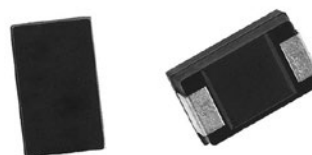


Ultra High Precision Z-Foil Molded Surface Mount Resistor with TCR down to ± 0.2 ppm/ $^{\circ}\text{C}$, PCR of ± 5 ppm at Rated Power, Flexible Terminations, and Load-Life Stability of ± 0.005 % (50 ppm)

FEATURES AND BENEFITS

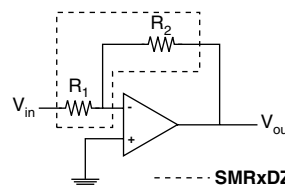
- Temperature coefficient of resistance (TCR): ± 0.2 ppm/ $^{\circ}\text{C}$ typical (-55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ ref.)
- Tolerance: to ± 0.01 %
- Power coefficient of resistance (PCR) "ΔR due to self heating": 5 ppm at rated power
- Flexible Terminations ensure minimal stress transference from the PCB due to a difference in thermal coefficient of expansions (TCE)
- Electrostatic discharge (ESD): at least to 25 kV
- Load-life stability: ± 0.005 % (70°C , 2000 h)
- Resistance range: 5 Ω to 80 k Ω (for higher and lower values, please contact us)
- Power rating: to 600 mW at $+70^{\circ}\text{C}$
- Non-inductive, non-capacitive design
- Current noise: -40 dB
- Voltage coefficient: < 0.1 ppm/V
- Non-inductive: < 0.08
- Non hot spot design
- Terminal finishes available: lead (Pb)-free, tin/lead alloy
- Matched sets with TCR tacking are available upon request
- For higher performances, please contact us
- Any value available within Resistance Range (e.g., 1K234)
- For prototype samples, please contact foil@vpgsensors.com



Any value at any tolerance
available within resistance range



RoHS*
COMPLIANT



APPLICATIONS

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

INTRODUCTION

The SMRx DZ is an ultra high 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. One of the important parameters influencing stability is the Temperature Coefficient of Resistance (TCR). Although the TCR of foil resistors is considered

Table 1 – Tolerance and TCR vs. Resistance Value (-55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ Ref.)

Value (Ω)	Standard Tolerance ⁽¹⁾ (%)	Typical TCR and Max. Spread ⁽¹⁾ (ppm/ $^{\circ}\text{C}$)
50 Ω to 80 k Ω	± 0.01 %	$\pm 0.2 \pm 1.8$
20 Ω to <50 Ω	± 0.02 %	$\pm 0.2 \pm 2.8$
10 Ω to <20 Ω	± 0.05 %	$\pm 0.2 \pm 4.8$
5 Ω to <10 Ω	± 0.1 %	$\pm 0.2 \pm 6.8$

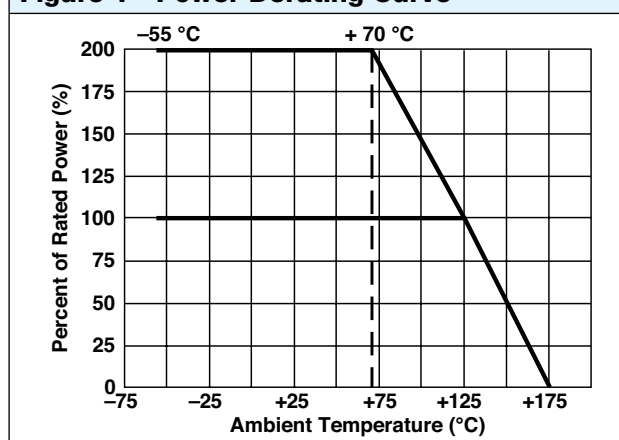
Note

⁽¹⁾ For values < 5 Ω and tighter performance, contact us.

Note

* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS compliant. Please see the information/tables in this datasheet for details.

Figure 1 – Power Derating Curve



extremely low, this characteristic has been further refined over the years. The SMRxDZ utilizes ultra high precision Bulk Metal® Z-Foil.

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).

Voltage division with tight tracking <2 ppm/°C can be achieved with two 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 2—Performance Specifications

Parameters	Specifications				Maximum Limit ⁽¹⁾	
	SMR1DZ		SMR3DZ		SMR1DZ	SMR3DZ
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	
Weight	0.1143 g		0.244 g			
Packaging	Bulk (loose) or tape and reel, per EIA-481-1					
Test	Conditions				Maximum Limit ⁽¹⁾	
Max. Working Voltage	73 V		180 V		—	
Max. 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				R >100 Ω: ±0.02% (200 ppm) R ≤100 Ω: ±0.03% (300 ppm)	
Short Time Overload	6.25 x rated power; 5 s				±0.01% (100 ppm)	
Low Temperature Operation	–65°C, 24 h (no load): 45 min at rated power				±0.01% (100 ppm)	
Dielectric Withstanding Voltage	Atmospheric pressure; AC 200 V; 1 min				±0.01% (100 ppm)	
Insulation Resistance	DC 100 V; 1 min				over 10 000 MΩ	
Resistance to Soldering Heat	260°C for 10 s				±0.03%	
Moisture Resistance	+65°C to –10°C; 90% to 98% RH; rated power; 240 h				±0.03% (300 ppm)	
Shock	100 G; Sawtooth				±0.01% (100 ppm)	
Vibration, High Frequency	10~2000~10 Hz; 20 G; X, Y, Z each 2.5 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% 0.05% max	Typical 0.005% 0.015% 0.05% max
High Temperature Exposure	175°C; no load 2000 h				±0.1% (1000 ppm)	
Note						
⁽¹⁾ As shown +0.01 Ω to allow for measurement errors at low values.						

