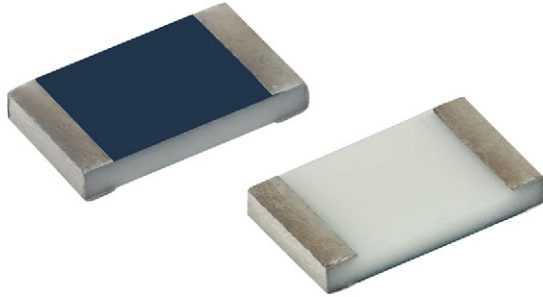


## High Stability Resistor Chips

### (< 0.25 % at $P_n$ at 70 °C During 1000 h) Thick Film Technology



#### LINKS TO ADDITIONAL RESOURCES



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

- 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](http://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

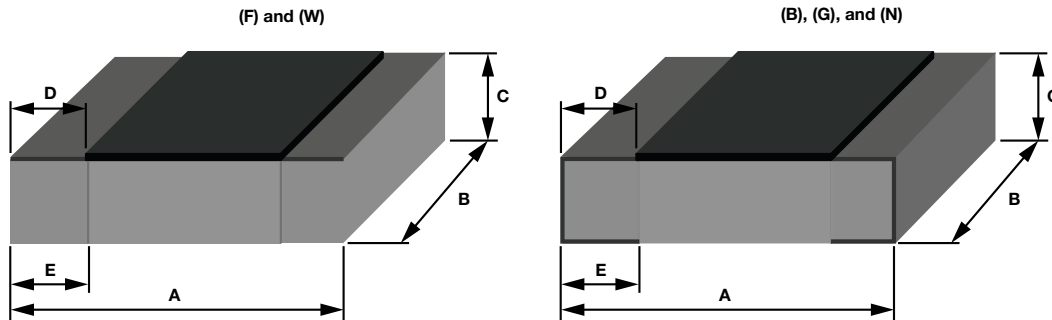
STANDARD ELECTRICAL SPECIFICATIONS								
MODEL	SIZE	RATED POWER $P_n$ W	LIMITING ELEMENT VOLTAGE V	MAX. OVERLOAD VOLTAGE V	RESISTANCE RANGE <sup>(1)</sup> Ω	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	UNIT WEIGHT mg
CHP0502 HCHP0502	0502	0.050	50	100	0.1 to 25M	0.5, 1, 2, 5	100, 200	1
CHP0505 HCHP0505	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 <sup>(2)</sup> 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 <sup>(3)</sup>	200	400	0.1 to 100M	0.5, 1, 2, 5	100, 200	26
CHP1020 HCHP1020	1020	1.000 <sup>(3)</sup>	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 <sup>(3)</sup>	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

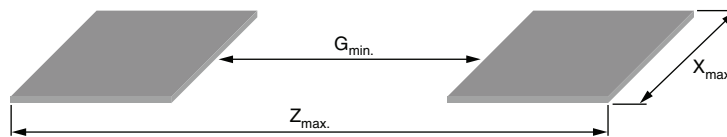
<sup>(1)</sup> Shall be read in conjunction with other tables

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

<sup>(3)</sup> With special assembly care

**DIMENSIONS** in millimeters


CASE SIZE	A	B	C	D	E
	$\pm 0.152$	$\pm 0.127$	$\pm 0.127$	$\pm 0.127$	$\pm 0.127$
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 <sub>max.</sub>	G <sub>min.</sub>	X <sub>max.</sub>
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>B (W/A):</b> SnPb over nickel barrier for solder reflow <b>N (W/A):</b> SnAg over nickel barrier for solder reflow <b>F (Flip Chip):</b> SnAg over nickel barrier for solder reflow <b>W (one face) and G (W/A) type:</b> 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](http://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 <sub>max.</sub>	2 (G)	200 (L)
0.5 ≤ R ≤ R <sub>max.</sub>	5 (J)	200 (L)
0.1 ≤ R ≤ R <sub>max.</sub>	5 (J)	300 (M)

