5.3 RESISTORS (10)

5.3.1 VISHAY S.A. Fance: Chip resistors

5.3.1.1 Contact Information

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5.3.1.2 Qualification

Current Qualification Certificate No.	In QML since:	Type Designation
287G	Feb. 2009	Thin Film Technology for Chip, Wraparound, Single and Network Resistors, Fixed, Based on Types P for Single Chip, PRA and CNW for Resistor Networks

APPLICABLE DOCUMENTS

ESCC Generic Specification No. 4001

ESCC Detail Specification Nos. 4001/023, 4001/025

Vishay S.A. Process Identification Document PID PID-TFD P PRA CNW

5.3.1.3 List of Qualified Components

NOTE: the Established Reliability Level R is evaluated according to ESCC specification 26000.

Type PHR, Variants 01 to 08, 13 and 14 are qualified

Type PFRR, Variants 09 to 12 and 15 are qualified

Type PRAHR/CNWHR, Variants 01 to 42 are qualified

Detail Specification		
4001/023	PHR	High Stability and Precision Chip
4001/023	PFRR	High Stability and Precision Chip with Established Reliability Level R
4001/025	PRA/CNWHR	High Stability and Precision Surface Mount Array

Lead material is E with either Type 2 or Type 4 finish. The terminal material and finish of some of these variants makes them unsuitable for solder assembly methods. They shall be assembled using glue or wire bond techniques. See Detail specifications.

Operating Temperature Range, (°C): -55 to +155

TYPE PHR:

Detail Specification	Style	Critical R (kΩ)	Rated Dissipation (W)	Limiting Element Voltage (V)	Type Variant
4001/023	0402	18	0.050	30	13; 14
	0603	12.25	0.100	35	01; 05
	0805	45	0.125	75	02; 06
	1206	40	0.250	100	03; 07
	2010	45	0.500	150	04; 08

Variant	Style	Resistance Range (Note 1)		Tolerance (±%) (Note 2)	Temperature Coefficient (10^{-6}/ºC) (Note 2)	Weight (g)
		Min (Ω)	Max (MΩ)			
01, 05	0603	10	0.200 (0.160 for TC"C")	0.01; 0.02; 0.05; 0.1	±5; ±10; ±25	0.003
02, 06	0805	10	0.250	0.01; 0.02; 0.05; 0.1	±5; ±10; ±25	0.004
03, 07	1206	10	1.000	0.01; 0.02; 0.05; 0.1	±5; ±10; ±25	0.01
04,08	2010	10	3.000	0.01; 0.02; 0.05; 0.1	±5; ±10; ±25	0.03
13, 14	0402	10	0.100 (0.067 for TC"C")	0.01; 0.02; 0.05; 0.1	±5; ±10; ±25	0.002

NOTE 1:

Variant	Style	Critical Resistance (KΩ)
01 - 05	0603	12.25
02 - 06	0805	45
03 - 07	1206	40
04 - 08	2010	45
13 - 14	0402	18

NOTE 2:

Resistance (Ω)	Available Tolerances (±%)	Series
10 ≤ R < 50	0.1	Any value in the resistance range
50 ≤ R < 100	0.05 and 0.1	
100 ≤ R < 250	0.02; 0.05 and 0.1	
R ≥ 250	0.01; 0.02; 0.05 and 0.1	

Resistance (Ω)	Temperature Coefficient (ppm/ºC)	Series
10 ≤ R < 20	E: 25 (-55ºC; +155 ºC)	Any value in the resistance range
20 ≤ R < 50	Y: 10 (-55ºC; +155 ºC)	
20 ≤ R < 50	Z: 5 (+22ºC; +70 ºC)	
R ≥ 50	C: 5 (-55ºC; +155 ºC)	

TYPE PFRR:

Detail Specification	Style	Critical R (kΩ)	Rated Dissipation (W)	Limiting Element Voltage (V)	Type Variant
4001/023	0402	32	0.050	40	15
	0603	25	0.100	50	09
	0805	80	0.125	100	10
	1206	90	0.250	150	11
	2010	80	0.500	200	12

Style	Resistance Range (Ω)	Tolerance (±%)	Temperature Coefficient TC($\pm 10^{-6}$ /°C)
0402; 0603; 0805; 1206; 2010	From 100 to ≤ 100K	0.05; 0.1	10; 25
0603; 0805; 1206; 2010	From 100 to ≤ 261K	0.05; 0.1	10; 25
0805; 1206; 2010	From 261K to ≤ 301K	0.05; 0.1	10; 25
1206; 2010	From 301K to ≤ 1M	0.05; 0.1	10; 25
2010	From 1M to 3M01	0.05; 0.1	10; 25

