

# Ultra High Precision Z-Foil Molded Surface Mount Resistor with TCR down to $\pm 0.05 \text{ ppm}/^\circ\text{C}$ , PCR of $\pm 5 \text{ ppm}$ at Rated Power, Flexible Terminations, and Load Life Stability of $\pm 0.005 \%$ (50 ppm)



Any value at any tolerance available within resistance range

## 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 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  $< 2 \text{ ppm}/^\circ\text{C}$  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 - TOLERANCE AND TCR VERSUS RESISTANCE VALUE (- 55 °C to + 125 °C, + 25 °C Ref.)		
VALUE	STANDARD TOLERANCE <sup>1)</sup>	TYPICAL TCR AND MAX. SPREAD <sup>1)</sup> (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. Tighter performances are available

## FEATURES

- Temperature Coefficient of Resistance (TCR):  
± 0.05 ppm/°C typical (0 °C to + 60 °C)  
± 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) above 25 000 Volts
- Load Life Stability: ± 0.005 % (70 °C, 2000 hours 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
- Non Hot Spot Design
- Terminal Finishes available: Lead (Pb)-free  
Tin/Lead Alloy
- Matched sets with TCR tracking are available upon request
- For higher Performances please contact us
- Any Value available within Resistance Range (e.g. 1K234)
- Prototype Samples available from 48 hours. For more Information, please contact [foil@vishaypg.com](mailto:foil@vishaypg.com)



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

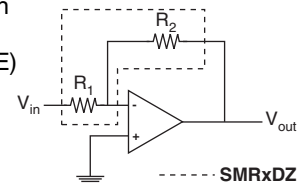
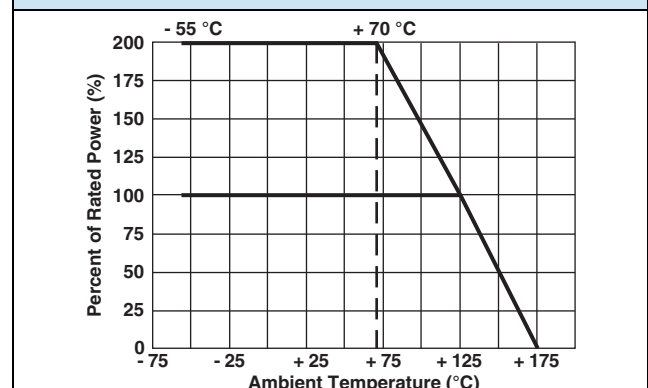


FIGURE 1 - POWER DERATING CURVE



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

**TABLE 2 - PERFORMANCE SPECIFICATIONS**

TEST	CONDITIONS				MAXIMUM LIMIT <sup>1)</sup>	
	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	
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 + 175 °C; 30 minutes; 5 cycles				± 0.01 % (100 ppm)	
Short Time Overload	6.25 x Rated Power; 5 seconds				± 0.01 % (100 ppm)	
Low Temperature Operation	- 65 °C, 24 hours (no load); 45 minutes at Rated Power				± 0.01 % (100 ppm)	
Dielectric Withstanding Voltage	Atmospheric Pressure; AC 200 V; 1 minute				± 0.01 % (100 ppm)	
Insulation Resistance (MΩ)	DC 100 V; 1 minute				over 10 000	
Resistance to Soldering Heat (%)	260 °C; 10 seconds				± 0.02 %, ± 0.01 % typical	
Moisture Resistance	+ 65 °C to - 10 °C; 90 % to 98 % RH; Rated Power; 240 hours				± 0.02 % (200 ppm)	
Shock	100 G; Sawtooth				± 0.01 % (100 ppm)	
Vibration, High Frequency	10 ~ 2000 ~ 10 Hz; 20 G; X, Y, Z each 2.5 hours				± 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 hours				± 0.05 % (500 ppm)	
Weight					0.1143 g	0.244 g
Packaging	Bulk (loose) or Tape and Reel, per EIA-481-1					

**Note**

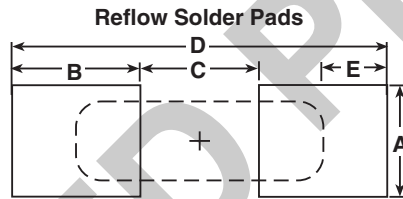
1. As shown + 0.01 Ω to allow for measurement error at low values

**FIGURE 2 - DIMENSIONS** in inches (millimeters)



MODEL	L	W	H	P	TW	TH (minimum)
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)

