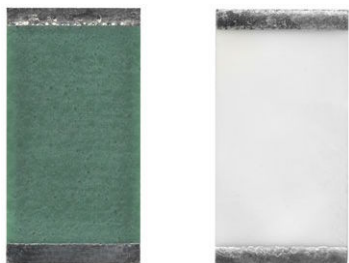


High Stability Resistor Chips

(< 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 M Ω
- 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

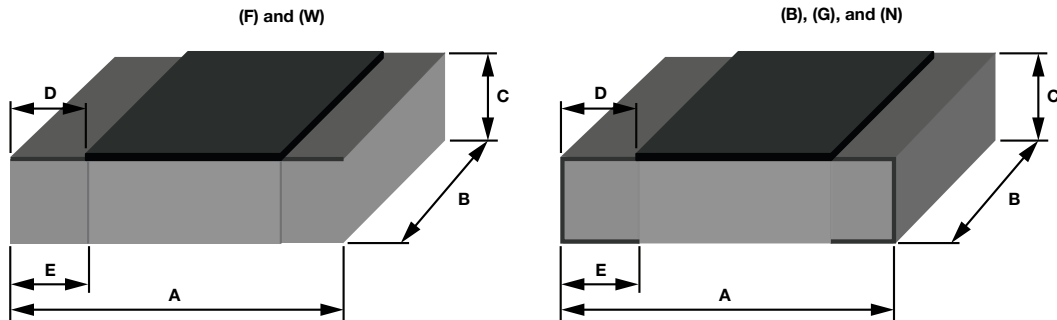
| STANDARD ELECTRICAL SPECIFICATIONS | | | | | | | | |
|------------------------------------|------|---------------------------|-------------------------------|----------------------------|---------------------------------------------|----------------------|-----------------------------------------|-------------------|
| MODEL | SIZE | RATED POWER P_n W | LIMITING ELEMENT VOLTAGE V | MAX. OVERLOAD VOLTAGE V | RESISTANCE RANGE ⁽¹⁾ Ω | TOLERANCE \pm % | TEMPERATURE COEFFICIENT \pm 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

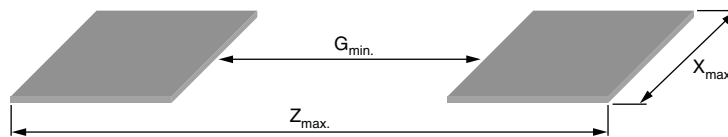
⁽¹⁾ Shall be read in conjunction with other tables

⁽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

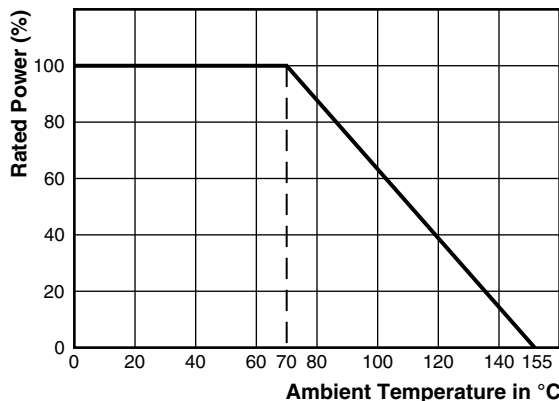
- (1) Improved performance on request

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

PACKAGING RULES

Waffle Pack

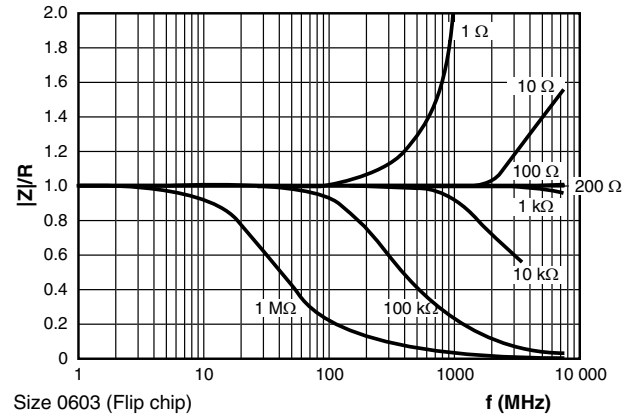
Can be filled up to maximum quantity indicated in the table here above, taking into account the minimum order quantity. When quantity ordered exceeds maximum quantity of a single waffle pack, the waffle packs are stacked up on the top of each other and closed by one single cover.