**Note**

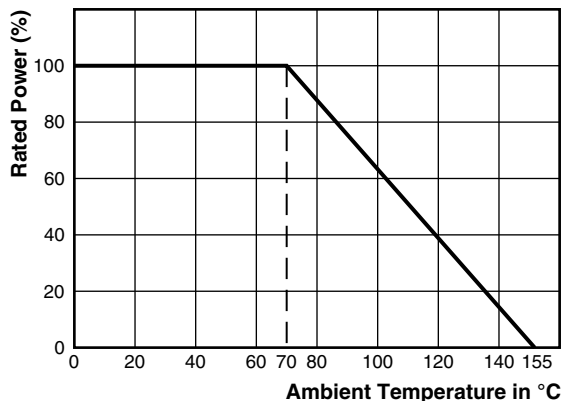
- (1) Improved performance on request

**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" x 2"	TAPE AND REEL			
			MIN.	MAX.		
0502	100	400	100	4000	8 mm	
0505		100		4000		
0603				5000		
0805				4000		
0705		2500				
1005					4000	
1206				4000		
1010		4000				
1505					2000	
2010				2000		
2208		2000				
1020					2000	
2512				50		2000

**PACKAGING RULES**

**Waffle Pack**

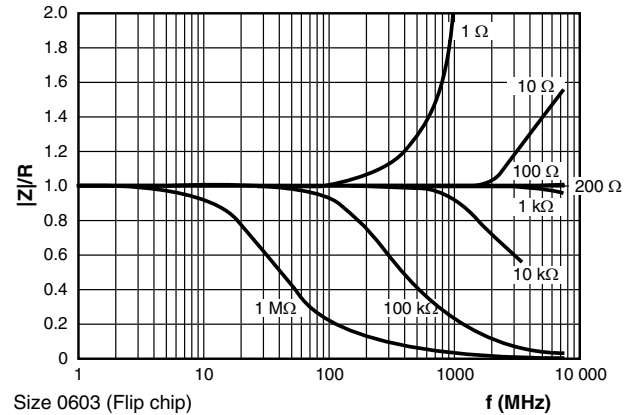
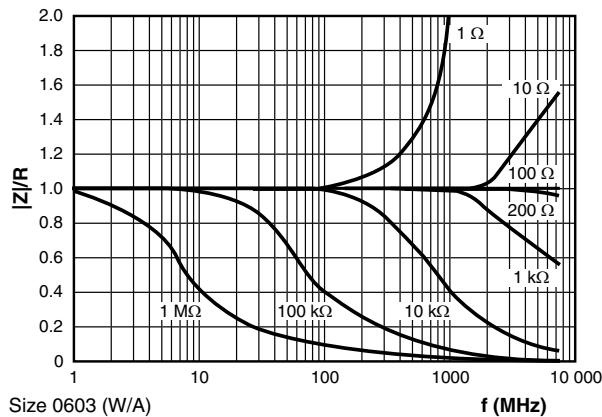
Can be filled up to maximum quantity indicated in the table here above, taking into account the minimum order quantity. When quantity ordered exceeds maximum quantity of a single waffle pack, the waffle packs are stacked up on the top of each other and closed by one single cover.

**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



## POPULAR OPTIONS

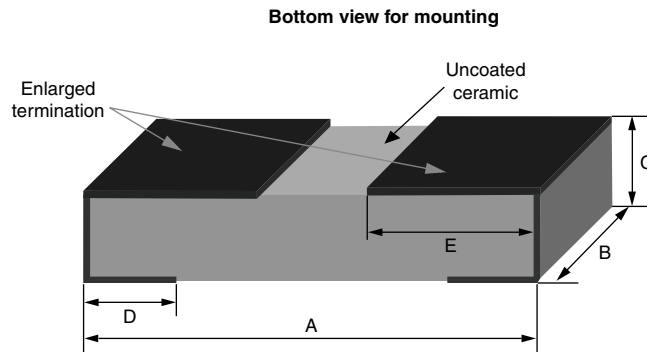
For any option it is recommended to consult Vishay Sfernice for availability first.

