High Precision Bulk Metal® Foil Surface Mount Voltage Divider, TCR Tracking of < 0.5 ppm/°C, Tolerance Match of 0.01 % and Stability of ± 0.005 % (50 ppm)

INTRODUCTION

Bulk Metal® Foil (BMF) technology out-performs all other resistor technologies available today for applications that require high precision and high stability.

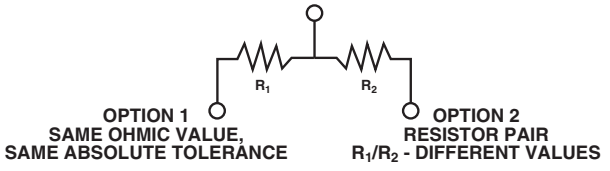
This technology has been invented, patented and pioneered by Vishay Foil Resistors (VFR). Products based on this technology are the most suitable for a wide range of appilcations.

BMF technology allows the production of customer oriented products designed to satisfy challenging and specific technical requirements. Model DSM offers low TCR (both absolute and tracking), excellent load life stability, tight tolerance, excellent ratio stability, and low current noise, all in one package.

The DSM surface mount divider provides a matched pair of Bulk Metal Foil resistors in a small epoxy molded package. The electrical specification of this integrated construction offers improved performance and better real estate utilization over discrete resistors and matched pairs.

VFR's application engineering department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact foil@vpgsensors.com.

FIGURE 1 - SCHEMATIC



FEATURES

- Temperature coefficient of resistance (TCR):
  Absolute: 2 ppm/°C typical
  (- 55 °C to + 125 °C, + 25 °C ref.)
  Tracking: 0.5 ppm/°C typical
- Tolerance: absolute: ± 0.02 %; match: 0.01 %
- Power rating: at 70 °C: entire package: 0.1 W
  each resistor: 0.05 W
- Ratio stability: 0.005 % (0.05 W at 70 °C, 2000 h)
- Resistance range: 100 Ω to 12 kΩ per resistor
- Large variety of resistance ratios: 1:120
- Bulk Metal Foil resistors are not restricted to standard values/ratios; specific "as required" values/ratios can be supplied at no extra cost or delivery (e.g. 1K234/2K345 vs. 1K/2K)
- Thermal stabilization time < 1 s (nominal value achieved within 10 ppm of steady state value)
- Electrostatic discharge (ESD) at least to 25kV
- Short time overload: 0.005 %
- Non inductive, non capacitive design
- Rise time: 1 ns effectively no ringing
- Current noise: < 0.010 $\mu V_{RMS}/V$ of applied voltage (- 40 dB)
- Voltage coefficient: 0.1 ppm/V
- Non inductive: 0.08 μH
- Non hot spot design
- Terminals: silver coated copper alloy (see Table 5)
- Compliant to RoHS directive 2002/95/EC
- Prototype quantities available in just 5 working days or sooner. For more information, please contact foil@vpgsensors.com
- For better performances, please see DSMZ datasheet (Z-Foil)

Pb-free Available

RoHS* COMPLIANT

TABLE 1 - MODEL DSM SPECIFICATIONS

MODEL	ABSOLUTE TCR (- 55 °C TO + 125 °C, + 25 °C REF.) TYPICAL + MAX. SPREAD	RESISTANCE RATIO	TCR TRACKING	TOLERANCE	
				ABSOLUTE	MATCH
DSM	± 2 ppm/°C ± 3 ppm/°C	R1/R2 = 1	1.0 ppm/°C	± 0.02 %	0.01 %
		1 < R1/R2 ≤ 10	2.0 ppm/°C	± 0.05 %	0.02 %
		10 < R1/R2 ≤ 120	3.0 ppm/°C	± 0.1 %	0.05 %

