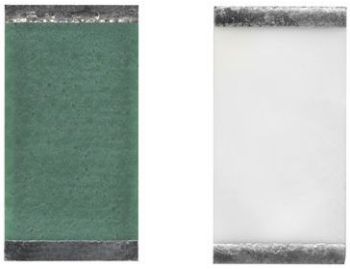
High Stability Resistor Chips (< 0.25 % at P_n at 70 °C During 1000 h) Thick Film Technology



LINKS TO ADDITIONAL RESOURCES

3D Models

Vishay Sfernice thick film resistor chips are specially designed to meet very stringent specifications in terms of reliability, stability < 0.25 % at P_n at +70 °C during 1000 h, homogeneity, reproducibility and quality.

They conform to specifications NFC 83-240 and MIL-R-55342 D.

Evaluated to ESCC 4001/026 (see CHPHR datasheet).

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

B (W/A), N (W/A), and F (one face) types are for solder reflow assembly.

G (W/A) and W (one face) types are for wire bonding, gluing and even high temperature solder reflow.

FEATURES

Pb-free Available

RoHS* Available

HALOGEN FREE

- CHP: standard passivated version for industrial, professional and military applications
- Robust terminations
- Large ohmic value range 0.1 Ω to 100 MΩ
- Tight tolerance to 0.5 %
- HCHP: for high frequency applications
- ESCC approved see CHPHR
- High temperature (245 °C) see CHPHT
- SMD wraparound chip resistor
- Withstand moisture resistance test of AEC-Q200
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RATED POWER P_n W	LIMITING ELEMENT VOLTAGE V	MAX. OVERLOAD VOLTAGE V	RESISTANCE RANGE (1) Ω	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	UNIT WEIGHT mg
CHP0502 HCHP0502	0502	0.050	50	100	0.1 to 25M	0.5, 1, 2, 5	100, 200	1
CHP0505 HCHP0505	0505	0.125	50	100	0.1 to 10M	0.5, 1, 2, 5	100, 200	3
CHP0603 HCHP0603	0603	0.125	50	100	0.1 to 25M	0.5, 1, 2, 5	100, 200	2
CHP0805 (2) HCHP0805	0805	0.200	150	300	0.1 to 25M	0.5, 1, 2, 5	100, 200	4
CHP1005 HCHP1005	1005	0.250	150	300	0.1 to 50M	0.5, 1, 2, 5	100, 200	5
CHP1206 HCHP1206	1206	0.250	200	400	0.1 to 50M	0.5, 1, 2, 5	100, 200	8
CHP1505 HCHP1505	1505	0.500	200	400	0.1 to 75M	0.5, 1, 2, 5	100, 200	8
CHP2010 HCHP2010	2010	1.000 (3)	200	400	0.1 to 100M	0.5, 1, 2, 5	100, 200	26
CHP1020 HCHP1020	1020	1.000 (3)	200	400	0.1 to 10M	0.5, 1, 2, 5	100, 200	25
CHP2208 HCHP2208	2208	0.750	200	400	0.1 to 100M	0.5, 1, 2, 5	100, 200	21
CHP2512 HCHP2512	2512	2.000 (3)	250	500	0.1 to 100M	0.5, 1, 2, 5	100, 200	42
CHP1010 HCHP1010	1010	0.500	200	400	0.1 to 25M	0.5, 1, 2, 5	100, 200	12

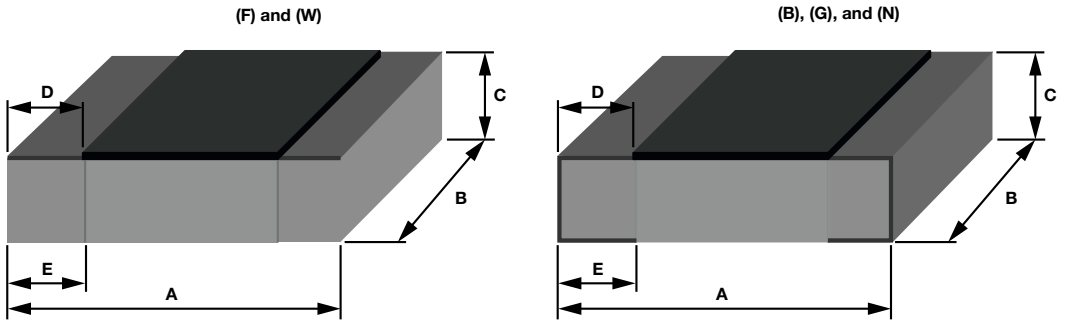
Notes

(1) Shall be read in conjunction with other tables

(2) Model CHP0805 being same size than case 0705 with same performances, only codification of CHP0805 remains

