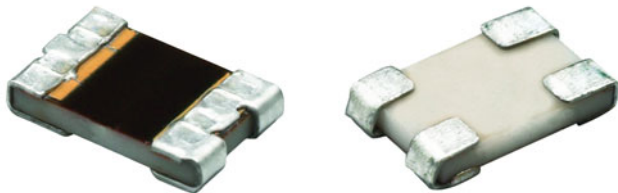


High Precision Foil Surface Mount Current Sensing Chip Resistors with TCR of $\pm 0.2 \text{ ppm}/^\circ\text{C}$, Load Life Stability of $\pm 0.015 \%$, ESD Immunity up to 25 kV and Fast Thermal Stabilization



INTRODUCTION

The Z-foil technology provides a significant reduction of the resistive component's sensitivity to ambient temperature variations (TCR) and applied power changes (PCR).

Designers can now guarantee a high degree of stability and accuracy in fixed-resistor applications using solutions based on Vishay's Foil Resistors revolutionary Z-foil technology.

Model VCS1610Z is a surface mount chip resistor designed with 4 pads for Kelvin connection. Utilizing Vishay's Bulk Metal® Z-foil as the resistance element, it provides performance capabilities far greater than other resistor technologies can supply in a product of comparable size. $\pm 0.2 \text{ ppm}/^\circ\text{C}$ typical TCR (- 55 °C to + 125 °C, + 25 °C ref.) removes errors due to temperature gradients.

This small device dissipates heat almost entirely through the pads so surface mount users are encouraged to be generous with the board's pads and traces.

Our application engineering department is available to advise and to make recommendations. For non-standard technical requirements and special applications, please contact us.

TABLE 1 - TOLERANCE AND TCR VS. RESISTANCE VALUE
(- 55 °C to + 125 °C, + 25° Ref.)

| VALUE (Ω) | TOLERANCE | TYPICAL TCR AND MAX. SPREAD (ppm/°C) |
|-----------------------|------------|---|
| 0R5 to 10R | 0.5 %, 1 % | $\pm 0.2 \pm 4.8$ |
| 0R3 to 0R5 | 0.5 %, 1 % | $\pm 0.2 \pm 9.8$ |

Note

• Tighter tolerances and higher values are available. Please contact application engineering foil@vishaypg.com

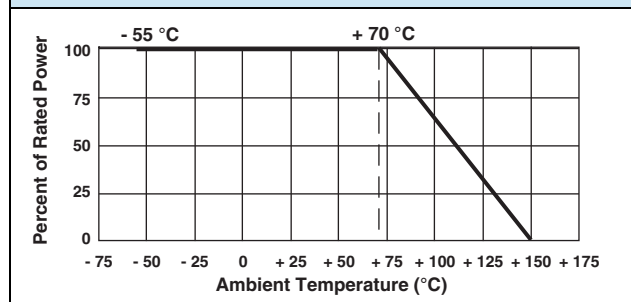
FEATURES

- Temperature coefficient of resistance (TCR): $\pm 0.2 \text{ ppm}/^\circ\text{C}$ typical (- 55 °C to + 125 °C, + 25 °C ref.) (see table 1)
- Resistance range: 0.3 Ω to 10 Ω
- Resistance tolerance: to $\pm 0.5 \%$
- Load life stability: $\pm 0.015 \%$ at 70 °C, 2000 h at rated power
- Power rating: 0.25 W at + 70 °C
- Vishay Foil resistors are not restricted to standard values; specific "as required" values can be supplied at no extra cost or delivery (e.g. 0.345 Ω vs. 0.3 Ω)
- Electrostatic discharge (ESD) at least to 25 kV
- Thermal stabilization time < 1 s (nominal value achieved within 10 ppm of steady state value)
- Short time overload < 0.005 %
- Non-inductive, non-capacitive design
- Thermal EMF: 0.05 $\mu\text{V}/^\circ\text{C}$ typical
- Current noise: 0.010 $\mu\text{V}_{\text{RMS}}/\text{V}$ of applied voltage (< - 40 dB)
- Rise time: 1 ns effectively no ringing
- Voltage coefficient: < 0.1 ppm/V
- Non inductive: < 0.08 μH
- Non hot spot design
- Prototype quantities available in just 5 working days or sooner. For more information, please contact foil@vishaypg.com



RoHS*
COMPLIANT

FIGURE 1 - POWER DERATING CURVE (1)



Note

(1) Power rating: 0.25 W at + 70 °C

* TERMINATIONS

- Tin/lead plated
- Two options of lead (Pb)-free leads available:
 - Gold plated
 - Tin plated

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

Why use Kelvin connections?

