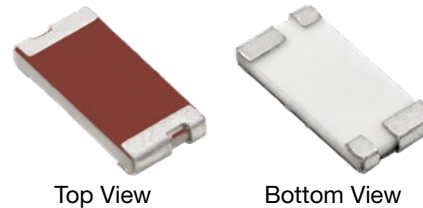


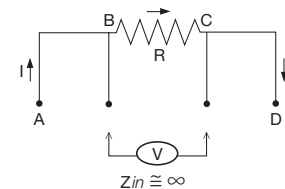
## Model 303336 Bulk Metal® Foil Technology CSM2512F, with Screen/Test Flow in Compliance with EEE-INST-002 (Tables 2A and 3A, Film/Foil, Level 1) MIL-PRF-55342 and MIL-PRF-49465

### FEATURES

- Temperature coefficient of resistance (TCR): 10 ppm/°C max. (-55°C to +125°C, +25°C ref.)  
For tighter TCR please contact us.
- Power rating: to 1 W
- Resistance tolerance: to ±0.1%
- Resistance range: 50 mΩ to 200 mΩ
- Load-life stability: to ±0.05% typical (70°C, 2000 h at rated power)
- Solderable terminations
- For prototype units, append a “U” to the model number (example: 303336U). 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](mailto:foil@vpgsensors.com)
- For oriented performances please contact Application Engineering



**RoHS\***  
COMPLIANT

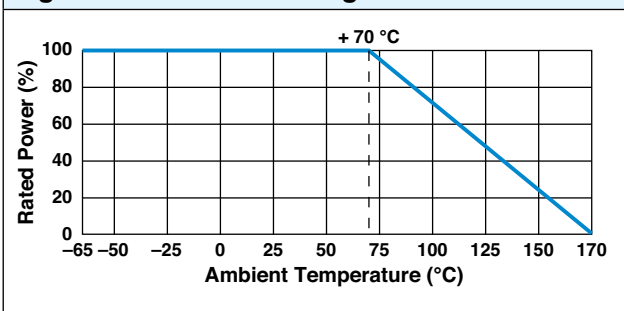


**Four terminal (Kelvin) design:**  
allows for precise and accurate measurements.

### INTRODUCTION

Model 303336 (CSM2512F with screen/test flow in compliance with EEE-INST-002) is a surface mount chip resistor designed with 4 pads for Kelvin connection. Utilizing Bulk Metal® Foil as the resistance element, it provides enhanced characteristic capabilities resulting in superior performance when compared with other resistor technologies. The unique combination of Z Foil technology along with the designed 4 pads lead frame configuration results in significant reduction of the component's sensitivity to applied power changes such as power coefficient of resistance (PCR) and thermal resistance.

