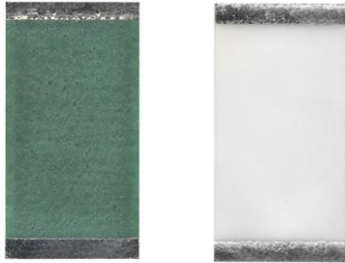


## High Stability Resistor Chips

### (< 0.25 % at Pn at 70 °C during 1000 h) Thick Film Technology


**DESIGN SUPPORT TOOLS**
[click logo to get started](#)
**3D**  
 Models  
 Available

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**

- 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](http://www.vishay.com/doc?99912)


**RoHS\***  
 Available  
**HALOGEN**  
**FREE**
**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

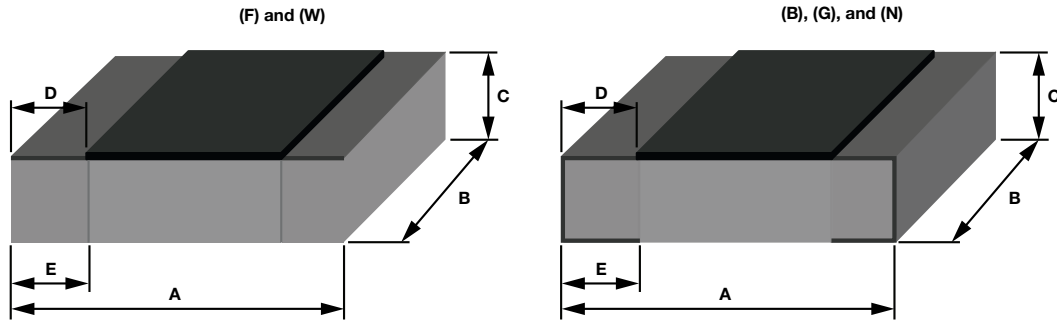
| STANDARD ELECTRICAL SPECIFICATIONS |      |                        |                               |                            |                                      |                  |                                     |                   |
|------------------------------------|------|------------------------|-------------------------------|--------------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

**Notes**

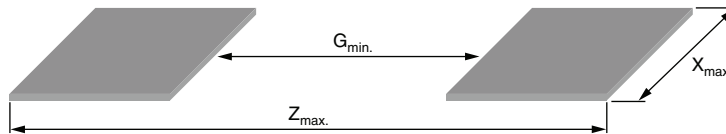
<sup>(1)</sup> Shall be read in conjunction with other tables

<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       |
|-----------|---------|---------|---------|---------|---------|
|           | ± 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 <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<br>R ≤ 0.5 Ω: overglaze protection (no epoxy coating)  |
| Terminations              | <p><b>B (W/A):</b><br/>SnPb over nickel barrier for solder reflow</p> <p><b>N (W/A):</b><br/>SnAg over nickel barrier for solder reflow</p> <p><b>F (Flip Chip):</b><br/>SnAg over nickel barrier for solder reflow</p> <p><b>W (one face) and G (W/A) type:</b><br/>gold over nickel barrier for other applications</p> |

**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 in Ω                | TIGHTEST TOLERANCE (%) | BEST TCR (ppm/°C) |
| 10 Ω < R < 5M                         | 0.5 % (D)              | 100 (K)           |
| 5 Ω < R < 10M                         | 1 % (F)                | 100 (K)           |
| 1 Ω < R < R <sub>max.</sub>           | 2 % (G)                | 200 (L)           |
| 0.1 Ω < R < R <sub>max.</sub>         | 5 % (J)                | 200 (L)           |

