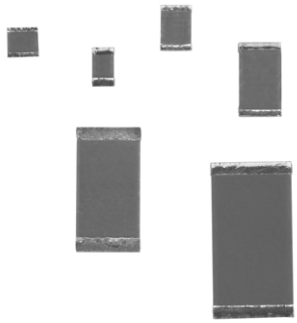
ESCC (ⓔ) 4001/026 Qualified *R* Failure Rate High Precision Thick Film Chip Resistors



FEATURES

HALOGEN FREE

- Load life stability at ± 70 °C for 2000 h: 2.5 % under P_n
- Temperature coefficient to: 100 ppm/°C
- HCHP option R0094: for high frequency applications (up to 10 GHz)
- Tolerances down to 1 %
- *R* failure rate (level E7)
- SMD wraparound chip resistor
- Generic specification ESCC 4001
- Detailed specification ESCC 4001/026
- Robust terminations
- Large ohmic value range 1 Ω to 10 MΩ
- ESCC (ⓔ) qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

LINKS TO ADDITIONAL RESOURCES

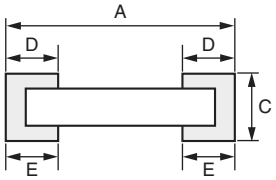
3D Models

Vishay Sfernice thick film chip resistors CHPFR are specially designed to meet the requirements of the ESCC 4001/026 specification. They have undergone the CNES evaluation (Space French National Agency). They are in level 1 of the ESCC EPPL (European Preferred Part List) and ESCC qualified. At the end of production a 100 % overload screening is performed.

Thin film technology terminations, with nickel barrier, are very convenient for high operating conditions. They can withstand thousands of very severe thermal shocks.

- SnPb (W/A) terminations over nickel barrier for solder reflow (variant 11 to 15)
- Gold (W/A) terminations gold over nickel barrier for gluing (variant 16 to 20)

DIMENSIONS in millimeters



VARIANT NUMBER	STYLE	DIMENSIONS in millimeters									
		A		B		C		D		E	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
11, 16	0603	1.36	1.68	0.72	0.98	0.38	0.53	0.17	0.51	0.25	0.51
12, 17	0805 (1)	1.75	2.07	1.14	1.4	0.38	0.53	0.17	0.51	0.25	0.51
13, 18	1206	2.89	3.21	1.47	1.73	0.38	0.53	0.17	0.51	0.25	0.51
14, 19	2010	4.92	5.24	2.41	2.67	0.5	0.63	0.25	0.64	0.25	0.64
15, 20	2512	6.19	6.51	2.93	3.32	0.5	0.63	0.25	0.64	0.25	0.64

Note

(1) Model CHPFR0805 being same size than case 0705 with same performances, only codification of CHPFR0805 remains

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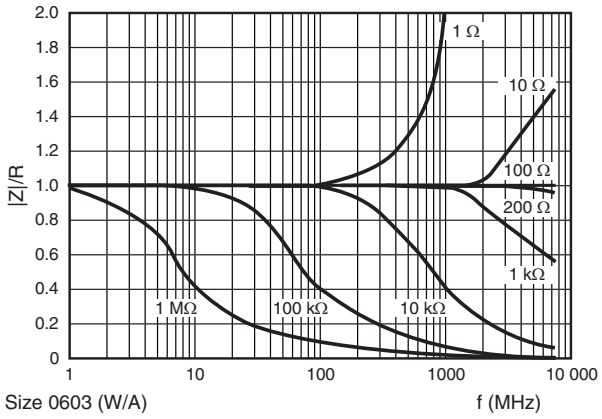
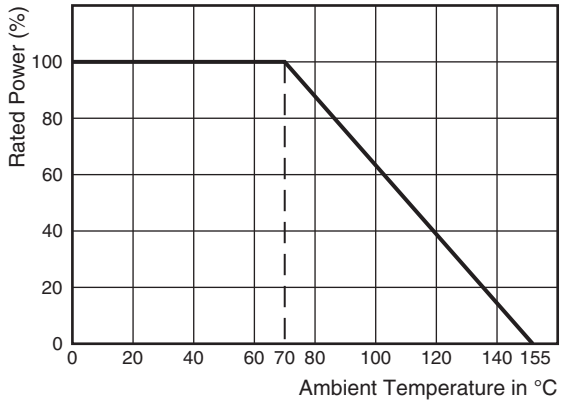
CLIMATIC SPECIFICATIONS	
Operating temperature range	-55 °C; +155 °C
Soldering temperature (T_{sol})	Thick film (ruthenium oxyde)

TYPICAL HF PERFORMANCE OF HCHP



POWER DERATING CURVE



MECHANICAL SPECIFICATIONS	
Substrate	Alumina
Technology	Thick film (ruthenium oxyde)
Protection	Epoxy coating
Terminations	**B (W/A):** SnPb over nickel barrier for solder reflow **G (W/A) type:** gold over nickel barrier for gluing