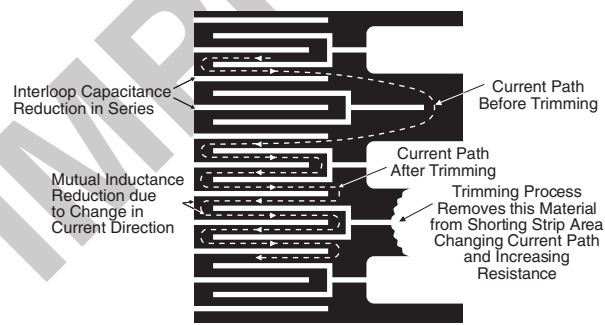
**FIGURE 3 - RECOMMENDED MOUNTING PAD GEOMETRIES** in inches (millimeters)



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	Reflow	0.118 (3.00)	0.106 (2.69)	0.175 (4.45)	0.388 (9.86)	0.050 (1.27)

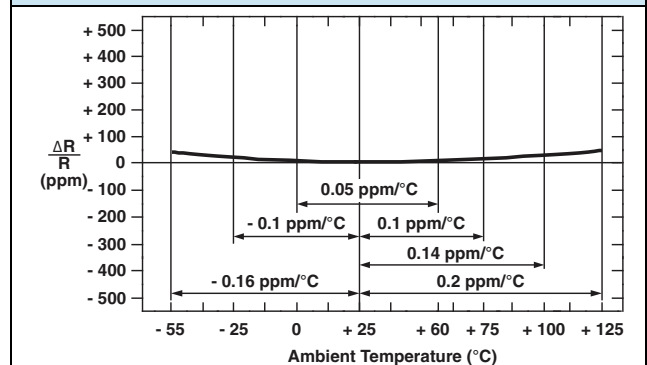
Per IPC-SM-782 Rev A

**FIGURE 4 - TRIMMING TO VALUES**  
(conceptual illustration)



NOTE: Foil shown in black, etched spaces in white

**FIGURE 5 - TYPICAL TCR CURVE Z-FOIL**

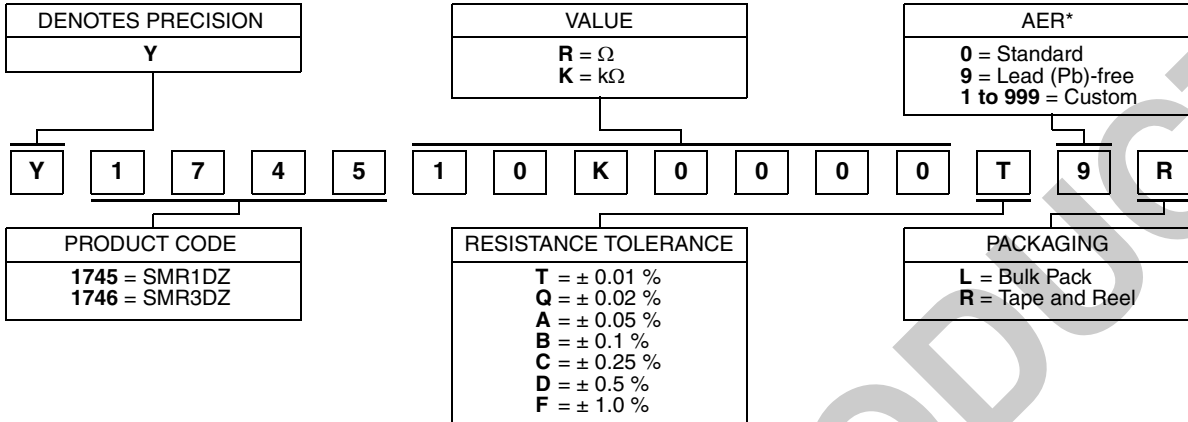


**Notes**

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

**TABLE 3 - GLOBAL 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  $k\Omega$   
 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)

SMR1DZ	10K000	TCR0.2	T	S	T
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	RESISTANCE TOLERANCE	TERMINATION	PACKAGING
SMR1DZ SMR3DZ	10.0 $k\Omega$		T = $\pm 0.01\%$ Q = $\pm 0.02\%$ A = $\pm 0.05\%$ B = $\pm 0.1\%$ C = $\pm 0.25\%$ D = $\pm 0.5\%$ F = $\pm 1.0\%$	S = Lead (Pb)-free B = Tin/Lead	B = Bulk Pack T = Tape and Reel

**Note**

\* For non-standard requests, please contact Application Engineering.

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

Vishay Precision Group 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, Vishay Precision Group 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 Vishay Precision Group's knowledge of typical requirements that are often placed on Vishay Precision Group 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.

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

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

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А