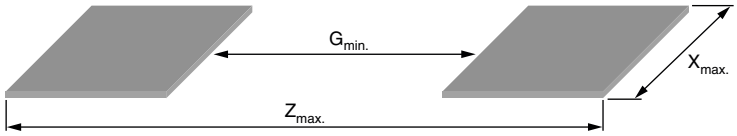
(3) With special assembly care

DIMENSIONS in millimeters



CASE SIZE	A	B	C	D	E
	± 0.152	± 0.127	± 0.127	± 0.127	± 0.127
0502	1.22	0.70	0.38	0.20	0.31
0505	1.22	1.25	0.38	0.20	0.31
0603	1.60	0.90	0.38	0.31	0.40
0805	1.85	1.25	0.38	0.31	0.50
1005	2.49	1.25	0.38	0.31	0.50
1010	2.49	2.64	0.38	0.31	0.50
1020	2.49	5.18	0.50	0.31	0.50
1206	3.00	1.73	0.38	0.40	0.50
1505	3.70	1.25	0.50	0.50	0.50
2010	5.03	2.64	0.50	0.50	0.50
2208	5.53	2.05	0.50	0.50	0.50
2512	6.30	3.30	0.50	0.50	0.50

SUGGESTED LAND PATTERN (to IPC-7351A) in millimeters



CASE SIZE	$Z_{max.}$	$G_{min.}$	$X_{max.}$
0502	1.77	0.19	0.83
0505	1.77	0.19	1.38
0603	2.15	0.39	1.03
0805	2.70	0.44	1.38
1005	3.34	1.08	1.38
1010	3.34	1.08	2.77
1020	3.34	1.08	5.31
1206	3.85	1.59	1.85
1505	4.55	2.29	1.38
2010	5.88	3.62	2.77
2208	6.38	4.12	2.18
2512	7.15	4.89	3.43

MECHANICAL SPECIFICATIONS	
Substrate	Alumina
Technology	Thick film (ruthenium oxide)
Protection	0.5 Ω < *R* < 100 MΩ: epoxy coating *R* ≤ 0.5 Ω: overglaze protection (no epoxy coating)
Terminations	**B (W/A):** SnPb over nickel barrier for solder reflow **N (W/A):** SnAg over nickel barrier for solder reflow **F (Flip Chip):** SnAg over nickel barrier for solder reflow **W (one face) and G (W/A) type:** gold over nickel barrier for other applications

Note

- Refer to Application Note "Guidelines for Vishay Sfernice Resistive and Inductive Components" (www.vishay.com/doc?52029) for recommended reflow profile. Profile #3 applies

CLIMATIC SPECIFICATIONS	
Operating temperature range	-55 °C; +155 °C

Note

- For temperature up to 215 °C please consult Vishay Sfernice

BEST TOL. AND TCR VS. OHMIC VALUE (1)		
OHMIC VALUE RANGE (Ω)	**TIGHTEST TOLERANCE (%)**	**BEST TCR (ppm/°C)**
10 ≤ *R* ≤ 5M	0.5 (D)	100 (K)
5 ≤ *R* ≤ 10M	1 (F)	100 (K)
1 ≤ *R* ≤ $R_{max.}$	2 (G)	200 (L)
0.5 ≤ *R* ≤ $R_{max.}$	5 (J)	200 (L)
0.1 ≤ *R* ≤ $R_{max.}$	5 (J)	300 (M)

