

# Ultra High Precision Bulk Metal® Z-Foil Surface Mount Voltage Divider, TCR Tracking of $< 0.1 \text{ ppm}/^\circ\text{C}$ , PCR of $\pm 5 \text{ ppm}$ at Rated Power and Stability of $\pm 0.005 \%$ (50 ppm)



## INTRODUCTION

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

The Z-Foil technology provides a significant reduction of the resistive element's sensitivity to ambient temperature variations (TCR) and to self heating when power is applied (power coefficient).

The DSMZ offers low TCR (both absolute and tracking), low PCR, excellent load life stability, tight tolerance match, excellent ratio stability, low thermal EMF, and low current noise - all in one package.

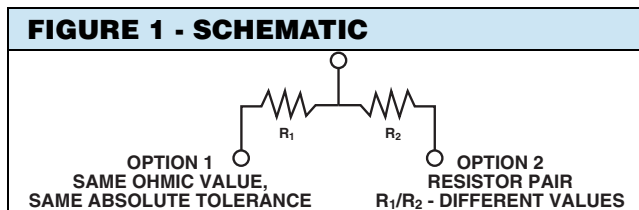
The DSMZ surface mount divider provides a matched pair of Bulk Metal® Z-Foil resistors in a small epoxy molded package. The electrical specification of this integrated construction offers improved performance and better real estate utilization over discrete resistors and matched pairs.

Our application engineering department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact us.

TABLE 1 - RESISTANCE VALUES AND TOLERANCES (1)	
RESISTANCE VALUES	100 $\Omega$ to 10 k $\Omega$ per resistor (2)
ABSOLUTE TOLERANCE EACH RESISTOR	$\pm 0.02 \%$ , $\pm 0.05 \%$ , $\pm 0.1 \%$
RESISTANCE TOLERANCE MATCH	0.01 %, 0.02 %, 0.05 %
TCR	Absolute: (typical and maximum spread): $\pm 0.2 \pm 2.0 \text{ ppm}/^\circ\text{C}$ Tracking: (maximum) For $R_1/R_2 = 1$ 0.5 ppm/ $^\circ\text{C}$ For $1 < R_1/R_2 \leq 10$ 1.0 ppm/ $^\circ\text{C}$ For $10 < R_1/R_2 \leq 100$ 2.0 ppm/ $^\circ\text{C}$

### Notes

- (1) Tighter performances are available  
(2) 100  $\Omega$  to 12 k $\Omega$  per resistor available in DSM



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

## FEATURES

- Temperature coefficient of resistance (TCR):  
Absolute:  $\pm 0.05 \text{ ppm}/^\circ\text{C}$  typ. (0  $^\circ\text{C}$  to + 60  $^\circ\text{C}$ )  
 $\pm 0.2 \text{ ppm}/^\circ\text{C}$  typ. (- 55  $^\circ\text{C}$  to + 125  $^\circ\text{C}$ , + 25  $^\circ\text{C}$  Ref.)  
Tracking: 0.1 ppm/ $^\circ\text{C}$  typical
- Power coefficient tracking  
"ΔR due to self heating":  $\pm 5 \text{ ppm}$  at rated power
- Power rating at 70  $^\circ\text{C}$ : entire package: 0.1 W,  
each resistor: 0.05 W
- Tolerance: absolute:  $\pm 0.02 \%$ ; match: 0.01 %
- Ratio stability: 0.005 % (0.05 W at 70  $^\circ\text{C}$ , 2000 h)
- Resistance range: 100  $\Omega$  to 10 k $\Omega$  per resistor
- Large variety of resistance ratios: 1:100
- 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)
- Electrostatic discharge (ESD) up to 25 000 V
- Short time overload  $\leq 0.005 \%$
- Non-inductive, non-capacitive design
- Rise time: 1 ns effectively no ringing
- Current noise:  $< -40 \text{ dB}$
- Thermal EMF: 0.05  $\mu\text{V}/^\circ\text{C}$  typical
- Voltage Coefficient:  $< 0.1 \text{ ppm}/\text{V}$
- Non Inductive:  $< 0.08 \mu\text{H}$
- Non Hot Spot Design
- Terminals: silver coated copper alloy
- Compliant to RoHS directive 2002/95/EC
- Prototype quantities available in just 5 working days or sooner. For more information, please contact [foil@vishaypg.com](mailto:foil@vishaypg.com)
- For better performances, please contact application engineering