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

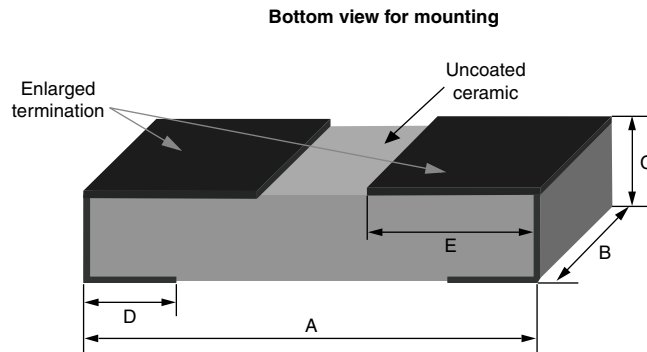
For any option it is recommended to consult Vishay Sfernice for availability first.

Option: Enlarged terminations: **0063**

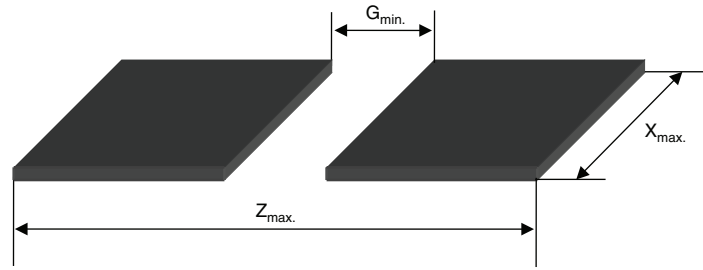
For stringent and special power dissipation requirements, the thermal resistance between the resistive layer and the solder joint can be reduced using enlarged terminations chip resistors which are soldered on large and thick copper pads acting as heat sinks (see application note: 53048 Power Dissipation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

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 _{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.

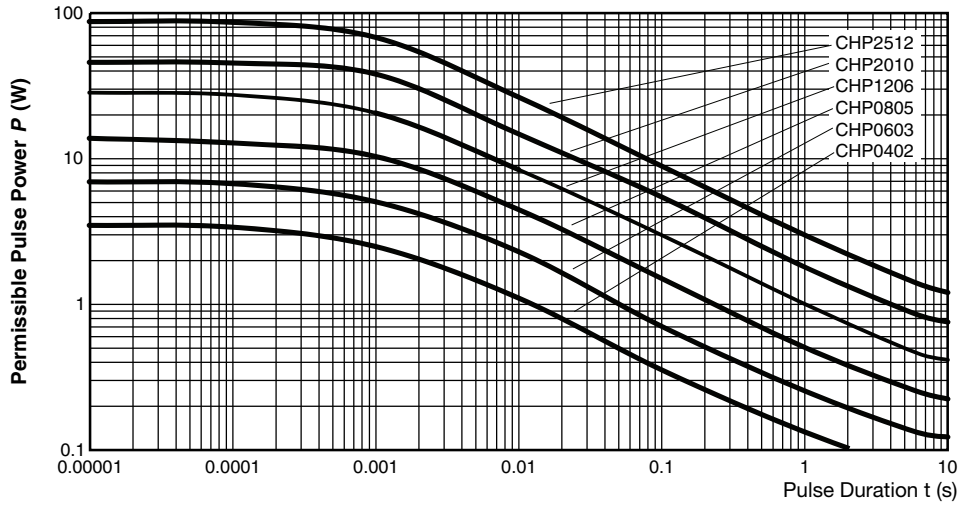
A price adder will apply to the unit price of the parts for options 0013 and 0014.

