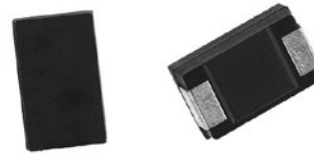


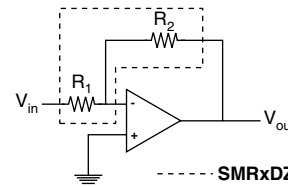
Ultra High Precision Z-Foil Molded Surface Mount Resistor
with TCR down to ± 0.2 ppm/ $^{\circ}\text{C}$, PCR of ± 5 ppm at Rated Power,
Flexible Terminations, and Load-Life Stability of ± 0.005 % (50 ppm)

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



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 SMRxDZ 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.)

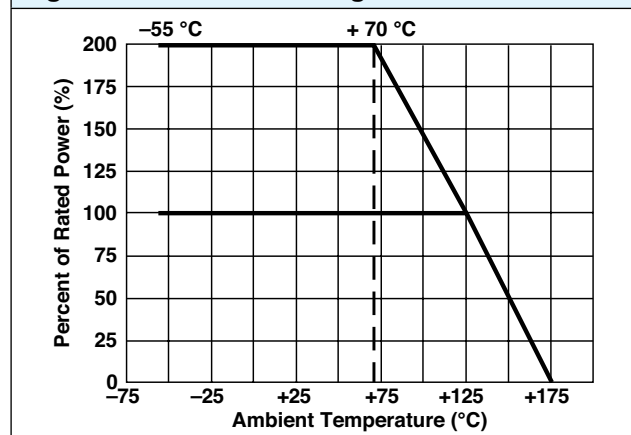
Value (Ω)	Standard Tolerance ⁽¹⁾ (%)	Typical TCR and Max. Spread ⁽¹⁾ (ppm/ $^{\circ}\text{C}$)
50 Ω to 80 k Ω	± 0.01 %	$\pm 0.2 \pm 1.8$
20 Ω to <50 Ω	± 0.02 %	$\pm 0.2 \pm 2.8$
10 Ω to <20 Ω	± 0.05 %	$\pm 0.2 \pm 4.8$
5 Ω to <10 Ω	± 0.1 %	$\pm 0.2 \pm 6.8$

Note
⁽¹⁾ For values $< 5 \Omega$ 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).

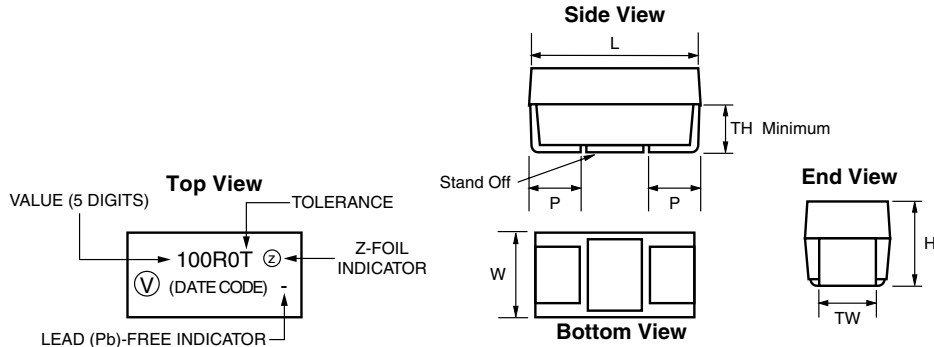
Voltage division with tight tracking <2 ppm/°C can be achieved with two randomly selected units even with a large ratio between the two values.

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

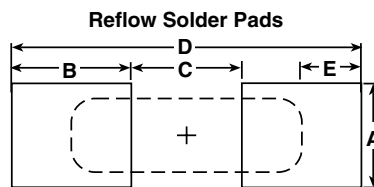
Parameters	Specifications				Maximum Limit ⁽¹⁾	
	SMR1DZ		SMR3DZ		SMR1DZ	SMR3DZ
Resistance Range					5 Ω to 33 kΩ	5 Ω to 80 kΩ
Rated Power	5 Ω to 10 kΩ 0.250 W at 70°C 0.125 W at 125°C	10 kΩ to 33 kΩ 0.160 W at 70°C 0.08 W at 125°C	5 Ω to 30 kΩ 0.6 W at 70°C 0.3 W at 125°C	30 kΩ to 80 kΩ 0.4 W at 70°C 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)



Model	L	W	H	P	TW	TH (Minimum)
SMR1DZ	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)
SMR3DZ	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)

