

Bulk Metal® Foil Technology

Surface Mount Hermetic Resistor Networks in Gull Wing Configuration

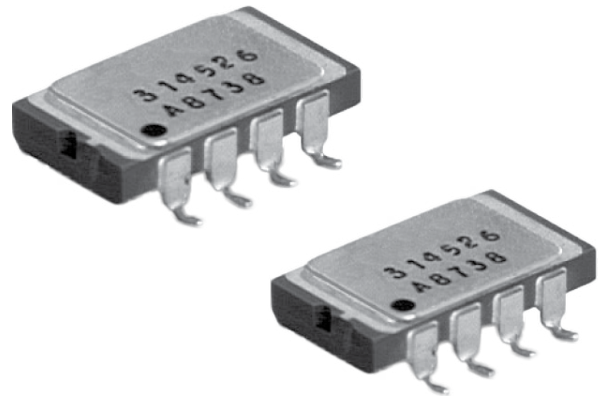
INTRODUCTION

Vishay Foil Resistors Model VSM networks incorporate all the performance features of Bulk Metal® Foil technology in a product ready for surface mounting. The 8, 14 and 16 pin side brazed DIPs are a ceramic package. Ceramic has the advantage of electrical isolation on the underside, and, in DIP form, a favorable pin arrangement when two networks are to be placed side by side and connected together.

Review technical document about [ten technical reasons to specify Bulk Metal Foil resistor networks](#).

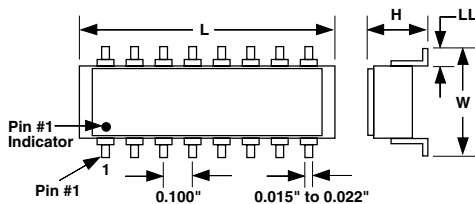
ORDERING INFORMATION—VSM40, VSM42, VSM45 OR VSM46 NETWORKS

Networks are built to your requirements. Send your schematic and electrical requirements to our Application Engineering Department at foil@vpgsensors.com. A unique part number will be assigned which defines all aspects of your network.



Product may not be to scale

FIGURE 1—PACKAGE SIZES AND CHARACTERISTICS

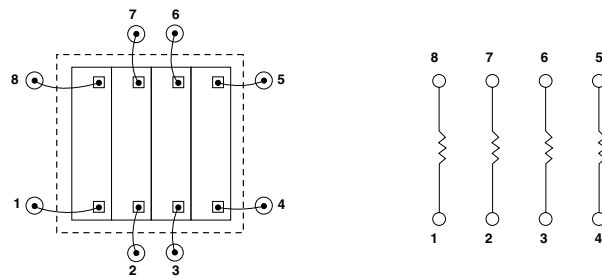


NOTE:

1. These networks utilize Bulk Metal® Foil resistor chips V5X5 and V15X5.
2. The V5X5 and V15X5 chips have maximum resistance values of 10K and 33K respectively in Bulk Metal® Foil.
3. The V5X5 and V15X5 chip(s) can be intermixed in a package.

Model	No. of Pins	Maximum Dimensions in Inches (mm)				Chip Capacity		Maximum Power Rating (W) at +70°C
		L	W	H	LL	V5X5	V15X5	
VSM40	8	0.405 (10.29)	0.470 (11.938)	0.180 (4.572)	0.090 (2.286)	12	4	0.4
VSM42	8	0.540 (13.716)	0.470 (11.938)	0.180 (4.572)	0.090 (2.286)	12	4	0.4
VSM45	14	0.785 (19.914)	0.470 (11.938)	0.180 (4.572)	0.090 (2.286)	30	10	1.2
VSM46	16	0.810 (20.574)	0.470 (11.938)	0.180 (4.572)	0.090 (2.286)	36	12	1.4

FIGURE 2—SAMPLE CIRCUIT DESIGN AND CHIP LAYOUT



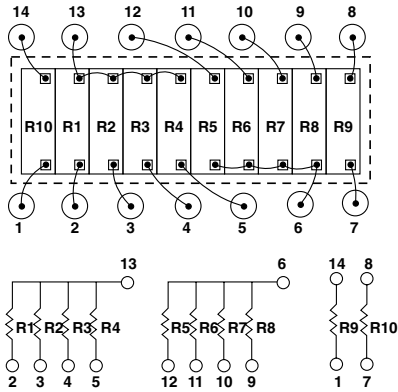
NOTE:

Usable area is represented by the dotted lines—a rectangle 0.150 in x 0.200 in. Illustrations not to scale. Chips shown undersize for clarity. Drawing view is from the top looking down into the package.

