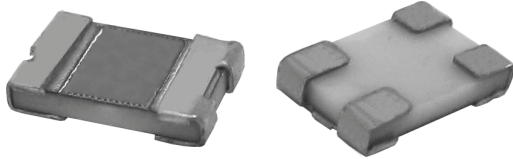


High Precision Foil Surface Mount Current Sensing Chip Resistors with TCR of $\pm 2 \text{ ppm}/^\circ\text{C}$, Load Life Stability of $\pm 0.02 \%$, ESD Immunity up to 25 kV and Fast Thermal Stabilization



TERMINATIONS

- Two lead (Pb)-free options are available:
Gold plated or tin plated
- Tin/lead plated

TABLE 1 - TOLERANCE AND TCR VS. RESISTANCE VALUE (- 55 °C to + 125 °C, + 25° Ref.)			
VALUE (Ω)	TOLERANCE	TYPICAL TCR	MAXIMUM TCR
0R5 to 1R	0.5 %, 1 %	$\pm 2 \text{ ppm}/^\circ\text{C}$	$\pm 10 \text{ ppm}/^\circ\text{C}$
0R1 to 0R5	0.5 %, 1 %	$\pm 2 \text{ ppm}/^\circ\text{C}$	$\pm 15 \text{ ppm}/^\circ\text{C}$

Note

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

INTRODUCTION

Why should I use the VCS1610?

The VCS1610 is a current sensing solution that was developed with a low TCR to meet demands for new and stable resistive product solutions in the industry today. This resistor is most-often used to monitor a current that is directly proportional to some physical characteristic (such as pressure, weight, etc) being measured by an analog sensor. The resistor converts the current to a voltage that is representative of the physical characteristic and feeds that voltage into control circuits, instrumentation, or other indicators.

Variations induced in the resistor, not representative of the monitored characteristic, can be caused by high TCR response to both ambient temperature and self-heating and can feed erroneous signals into the system. Resistance is usually kept low to reduce the I²R self-heating (Joule effect) portion of the error while minimizing the stresses that cause long-term resistance changes. It is critical for this resistor to reach thermal equilibrium quickly in circuits that require fast response or where the current changes quickly.

FEATURES

- Temperature coefficient of resistance (TCR): $\pm 2.0 \text{ ppm}/^\circ\text{C}$ typical (- 55 °C to + 125 °C, + 25 °C ref.) (see table 1)
- Tolerance: to $\pm 0.5 \%$
- Load life stability: $\pm 0.02 \%$ at 70 °C, 2000 h at rated power
- Power rating: 0.25 W at + 70 °C
- Resistance range: 0.1 Ω to 1 Ω (for higher or lower values please contact Vishay application engineering department)
- Vishay Foil resistors are not restricted to standard values; specific "as required" values can be supplied at no extra cost or delivery (e.g. 0.2345 Ω vs. 0.2 Ω)
- Electrostatic discharge (ESD) up to 25 000 V
- Thermal stabilization time < 1 s
- Short time overload $\leq 0.005 \%$
- Non-inductive, non-capacitive design
- Thermal EMF: 0.05 $\mu\text{V}/^\circ\text{C}$ typical
- Current noise: < - 42 dB
- Rise time: 1 ns effectively no ringing
- Voltage coefficient: < 0.1 ppm/V
- Non inductive: < 0.08 μH
- Weight: 0.027 mg
- Compliant to RoHS directive 2002/95/EC
- Prototype quantities available in just 5 working days or sooner. For more information, please contact foil@vishaypg.com
- For improved performances, please see VCS1610Z



RoHS*
COMPLIANT

The VCS1610 is used where the emphasis is on accuracy and repeatability under stress conditions in applications requiring precision resistor performance up to 0.25 W and up to 70 °C. Applications as EB systems, switching power supplies, force-balanced scales all rely on current sense resistors to develop a precise voltage proportional to the current. The VCS1610 is a four terminal resistor which is essential to achieve high accuracy and stability.

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.

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

Why is the VCS1610 vital to avoid Thermal EMF (parasitic effect)?

When the junction of two dissimilar metals is heated, a voltage is generated across the junction creating a DC-offset error signal. This voltage is proportional to the temperature difference across the junction and is called a Thermal Electro-motive Force (Thermal EMF), or thermocouple. Thermal EMF is an important consideration in low ohmic current sensing resistors used mostly in DC circuits (there is no effect in AC circuitry). The VCS1610 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 ESD impact on my resistor?

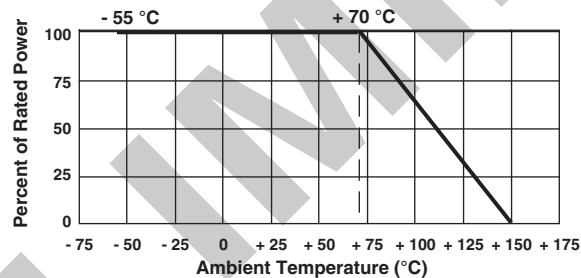
Electrostatic Discharge (ESD) is known to produce catastrophic failures in thin-film and thick-film (cermet) resistors at only 3000 V. On the other hand, the Bulk Metal Foil resistor withstands ESD events up to 25 000 V because its thicker resistance element and greater metallic mass afford much higher 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 VCS1610, 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.