PACKAGING

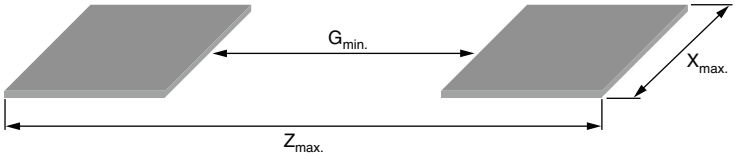
Waffle-pack or tape and reel when specified

SIZE	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
	WAFFLE PACK 2" x 2"	TAPE AND REEL (1)		
		MIN.	MAX.	
0603	100	100	5000	8 mm
0805			4000	
1206	140			
2010	60		2000	12 mm
2512	45			12 mm

Note

(1) MOQ for tape and reel: 50 pieces

SUGGESTED LAND PATTERN (please refer to IPC-7351A)



CHIP SIZE	$Z_{max.}$	$G_{min.}$	$X_{max.}$
0603	2.38	0.34	0.98
0805	2.77	0.73	1.40
1206	3.91	1.87	1.73
2010	5.94	3.64	2.67
2512	7.21	4.91	3.32

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STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RESISTANCE RANGE R_n Ω	POWER RATING (1) W	TOLERANCE (2) ± %	TEMPERATURE COEFFICIENT (2) (± 10^{-6}/°C)	CRITICAL RESISTANCE kΩ	TERMINAL MATERIAL AND FINISH
CHPFR	0603	1 to 10M	0.1	1, 2, 5	100, 200	25	E4
CHPFR	0805	1 to 10M	0.2	1, 2, 5	100, 200	50	E4
CHPFR	1206	1 to 10M	0.25	1, 2, 5	100, 200	160	E4
CHPFR	2010	1 to 10M	0.5	1, 2, 5	100, 200	180	E4
CHPFR	2512	1 to 10M	0.8	1, 2, 5	100, 200	112.5	E4
CHPFR	0603	1 to 10M	0.1	1, 2, 5	100, 200	25	E2
CHPFR	0805	1 to 10M	0.2	1, 2, 5	100, 200	50	E2
CHPFR	1206	1 to 10M	0.25	1, 2, 5	100, 200	160	E2
CHPFR	2010	1 to 10M	0.5	1, 2, 5	100, 200	180	E2
CHPFR	2512	1 to 10M	0.8	1, 2, 5	100, 200	112.5	E2

Notes

(1) At T_{amb} > +70 °C derate linearly to 0 W at T_{amb} = +155 °C

(2) Restrictions might apply depending on ohmic value please refer to Table 1

TABLE 1

RESISTANCE (Ω)	VALUE SERIES	AVAILABLE TOLERANCE (± %)	AVAILABLE TEMPERATURE COEFFICIENT (± 10^{-6}/°C)
$1 \le R_n < 10$	Any value in the resistance range to 3 significant figures	2, 5	200
$10 \le R_n < 1M$		1, 2, 5	100, 200
$R_n \ge 1M$		2, 5	200

MAXIMUM RATINGS

CHARACTERISTICS	VARIANT NUMBER	STYLE	SYMBOLS	LIMITS	UNITS	REMARKS
Limiting element voltage	11, 16	0603	U_L	50	V	-
	12, 17	0805		100		
	13, 18	1206		200		
	14, 19	2010		300		
	15, 20	2512		300		
Rated voltage	All	All	U_R	$\sqrt{(P_n \times R_n)}$	V	(1)
Isolation voltage	11, 16	0603	U_I	100	V	-
	12, 17	0805		200		
	13, 18	1206		300		
	14, 19	2010		300		
	15, 20	2512		300		
Operating temperature range	All	All	T_{op}	-65 to +155	°C	T_{amb}
Storage temperature range	All	All	T_{stg}	-65 to +155	°C	-
Soldering temperature	All	All	T_{sol}	+260	°C	(2)
Maximum weight	11, 16	0603		0.002	g	-
	12, 17	0805		0.004		
	13, 18	1206		0.008		
	14, 19	2010		0.026		
	15, 20	2512		0.042		