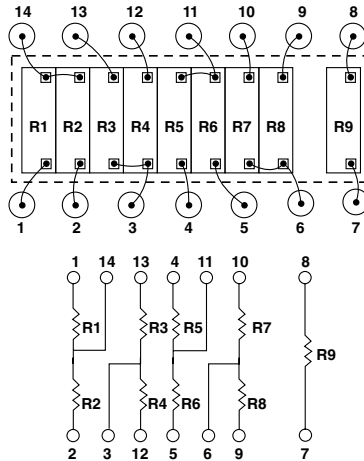
FIGURE 3—SAMPLE CIRCUIT DESIGNS AND CHIP LAYOUTS

NOTE:

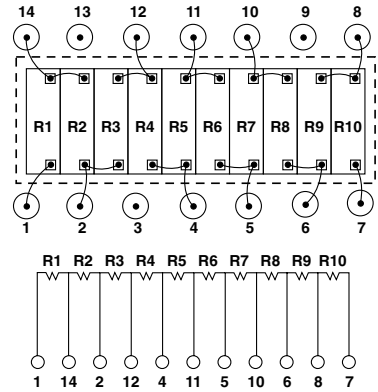
Usable area is represented by the dotted lines—a rectangle 0.150 in x 0.500 in. Illustrations not to scale. Chips shown undersize for clarity. Drawing view is from the top looking down into the package.



TWO DECADES OF BCD LADDER PLUS TWO SCALING RESISTORS



FOUR DIVIDERS PLUS APPLICATION RESISTOR



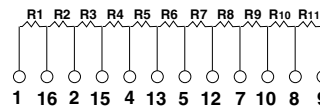
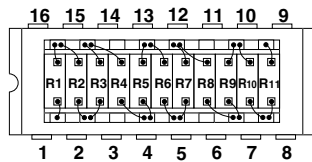
TEN RESISTOR DIVIDER

FIGURE 4—SAMPLE CIRCUIT DESIGNS AND CHIP LAYOUTS

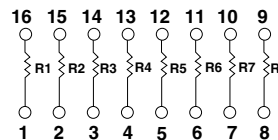
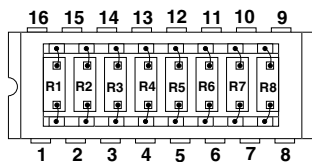
NOTE:

Usable area is represented by the dotted lines—a rectangle 0.150 in x 0.600 in. Illustrations not to scale. Chips shown undersize for clarity. Drawing view is from the top looking down into the package.

ELEVEN RESISTOR DIVIDER



EIGHT RESISTOR PACKAGE



FIVE RESISTOR CURRENT SUMMING NETWORK

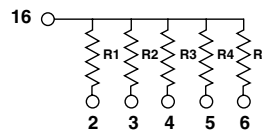
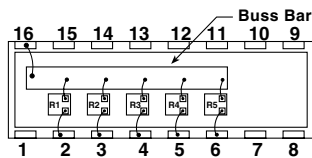


