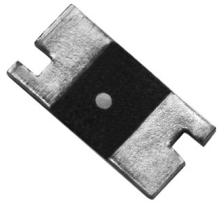
Bulk Metal® Technology High Precision, Current Sensing, Power Surface Mount, Metal Strip Resistor

with Resistance Value from 5 mΩ, Rated Power up to 1 W and TCR to ±25 ppm/°C

FEATURES

- Temperature coefficient of resistance: to ±25 ppm/°C (–55°C to +125°C, +25°C ref.)
- Power rating: to 1 W
- Resistance tolerance: to ±0.1%
- Resistance range: 5 mΩ to 200 mΩ
- Load life stability to ±0.2% (70°C, 2000 h at rated power)
- Short time overload: ±0.1% typical
- Maximum current: up to 14 A
- Low inductance <5 nH
- Solderable terminations
- Excellent frequency response to 50 MHz
- Terminal finishes available: lead (Pb)-free, tin/lead alloy
- Quick prototype quantities available, please contact: foil@vpgsensors.com
- For better performance please contact: application engineering: foil@vpgsensors.com



Pb-free Available

RoHS* COMPLIANT

INTRODUCTION

Four terminal (Kelvin) design: allows for precise and accurate measurements.

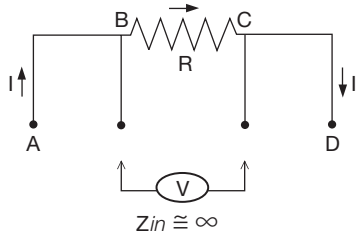
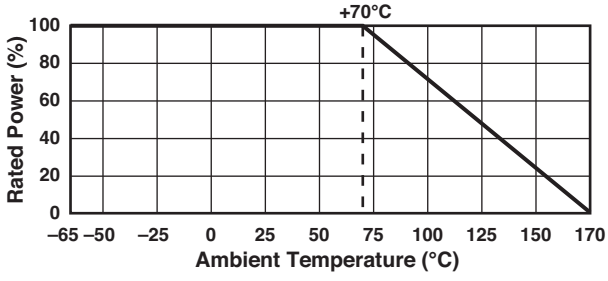


Figure 1 – Power Derating Curve



Notes

* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS compliant. Please see the information/tables in this datasheet for details.

Table 1 – Specifications	
PARAMETER	**CSM2512L**
Resistance Range	5 mΩ to 200 mΩ
Power Rating at 70°C	1 W
Maximum Current(1)	14 A
Tolerance	±0.5% (5 mΩ to <20 mΩ) ±0.1% (20 mΩ to 200 mΩ)
Temperature Coefficient Max. (–55°C to +125°C, +25°C Ref.)	±25 ppm/°C
Operating Temperature Range	–65°C to +170°C
Maximum Working Voltage	$(P \times R)^{1/2}$
Weight (Maximum)	0.09 g

Notes
(1) Maximum current for a given resistance value is calculated using $I = \sqrt{P/R}$

ABOUT CSM (Low Ohm Value 5 mΩ to 200 mΩ)

High-precision Bulk Metal® surface-mount Power Metal Strip® resistor of 5 mΩ to 200 mΩ that features load-life stability of ±0.2% at +70°C for 2000 h at rated power, TCR to ±25 ppm/C from –55°C to +125°C, +25°C ref., and a tolerance of ±0.1%.

Typical current sensing resistors offer a load-life stability of ≥ 1% through a 2000 h workload. The CSM2512L is ideal for precision current sensing applications in switching linear power supplies, power amplifiers, measurement instrumentation, bridge networks, and medical and test equipment.

Traditional Passive current sensors and shunts generate heat under power, which changes their resistance, and thus their voltage output. The CSM's low TCR reduces errors due to temperature gradients, thus reducing a major source of uncertainty in current measurement.