Notes

(1) Shall never exceed limiting element voltage. R_n = rated resistance

(2) Duration 10 s maximum

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PERFORMANCE

TEST	CONDITIONS	LIMITS REQUIRED BY THE ESCC4001/026 SPECIFICATION
Insulation resistance	ESCC4001 § 8.3.1.2 V = 100 V	1000 MΩ
Low temperature electrical measurement	ESCC4001 § 8.3.1.1 TC = 100 ppm/°C TC = 200 ppm/°C	 ± 0.8 % ± 1.6 %
High temperature electrical measurement	ESCC4001 § 8.3.3 TC = 100 ppm/°C TC = 200 ppm/°C	 ± 1.36 % ± 2.72 %
Rapid change of temperature	ESCC4001 § 8.8	± 0.25 + (0.05 Ω x 100/R_n) %
Robustness of terminations	ESCC4001 § 8.11.2	± 0.25 + (0.05 Ω x 100/R_n) %
Resistance to solder heat	ESCC4001 § 8.12	± 0.5 + (0.05 Ω x 100/R_n) %
Climatic sequence	ESCC4001 § 8.10	± 1 + (0.05 Ω x 100/R_n) %
Load life	ESCC4001 § 8.13 1000 h 2000 h	 ± 1.5 + (0.05 Ω x 100/R_n) % ± 2.5 + (0.05 Ω x 100/R_n) %

GLOBAL PART NUMBER INFORMATION

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

C	H	P	F	R	0	6	0	3	K	1	0	0	1	F	B	T	

GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING
CHPFR	**0603** **0805** **1206** **2010** **2512**	**K** = 100 ppm **L** = 200 ppm	The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. Example: **1R50** = 1.5 Ω **22R1** = 22.1 Ω **3901** = 3900 Ω **1004** = 1 MΩ	**F** = ± 1 % **G** = ± 2 % **J** = ± 5 %	**B**: SnPb over nickel barrier **G**: gold	For more information see Codification of Packaging table

GLOBAL PART NUMBER INFORMATION

ESCC Code: 400102613R1003F4

4	0	0	1	0	2	6	1	3	R	1	0	0	3	F	4

ESCC SPEC	VARIANT	FAILURE RATE	RESISTANCE VALUE	TOLERANCE	TEMPERATURE COEFFICIENT
4001026	**0603** = 11, 16 **0805** = 12, 17 **1206** = 13, 18 **2010** = 14, 19 **2512** = 15, 20	**R**	The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. Example: **3901** = 3900 Ω **1004** = 1 MΩ	**F** = ± 1 % **G** = ± 2 % **J** = ± 5 %	**4** = 100 ppm/°C **6** = 200 ppm/°C

Note

- MOQ for tape and reel: 50 pieces

CROSS REFERENCE BETWEEN ESA PART NUMBER AND VISHAY PART NUMBER

ESA PART NUMBER	VISHAY PART NUMBER	EXPLANATIONS				
4001026131003F4	CHPFR1206K1003FB	4001026 = CHPFR	13 = 1206 with B terminations	1003 = 1003 (100 kΩ)	F = F (tol. 1 %)	4 = K (TCR 100 ppm/°C)

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HYPER FREQUENCY OPTION

Hyper Frequency Option Numbering: HCHP0603K1001FBT55

H	C	H	P	0	6	0	3	K	1	0	0	1	F	B	T	5	5

GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING	OPTION
HCHP	**0603** **0805** **1206** **2010** **2512**	**K** = 100 ppm **L** = 200 ppm	The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. Example: **1R50** = 1.5 Ω **22R1** = 22.1 Ω **3901** = 3900 Ω **1004** = 1 MΩ	**F** = ± 1 % **G** = ± 2 % **J** = ± 5 %	**B**: SnPb over nickel barrier **G**: gold	**Blank** = waffle pack **T** = tape and reel	**094** = HiRel production

CROSS REFERENCE BETWEEN ESA PART NUMBER AND CHPFR PART NUMBER

VARIANT ESA	VISHAY MODELS
11	CHPFR0603/B terminations
12	CHPFR0805/B terminations
13	CHPFR1206/B terminations
14	CHPFR2010/B terminations
15	CHPFR2512/B terminations
16	CHPFR0603/G terminations
17	CHPFR0805/G terminations
18	CHPFR1206/G terminations
19	CHPFR2010/G terminations
20	CHPFR2512/G terminations

CODIFICATION OF PACKAGING

WAFFLE PACK	
W	100 min., 1 mult.
WA	100 min., 100 mult. (available only in size 1206)
PLASTIC TAPE	
T	100 min., 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 (quantity depending on size of chips)
PAPER TAPE	
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 (quantity depending on size of chips)

CODIFICATION OF OPTIONS ON TWO DIGITS

OPTION	OPTION 2 DIGITS
..	..
0099	99
0100	0A
0101	0B
0102	0C
0103	0D
0104	0E
0105	0F
..	..
0124	0Y
0125	0Z
0126	1A
0127	1B
0128	1C
..	..
0320	8M
0321	8N
0322	8O
0323	8P
0324	8Q
0325	8R
..	..

CODIFICATION OF SIZES

CODE 18	CODE 40
C	0603
D	0805
H	1206
J	2010
L	2512

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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 U_L whichever is less - duration 2 s

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