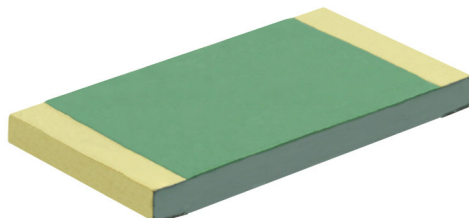


# High Stability - Very High Temperature (270 °C) Thin Film Wraparound Chip Resistors, Sulfur Resistant



## LINKS TO ADDITIONAL RESOURCES



## INTRODUCTION

For applications such as down hole applications, the need for parts able to withstand very severe conditions (temperature as high as 250 °C powered or up to 270 °C un-powered) has led Vishay Sfernice to push out the limit of the thin film technology.

Designers might read the application note “Power Dissipation Considerations in High Precision Vishay Sfernice Thin Film Chip Resistors and Arrays (P, PRA etc...) (High Temperature Application)” [www.vishay.com/doc?53047](http://www.vishay.com/doc?53047) in conjunction with this datasheet to help them to properly design their board and get the best performances of the PVHT.

Vishay Sfernice research and development engineers will be willing to support any customer design considerations.

## FEATURES

- Operating temperature range: -55 °C; +250 °C
- Storage temperature: -55 °C; +270 °C
- Gold terminations (< 1 µm thick)
- 5 sizes available (0402, 0603, 0805, 1206, 2010); other sizes upon request
- Temperature coefficient down to 5 ppm/°C typical, 10 ppm/°C maximum (-55 °C; +270 °C)
- Tolerance down to 0.05 %
- Load life stability: 0.8 % typical (1 % max.) after 2000 h at 250 °C (ambient) at Pn
- Shelf life stability: 1.5 % typical after 8000 h
- SMD wraparound
- 0.02 % upon request
- TCR remains constant after long term storage at 270 °C
- Sulfur resistant (per ASTM B809-95 humid vapor test)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

## STANDARD ELECTRICAL SPECIFICATIONS

| MODEL    | SIZE | RESISTANCE RANGE<br>Ω | RATED POWER <sup>(1)(2)</sup><br>P <sub>250 °C</sub><br>W | LIMITING ELEMENT VOLTAGE<br>V | TOLERANCE<br>± %  | TEMPERATURE COEFFICIENT <sup>(3)</sup><br>± ppm/°C |
|----------|------|-----------------------|-----------------------------------------------------------|-------------------------------|-------------------|----------------------------------------------------|
| PVHT0402 | 0402 | 39 to 45K             | 0.031                                                     | 50                            | 0.05, 0.1, 0.5, 1 | 5, 10, 15, 25, 30, 50, 55                          |
| PVHT0603 | 0603 | 39 to 108K            | 0.062                                                     | 75                            | 0.05, 0.1, 0.5, 1 | 5, 10, 15, 25, 30, 50, 55                          |
| PVHT0805 | 0805 | 39 to 240K            | 0.100                                                     | 150                           | 0.05, 0.1, 0.5, 1 | 5, 10, 15, 25, 30, 50, 55                          |
| PVHT1206 | 1206 | 39 to 900K            | 0.165                                                     | 200                           | 0.05, 0.1, 0.5, 1 | 5, 10, 15, 25, 30, 50, 55                          |
| PVHT2010 | 2010 | 39 to 2.5M            | 0.2                                                       | 300                           | 0.05, 0.1, 0.5, 1 | 5, 10, 15, 25, 30, 50, 55                          |

### Notes

- (1) For power handling improvement, please refer to application note 53047 “Power Dissipation Considerations in High Precision Vishay Sfernice Thin Film Chip Resistors and Arrays (High Temperature Applications)” [www.vishay.com/doc?53047](http://www.vishay.com/doc?53047) and consult Vishay Sfernice
- (2) See derating curve on next page
- (3) See Table 1 on next page

## CLIMATIC SPECIFICATIONS

|                             |                 |
|-----------------------------|-----------------|
| Operating temperature range | -55 °C; +250 °C |
| Storage temperature range   | -55 °C; +270 °C |

## PERFORMANCE VS. HUMID SULFUR VAPOR

|                 |                                                                        |
|-----------------|------------------------------------------------------------------------|
| Test conditions | 50 °C ± 2 °C, 85 % ± 4 % RH, exposure time 500 h                       |
| Test results    | Resistance drift < (0.05 % R + 0.05 Ω), no corrosion products observed |

## MECHANICAL SPECIFICATIONS

|                   |                                                   |
|-------------------|---------------------------------------------------|
| Substrate         | Alumina                                           |
| Resistive Element | Thin Film                                         |
| Passivation       | Silicon nitride (Si <sub>3</sub> N <sub>4</sub> ) |
| Protection        | Epoxy + Silicone                                  |
| Terminations      | Gold (< 1 µm) over nickel barrier                 |

### Caution:

Performances obtained with following mounting conditions:

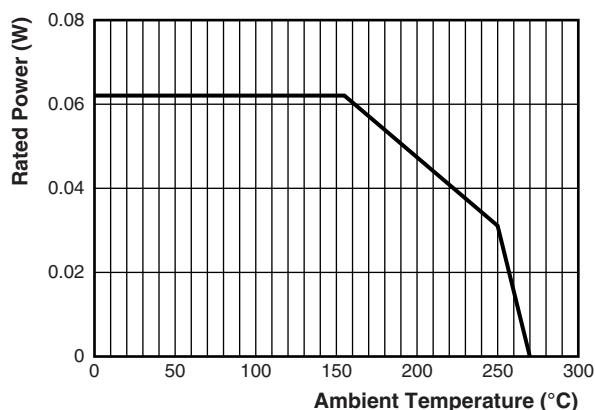
- Test board material: alumina
- Solder paste: PbSnAg (93.5/5/1.5)

**TABLE 1 - TEMPERATURE COEFFICIENT**

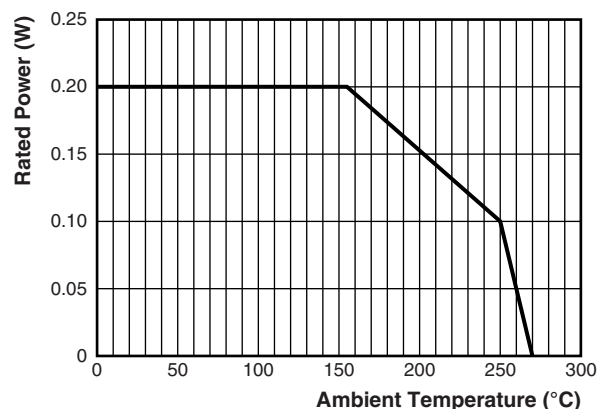
|   |           |                 |
|---|-----------|-----------------|
| Z | 5 ppm/°C  | 0 °C; +70 °C    |
|   | 10 ppm/°C | -55 °C; +270 °C |
| Y | 10 ppm/°C | -55 °C; +155 °C |
|   | 15 ppm/°C | -55 °C; +270 °C |
| E | 25 ppm/°C | -55 °C; +155 °C |
|   | 30 ppm/°C | -55 °C; +270 °C |
| H | 50 ppm/°C | -55 °C; +155 °C |
|   | 55 ppm/°C | -55 °C; +270 °C |

**TABLE 2**

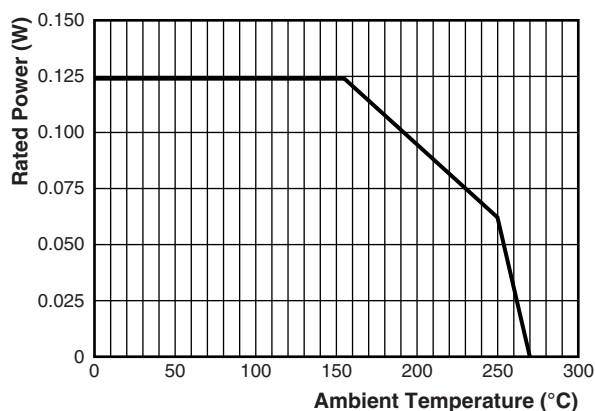
| SERIES | RANGE ( $\Omega$ ) | TOL. ( $\pm$ %)   | TCR CODE   |
|--------|--------------------|-------------------|------------|
| 0402   | 39 to < 50         | 0.1, 0.5, 1       | Z; Y; E; H |
|        | 50 to 45K          | 0.05, 0.1, 0.5, 1 | Z; Y; E; H |
| 0603   | 39 to < 50         | 0.1, 0.5, 1       | Z; Y; E; H |
|        | 50 to 108K         | 0.05, 0.1, 0.5, 1 | Z; Y; E; H |
| 0805   | 39 to < 50         | 0.1, 0.5, 1       | Z; Y; E; H |
|        | 50 to 240K         | 0.05, 0.1, 0.5, 1 | Z; Y; E; H |
| 1206   | 39 to < 50         | 0.1, 0.5, 1       | Z; Y; E; H |
|        | 50 to 900K         | 0.05, 0.1, 0.5, 1 | Z; Y; E; H |
| 2010   | 39 to < 50         | 0.1, 0.5, 1       | Z; Y; E; H |
|        | 50 to 2.5M         | 0.05, 0.1, 0.5, 1 | Z; Y; E; H |