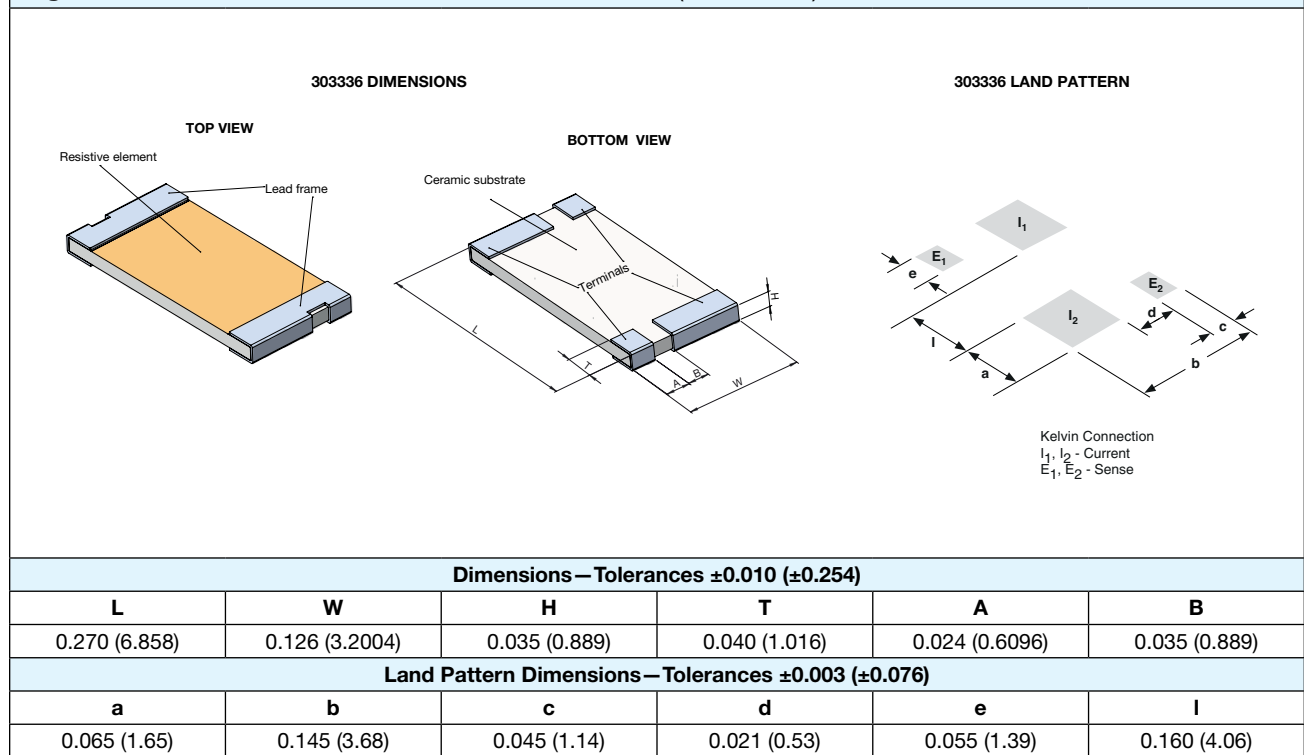
**Figure 1 – Power Derating Curve**



**Table 1 – Specifications**

Parameter	Value
Resistance range	50 mΩ to 200 mΩ <sup>(1)</sup>
Power rating at 70°C	1 W
Maximum current <sup>(2)</sup>	4.5 A
Tolerance	to ±0.1%
Temperature coefficient maximum (-55°C to +125°C, +25°C Ref.)	±10 ppm/°C <sup>(3)</sup>
Operating temperature range	-65°C to +170°C
Maximum working voltage	(P × R) <sup>1/2</sup>
Weight (maximum)	0.063 g
<b>Notes</b>	
<sup>(1)</sup> Contact application engineering for values outside this range.	
<sup>(2)</sup> Maximum current for a given resistance value is calculated using $I = \sqrt{P/R}$ .	
<sup>(3)</sup> For tighter TCR, please contact application engineering: <a href="mailto:foil@vpgsensors.com">foil@vpgsensors.com</a> .	

**Figure 2—Dimensions and Land Pattern in Inches (Millimeters)**



**NOTES**

- Tightest absolute tolerance: 0.1% for any value within the pertinent ohmic value range.
- Measurement error allowed for  $\Delta R$  limits: 0.0005  $\Omega$ .
- For prototype units, append a “U” to the model number (example: 303336U). These units have all of the table 2A 100% tests performed, with no destructive qualification testing required.

<b>Table 2 – EEE-INST-002 (Table 2A Film/Foil, Level 1) 100% Tests/Inspections<sup>(1)</sup></b>	
<b>RC Record</b>	In tolerance
<b>Thermal Shock</b>	25 x (-65°C to +150°C)
<b>RC Record</b>	$\Delta R = 0.1\%$
<b>High Temperature Exposure</b>	+170°C, 100 h, no power
<b>RC Record</b>	In tolerance $\Delta R = 0.2\%$
<b>Final Inspection</b>	5% PDA on $\Delta R$ , 10% PDA on out of tolerance
<b>Visual Inspection</b>	Magnification 30 x to 60 x
<b>Mechanical Inspection</b>	Dimensions, workmanship, 3 units sample size
<b>Note</b>	
<sup>(1)</sup> Vishay Foil Resistors 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 AND 55342 <sup>(1)</sup>**

