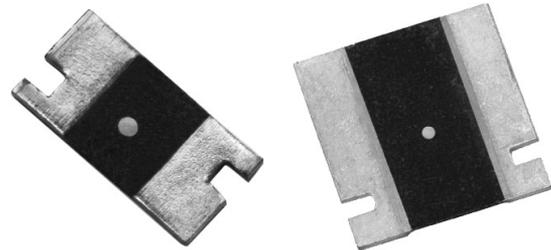
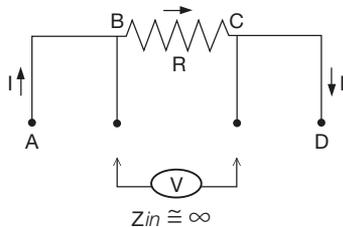


**Models 303415 and 303416 – Fixed Resistors CSM2512 and CSM3637
with Screen/Test Flow in Compliance with EEE-INST-002
(Tables 2A and 3A, Film/Foil, Level 1) MIL-PRF-55342 and MIL-PRF-49465**

FEATURES

- Temperature coefficient: ± 25 ppm/ $^{\circ}\text{C}$ max. (-55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ ref.) (see Table 1)
- Surface mount configuration
- Four terminal (Kelvin) design: allows for precision accurate measurements
- Power rating: to 3 W
- Resistance tolerance: $\pm 0.5\%$; $\pm 1.0\%$
- Resistance range: 2 m Ω to 200 m Ω
- Bulk Metal[®] resistors are not restricted to standard values; specific “as required” values can be supplied (e.g., 7.345 m Ω vs. 7 m Ω)
- Short time overload: 0.5%
- Maximum current: up to 38 A
- Terminal finish: tin/lead alloy
- For prototype units, append a “U” to the model number (303415U, 303416U). These units have all of the table 2A (page 3) 100% tests performed, with no destructive qualification testing required (table 3A, page 3). For more information, please contact: foil@vpgsensors.com
- For oriented performances, please contact: application engineering



INTRODUCTION

303415 and 303416 are low value current sense resistors, providing power and precision in a four terminal, surface mount configuration. Its all welded construction is made up of a Bulk Metal[®] resistive element with plated copper terminations.

Figure 1 – Power Derating Curve

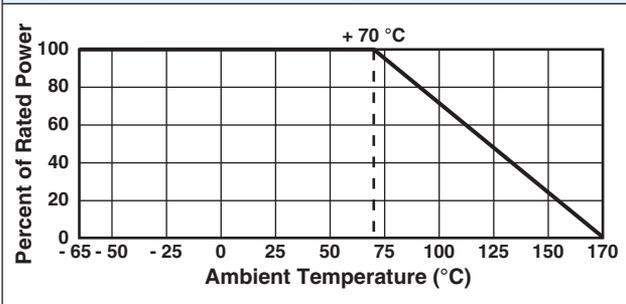


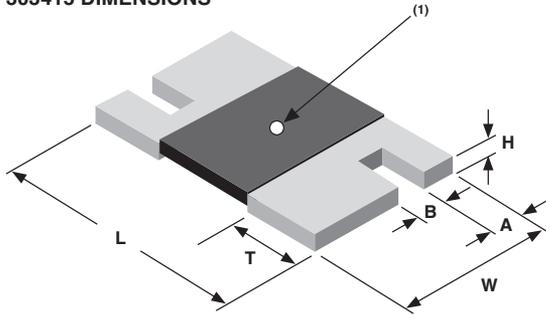
Table 1 – Specifications		
PARAMETER	303415	303416
Resistance Range	5 m Ω to 200 m Ω	2 m Ω to 100 m Ω
Power Rating at 70 $^{\circ}\text{C}$	1 W	3 W (2 m Ω to 10 m Ω) 2 W (>10 m Ω to 100 m Ω)
Maximum Current ⁽¹⁾	14 A	38 A
Tolerance	$\pm 0.5\%$	$\pm 0.5\%$
Temperature Coefficient Max. (-55 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$, +25 $^{\circ}\text{C}$ ref.)	± 20 ppm/ $^{\circ}\text{C}$ (5 m Ω to <100 m Ω) ± 25 ppm/ $^{\circ}\text{C}$ (100 m Ω to 200 m Ω)	± 25 ppm/ $^{\circ}\text{C}$ (2 m Ω to ≤ 3 m Ω) ± 20 ppm/ $^{\circ}\text{C}$ (>3 m Ω to 100 m Ω)
Weight (maximum)	0.09 g	0.44 g

Note

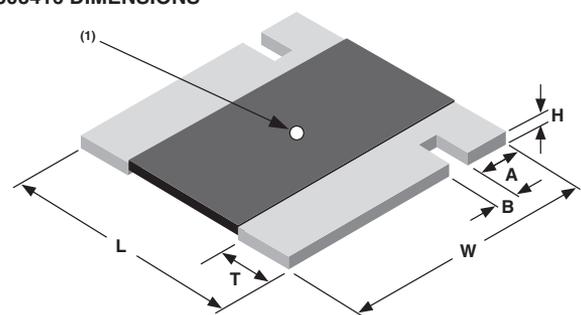
⁽¹⁾ Maximum current for a given resistance value is calculated using $I = \sqrt{P/R}$

Figure 2 – Dimensions and Imprinting in inches (millimeters)