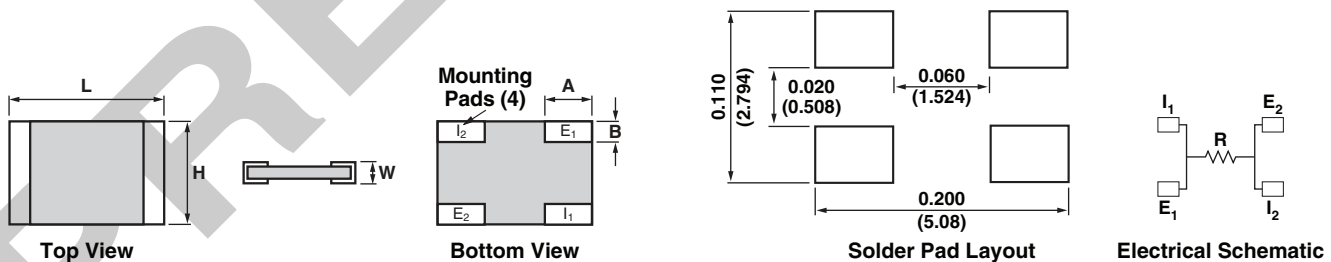
FIGURE 1 - POWER DERATING CURVE (1)



Note

(1) Power rating: 0.25 W at +70 °C

FIGURE 2 - DIMENSIONS in inches (millimeters)



	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 3 - TYPICAL RESISTANCE/TEMPERATURE CURVE

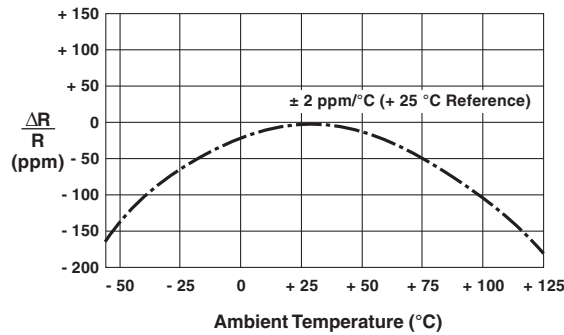


TABLE 2 - PERFORMANCE SPECIFICATIONS

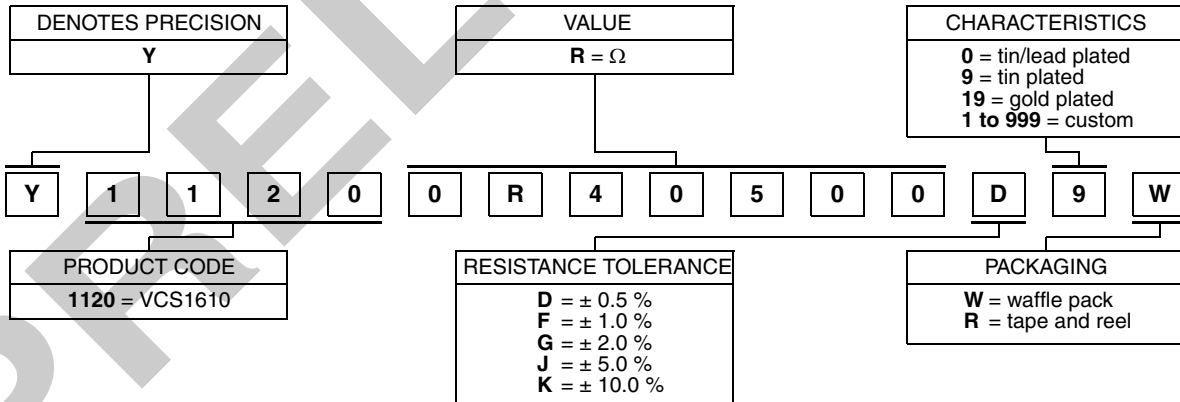
TEST	MIL-PRF-55342 ΔR LIMITS	TYPICAL ΔR LIMITS
Thermal Shock 5 x (- 65 °C to + 150 °C)	$\pm 0.10\%$	$\pm 0.005\%$ (50 ppm)
Low Temperature Operation	$\pm 0.10\%$	$\pm 0.005\%$ (50 ppm)
Short Time Overload	$\pm 0.10\%$	$\pm 0.005\%$ (50 ppm)
High Temperature Exposure	$\pm 0.10\%$	$\pm 0.01\%$ (100 ppm)
Resistance to Soldering Heat	$\pm 0.2\%$	$\pm 0.01\%$ (100 ppm)
Moisture Resistance	$\pm 0.2\%$	$\pm 0.01\%$ (100 ppm)
Load Life 2000 h at 70 °C	$\pm 0.5\%$	$\pm 0.02\%$ (200 ppm)

Note

- Measurement error 0.001 R

TABLE 3 - GLOBAL PART NUMBER INFORMATION (1)

NEW GLOBAL PART NUMBER: Y11200R40500D9W (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1120 0R40500 D 9 W:

TYPE: VCS1610
VALUES: 0.405 Ω
ABSOLUTE TOLERANCE: $\pm 0.5\%$
TERMINATION: lead (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, "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

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

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