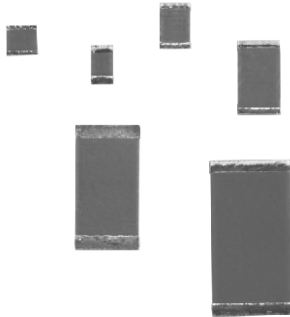


ESCC 4001/026 Qualified (Ⓢ) High Stability Thick Film Resistor Chips


HALOGEN FREE

FEATURES

- SMD wraparound chip resistor
- Generic specification ESCC 4001
- Detailed specification ESCC 4001/026
- Robust terminations
- Large ohmic value range 1 Ω to 10 MΩ
- HCHP option 0.55: For high frequency applications (up to 10 GHz)
- ESA (Ⓢ) qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?999912

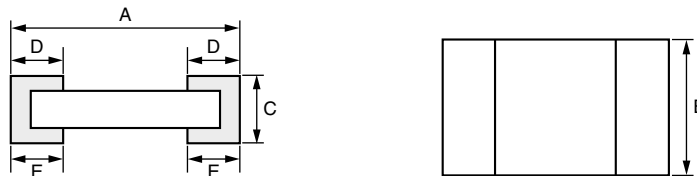
Vishay Sfernice thick film chip resistors CHPHR are specially designed to meet the requirements of the ESA 4001/026 specification. They have undergone the CNES evaluation (Space French National Agency). They are in level 1 of the ESA EPPL (European Preferred Part List) and ESA qualification is on-going.

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) type is for solder reflow assembly (variant 01 to 05)

G (W/A) type is for gluing (variant 06 to 10)

DIMENSIONS in millimeters



| VARIANT NUMBER | STYLE | DIMENSIONS in millimeters | | | | | | | | | |
|----------------|---------------------|---------------------------|------|------|------|------|------|------|------|------|------|
| | | A | | B | | C | | D | | E | |
| | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. |
| 01, 06 | 0603 | 1.36 | 1.68 | 0.72 | 0.98 | 0.38 | 0.53 | 0.17 | 0.51 | 0.25 | 0.51 |
| 02, 07 | 0805 ⁽¹⁾ | 1.75 | 2.07 | 1.14 | 1.4 | 0.38 | 0.53 | 0.17 | 0.51 | 0.25 | 0.51 |
| 03, 08 | 1206 | 2.89 | 3.21 | 1.47 | 1.73 | 0.38 | 0.53 | 0.17 | 0.51 | 0.25 | 0.51 |
| 04, 09 | 2010 | 4.92 | 5.24 | 2.41 | 2.67 | 0.5 | 0.63 | 0.25 | 0.64 | 0.25 | 0.64 |
| 05, 10 | 2512 | 6.19 | 6.51 | 2.93 | 3.32 | 0.5 | 0.63 | 0.25 | 0.64 | 0.25 | 0.64 |

Note

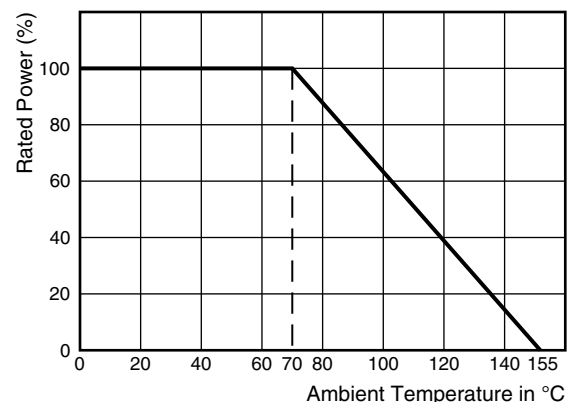
⁽¹⁾ Model CHPHR0805 being same size than case 0705 with same performances, only codification of CHPHR0805 remains.

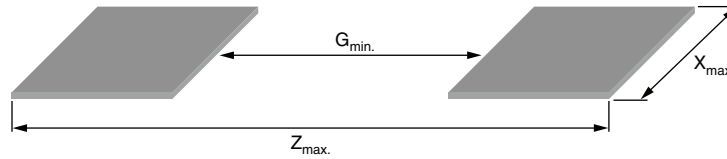
| MECHANICAL SPECIFICATIONS | |
|---------------------------|--|
| Substrate | Alumina |
| Technology | Thick film (Ruthenium oxyde) |
| Protection | Epoxy coating |
| Terminations | B (W/A): SnPb over nickel barrier for solder reflow G (W/A) type: Gold over nickel barrier for gluing |

