

# High Precision Bulk Metal® Foil Molded Surface Mount Resistor with TCR down to $\pm 2 \text{ ppm}/^\circ\text{C}$ , Flexible Terminations, and Load Life Stability of $\pm 0.005 \%$ (50 ppm)



Any value at any tolerance available within resistance range

## INTRODUCTION

The SMRxD is a precision molded surface mountable resistor offering all the elements of precision; including low TCR, tight tolerance, long term stability, low noise, low thermal EMF, and non-measurable voltage coefficient. It utilizes the Bulk Metal® Foil technology for the resistive element with its inherent low and predictable TCR and long term stability. This surface mountable product affords similar performance to the time tested S series molded through-hole product.

The flexible terminations of this product also reduce stress transference from the PCB to the resistor.

Voltage division with tight tracking  $< 3 \text{ ppm}/^\circ\text{C}$  can be achieved with 2 randomly selected units even with a large ratio between the two values.

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

**TABLE 1 - THE SMRxD SERIES IS LISTED IN THE FOLLOWING DSCC SPECIFICATIONS**

MODEL	DSCC	MIL SPEC
SMR1D	06020	MIL-PRF-55182
SMR3D	06021	MIL-PRF-55182

**TABLE 2 - TOLERANCE AND TCR VERSUS RESISTANCE VALUE**  
(- 55 °C to + 125 °C, + 25 °C ref.)

VALUE	STANDARD TOLERANCE <sup>1)</sup>	TYPICAL TCR AND MAX. SPREAD <sup>1)</sup> (ppm/°C)
50 Ω to 80 kΩ	$\pm 0.01 \%$	$\pm 2 \pm 3$
20 Ω to $< 50 \Omega$	$\pm 0.02 \%$	$\pm 2 \pm 4$
10 Ω to $< 20 \Omega$	$\pm 0.05 \%$	$\pm 2 \pm 6$
5 Ω to $< 10 \Omega$	$\pm 0.1 \%$	$\pm 2 \pm 8$

### Note

1. Tighter performances are available

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

## FEATURES

- Temperature coefficient of resistance (TCR):  $\pm 2 \text{ ppm}/^\circ\text{C}$  typical (- 55 °C to + 125 °C, + 25 °C ref.)
- Tolerance: to  $\pm 0.01 \%$
- Flexible terminations ensure minimal stress transference from the PCB due to a difference in thermal coefficient of expansions (TCE)
- Electrostatic discharge (ESD) above 25 000 V
- Load life stability:  $\pm 0.005 \%$  (70 °C, 2000 h at rated power)
- Resistance range: 5 Ω to 80 kΩ (for higher and lower values, please contact us)
- Power rating: to 600 mW at 70 °C
- Non inductive, non capacitive design
- Current noise: - 40 dB
- Voltage coefficient:  $< 0.1 \text{ ppm}/\text{V}$
- Non inductive:  $< 0.08 \mu\text{H}$
- Non hot spot design
- Terminal finishes available: lead (Pb)-free tin/lead alloy
- Matched sets with TCR tracking are available upon request
- Any value available within resistance range (e.g. 1K234)
- Prototype samples available from 48 h. For more information, please contact [foil@vishaypg.com](mailto:foil@vishaypg.com)
- For better performances please review SMRxDZ datasheet



Available  
**RoHS\***  
COMPLIANT

## APPLICATIONS

- Military, airborne and space
- Precision amplifiers
- High precision instrumentation
- Medical
- Automatic test equipment (ATE)
- Industrial
- Audio (high end stereo equipment)
- EB application
- Pulse application
- Measurement instrumentation



