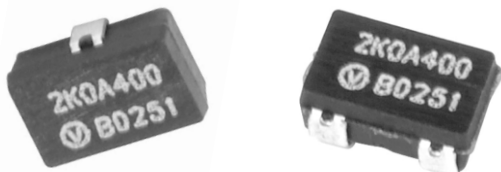


# Bulk Metal® Foil Surface Mount Voltage Divider, TCR Tracking of $< \pm 0.5 \text{ ppm}/^\circ\text{C}$ with Stability of $\pm 0.005\%$ (50 ppm)



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.

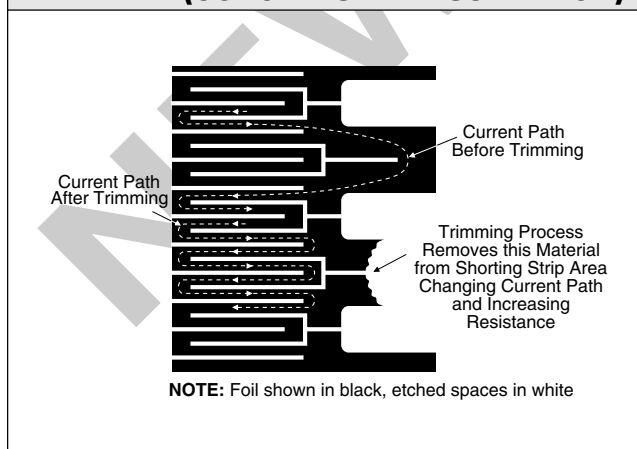
BMF technology allows to produce customer oriented products designed to satisfy challenging and specific technical requirements.

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

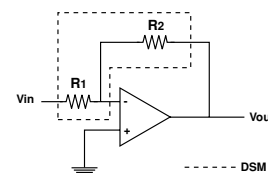
- Temperature Coefficient of Resistance (TCR):  $\pm 2 \text{ ppm}/^\circ\text{C}$  (Absolute)  $\pm 0.5 \text{ ppm}/^\circ\text{C}$  (Tracking)
- Tolerance: Absolute: 0.02% Resistance Ratio: 0.01%
- Resistance Ratio Stability: 0.005% (0.05 watts at 70°C, 2000 hours)
- Power Rating at 70°C: Entire Package: 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: 1 ns 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:  $< 0.1 \text{ ppm}/\text{V}$
- 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		400R	100R
25	5K	100R	2.5	1K	400R
	10K	400R		500R	200R
20	5K	200R	2	10K	5K
	10K	500R		2K	1K
10	2K	100R	1.25	1K	500R
	10K	1K		400R	200R
5	5K	500R	1.0	200R	100R
	2K	200R		500R	400R
5	1K	100R	1.0	100R	100R
	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.

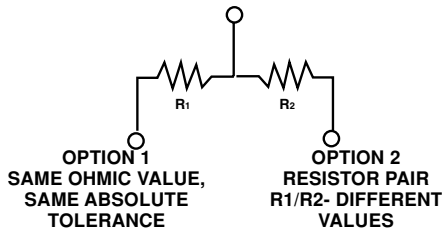
\* Pb containing terminations are not RoHS compliant, exemptions may apply

### SALES

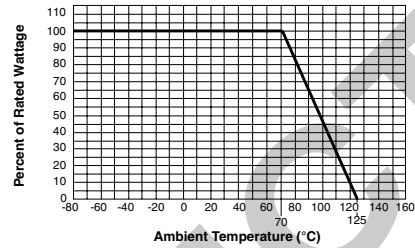
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Vishay Foil Resistors Bulk Metal® Foil Surface Mount Voltage Divider,  
 TCR Tracking of  $< \pm 0.5 \text{ ppm}/^\circ\text{C}$   
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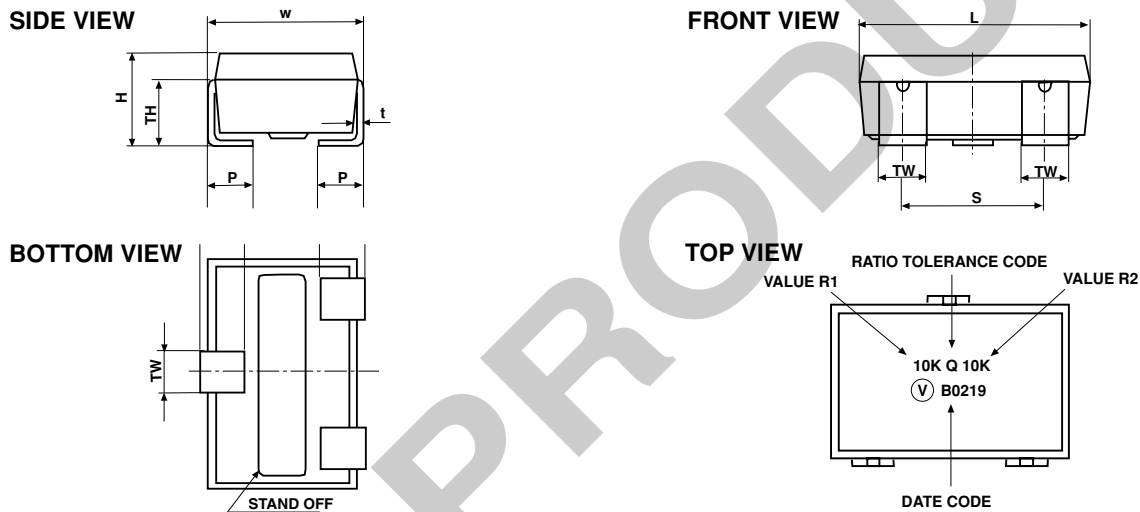
**FIGURE 2 - SCHEMATIC**