Note

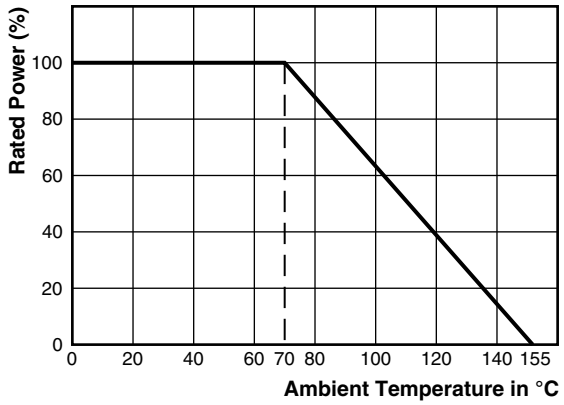
(1) Improved performance on request

CHIPS FOR HIGH FREQUENCY APPLICATIONS

The HF performance of flip chip and W/A types can be improved on request.

Please ask for HCHP

POWER DERATING CURVE



PACKAGING

ESD packaging available: Waffle pack and plastic tape and reel (low conductivity). Paper tapes available on request (ESD only).

SIZE	MOQ	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
		WAFFLE PACK 2" × 2"	TAPE AND REEL		
			MIN.	MAX.	
0502	100	400	100	4000	8 mm
0505		100			
0603				5000	
0805 0705				4000	
1005		221			
1206		140			
1505		60			
2010				2000	8 mm
1010		100		2500	8 mm
2208		60		4000	8 mm
1020		60		1000	8 mm
2512		50		2000	12 mm

PACKAGING RULES

Waffle Pack

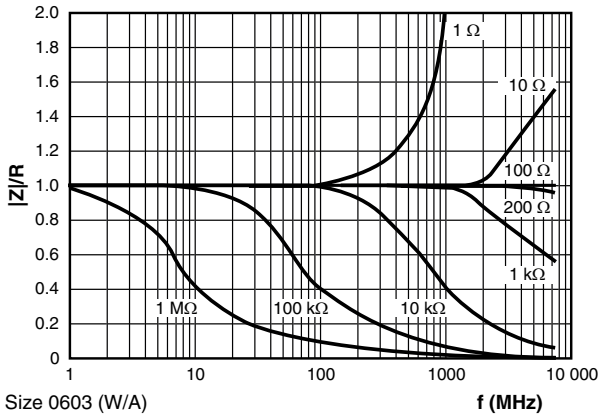
Can be filled up to maximum quantity indicated in the table here above, taking into account the minimum order quantity. When quantity ordered exceeds maximum quantity of a single waffle pack, the waffle packs are stacked up on the top of each other and closed by one single cover.

To get "not stacked up" waffle pack in case of ordered quantity > maximum number of pieces per package: Please consult Vishay Sfernice for specific ordering code

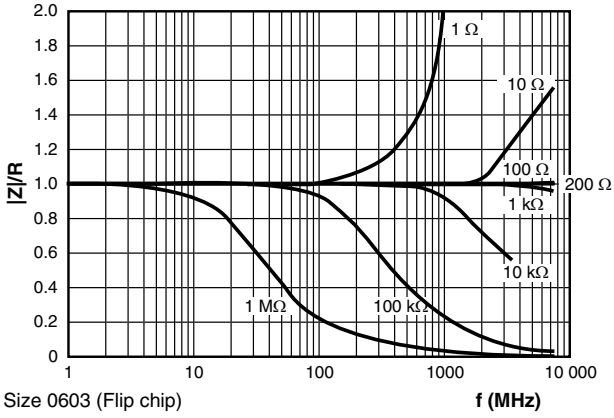
Tape and Reel

See Part Numbering information to get the quantity desired by tape.

TYPICAL HF PERFORMANCE OF HCHP



Size 0603 (W/A)



Size 0603 (Flip chip)

POPULAR OPTIONS

For any option it is recommended to consult Vishay Sfernice for availability first.