**FIGURE 1 - POWER DERATING CURVE**



**TABLE 3 - PERFORMANCE SPECIFICATIONS**

TEST	CONDITIONS				MAXIMUM LIMIT <sup>1)</sup>	
	SMR1D		SMR3D		SMR1D	SMR3D
Resistance Range					5 Ω to 33 kΩ	5 Ω to 80 kΩ
Rated Power	5 Ω to 10 kΩ 0.250 W at 70 °C 0.125 W at 125 °C	10 kΩ to 33 kΩ 0.160 W at 70 °C 0.08 W at 125 °C	5 Ω to 30 kΩ 0.6 W at 70 °C 0.3 W at 125 °C	30 kΩ to 80 kΩ 0.4 W at 70 °C 0.2 W at 125 °C	see figure 1	
Maximum Working Voltage					73 V	180 V
Maximum Operating Temperature	+ 175 °C (see figure 1)					
Working Temperature Range	- 55 °C to + 125 °C (MIL range)					
Thermal Shock	- 65 °C to + 150 °C; 30 min; 5 cycles				± 0.01 % (100 ppm)	
Short Time Overload	6.25 x rated power; 5 s				± 0.01 % (100 ppm)	
Low Temperature Storage	24 h at - 65 °C				± 0.01 % (100 ppm)	
Low Temperature Operation	45 min, rated power at - 65 °C				± 0.01 % (100 ppm)	
Dielectric Withstanding Voltage	atmospheric pressure; AC 200 V; 1 min				± 0.01 % (100 ppm)	
Insulation Resistance (MΩ)	DC 100 V; 1 min				over 10 000	
Resistance to Soldering Heat (%)	260 °C; 10 s				± 0.02 %, ± 0.01 % typical	
Moisture Resistance	+ 65 °C to - 10 °C; 90 % to 98 % RH; rated power; 240 h				± 0.02 % (200 ppm)	
Shock	100 G; sawtooth				± 0.01 % (100 ppm)	
Vibration, High Frequency	10 ~ 2000 ~ 10 Hz; 20 G; Y, Z each 4 h				± 0.01 % (100 ppm)	
Load Life Stability (2000 h)	0.04 W at + 70 °C 0.25 W at + 70 °C 0.125 W at + 125 °C		0.1 W at + 70 °C 0.6 W at + 70 °C 0.3 W at + 125 °C		Typical 0.005 % 0.02 % 0.02 %	Typical 0.005 % 0.015 % 0.015 %
High Temperature Exposure	175 °C; no load 2000 h				± 0.05 % (500 ppm)	
Weight					0.1143 g	0.244 g
Packaging	bulk (loose) or tape and reel, per EIA-481-1					

**Note**

1. As shown + 0.01 Ω to allow for measurement error at low values

**FIGURE 2 - DIMENSIONS** in inches (millimeters)



MODEL	L	W	H	P	TW	TH (minimum)
SMR1D	0.236 ± 0.012 (5.99 ± 0.30)	0.126 ± 0.012 (3.20 ± 0.30)	0.098 ± 0.012 (2.49 ± 0.30)	0.051 ± 0.012 (1.30 ± 0.30)	0.087 ± 0.004 (2.21 ± 0.10)	0.039 (0.99)
SMR3D	0.287 ± 0.012 (7.29 ± 0.30)	0.170 ± 0.012 (4.32 ± 0.30)	0.110 ± 0.012 (2.79 ± 0.30)	0.051 ± 0.012 (1.30 ± 0.30)	0.095 ± 0.004 (2.41 ± 0.10)	0.039 (0.99)

**FIGURE 3 - RECOMMENDED MOUNTING PAD GEOMETRIES** in inches (millimeters)



MODEL	METHOD	A MIN.	B REF	C REF	D ± 0.04 (± 1.02)	E REF
SMR1D	Reflow	0.110 (2.79)	0.106 (2.69)	0.124 (3.15)	0.337 (8.55)	0.050 (1.27)
SMR3D	Reflow	0.118 (3.00)	0.106 (2.69)	0.175 (4.45)	0.388 (9.86)	0.050 (1.27)

Per IPC-SM-782 Rev. A

**FIGURE 4 - TRIMMING TO VALUES**  
(conceptual illustration)



**FIGURE 5 - TYPICAL TCR CURVE**  
(for more details, see table 2)



**Note:** The TCR values for < 80 Ω are influenced by the termination composition and the result in deviation from this curve

**TABLE 4 - GLOBAL PART NUMBER INFORMATION**

NEW GLOBAL PART NUMBER: Y112110K0000T9R (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1121 10K0000 T 9 R:

TYPE: SMR1D  
 VALUE: 10.0  $k\Omega$   
 ABSOLUTE TOLERANCE:  $\pm 0.01\%$   
 TERMINATION: lead (Pb)-free  
 PACKAGING: tape and reel

HISTORICAL PART NUMBER: SMR1D 10K000 TCR2 T S T (will continue to be used)

<b>SMR1D</b>	<b>10K000</b>	<b>TCR2</b>	<b>T</b>	<b>S</b>	<b>T</b>
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	RESISTANCE TOLERANCE	TERMINATION	PACKAGING
SMR1D SMR3D	10.0 $k\Omega$		T = $\pm 0.01\%$ Q = $\pm 0.02\%$ A = $\pm 0.05\%$ B = $\pm 0.1\%$ C = $\pm 0.25\%$ D = $\pm 0.5\%$ F = $\pm 1.0\%$	S = lead (Pb)-free B = tin/lead	B = bulk pack T = tape and reel

**Note**

\* For non-standard requests, please contact application engineering.

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

Vishay Precision Group 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, Vishay Precision Group 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 Vishay Precision Group's knowledge of typical requirements that are often placed on Vishay Precision Group 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.

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

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

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)  
Email: org@lifeelectronics.ru