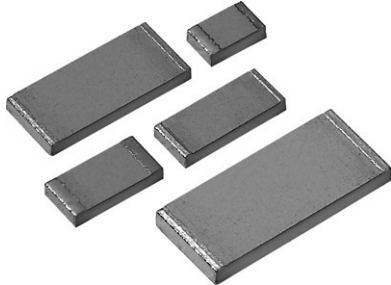


## Ultra High Precision Foil Wraparound Surface Mount Chip Resistor with TCR of $\pm 0.05$ ppm/°C and Power Coefficient of 5 ppm at Rated Power and Load Life Stability of $\pm 0.005$ % (50 ppm)



Top View

### 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 (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
10 to < 25	± 0.25	± 0.2 ± 3.8

#### Note

(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.

\* 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 125 kΩ (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@vishaypg.com](mailto:foil@vishaypg.com)
- For better performances please contact us

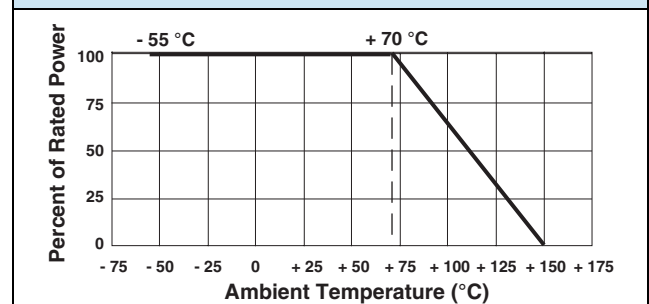


RoHS\*  
COMPLIANT

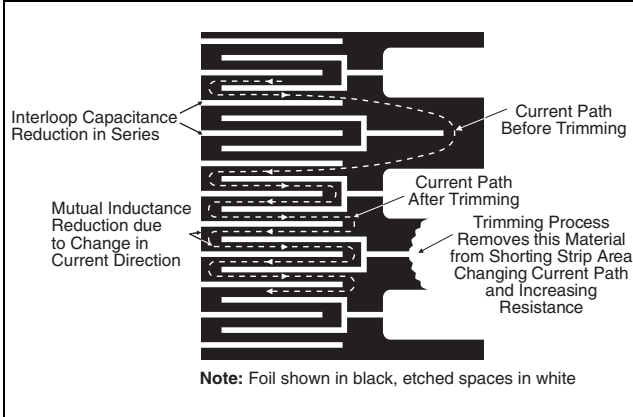
### APPLICATIONS

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

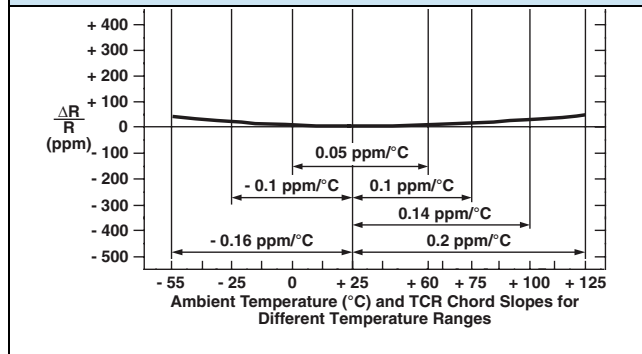
**FIGURE 1 - POWER DERATING CURVE**



**FIGURE 2 - TRIMMING TO VALUES**  
(Conceptual Illustration)



**FIGURE 3 - TYPICAL RESISTANCE/TEMPERATURE 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)

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>	G <sup>(1)</sup>	X <sup>(1)</sup>
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**

<sup>(1)</sup> Land Pattern Dimensions are per IPC-7351A

**TABLE 3 - SPECIFICATIONS**

CHIP SIZE	RATED POWER (mW) at +70 °C	MAX. WORKING VOLTAGE ( $\leq \sqrt{P \times R}$ )	RESISTANCE RANGE ( $\Omega$ )	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 $\Delta R$ 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

