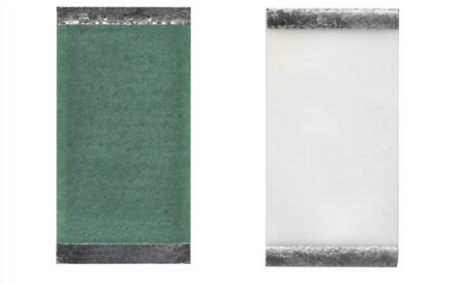
High Stability Resistor Chips (< 0.25 % at Pn at 70 °C during 1000 h) Thick Film Technology



Vishay Sfernice thick film resistor chips are specially designed to meet very stringent specifications in terms of reliability, stability < 0.25 % at Pn 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).

Sputtered Thin Film 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
- Halogen-free according to IEC 61249-2-21 definition
- 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

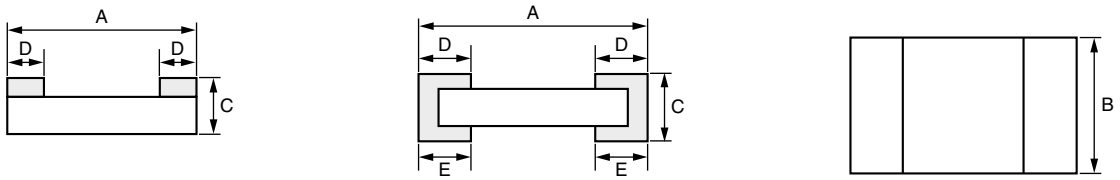
MODEL	SIZE	RATED POWER Pn W	LIMITING ELEMENT VOLTAGE V	MAX. OVERLOAD VOLTAGE V	RESISTANCE RANGE (1) Ω	TOLERANCE ± %	TEMPERATURE COEFFICIENT ± ppm/°C	UNIT WEIGHT mg
CHP0502 HCHP0502	0502	0.050	50	100	0.1 to 25M	0.5, 1, 2, 5	100, 200	1
CHP0505 HCHP0505	0505	0.125	50	100	0.1 to 10M	0.5, 1, 2, 5	100, 200	3
CHP0603 HCHP0603	0603	0.125	50	100	0.1 to 25M	0.5, 1, 2, 5	100, 200	2
CHP0805 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 (2)	200	400	0.1 to 100M	0.5, 1, 2, 5	100, 200	26
CHP1020 HCHP1020	1020	1.000 (2)	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 CHP2512	2512	2.000 (2)	250	500	0.1 to 100M	0.5, 1, 2, 5	100, 200	42
CHP1010 CHP1010	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

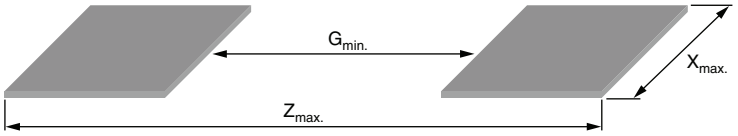
(2) With special assembly care

DIMENSIONS in millimeters (inches)



CASE SIZE	A		B		C		D/E	
	VALUE	TOL.	VALUE	TOL.	VALUE	TOL.	VALUE	TOL.
0502	1.27 (0.050)	0.152 (0.006)	0.60 (0.024)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
0505	1.27 (0.050)	0.152 (0.006)	1.27 (0.050)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
0603	1.52 (0.060)	0.152 (0.006)	0.85 (0.033)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
0805	1.91 (0.075)	0.152 (0.006)	1.27 (0.050)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
1005	2.54 (0.100)	0.152 (0.006)	1.27 (0.050)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
1206	3.05 (0.120)	0.152 (0.006)	1.70(0.067)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
1505	3.81 (0.150)	0.152 (0.006)	1.32 (0.052)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
2010	5.08 (0.200)	0.152 (0.006)	2.54 (0.100)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
1020	2.54 (0.100)	0.152 (0.006)	5.08 (0.200)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
2208	5.58 (0.220)	0.152 (0.006)	2.00 (0.079)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
2512	6.35 (0.250)	0.152 (0.006)	3.30 (0.130)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)
1010	2.54 (0.100)	0.152 (0.006)	2.54 (0.100)	0.127 (0.005)	0.5 (0.020)	0.127 (0.005)	0.38 (0.015)	0.127 (0.005)

SUGGESTED LAND PATTERN (to IPC-7351A)