Figure 2—Dimensions in Inches (Millimeters)

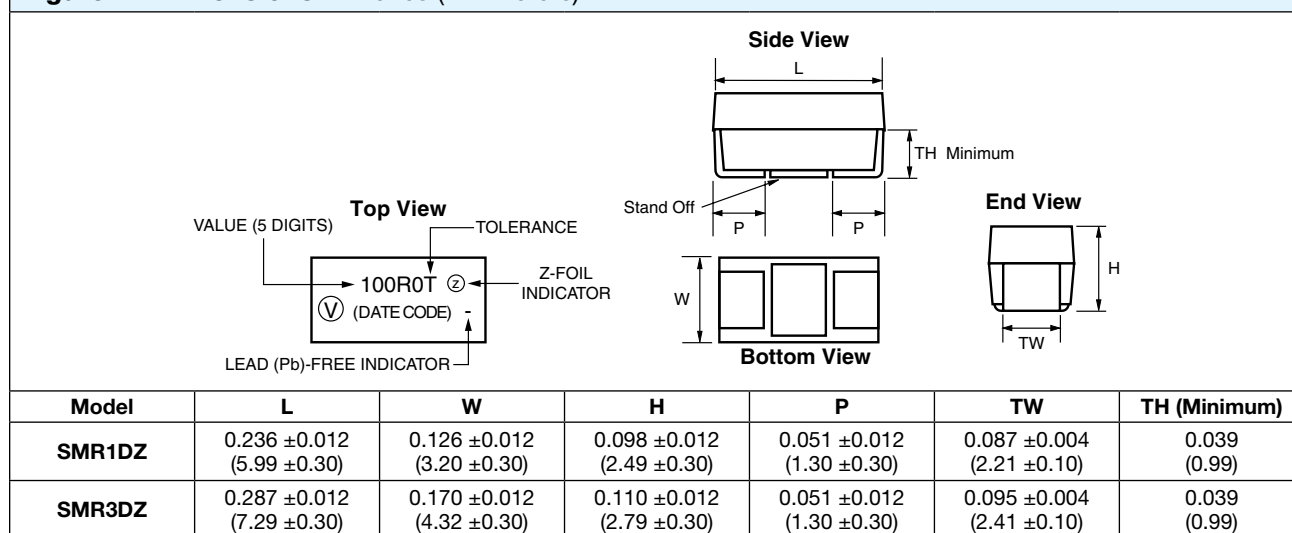


Figure 3—Recommended Mounting Pad Geometries in Inches (Millimeters)

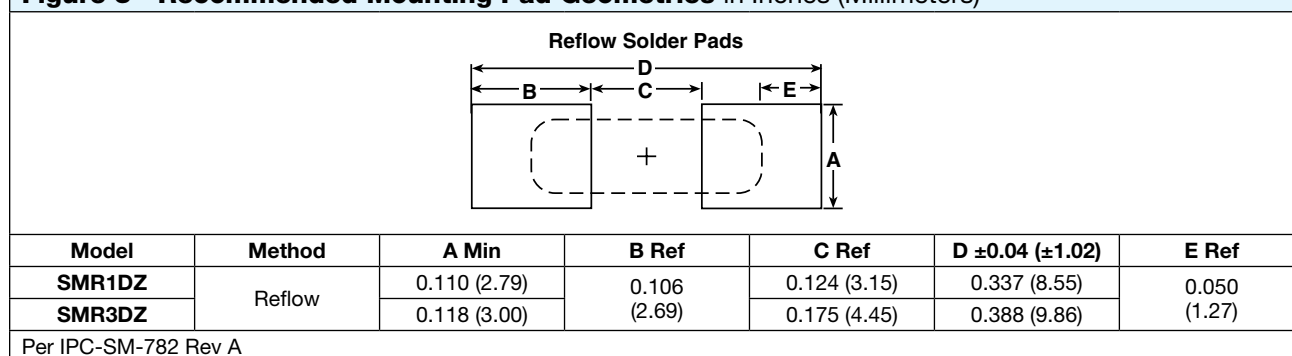


Figure 4—Trimming to Values
(conceptual illustration)