Four-terminal connections or Kelvin connections are required in these low ohmic value resistors to measure a precise voltage drop across the resistive element. The 4-terminal configuration eliminates the IR-drop error voltage that would be present in the voltage sense leads if a standard two-terminal resistor were used.

In current sense resistors the contact resistance and the terminations resistance may be greater than that of the resistive element itself so lead connection errors can be significant if only two terminal connections are used.

Why is the VCS1610Z vital in avoiding Thermal EMF (parasitic effect)?

When two dissimilar metals are heated, a parasitic voltage is generated and creates a DC-offset error. This voltage is proportional to a temperature difference between either end of the pair of conductors. This phenomenon is called a Thermal Electro-motive Force (Thermal EMF), or thermocouple effect. Thermal EMF is an important consideration in low ohmic current sensing resistors used mostly in DC circuits. The VCS1610Z is the ideal solution to minimize the effect of thermal EMF through the use of appropriate materials between the resistive layer and the terminations.

Should I be concerned about the impact of ESD on my resistor?

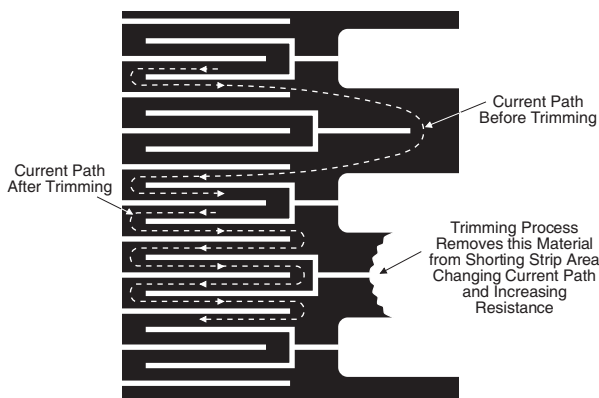
Electrostatic Discharge (ESD) is known to produce catastrophic failures in thin-film and thick-film (cermet) resistors at only 3000 V. On the other hand, the Bulk Metal® Foil resistor withstands ESD events up to 25 kV because its thicker resistance element and greater metallic mass afford much higher energy-handling capability than either the much thinner thin-film resistor or the sparse, non-homogeneous metallic content of the thick film resistor.

Should I be concerned about stability?

In order to select the resistor technology most appropriate to the application, a designer must take into account all normal and extraordinary stresses the resistor will experience in the application. In addition, the designer must consider the cost and reliability impact involved when it becomes necessary to add costly additional compensating circuitry when inadequate resistors are selected. The stability of Bulk Metal® Foil resistors, together with the advantages already mentioned, as well as the other basic advantages apparent in their specifications will not only provide unequalled performance in the circuit but will eliminate all the costs associated with extra compensation circuitry.

With VCS1610Z, only a minimal shift in resistance value will occur during its entire lifetime. Most of this shift takes place during the first few hundred hours of operation, and virtually no change is noted thereafter.

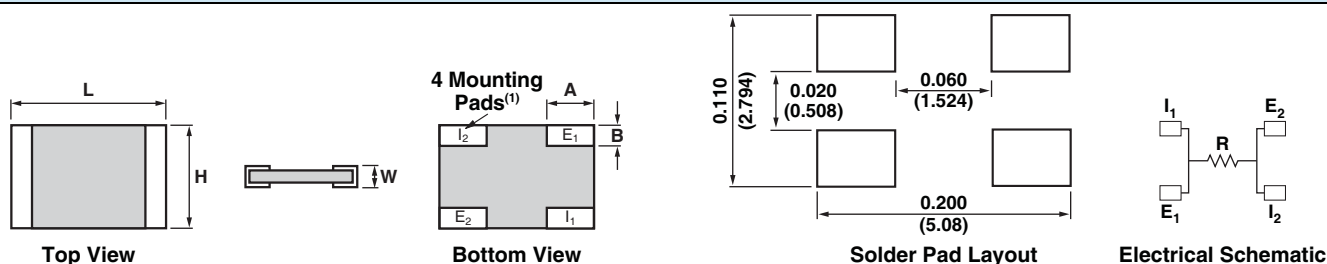
FIGURE 2 - TRIMMING TO VALUES(Conceptual Illustration)*



NOTE: Foil shown in black, etched spaces in white

* 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 eliminates the effect of "hot spot" and assures the long term stability of the Foil chips.

