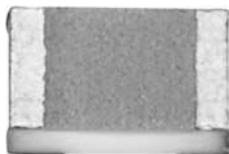




## ESCC (e) 4001/023 Qualified High Precision (5 ppm, 0.01 %), Thin Film Chip Resistors



Vishay Sfernice Thin Film division holds ESCC QML qualification (ESCC technology flow qualification).

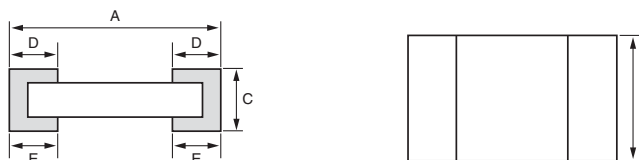
These High-Rel. components are ideal for low noise and precision applications, superior stability, low temperature coefficient of resistance, and low voltage coefficient, Vishay Sfernice's precision thin film wraparound resistors exceed requirements of MIL-PRF-55342G characteristics Y ( $\pm 10$  ppm/ $^{\circ}$ C).

### FEATURES

- Load life stability at  $\pm 70$   $^{\circ}$ C for 2000 h: 0.15 % under  $P_n$
- Low temperature coefficient down to  $\pm 5$  ppm/ $^{\circ}$ C
- Very low noise ( $< -35$  dB) and voltage coefficient ( $< 0.01$  ppm/V)
- Resistance range:  $10 \Omega$  to  $3 \text{ M}\Omega$  (depending on size)
- Laser trimmed tolerances to  $\pm 0.01$  %
- TCR in lot tracking  $\leq 5$  ppm/ $^{\circ}$ C
- Termination: Thin film technology
- SnPb terminations over nickel barrier
- ESCC 4001 (generic specifications)
- ESCC 4001/023 (detailed specifications)
- ESCC qualified
- SMD wraparound chip resistor
- Operating temperature range:  $-65$   $^{\circ}$ C to  $+155$   $^{\circ}$ C
- From 0402 to 2010
- Halogen-free according to IEC 61249-2-21 definition

HALOGEN  
FREE

### DIMENSIONS in millimeters



CASE SIZE	DIMENSIONS							
	A		B		C		D/E	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0402	0.87	1.64	0.47	0.86	0.25	1.02	0.12	0.38
0603	1.39	2.16	0.62	1.01	0.25	1.02	0.25	0.51
0805	1.78	2.55	1.14	1.53	0.25	1.02	0.25	0.51
1206	2.87	3.64	1.47	1.86	0.25	1.02	0.25	0.51
2010	4.95	5.72	2.41	2.80	0.25	1.02	0.35	0.85

### NOTION OF SINGLE LOT

The homogeneity of lots is given by the front end lot numbers (primary process lot) and not by the date code. The date code is applied after completion of end of production testing. Parts coming from different lots might have same date code. A customer who needs lot homogeneity should mention on his order: SINGLE PRODUCTION LOT

### END OF PRODUCTION TESTING

Mandatory testing performed at the end of the production process:

- 100 % overload: Voltage  $\sqrt{(6.25 P_n \times R_n)}$  or  $2 U_L$  whichever is less - duration 2 s
- 100 % burn in: 168 h at  $P_n$  at  $70$   $^{\circ}$ C

### OPTIONS

#### LOT VALIDATION TESTING

For procurement of qualified components, lot validation testing is not required and shall only be performed if specifically stipulated in the purchase order.

For procurement of unqualified components, lot validation testing shall be performed as stipulated in the purchase order. The need for lot validation testing shall be determined by the orderer.

When lot validation testing is required, it shall consist of the performance of one or more of the tests or subgroup test sequences of chart F4 indicated in the ESA Generic Specification ESCC 4001. The testing to be performed and the sample size shall be as stipulated in the purchase order. When procurement of more than one component type is involved from a family, range or series, the selection of representative samples shall also be stipulated in the purchase order.