CHIPS FOR HIGH FREQUENCY APPLICATIONS

High frequency option available up to 10 GHz
 3 sizes: 0603, 0805, 1206

POWER DERATING CURVE



SUGGESTED LAND PATTERN (please refer to IPC-7351A)


| CHIP SIZE | $Z_{max.}$ | $G_{min.}$ | $X_{max.}$ |
|-----------|------------|------------|------------|
| 0603 | 2.38 | 0.34 | 0.98 |
| 0805 | 2.77 | 0.73 | 1.40 |
| 1206 | 3.91 | 1.87 | 1.73 |
| 2010 | 5.94 | 3.64 | 2.67 |
| 2512 | 7.21 | 4.91 | 3.32 |

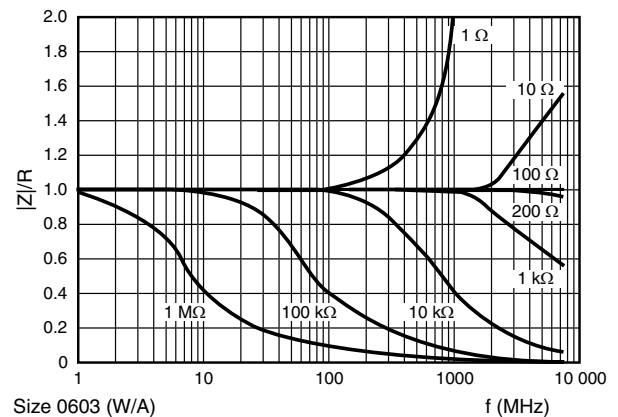
PACKAGING

Waffle-pack or tape and reel when specified

| SIZE | NUMBER OF PIECES PER PACKAGE | | TAPE WIDTH |
|------|------------------------------|--------------------------------|------------|
| | WAFFLE PACK 2" x 2" | TAPE AND REEL (1) MIN. MAX. | |
| 0603 | 100 | 5000 | 8 mm |
| 0805 | | 4000 | |
| 1206 | | 2000 | 8 mm |
| 2010 | | | |
| 2512 | | | |

Note

(2) MOQ for tape and reel: 50 pieces

TYPICAL HF PERFORMANCE OF HCHP

STANDARD ELECTRICAL SPECIFICATIONS

| MODEL | SIZE | RESISTANCE RANGE (2) R_n Ω | POWER RATING (2) W | TOLERANCE (3) \pm % | TEMPERATURE COEFFICIENT (3) ($\pm 10^{-6}/^\circ\text{C}$) | CRITICAL RESISTANCE $k\Omega$ | TERMINAL MATERIAL AND FINISH |
|-------|------|---|-----------------------|--------------------------|---|----------------------------------|------------------------------|
| CHPHR | 0603 | 1 to 10M | 0.1 | 1, 2, 5 | 100, 200 | 25 | E4 |
| CHPHR | 0805 | 1 to 10M | 0.2 | 1, 2, 5 | 100, 200 | 50 | E4 |
| CHPHR | 1206 | 1 to 10M | 0.25 | 1, 2, 5 | 100, 200 | 160 | E4 |
| CHPHR | 2010 | 1 to 10M | 0.5 | 1, 2, 5 | 100, 200 | 180 | E4 |
| CHPHR | 2512 | 1 to 10M | 0.8 | 1, 2, 5 | 100, 200 | 112.5 | E4 |
| CHPHR | 0603 | 1 to 10M | 0.1 | 1, 2, 5 | 100, 200 | 25 | E2 |
| CHPHR | 0805 | 1 to 10M | 0.2 | 1, 2, 5 | 100, 200 | 50 | E2 |
| CHPHR | 1206 | 1 to 10M | 0.25 | 1, 2, 5 | 100, 200 | 160 | E2 |
| CHPHR | 2010 | 1 to 10M | 0.5 | 1, 2, 5 | 100, 200 | 180 | E2 |
| CHPHR | 2512 | 1 to 10M | 0.8 | 1, 2, 5 | 100, 200 | 112.5 | E2 |

Notes

 (3) At $T_{amb} \leq +70\ ^\circ\text{C}$. For $T_{amb} > +70\ ^\circ\text{C}$ derate linearly to 0 W at $T_{amb} = +155\ ^\circ\text{C}$

(4) Restrictions might apply depending on ohmic value please refer to Table 1

TABLE 1

| RESISTANCE (Ω) | VALUE SERIES | AVAILABLE TOLERANCE (\pm %) | AVAILABLE TEMPERATURE COEFFICIENT ($\pm 10^{-6}/^\circ\text{C}$) |
|---------------------------|--|--------------------------------|--|
| $1 \leq R_n < 10$ | Any value in the resistance range to 3 significant figures | 2, 5 | 200 |
| $10 \leq R_n < 1\text{M}$ | | 1, 2, 5 | 100, 200 |
| $R_n \geq 1\text{M}$ | | 2, 5 | 200 |



