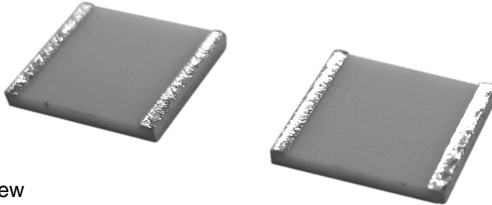


Ultra High Precision Foil Wraparound Surface Mount Chip Resistor with Temperature Coefficient of Resistance (TCR) of ± 0.05 ppm/ $^{\circ}$ C, and Load Life Stability of ± 0.005 % (50 ppm)



Top View

INTRODUCTION

Vishay VSMP2018 ultra high precision Bulk Metal[®] Z-Foil resistor is the result of a new concept in resistors manufacturing: A proprietary Bulk Metal Foil of known and controllable properties is applied to a special ceramic substrate. A resistive pattern is then photoetched by an ultra-fine technique developed by Vishay.

This process results in a resistor element that combines the all important characteristics of low temperature coefficient (TCR), long-term stability, ESD immunity, tight tolerance, non-inductance, low capacitance and low noise.

These characteristics are optimum, approaching in total performance the theoretical ideal, a straight wire.

The behavior of Vishay resistors under load is characterized by a very small initial resistance change which occurs within the first 500 h of the test. Only insignificant resistance changes are observed upon continuation of the test, and no signs of wear out appear even at full load over several thousands hours.

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 $^{\circ}$ C to + 125 $^{\circ}$ C, + 25 $^{\circ}$ C Ref.)

RESISTANCE VALUE (Ω)	TOLERANCE (%)	TYPICAL TCR AND MAX. SPREAD (ppm/ $^{\circ}$ C)
250 to 20K	± 0.01	$\pm 0.2 \pm 1.8$
100 to < 250	± 0.02	$\pm 0.2 \pm 1.8$
50 to < 100	± 0.05	$\pm 0.2 \pm 2.8$
25 to < 50	± 0.1	$\pm 0.2 \pm 3.8$
10 to < 25	± 0.25	$\pm 0.2 \pm 3.8$

Note

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

FEATURES

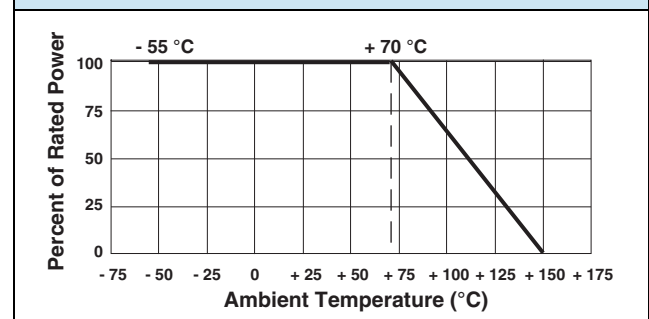
- Temperature coefficient of resistance (TCR):
0.05 ppm/ $^{\circ}$ C typical (0 $^{\circ}$ C to + 60 $^{\circ}$ C)
0.2 ppm/ $^{\circ}$ C typical (- 55 $^{\circ}$ C to + 125 $^{\circ}$ C, + 25 $^{\circ}$ C ref.)
- Resistance range: 10 Ω to 20 k Ω (higher values from 20 k Ω to 150 k Ω can be supplied on request)
- Vishay Foil resistors are not restricted to standard values; specific "as required" values can be supplied at no extra cost or delivery (e.g. 1K2345 vs. 1K)
- Tolerance: to ± 0.01 %
- Power coefficient "ΔR due to self heating":
5 ppm at rated power
- Power rating: to 750 mW at + 70 $^{\circ}$ C
- Load life stability: to ± 0.005 % at 70 $^{\circ}$ C, 2000 h at rated power
- 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: - 40 dB
- Voltage coefficient < 0.1 ppm/V
- Non inductive: < 0.08 μ H
- Non hot spot design
- Terminal finish: 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, please contact foil@vishaypg.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

FIGURE 1 - POWER DERATING CURVE



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

FIGURE 2 - TRIMMING TO VALUES
(Conceptual Illustration)