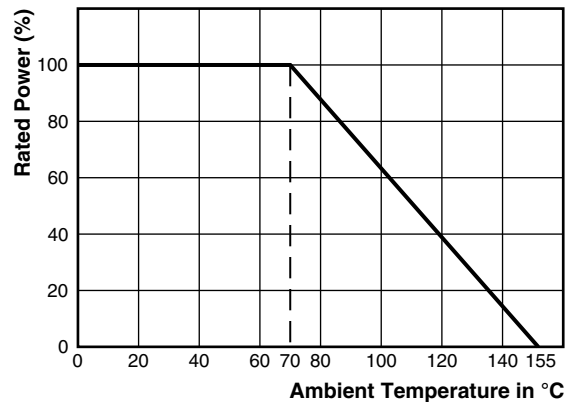
**Note**

- (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 | MOQ | NUMBER OF PIECES PER |                    | TAPE WIDTH |      |
|------|-----|----------------------|--------------------|------------|------|
|      |     | WAFFLE PACK          | TAPE AND MIN. MAX. |            |      |
| 0502 | 100 | 400                  | 4000               | 8 mm       |      |
| 0505 |     | 100                  |                    |            | 5000 |
| 0603 |     |                      | 100                |            |      |
| 0805 |     | 60                   |                    |            | 2000 |
| 1005 |     |                      | 140                |            |      |
| 1206 |     | 100                  |                    |            | 4000 |
| 1505 |     |                      | 60                 | 1000       |      |
| 2010 |     | 50                   |                    |            | 2000 |
| 1010 |     |                      | 50                 | 2000       |      |
| 2208 |     | 50                   |                    |            | 2000 |
| 1020 |     |                      | 50                 | 2000       |      |
| 2512 |     | 50                   |                    |            | 2000 |

**PACKAGING RULES**

**Waffle Pack**

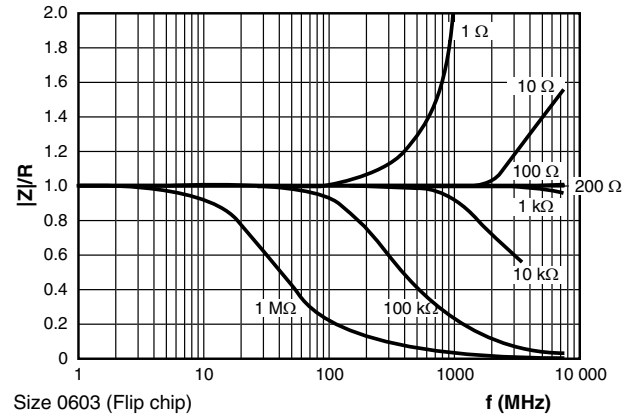
Can be filled up to maximum quantity indicated in the table here above, taking into account the minimum order quantity. When quantity ordered exceeds maximum quantity of a single waffle pack, the waffle packs are stacked up on the top of each other and closed by one single cover.

**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

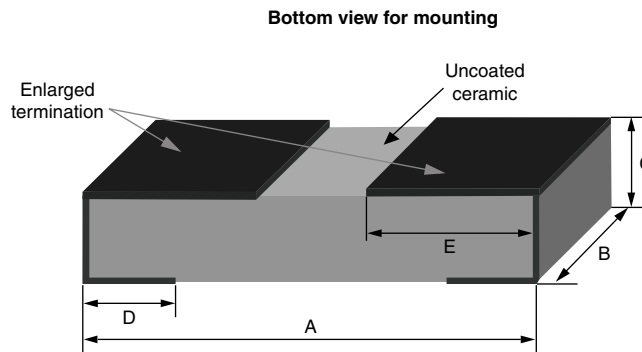
For any option it is recommended to consult Vishay Sfernice for availability first.

Option: Enlarged terminations: **0063**

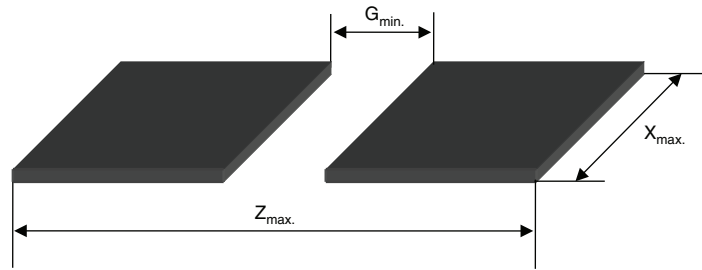
For stringent and special power dissipation requirements, the thermal resistance between the resistive layer and the solder joint can be reduced using enlarged terminations chip resistors which are soldered on large and thick copper pads acting as heat sinks (see application note: 53048 Power Dissipation 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.

