

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°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 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 W
- Load life stability: $\pm 0.02 \%$ (200 ppm) at 25°C , 2000 h at rated power
- Resistance range: 0.005Ω to 0.25Ω
- 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 ns effectively no ringing
- Thermal EMF: $0.05 \mu\text{V}/^\circ\text{C}$ typical
- Voltage coefficient: $< 0.1 \text{ ppm}/\text{V}$
- 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
- 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 W on heat sink (3) | 15 A |
| | $0.1 \Omega \leq R < 0.25 \Omega$ | $\pm 0.5 \%$ | or 3 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)

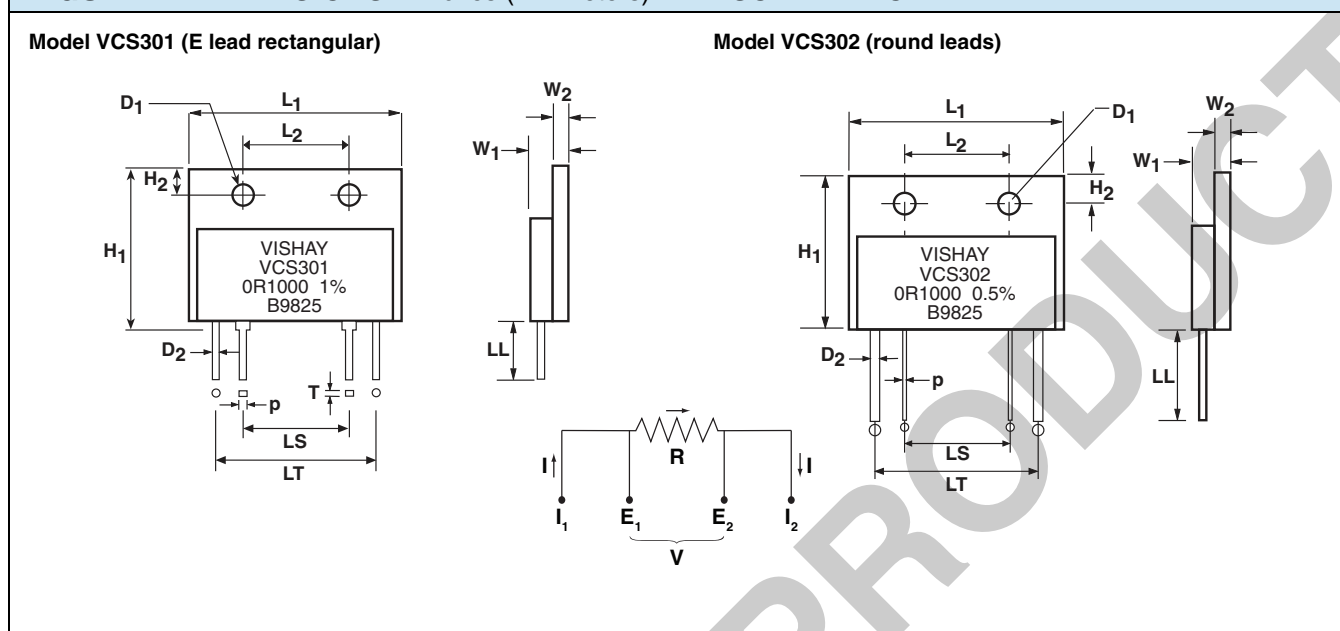
| (0 °C TO +60 °C) | | |
|---------------------|--------------------|-------------------------------------|
| $\geq 0.005 \Omega$ | to $< 0.01 \Omega$ | $\pm 15 \text{ ppm}/^\circ\text{C}$ |
| $\geq 0.01 \Omega$ | to $< 0.05 \Omega$ | $\pm 10 \text{ ppm}/^\circ\text{C}$ |
| $\geq 0.05 \Omega$ | to $< 0.1 \Omega$ | $\pm 5 \text{ ppm}/^\circ\text{C}$ |
| $\geq 0.1 \Omega$ | 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 ₁ ± 0.008 (± 0.20) | L ₂ ± 0.008 (± 0.20) | H ₁ MAXIMUM | H ₂ ± 0.008 (± 0.20) | W ₁ MAXIMUM | W ₂ MAXIMUM | LL MINIMUM | LS ± 0.020 (± 0.51) | LT ± 0.020 (± 0.51) | D ₁ NOMINAL | D ₂ 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

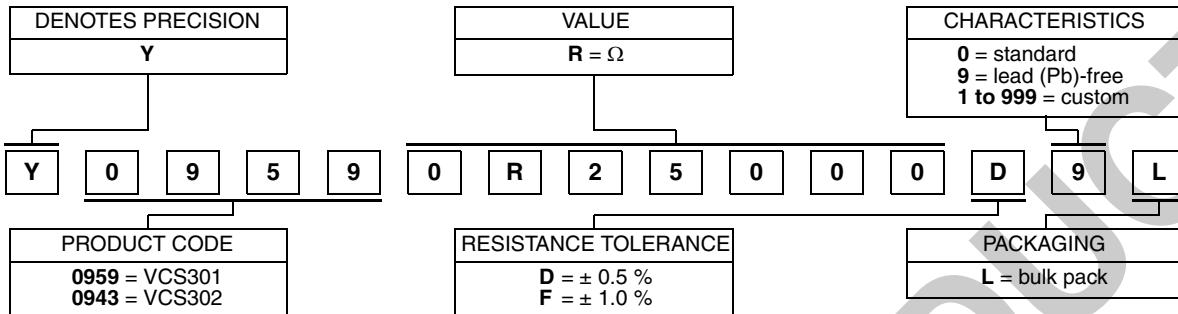
| TEST OR CONDITION | VCS301, VCS302 PERFORMANCE ⁽¹⁾ | |
|---|---|-------------------|
| | TYPICAL ΔR LIMITS | MAXIMUM ΔR LIMITS |
| Thermal Shock | 0.01 % | 0.02 % |
| Short Time Overload (5 x Rated Power for 5 s) | 0.01 % | 0.02 % |
| Terminal Strength | 0.02 % | 0.05 % |
| High Temperature Exposure (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)

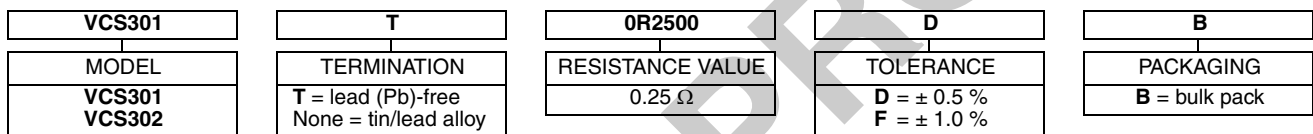
NEW GLOBAL PART NUMBER: Y09590R25000D9L (preferred part number format)



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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- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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