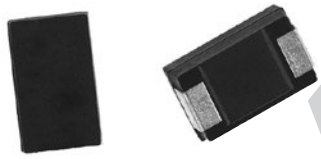
Ultra High Precision Z1 Foil Technology

Molded Surface Mount Resistor with Flexible Terminations

FEATURES AND BENEFITS

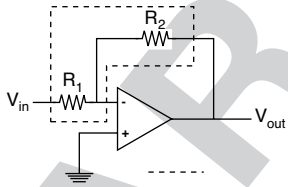
- Temperature coefficient of resistance (TCR): ±0.2 ppm/°C typical (–55°C to +125°C, +25°C ref.)
- Tolerance: to ±0.01%
- Power coefficient of resistance (PCR) "ΔR due to self heating": 5 ppm at rated power
- Flexible Terminations ensure minimal stress transference from the PCB due to a difference in thermal coefficient of expansions (TCE)
- Electrostatic discharge (ESD): at least to 25 kV
- Load-life stability: 0.01% typical (0.6 W at 70°C, 2000 h)
- 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
- Non hot spot design
- Terminal finishes available: lead (Pb)-free, tin/lead alloy
- Matched sets with TCR tacking are available upon request
- For customized performances, please contact us
- Any 6-digit 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

Pb-free Available

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 SMR3Z1 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. The SMR3Z1 is based on the Z1 Foil Technology which is is virtually insensitive to destabilizing factors.

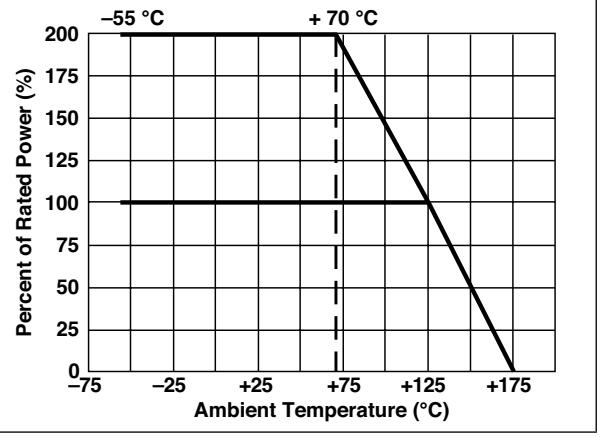
Table 1—Tolerance and TCR vs. Resistance Value (–55°C to +125°C, +25°C Ref.)

Value (Ω)	Standard Tolerance(1) (%)	Typical TCR and Max. Spread(1) (ppm/°C)
50 Ω to 80 kΩ	±0.01%	±0.2 ±1.8
20 Ω to <50 Ω	±0.02%	±0.2 ±2.8
10 Ω to <20 Ω	±0.05%	±0.2 ±4.8
5 Ω to <10 Ω	±0.1%	±0.2 ±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



The ultra-high stability of Z1 Foil Technology is achieved using a solid alloy that is matched to the ceramic substrate with polyimide bonding to enable a uniform thickness of the bond line, a superior adhesion strength, and an improved resistance to moisture. The Z1 Foil Technology provides an order of magnitude improvement in overall environmental performances and in long-term stability over time.

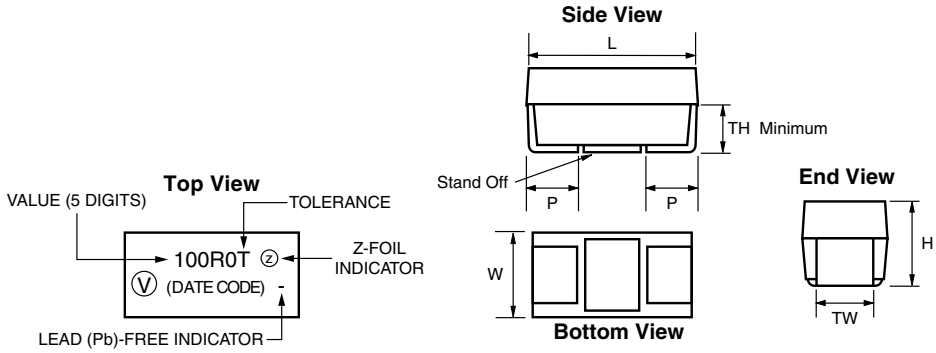
Our Application Engineering Department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact us.

Table 2—Performance Specifications

Parameters	Specifications		Maximum Limit [1]
Resistance Range	5 Ω to 30 kΩ	30 kΩ to 80 kΩ	5 Ω to 80 kΩ
Rated Power	0.6 W at 70°C 0.3 W at 125°C	0.4 W at 70°C 0.2 W at 125°C	See Figure 1
Weight	0.244 g		
Packaging	Bulk (loose) or tape and reel, per EIA-481-1		
Test	**Conditions**		**Maximum Limit [1]**
Max. Working Voltage	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, 100 cycles		0.005% (50 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		±0.005% (50 ppm)
Resistance to Soldering Heat	260°C for 10 s		±0.01 (100 ppm)
Moisture Resistance	+65°C to –10°C; 90% to 98% RH; rated power; 240 h		±0.01% (100 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)	0.6 W at +70°C 0.3 W at +125°C		0.01% (100 ppm) typical 0.025% (250 ppm) max
High Temperature Exposure	175°C; no load 2000 h		±0.05% (500 ppm)

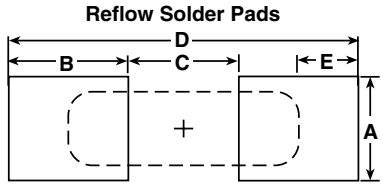
Note
[1] As shown +0.01 Ω to allow for measurement errors at low values.