FIGURE 3 - DIMENSIONS in inches (millimeters)



Note

⁽¹⁾I and E mounting pads are interchangeable

| | INCHES | MILLIMETERS |
|---|---------------|--------------|
| L | 0.160 ± 0.010 | 4.06 ± 0.25 |
| H | 0.100 ± 0.010 | 2.54 ± 0.25 |
| W | 0.040 maximum | 1.02 maximum |
| A | 0.045 ± 0.005 | 1.14 ± 0.13 |
| B | 0.030 ± 0.010 | 0.76 ± 0.25 |

FIGURE 4 - TYPICAL RESISTANCE/TEMPERATURE CURVE

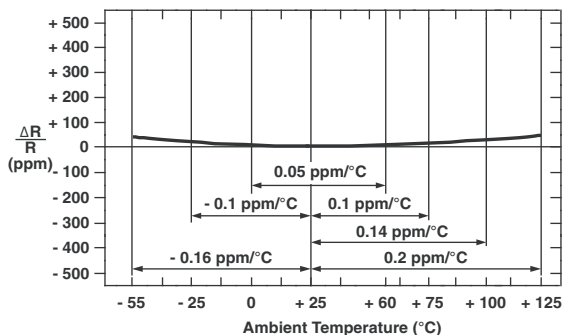


TABLE 2 - PERFORMANCE SPECIFICATIONS

| TEST | MIL-PRF-55342 ΔR LIMITS | TYPICAL ΔR LIMITS* |
|--|-------------------------|--------------------|
| Thermal Shock 5 x (- 65 °C to + 150 °C) | ± 0.10 % | ± 0.005 % (50 ppm) |
| Low Temperature Operation, - 65 °C, 45 min at P _{nom} | ± 0.10 % | ± 0.005 % (50 ppm) |
| Short Time Overload, 6.25 x Rated Power, 5 sec | ± 0.10 % | ± 0.005 % (50 ppm) |
| High Temperature Exposure, + 150 °C, 100 h | ± 0.10 % | ± 0.01 % (100 ppm) |
| Resistance to Soldering Heat, +245°C for 5 sec,+235°C for 30 sec | ± 0.2 % | ± 0.01 % (100 ppm) |
| Moisture Resistance | ± 0.2 % | ± 0.01 % (100 ppm) |
| Load Life Stability + 70 °C for 2000 h at Rated Power | ± 0.5 % | ± 0.015 % (150ppm) |

