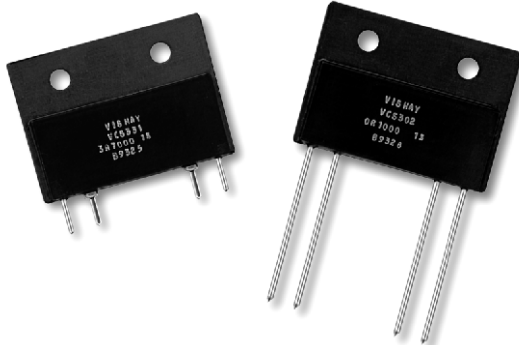


### Bulk Metal® Foil Technology High Precision 4-Terminal Power Current Sensing Resistors with TCR as low as $\pm 1 \text{ ppm}/^\circ\text{C}$ and Tolerance $\pm 0.1 \%$



#### Any value at any tolerance available within resistance range

The 300 Series offers precision Bulk Metal® Foil technology resistors as low as 5 mΩ with a temperature coefficient down to 1 ppm/°C and unmatched long term stability. The 4 terminal current sensing resistors, when mounted on a heat sink, can sustain 10 watts 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  $\pm 1 \text{ ppm}/^\circ\text{C}$  Max. (see table 2)
- Tolerance: to  $\pm 0.1 \%$  (see table 1)
- Power Rating (heat-sinked): 10 W
- Load Life Stability:  $\pm 0.05 \%$  at 25 °C, 2000 hours at Rated Power
- Resistance Range: 0.005 Ω to 500 Ω
- Electrostatic Discharge (ESD) above 25 000 V
- Non Inductive, Non Capacitive Design
- Rise Time: 1.0 ns without ringing
- Current Noise: < - 40 dB
- Thermal EMF: 0.05 μV/°C typical
- Voltage Coefficient: < 0.1 ppm/V
- Non Inductive: 0.08 μH
- Non Hot Spot Design
- Terminal Finishes available: Lead (Pb)-free  
Tin/Lead Alloy
- Any value available within resistance range (e.g. 1K2345)
- Prototype samples available from 48 hours. For more information, please contact [foil@vishay.com](mailto:foil@vishay.com)
- For better performances, please contact Application Engineering



RoHS\*  
COMPLIANT

**TABLE 1 - CHARACTERISTICS**

MODEL NUMBER	RESISTANCE RANGE	TOLERANCE <sup>1)</sup>	POWER RATING <sup>2)</sup> at + 25 °C	MAXIMUM CURRENT <sup>2)</sup>
VCS301, VCS302	0.005 Ω < R < 0.1 Ω 0.1 Ω ≤ R < 0.25 Ω	$\pm 1 \%$ $\pm 0.5 \%$	10 W on Heat Sink <sup>3)</sup> or 3 W in Free Air	15 A
VCS331, VCS332	0.25 Ω < R < 500 Ω	$\pm 0.1 \%$		5 A

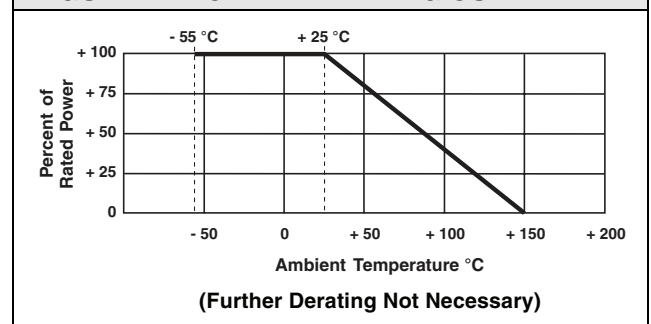
#### Notes

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 inches length x 4 inches width x 2 inches height x 0.04 inches thick)

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

(0 °C TO + 60 °C)		
≥ 0.005 Ω	to < 0.01 Ω	$\pm 15 \text{ ppm}/^\circ\text{C}$
≥ 0.01 Ω	to < 0.05 Ω	$\pm 10 \text{ ppm}/^\circ\text{C}$
≥ 0.05 Ω	to < 0.1 Ω	$\pm 5 \text{ ppm}/^\circ\text{C}$
≥ 0.1 Ω	to < 1 Ω	$\pm 3 \text{ ppm}/^\circ\text{C}$
≥ 1 Ω	to < 10 Ω	$\pm 2 \text{ ppm}/^\circ\text{C}$
≥ 10 Ω	to < 500 Ω	$\pm 1 \text{ ppm}/^\circ\text{C}$