Option: Enlarged terminations: **0063**

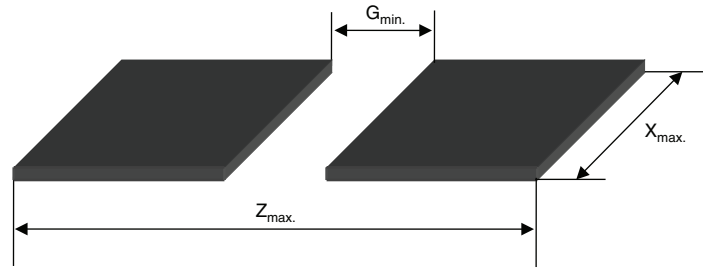
For stringent and special power dissipation requirements, the thermal resistance between the resistive layer and the solder joint can be reduced using enlarged terminations chip resistors which are soldered on large and thick copper pads acting as heat sinks (see application note: 53048 Power Dissipation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

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

## DIMENSIONS (Option 0063) in millimeters



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 <sub>max.</sub>	G <sub>min.</sub>	X <sub>max.</sub>
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)

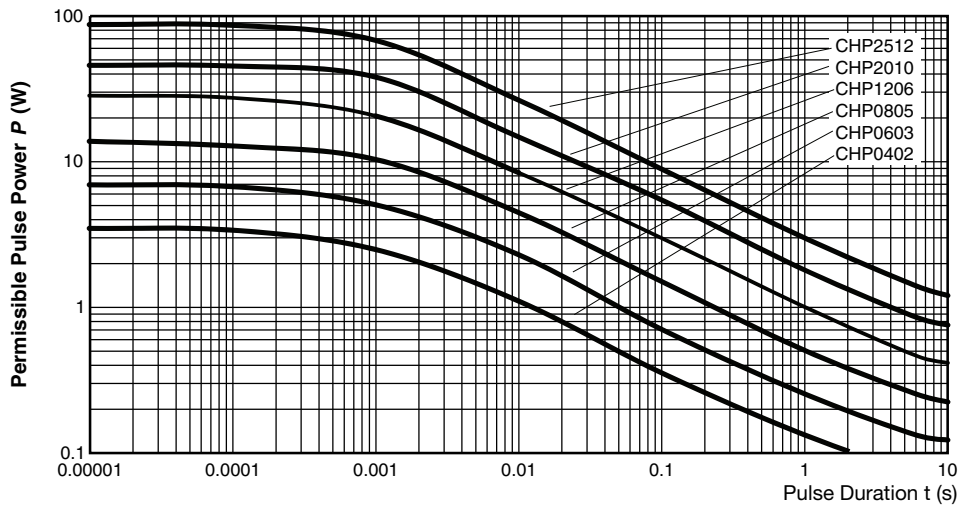
No standard marking available for smaller sizes.

A price adder will apply to the unit price of the parts for options 0013 and 0014.

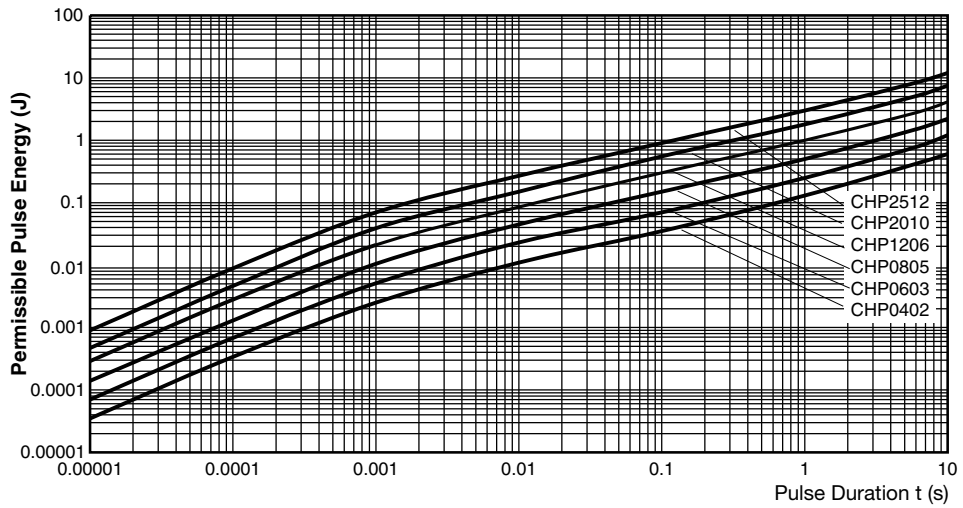
**PERFORMANCE**

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 <sub>n</sub> / 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    2000 h    10 000 h < 0.25 %   < 0.5 %   < 1 %