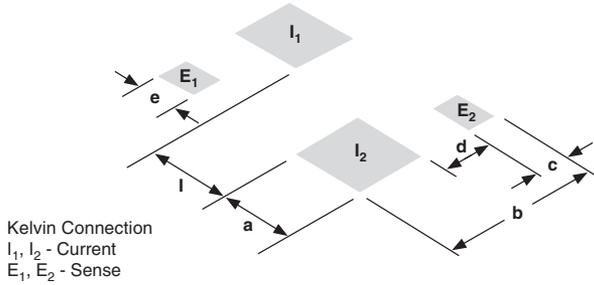
303415 DIMENSIONS



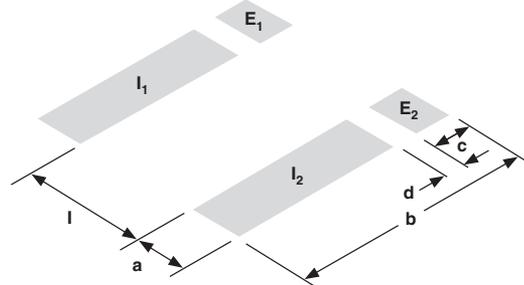
303416 DIMENSIONS



303415 LAND PATTERN



303416 LAND PATTERN



Dimensions – Tolerances ±0.010 (±0.254)

MODEL	RESISTANCE RANGE (mΩ)	L	W	H	T	A	B
303415	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)
303416	2 to 100	0.360 (9.144)	0.370 (9.398)	0.031 (0.8)	0.086 (2.184)	0.061 (1.549)	0.032 (0.813)

Land Pattern Dimensions – Tolerances ±0.003 (±0.076)

MODEL	RANGE	a	b	c	d	e	l
303415	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)
303416	2 to 100	0.116 (2.95)	0.390 (9.91)	0.066 (1.68)	0.024 (0.610)	–	0.178 (4.52)

Note

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

GENERAL NOTES

- Measurement error allowed for ΔR limits: 0.0005 Ω .
- For prototype units, append a “U” to the model number (303415U, 303416U). These units have all of the table 2A 100% tests performed, with no destructive qualification testing required.

Table 2 – EEE-INST-002 (Table 2A Film/Foil, Level 1) 100% Tests/Inspections	
RC Record	In tolerance
Thermal Shock	25 x (–65°C to +150°C)
RC Record	$\Delta R = 0.1\%$
High Temperature Exposure	+170°C, 100 h, no power
RC Record	In tolerance $\Delta R = 0.2\%$
Final Inspection	5% PDA on ΔR , 10% PDA on out of tolerance
Visual Inspection	Magnification 30x to 60x
Mechanical Inspection	Dimensions, workmanship, 3 units sample size

Table 3 – EEE-INST-002 (Table 3A Film/Foil, Level 1) Destructive Tests⁽¹⁾	
Group 2	Sample size: 3(0) Solderability MIL-STD-202, method 208
Group 3	Sample size: 10(0) – mounted on FR4 TCR measurement per MIL-STD-202, method 304 –55°C/+25°C/+125°C 303415: 5 m Ω to <100 m Ω : ± 20 ppm/°C 100 m Ω to 200 m Ω : ± 25 ppm/°C 303416: 2 m Ω to ≤ 3 m Ω : ± 25 ppm/°C >3 m Ω to 100 m Ω : ± 20 ppm/°C Low temperature storage per MIL-PRF-49465 $\Delta R = 0.2\%$ –55°C $\pm 2^\circ\text{C}$, 24 h ± 4 h ambient no load dwell for 2 h to 8 h at +25°C Low temperature operation per MIL-PRF-55342 $\Delta R = 0.2\%$ –65°C ambient no load dwell for 1 h, rated power for 45 min no load dwell at +25°C for 24 h ± 4 h Short time overload per MIL-STD-49465 $\Delta R = 0.5\%^{(2)}$ 5 x rated power at +25°C for 5 s, not to exceed maximum current rating (see Table 1)
Group 4	Sample size: 9(0) – mounted on FR4 Resistance to soldering heat $\Delta R = 0.05\%$ Performed per MIL-PRF-55342 para. 4.8.8.1 Moisture resistance per MIL-STD-202, method 106 $\Delta R = 0.05\%$ 240 h, no power
Group 5	Sample size: 9(0) Shock per MIL-STD-202, method 213, condition I $\Delta R = 0.05\%$ 100G, 6 ms axes Z and Y, 10 shocks per axis Vibration per MIL-STD-202, method 204, condition D $\Delta R = 0.05\%$ 10 Hz to 2000 Hz, 20G 2 axes, 6 h per axis

Table 3 – EEE-INST-002 (Table 3A Film/Foil, Level 1) Destructive Tests⁽¹⁾, Cont.

Group 6	Sample size: 12(0) – mounted on FR4 Life test per MIL-PRF-49465	$\Delta R = 1\%$ 2000 h, +70°C, rated power 1.5 hours “on” and 0.5 hour “off” cycle
Group 7B	Sample Size: 10(0) – mounted on FR4 Solder mounting integrity per MIL-PRF-55342	303415: 3 kg force, 30 s 303416: 5 kg force, 30 s
Group 9	Sample size: 5(0) – unmounted High temperature exposure per MIL-PRF-49465	$\Delta R = 0.3\%$ 1000 h, +170°C $\pm 7^\circ\text{C}$, no power
Group 10⁽³⁾	Sample size: For 303415: 12 For 303416: 3 Outgassing	Per ASTM E595

Notes

- ⁽¹⁾ Units selected randomly from lots which successfully passed the table 2A testing
 - ⁽²⁾ For 303415 Values $\geq 150\text{m}\Omega$, $\Delta R = \pm 1.0\%$
 - ⁽³⁾ Optional, per customer request.
- Measurement error allowed for ΔR limits: 0.0005 Ω .

Figure 3 – Part Number Information