Note

* Measurement error 0.001 R

FIGURE 5 - HIGH TEMPERATURE EXPOSURE

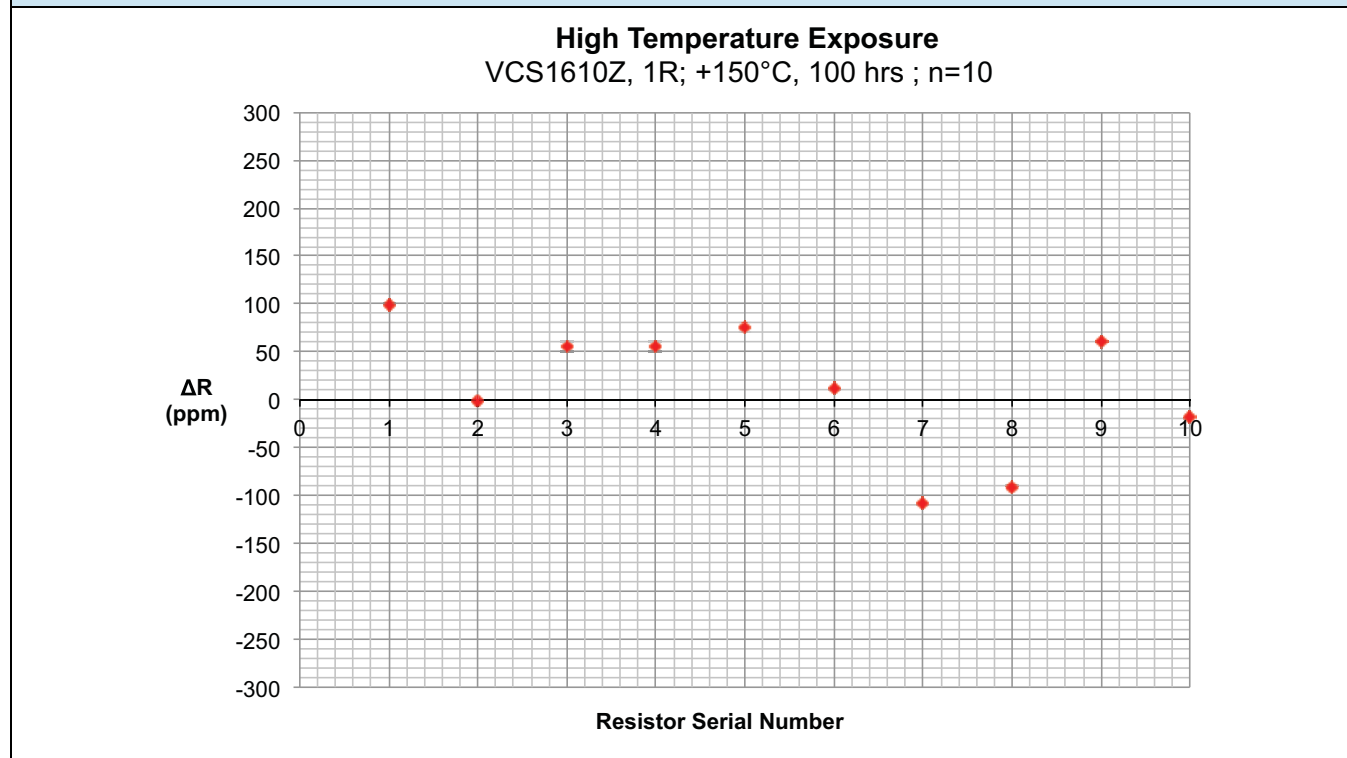


FIGURE 6 - LOAD LIFE

