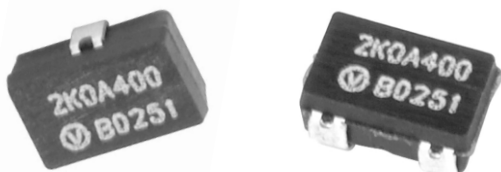


Bulk Metal® Foil Surface Mount Voltage Divider, TCR Tracking of $\leq \pm 0.5 \text{ ppm}/^\circ\text{C}$ with Stability of $\pm 0.005\%$ (50 ppm)



Any value at any tolerance available within the resistance range

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. Products based on this technology are the most suitable for a wide range of applications.

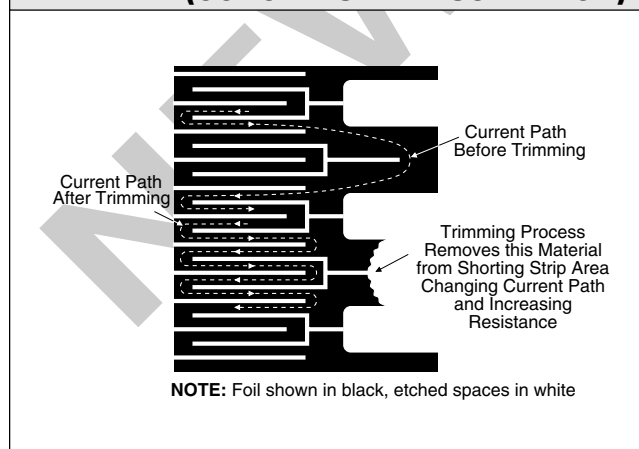
BMF technology allows to produce customer oriented products designed to satisfy challenging and specific technical requirements.

Model DSM offers Low TCR (both absolute and tracking), Excellent Load Life Stability, Tight tolerance, Excellent Ratio Stability, Low thermal EMF 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.

Our Application Engineering Department is available to advise and make recommendations for non-standard technical requirements and special applications, please contact us.

**FIGURE 1 - TRIMMING TO VALUES
(CONCEPTUAL ILLUSTRATION)**



FEATURES

- Temperature Coefficient of Resistance (TCR): $\pm 2 \text{ ppm}/^\circ\text{C}$ (Absolute)
 $\pm 0.5 \text{ ppm}/^\circ\text{C}$ (Tracking)
- Tolerance: Absolute: 0.02%
Resistance Ratio: 0.01%
- Resistance Ratio Stability: 0.005% (0.05 watts at 70°C , 2000 hours)
- Power Rating at 70°C : Entire Package: 0.1 watt
Each Resistor: 0.05 watts
- Electrostatic Discharge (ESD) above 25 000 Volts
- Short time overload $\leq 0.005\%$
- Non Inductive/Capacitive design
- Non hot spot design
- Rise time: 1ns without ringing
- Thermal EMF: $0.05 \mu\text{V}/^\circ\text{C}$
- Current Noise: - 40dB
- Large variety of resistance ratios: 1:200
- Non Inductive: $< 0.08 \mu\text{H}$
- Voltage Coefficient: $< 0.1 \text{ ppm/V}$
- Terminals: silver coated copper alloy
- Available with Z-Foil technology
- For better performances please contact us



RoHS*
COMPLIANT

APPLICATIONS

- Instrumentation amplifiers
- Bridge networks
- Differential amplifiers
- Ratio arms in bridge circuits
- Medical and test equipment
- Military
- Airborne etc.