CASE SIZE	DIMENSION IN MM (INCHES)		
	ZMAX.	GMIN.	XMAX.
0502	1.82 (0.072)	0.10 (0.004)	0.73 (0.029)
0505	1.82 (0.072)	0.10 (0.004)	1.40 (0.055)
0603	2.37 (0.093)	0.35 (0.014)	0.98 (0.038)
0805	2.76 (0.109)	0.74 (0.029)	1.40 (0.055)
1005	3.39 (0.134)	1.37 (0.054)	1.40 (0.055)
1206	3.90 (0.154)	1.88 (0.074)	1.73 (0.068)
1505	4.66 (0.184)	2.64 (0.104)	1.45 (0.057)
2010	5.93 (0.234)	3.91 (0.154)	2.67 (0.105)
1020	3.39 (0.134)	1.37 (0.054)	5.21 (0.205)
2208	6.43 (0.253)	4.41 (0.174)	2.04 (0.080)
2512	7.20 (0.284)	5.18 (0.204)	3.19 (0.125)
1010	3.39 (0.134)	1.37 (0.054)	2.67 (0.105)

MECHANICAL SPECIFICATIONS	
Substrate	Alumina
Technology	Thick film (ruthenium oxyde)
Protection	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" (document number: 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 in Ω	**TIGHTEST TOLERANCE (%)**	**BEST TCR (ppm/°C)**
$10\ \Omega < R < 5M$	0.5 % (D)	100 (K)
$5\ \Omega < R < 10M$	1 % (F)	100 (K)
$1\ \Omega < R < R_{max.}$	2 % (G)	200 (L)
$0.1\ \Omega < R < R_{max.}$	5 % (J)	200 (L)

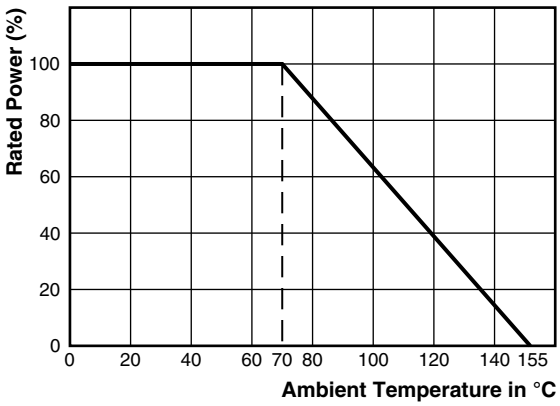
Note

(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	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
	WAFFLE PACK	TAPE AND REEL		
		MIN.	MAX.	
0502	100	100	4000	8 mm
0505				
0603				
0805				
1005	140			
1206				
1505	60			
2010			1000	8 mm
1010	100		4000	8 mm
2208	60		1000	8 mm
1020	60			8 mm
2512	45		2000	8 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.

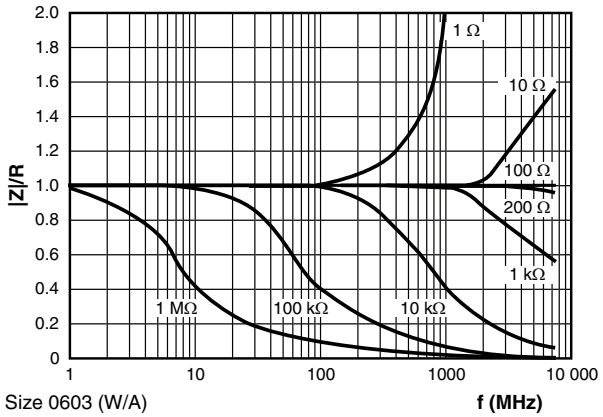
To get "not stacked up" waffle pack in case of ordered quantity > maximum number of pieces per package: Please consult Vishay Sfernice for specific ordering code

Tape and Reel

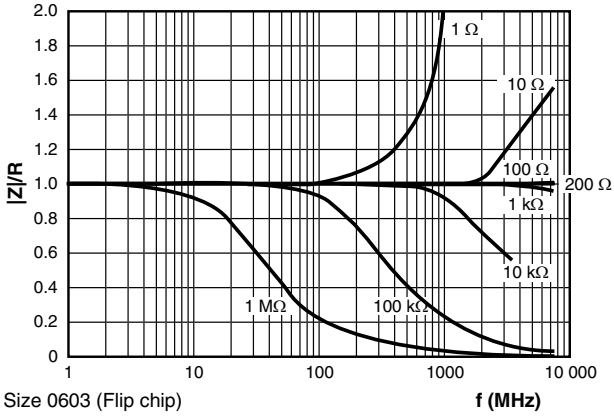
Can be filled up to maximum quantity indicated in the table here above, taking into account the minimum order quantity. When quantity ordered is between the MOQ and the maximum reel capacity, only one reel is provided.