PERFORMANCE

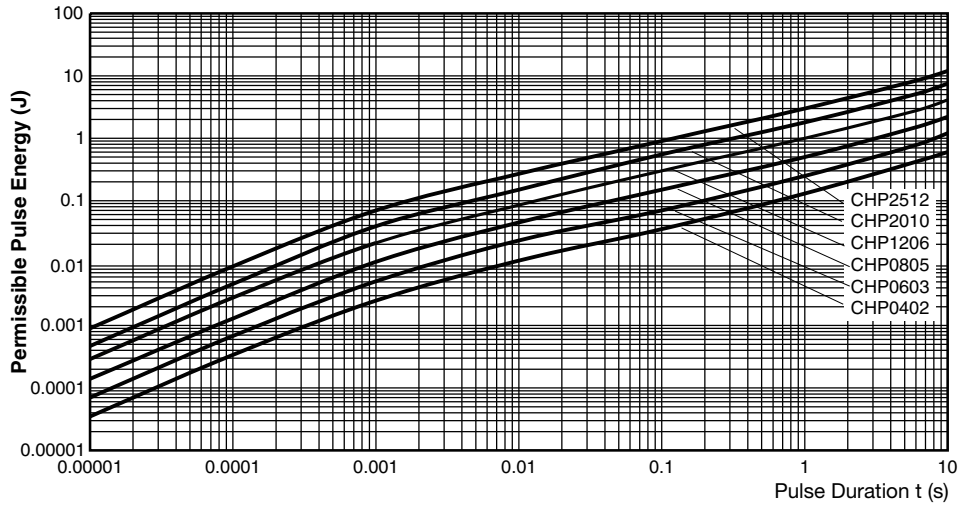
| TESTS | CONDITIONS | REQUIREMENTS | TYPICAL VALUES AND DRIFTS |
|---------------------------|--------------------------------------------------------------------------------------------|----------------------------|------------------------------------------------------------|
| Termination adhesion | 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 2000 h 10 000 h < 0.25 % < 0.5 % < 1 % |



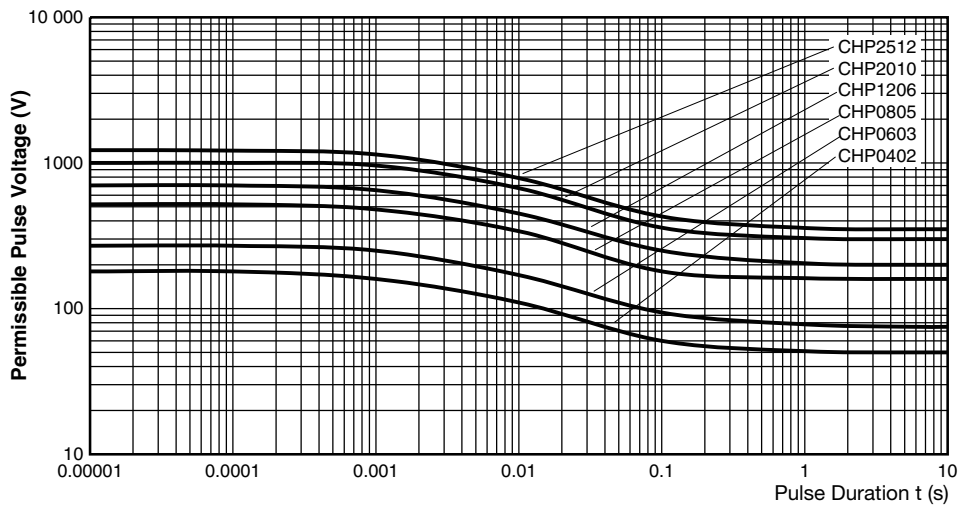
Maximum permissible pulse load P_i max. for single pulse ⁽¹⁾