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

FIGURE 2 - POWER DERATING CURVE

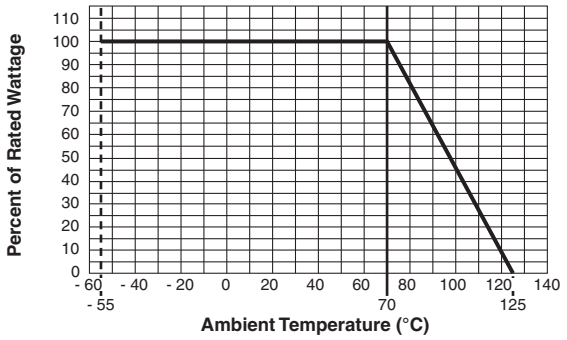


FIGURE 3 - TYPICAL RESISTANCE/ TEMPERATURE CURVE

(For more details, see table 1)

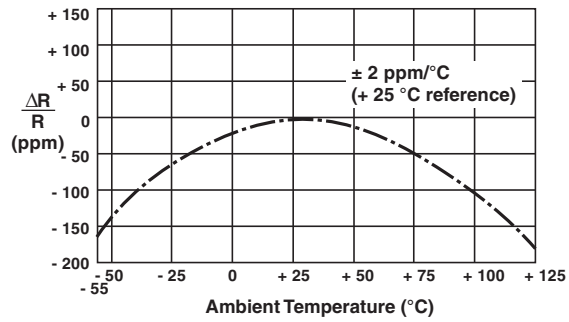
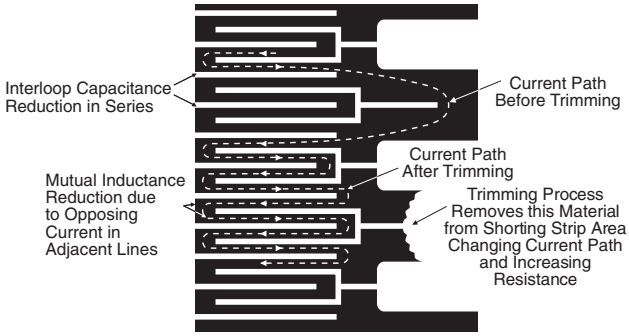


FIGURE 4 - TRIMMING TO VALUES

(Conceptual Illustration)



Note: Foil shown in black, etched spaces in white

FIGURE 5 - RECOMMENDED LAND PATTERN

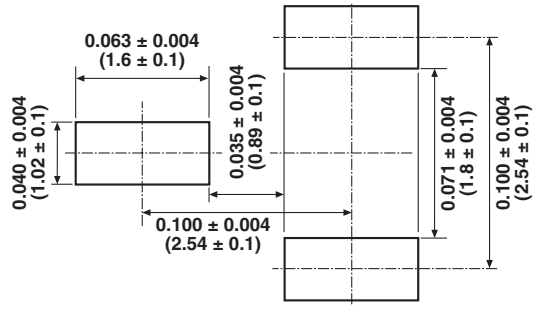
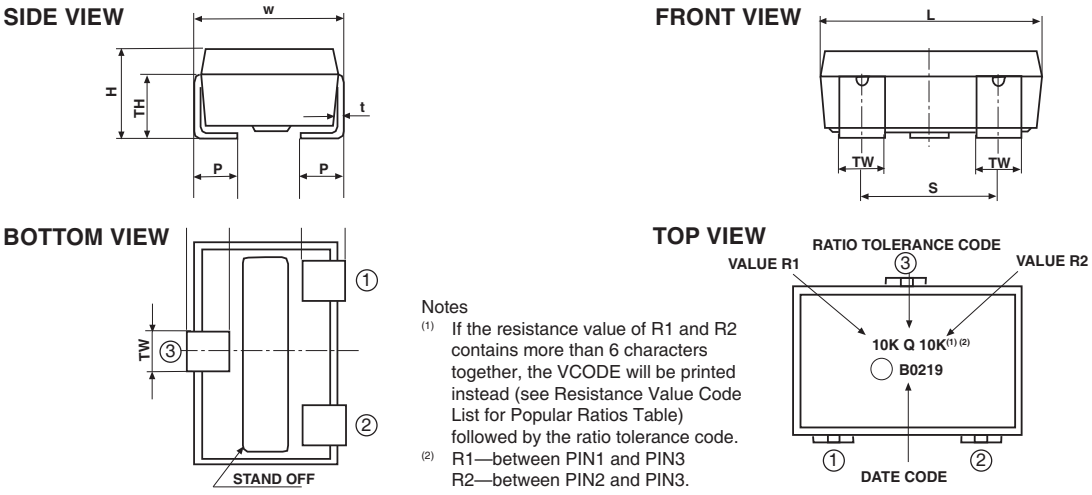


FIGURE 6 - DIMENSIONS AND IMPRINTING



Notes

(1) If the resistance value of R1 and R2 contains more than 6 characters together, the VCODE will be printed instead (see Resistance Value Code List for Popular Ratios Table) followed by the ratio tolerance code.