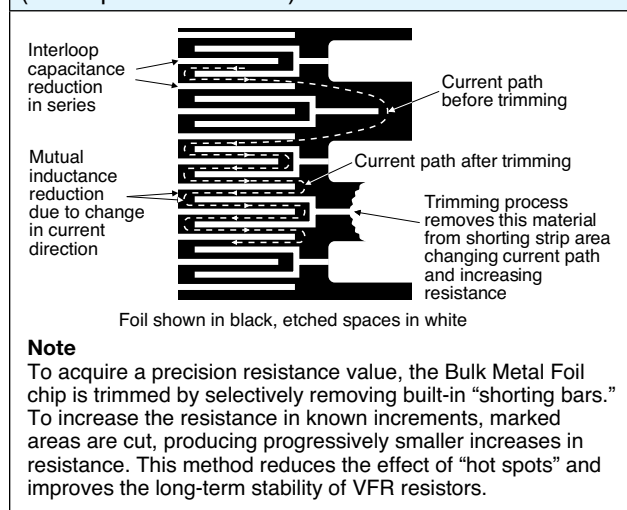


Figure 5—Typical TCR Curve Z-Foil

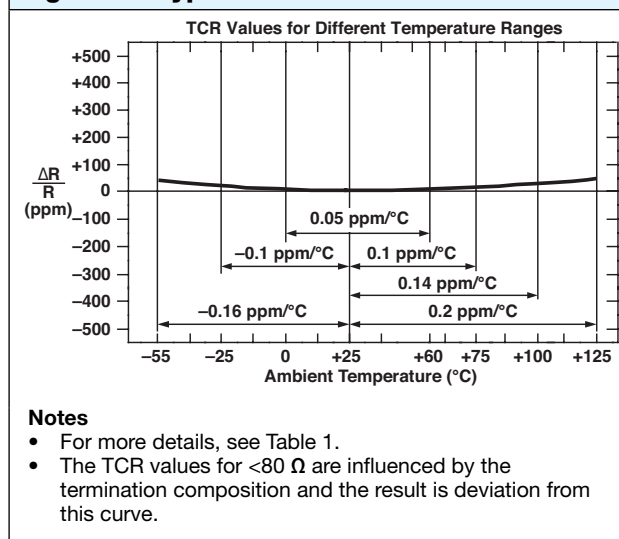
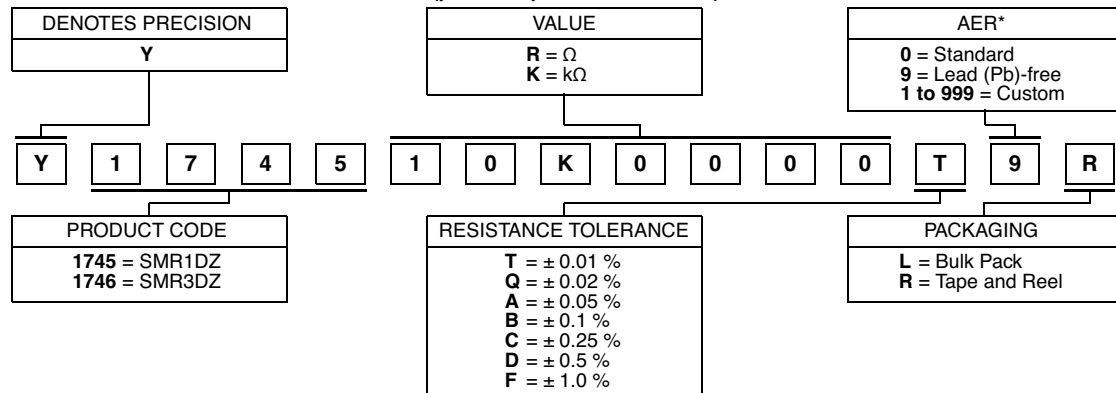


Table 3—Part Number Information

NEW GLOBAL PART NUMBER: Y174510K0000T9R (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1745 10K0000 T 9 R:

TYPE: SMR1DZ

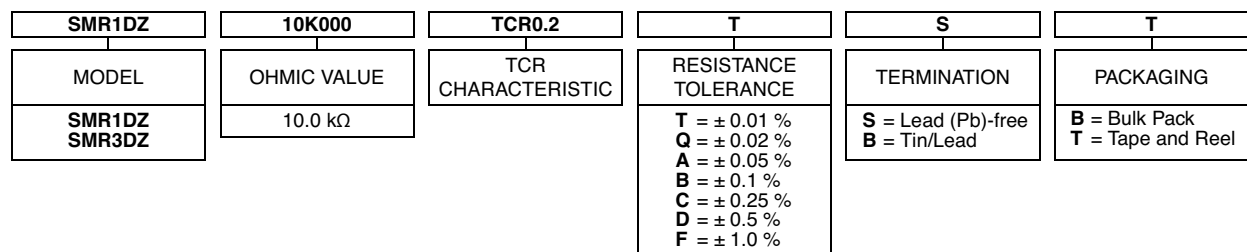
VALUE: 10.0 k Ω

ABSOLUTE TOLERANCE: $\pm 0.01\%$

TERMINATION: Lead (Pb)-free

PACKAGING: Tape and Reel

HISTORICAL PART NUMBER: SMR1DZ 10K000 TCR0.2 T S T (will continue to be used)



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