TYPE PRAHR/CNWHR:

Detail Specification	Style	Critical R (K Ω)	Rated Dissipation (W/resistor)	Limiting Element Voltage (V/resistor)	Type Variant	
					Same Ohmic Values	Different Ohmic Values
4001/025	PRA100	12.25	0.100	35	01 to 07	22 to 28
	PRA135	56.25	0.100	75	08 to 14	29 to 35
	PRA182	100	0.100	100	15 to 21	36 to 42

Style	Resistance Range (Ω)	Tolerance (±%)		Temperature Coefficient TC(±10-6 /°C)	
		Absolute	Relative	Absolute	Relative
PRA100; PRA135; PRA182	From 100 to 200K	0.1; 0.5; 1	0.05; 0.1	10	3; 5
PRA135; PRA182	From 200K to 250K	0.1; 0.5; 1	0.05; 0.1	10	3; 5
PRA182	From 250K to 1M	0.1; 0.5; 1	0.05; 0.1	10	3; 5

Number of Resistors per Array: 2 to 8

NOTES:
1. Note that gold finish variants are not intended for de-golding and tinning.
2. The electrical ranges of these ESCC QML Qualified components variants are listed in the ESCC Detail Specifications and in the Qualified Part List (REP005) document available on the ESCIES website, https:// escies.org.

5.3.1.4 Technology Flow Abstract

GENERAL FEATURES

The thin film technology for chip, fixed, wraparound, single and network resistors are designed on types based on P for single chip, PRA for 2 to 8 resistors of similar value and CNW for 2 to 8 resistors with at least two different values with the same form factor as PRA.

Technology Flow	Scope	Site
Design Centre	Single resistor chips in 0402 0603, 0805, 1206 and 2010 formats 2 to 8 resistors of similar value in formats 0603, 0805 and 1206 2 to 8 resistors with at least 2 different values with the same form factor, 0603, 0805 or 1206	Vishay S.A. Division SFERNICE 199, Boulevard de la Madeleine CS71159 F-06003 Nice Cedex 01 France
Fabrication	Film deposition Photolithography Thermal treatment Passivation Thermal stabilization and control	As above
Assembly	Laser trim Protective layer Termination and Test	As above
Test	Chart F2, F3 and F4 Periodic Testing	As above

BASIC INFORMATION

The technology consists of:

–Substrate: High purity alumina (99.5%)

–Resistive Layer: Nickel chromium
–Passivation Layer: Silicon Nitride
–Protection: Epoxy and Silicone
–Termination: Nickel barrier
–Processes: Thin film deposition
–Finish: SnPbAg or Au

Critical resistance by style:

– P 0402 FR:32 k
– P 0603 FR:25 k
– P 0603 HR:12.25 k
– P 0805 FR: 80k
– P 0805 HR: 45 k
– P 1206 FR: 90 k
– P 1206 HR: 40 k
– P 2010 FR: 80k
– P 2010 HR: 45 k
– PRA 100: 12.25 k
– PRA 135: 56.25 k
– PRA 182: 100 k

COMPONENT TYPES

The available formats are defined in the variants table in the Detail Specifications. Variants with established reliability in accordance with Basic specification No. 26000 are designated with an ''FR" suffix here for convenience. Variants 09, 10, 11 and 12 have established reliability level 'R' at 60% confidence level.

5.3.1.5 Technology Flow definition

1. Design

The design manuals covers the design rules and limits:

– HP-BE/001 (Maîtrise de la conception)
– HP-BE/004 (Données technologiques, Régles d'implementation, Performances)

Critical design characteristics:

– Minimum metal width: 10 µm
– Power dissipation lower than 250mW/mm2
– Current density lower than 7000 A/mm2
– Electrical field lower than 5V/ µm

2. Fabrication/Assembly

The manufacturing flows and procedures are described in section 4 of Vishay S.A.PID.

3. Test

Complete test sequence as detailed in ESCC Generic 4001 and the relevant Detail Specifications is conducted by Vishay S.A.

The deletion of the Third Harmonic Control requirement from ESCC Detail Specification No. 4001/023 for thin film wraparound technology is documented in reference report MAT/ 3HC/07.02 revision 3 dated 2007-06-20.

For variants with established reliability the efficiency of the Overload Test is increased with the implementation of a resistance change rejection criteria of 500 ppm and approved by TRB decisions on 2007-04-04.

4. Radiation Characteristics

The resistors covered in this technology domain is considered insensitive to radiation effects.