**FIGURE 3 - POWER DERATING CURVE**

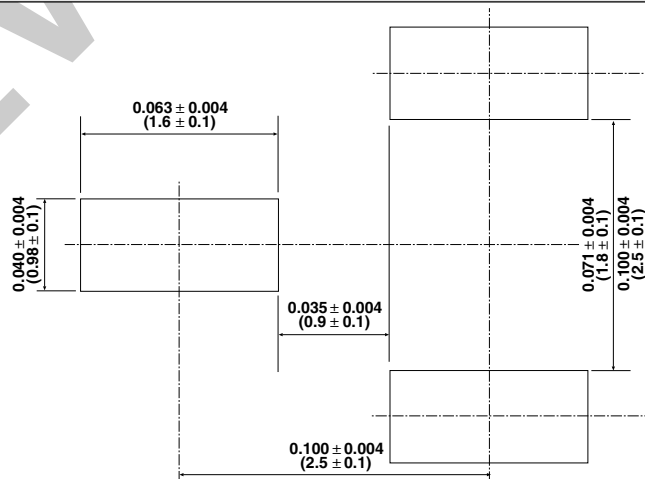


**FIGURE 4 - DIMENSIONS AND IMPRINTING**



DIMENSIONS	L	W	H	P	TW	TH	S	t
INCHES	$0.160 \pm 0.008$	$0.106 \pm 0.008$	$0.063 \pm 0.008$	$0.031 \pm 0.005$	$0.031 \pm 0.004$	$0.043 \pm 0.008$	$0.100 \pm 0.008$	$0.005 \pm 0.002$
MILLIMETERS	$4.0 \pm 0.2$	$2.7 \pm 0.2$	$1.6 \pm 0.2$	$0.8 \pm 0.13$	$0.8 \pm 0.1$	$1.1 \pm 0.2$	$2.5 \pm 0.2$	$0.13 \pm 0.05$

**FIGURE 5 - RECOMMENDED LAND PATTERN**



SALES

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**Bulk Metal<sup>®</sup> 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)**

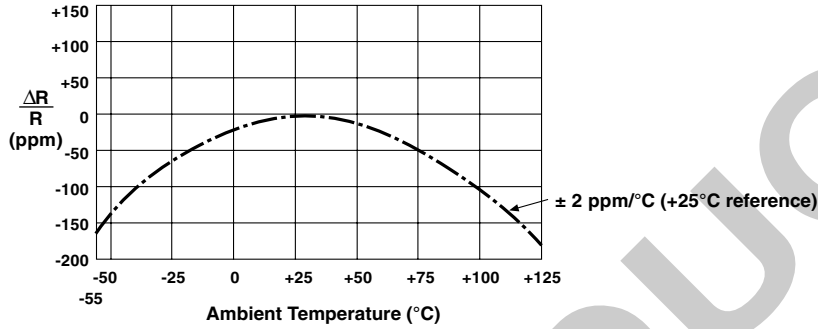
<b>TABLE 3 - PERFORMANCE SPECIFICATIONS</b> (Test Methods Per MIL-PRF-914)	
<b>SPECIFICATIONS</b>	<b>TYPICAL LIMITS</b>
<b>Power rating</b> at 70°C	Entire package: 0.1 watts Each resistor: 0.05 watts (Note: Power derated to 0 Watt at 150°C)
<b>Maximum Working Voltage</b> (each resistor)	25V
<b>Working Temperature Range</b>	- 65°C to + 150°C
<b>TCR</b> - 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)
<b>Thermal Shock</b> 25 x (- 65°C to + 125°C)	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
<b>Thermal Shock</b> 5 x (- 65°C to + 125°C) and <b>Power Conditioning</b> 1.5 rated power at 25°C, 100 hours	$\Delta R = 0.015\%$ (150 ppm) $\Delta \text{Ratio} = 0.01\%$ (100 ppm)
<b>DWV</b> atmospheric pressure, 200V (A.C.), 1 minute	Successfully passed
<b>Insulation Resistance</b> 100V (D.C.), 1 minute	$> 10^4 \text{ M}\Omega$
<b>Resistance to Soldering Heat</b>	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
<b>Moisture Resistance</b> + 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)
<b>Shock</b> 100G	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)
<b>Vibration, High Frequency</b> (10Hz - 2000Hz), 20G	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
<b>High Temperature Exposure</b> 100 hours at 125°C	$\Delta R = 0.01\%$ (100 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
<b>Low Temperature Storage</b> 24 hours at - 65°C	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
<b>Load Life Stability</b> 2000 hours at + 70°C; rated power	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.005\%$ (50 ppm)
<b>Shelf Life Stability</b> 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)
<b>Short Time Overload</b> 2.5 x Rated Voltage; 5 seconds	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)
<b>Weight</b>	0.04 grams
<b>Low Temperature Operation</b>	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)

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**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	R	X 1.0					
	Example 249R00 = 249Ω							
	1KΩ to < 20KΩ	K	X 10 <sup>3</sup>					
	Example 10K000 = 10.0KΩ							

\*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

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