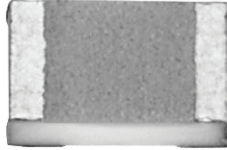


ESCC (e) 4001/023 Qualified High Precision (5 ppm, 0.01 %), Thin Film Chip Resistors


**HALOGEN
FREE**

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 (± 10 ppm/°C).

FEATURES

- Load life stability at ± 70 °C for 2000 h: 0.15 % under Pn
- Low temperature coefficient down to ± 5 ppm/°C
- Very low noise (< -35 dB) and voltage coefficient (< 0.01 ppm/V)
- Resistance range: 10 Ω to 3 M Ω (depending on size)
- Laser trimmed tolerances to ± 0.01 %
- TCR in lot tracking ≤ 5 ppm/°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 °C to $+155$ °C
- From 0402 to 2010
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	ESCC VARIANT NUMBER	RESISTANCE RANGE Ω	RATED POWER AT +70 °C (Pn) W ⁽¹⁾	LIMITING ELEMENT VOLTAGE (UL) V ⁽¹⁾	INSULATION VOLTAGE (U _i) V	TOLERANCE \pm %	TEMPERATURE COEFFICIENT \pm ppm/°C
PHR 0402 (e)	0402	13 and 14	10 to 150K	0.05	30	50	0.01, 0.02, 0.05, 0.1	5, 10, 25
PHR 0603 (e)	0603	01 and 05	10 to 500K	0.1	35	100	0.01, 0.02, 0.05, 0.1	5, 10, 25
PHR 0805 (e)	0805	02 and 06	10 to 750K	0.125	75	200	0.01, 0.02, 0.05, 0.1	5, 10, 25
PHR 1206 (e)	1206	03 and 07	10 to 3.5M	0.25	100	300	0.01, 0.02, 0.05, 0.1	5, 10, 25
PHR 2010 (e)	2010	04 and 08	10 to 6M	0.50	150	300	0.01, 0.02, 0.05, 0.1	5, 10, 25

Note

⁽¹⁾ Limiting voltages and power rating are already derated (for maximum ratings admissible, refer to P chip: www.vishay.com/cod?53017).

CLIMATIC SPECIFICATIONS

Operating temperature range	-65 °C; $+155$ °C
Soldering temperature (T _{sol})	260 °C, immersion 10 s

MECHANICAL SPECIFICATIONS

Substrate material	Alumina
Technology	Thin Film
Film	Nickel Chromium with mineral passivation
Protection	Epoxy and silicone
Terminations	B type: SnPb over nickel barrier for solder reflow ⁽³⁾ G type: Gold

Note

⁽²⁾ For B terminations use recommended reflow profile #1 as per Application Note "Guidelines for Vishay Sfernice Resistive and Inductive Components" (document number: 52029)

DIMENSIONS in millimeters


VARIANT NUMBER	STYLE	DIMENSIONS									
		A		B		C		D		E	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
01, 05	0603	1.39	2.16	0.62	1.01	0.25	1.02	0.17	0.51	0.25	0.51
02, 06	0805	1.78	2.55	1.14	1.53	0.25	1.02	0.17	0.51	0.25	0.51
03, 07	1206	2.87	3.64	1.47	1.86	0.25	1.02	0.17	0.51	0.25	0.51
04, 08	2010	4.95	5.72	2.41	2.8	0.25	1.02	0.35	0.85	0.35	0.85
13, 14	0402	0.87	1.64	0.47	0.86	0.25	1.02	0.09	0.38	0.12	0.38

TRACEABILITY DEFINITIONS

The two major traceability elements are defined as:

- The primary process lot number named Front End lot (FE lot). One “FE lot” is composed of several wafers issued from the same thin film deposition sequence.
- The date code named Batch Number (BN). The “BN” is defined after completion of the end of production testing sequence. The lot homogeneity is given by the “FE lot” and not by the “BN”.

According to the applied rules validated by the ESCC through the product qualification, the following situations are agreed:

- Parts coming from different “FE lot” might have the same “BN”.
- A maximum of two different “BN” might be applied to the same “FE lot” to enable the use of overruns from a previous PO.
- Unless requested / approved by the customer the “BN” will be 2 years old maximum.

SPECIFIC TRACEABILITY REQUIREMENTS

The following specific requirements have to be treated as:

- A customer who requires “Lot Homogeneity” has to mention it on the PO as “SINGLE PRODUCTION LOT”.
- A customer who requires “Lot Homogeneity” in addition to a “Single Batch Number” has to mention it on the PO as “SINGLE PRODUCTION LOT AND OPTION R0101”.