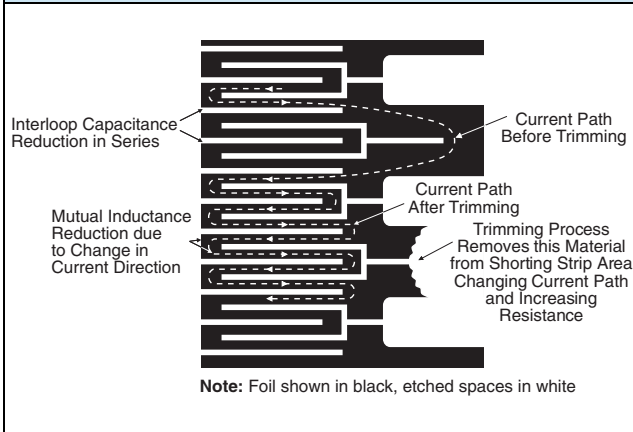
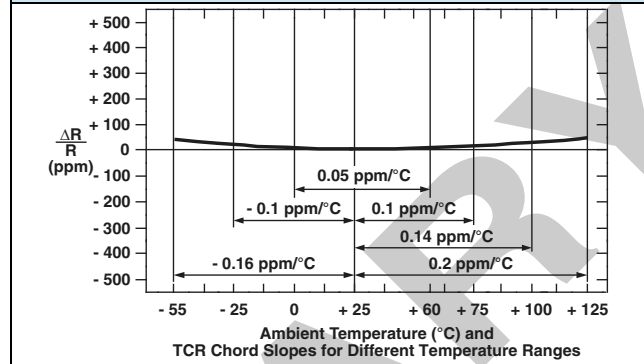


FIGURE 3 - TYPICAL RESISTANCE/TEMPERATURE CURVE



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	± 0.005 (0.13)	± 0.005 (0.13)	THICKNESS MAXIMUM	± 0.005 (0.13)	Z ⁽¹⁾	G ⁽¹⁾	X ⁽¹⁾
2018	0.204 (5.18)	0.184 (4.67)	0.025 (0.64)	0.018 (0.46)	0.248 (6.30)	0.146 (3.71)	0.184 (4.67)

Note

⁽¹⁾ Land pattern dimensions are per IPC-7351A.

TABLE 3 - SPECIFICATIONS

CHIP SIZE	RATED POWER (mW) at + 70 °C	MAX. WORKING VOLTAGE	RESISTANCE RANGE (Ω)	MAXIMUM WEIGHT (mg)
2018	750	$\leq \sqrt{P \times R}$	10 to 20K	40

TABLE 4 - PERFORMANCES

TEST (CONDITIONS PER MIL-PRF-55342)	MIL-PRF-55342 CHARACTERISTIC ΔR LIMITS	TYPICAL ΔR LIMITS	MAXIMUM ΔR LIMITS ⁽¹⁾
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 0.75 W	$\pm 0.1 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
Short Time Overload, 6.25 x 0.75 W, 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

⁽¹⁾ As shown + 0.01 Ω to allow for measurement errors at low values.