When several reels are needed for ordered quantity within MOQ and maximum reel capacity: Please consult Vishay Sfernice for specific ordering code

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.

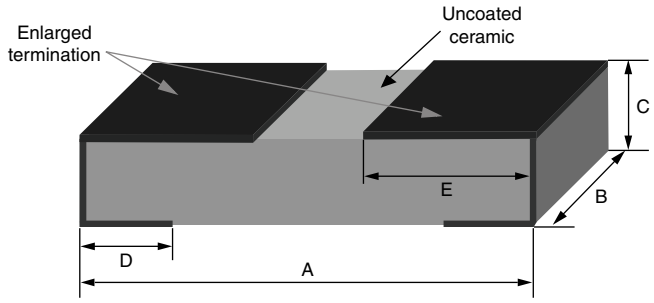
Option: Enlarged terminations: **0063**

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).

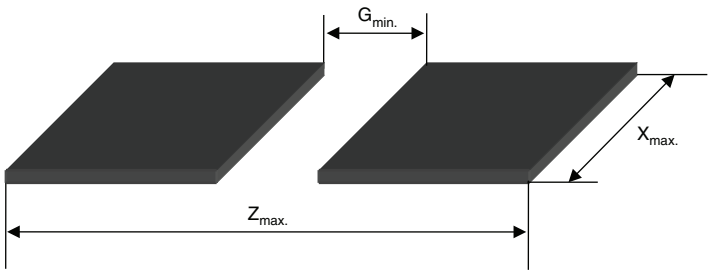
DIMENSIONS (Option 0063) in millimeters

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.

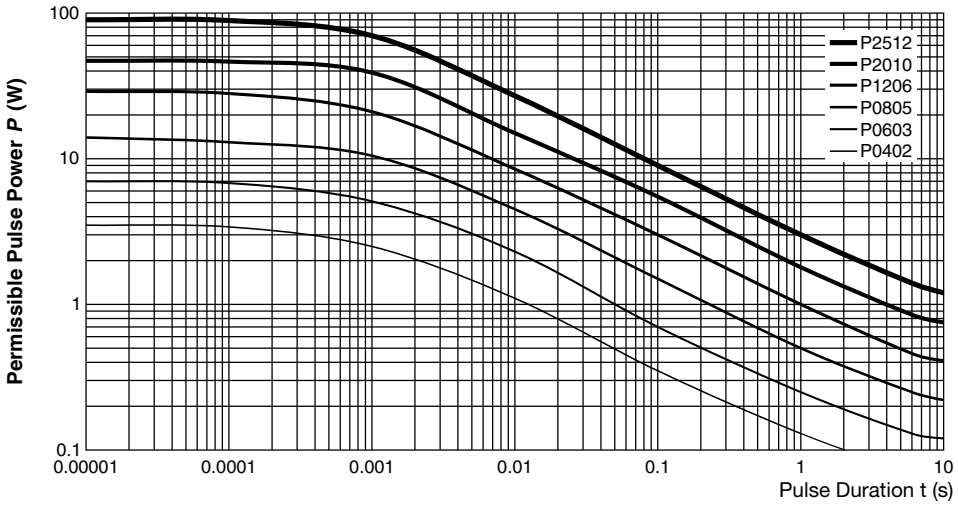
Option to order 0014:

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.