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 UL whichever is less - duration 2 s
- 100 % burn in: 168 h at P_n at 70 °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.

LAND PATTERN in millimeters			
CHIP SIZE	Z _{max.}	G _{min.}	X _{max.}
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

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

QUALIFIED OHMIC RANGE: MAX. VALUE (1)				
PHR 0402	PHR 0603	PHR 0805	PHR 1206	PHR 2010
100 kΩ (67 kΩ for TCR C)	200 kΩ (160 kΩ for TCR C)	250 kΩ	1 MΩ	3 MΩ

Note

- (1) For values, TCR, tolerance outside of qualified range: Please consult.

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.

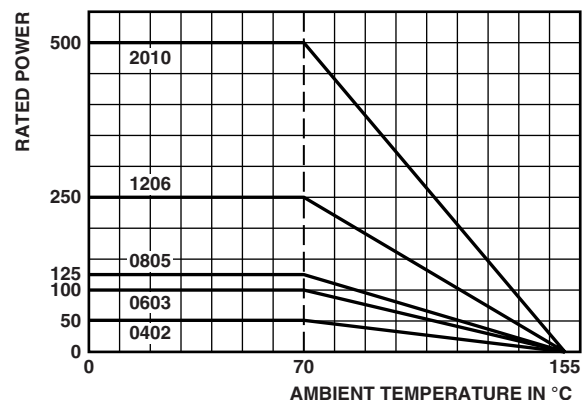
PACKAGING				
Two types of packaging are available: Waffle-pack and tape and reel.				
SIZE	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
	WAFFLE PACK 2" x 2"	TAPE AND REEL (3)		
		MIN.	MAX.	
0402	100	50	5000	8 mm
0603			4000	
0805				
1206	140	2000		
2010	60			

Note

- (2) MoQ: 50 pieces

EXTENDED FEATURES

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

POWER DERATING CURVE




PERFORMANCE				
TEST	CONDITIONS	REQUIREMENTS		TYPICAL
		ESA/SCC 4001/023	MIL-PRF-55342G	
Short time overload	$U = \sqrt{(6.25 P_n \times R_n)}$ $U_{max.} < 2 UL - 2 s$	$\pm 0.05 \% + (0.05 \Omega \times 100/R_n)$	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 Pn 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 Pn 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

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

LIMITED TO 18 DIGITS: If more digits are necessary a codification of some digits might be necessary

P	H	R	0	6	0	3	Y	1	0	0	3	B	B	T	0	1	4
TYPE	TCR			OHMIC VALUE				TOLERANCE			TERMINATION		PACKAGING		OPTION		
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		For more information see Codification of Packaging table		Leave blank if no option		

Note

- Terminations **B**: Variants 01 / 02 / 03 / 04 and 13
- Terminations **G**: Variants 05 / 06 / 07 / 08 and 14

GLOBAL PART NUMBER INFORMATION

ESCC Code

4	0	0	1	0	2	3	0	1	1	0	0	3	B	1
ESCC SPEC		VARIANT			OHMIC VALUE				TOLERANCE			TCR		
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)		

CODIFICATION PACKAGING - Waffle Pack

CODE 18	PACKAGING
W	25 min. (100 min. for size 0402), 1 mult
WA	100 min., 100 mult ⁽¹⁾

CODIFICATION PACKAGING - Plastic Tape ⁽²⁾

CODE 18	PACKAGING
T	50 min. (100 min. for size 0402), 1 mult
TA	100 min., 100 mult
TB	250 min., 250 mult
TC	500 min., 500 mult
TD	1000 min., 1000 mult
TE	2500 min., 2500 mult
TF	Full tape ⁽³⁾

CODIFICATION PACKAGING - Paper Tape ⁽²⁾

CODE 18	PACKAGING
PT	100 min., 1 mult
PA	100 min., 100 mult
PB	250 min., 250 mult
PC	500 min., 500 mult
PD	1000 min., 1000 mult
PE	2500 min., 2500 mult
PF	Full tape ⁽³⁾

Notes

- ⁽¹⁾ Available only in size 1206.
- ⁽²⁾ Plastic tape in standard for all sizes except 0402. Paper tape in standard for size 0402 (option for other sizes. Availability to be checked with factory).
- ⁽³⁾ Qty. depending on size of chips.



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. 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.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.