Figure 2—Dimensions in Inches (Millimeters)



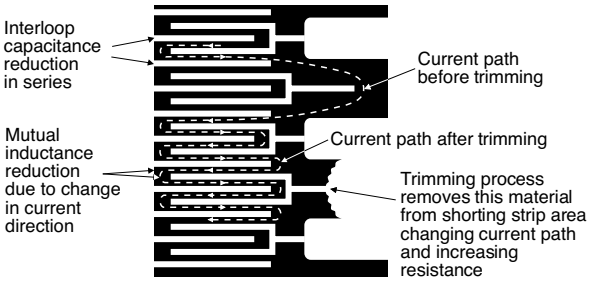
Model	L	W	H	P	TW	TH (Minimum)
SMR3Z1	0.287 ±0.012 (7.29 ±0.30)	0.170 ±0.012 (4.32 ±0.30)	0.110 ±0.012 (2.79 ±0.30)	0.051 ±0.012 (1.30 ±0.30)	0.095 ±0.004 (2.41 ±0.10)	0.039 (0.99)

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



Model	Method	A Min	B Ref	C Ref	D ±0.04 (±1.02)	E Ref
SMR3Z1	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						

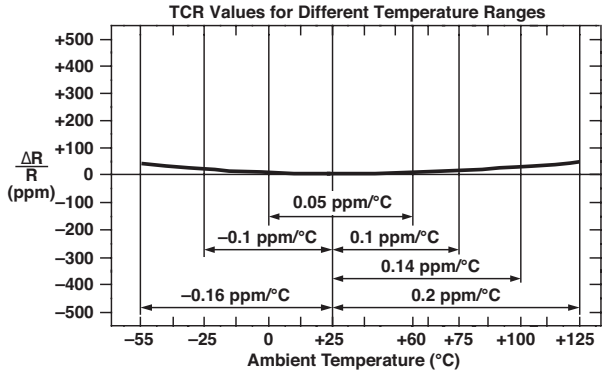
Figure 4—Trimming to Values
(conceptual illustration)



Foil shown in black, etched spaces in white

Note
To acquire a precision resistance value, the Bulk Metal Foil chip is trimmed by selectively removing built-in "shorting bars." To increase the resistance in known increments, marked areas are cut, producing progressively smaller increases in resistance. This method reduces the effect of "hot spots" and improves the long-term stability of VFR resistors.

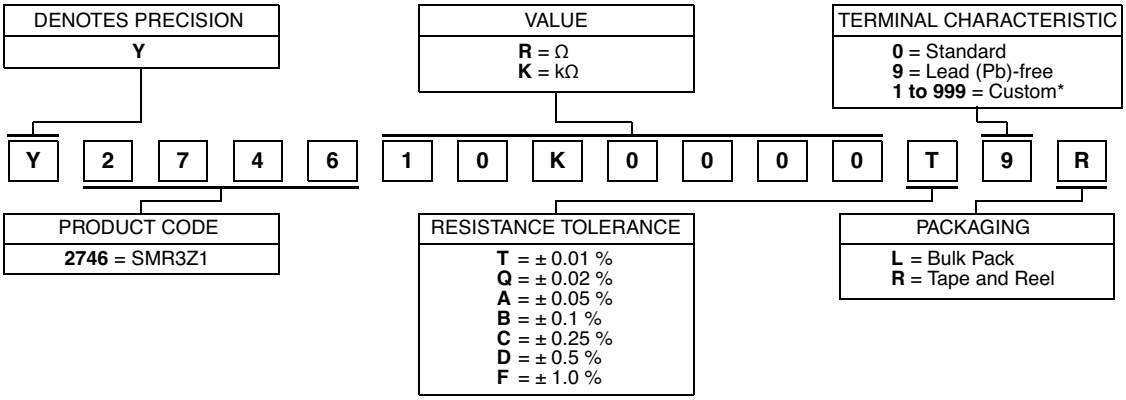
Figure 5—Typical TCR Curve Z-Foil



Notes
- For more details, see Table 1.
- The TCR values for <80 Ω are influenced by the termination composition and the result is deviation from this curve.

Table 3—Part Number Information

NEW GLOBAL PART NUMBER: Y274610K0000T9R (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y2746 10K0000 T 9 R:

TYPE: SMR3Z1
VALUE: 10.0 kΩ
ABSOLUTE TOLERANCE: ± 0.01 %
TERMINATION: Lead (Pb)-free
PACKAGING: Tape and Reel

HISTORICAL PART NUMBER STYLE: SMR3Z1 10K000 TCR0.2 T S T (will continue to be used)

SMR3Z1	10K000	TCR0.2	T	S	T
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	RESISTANCE TOLERANCE	TERMINATION	PACKAGING
SMR3Z1	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

* Customizations are available, contact Application Engineering foil@vpgsensors.com

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