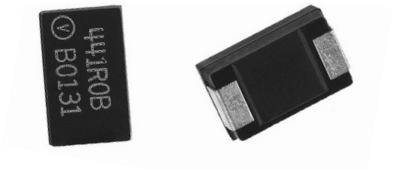
High Precision Bulk Metal® Foil Molded Surface Mount Resistor with TCR down to ± 2 ppm/°C, Flexible Terminations, and Load Life Stability of ± 0.005 % (50 ppm)



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 ppm/°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[1)]	TYPICAL TCR AND MAX. SPREAD[1)] (ppm/°C)
50 Ω to 80 kΩ	± 0.01 %	± 2 ± 3
20 Ω to < 50 Ω	± 0.02 %	± 2 ± 4
10 Ω to < 20 Ω	± 0.05 %	± 2 ± 6
5 Ω to < 10 Ω	± 0.1 %	± 2 ± 8

Note
1. Tighter performances are available

FEATURES

- Temperature coefficient of resistance (TCR): ± 2 ppm°C typical (- 55 °C to + 125 °C, + 25 °C ref.)
- Tolerance: to ± 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: ± 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 ppm/V
- Non inductive: < 0.08 µH
- 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
- For better performances please review SMRxDZ datasheet

Pb-free 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

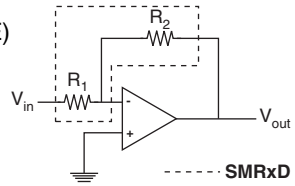
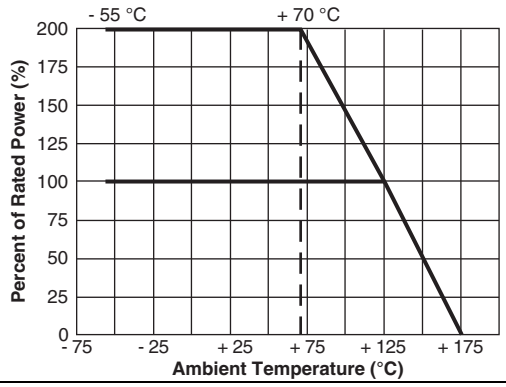


FIGURE 1 - POWER DERATING CURVE



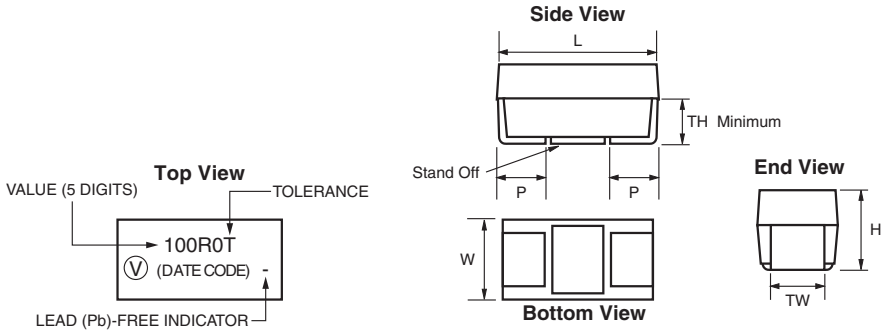
* Pb containing terminations are not RoHS compliant, exemptions may apply

TABLE 3 - PERFORMANCE SPECIFICATIONS						
TEST	**CONDITIONS**				**MAXIMUM LIMIT[1)]**	
	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

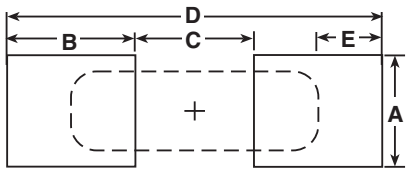
1. As shown + 0.01 Ω to allow for measurement error at low values

FIGURE 2 - DIMENSIONS in inches (millimeters)



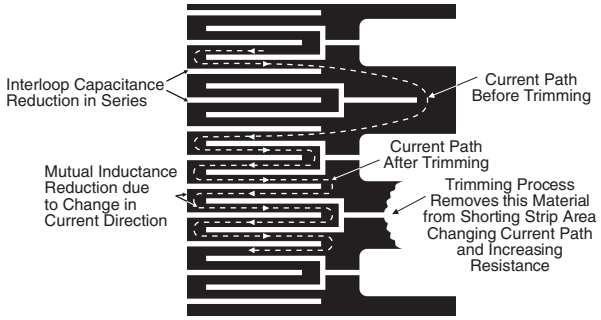
MODEL	L	W	H	P	TW	TH (minimum)
SMR1D	0.236 ± 0.012 (5.99 ± 0.30)	0.126 ± 0.012 (3.20 ± 0.30)	0.098 ± 0.012 (2.49 ± 0.30)	0.051 ± 0.012 (1.30 ± 0.30)	0.087 ± 0.004 (2.21 ± 0.10)	0.039 (0.99)
SMR3D	0.287 ± 0.012 (7.29 ± 0.30)	0.170 ± 0.012 (4.32 ± 0.30)	0.110 ± 0.012 (2.79 ± 0.30)	0.051 ± 0.012 (1.30 ±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

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



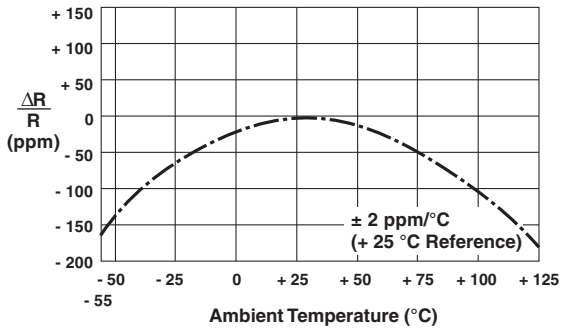
MODEL	METHOD	A MIN.	B REF	C REF	D ± 0.04 (± 1.02)	E REF
SMR1D	Reflow	0.110 (2.79)	0.106 (2.69)	0.124 (3.15)	0.337 (8.55)	0.050 (1.27)
SMR3D	Reflow	0.118 (3.00)	0.106 (2.69)	0.175 (4.45)	0.388 (9.86)	0.050 (1.27)
Per IPC-SM-782 Rev. A						

FIGURE 4 - TRIMMING TO VALUES (conceptual illustration)



NOTE: Foil shown in black, etched spaces in white

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)

DENOTES PRECISION	VALUE	AER*
Y	**R** = Ω **K** = kΩ	**0** = standard **9** = lead (Pb)-free **1 to 999** = custom

Y	1	1	2	1	1	0	K	0	0	0	0	T	9	R

PRODUCT CODE	RESISTANCE TOLERANCE	PACKAGING
1121 = SMR1D **1169** = SMR3D	**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 %	**L** = bulk pack **R** = tape and reel

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

TYPE: SMR1D
VALUE: 10.0 kΩ
ABSOLUTE TOLERANCE: ± 0.01 %
TERMINATION: lead (Pb)-free
PACKAGING: tape and reel

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

SMR1D	10K000	TCR2	T	S	T
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	RESISTANCE TOLERANCE	TERMINATION	PACKAGING
SMR1D **SMR3D**	10.0 kΩ		**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 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.

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- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

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