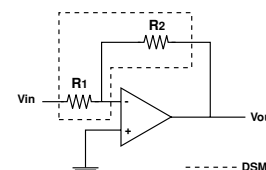


TABLE 1 - POPULAR RATIOS***

R1/R2 RESISTANCE RATIO	R1	R2	R1/R2 RESISTANCE RATIO	R1	R2
100	10K	100R	4	2K	500R
50	10K	200R		400R	100R
	5K	100R	2.5	1K	400R
25	10K	400R		500R	200R
	5K	200R	2	10K	5K
20	10K	500R		2K	1K
	2K	100R		1K	500R
10	10K	1K		400R	200R
	5K	500R	1.25	200R	100R
	2K	200R	1.0	500R	400R
	1K	100R		100R	100R
5	10K	2K		200R	200R
	5K	1K		400R	400R
	2K	400R		500R	500R
	1K	200R		1K	1K
	500R	100R		2K	2K
				5K	5K
				10K	10K
				20K	20K

*** Other ratios available per request.

TABLE 2 - RESISTANCE VALUES AND TOLERANCES**

RESISTANCE VALUES	100Ω - 20kΩ per resistor
ABSOLUTE TOLERANCE EACH RESISTOR	$\pm 0.02\%$, $\pm 0.05\%$, $\pm 0.1\%$
RESISTANCE RATIO TOLERANCE	$\pm 0.01\%$, $\pm 0.02\%$, $\pm 0.05\%$

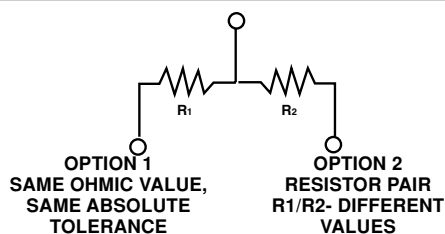
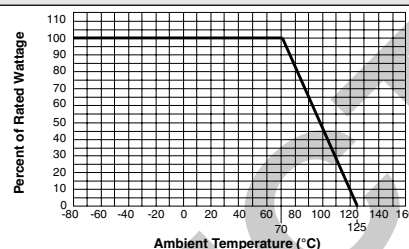
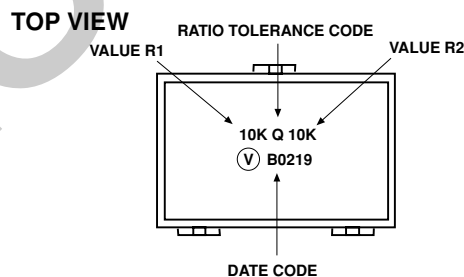
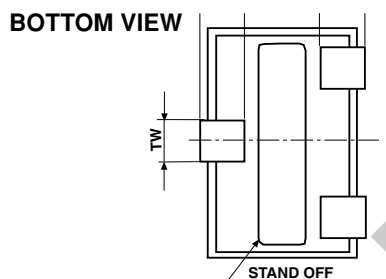
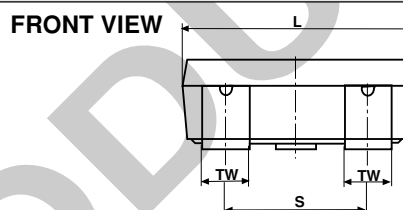
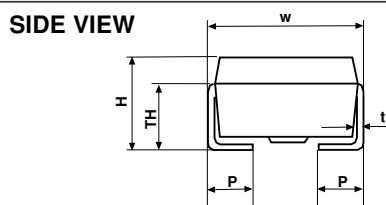
** Tighter performances are available.

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

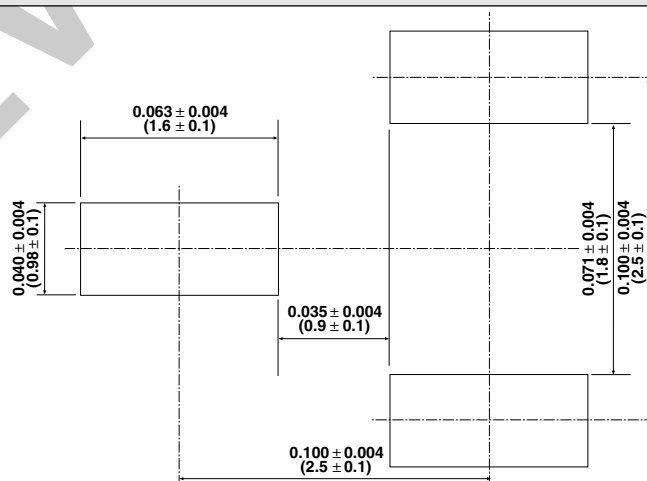
SALES

• AMERICAS: foilsales.usa@vishay.com • ASIA/JAPAN: foilsales.asia@vishay.com • UK/HOLLAND/SCANDINAVIA: foilsales.eunorth@vishay.com
• GERMANY/CZECH REPUBLIC/AUSTRIA: foilsales.eucentral@vishay.com • FRANCE/SWITZERLAND/SOUTHERN EUROPE: foilsales.eusouth@vishay.com • ISRAEL: foilsales.israel@vishay.com