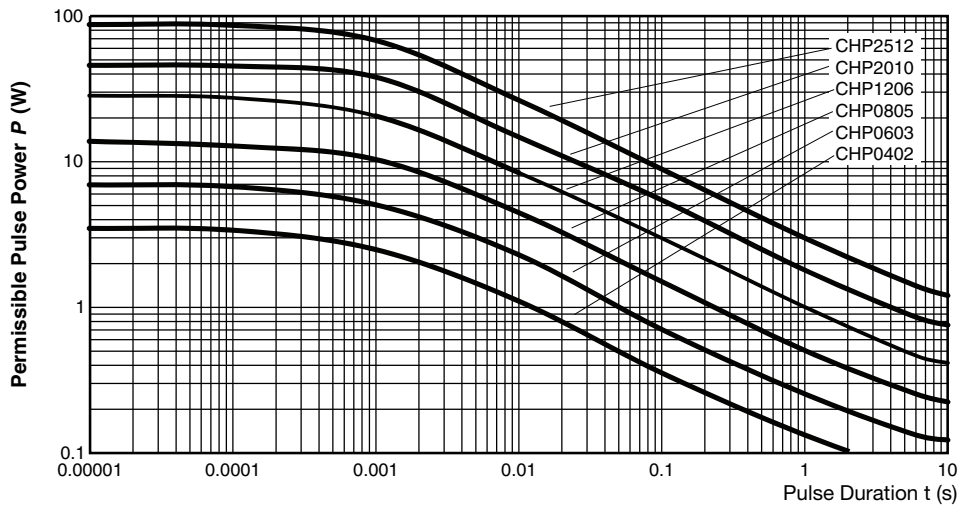
A price adder will apply to the unit price of the parts for options 0013 and 0014.

**PERFORMANCE**

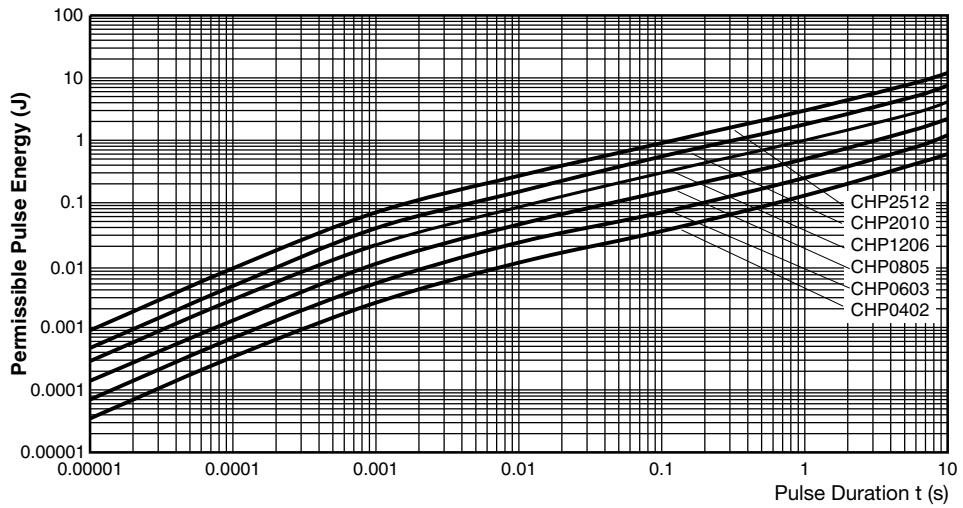
| TESTS                     | CONDITIONS   | REQUIREMENTS               | TYPICAL VALUES AND DRIFTS                                  |
|---------------------------|--|----------------------------|--|
| Termination adhesion      | 5N for 10 s  | ± (0.25 % + 0.05 Ω)        | < ± 0.1 %  |
| Resistance to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



