

High Precision Foil Wraparound Surface Mount Chip Resistor with TCR of $\pm 2 \text{ ppm}/^\circ\text{C}$ and Load Life Stability of $\pm 0.01 \%$ (100 ppm)



Top View

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.

FEATURES

- Temperature coefficient of resistance (TCR): $\pm 2.0 \text{ ppm}/^\circ\text{C}$ typical (- 55 °C to + 125 °C, + 25 °C ref.) (see table 1)
- Tolerance: to $\pm 0.01 \%$
- Power rating: to 400 mW at + 70 °C
- Load life stability: to $\pm 0.01 \%$ 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: $\leq 0.01 \%$
- 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 foil@vishaypg.com
- For better performances please review **VSMP** and **VFCP** Series datasheets

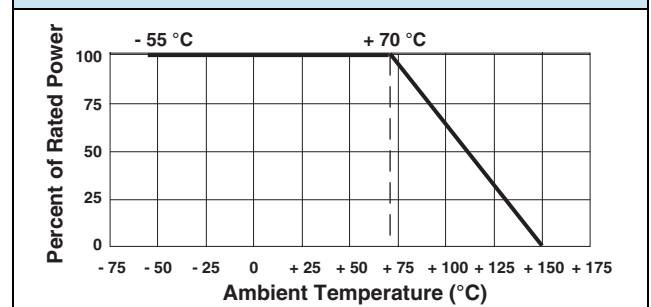


RoHS*
COMPLIANT

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



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

FIGURE 2 - TRIMMING TO VALUES
(Conceptual Illustration)

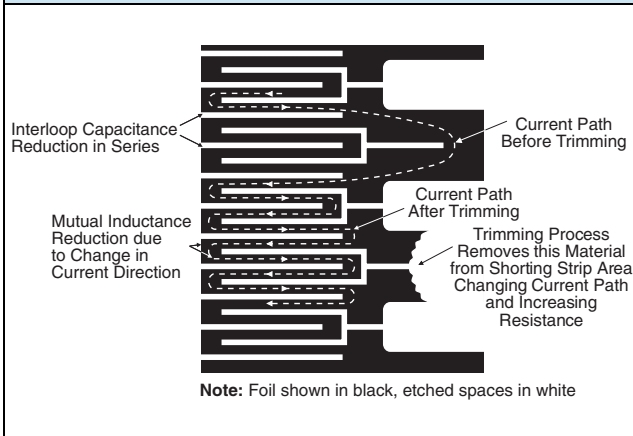
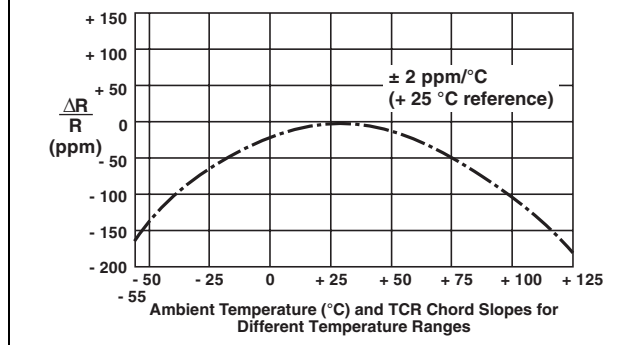


FIGURE 3 - TYPICAL RESISTANCE/TEMPERATURE CURVE
(For more Details, see Table 1)



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	± 0.005 (0.13)	± 0.005 (0.13)	THICKNESS MAXIMUM	± 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)	0.097 (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

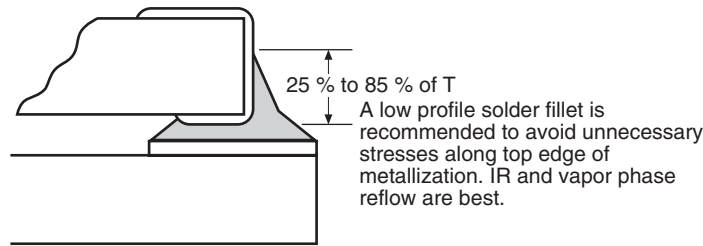
CHIP SIZE	RATED POWER (mW) at + 70 °C	MAX. WORKING VOLTAGE ($\leq \sqrt{P \times R}$)	RESISTANCE RANGE (Ω)	MAXIMUM WEIGHT (mg)
0805	100	28 V	10 to 8K	6
1206	150	61 V	10 to 25K	11
1506	200	78 V	10 to 30K	12
2010	300	145 V	10 to 70K	27
2512	400	220 V	10 to 125K	40

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 %	± 0.01 % (100 ppm)	± 0.02 % (200 ppm)
Short Time Overload, 6.25 x Rated Power, 5 s	± 0.1 %	± 0.01 % (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 (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 5 - GLOBAL PART NUMBER INFORMATION (1)

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



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1455 12K7565 T 9 R:

TYPE: VSM1506
VALUES: 12.7560 k Ω
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 k Ω		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

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

Disclaimer

ALL PRODUCTS, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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

The product specifications do not expand or otherwise modify Vishay Precision Group's terms and conditions of purchase, including but not limited to, the warranty expressed therein.

Vishay Precision Group makes no warranty, representation or guarantee other than as set forth in the terms and conditions of purchase. **To the maximum extent permitted by applicable law, Vishay Precision Group disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.**

Information provided in datasheets and/or specifications may vary from actual results in different applications and performance may vary over time. Statements regarding the suitability of products for certain types of applications are based on Vishay Precision Group's knowledge of typical requirements that are often placed on Vishay Precision Group products. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application.

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

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Vishay Precision Group:](#)

[VSM2110 50 .025%](#) [Y1172806R000F0W](#) [Y1172700R000F0W](#) [Y1172100R000B0R](#) [Y1455150R000B0W](#)
[Y161110K0000T9R](#) [Y117210R0000C0W](#)