FIGURE 4 - 100 CYCLE THERMAL SHOCK - 65 °C TO 150 °C, 10 UNITS EACH VALUE

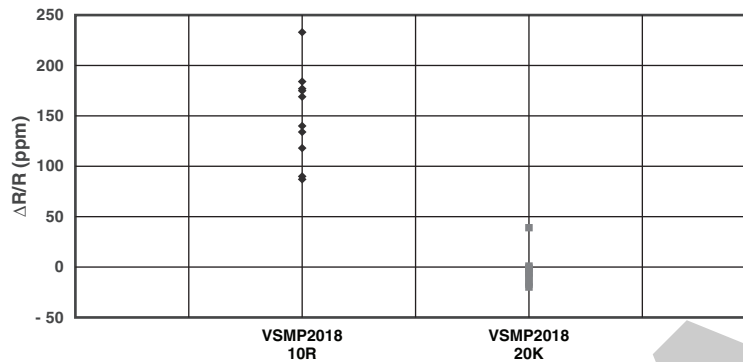


FIGURE 5 - LOAD LIFE STABILITY 2000 h AT + 70 °C, 0.75 W, 20 UNITS EACH VALUE

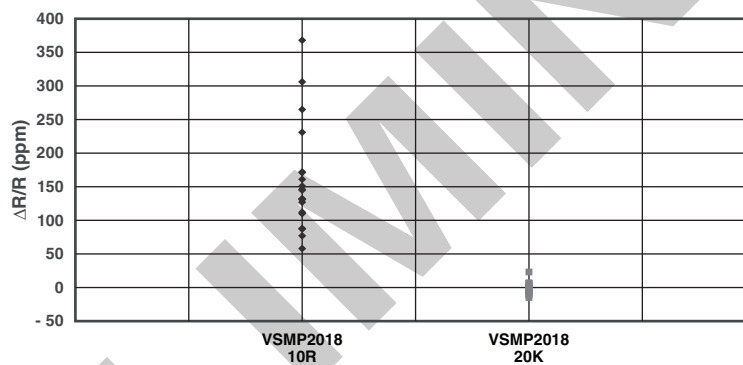
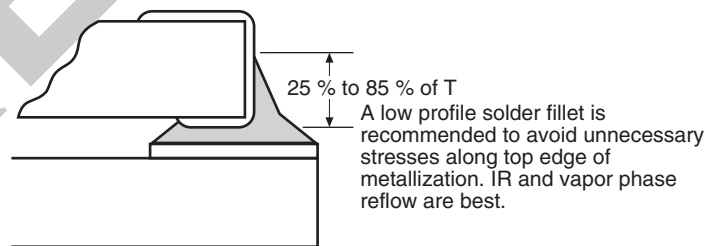


FIGURE 6 - RECOMMENDED MOUNTING

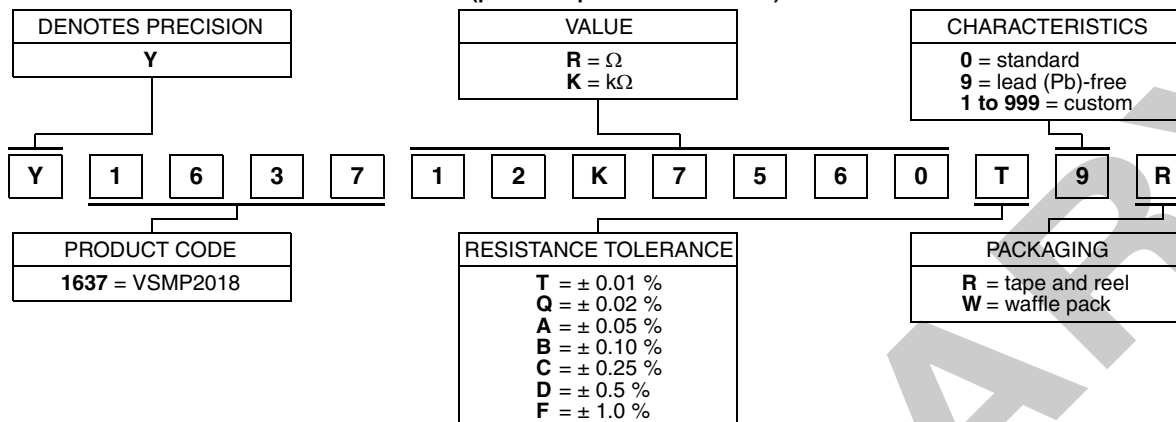


Notes

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

TABLE 5 - GLOBAL PART NUMBER INFORMATION (1)

NEW GLOBAL PART NUMBER: Y163712K7560T9R (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1637 12K7560 T 9 R:

TYPE: VSMP2018
VALUES: 12.7560 kΩ
ABSOLUTE TOLERANCE: 0.01 %
TERMINATION: lead (Pb)-free
PACKAGING: tape and reel

HISTORICAL PART NUMBER: VSMP2018 12K756 TCR0.2 T S T (will continue to be used)

VSMP2018	12K756	TCR0.2	T	S	T
MODEL	RESISTANCE VALUE	TCR CHARACTERISTICS	TOLERANCE	TERMINATION	PACKAGING
VSMP2018	12.756 kΩ		T = ± 0.01 % Q = ± 0.02 % A = ± 0.05 % B = ± 0.10 % C = ± 0.25 % D = ± 0.5 % F = ± 1.0 %	S = lead (Pb)-free B = tin/lead	T = tape and reel W = waffle pack

Note

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

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