RoHS\*  
COMPLIANT

## APPLICATIONS

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

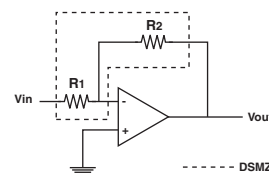
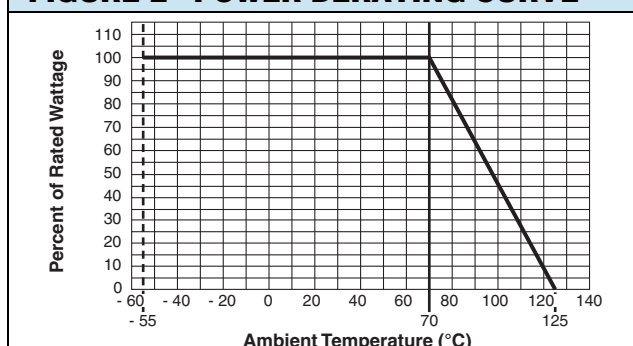
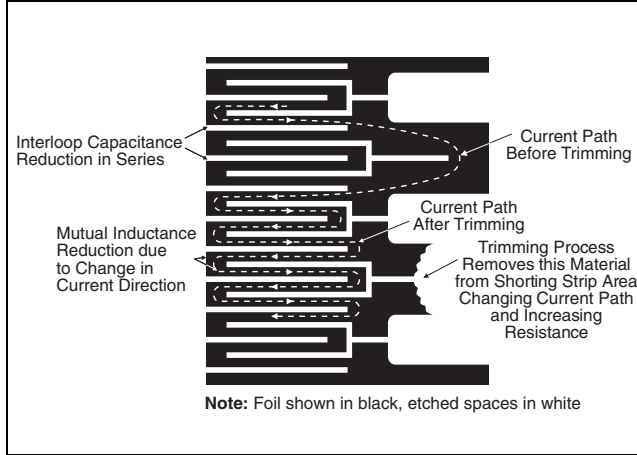