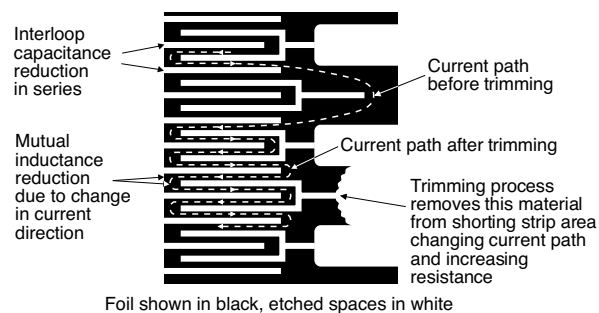
Figure 3—Recommended Mounting Pad Geometries in Inches (Millimeters)



Model	Method	A Min	B Ref	C Ref	D ±0.04 (±1.02)	E Ref
SMR1DZ	Reflow	0.110 (2.79)	0.106 (2.69)	0.124 (3.15)	0.337 (8.55)	0.050 (1.27)
SMR3DZ		0.118 (3.00)				

Per IPC-SM-782 Rev A

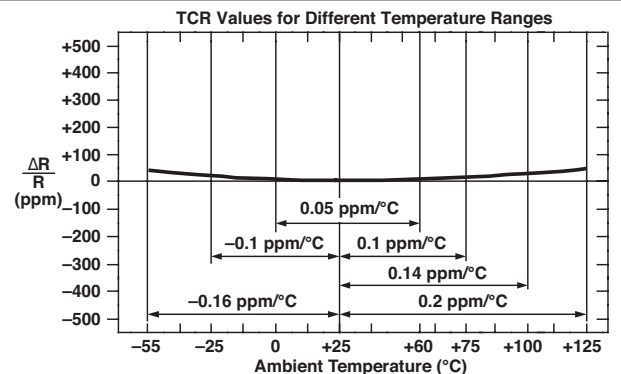
Figure 4—Trimming to Values (conceptual illustration)



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

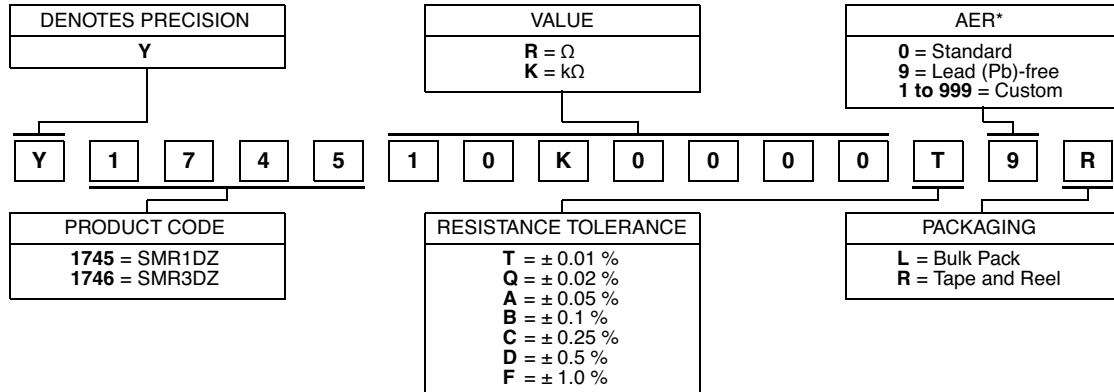


Notes

- 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

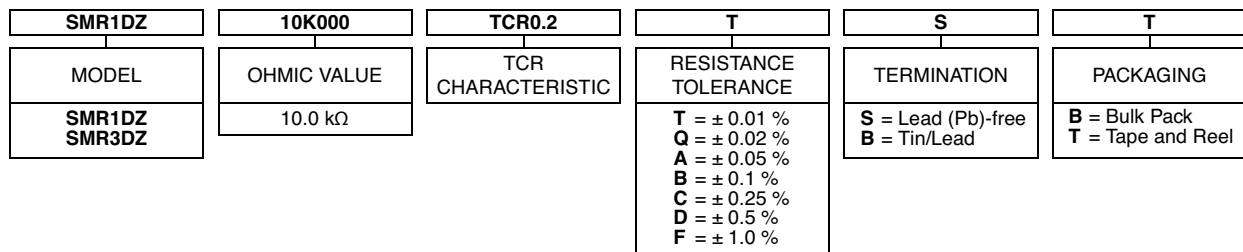
NEW GLOBAL PART NUMBER: Y174510K0000T9R (preferred part number format)



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

TYPE: SMR1DZ
 VALUE: 10.0 kΩ
 ABSOLUTE TOLERANCE: ± 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)



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

VPG 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, VPG 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 VPG's knowledge of typical requirements that are often placed on VPG 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. You should ensure you have the current version of the relevant information by contacting VPG prior to performing installation or use of the product, such as on our website at vpgsensors.com.

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

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

Copyright Vishay Precision Group, Inc., 2014. All rights reserved.