TCR). Although the TCR of foil resistors is considered extremely low, this characteristic has been further refined over the years. The VSMP Series utilizes ultra high precision Bulk Metal[®] Z-foil. The Z-foil technology provides a significant reduction of the resistive element's sensitivity to ambient temperature variations (TCR) and to self heating when power is applied (power coefficient). Along with the inherently low PCR and TCR, Z-foil technology also provides remarkably improved load life stability, low noise and availability of tight tolerance.

The VSMP has a full wraparound termination which ensures safe handling during the manufacturing process, as well as providing stability during multiple thermal cyclings.

Our application engineering department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact us using the e-mail address in the footer below.

TABLE 1 - TOLERANCE AND TCR VS. RESISTANCE VALUE (1) (-55 °C to + 125 °C, + 25 °C Ref.)

•	,	
RESISTANCE VALUE (Ω)	TOLERANCE (%)	TYPICAL TCR AND MAX. SPREAD (ppm/°C)
250 to 125K	± 0.01	± 0.2 ± 1.8
100 to < 250	± 0.02	± 0.2 ± 1.8
50 to < 100	± 0.05	± 0.2 ± 2.8
25 to < 50	± 0.1	± 0.2 ± 3.8

Note

± 0.25

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

FEATURES

- 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.)
- Pb-free
 Available

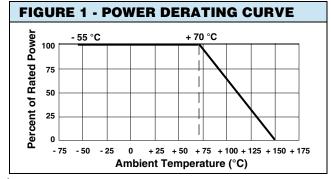
Tolerance: to ± 0.01 %

RoHS*

- Power coefficient "∆R due to self heating":
 5 ppm at rated power
- Power rating: to 750 mW at + 70 °C
- Load life stability: to ± 0.005 % at 70 °C, 2000 h at rated power
- Resistance range: 10 Ω to 125 k Ω (for higher and lower values, please contact us)
- Vishay Foil resistors are not restricted to standard values, we can supply specific "as required" values at no extra cost or delivery (e.g. 1K2345 vs. 1K)
- Fast thermal stabilization < 1 s
- Electrostatic discharge (ESD) up to 25 000 V
- Short time overload: ≤ 0.005 %
- Non inductive, non capacitive design
- Rise time: 1 ns effectively no ringing
- Current noise: 42 dB
- Voltage coefficient < 0.1 ppm/V
- Non inductive: < 0.08 μH
- Non hot spot design
- Terminal finishes available: lead (Pb)-free, tin/lead alloy
- Compliant to RoHS directive 2002/95/EC
- Matched sets are available on request
- Prototype quantities available in just 5 working days or sooner. For more information, please contact foil@vishav.com
- For better performances please contact us

APPLICATIONS

- Automatic test equipment (ATE)
- · High precision instrumentation
- Laboratory, industrial and medical
- Audio
- EB applications (electron beam scanning and recording equipment, electron microscopes)
- Down hole instrumentation
- Communication



10 to < 25

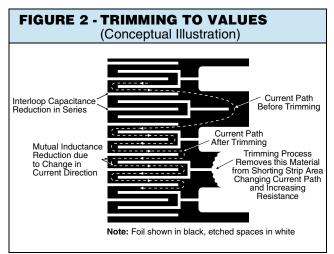
 $\pm 0.2 \pm 3.8$

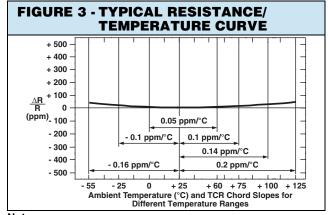
⁽¹⁾ For tighter performances and non-standard values up to 150K, please contact Vishay application engineering using the e-mail addresses in the footer below.

VSMP Series (0805, 1206, 1506, 2010, 2512) (Z-Foil)

Vishay Foil Resistors







Note

TABLE 2 - DIMENSIONS AND LAND PATTERN in Inches (Millimeters) **Top View Recommended Land Pattern** Footprint →/D/< THICKNESS CHIP Z (1) G (1) X (1) SIZE $\pm 0.005 (0.13)$ $\pm 0.005 (0.13)$ MAXIMUM $\pm 0.005 (0.13)$ 0805 0.080 (2.03) 0.050 (1.27) 0.025 (0.64) 0.015 (0.38) 0.122 (3.10) 0.028 (0.71) 0.050 (1.27) 1206 0.126 (3.20) 0.062 (1.57) 0.025 (0.64) 0.020 (0.51) 0.175 (4.45) 0.059 (1.50) 0.071 (1.80) 1506 0.150 (3.81) 0.062 (1.57) 0.025 (0.64) 0.020 (0.51) 0.199 (5.05) 0.083 (2.11) 0.071 (1.80) 0.097 (2.46) 2010 0.198 (5.03) 0.025 (0.64) 0.025 (0.64) 0.247 (6.27) 0.115 (2.92) 0.103 (2.62) 2512 0.249 (6.32) 0.127 (3.23) 0.025 (0.64) 0.032 (0.81) 0.291 (7.39) 0.150 (3.81) 0.127 (3.23)