TABLE 1 – Performances

Test or Condition		MIL-PRF-83401							Bulk Metal Foil ^(1,2,3)	
		Y	R	C	V	H	K	M	Typical	Max
Resistance Temp Characteristic	ppm/°C	±5	±25	±50	±50	±50	±100	±300	±2	±5
Tracking To Reference Element (-55 to +125°C)	ppm/°C	±5	±5	±5	±5	NA	NA	NA	±2	±5
Max Ambient Temp at Rated Wattage		+70°C								
Max Ambient Temp at Zero Power		+125°C								
Thermal Shock and Power Conditioning	ΔR	±0.02%	±0.08%	±0.25%	±0.25%	±0.50%	±0.70%	±0.70%	±0.003%	±0.015%
	ΔRatio	±0.01%	±0.04%	±0.03%	±0.03%	NA	NA	NA	±0.01%	±0.015%
Low Temperature Operation	ΔR	±0.02%	±0.03%	±0.10%	±0.10%	±0.10%	±0.25%	±0.50%	±0.005%	±0.01%
	ΔRatio	±0.02%	±0.02%	±0.02%	±0.02%	NA	NA	NA	±0.005%	±0.01%
Short Time Overload	ΔR	±0.02%	±0.03%	±0.10%	±0.10%	±0.10%	±0.25%	±0.50%	±0.002%	±0.01%
	ΔRatio	±0.01%	±0.02%	±0.02%	±0.02%	NA	NA	NA	±0.002%	±0.01%
Resistance to Soldering Heat	ΔR	±0.01%	±0.05%	±0.10%	±0.10%	±0.10%	±0.25%	±0.25%	±0.002%	±0.01%
	ΔRatio	±0.01%	±0.02%	±0.02%	±0.02%	NA	NA	NA	±0.001%	±0.01%
Moisture Resistance	ΔR	±0.02%	±0.05%	±0.20%	±0.20%	±0.40%	±0.50%	±0.50%	±0.003%	±0.01%
	ΔRatio	±0.01%	±0.02%	±0.02%	±0.02%	NA	NA	NA	±0.003%	±0.01%
Shock (Specified Pulse)	ΔR	±0.02%	±0.03%	±0.25%	±0.25%	±0.25%	±0.25%	±0.25%	±0.001%	±0.01%
	ΔRatio	±0.02%	±0.02%	±0.03%	±0.03%	NA	NA	NA	±0.001%	±0.01%
Vibration, High Frequency	ΔR	±0.02%	±0.03%	±0.25%	±0.25%	±0.25%	±0.25%	±0.25%	±0.001%	±0.01%
	ΔRatio	±0.02%	±0.02%	±0.03%	±0.03%	NA	NA	NA	±0.001%	±0.01%
Load Life (+70°C, Full Power, 1000 h)	ΔR	±0.05%	±0.1%	±0.10%	±0.10%	±0.50%	±0.50%	±2.00%	±0.015%	±0.025%
	ΔRatio	±0.025%	±0.03%	±0.03%	±0.03%	NA	NA	NA	±0.005%	±0.01%
25°C Power Rating (1000 h)	ΔR	±0.05%	±0.1%	±0.10%	±0.10%	±0.50%	±0.50%	±2.00%	±0.002%	±0.01%
	ΔRatio	±0.025%	±0.03%	±0.03%	±0.03%	NA	NA	NA	±0.001%	±0.01%
High Temperature Exposure (+125°C, 100 h)	ΔR	±0.02%	±0.05%	±0.10%	±0.10%	±0.20%	±0.50%	±1.00%	±0.005%	±0.01%
	ΔRatio	±0.01%	±0.02%	±0.03%	±0.03%	NA	NA	NA	±0.005%	±0.01%
Low Temperature Storage	ΔR	±0.01%	±0.03%	±0.10%	±0.10%	±0.10%	±0.25%	±0.50%	±0.002%	±0.01%
	ΔRatio	±0.01%	±0.02%	±0.02%	±0.02%	NA	NA	NA	±0.002%	±0.01%
Insulation Resistance		10,000 MΩ								
Resistance Tolerance and, when applicable, Resistance Ratio Accuracy		±0.005% (V)	±0.05% (A)	±0.1% (B)	±0.1% (B)	±0.1% (B)	±0.5% (D)	±1.0% (F)	±0.005% (V)	±0.1% (B)
		±0.01% (T)	±0.1% (B)	±0.5% (D)	±0.5% (D)	±0.5% (D)	±1.0% (F)	±2.0% (G)	±0.01% (T)	±0.5% (D)
		±0.05% (A)	±0.5% (D)	±1.0% (F)	±1.0% (F)	±1.0% (F)	±2.0% (G)	±5.0% (J)	±1.0% (F)	
		±0.1% (B)								
		±0.5% (D)								
		±1.0% (F)								

(1) ΔR's are not cumulative. For purposes of determining reliability calculations, consider the characteristics shown as figures of merit and allow no more than ±0.05% ΔR lifetime. Allow proportionately less if the severity of anticipated environmental stress is small compared to the tests as defined in MIL-PRF-83401.

(2) Post Manufacturing Operations (PMO)—screening has the effect of minimizing ΔR's. Consult our Application Engineering for details.

(3) ΔRatio refers to the change in ratio between resistors within the network package from before, to after, the specific test.



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, "VPG"), 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 VPG's terms and conditions of purchase, including but not limited to, the warranty expressed therein.

VPG 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, VPG 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 VPG's knowledge of typical requirements that are often placed on VPG 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. You should ensure you have the current version of the relevant information by contacting VPG prior to performing installation or use of the product, such as on our website at vpgsensors.com.

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

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

Copyright Vishay Precision Group, Inc., 2014. All rights reserved.