

High Precision Foil Wraparound Surface Mount Chip Resistor with TCR of ± 2 ppm/°C and Load Life Stability of ± 0.01 % (100 ppm)

INTRODUCTION

Bulk Metal® Foil (BMF) technology out-performs all other resistor technologies available today for applications that require high precision and high stability, and allows production of customer oriented products designed to satisfy challenging and specific technical requirements.

The BMF provides an inherently low and predictable Temperature Coefficient of Resistance (TCR) and excellent load life stability for high precision analog applications. Model VSM offers low TCR, excellent load life stability, tight tolerance, excellent shelf life stability, low current noise and low voltage coefficient, all in the same resistor.

The VSM 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	$\pm 2 \pm 2$
100 to < 250	± 0.02	$\pm 2 \pm 3$
50 to < 100	± 0.05	$\pm 2 \pm 3$
25 to < 50	± 0.1	$\pm 2 \pm 4$
10 to < 25	± 0.25	$\pm 2 \pm 6$

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.

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

FEATURES

- Temperature coefficient of resistance (TCR): ± 2.0 ppm/°C typical (- 55 °C to + 125 °C, + 25 °C ref.) (see table 1)
- Tolerance: to ± 0.01 %
- Power rating: to 400 mW at + 70 °C
- Load life stability: to ± 0.01 % 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: ≤ 0.01 %
- 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 per request
- Prototype quantities available in just 5 working days or sooner. For more information, please contact info@bedek.de
- For better performances please review VSMP and VFCP Series datasheets



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

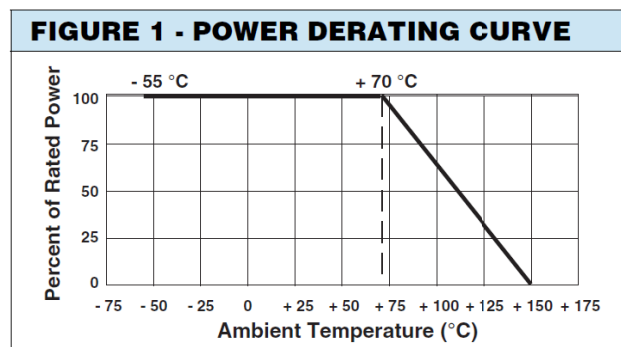


FIGURE 2 - TRIMMING TO VALUES
(Conceptual Illustration)

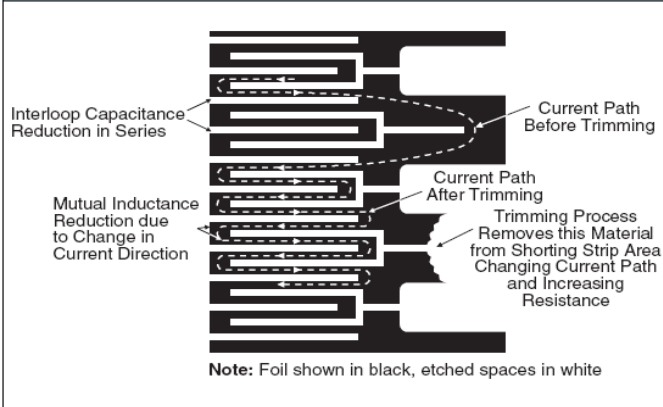
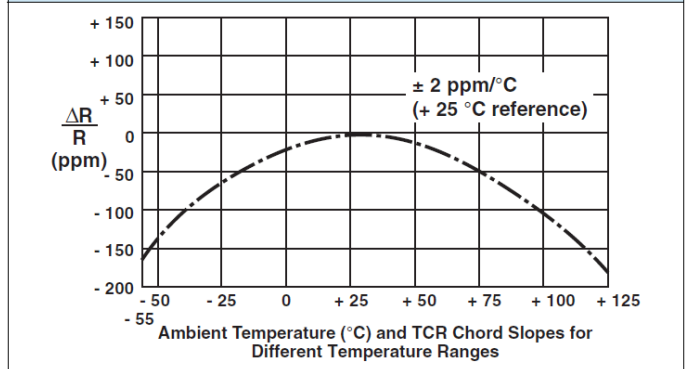


FIGURE 3 - TYPICAL RESISTANCE/TEMPERATURE CURVE
(For more Details, see Table 1)



Note

- The TCR values for < 100 Ω 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 ± 0.005 (0.13)	W ± 0.005 (0.13)	THICKNESS MAXIMUM	D ± 0.005 (0.13)	Z ⁽¹⁾	G ⁽¹⁾	X ⁽¹⁾
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)	0.97 (2.46)	0.025 (0.64)	0.247 (0.27)	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. WORKING VOLTAGE (≤ √P x R)	RESISTANCE RANGE (Ω)	MAXIMUM WEIGHT (mg)
0805	100	28 V	10 to 8K (10k)	6
1206	150	61 V	10 to 25K	11
1506	200	78 V	10 to 30K	12
2010	300	145 V	10 to 70K (100k)	27
2512	400	220 V	10 to 125K	40

* For non standard values please contact VFR's application engineering using the e-mail addresses in the footer below.