Lot validation testing will be composed of one LVT charges and LVT samples:

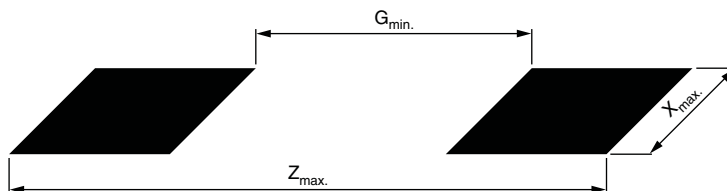
- Lot validation test charges has to be ordered separately on purchase order.
- Lot validation samples have to be ordered separately on purchase order.

#### FINAL INSPECTION

If requested by the orderer a final inspection can be performed on site.

Final inspection has to be stipulated separately on purchase order.

Vishay Sfernice ESCC (e) 4001/023 Qualified High Precision (5 ppm, 0.01 %),  
Thin Film Chip Resistors

**LAND PATTERN** in millimeters


CHIP SIZE	Z <sub>max.</sub>	G <sub>min.</sub>	X <sub>max.</sub>
0402	1.55	0.15	0.73
0603	2.37	0.35	0.98
0705/0805	2.76	0.74	1.40
1206	3.91	1.85	1.73
2010	5.93	3.71	2.67

**Note**

- Suggested land pattern: According to IPC-7351A

**STANDARD ELECTRICAL SPECIFICATIONS**

VISHAY SFERNICE DESIGNATION	PHR 0402 <sup>(1)</sup>	PHR 0603 (e)	PHR 0805 (e)	PHR 1206 (e)	PHR 2010 (e)
ESA specification applied	ESCC 4001/023				
Variant number	13 to 14	01 to 05	02 to 06	03 to 07	04 to 08
Power rating at + 70 °C (P <sub>n</sub> ) <sup>(3)</sup>	0.05 W	0.1 W	0.125 W	0.25 W	0.50 W
Limiting element voltage (U <sub>L</sub> ) <sup>(3)</sup>	30 V	35 V	75 V	100 V	150 V
Ohmic value range	Min. 10 Ω Max. 150 kΩ	Min. 10 Ω Max. 500 kΩ	Min. 10 Ω Max. 750 kΩ	Min. 10 Ω Max. 3.5 MΩ	Min. 10 Ω Max. 6 MΩ
Insulation voltage (U <sub>i</sub> )	50 V	100 V	200 V	300 V	300 V
Temperature coefficient available	± 5 ppm/°C; ± 10 ppm/°C; ± 25 ppm/°C				
Tolerance available	± 0.01 %, ± 0.02 %, ± 0.05 %, ± 0.1 %				
Temperature range	- 65 °C to + 155 °C				
Soldering temperature (T <sub>sol</sub> )	260 °C, immersion 10 s				

**QUALIFIED OHMIC RANGE <sup>(1)</sup>**

MODEL	ESCC VARIANT	OHMIC RANGE (Ω)	TOLERANCE (%)
PHR	01 to 08 and 13 to 14 <sup>(1)</sup>	10 to < 50	0.1
		50 to < 100	0.05 and 0.1
		100 to < 250	0.02, 0.05 and 0.1
		≥ 250	0.01, 0.02, 0.05 and 0.1

**QUALIFIED OHMIC RANGE <sup>(1)</sup>**

MODEL	ESCC VARIANT	OHMIC RANGE (Ω)	TEMPERATURE COEFFICIENT (ppm/°C)	ESCC CODE
PHR	01 to 08 and 13 to 14 <sup>(1)</sup>	10 to < 20	E: 25 (- 55 °C; + 155 °C)	2
		20 to < 50	Y: 10 (- 55 °C; + 155 °C)	1
		20 to < 50	Z: 5 (+ 22 °C; + 70 °C)	0
		≥ 50	C: 5 (- 55 °C; + 155 °C)	9

**QUALIFIED OHMIC RANGE: MAX. VALUE <sup>(1)</sup>**

PHR 0402 <sup>(1)</sup>	PHR 0603	PHR 0805	PHR 1206	PHR 2010
100 kΩ	200 kΩ	250 kΩ	1 MΩ	3 MΩ

**Notes**

- PHR 0402: Qualification ongoing.
- For values, TCR, tolerance outside of qualified range: Please consult.
- Limiting Voltages and Power rating are already derated (for maximum ratings admissible, refer to P chip: [www.vishay.com/cod?53017](http://www.vishay.com/cod?53017)).