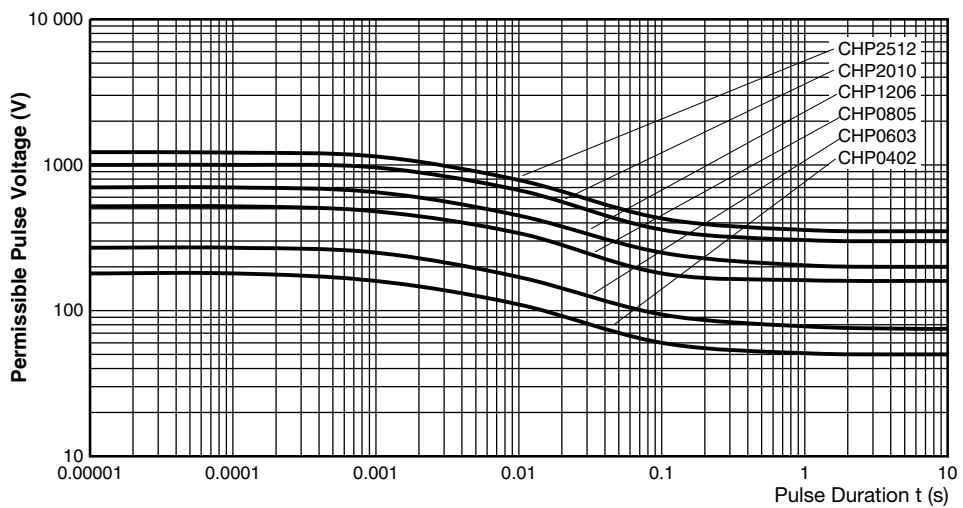
Maximum permissible pulse load  $P_i$  max. for single pulse <sup>(1)</sup>