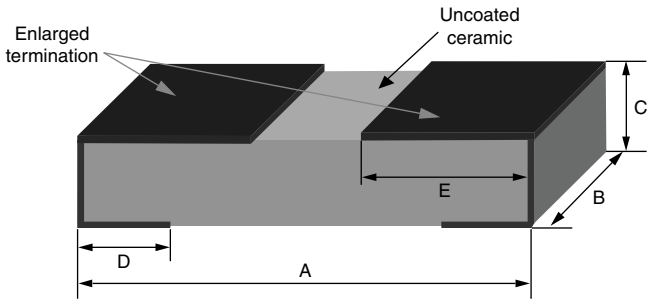
Option: Enlarged terminations: **0063**

For stringent and special power dissipation requirements, the thermal resistance between the resistive layer and the solder joint can be reduced using enlarged terminations chip resistors which are soldered on large and thick copper pads acting as heat sinks (see application note: 53048 Power Dissipation in High Precision Vishay Sfernice Chip Resistors and Arrays (P Thin Film, PRA Arrays, CHP Thick Film) www.vishay.com/doc?53048.

Option to order: 0063 (applies to size 1206 / 1505 / 1020 / 2010 / 2512).

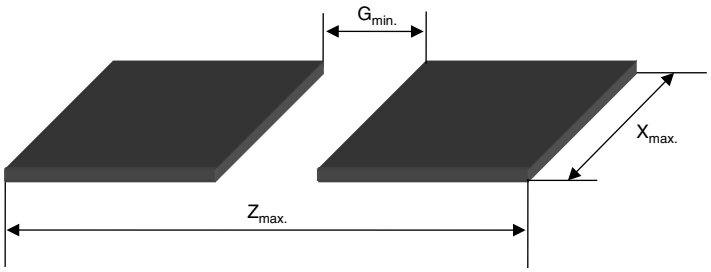
DIMENSIONS (Option 0063) in millimeters

Bottom view for mounting



CASE SIZE	A	B	C	D	E
	± 0.152	± 0.127	± 0.127	± 0.127	± 0.127
1206	3.00	1.73	0.38	0.40	1.19
1505	3.70	1.25	0.50	0.50	1.54
2010	5.03	2.64	0.50	0.50	2.20
1020	2.49	5.18	0.50	0.31	0.93
2208	5.53	2.05	0.50	0.50	2.45
2512	6.30	3.30	0.50	0.50	2.84

SUGGESTED LAND PATTERN (Option 0063)



CASE SIZE	DIMENSIONS (in millimeters)		
	$Z_{max.}$	$G_{min.}$	$X_{max.}$
1206	3.85	0.50	1.86
1505	4.55	0.50	1.38
2010	5.88	0.50	2.77
1020	3.34	0.50	5.31
2208	6.38	0.50	2.18
2512	7.15	0.50	3.43

OPTION: MARKING

Option to order 0013:

Marking of ohmic value and tolerance:
Sizes: 0805 to 1005: 3 digits marking (according to EIA-96)
Sizes: 1206 to 2010: 4 digits marking (same codification than in the ordering procedure)
Tolerance indicated by a color dot.

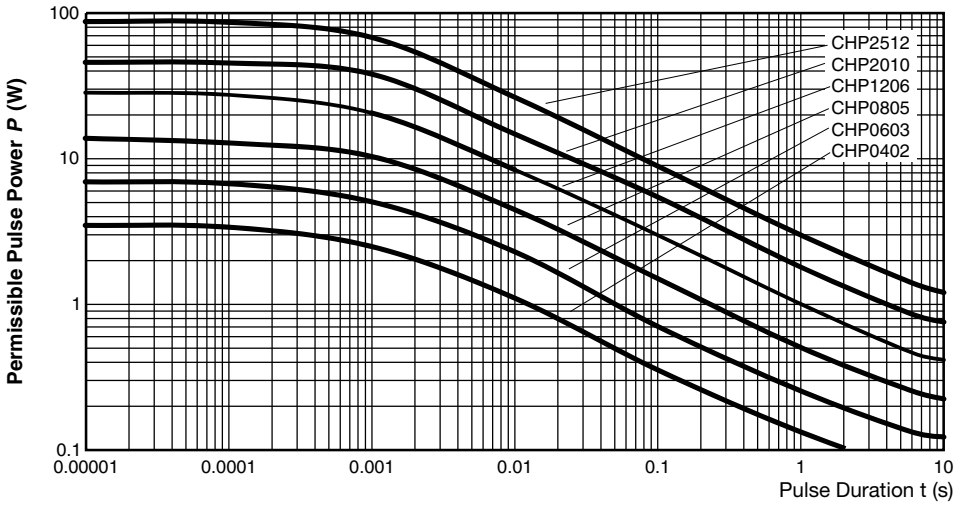
Option to order 0014:

Marking of ohmic value:
Sizes 0805 to 1005: 3 digits marking (according to EIA-96)
Sizes 1206 to 2010: 4 digits marking (same codification than in the ordering procedure)
No standard marking available for smaller sizes.
A price adder will apply to the unit price of the parts for options 0013 and 0014.

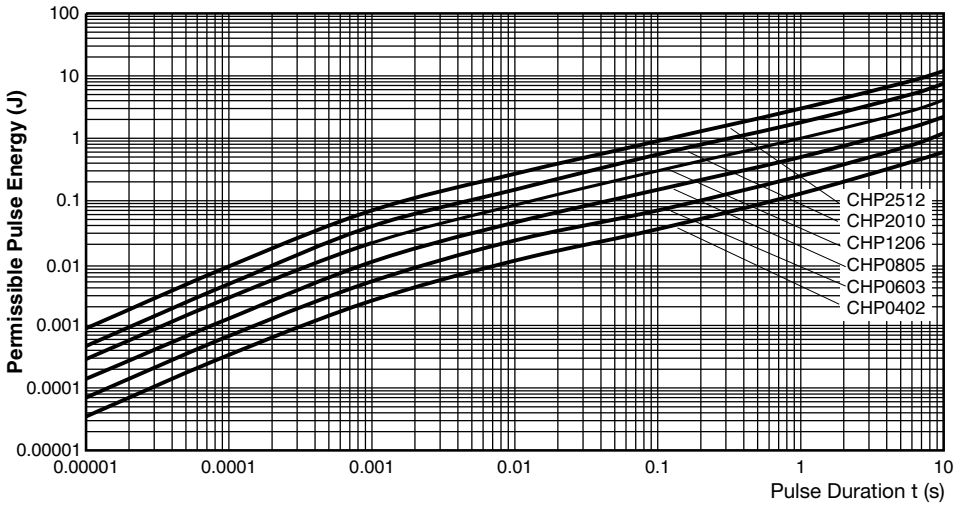
PERFORMANCE

TESTS	CONDITIONS	REQUIREMENTS	TYPICAL VALUES AND DRIFTS
Termination adhesion	5N for 10 s	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Resistance to solder heat	Immersion 10 s in Sn/Pb 60/40 at +260 °C	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Rapid temperature change	5 cycles -55 °C +155 °C	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Climatic sequence	Phase A dry heat Phase B damp heat Phase C cold -55 °C Phase D damp heat 5 cycles	± (1 % + 0.05 Ω)	< ± 0.2 %
Humidity (steady state)	56 days	± (1 % + 0.05 Ω)	< ± 0.2 %
Moisture resistance	AEC-Q200 85 °C / 85 % RH / P_n / 10 1000 h	5 % + 0.05 Ω	Max. < 3 % + 0.05 Ω
Short time overload	6.25 Pr for 2 s	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Load life	1000 h at rated power 90'/30' at +70 °C	1000 h ± (1 % + 0.05 Ω)	1000 h < 0.25 % 2000 h < 0.5 % 10 000 h < 1 %