**POPULAR OPTIONS**
**OPTION 0041**

Production according to ESCC 4001/023 for: Cases, ohmic values, tolerance or TCR outside of qualified range.  
Please consult Vishay Sfernice for feasibility.

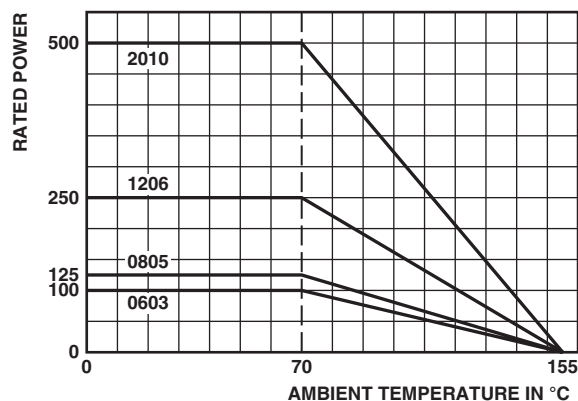


ESCC (Ⓢ) 4001/023 Qualified High Precision (5 ppm, 0.01 %), Vishay Sfernice  
Thin Film Chip Resistors

MECHANICAL SPECIFICATIONS	
Substrate material	Alumina
Technology	Thin Film
Film	<b>Nickel Chromium</b> with mineral passivation
Protection	Epoxy and silicone
Terminations	<b>B type:</b> SnPb over nickel barrier for solder reflow <sup>(1)</sup> <b>G type:</b> Gold

**Note**

<sup>(1)</sup> For B terminations use recommended reflow profile #1 as per Application Note "Guidelines for Vishay Sfernice Resistive and Inductive Components" (document number: 52029)

**POWER DERATING CURVE**

PACKAGING				
Two types of packaging are available: waffle-pack and tape and reel.				
SIZE	NUMBER OF PIECES PER PACKAGE		TAPE WIDTH	
	WAFFLE PACK 2" x 2"	TAPE AND REEL <sup>(2)</sup>		
		MIN.	MAX.	
0402	100	50	5000	8 mm
0603				
0805				
1206	140	4000		
2010	60			

**Note**

<sup>(2)</sup> MoQ: 50 pieces

**EXTENDED FEATURES**

You may consult Vishay Sfernice for chip sizes, ohmic values and tolerances outside of the qualified range.

PERFORMANCE				
TEST	CONDITIONS	REQUIREMENTS		TYPICAL
		ESA/SCC 4001/023	MIL-PRF-55342G	
Short time overload	$U = \sqrt{(6.25 P_n \times R_n)}$ $U_{max.} < 2 U_L - 2 S$	$\pm 0.05 \% + (0.05 \Omega \times 100/R_n)$	0.10 %	$\pm 0.01 \%$
Rapid temperature change	- 55 °C/+ 155 °C 5 cycles CEI 66-2-14 Test Na	$\pm 0.05 \% + (0.05 \Omega \times 100/R_n)$	0.1 % (for 100 cycles)	$\pm 0.01 \%$ $\pm 0.015 \%$ (for 500 cycles)
Soldering (thermal shock)	260 °C/10 s CEI 68-2-20 A Test T6 (met. 1A)	$\pm 0.05 \% + (0.05 \Omega \times 100/R_n)$	-	$\pm 0.005 \%$
Terminal strength: adhesion bend strength of end plated facing	CEI 115-1 Clause 4.32 CEI 115-1 Clause 4.33	$\pm 0.05 \% + (0.05 \Omega \times 100/R_n)$	-	$\pm 0.01 \%$
Climatic sequence	CEI 67-2-1/CEI 68-2-2 CEI 67-2-13/CEI 68-2-30	$\pm 0.10 \% + (0.05 \Omega \times 100/R_n)$	-	$\pm 0.02 \%$ Insulation resistance > 1 GΩ
Load life	2000 h $P_n$ at + 70 °C 90'/30' cycle	$\pm 0.15 \% + (0.05 \Omega \times 100/R_n)$	0.5 %	$\pm 0.02 \%$ Insulation resistance > 1 GΩ
High temperature exposure	2000 h $P_n$ at + 155 °C CEI 68-2-20A Test B	$\pm 0.15 \% + (0.05 \Omega \times 100/R_n)$	$\pm 0.10 \%$ (duration 1000 h)	$\pm 0.05 \%$ Insulation resistance > 1 GΩ