The stability of the CSM can be further enhanced by post-manufacturing operations (PMO), such as temperature cycling, short-time overload, and accelerated load life which are uniquely applicable to CSM2512L

The CSM's all-welded construction is composed of a Bulk Metal® resistive element with welded copper terminations, plated for soldering. The terminations make true ohmic contact with the resistive layer along the entire side of the resistive element, thereby minimizing temperature variations. Also, the resistor element is designed to uniformly dissipate power without creating hot spots, and the welded terminations material is compatible with the element material.

The stability problems associated with analog circuits are very pervasive, but knowledgeable selection of a few high-quality resistors, networks, or trimming potentiometers in critical locations can greatly improve circuit performance, long-term application-related performance, as well as the designer's peace-of-mind.

Additionally, the overall system cost is often reduced when a knowledgeable designer concentrates costs in a few exceptionally stable components whose proven minimal-deviation load and environmental stability can often eliminate the necessity of additional compensating circuitry or temperature-controlling systems. The higher reliability and better overall system performances also achieve excellent product results in the field, enhancing market acceptance and product reputation.

Designers often unnecessarily pay for tighter tolerances than required simply to accommodate the resistance stability shifts they know to be imminent in an application due to the large application-related changes in the components they selected. Selection of a high-stability component like the CSM in these applications eliminates the need for shift allowance due to "planned instability" and allows the use of looser initial tolerances than would be necessary with current-sensing resistors based on other technologies.

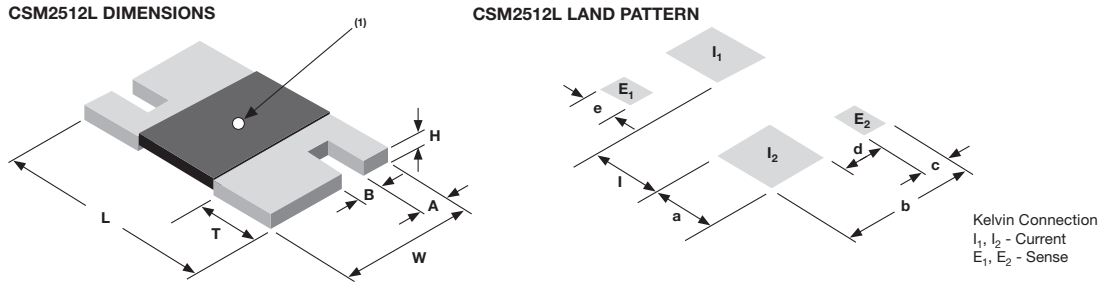
Notes
* This datasheet provides information about parts that are ROHS-compliant and/or parts that are non-ROHS-compliant. For example , parts with lead (Pb) terminations. Please see the information /tables in this datasheet for details.

The Key Applications

Applications requiring accuracy and repeatability under stress conditions such as the following:

- Switching and linear power supplies
- Precision current-sensing
- Power management systems
- Feedback circuits
- Measurement instrumentation
- Precision instrumentation amplifiers
- Medical and automatic test equipment
- Satellites and aerospace systems
- Commercial and Military avionics
- Test and measurement equipment
- Electronic scales

Figure 2 – Dimensions and Imprinting in inches (millimeters)



Dimensions – Tolerances ±0.010 (±0.254),* ±0.015 (±0.381)

MODEL	RESISTANCE RANGE (mΩ)	L	W	H	T	A	B
CSM2512L	5 to 200	0.250 (6.350)	0.125 (3.175)	0.025 (0.635)	0.031 (0.8)	0.030 (0.762)*	0.032 (0.813)*

Land Pattern Dimensions – Tolerances ±0.003 (±0.076)

MODEL	RANGE	a	b	c	d	e	l
CSM2512L	5 to 200	0.065 (1.65)	0.145 (3.68)	0.045 (1.14)	0.021 (0.53)	0.055 (1.39)	0.160 (4.06)

