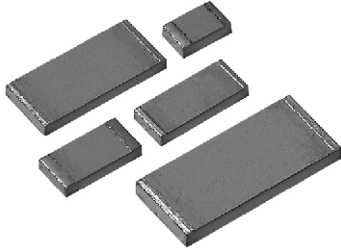




### Ultra High Precision Foil Wraparound Surface Mount Chip Resistor with TCR of $\pm 0.05 \text{ ppm/}^\circ\text{C}$ and Power Coefficient of $5 \text{ ppm}$ at Rated Power and Load Life Stability of $\pm 0.005 \%$ (50 ppm)



Top View

Any value at any tolerance within resistance range

#### INTRODUCTION

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<sup>1)</sup>**  
(- 55 °C to + 125 °C, + 25 °C Ref.)

RESISTANCE VALUE (Ω)	TOLERANCE (%)	TYPICAL TCR AND MAX. SPREAD (ppm/°C)
250 to 150K	± 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
10 to < 25	± 0.25	± 0.2 ± 3.8

#### Note

1. For tighter performances, please contact Vishay Application Engineering using the e-mail addresses in the footer below.

\* 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.)
- Tolerance: to ± 0.01 %
- Power coefficient "ΔR 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 150 kΩ (for higher and lower values, please contact us)
- Fast thermal stabilization < 1 s
- **Electrostatic discharge (ESD) above 25 000 V**
- Short time overload: ≤ 0.005 %
- Non inductive, non capacitive design
- Rise time: 1 ns without 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
- Matched sets are available on request
- Any value available within resistance range (e.g. 1K2345)
- Screening per EEE-INST-002 is available for military and space
- Prototype samples available from 48 h. For more information, please contact [foil@vishay.com](mailto:foil@vishay.com)
- For better performances please contact us

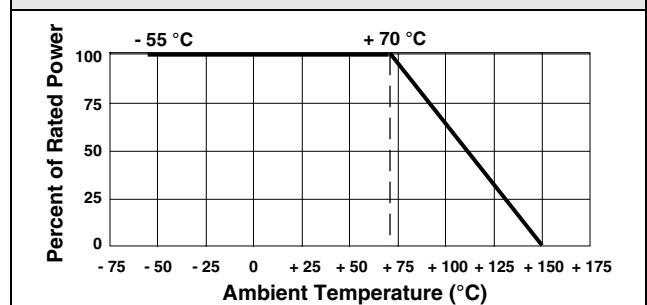


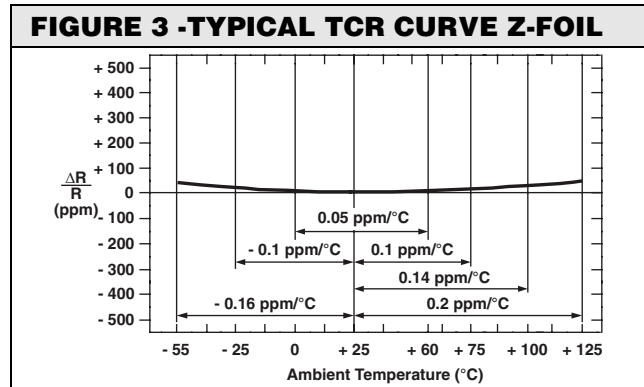
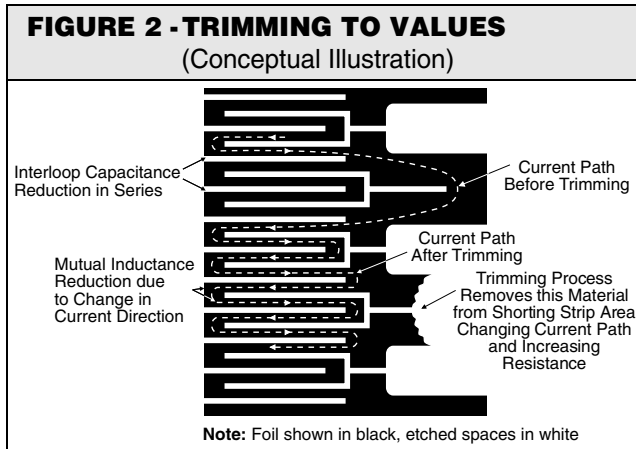
RoHS\* COMPLIANT

#### APPLICATIONS

- Automatic test equipment (ATE)
- High precision instrumentation
- Laboratory, industrial and medical
- Audio
- EB applications (electron beam scanning and recording equipment, electron microscopes)
- Military and space
- Satellite
- Commercial aviation
- Airborne
- Down hole instrumentation
- Communication

**FIGURE 1 - POWER DERATING CURVE**





**Note**

- The TCR values for  $< 100 \Omega$  are influenced by the termination composition and result in deviation from this curve.