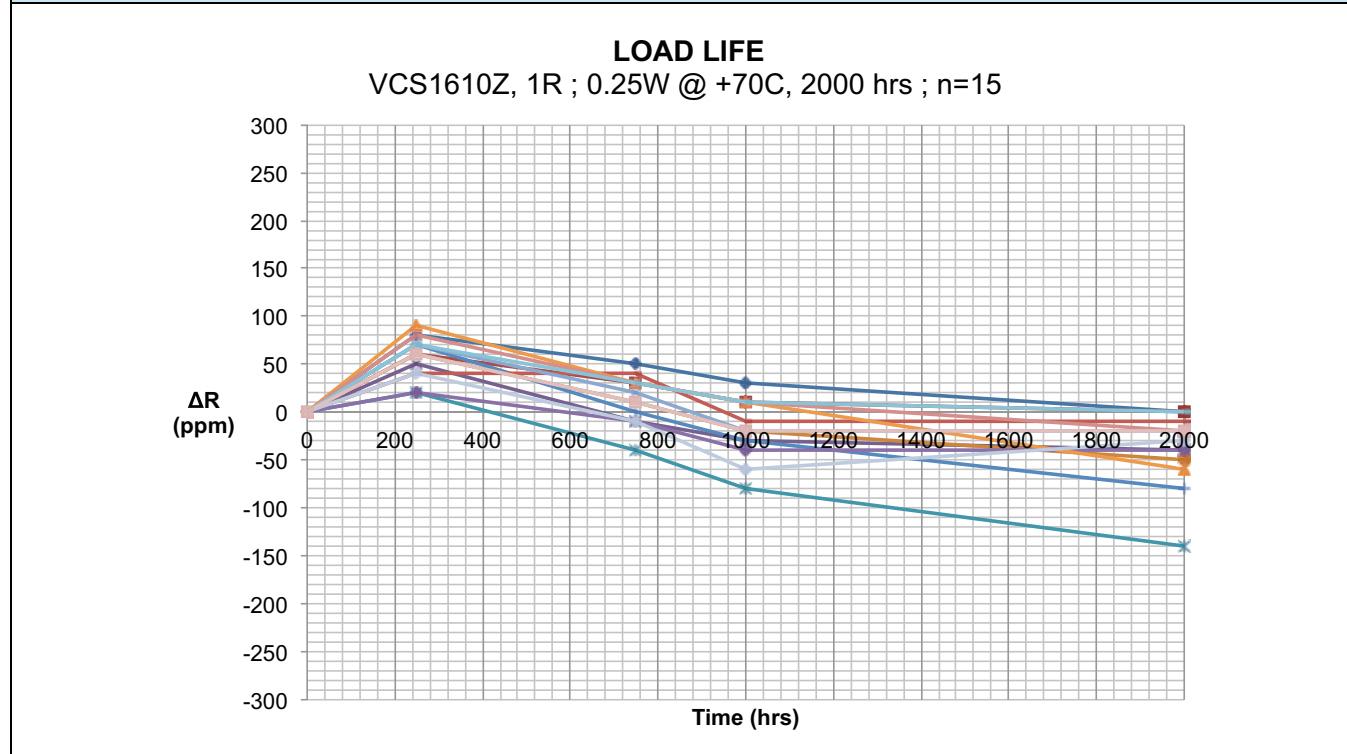


FIGURE 7 - LOW TEMPERATURE OPERATION

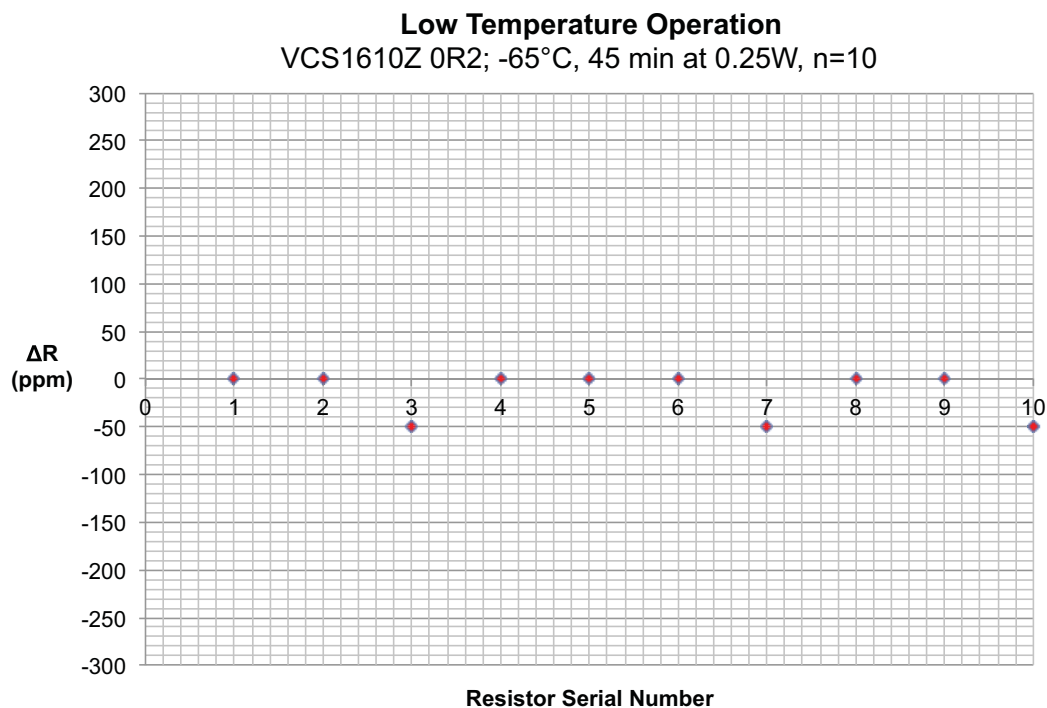
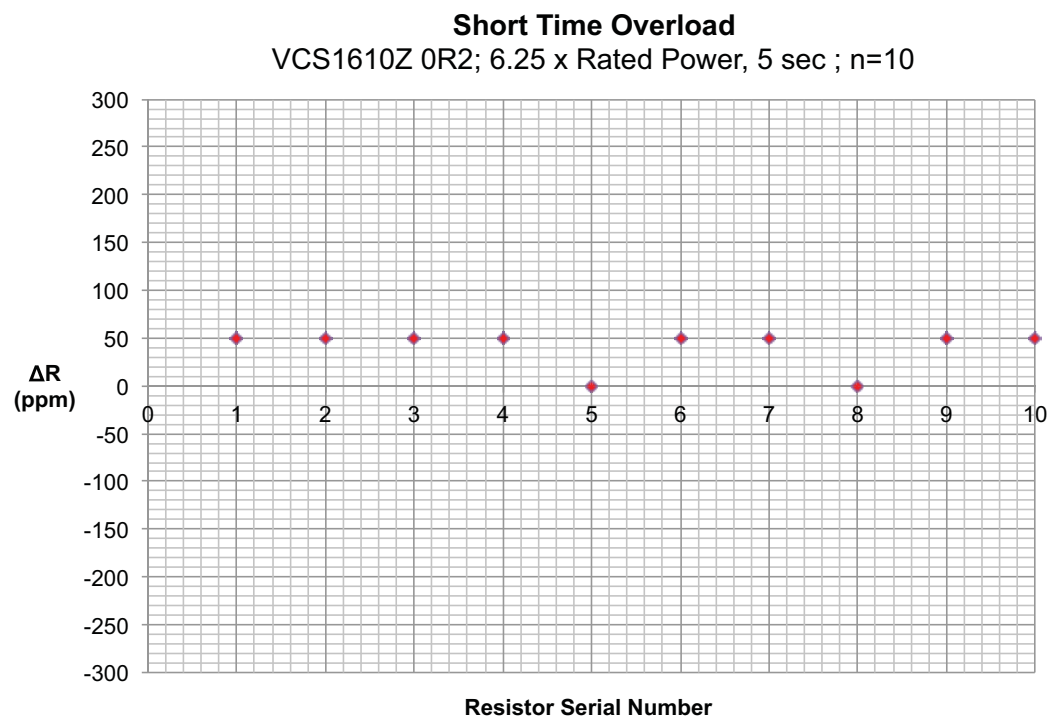