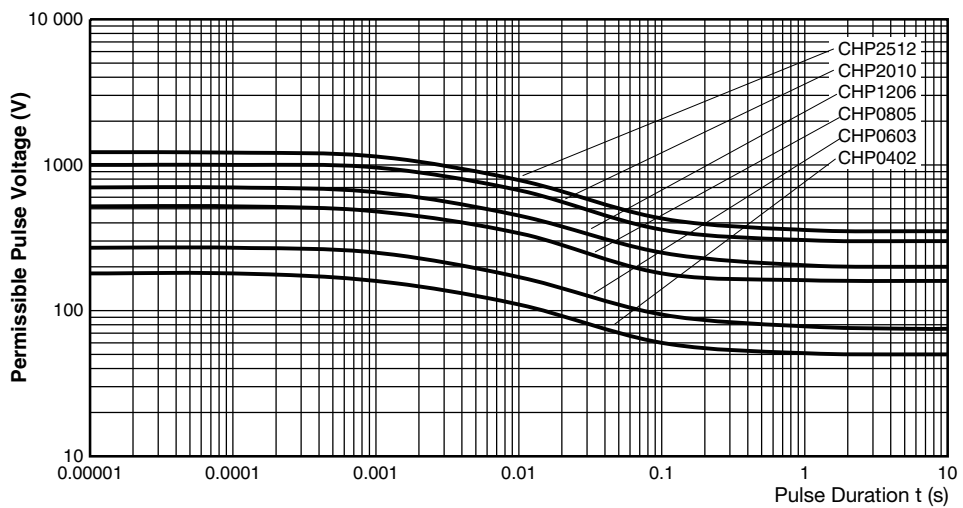
Maximum permissible pulse load  $P_i$  max. for single pulse <sup>(1)</sup>