Vishay Foil Resistors Bulk Metal® Foil Surface Mount Voltage Divider,
TCR Tracking of $< \pm 0.5 \text{ ppm}/^\circ\text{C}$
with Stability of $\pm 0.005\%$ (50 ppm)

FIGURE 2 - SCHEMATIC**FIGURE 3 - POWER DERATING CURVE****FIGURE 4 - DIMENSIONS AND IMPRINTING**

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	4.0 ± 0.2	2.7 ± 0.2	1.6 ± 0.2	0.8 ± 0.13	0.8 ± 0.1	1.1 ± 0.2	2.5 ± 0.2	0.13 ± 0.05

FIGURE 5 - RECOMMENDED LAND PATTERN

SALES

• AMERICAS: foilsales.usa@vishay.com • ASIA/JAPAN: foilsales.asia@vishay.com • UK/HOLLAND/SCANDINAVIA: foilsales.eunorth@vishay.com
 • GERMANY/CZECH REPUBLIC/AUSTRIA: foilsales.eucentral@vishay.com • FRANCE/SWITZERLAND/SOUTHERN EUROPE: foilsales.eusouth@vishay.com • ISRAEL: foilsales.israel@vishay.com



Bulk Metal[®] Foil Surface Mount Voltage Divider, Vishay Foil Resistors
TCR Tracking of $< \pm 0.5 \text{ ppm/}^{\circ}\text{C}$
with Stability of $\pm 0.005\%$ (50 ppm)

TABLE 3 - PERFORMANCE SPECIFICATIONS (Test Methods Per MIL-PRF-914)

SPECIFICATIONS	TYPICAL LIMITS
Power rating at 70°C	Entire package: 0.1 watts Each resistor: 0.05 watts (Note: Power derated to 0 Watt at 150°C)
Maximum Working Voltage (each resistor)	25V
Working Temperature Range	- 65°C to + 150°C
TCR - 55°C to + 125°C (+ 25°C reference)	Absolute: (typical and maximum spread): $\pm 2 \pm 3 \text{ ppm/}^{\circ}\text{C}$ Tracking: (maximum) For $R1/R2 = 1$ $\pm 1.0 \text{ ppm/}^{\circ}\text{C}$ ($0 \pm 0.5 \text{ ppm/}^{\circ}\text{C}$ per request) For $1 < R1/R2 \leq 10$ $\pm 2.0 \text{ ppm/}^{\circ}\text{C}$ ($0 \pm 1.0 \text{ ppm/}^{\circ}\text{C}$ per request) For $10 < R1/R2 \leq 200$ $\pm 3.0 \text{ ppm/}^{\circ}\text{C}$ ($0 \pm 2.0 \text{ ppm/}^{\circ}\text{C}$ per request)
Thermal Shock 25 x (- 65°C to + 125°C)	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
Thermal Shock 5 x (- 65°C to + 125°C) and Power Conditioning 1.5 rated power at 25°C, 100 hours	$\Delta R = 0.015\%$ (150 ppm) $\Delta \text{Ratio} = 0.01\%$ (100 ppm)
DWV atmospheric pressure, 200V (A.C.), 1 minute	Successfully passed
Insulation Resistance 100V (D.C.), 1 minute	$> 10^4 \text{ M}\Omega$
Resistance to Soldering Heat	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
Moisture Resistance + 65°C to + 10°C; 90% to 98%RH; 0.1 x rated power, 240 hours	$\Delta R = 0.02\%$ (200 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
Shock 100G	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)
Vibration, High Frequency (10Hz - 2000Hz), 20G	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
High Temperature Exposure 100 hours at 125°C	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
Low Temperature Storage 24 hours at - 65°C	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
Load Life Stability 2000 hours at + 70°C; rated power	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
Shelf Life Stability 1 year at + 15°C to 35°C; 15% to 75%RH, no load	$\Delta R = 0.0025\%$ (25 ppm) $\Delta \text{Ratio} = 0.002\%$ (20 ppm)
Short Time Overload 2.5 x Rated Voltage; 5 seconds	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)
Weight	0.04 grams
Low Temperature Operation	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)