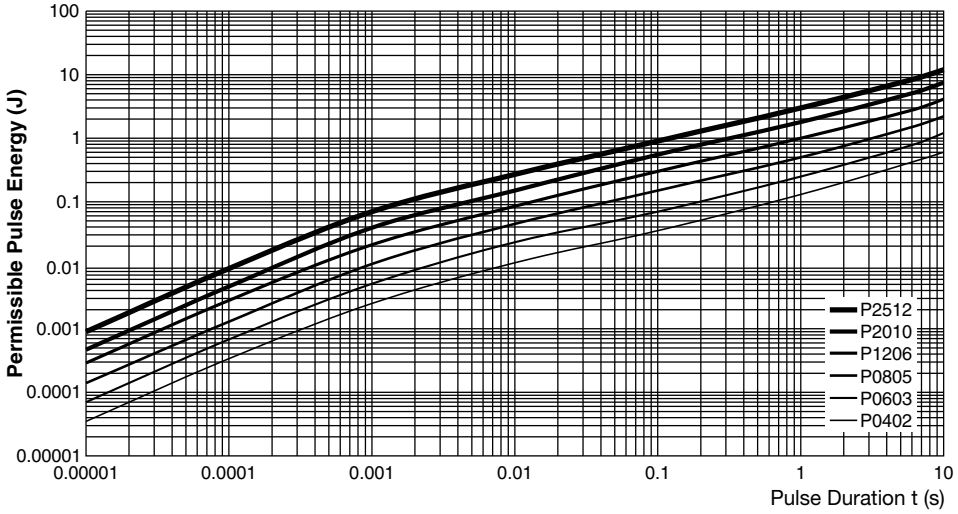
PERFORMANCE

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/Pn/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 %

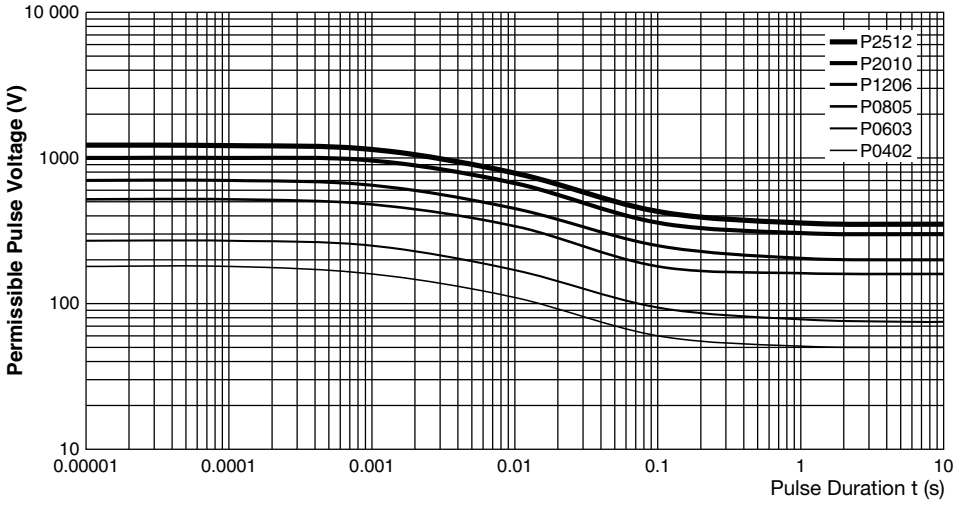
Maximum permissible pulse load P_i max. for single pulse (1)



Energy for single pulse (1)



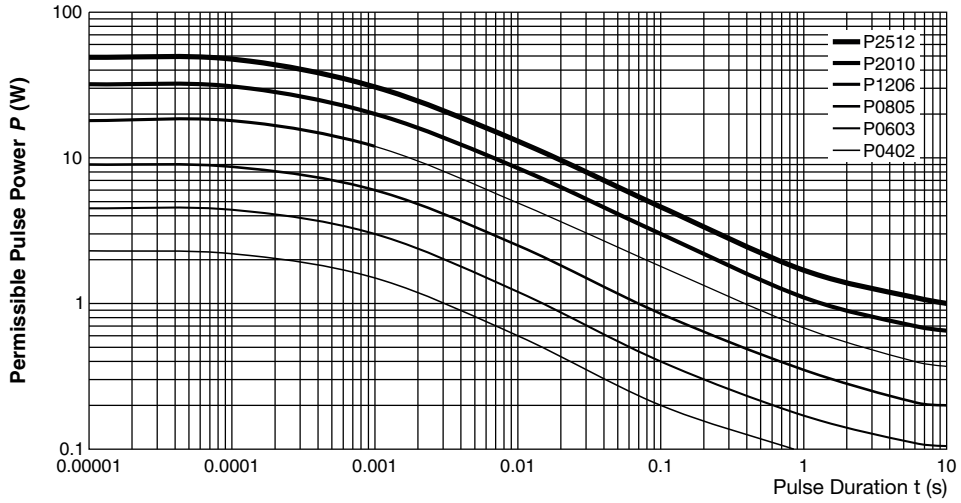
Maximum permissible pulse voltage U_i max. single pulse (1)