Vishay Sfernice ESCC (e) 4001/023 Qualified High Precision (5 ppm, 0.01 %), Thin Film Chip Resistors

ESCC/PHR CODIFICATION CORRESPONDANCE TABLES			
VARIANT	MODEL	CASE SIZE	TERMINATION
13	PHR	0402	B (tin/lead)
01		0603	
02		0805	
03		1206	
04		2010	G (gold)
14		0402	
05		0603	
06		0805	
07	1206		
08	2010		

ESCC/PHR CODIFICATION CORRESPONDANCE TABLES		
TEMPERATURE COEFFICIENT	ESCC CODE	PHR CODE
5 ppm/°C (+ 22 °C; + 70 °C)	0	Z
10 ppm/°C (- 55 °C; + 155 °C)	1	Y
25 ppm/°C (- 55 °C; + 155 °C)	2	E
5 ppm/°C (- 55 °C; + 155 °C)	9	C

ESCC/PHR CODIFICATION CORRESPONDANCE TABLES		
TOLERANCE	ESCC CODE	PHR CODE
0.1 %	B	B
0.05 %	W	W
0.02 %	P	P
0.01 %	L	L

**GLOBAL PART NUMBER INFORMATION**

Global Part Numbering: PHR0603Y1003BBT014 (preferred part number format)

P	H	R	0	6	0	3	Y	1	0	0	3	B	B	T	0	1	4
<b>TYPE</b>	<b>TCR</b>	<b>OHMIC VALUE</b>	<b>TOLERANCE</b>	<b>TERMINATION</b>	<b>PACKAGING</b>	<b>OPTION</b>											
PHR0402 PHR0603 PHR0805 PHR1206 PHR2010	Y = ± 10 ppm/°C E = ± 25 ppm/°C Z = 5 ppm/°C (22 °C; + 70 °C) C = 5 ppm/°C (- 55 °C; + 155 °C)	The first three digits are significant figures and the last digit specifies the number of zero to follow. R designates decimal point. Example: 10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ	L = ± 0.01 % P = ± 0.02 % W = ± 0.05 % B = ± 0.10 %	B: SnPb over nickel barrier G: Gold	T: For tape and reel (leave blank for waffle pack)	Leave blank if no option											

**GLOBAL PART NUMBER INFORMATION**

ESCC Code

4	0	0	1	0	2	3	0	1	1	0	0	3	B	1	T
<b>ESCC SPEC</b>	<b>VARIANT</b>	<b>OHMIC VALUE</b>	<b>TOLERANCE</b>	<b>TCR</b>	<b>PACKAGING</b>										
4001023	13 or 14 = 0402 01 or 05 = 0603 02 or 06 = 0805 03 or 07 = 1206 04 or 08 = 2010	The first three digits are significant figures and the last digit specifies the number of zero to follow. R designates decimal point. Example: 10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ	L = ± 0.01 % P = ± 0.02 % W = ± 0.05 % B = ± 0.10 %	1 = ± 10 ppm/°C 0 = ± 5 ppm/°C (+ 22 °C; + 70 °C) 2 = ± 25 ppm/°C 9 = ± 5 ppm/°C (- 55 °C; + 155 °C)	T = For tape and reel (leave blank for waffle pack)										



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay 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.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. 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. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.