SALES

• AMERICAS: foilsales.usa@vishay.com • ASIA/JAPAN: foilsales.asia@vishay.com • UK/HOLLAND/SCANDINAVIA: foilsales.eunorth@vishay.com
• GERMANY/CZECH REPUBLIC/AUSTRIA: foilsales.eucentral@vishay.com • FRANCE/SWITZERLAND/SOUTHERN EUROPE: foilsales.eusouth@vishay.com • ISRAEL: foilsales.israel@vishay.com

Vishay Foil Resistors Bulk Metal® Foil Surface Mount Voltage Divider,
TCR Tracking of $\leq \pm 0.5 \text{ ppm/}^\circ\text{C}$
with Stability of $\pm 0.005\%$ (50 ppm)

FIGURE 6 - TYPICAL TCR CURVE (For more details, see table 3)

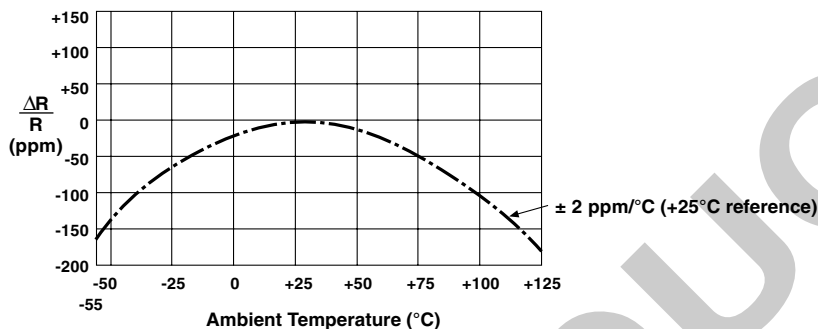


TABLE 4 - ORDERING INFORMATION

MODEL	RESISTANCE VALUE (R1, R2)*			ABSOLUTE TCR	ABSOLUTE TOLERANCE	TOLERANCE RATIO	TERMINATION	PACKAGING
DSM	RESISTANCE RANGE	LETTER DESIGNATOR	MULTIPLIER FACTOR	TCR2	Q = 0.02% A = 0.05% B = 0.1% C = 0.25% D = 0.6% F = 1.0%	T = $\pm 0.01\%$ Q = $\pm 0.02\%$ A = $\pm 0.05\%$	S = Lead (Pb)-free B = Tin/Lead	T = Tape and Reel W = Waffle pack B = Bulk
	100Ω to < 1KΩ Example 249R00 = 249Ω	R	X 1.0					
	1KΩ to < 20KΩ Example 10K000 = 10.0KΩ	K	X 10 ³					

*Specify the resistance value for each resistor of the network - even if all values are the same.

Example:

DSM 10K 10K TCR2 QTSW

Model: DSM

Value: R1 = 10K R2 = 10K

TCR2: 2 ppm/°C typical refers to any value in the resistance range

Tolerance: Absolute: $\pm 0.02\%$ Match: $\pm 0.01\%$

Termination: Lead (Pb)-free

Packaging: Waffle Pack

TCR Tracking: See table 3

SALES

• AMERICAS: foilsales.usa@vishay.com • ASIA/JAPAN: foilsales.asia@vishay.com • UK/HOLLAND/SCANDINAVIA: foilsales.eunorth@vishay.com
• GERMANY/CZECH REPUBLIC/AUSTRIA: foilsales.eucentral@vishay.com • FRANCE/SWITZERLAND/SOUTHERN EUROPE: foilsales.eusouth@vishay.com • ISRAEL: foilsales.israel@vishay.com



Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.