**FIGURE 1 - POWER DERATING CURVE**

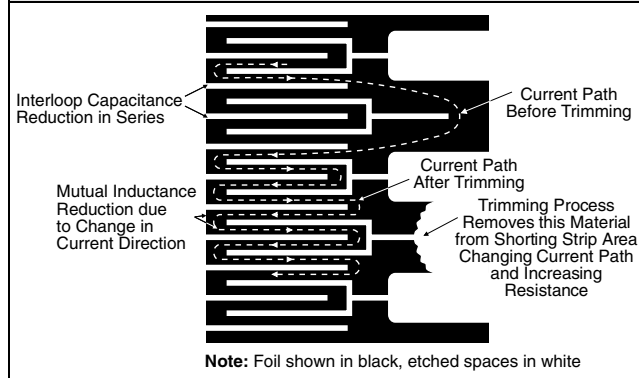
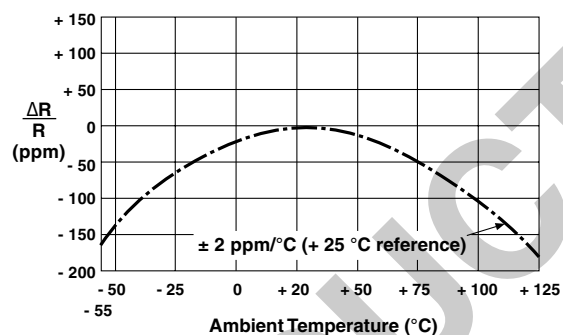


\* Pb containing materials are not RoHS compliant, exemptions may apply

Vishay Foil Resistors Bulk Metal® Foil Technology High Precision  
4-Terminal Power Current Sensing Resistors with  
TCR as low as  $\pm 1 \text{ ppm}/^\circ\text{C}$  and Tolerance  $\pm 0.1 \%$

**FIGURE 2 - TRIMMING TO VALUES**

(Conceptual Illustration)

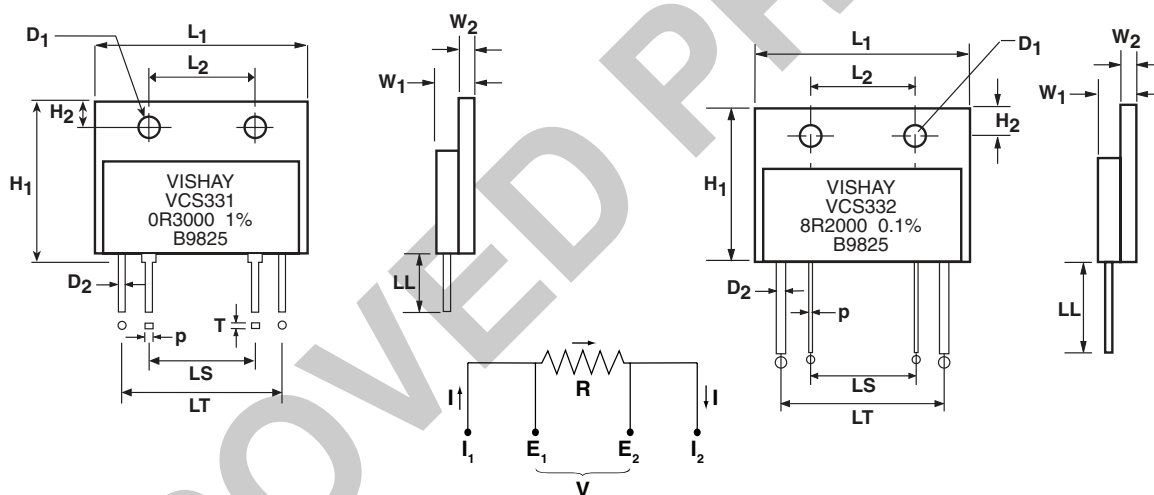
**FIGURE 3 - TYPICAL TCR CURVE**

(For more details, see table 2)

**FIGURE 4 - DIMENSIONS in inches (millimeters) AND SCHEMATIC**

Model VCS301 and VCS331 (E Lead Rectangular)

Model VCS302 and VCS332 (Round Leads)



MODEL	$L_1$ $\pm 0.008$ ( $\pm 0.20$ )	$L_2$ $\pm 0.008$ ( $\pm 0.20$ )	$H_1$ MAXIMUM	$H_2$ $\pm 0.008$ ( $\pm 0.20$ )	$W_1$ MAXIMUM	$W_2$ MAXIMUM	LL MINIMUM	LS $\pm 0.020$ ( $\pm 0.51$ )	LT $\pm 0.020$ ( $\pm 0.51$ )	D1 NOMINAL	D2 NOMINAL	P NOMINAL	T NO
VCS301 VCS331	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 VCS332	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)	-



Bulk Metal® Foil Technology High Precision  
4-Terminal Power Current Sensing Resistors with  
TCR as low as  $\pm 1 \text{ ppm/}^\circ\text{C}$  and Tolerance  $\pm 0.1 \%$