(2) R1—between PIN1 and PIN3
R2—between PIN2 and PIN3.

DIMENSIONS	L	W	H	P	TW	TH	S	t
INCHES	0.160 ± 0.008	0.106 ± 0.008	0.063 ± 0.008	0.031 ± 0.005	0.031 ± 0.004	0.043 ± 0.008	0.100 ± 0.008	0.005 ± 0.002
MILLIMETERS	4.06 ± 0.20	2.69 ± 0.20	1.60 ± 0.20	0.79 ± 0.13	0.79 ± 0.10	1.09 ± 0.20	2.54 ± 0.20	0.13 ± 0.05

TABLE 3 - PERFORMANCE SPECIFICATIONS (Test Method Per MIL-PRF-914)	
SPECIFICATIONS	**TYPICAL LIMITS**
Power Rating at 70 °C	Entire package: 0.1 W Each resistor: 0.05 W
Maximum Working Voltage (each resistor)	25 V
Working Temperature Range	- 65 °C to + 125 °C
Thermal Shock 25 x (- 65 °C to + 125 °C)	ΔR = 0.01 % (100 ppm) ΔRatio = 0.005 % (50 ppm)
Thermal Shock 5 x (- 65 °C to + 125 °C) and **Power Conditioning** 1.5 rated power at 25 °C, 100 h	ΔR = 0.015 % (150 ppm) ΔRatio = 0.01 % (100 ppm)
DWV atmospheric pressure, 200 V (A.C.), 1 min	Successfully passed
Insulation Resistance 100 V (D.C.), 1 min	> 10^4 MΩ
Resistance to Soldering Heat	ΔR = 0.01 % (100 ppm) ΔRatio = 0.005 % (50 ppm)
Moisture Resistance + 65 °C to - 10 °C; 90 % to 98 % RH; 0.1 x rated power, 240 h	ΔR = 0.02 % (200 ppm) ΔRatio = 0.005 % (50 ppm)
Shock (Specified Pulse) 100 G	ΔR = 0.005 % (50 ppm) ΔRatio = 0.0025 % (25 ppm)
Vibration, High Frequency (10 Hz to 2000 Hz), 20 G	ΔR = 0.01 % (100 ppm) ΔRatio = 0.005 % (50 ppm)
High Temperature Exposure 100 h at 125 °C	ΔR = 0.01 % (100 ppm) ΔRatio = 0.005 % (50 ppm)
Low Temperature Storage 24 h at - 65 °C	ΔR = 0.005 % (50 ppm) ΔRatio = 0.005 % (50 ppm)
Load Life Stability 2000 h at + 70 °C; rated power	ΔR = 0.005 % (50 ppm) ΔRatio = 0.005 % (50 ppm)
Short Time Overload 6.25 x rated power; 5 s	ΔR = 0.005 % (50 ppm) ΔRatio = 0.0025 % (25 ppm)
Low Temperature Operation	ΔR = 0.005 % (50 ppm) ΔRatio = 0.0025 % (25 ppm)
Weight	0.04 g

FIGURE 7 - DSM 10K/10K, 20 UNITS, LOAD LIFE 0.05 W each value, at + 70 °C

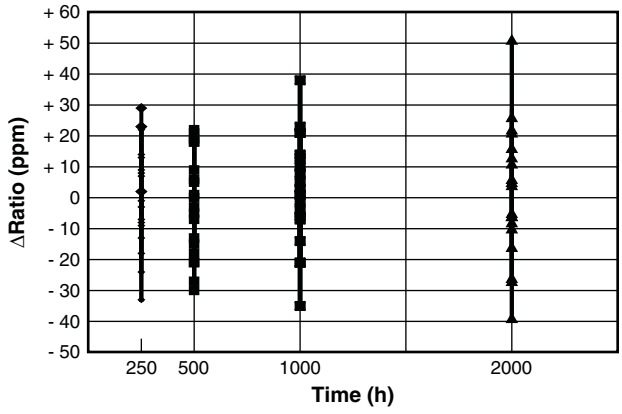


FIGURE 8 - DSM 10K/10K, 20 UNITS, HIGH TEMPERATURE EXPOSURE,
100 h at 125 °C, followed by low temperature storage, 24 h at - 65 °C