Energy for single pulse <sup>(1)</sup>



Maximum permissible pulse voltage  $U_i$  max. for single pulse <sup>(1)</sup>

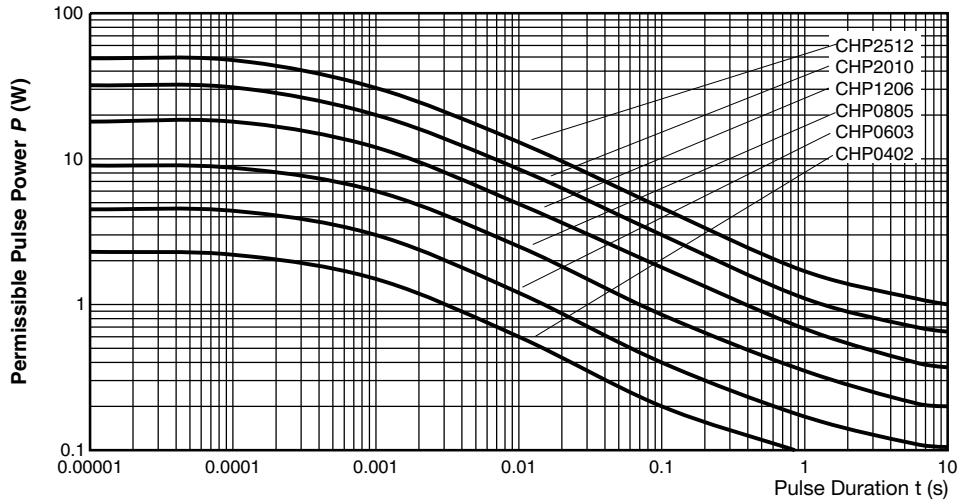


**Note**

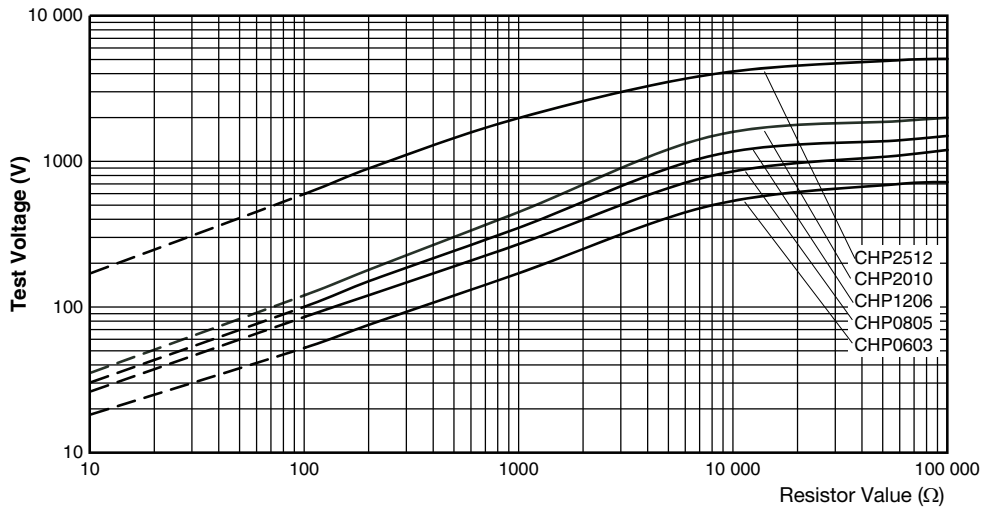
<sup>(1)</sup> One should use the 3 curves together to get the right performances



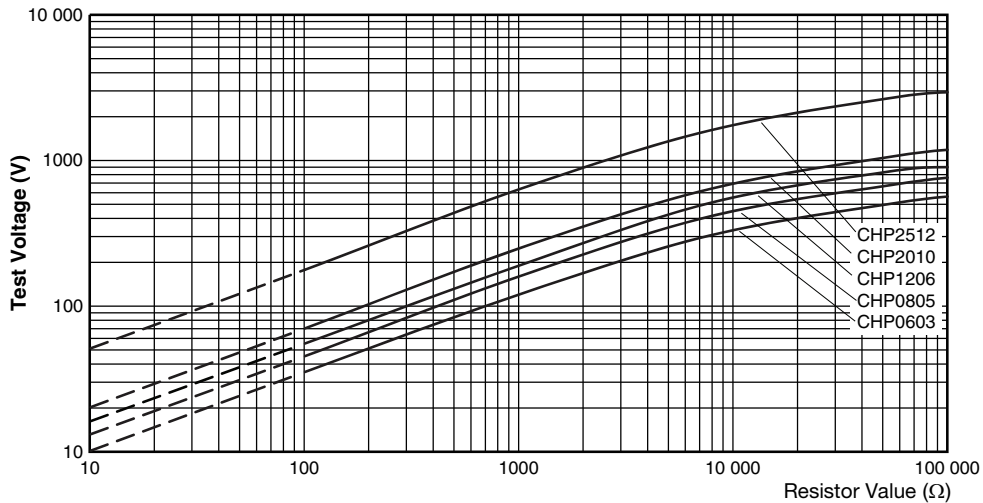
Maximum permissible pulse load  $P_i$  max.



1.2/50  $\mu$ s lightning surge



10/700  $\mu$ s 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)  B: lead bearing version N and G: lead (Pb)-free / RoHS version	For more information see Codification of Packaging table	From 1 to 3 digits, leave blank if no option											
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	
<b>WAFFLE PACK</b>	
W	100 min., 1 mult.
WA	100 min., 100 mult. (available only in size 1206)
<b>PLASTIC TAPE</b>	
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)
<b>PAPER TAPE</b> (available upon request for sizes 0603, 0805, and 1206)	
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		



## **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.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. 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.