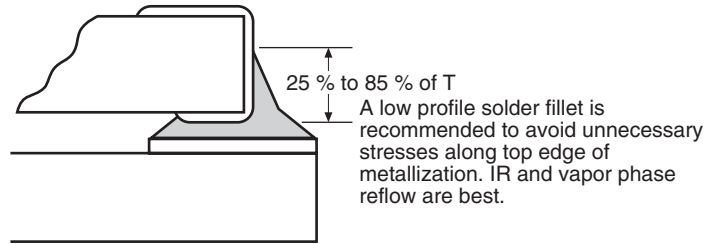
**TABLE 5 - PERFORMANCES**

TEST OR CONDITIONS	MIL-PRF-55342 CHARACTERISTIC $\Delta R$ LIMITS	TYPICAL $\Delta R$ LIMITS	MAXIMUM $\Delta R$ LIMITS <sup>(1)</sup>
Thermal Shock, 100 x (-65 °C to +150 °C)	$\pm 0.1\%$	$\pm 0.005\%$ (50 ppm)	$\pm 0.01\%$ (100 ppm)
Low Temperature Operation, -65 °C, 45 min at P <sub>nom</sub>	$\pm 0.1\%$	$\pm 0.005\%$ (50 ppm)	$\pm 0.01\%$ (100 ppm)
Short Time Overload, 6.25 x Rated Power, 5 s	$\pm 0.1\%$	$\pm 0.005\%$ (50 ppm)	$\pm 0.01\%$ (100 ppm)
High Temperature Exposure, +150 °C, 100 h	$\pm 0.1\%$	$\pm 0.01\%$ (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**

<sup>(1)</sup> As shown +0.01  $\Omega$  to allow for measurement errors at low values.

**FIGURE 4 - RECOMMENDED MOUNTING (1)(2)(3)**

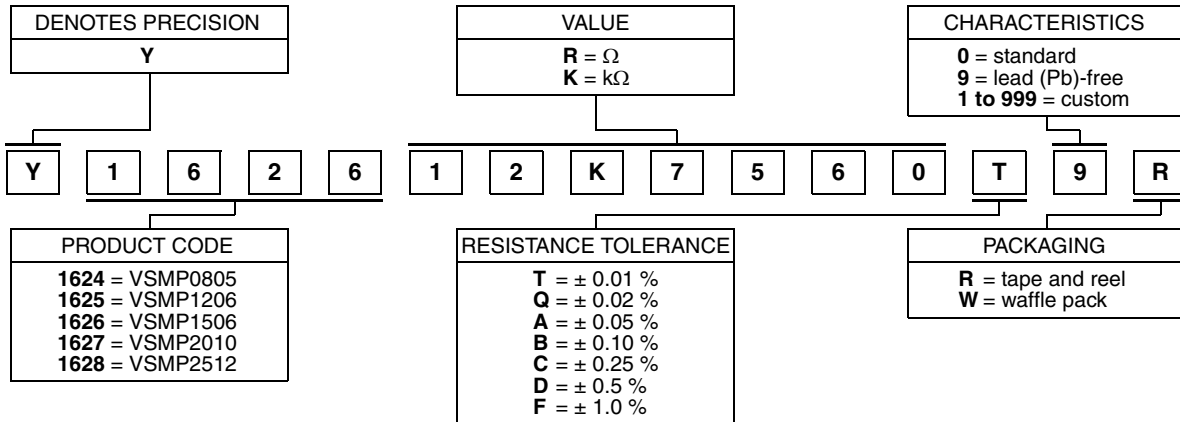


**Notes**

- (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 - GLOBAL PART NUMBER INFORMATION (1)**

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



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		<b>T</b> = ± 0.01 % <b>Q</b> = ± 0.02 % <b>A</b> = ± 0.05 % <b>B</b> = ± 0.10 % <b>C</b> = ± 0.25 % <b>D</b> = ± 0.5 % <b>F</b> = ± 1.0 %	<b>S</b> = lead (Pb)-free <b>B</b> = tin/lead	<b>T</b> = tape and reel <b>W</b> = waffle pack

**Note**

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

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