Note

⁽¹⁾ Land Pattern Dimensions are per IPC-7351A

TABLE 3 - SPECIFICATIONS						
CHIP SIZE	RATED POWER (mW) at + 70 °C	$\begin{array}{c} \text{MAX.} \\ \text{WORKING} \\ \text{VOLTAGE} \\ (\leq \sqrt{P \times R}) \end{array}$	$\begin{array}{c} \textbf{RESISTANCE} \\ \textbf{RANGE} \\ \textbf{(}\Omega\textbf{)} \end{array}$	MAXIMUM WEIGHT (mg)		
0805	200	40 V	10 to 8K	6		
1206	300	87 V	10 to 25K	11		
1506	300	95 V	10 to 30K	12		
2010	500	187 V	10 to 70K	27		
2512	750	220 V	10 to 125K	40		

TABLE 4 - LOAD LIFE STABILITY (+ 70 °C for 2000 h)				
CHIP SIZE	MAXIMUM ∆R LIMITS			
0805	± 0.005 % at 100 mW ± 0.01 % at 200 mW			
1206, 1506	± 0.005 % at 150 mW ± 0.01 % at 300 mW			
2010	± 0.005 % at 200 mW ± 0.01 % at 500 mW			
2512	± 0.005 % at 500 mW ± 0.01 % at 750 mW			

TABLE 5 - PERFORMANCES						
TEST OR CONDITIONS	MIL-PRF-55342 CHARACTERISTIC E ∆R LIMITS	TYPICAL ∆R LIMITS	MAXIMUM ∆R LIMITS ⁽¹⁾			
Thermal Shock, 100 x (- 65 °C to + 150 °C)	± 0.1 %	± 0.005 % (50 ppm)	± 0.01 % (100 ppm)			
Low Temperature Operation, - 65 °C, 45 min at P _{nom}	± 0.1 %	± 0.005 % (50 ppm)	± 0.01 % (100 ppm)			
Short Time Overload, 6.25 x Rated Power, 5 s	± 0.1 %	± 0.005 % (50 ppm)	± 0.01 % (100 ppm)			
High Temperature Exposure, + 150 °C, 100 h	± 0.1 %	± 0.01 % (100 ppm)	± 0.02 % (200 ppm)			
Resistance to Soldering Heat	± 0.2 %	± 0.005 % (50 ppm)	± 0.01 % (100 ppm)			
Moisture Resistance	± 0.2 %	± 0.005 % (50 ppm)	± 0.02 % (200 ppm)			
Load Life Stability + 70 °C for 2000 h at Rated Power	± 0.5 %	± 0.005 % (50 ppm)	± 0.01 % (100 ppm)			

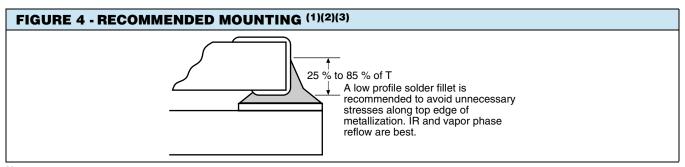
Note

[•] The TCR values for < 100 Ω are influenced by the termination composition and result in deviation from this curve.

 $^{^{(1)}\,}$ As shown + 0.01 Ω to allow for measurement errors at low values.

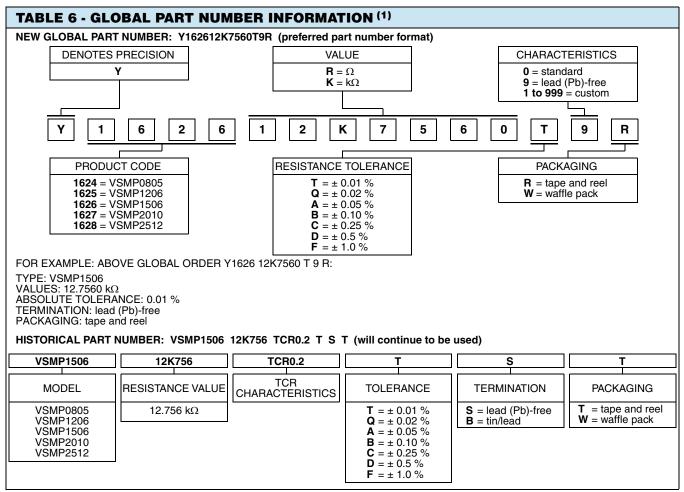


Vishay Foil Resistors



Notes

- (1) Avoid the use of cleaning agents which could attack epoxy resins, which form part of the resistor construction
- (2) Vacuum pick up is recommended for handling
- (3) Soldering iron may damage the resistor



Note

⁽¹⁾ For non-standard requests, please contact application engineering.



Vishay

Disclaimer

All product specifications and data are subject to change without notice.

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

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

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

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

Revision: 18-Jul-08

Document Number: 91000 www.vishay.com