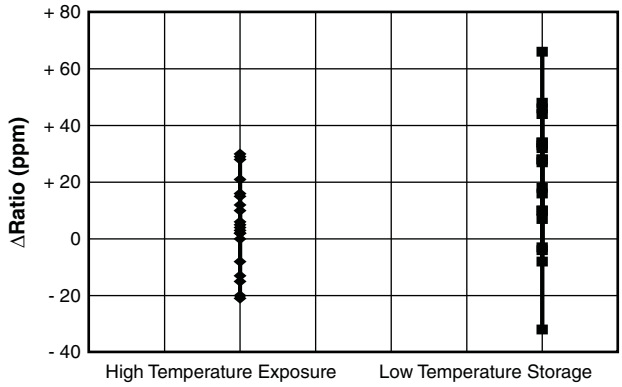


TABLE 4 - RESISTANCE VALUE CODE LIST FOR POPULAR RATIOS
(other values available upon request)

VCODES	R1/R2 RATIO	R1	R2	VCODES	R1/R2 RATIO	R1	R2
V0052	100	10K	100R	V0080	2.5	1K	400R
V0065	50	10K	200R	V0081		500R	200R
V0066		5K	100R	V0082	2	10K	5K
V0067	25	10K	400R	V0083		2K	1K
V0068		5K	200R	V0084		1K	500R
V0069	20	10K	500R	V0085		400R	200R
V0070		2K	100R	V0086		200R	100R
V0071	10	10K	1K	V0087	1.25	500R	400R
V0072		2K	200R	V0001	1	10K	10K
V0073		1K	100R	V0002		5K	5K
V0074	5	5K	1K	V0059		2K	2K
V0075		2K	400R	V0004		1K	1K
V0076		1K	200R	V0091		500R	500R
V0077		500R	100R	V0090		400R	400R
V0246	4	10K	2K5	V0089		200R	200R
V0078		2K	500R	V0088		100R	100R
V0079		400R	100R				

TABLE 5 - GLOBAL PART NUMBER INFORMATION [1]

NEW GLOBAL PART NUMBER: Y1485V0067BA9W (preferred part number format)

DENOTES PRECISION	VCODE	TOLERANCE MATCH	PACKAGING
Y	RESISTANCE VALUE CODE	**T** = 0.01 % **Q** = 0.02 % **A** = 0.05 %	**R** = tape and reel **W** = waffle pack **L** = bulk pack

Y	1	4	8	5	V	0	0	6	7	B	A	9	W

PRODUCT CODE	RESISTANCE TOLERANCE	CHARACTERISTICS
1485 = DSM	**Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.10 %	**0** = standard **9** = lead (Pb)-free **1 to 999** = custom

FOR EXAMPLE: ABOVE GLOBAL ORDER Y1485 V0067 B A 9 W:
TYPE: DSM
VALUES: 10K/400R
ABSOLUTE TOLERANCE: ± 0.1 %
TOLERANCE MATCH: 0.05 %
TERMINATION: lead (Pb)-free
PACKAGING: waffle pack

HISTORICAL PART NUMBER: DSM 10K 400R TCR2 B A S W (will continue to be used)

DSM	10K 400R	TCR2	B	A	S	W
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	ABSOLUTE TOLERANCE	TOLERANCE MATCH	TERMINATION	PACKAGING
	R_1 = 10 kΩ R_2 = 400 Ω		**Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.10 %	**T** = 0.01 % **Q** = 0.02 % **A** = 0.05 %	**S** = lead (Pb)-free **B** = standard	**T** = tape and reel **W** = waffle pack **B** = bulk pack

Note

[1] For non-standard requests or additional values, please contact application engineering.

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