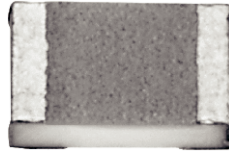


## ESCC (e) 4001/023 Qualified R Failure Rate High Precision (10 ppm/°C, 0.05 %) Thin Film Chip Resistors



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

These HiRel 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/°C).

### FEATURES

**HALOGEN  
FREE**

- Load life stability at  $\pm 70$  °C for 2000 h: 0.25 % under Pr
- Temperature coefficient to: 10 ppm/°C
- Very low noise ( $< -35$  dB) and voltage coefficient ( $< 0.01$  ppm/V)
- Resistance range: 100  $\Omega$  to 3.01 M $\Omega$  (depending on size)
- Tolerances down to 0.05 %
- SnPb terminations over nickel barrier
- ESCC 4001 (generic specification)
- ESCC 4001/023 (detail specification)
- ESCC qualified
- R failure rate (0.01 % per 1000 h)
- SMD wraparound chip resistor
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	ESCC VARIANT NUMBER	RESISTANCE RANGE $\Omega$	RATED POWER AT +70 °C (Pr) W	LIMITING ELEMENT VOLTAGE (UL) V	INSULATION VOLTAGE (U <sub>i</sub> ) V	TOLERANCE $\pm$ %	TEMPERATURE COEFFICIENT $\pm$ ppm/°C
PFRR 0402 (e)	0402	15	100 to 150K	0.05	30	50	0.05, 0.1	10, 25
PFRR 0603 (e)	0603	09	100 to 261K	0.1	50	100	0.05, 0.1	10, 25
PFRR 0805 (e)	0805	10	100 to 301K	0.125	100	200	0.05, 0.1	10, 25
PFRR 1206 (e)	1206	11	100 to 1M	0.25	150	300	0.05, 0.1	10, 25
PFRR 2010 (e)	2010	12	100 to 3.01M	0.50	200	300	0.05, 0.1	10, 25

### CLIMATIC SPECIFICATIONS

Operating temperature range	- 55 °C; + 155 °C
Soldering temperature (T <sub>sol</sub> )	260 °C, immersion 10 s

### MECHANICAL SPECIFICATIONS

Substrate material	Alumina
Technology	Thin Film
Film	<b>Nickel Chromium</b> with mineral passivation
Protection	Epoxy and Silicon
Terminations	<b>B type:</b> SnPb over nickel barrier for solder reflow

### QUALIFIED OHMIC RANGE: MAX. VALUE

PFRR0402	PFRR0603	PFRR0805	PFRR1206	PFRR2010
100 k $\Omega$	200 k $\Omega$	250 k $\Omega$	1 M $\Omega$	3 M $\Omega$

DIMENSIONS in millimeters									
VARIANT NUMBER	STYLE	A		B		C		D/E	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
09	0603	1.368	1.672	0.723	0.977	0.373	0.627	0.25	0.51
10	0805	1.758	2.062	1.143	1.397	0.373	0.627	0.25	0.51
11	1206	2.908	3.212	1.473	1.727	0.373	0.627	0.27	0.53
12	2010	4.898	5.232	2.413	2.667	0.373	0.627	0.35	0.61
15	0402	0.848	1.152	0.473	0.727	0.373	0.627	0.15	0.35

LAND PATTERN DIMENSIONS 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-7351

**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

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: PFRR0603Y1003BBT (preferred part number format)

P	F	R	R	0	6	0	3	Y	1	0	0	3	B	B	T
TYPE		TCR		OHMIC VALUE				TOLERANCE		TERMINATION		PACKAGING			
PFRR0402 PFRR0603 PFRR0805 PFRR1206 PFRR2010		Y = ± 10 ppm/°C E = ± 25 ppm/°C		The first three digits are significant figures and the last digit specifies the number of zeros to follow. Example: 3901 = 3900 Ω 1004 = 1 MΩ				W = ± 0.05 % B = ± 0.10 %		B: SnPb over nickel barrier		T: For tape and reel (leave blank for waffle pack)			

**GLOBAL PART NUMBER INFORMATION**

ESCC Code

4	0	0	1	0	2	3	0	9	R	1	0	0	3	B	1
ESCC SPEC		VARIANT		FAILURE RATE		OHMIC VALUE				TOLERANCE		TCR			
4001023		0402 = 15 0603 = 09 0805 = 10 1206 = 11 2010 = 12		R		The first three digits are significant figures and the last digit specifies the number of zeros to follow. Example: 3901 = 3900 Ω 1004 = 1 MΩ				W = ± 0.05 % B = ± 0.10 %		1 = ± 10 ppm/°C 2 = ± 25 ppm/°C			

Vishay Sfernice thin film is the first passive manufacturer to hold the ESCC Technology Flow Qualification, official certificate is available on ESCIES web site <https://escies.org/ReadArticle?docId=727>.