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



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

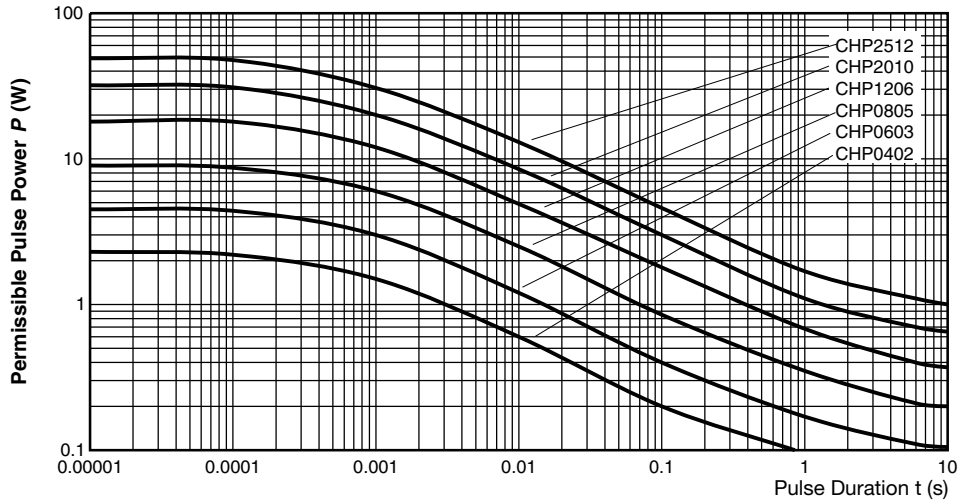


**Note**

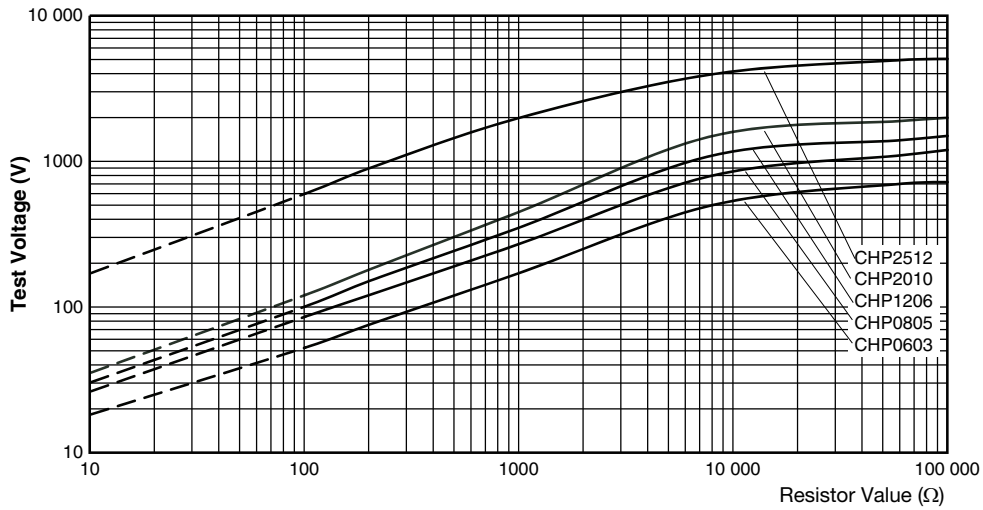
<sup>(1)</sup> One should use the 3 curves together to get the right performances



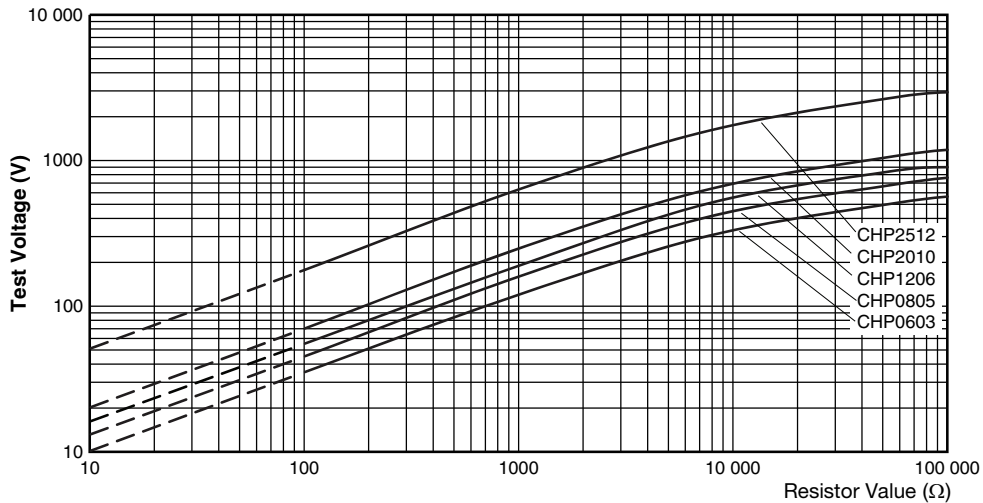
Maximum permissible pulse load  $P_i$  max.



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 cofication 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<br>HCHP<br>(3 or 4 digits)   | 0502<br>0505<br>0603<br>0805<br>1005<br>1206<br>1505<br>2010<br>1020<br>1010<br>2208<br>2512 | K = 100 ppm<br>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<br><br>10R0 = 10 Ω<br>3901 = 3900 Ω<br>1004 = 1 MΩ | D = ± 0.5 %<br>F = ± 1 %<br>G = ± 2 %<br>J = ± 5 % | B: SnPb over nickel barrier<br>N: SnAg over nickel barrier<br>F: SnAg over nickel barrier (one face)<br>G: gold over nickel barrier<br>W: gold over nickel barrier (one face)<br><br>B: lead bearing version<br>N and G: lead (Pb)-free/<br>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)<br>CHP0805K33R0FG0045 (CHP option 45)<br>HCHP0805K16R5FBT55 (HCHP option 55)<br>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>         |  |
| 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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