| MAXIMUM RATINGS | | | | | | |
|-----------------------------|----------------|-------|-----------|---------------------------|-------|-----------|
| CHARACTERISTICS | VARIANT NUMBER | STYLE | SYMBOLS | LIMITS | UNITS | REMARKS |
| Limiting element voltage | 01, 06 | 0603 | U_L | 50 | V | - |
| | 02, 07 | 0805 | | 100 | | |
| | 03, 08 | 1206 | | 200 | | |
| | 04, 09 | 2010 | | 300 | | |
| | 05, 10 | 2512 | | 300 | | |
| Rated voltage | All | All | U_R | $\sqrt{(P_n \times R_n)}$ | V | (1) |
| Isolation voltage | 01, 06 | 0603 | U_i | 100 | V | - |
| | 02, 07 | 0805 | | 200 | | |
| | 03, 08 | 1206 | | 300 | | |
| | 04, 09 | 2010 | | 300 | | |
| | 05, 10 | 2512 | | 300 | | |
| Operating temperature range | All | All | T_{op} | - 65 to + 155 | °C | T_{amb} |
| Storage temperature range | All | All | T_{stg} | - 65 to + 155 | °C | - |
| Soldering temperature | All | All | T_{sol} | + 260 | °C | (2) |
| Maximum weight | 01, 06 | 0603 | | 0.002 | g | - |
| | 02, 07 | 0805 | | 0.004 | | |
| | 03, 08 | 1206 | | 0.008 | | |
| | 04, 09 | 2010 | | 0.026 | | |
| | 05, 10 | 2512 | | 0.042 | | |

Notes

(1) Shall never exceed limiting element voltage. R_n = Rated resistance

(2) Duration 10 s maximum

| PERFORMANCE | | |
|---|--|--|
| TEST | CONDITIONS | LIMITS REQUIRED BY THE ESCC4001/026 SPECIFICATION |
| Insulation resistance | ESCC4001 § 8.3.1.2 V = 100 V | 1000 MΩ |
| Low temperature electrical measurement | ESCC4001 § 8.3.1.1 TC = 100 ppm/°C TC = 200 ppm/°C | ± 0.8 % ± 1.6 % |
| High temperature electrical measurement | ESCC4001 § 8.3.3 TC = 100 ppm/°C TC = 200 ppm/°C | ± 1.36 % ± 2.72 % |
| Rapid change of temperature | ESCC4001 § 8.8 | ± 0.25 + (0.05 Ω x 100/ R_n) % |
| Robustness of terminations | ESCC4001 § 8.11.2 | ± 0.25 + (0.05 Ω x 100/ R_n) % |
| Resistance to solder heat | ESCC4001 § 8.12 | ± 0.5 + (0.05 Ω x 100/ R_n) % |
| Climatic sequence | ESCC4001 § 8.10 | ± 1 + (0.05 Ω x 100/ R_n) % |
| Load life | ESCC4001 § 8.13 1000 h 2000 h | ± 1 + (0.05 Ω x 100/ R_n) % ± 1.5 + (0.05 Ω x 100/ R_n) % |



| GLOBAL PART NUMBER INFORMATION | | | | | | | | | | | | | | | | | |
|---|---|--------------------------------------|---|----------------------------|---|---|---|---|-------------------------------------|---|--|---|--|---|---|---|--|
| LIMITED TO 18 DIGITS: If more digits are necessary a cofication of some digits might be necessary | | | | | | | | | | | | | | | | | |
| C | H | P | H | R | 0 | 6 | 0 | 3 | K | 1 | 0 | 0 | 1 | F | B | T | |
| GLOBAL MODEL | | SIZE | | TCR | | VALUE | | | TOLERANCE | | TERMINATION | | PACKAGING | | | | |
| CHPHR | | 0603 0805 1206 2010 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. Example: 1R50 = 1.5 Ω 22R1 = 22.1 Ω 3901 = 3900 Ω 1004 = 1 MΩ | | | F = ± 1 % G = ± 2 % J = ± 5 % | | B: SnPb over nickel barrier G: Gold | | For more information see Codification of Packaging table | | | | |

| GLOBAL PART NUMBER INFORMATION | | | | | | | | | | | | | | |
|-------------------------------------|---|---|----------------|---|---|---|---|---|-------------------------------------|---|----------------------------|---|---|---|
| ESA Part Numbering: 4001026011001F4 | | | | | | | | | | | | | | |
| 4 | 0 | 0 | 1 | 0 | 2 | 6 | 0 | 1 | 1 | 0 | 0 | 1 | F | 4 |
| DETAILED SPECIFICATION NUMBER | | | VARIANT NUMBER | | | RESISTANCE VALUE | | | TOLERANCE | | TEMPERATURE COEFFICIENT | | | |
| | | | 01 to 10 | | | The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. Example: 1R50 = 1.5 Ω 22R1 = 22.1 Ω 3901 = 3900 Ω 1004 = 1 MΩ | | | F = ± 1 % G = ± 2 % J = ± 5 % | | 4 = 100 ppm 6 = 200 ppm | | | |