<b>Group 2</b>	Sample size: 3(0) Solderability	MIL-STD-202, method 208
<b>Group 3</b>	Sample size: 10(0) – mounted on PCB TCR measurement per MIL-STD-202, method 304 Low temperature storage per MIL-PRF-49465 Low temperature operation per MIL-PRF-55342 Short time overload per MIL-STD-49465	$\pm 10$ ppm/ $^{\circ}\text{C}$ <sup>(3)</sup> (-55 $^{\circ}\text{C}$ / +25 $^{\circ}\text{C}$ / +125 $^{\circ}\text{C}$ ) $\Delta R = 0.02\%$ -55 $^{\circ}\text{C}$ $\pm 2^{\circ}\text{C}$ , 24 h $\pm 4$ h ambient no load dwell for 2 h to 8 h at +25 $^{\circ}\text{C}$ $\Delta R = 0.02\%$ -65 $^{\circ}\text{C}$ ambient no load dwell for 1 h, rated power for 45 min no load dwell at +25 $^{\circ}\text{C}$ for 24 h $\pm 4$ h $\Delta R = 0.05\%$ 5 $\times$ rated power at +25 $^{\circ}\text{C}$ for 5 s, not to exceed maximum current rating
<b>Group 4</b>	Sample size: 9(0) – mounted on PCB Resistance to soldering heat Moisture resistance per MIL-STD-202, method 106 (7a and 7b not required)	$\Delta R = 0.05\%$ performed per MIL-PRF-55342 para. 4.8.8.1 $\Delta R = 0.02\%$ 240 h, no power
<b>Group 5</b>	Sample size: 9(0) Shock per MIL-STD-202, method 213, condition I Vibration per MIL-STD-202, method 204, condition D	$\Delta R = 0.05\%$ 100G, 6 ms axes Z and Y, 10 shocks per axis $\Delta R = 0.05\%$ 10 Hz to 2000 Hz, 20G 2 axes, 6 h per axis
<b>Group 6</b>	Sample size: 12(0) – mounted on PCB Life test per MIL-PRF-49465	$\Delta R = 0.1\%$ 2000 h, +70 $^{\circ}\text{C}$ , rated power 1.5 hours "on" and 0.5 hour "off" cycle
<b>Group 7B</b>	Sample Size: 10(0) – mounted on PCB Solder mounting integrity per MIL-PRF-55342	3 kg force, 30 s
<b>Group 9</b>	Sample size: 5(0) – unmounted High temperature exposure per MIL-PRF-49465	$\Delta R = 0.3\%$ 1000 h, +170 $^{\circ}\text{C}$ -7 $^{\circ}\text{C}$ , no power
<b>Group 10<sup>(2)</sup></b>	Sample size: 12 - outgassing	Per ASTM E595

**Notes**

<sup>(1)</sup> Units selected randomly from lots which successfully passed the table 2A testing

<sup>(2)</sup> Optional, per customer request.

<sup>(3)</sup> For tighter TCR, please contact application engineering: foil@vpgsensors.com.

Measurement error allowed for  $\Delta R$  limits: 0.0005  $\Omega$ .

**Figure 3 – Global Part Number Information**

<b>Model #</b>	303336
<b>Base Model</b>	CSM2512F
<b>Value Range</b>	50 mΩ to 200 mΩ

Part Number:

**{Model} - {Value} - {Tolerance} - {Termination} - {Packaging}**

Absolute Tolerance	Code
0.1%	B
0.2%	E
0.25%	C
0.5%	D
1.0%	F

Termination	Code
Tin/lead	B

Packaging	Code
Waffle	W
Tape and Reel	T

**Example:** 303336 - 0R123 - EBW

**303336, 123 mΩ, 0.2%, 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](http://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.

Copyright Vishay Precision Group, Inc., 2014. All rights reserved.