Energy for single pulse ⁽¹⁾



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

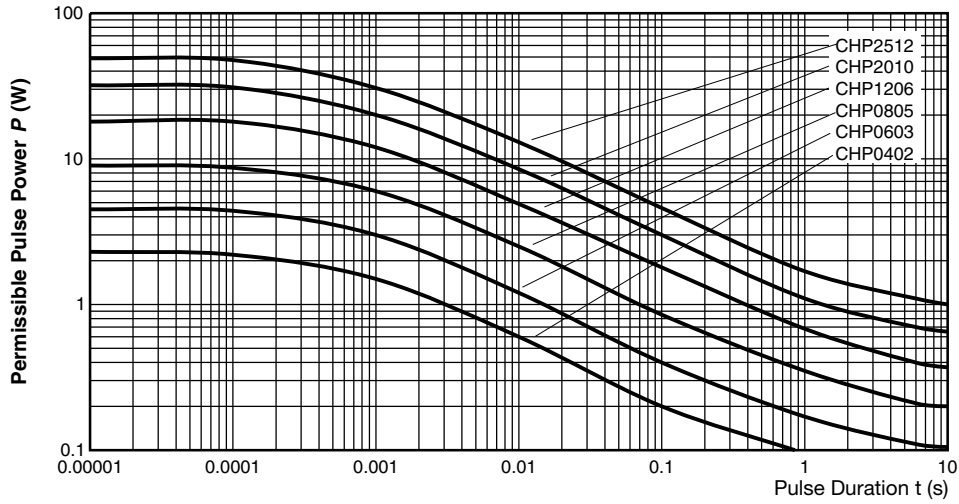


Note

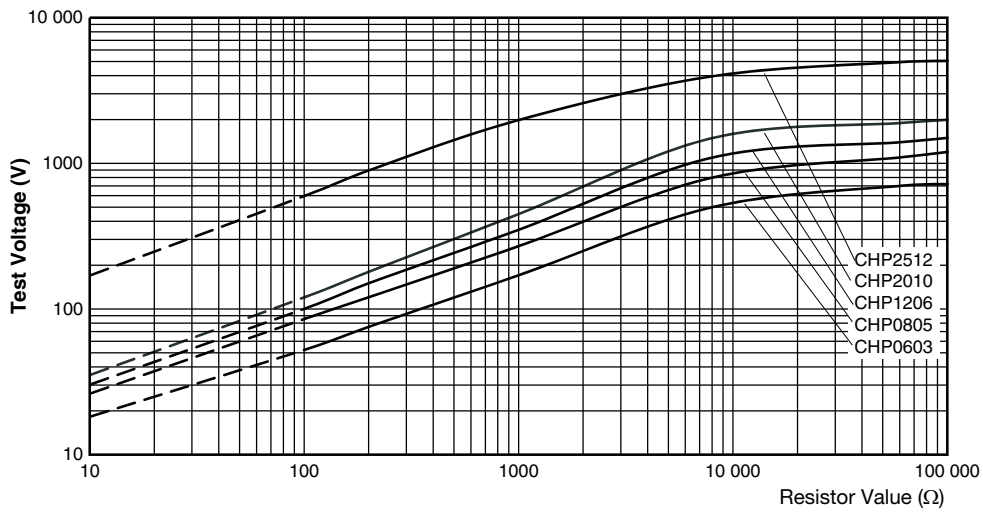
⁽¹⁾ One should use the 3 curves together to get the right performances



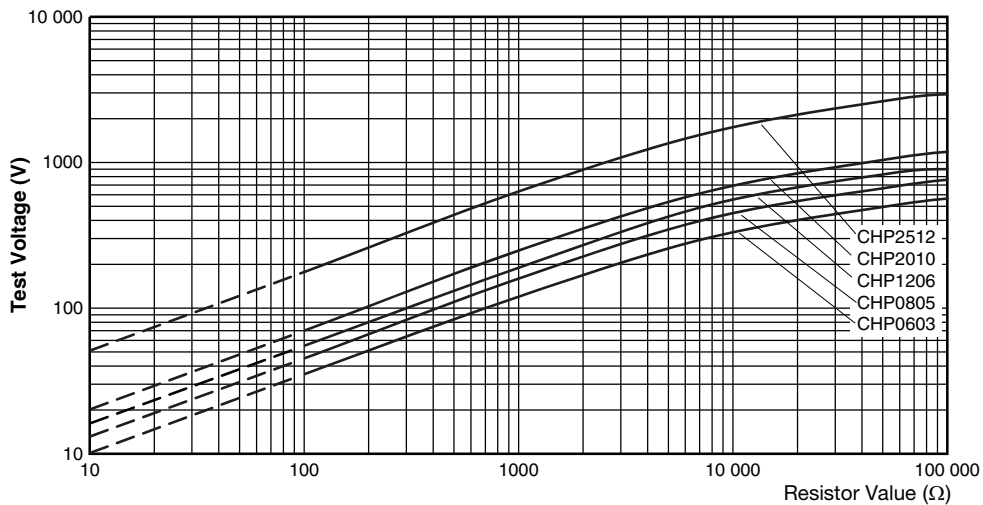
Maximum permissible pulse load P_i max.



1.2/50 μ s lightning surge



10/700 μ 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) | 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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