Note
(1) White dot indicates top side of part for mounting purposes

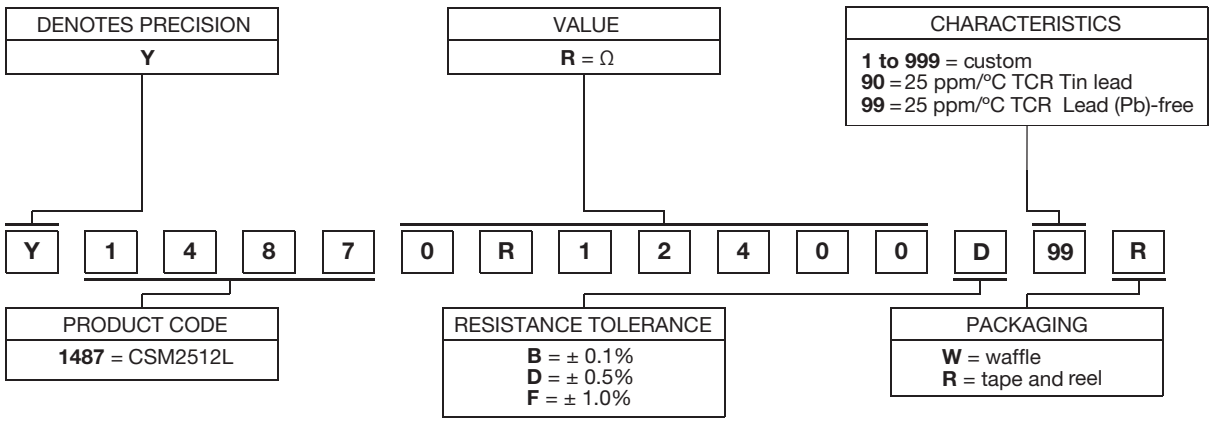
Table 2 – CSM Series Performance Specifications

TEST	CONDITIONS	MIL-PRF-49465 ΔR LIMITS	CSM2512L	
			TYPICAL ΔR LIMITS(1)	MAXIMUM ΔR LIMITS (1)
Thermal Shock	–55°C to +150°C, 1000 cycles, 15 min at each extreme	±(0.5%+0.0005R)	0.1%	0.3%
Load Life Stability	2000 h, 70°C at rated power	±(1.0%+0.0005R)	0.2%	1.0%
Bias Humidity	+85°C, 85% humidity 10% bias, 1000 h	±(0.5%+0.0005R)	0.05%	0.2%
Short Time Overload	5 x rated power for 5 s (2)	±(0.5%+0.0005R)	0.1%	0.5%
High Temperature Exposure	1000 h, 170°C	±(1.0%+0.0005R)	0.2%	0.3%
Low Temperature Storage	–55°C for 24 h	±(0.5%+0.0005R)	0.05%	0.2%
Moisture Resistance	MIL-STD-202, method 106, 0 power, 7a and 7b not required	±(0.5%+0.0005R)	0.02%	0.05%
Shock	100 g, 6 ms, 5 pulses	±(0.1%+0.0005R)	0.02%	0.05%
Vibration	(10 Hz to 2000 Hz) 20 g	±(0.1%+0.0005R)	0.02%	0.05%
Resistance to Soldering Heat	10 s to 12 s at +260°C	±(0.25%+0.0005R)	0.05%	0.5%
Solderability	MIL-STD-202	95% coverage	–	–

Note
(1) Measurement error allowed for ΔR limits: 0.0005 Ω.
(2) Maximum current should not be exceeded (see table 1).

Table 3 – Global Part Number Information(1)

GLOBAL PART NUMBER: Y14870R12400D99R



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1487 0R12400 D 99 R:

TYPE: CSM2512L
VALUE: 124.0 mΩ
ABSOLUTE TOLERANCE: ± 0.5%
TERMINATION: Lead Free
PACKAGING: tape and reel

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