Vishay Foil Resistors

**TABLE 3 - VISHAY VCS301, VCS302, VCS331, VCS332 PERFORMANCE**

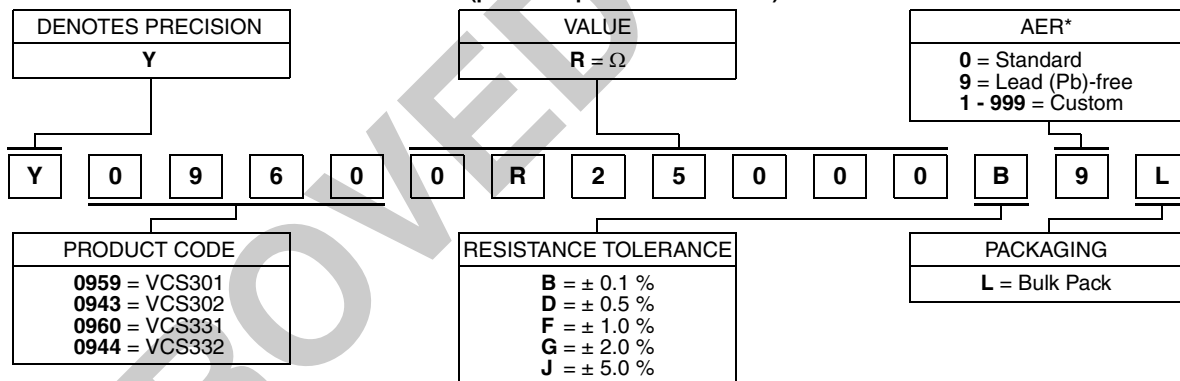
TEST OR CONDITION	VCS301, VCS302, VCS331, VCS332 PERFORMANCE <sup>1)</sup>
Maximum Ambient Temperature at Rated Power	$\pm 25^\circ\text{C}$
Maximum Ambient Temperature at Zero Power	$\pm 150^\circ\text{C}$
Temperature Coefficient	see table 2
Thermal Shock	$\pm 0.05 \%$
Short Time Overload (5 x Rated Power for 5 seconds)	$\pm 0.02 \%$
Terminal Strength	$\pm 0.05 \%$
High Temperature Exposure	$\pm 0.05 \%$ (2000 hours at $150^\circ\text{C}$ )
Moisture Resistance	$\pm 0.05 \%$
Low Temperature Storage (24 hours at $-55^\circ\text{C}$ )	$\pm 0.05 \%$
Shock (Specified Pulse)	$\pm 0.1 \%$
Vibration (High Frequency)	$\pm 0.1 \%$
Load Life (Rated Power, $+25^\circ\text{C}$ , 2000 hours)	$\pm 0.05 \%$
Resistance Tolerance	0.1 %, 0.5 %, 1 %, 2 %, 5 %
Thermal EMF	0.2 $\mu\text{V/}^\circ\text{C}$ Max. (E Terminal)
Weight	8.1 g maximum
Case Temperature Rise	17 $^\circ\text{C/W}^2$ (VCS301, VCS302) - 9 $^\circ\text{C/W}^2$ (VCS331, VCS332)
Thermal Resistance	8 $^\circ\text{C/W}^2$ (VCS301, VCS302) - 12.5 $^\circ\text{C/W}^2$ (VCS331, VCS332)

**Notes**

1.  $\Delta R$ 's plus additional 0.0005  $\Omega$  for measurement error
2. All measurements done in free air

**TABLE 4 - GLOBAL PART NUMBER INFORMATION**

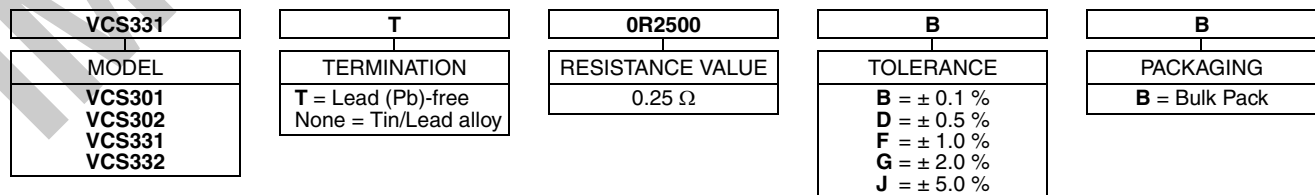
NEW GLOBAL PART NUMBER: Y09600R25000B9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y0960 0R25000 B 9 L:

TYPE: VCS331  
VALUE: 0.25  $\Omega$   
ABSOLUTE TOLERANCE:  $\pm 0.1 \%$   
TERMINATION: Lead (Pb)-free  
PACKAGING: Bulk

HISTORICAL PART NUMBER: VCS331T 0R2500 B B (will continue to be used)

**Note**

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



### Disclaimer

All product specifications and data are subject to change without notice.

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