

# High Precision 4-Terminal Power Current Sensing Resistors with TCR as low as $\pm 3 \text{ ppm}/^\circ\text{C}$ Maximum, Tolerance to $\pm 0.5 \%$ and Load Life Stability $\pm 0.02 \%$ (200 ppm) at $25^\circ\text{C}$ , 2000 h at Rated Power



## INTRODUCTION

The VCS301 and VCS302 offer precision resistors as low as  $5 \text{ m}\Omega$  with a temperature coefficient down to  $3 \text{ ppm}/^\circ\text{C}$  maximum and unmatched long term stability. The 4 terminal current sensing resistors, when mounted on a heat sink, can sustain  $10 \text{ W}$  continuously without an appreciable change in resistance ( $0.15 \%$  maximum). The typical  $50 \%$  power derating specification associated with other technologies is not necessary. A choice of lead configurations is available.

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

## FEATURES

- Temperature coefficient of resistance (TCR): down to  $\pm 3 \text{ ppm}/^\circ\text{C}$  max. (see table 2)
- Tolerance: to  $\pm 0.5 \%$  (see table 1)
- Power rating (heat-sinked):  $10 \text{ W}$
- Load life stability:  $\pm 0.02 \%$  (200 ppm) at  $25^\circ\text{C}$ , 2000 h at rated power
- Resistance range:  $0.005 \Omega$  to  $0.25 \Omega$
- Vishay Foil resistors are not restricted to standard values; specific "as required" values can be supplied at no extra cost or delivery (e.g.  $0R123$  vs.  $0R1$ )
- Non inductive, non capacitive design
- Rise time:  $1.0 \text{ ns}$  effectively no ringing
- Thermal EMF:  $0.05 \mu\text{V}/^\circ\text{C}$  typical
- Voltage coefficient:  $< 0.1 \text{ ppm/V}$
- Non inductive:  $0.08 \mu\text{H}$
- Non hot spot design
- Terminal finish: lead (Pb)-free or tin/lead alloy
- 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](mailto:foil@vishaypg.com)
- For better performances, please contact application engineering



RoHS\*  
COMPLIANT

**TABLE 1 - CHARACTERISTICS**

MODEL NUMBER	RESISTANCE RANGE	TOLERANCE (1)	POWER RATING (2) at $+25^\circ\text{C}$	MAXIMUM CURRENT (2)
VCS301, VCS302	$0.005 \Omega < R < 0.1 \Omega$	$\pm 1 \%$	$10 \text{ W}$ on heat sink (3)	$15 \text{ A}$
	$0.1 \Omega \leq R < 0.25 \Omega$	$\pm 0.5 \%$	or $3 \text{ W}$ in free air	

### Notes

1. Tighter tolerance is available - for more details contact application engineering
2. The lower of the two limitations (power or current) is decisive
3. Heatsink - aluminum ( $6''$  length x  $4''$  width x  $2''$  height x  $0.04''$  thick)

**TABLE 2 - TCR CHART (MAXIMUM)**

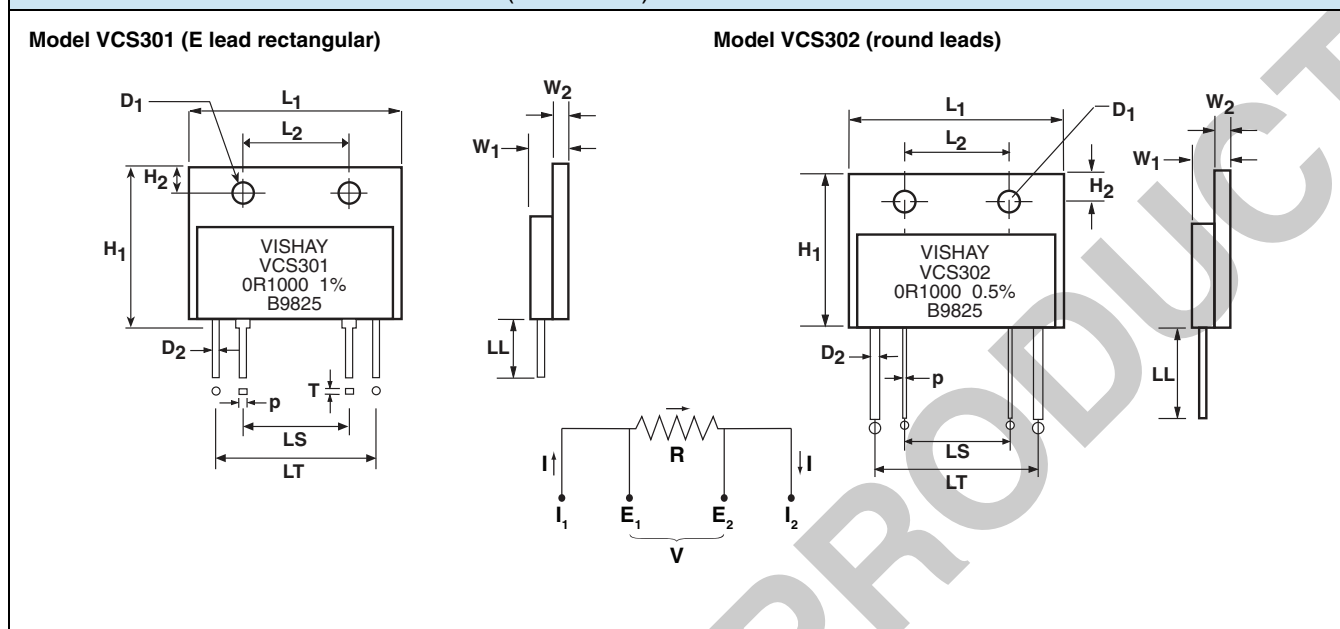
(0 °C TO +60 °C)		
$\geq 0.005 \Omega$	to $< 0.01 \Omega$	$\pm 15 \text{ ppm}/^\circ\text{C}$
$\geq 0.01 \Omega$	to $< 0.05 \Omega$	$\pm 10 \text{ ppm}/^\circ\text{C}$
$\geq 0.05 \Omega$	to $< 0.1 \Omega$	$\pm 5 \text{ ppm}/^\circ\text{C}$
$\geq 0.1 \Omega$	to $< 0.25 \Omega$	$\pm 3 \text{ ppm}/^\circ\text{C}$

