

## Bulk Metal<sup>®</sup> Foil Technology Precision Molded Surface Mount Resistor



Product may not be to scale

The SMR1D is a truly precision molded surface mountable resistor offering all the elements of precision; including lowest TCR, tight tolerances, long term stability, low noise, low thermal EMF, and non-measurable voltage coefficient. It utilizes the Bulk Metal<sup>®</sup> Foil technology for the resistive element with its inherent and legendary low predictable TCR\* and long term stability. This surface mountable product affords similar performance to the time tested S102 molded through-hole product.

Voltage division with tight tracking < 3ppm can be achieved with 2 randomly selected units even with a large ratio between the two values.

The molded SMR1D, while slightly larger and heavier than the Bulk Metal<sup>®</sup> Foil VSM surface mountable chip resistor, has a rugged construction capable of withstanding significant thermal cycling and allows for board installation without concern for tolerance shifts due to manufacturing processes or mechanical stresses.

\*Reference Reason 1 in "7 Technical Reasons to Specify BMF Resistors."

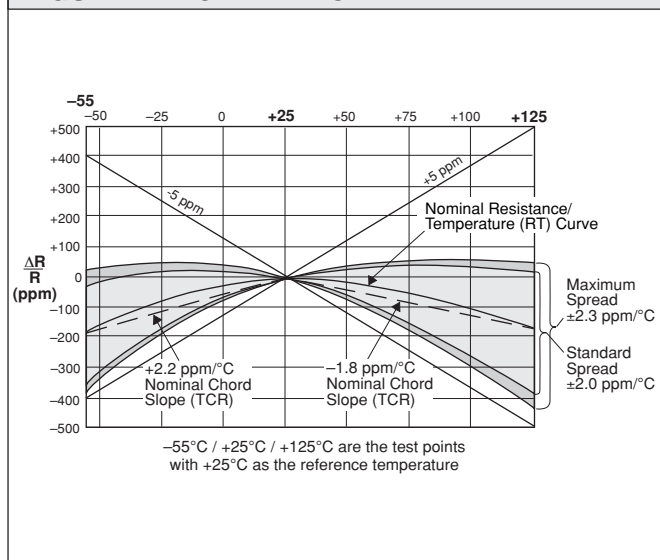
### FEATURES

- Small footprint
- Temperature Coefficient of Resistance — Nominal TCR:
  - + 0.6 ppm/°C (0°C to + 25°C);
  - 0.6ppm/°C (+ 25°C to + 60°C)
  - + 2.2ppm/°C (- 55°C to + 25°C)
  - 1.8ppm/°C (+ 25°C to + 125°C)
- Value Range: 5Ω to 33KΩ
- Tight Tolerances available to ± 0.01 percent
- Power: 0.25 watts @ + 70°C
- Excellent Long Term Stability: ± 0.02% maximum
- Low Thermal EMF: 0.1 m V/°C maximum
- Low Noise, High Frequency Operation
- Matched Sets Available

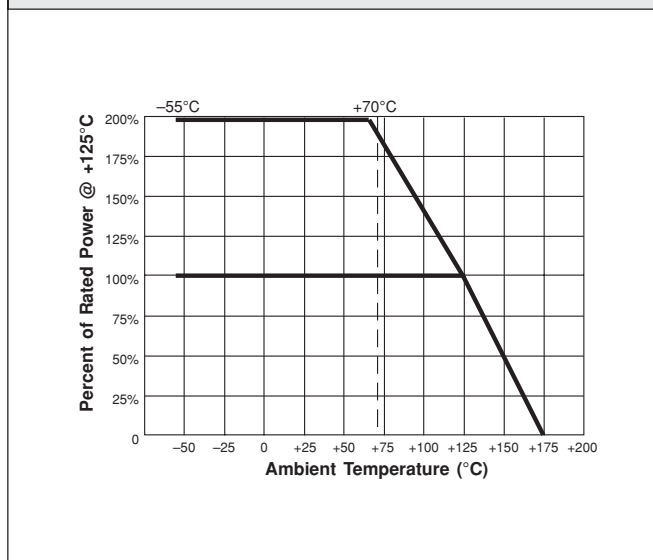
**TABLE 1 - TOLERANCE VERSUS RESISTANCE VALUE**

VALUE (Ω)	STANDARD TOLERANCE (%)
100Ω to 33KΩ	± 0.01%
20Ω to < 100Ω	± 0.02%
10Ω to < 20Ω	± 0.05%
5Ω to < 10Ω	± 0.10%