**TABLE 2 - DIMENSIONS AND LAND PATTERN** in inches (millimeters)

Top View

Recommended Land Pattern

CHIP SIZE	L $\pm 0.005$ (0.13)	W $\pm 0.005$ (0.13)	THICKNESS MAXIMUM	D $\pm 0.005$ (0.13)	Z <sup>1)</sup> MAXIMUM	G <sup>1)</sup> MINIMUM	X <sup>1)</sup> MAXIMUM
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)
2010	0.198 (5.03)	0.097 (2.46)	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	MAX VOLTAGE RATING ( $\leq \sqrt{P \times R}$ )	RESISTANCE RANGE ( $\Omega$ )	MAXIMUM WEIGHT (mg)
0805	200	49 V	10 to 12K	6
1206	300	95 V	10 to 30K	11
1506	300	110 V	10 to 40K	12
2010	500	200 V	10 to 100K	27
2512	750	220 V	10 to 150K	40

**TABLE 4 - LOAD LIFE STABILITY**  
(+70 °C for 2000 h)

CHIP SIZE	MAXIMUM $\Delta R$ LIMITS
0805	$\pm 0.005 \%$ at 100 mW $\pm 0.01 \%$ at 200 mW
1206, 1506	$\pm 0.005 \%$ at 150 mW $\pm 0.01 \%$ at 300 mW
2010	$\pm 0.005 \%$ at 200 mW $\pm 0.01 \%$ at 500 mW
2512	$\pm 0.005 \%$ at 500 mW $\pm 0.01 \%$ at 750 mW

**TABLE 5 - PERFORMANCES**

TEST OR CONDITIONS	MIL-PRF-55342 CHARACTERISTIC $\Delta R$ LIMITS	TYPICAL $\Delta R$ LIMITS	MAXIMUM $\Delta R$ LIMITS <sup>1)</sup>
Thermal Shock	$\pm 0.1 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
Low Temperature Operation	$\pm 0.1 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
Short Time Overload	$\pm 0.1 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
High Temperature Exposure	$\pm 0.1 \%$	$\pm 0.01 \%$ (100 ppm)	$\pm 0.02 \%$ (200 ppm)
Resistance to Soldering Heat	$\pm 0.2 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
Moisture Resistance	$\pm 0.2 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.02 \%$ (200 ppm)
Load Life Stability +70 °C for 2000 h at Rated Power	$\pm 0.5 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)

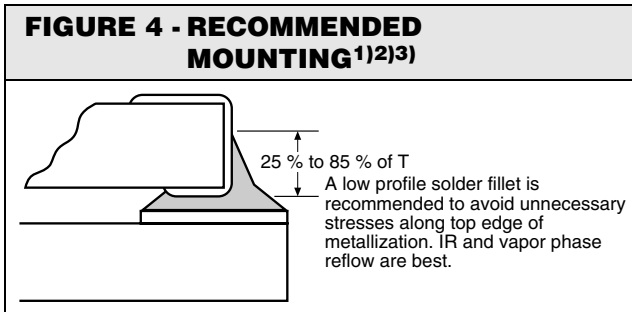
**Note**

1. As shown +0.01  $\Omega$  to allow for measurement errors at low values.



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

Ultra High Precision Foil Wraparound Surface Mount Chip Resistor with TCR of  $\pm 0.05 \text{ ppm}/^\circ\text{C}$  and Power Coefficient of  $5 \text{ ppm}$  at Rated Power and Load Life Stability of  $\pm 0.005 \%$  (50 ppm) 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

**TABLE 6 - SPACE AND MILITARY SPECIFICATIONS**

MODEL	EEE-INST-002	DSCC	MIL-PRF
VSMP0805	√	07024	55342
VSMP1206	√	07025	
VSMP1506	√	03010	
VSMP2010	√	06001	
VSMP2512	√	06002	

**TABLE 7 - GLOBAL PART NUMBER INFORMATION**

**NEW GLOBAL PART NUMBER: Y162612K7560T9R (preferred part number format)**

DENOTES PRECISION

**Y**

VALUE

**R** = Ω  
**K** = kΩ

AER\*

**0** = standard  
**9** = lead (Pb)-free  
**1 - 999** = custom

Y 1 6 2 6 1 2 K 7 5 6 0 T 9 R

PRODUCT CODE

**1624** = VSMP0805  
**1625** = VSMP1206  
**1626** = VSMP1506  
**1627** = VSMP2010  
**1628** = VSMP2512

RESISTANCE TOLERANCE

**T** =  $\pm 0.01 \%$   
**Q** =  $\pm 0.02 \%$   
**A** =  $\pm 0.05 \%$   
**B** =  $\pm 0.10 \%$   
**C** =  $\pm 0.25 \%$   
**D** =  $\pm 0.5 \%$   
**F** =  $\pm 1.0 \%$

PACKAGING

**R** = tape and reel  
**W** = waffle pack

FOR EXAMPLE: ABOVE GLOBAL ORDER Y1626 12K7560 T 9 R:  
 TYPE: VSMP1506  
 VALUES: 12.7560 kΩ  
 ABSOLUTE TOLERANCE: 0.01 %  
 TERMINATION: lead (Pb)-free  
 PACKAGING: tape and reel

**HISTORICAL PART NUMBER: VSMP1506 12K756 TCR0.2 T S T (will continue to be used)**

VSMP1506	12K756	TCR0.2	T	S	T
MODEL	RESISTANCE VALUE	TCR CHARACTERISTICS	TOLERANCE	TERMINATION	PACKAGING
VSMP0805 VSMP1206 VSMP1506 VSMP2010 VSMP2512	12.756 kΩ		T = $\pm 0.01 \%$ Q = $\pm 0.02 \%$ A = $\pm 0.05 \%$ B = $\pm 0.10 \%$ C = $\pm 0.25 \%$ D = $\pm 0.5 \%$ F = $\pm 1.0 \%$	S = lead (Pb)-free B = tin/lead	T = tape and reel W = waffle pack

**Note**

\* For non-standard requests, please contact application engineering.



## 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.