FIGURE 8 - SHORT TIME OVERLOAD



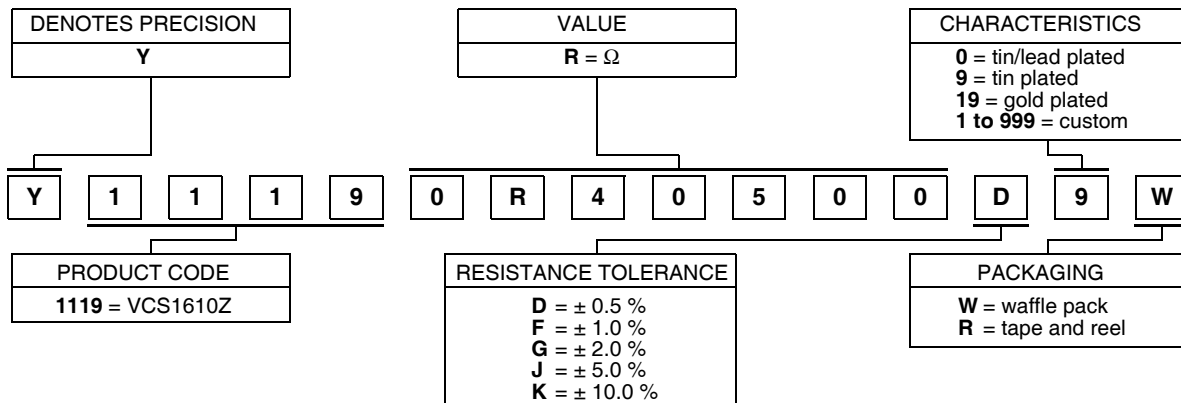
VCS1610Z (Kelvin Connection)

Vishay Foil Resistors



TABLE 3 - GLOBAL PART NUMBER INFORMATION (1)

NEW GLOBAL PART NUMBER: Y11190R40500D9W (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1119 0R40500 D 9 W:

TYPE: VCS1610Z

VALUES: 0.405 Ω

ABSOLUTE TOLERANCE: ± 0.5 %

TERMINATION: tin plated, lead-free (Pb-free)

PACKAGING: waffle pack

Note

(1) For non-standard requests or additional values, 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, "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.



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331