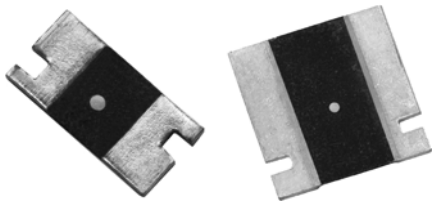
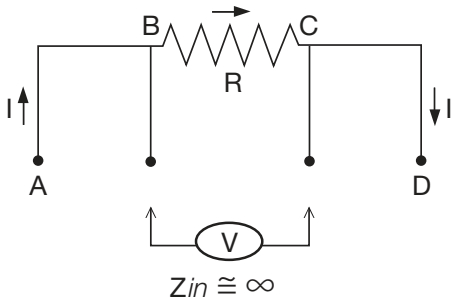
Models # 303144 and 303145 - Fixed Resistors CSM2512 and CSM3637 with Screen/Test Flow in Compliance with EEE-INST-002 (Tables 2A and 3A, Film/Foil, Level 1) MIL-PRF-55342 and MIL-PRF-49465



303144 and 303145 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.

The four terminal devices separate the current leads from the voltage sensing leads. This configuration eliminates the effect of the lead wire resistance from points A to B and C to D.

Vishay Foil Resistors' application engineering department is available to advise and make recommendations.



FEATURES

- Temperature coefficient: ± 20 ppm/°C max. (- 55 °C to + 125 °C, + 25 °C ref.) (see Table 1)
- Surface mount configuration
- Four terminal (Kelvin) design: allows for precision accurate measurements
- Power rating: 1 W to 3 W
- Resistance tolerance: ± 0.5 %
- Resistance range: 2 mΩ to 200 mΩ
- Bulk Metal Foil resistors are not restricted to standard values; specific “as required” values can be supplied at no extra cost or delivery (e.g. 2.345 mΩ vs. 2 mΩ)
- Short time overload: 0.2 % typical
- Thermal EMF: 3 µV/°C
- Maximum current: up to 38 A
- Terminal finish: tin/lead alloy
- For prototype units, append a “U” to the model number (example: 303144U). 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

FIGURE 1 - POWER DERATING CURVE

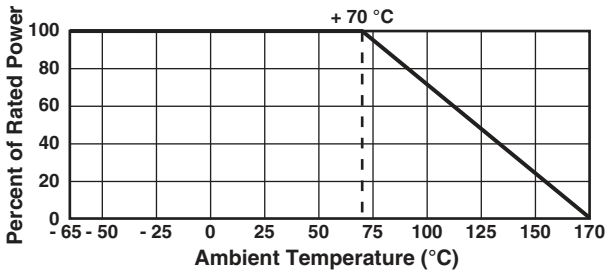
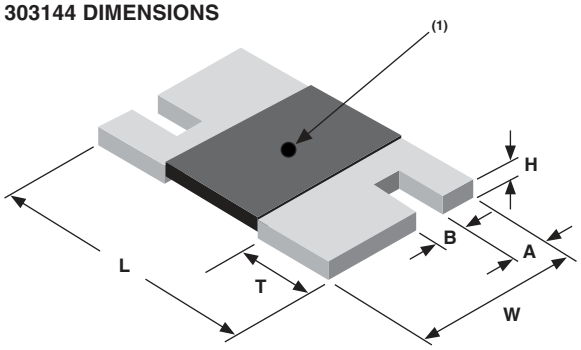