Note

- MOQ for tape and reel: 50 pieces

| CROSS REFERENCE BETWEEN ESA PART NUMBER AND VISHAY PART NUMBER | | | | | | |
|--|--------------------|-----------------|-------------------------------|--------------------|------------------|------------------------|
| ESA PART NUMBER | VISHAY PART NUMBER | EXPLANATIONS | | | | |
| 4001026011001F4 | CHPHR0603K1001FB | 4001026 = CHPHR | 01 = 0603 with B terminations | 1001 = 1001 (1 kΩ) | F = F (tol. 1 %) | 4 = K (TCR 100 ppm/°C) |

| CROSS REFERENCE BETWEEN ESA PART NUMBER AND CHPHR PART NUMBER | |
|---|--------------------------|
| VARIANT ESA | VISHAY MODELS |
| 01 | CHPHR0603/B terminations |
| 02 | CHPHR0805/B terminations |
| 03 | CHPHR1206/B terminations |
| 04 | CHPHR2010/B terminations |
| 05 | CHPHR2512/B terminations |
| 06 | CHPHR0603/G terminations |
| 07 | CHPHR0805/G terminations |
| 08 | CHPHR1206/G terminations |
| 09 | CHPHR2010/G terminations |
| 10 | CHPHR2512/G terminations |



HYPER FREQUENCY OPTION

Hyper Frequency Option Numbering: HCHP0603K1001FBT55

| | | | | | | | | | | | | | | | | | |
|--------------|----------------------|----------------------------|---|---|---|---|---|-------------------------------------|--|--|------------------------|---|---|---|---|---|---|
| H | C | H | P | 0 | 6 | 0 | 3 | K | 1 | 0 | 0 | 1 | F | B | T | 5 | 5 |
| GLOBAL MODEL | SIZE | TCR | VALUE | | | | | TOLERANCE | TERMINATION | PACKAGING | OPTION | | | | | | |
| HCHP | 0603 0805 1206 | K = 100 ppm L = 200 ppm | The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. Example: 1R50 = 1.5 Ω 22R1 = 22.1 Ω 3901 = 3900 Ω 1004 = 1 MΩ | | | | | F = ± 1 % G = ± 2 % J = ± 5 % | B: SnPb over nickel barrier G: Gold | Blank = Waffle pack T = Tape and reel | 055 = HiRel production | | | | | | |

Note

- MOQ for taping: 50 pieces

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

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



TRACEABILITY DEFINITIONS

The two major traceability elements are defined as:

- The primary process lot number named Front End lot (FE lot). One “FE lot” is composed of several wafers issued from the same thin film deposition sequence.
- The date code named Batch Number (BN). The “BN” is defined after completion of the end of production testing sequence. The lot homogeneity is given by the “FE lot” and not by the “BN”.

According to the applied rules validated by the ESCC through the product qualification, the following situations are agreed:

- Parts coming from different “FE lot” might have the same “BN”.
- A maximum of two different “BN” might be applied to the same “FE lot” to enable the use of overruns from a previous PO.
- Unless requested / approved by the customer the “BN” will be 2 years old maximum.

SPECIFIC TRACEABILITY REQUIREMENTS

The following specific requirements have to be treated as:

- A customer who requires “Lot Homogeneity” has to mention it on the PO as “SINGLE PRODUCTION LOT”.
- A customer who requires “Lot Homogeneity” in addition to a “Single Batch Number” has to mention it on the PO as “SINGLE PRODUCTION LOT AND OPTION R0101”.

END OF PRODUCTION TESTING

Mandatory testing performed at the end of the production process:

- 100 % overload: Voltage $\sqrt{(6.25 P_n \times R_n)}$ or $2 U_L$ whichever is less - duration 2 s
- 100 % burn in: 168 h at P_n at 70 °C

OPTIONS

LOT VALIDATION TESTING

For procurement of qualified components, lot validation testing is not required and shall only be performed if specifically stipulated in the purchase order.

For procurement of unqualified components, lot validation testing shall be performed as stipulated in the purchase order. The need for lot validation testing shall be determined by the orderer.

When lot validation testing is required, it shall consist of the performance of one or more of the tests or subgroup test sequences of chart F4 indicated in the ESA generic specification ESCC 4001. The testing to be performed and the sample size shall be as stipulated in the purchase order. When procurement of more than one component type is involved from a family, range or series, the selection of representative samples shall also be stipulated in the purchase order.

Lot validation testing will be composed of one LVT charges and LVT samples:

Lot validation test charges has to be ordered separately on purchase order.

Lot validation samples have to be ordered separately on purchase order.

FINAL INSPECTION

If requested by the orderer a final inspection can be performed on site.

Final inspection has to be stipulated separately on purchase order.



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.