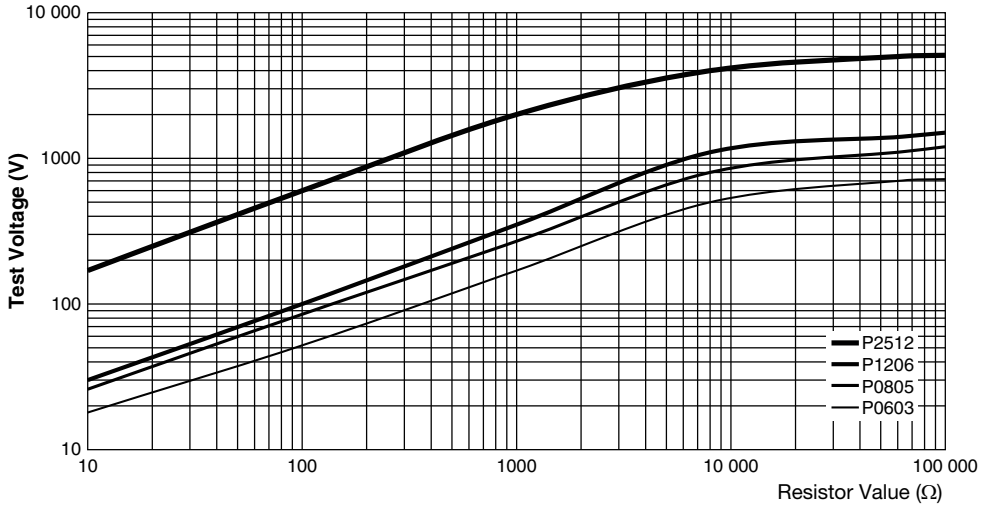
Note

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

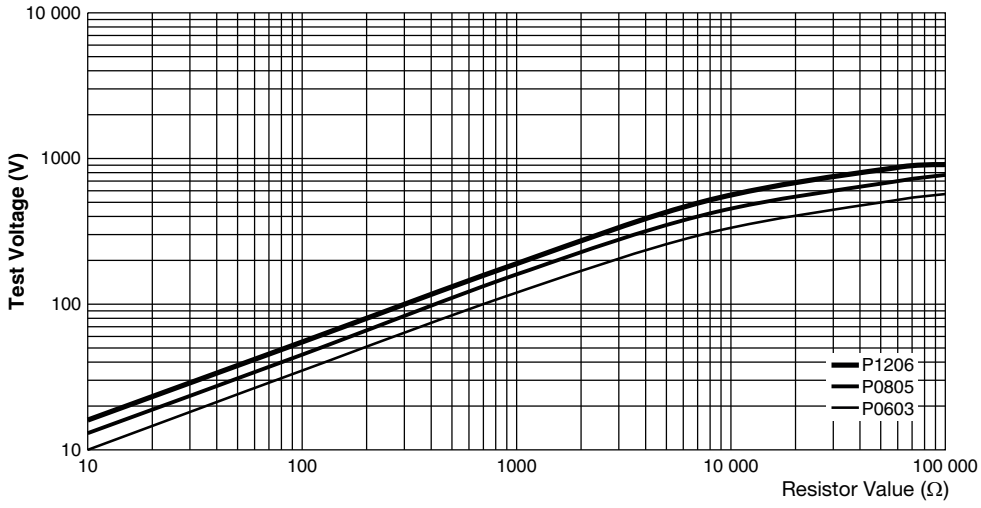
Maximum permissible pulse load P_l max.



1.2/50 µs lightning surge



10/700 µs lightning surge



GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CHP0805K1001FBT131 (preferred part number format)

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

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	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	**Blank** = Waffle pack **T** = Tape and reel **PT** = Paper tape (2)	Leave blank if no option

Historical Part Number example: CHP 0805 100 ppm 1K 1 % B TR R0131 (will continue to be accepted)

CHP	0805	100 ppm	1K	1 %	B	TR	R0151	e2
HISTORICAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	TAPE	OPTION	RoHS
CHP **HCHP** (3 or 4 digits)	**0502** **0505** **0603** **0805** **1005** **1206** **1505** **2010** **1020** **1010** **2208** **2512**	In clear	In clear	In clear	**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		Leave blank if no option	**e2**: Tin/silver **e4**: Gold **Blank**: SnPb

Notes

(1) For specific quantity of parts per packaging please consult Vishay Sfernice

(2) For paper tape please consult Vishay Sfernice

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.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. 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.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.