TABLE 1 - SPECIFICATIONS

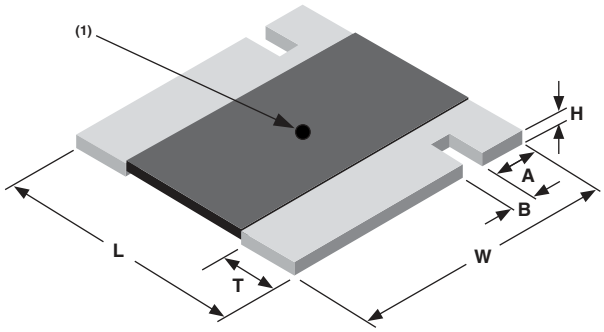
PARAMETER	303144	303145
Resistance Range	3 mΩ to 200 mΩ	2 mΩ to 200 mΩ
Power Rating at 70 °C	1 W	3 W (2 mΩ to 10 mΩ) 2 W (> 10 mΩ to 200 mΩ)
Maximum Current	18 A	38 A
Tightest Tolerance	± 0.5 %	
Temperature Coefficient Max. (- 55 °C to + 125 °C, + 25 °C ref.)	± 20 ppm/°C (3 mΩ to < 100 mΩ) ± 25 ppm/°C (100 mΩ to 200 mΩ)	± 25 ppm/°C (2 mΩ to ≤ 3 mΩ) ± 25 ppm/°C (100 mΩ to 200 mΩ) ± 20 ppm/°C (> 3 mΩ to < 100 mΩ)
Operating Temperature Range	- 55 °C to + 125 °C, ref. + 25 °C	
Weight (maximum)	0.09 g	0.29 g

FIGURE 2 - DIMENSIONS AND IMPRINTING in inches (millimeters)

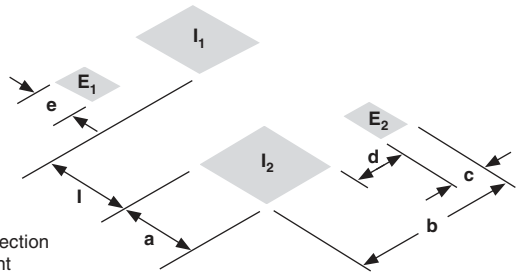
303144 DIMENSIONS



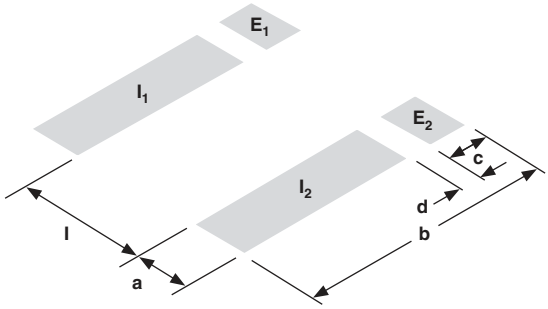
303145 DIMENSIONS



303144 LAND PATTERN



303145 LAND PATTERN



Kelvin Connection
I_1, I_2 - Current
E_1, E_2 - Sense

DIMENSIONS - TOLERANCES ± 0.010 (± 0.254)

MODEL	RESISTANCE RANGE (mΩ)	L	W	H	T	A	B
303144	3 to < 5	0.250 (6.350)	0.125 (3.175)	0.025 (0.635)	0.087 (2.210)	0.030 (0.762)	0.032 (0.813)
	5 to < 7				0.047 (1.194)		
	7 to 200				0.030 (0.762)		
303145	2 to 200	0.360 (9.144)	0.370 (9.398)	0.025 (0.635)	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
303144	0R003 to 0R0049	0.120 (3.05)	0.145 (3.68)	0.045 (1.14)	0.021 (0.53)	0.055 (1.39)	0.050 (1.27)
	0R005 to 0R0069	0.083 (2.10)	0.145 (3.68)	0.045 (1.14)	0.021 (0.53)	0.055 (1.39)	0.125 (3.17)
	0R007 to 0R2	0.065 (1.65)	0.145 (3.68)	0.045 (1.14)	0.021 (0.53)	0.055 (1.39)	0.160 (4.06)
303145	0R002 to 0R2	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

NOTES

- Tightest absolute tolerance: 0.5 % for any value within the pertinent ohmic value range.
- Measurement error allowed for ΔR limits: 0.0005 Ω.
- For prototype units, append a “U” to the model number (example: 303144U). 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** (1)	
RC Record	In tolerance
Thermal Shock	25 x (- 65 °C to + 150 °C)
RC Record	ΔR = 0.1 %
High Temperature Exposure	+ 170 °C, 100 h, no power
RC Record	In tolerance ΔR = 0.2 %
Final Inspection	5 % PDA on ΔR, 10 % PDA on out of tolerance
Visual Inspection	Magnification 30 x to 60 x
Mechanical Inspection	Dimensions, workmanship, 3 units sample size