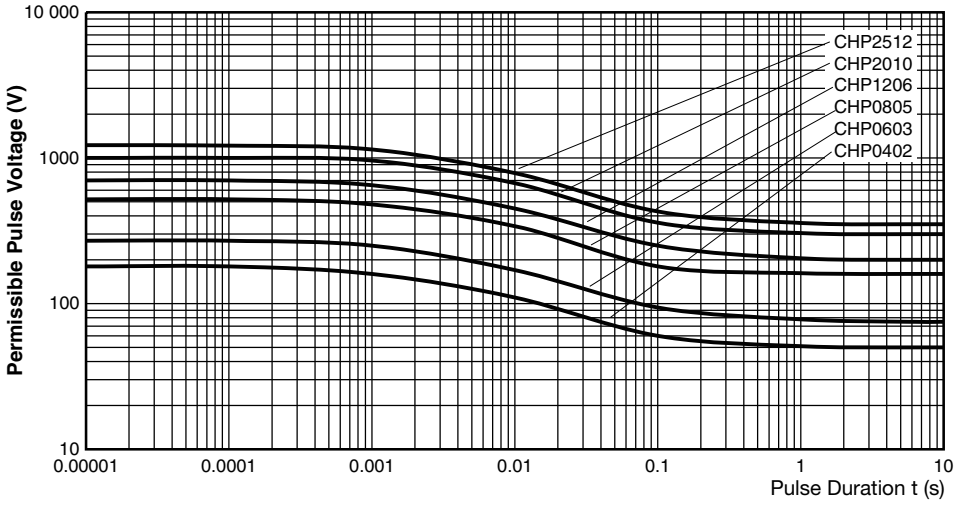
Maximum permissible pulse load P_i max. for single pulse (1)



Energy for single pulse (1)



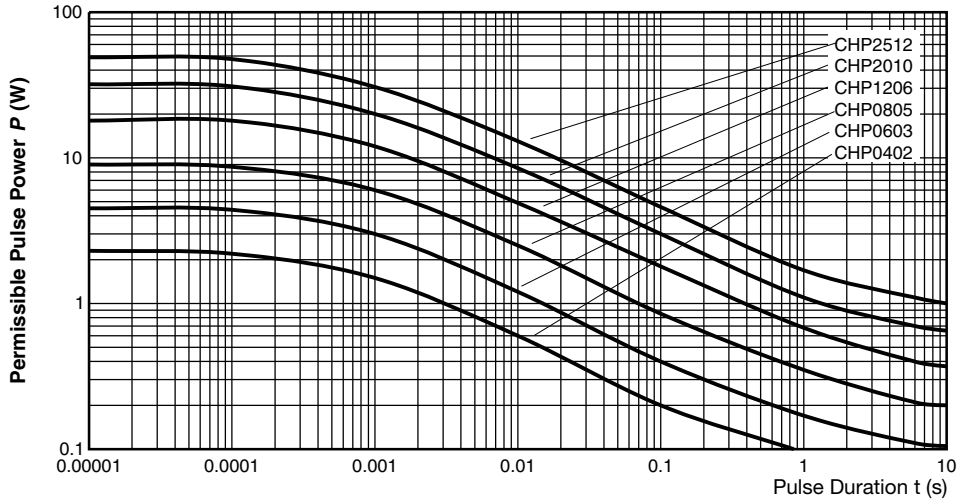
Maximum permissible pulse voltage U_i max. for single pulse (1)