**FIGURE 1 - POWER DERATING CURVE**



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

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



MODEL	L <sub>1</sub> ± 0.008 (± 0.20)	L <sub>2</sub> ± 0.008 (± 0.20)	H <sub>1</sub> MAXIMUM	H <sub>2</sub> ± 0.008 (± 0.20)	W <sub>1</sub> MAXIMUM	W <sub>2</sub> MAXIMUM	LL MINIMUM	LS ± 0.020 (± 0.51)	LT ± 0.020 (± 0.51)	D <sub>1</sub> NOMINAL	D <sub>2</sub> NOMINAL	P NOMINAL	T NO
VCS301	1.340 (34.04)	0.701 (17.81)	1.063 (27.00)	0.197 (5.00)	0.210 (5.33)	0.087 (2.21)	0.216 (5.49)	0.689 (17.50)	1.083 (27.51)	0.138 (3.51)	0.040 (1.02)	0.040 (1.02)	0.016 (0.41)
VCS302	1.340 (34.04)	0.701 (17.81)	1.024 (26.01)	0.197 (5.00)	0.210 (5.33)	0.087 (2.21)	1.000 (25.40)	0.689 (17.50)	1.083 (27.51)	0.138 (3.51)	0.040 (1.02)	0.032 (0.81)	-

**TABLE 3 - VISHAY VCS301, VCS302 PERFORMANCE**

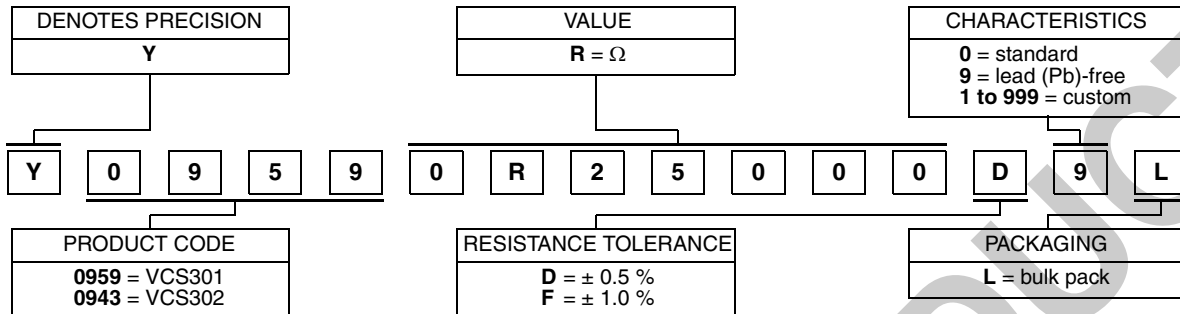
TEST OR CONDITION	VCS301, VCS302 PERFORMANCE <sup>(1)</sup>	
	TYPICAL ΔR LIMITS	MAXIMUM ΔR LIMITS
Thermal Shock	0.01 %	0.02 %
Short Time Overload (5 x Rated Power for 5 s)	0.01 %	0.02 %
Terminal Strength	0.02 %	0.05 %
High Temperature Exposure (2000 h at 150 °C)	0.02 %	0.05 %
Moisture Resistance	0.03 %	0.05 %
Low Temperature Storage (24 h at - 55 °C)	0.005 %	0.01 %
Shock (Specified Pulse)	0.01 %	0.02 %
Vibration (High Frequency)	0.01 %	0.02 %
Load Life (Rated Power, + 25 °C, 2000 h)	0.02 %	0.05 %
Resistance Tolerance	0.5 %	1 %
Thermal EMF	0.2 μV/°C max. (E terminal)	
Weight	8.1 g maximum	

**Notes**

- ΔR's plus additional 0.0005 Ω for measurement error
- All measurements done in free air

**TABLE 4 - GLOBAL PART NUMBER INFORMATION (1)**

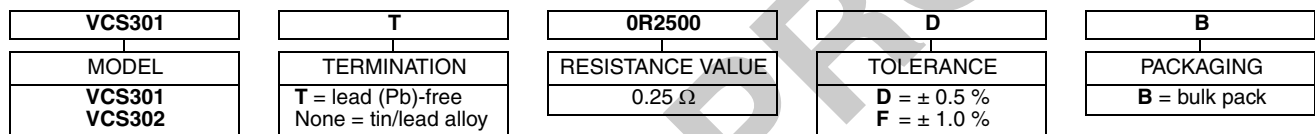
**NEW GLOBAL PART NUMBER: Y09590R25000D9L (preferred part number format)**



FOR EXAMPLE: ABOVE GLOBAL ORDER Y0959 0R25000 D 9 L:

TYPE: VCS301  
VALUE: 0.25 Ω  
ABSOLUTE TOLERANCE: ± 0.5 %  
TERMINATION: lead (Pb)-free  
PACKAGING: bulk

**HISTORICAL PART NUMBER: VCS301T 0R2500 D B (will continue to be used)**



**Note**

(1) For non-standard requests, please contact application engineering



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