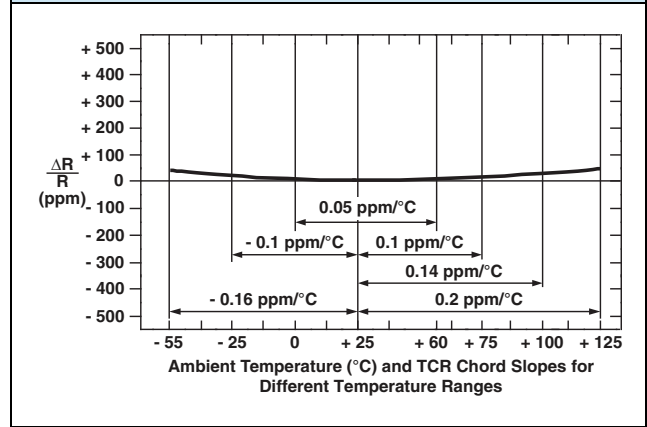
FIGURE 2 - POWER DERATING CURVE



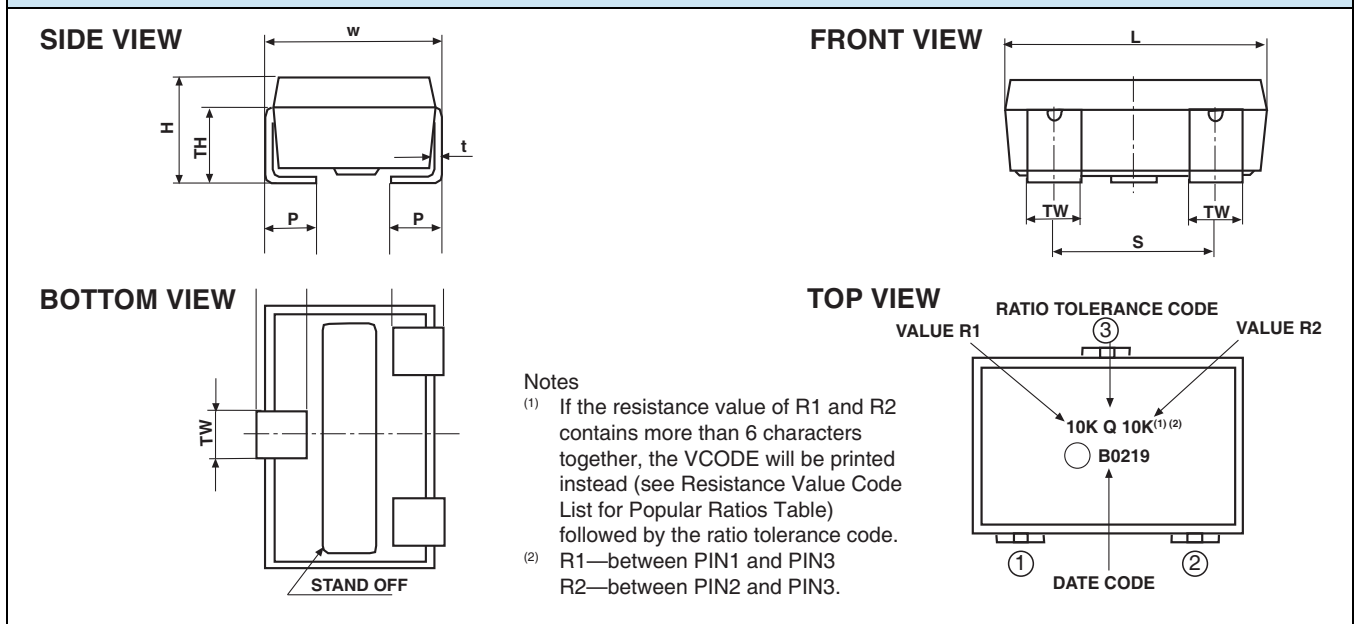
**FIGURE 3 - TRIMMING TO VALUES**  
(Conceptual Illustration)