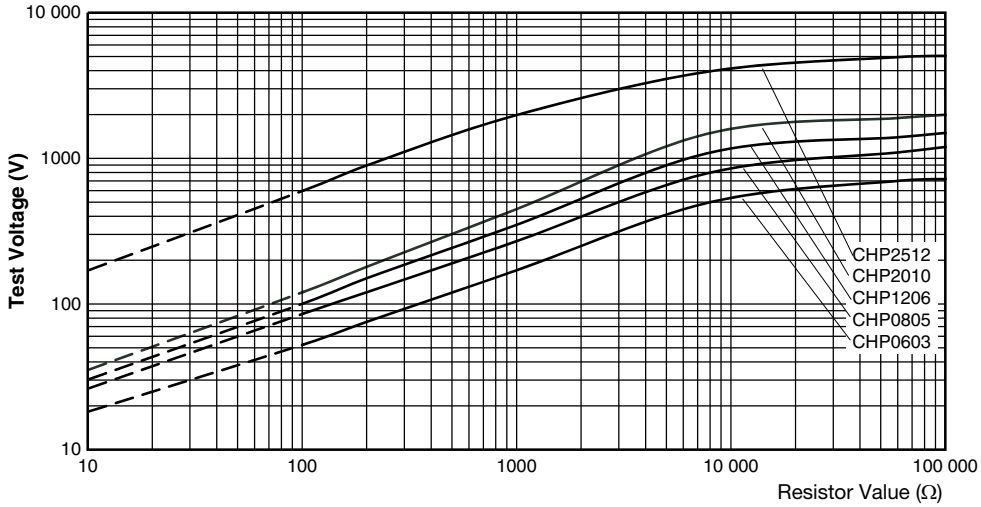
Note

(1) One should use the 3 curves together to get the right performances

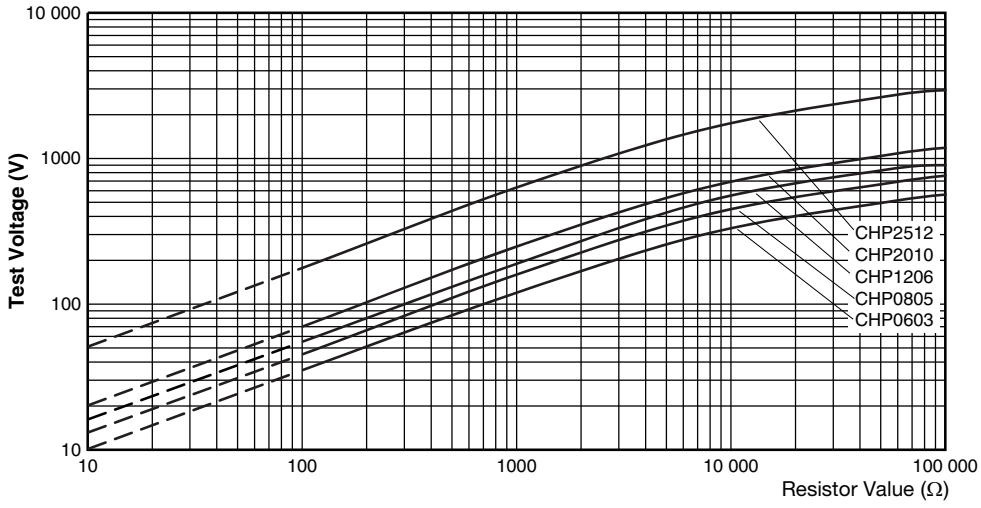
Maximum permissible pulse load P_l max.



1.2/50 µs lightning surge



10/700 µs lightning surge



GLOBAL PART NUMBER INFORMATION

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

C	H	P		0	8	0	5	K	1	0	0	1	F	B	T	9	9	9

GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING (1)	OPTION
CHP **HCHP** (3 or 4 digits)	**0502** **0505** **0603** **0805** **1005** **1206** **1505** **2010** **1020** **1010** **2208** **2512**	**K** = 100 ppm **L** = 200 ppm **M** = 300 ppm	The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point 10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ	**D** = ± 0.5 % **F** = ± 1 % **G** = ± 2 % **J** = ± 5 %	**B**: SnPb over nickel barrier **N**: SnAg over nickel barrier **F**: SnAg over nickel barrier (one face) **G**: gold over nickel barrier **W**: gold over nickel barrier (one face)	For more information see Codification of Packaging table	From 1 to 3 digits, leave blank if no option

B: lead bearing version
N and G: lead (Pb)-free / RoHS version

Historical Part Number Examples: **CHP2010K50R0FBT100 (tapes of 100 pieces)**
CHP0805K33R0FG0045 (CHP option 45)
HCHP0805K16R5FBT55 (HCHP option 55)
CHP2010L1006JN (waffle pack)

Notes

- Historical part numbers are not recommended but can still be used for ordering

(1) For paper tape please consult Vishay Sfernice

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

CODIFICATION OF SIZES

CODE 18	CODE 40	CODE 18	CODE 40
7	02016	M	22
8	0302	N	33
9	0402	O	44
A	0502	P	55
B	0505	Q	515
C	0603	R	48
D	0805	S	408
E	1005	T	816
F	1010	U	914
G	1020	V	073
H	1206	W	074
I	1505	X	100
J	2010	Y	135
K	2208	Z	182
L	2512		

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