This qualification open the door to a new concept at ESA: The Failure Rate option (similar to the one offered in the MIL system), for instance R failure rate: 0.01 % per 1000 h.

New specifications describing this new concept have been released by the ESA:

2544001: Requirements for the Technology Flow Qualification of Film Resistors  
<https://escies.org/escc/specifications/2544001.pdf>

26000: Failure Rate Level Sampling Plans and Procedures  
<https://escies.org/escc/specifications/26000.pdf>

21300: Terms, Definitions, Abbreviations, Symbols and Units  
<https://escies.org/escc/specifications/21300.pdf>

21700: General Requirements for the Marking of the ESCC Components  
<https://escies.org/escc/specifications/21700.pdf>

4001: Generic Specification Resistors Fixed Film  
<https://escies.org/escc/specifications/4001.pdf>

4001023: Resistors, Fixed, Chip, Thin Film, Type PHR and PFRR  
<https://escies.org/escc/specifications/4001023.pdf>

Parts are delivered with space C.O.C.

Parts undergo 100 % overload at end of production process.

**ESCC/PFRR CODIFICATION CORRESPONDANCE TABLES**

VARIANT	MODEL	CASE SIZE	TERMINATION
15	PFRR	0402	B (tin/lead)
09	PFRR	0603	B (tin/lead)
10	PFRR	0805	B (tin/lead)
11	PFRR	1206	B (tin/lead)
12	PFRR	1210	B (tin/lead)

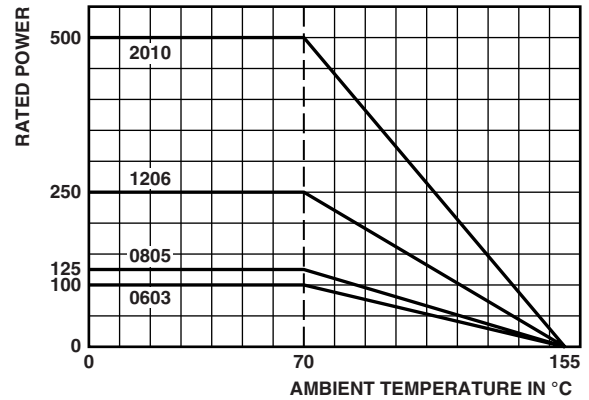
TEMPERATURE COEFFICIENT	ESCC CODE	PFRR CODE
10 ppm/°C (- 55 °C; + 155 °C)	1	Y
25 ppm/°C (- 55 °C; + 155 °C)	2	E

TOLERANCE	MODEL	CASE SIZE
0.1 %	B	B
0.05 %	W	W



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		
	MIN.	MAX.		
0402	100	5000	8 mm	
0603				
0805		4000		
1206				
2010				

**POWER DERATING CURVE**



**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	$U = \sqrt{(6.25 Pr \times Rn)}$ $U_{max.} < 2 UL - 2 s$	$\pm 0.05 \% + (0.05 \Omega \times 100/Rn)$	0.10 %	$\pm 0.01 \%$
Rapid temperature change	- 55 °C/+ 155 °C 5 cycles CEI 66-2-14 Test Na	$\pm 0.05 \% + (0.05 \Omega \times 100/Rn)$	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)	$\pm 0.05 \% + (0.05 \Omega \times 100/Rn)$	-	$\pm 0.005 \%$
Terminal strength: Adhesion bend strength of end plated facing	CEI 115-1 Clause 4.32 CEI 115-1 Clause 4.33	$\pm 0.05 \% + (0.05 \Omega \times 100/Rn)$	-	$\pm 0.01 \%$
Climatic sequence	CEI 67-2-1/CEI 68-2-2 CEI 67-2-13/CEI 68-2-30	$\pm 0.10 \% + (0.05 \Omega \times 100/Rn)$	-	$\pm 0.02 \%$ Insulation resistance > 1 GΩ
Load life	2000 h Pr at + 70 °C 90°/30° cycle 8000 h	$\pm 0.25 \% + (0.05 \Omega \times 100/Rn)$ $1 \% + (0.05 \Omega \times 100/Rn)$	0.5 %	$\pm 0.05 \%$ (8000 h) Insulation resistance > 1 GΩ
High temperature exposure	2000 h Pr at + 155 °C CEI 68-2-20A Test B	$\pm 0.15 \% + (0.05 \Omega \times 100/Rn)$	$\pm 0.10 \%$ (duration 1000 h)	$\pm 0.05 \%$ Insulation resistance > 1 GΩ



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