**FIGURE 4 - TYPICAL RESISTANCE/TEMPERATURE CURVE**  
(For more details, see table 1)

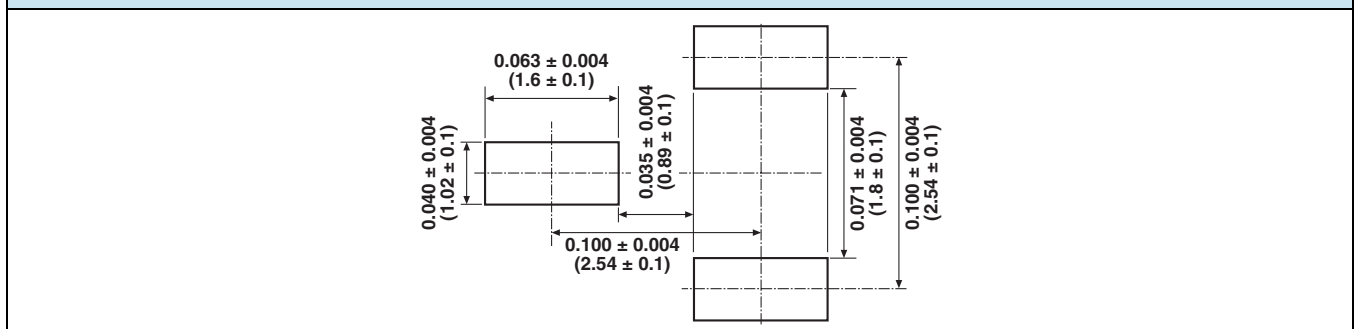


**FIGURE 5 - DIMENSIONS AND IMPRINTING**



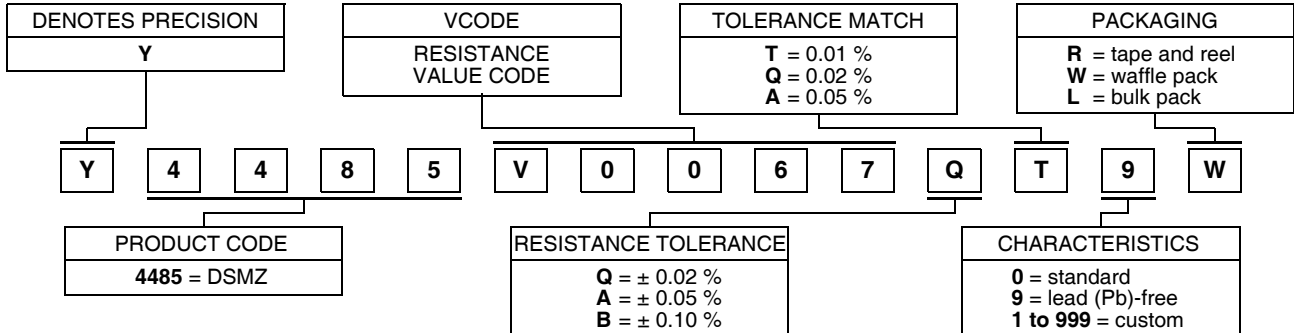
DIMENSIONS	L	W	H	P	TW	TH	S	t
INCHES	0.160 ± 0.008	0.106 ± 0.008	0.063 ± 0.008	0.031 ± 0.005	0.031 ± 0.004	0.043 ± 0.008	0.100 ± 0.008	0.005 ± 0.002
MILLIMETERS	4.06 ± 0.20	2.69 ± 0.20	1.60 ± 0.20	0.79 ± 0.13	0.79 ± 0.10	1.09 ± 0.20	2.54 ± 0.20	0.13 ± 0.05

**FIGURE 6 - RECOMMENDED LAND PATTERN**



**TABLE 2 - PERFORMANCE SPECIFICATIONS** (Test Method Per MIL-PRF-914)

SPECIFICATIONS	TYPICAL LIMITS
<b>Power rating at 70 °C</b>	Entire package: 0.1 W Each resistor: 0.05 W
<b>Maximum Working Voltage</b> (each resistor)	25 V
<b>Working Temperature Range</b>	- 65 °C to + 125 °C
<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, 200 V (A.C.), 1 minute	Successfully passed
<b>Insulation Resistance</b> 100 V (D.C.), 1 minute	> 10 <sup>4</sup> 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 (Specified Pulse)</b> 100 G	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)
<b>Vibration, High Frequency</b> (10 Hz - 2000 Hz), 20 G	$\Delta R = 0.01\%$ (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>Short Time Overload</b> 6.25 x Rated Power; 5 seconds	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)
<b>Low Temperature Operation</b>	$\Delta R = 0.005\%$ (50 ppm) $\Delta \text{Ratio} = 0.0025\%$ (25 ppm)
<b>Weight</b>	0.04 g

**TABLE 3 - GLOBAL PART NUMBER INFORMATION (1)**
**NEW GLOBAL PART NUMBER: Y4485V0067QT9W (preferred part number format)**


FOR EXAMPLE: ABOVE GLOBAL ORDER Y4485 V0067 Q T 9 W:

 TYPE: DSMZ  
 VALUES: 10K/400R  
 ABSOLUTE TOLERANCE: ± 0.02 %  
 TOLERANCE MATCH: 0.01 %  
 TERMINATION: lead (Pb)-free  
 PACKAGING: waffle pack

**HISTORICAL PART NUMBER: DSMZ 10K 400R TCR0.2 Q T S W (will continue to be used)**

<b>DSMZ</b>	<b>10K 400R</b>	<b>TCR0.2</b>	<b>Q</b>	<b>T</b>	<b>S</b>	<b>W</b>
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	ABSOLUTE TOLERANCE	TOLERANCE MATCH	TERMINATION	PACKAGING
	<b>R<sub>1</sub></b> = 10 kΩ <b>R<sub>2</sub></b> = 400 Ω		<b>Q</b> = ± 0.02 % <b>A</b> = ± 0.05 % <b>B</b> = ± 0.10 %	<b>T</b> = 0.01 % <b>Q</b> = 0.02 % <b>A</b> = 0.05 %	<b>S</b> = lead (Pb)-free <b>B</b> = tin/lead	<b>T</b> = tape and reel <b>W</b> = waffle pack <b>B</b> = bulk pack

**Note**

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

**TABLE 4 - RESISTANCE VALUE CODE LIST FOR POPULAR RATIOS (1)**

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
V0078	2K		500R			V0088	100R	100R
V0079	400R		100R					

**Note**

(1) Other values available upon request.

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