Note

(1) VFR will perform a pre-cap visual inspection 100 % in the production flow prior to overcoating

TABLE 3 - EEE-INST-002 (Table 3A Film/Foil, level 1) **DESTRUCTIVE TESTS - MIL-PRF-49465**(2)		
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	303144: 3 mΩ to < 100 mΩ: ± 20 ppm/°C 100 mΩ to 200 mΩ: ± 25 ppm/°C 303145: 2 mΩ to ≤ 3 mΩ: ± 25 ppm/°C > 3 mΩ to < 100 mΩ: ± 20 ppm/°C 100 mΩ to 200 mΩ: ± 25 ppm/°C
	Low temperature storage per MIL-PRF-49465	ΔR = 0.2 % - 55 °C ± 2 °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	ΔR = 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	ΔR = 0.5 % 5 x rated power at + 25 °C for 5 s, not to exceed maximum current rating
Group 4	Sample size: 9(0) - mounted on FR4	
	Resistance to soldering heat	ΔR = 0.05 % 10 s to 12 s at + 260 °C reflow method
	Moisture resistance per MIL-STD-202, method 106 (7a and 7b not required)	ΔR = 0.05 % 240 h, no power
Group 5	Sample size: 9(0)	
	Shock per MIL-STD-202, method 213, condition I	ΔR = 0.05 % 100G, 6 ms axes Z and Y, 10 shocks per axis
	Vibration per MIL-STD-202, method 204, condition D	ΔR = 0.05 % 10 Hz to 2000 Hz, 20G 2 axes, 6 h per axis
Group 6	Sample size: 12(0) - mounted on FR4	
	Life test per MIL-PRF-49465	ΔR = 1 % 2000 h, + 70 °C, rated power

TABLE 3 - EEE-INST-002 (Table 3A Film/Foil, level 1) DESTRUCTIVE TESTS - MIL-PRF-49465[2]	
Group 7B	Sample Size: 10(0) - mounted on FR4 Solder mounting integrity per MIL-PRF-55342 — 303144: 3 kg force, 30 s; 303145: 5 kg force, 30 s
Group 9	Sample size: 5(0) - mounted on FR4 High temperature exposure per MIL-PRF-49465 — ΔR = 0.3 %; 1000 h, + 170 °C ± 7 °C, no power
Group 10[3]	Sample size: For 303144: 12 For 303145: 4 Outgassing — Per ASTM E595

Notes

[2] Units selected randomly from lots which successfully passed the table 2A testing

[3] Optional, per customer request.

Measurement error allowed for ΔR limits: 0.0005 Ω.

PART NUMBER IDENTIFICATION

Model #	303144	303145
Base Model	CSM2512	CSM3637
Value Range	3 mΩ to 200 mΩ	2 mΩ to 200 mΩ

Part Number: **{Model} - {Value} - {Tolerance} - {Termination} - {Packaging}**

Absolute Tolerance	Code
0.5 %	D

Termination	Code
Tin/lead	B

Packaging	Code
Waffle	W
Tape and reel	T

Example: 303144 - 0R1 - DBW

303144, 100 mΩ, 0.5 %, tin/lead termination, waffle packaging

Disclaimer

ALL PRODUCTS, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Vishay Precision Group, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “VPG”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

The product specifications do not expand or otherwise modify VPG’s terms and conditions of purchase, including but not limited to, the warranty expressed therein.

VPG makes no warranty, representation or guarantee other than as set forth in the terms and conditions of purchase. **To the maximum extent permitted by applicable law, VPG disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.**

Information provided in datasheets and/or specifications may vary from actual results in different applications and performance may vary over time. Statements regarding the suitability of products for certain types of applications are based on VPG’s knowledge of typical requirements that are often placed on VPG products. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. You should ensure you have the current version of the relevant information by contacting VPG prior to performing installation or use of the product, such as on our website at vpgsensors.com.

No license, express, implied, or otherwise, to any intellectual property rights is granted by this document, or by any conduct of VPG.

The products shown herein are not designed for use in life-saving or life-sustaining applications unless otherwise expressly indicated. Customers using or selling VPG products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify VPG for any damages arising or resulting from such use or sale. Please contact authorized VPG personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.