TABLE 4 - PERFORMANCES

TEST OR CONDITIONS	MIL-PRF-55342 CHARACTERISTIC E ΔR LIMITS	TYPICAL ΔR LIMITS	MAXIMUM ΔR LIMITS (1)
Thermal Shock, 100 x (- 65 °C to + 150 °C)	± 0.1 %	± 0.005 % (50 ppm)	± 0.02 % (200 ppm)
Low Temperature Operation, - 65 °C, 45 min at P _{nom}	± 0.1 %	± 0.005 % (100 ppm)	± 0.02 % (200 ppm)
Short Time Overload, 6.25 x Rated Power, 5 s	± 0.1 %	± 0.005 % (100 ppm)	± 0.02 % (200 ppm)
High Temperature Exposure, + 150 °C, 100 h	± 0.1 %	± 0.01 % (100 ppm)	± 0.03 % (300 ppm)
Resistance to Soldering Heat	± 0.2 %	± 0.005 % (50 ppm)	± 0.01 % (100 ppm)
Moisture Resistance	± 0.2 %	± 0.005 % (50 ppm)	± 0.03 % (300 ppm)
Load Life Stability + 70 °C for 2000 h at Rated Power	± 0.5 %	± 0.005 % (50 ppm)	± 0.01 % (100 ppm)

Note

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

FIGURE 4 - RECOMMENDED MOUNTING

Notes

- (1) IR and vapor phase reflow are recommended.
 - (2) Avoid the use of cleaning agents which could attack epoxy resins, which form part of the resistor construction
 - (3) Vacuum pick up is recommended for handling
 - (4) If the use of a soldering iron becomes necessary, precautionary measures should be taken to avoid any possible damage / overheating of the resistor
- * Recommendation: The solder fillet profile should be such as to avoid running over the top metallization

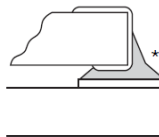


TABLE 5 - GLOBAL PART NUMBER INFORMATION (1)

NEW GLOBAL PART NUMBER: Y145512K7560T9R (preferred part number format)

DENOTES PRECISION Y	VALUE R = Ω K = kΩ	CHARACTERISTICS 0 = standard 9 = lead (Pb)-free 1 to 999 = custom
Y	1 4 5 5 1 2 K 7 5 6 0	T 9 R
PRODUCT CODE 1172 = VSM0805 1496 = VSM1206 1455 = VSM1506 1611 = VSM2010 1612 = VSM2512	RESISTANCE TOLERANCE T = ± 0.01 % Q = ± 0.02 % A = ± 0.05 % B = ± 0.10 % C = ± 0.25 % D = ± 0.5 % F = ± 1.0 %	PACKAGING R = tape and reel W = waffle pack

FOR EXAMPLE: ABOVE GLOBAL ORDER Y1455 12K756 T 9 R:
 TYPE: VSM1506
 VALUES: 12.7560 kΩ
 ABSOLUTE TOLERANCE: 0.01 %
 TERMINATION: lead (Pb)-free
 PACKAGING: tape and reel

HISTORICAL PART NUMBER: VSM1506 12K756 TCR2 T S T (will continue to be used)

VSM1506	12K756	TCR2	T	S	T
MODEL	RESISTANCE VALUE	TCR CHARACTERISTICS	TOLERANCE	TERMINATION	PACKAGING
VSM0805 VSM1206 VSM1506 VSM2010 VSM2512	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

CRYOGENIC TEST

Different expansion/contraction rates of composite materials in resistors may induce discontinuities during temperature excursions that are not evident at temperature extremes, making an unreliable resistor appear normal.

A good resistor must also return to its initial value with no resistance drift. In this demo, a VFR VSM0805 precision resistor is monitored through the range of +25°C, down to -196°C and back up to +25°C. Results confirm the VSM0805 exhibits only 5 ppm/°C TCR, experiences no discontinuities, and returns to its exact same starting value, showing absolutely no change in resistance (< 1 ppm measurement accuracy).

Note

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

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