**FIGURE 1 - NOMINAL TCR**



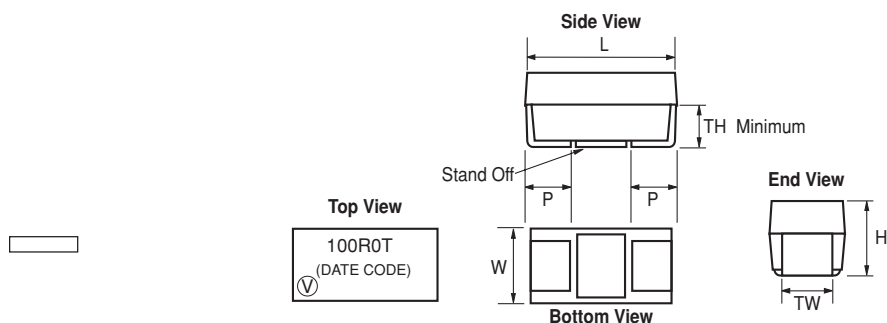
**FIGURE 2 - POWER DERATING CURVE**



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**TABLE 2 - MODEL SMR1D SPECIFICATIONS**

TEST	CONDITIONS	MAXIMUM LIMIT
Resistance Range		5Ω to 33KΩ
TCR	0°C to + 25°C	See Figures 1
	+ 25°C to + 60°C	
	- 55 to + 25°C + 25°C to + 125°C	
Rated Power	0.250 watts @ 70°C 0.125 watts @ 125°C	See Figure 2, previous page
Maximum Working Voltage		54 volts
Maximum Operating Temperature	+ 125°C	
Working Temperature Range	- 65 to + 125°C	
Thermal Shock	- 65°C to + 175°C; 30 minutes.; 5 cycles	± 0.01%
Overload	2.5 x Rated Voltage; 5 Seconds	± 0.01%
Low Temperature Operation	- 65°C; 45 minutes @ Rated Power	± 0.01%
Dielectric Withstanding Voltage	Atmospheric Pressure; AC 200 V; 1 minute	± 0.01%
Insulation Resistance (MΩ)	DC 100 V; 1 minute	over 10,000
Resistance to Soldering Heat (%)	260°C; 10 seconds	± 0.03%, ± 0.01% Typical
Moisture Resistance	+ 65°C to - 10°C; 90 to 98% RH; Rated Power; 240 hours	± 0.05%
Shock	100 G; Sawtooth	± 0.01%
Vibration, High Frequency	10~ 2,000~ 10 Hz; 20 G; X, Y, Z each 2.5 hours	± 0.01%
Load Life Stability Order of Magnitude better than Thin Film Technology	0.125 watts @ 125°C 2,000 hours.	± 0.02%
	0.25 watts @ 70°C 2,000 hours.	± 0.02%
	0.04 watts @ 70°C 2,000 hours.	± 0.005%
High Temperature Exposure	+ 175°C; No Load 2,000 hours	± 0.05%
Shelf Life	15 to 35°C; 15 to 75% RH; No Load; 10,000 hours	± 0.0025% (1 year) ± 0.005% (3 years)
Weight		0.1143 grams
Packaging	Bulk (Loose) or Tape & Reel, per EIA-481-1	

**FIGURE 3 - MODEL SMR1D DIMENSIONS** in inches (millimeters)


MODEL	L	W	H	P	TW	TH (MINIMUM)
SMR1D	0.236 ± 0.012 (6.0 ± 0.30)	0.126 ± 0.012 (3.2 ± 0.30)	0.098 ± 0.012 (2.5 ± 0.30)	0.051 ± 0.012 (1.3 ± 0.30)	0.087 ± 0.004 (2.2 ± 0.10)	0.039 (1.0)

**FIGURE 4 - RECOMMENDED MOUNTING PAD GEOMETRIES** in inches (millimeters)


METHOD	A	B	C	D	E	METHOD	A	B	C	D	E
	MINIMUM	REF	REF	± 0.04 (± 1.0)	REF		MINIMUM	REF	REF	± 0.04 (± 1.0)	REF
Wave	0.061 (1.55)	0.106 (2.70)	0.124 (3.15)	0.337 (8.55)	0.050 (1.28)	Reflow	0.110 (2.79)	0.106 (2.70)	0.124 (3.15)	0.337 (8.55)	0.050 (1.28)

Per IPC-SM-782 Rev A

**TABLE 3 - ORDERING INFORMATION**

MODEL	RESISTANCE RANGE	RESISTANCE VALUE		TOLERANCE	PACKAGING
		LETTER DESIGNATOR	MULTIPLIER FACTOR		
SMR1D	5Ω to < 1KΩ Example: 249R00 - 249Ω	R	x 1.0	T = ± 0.01% Q = ± 0.02% A = ± 0.05% B = ± 0.1% C = ± 0.25% D = ± 0.5% F = ± 1.0%	T = Tape and Reel B = Bulk Pack
	33KΩ Example: 33K000 = 33.0KΩ	K	x 10 <sup>3</sup>		