**POWER DERATING CURVE**

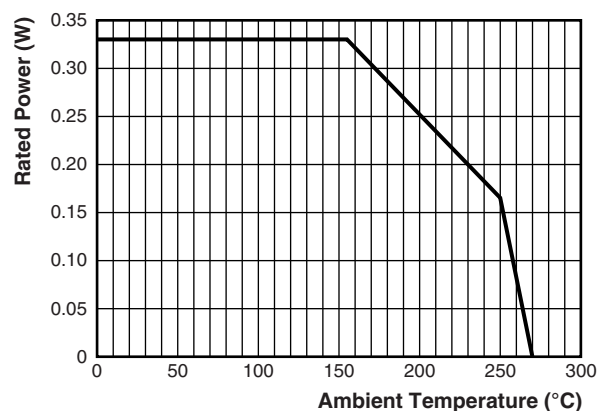
PVHT0402 Power Derating Curve



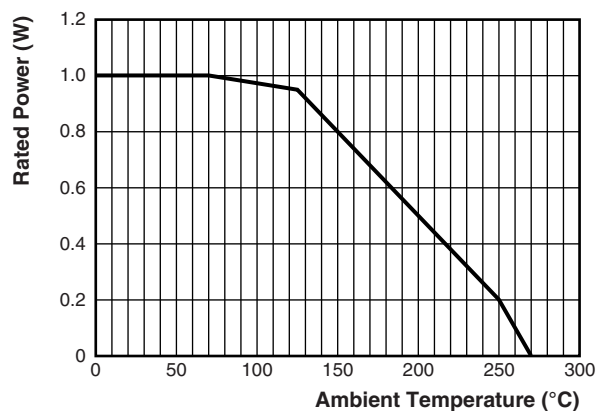
PVHT0805 Power Derating Curve



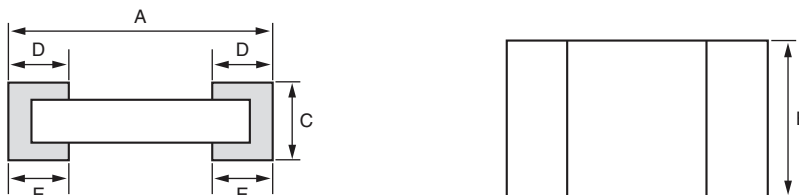
PVHT0603 Power Derating Curve



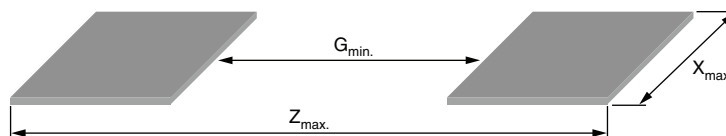
PVHT1206 Power Derating Curve



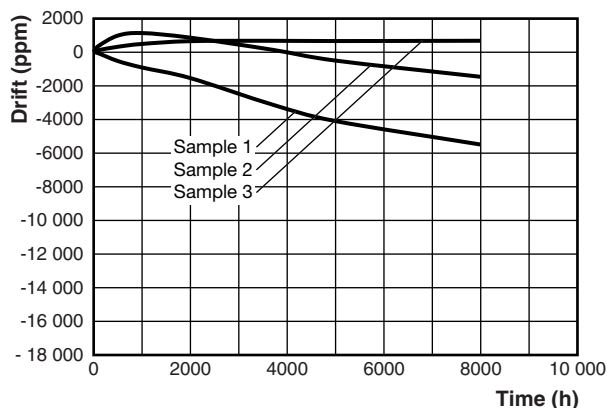
PVHT2010 Power Derating Curve

**DIMENSIONS** in millimeters (inches)


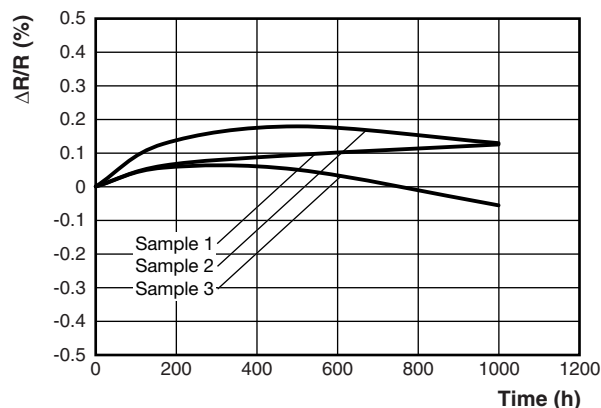
| CASE SIZE | A                                                            | B                                                            | C                              | D/E          |              |
|-----------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------|--------------|--------------|
|           | MAX. TOL.<br>+0.152 (+0.006)<br>MIN. TOL.<br>-0.152 (-0.006) | MAX. TOL.<br>+0.127 (+0.005)<br>MIN. TOL.<br>-0.127 (-0.005) |                                | NOMINAL      | TOLERANCE    |
|           | NOMINAL                                                      | NOMINAL                                                      |                                |              |              |
| 0402      | 1.00 (0.039)                                                 | 0.60 (0.024)                                                 | 0.4 (0.016)<br>± 0.051 (0.002) | 0.25 (0.010) | 0.1 (0.004)  |
| 0603      | 1.52 (0.060)                                                 | 0.85 (0.033)                                                 |                                | 0.38 (0.015) | 0.13 (0.005) |
| 0805      | 1.91 (0.075)                                                 | 1.27 (0.050)                                                 |                                | 0.40 (0.016) |              |
| 1206      | 3.06 (0.120)                                                 | 1.60 (0.063)                                                 |                                | 0.48 (0.019) |              |
| 2010      | 5.08 (0.200)                                                 | 2.54 (0.100)                                                 |                                |              |              |

**SUGGESTED LAND PATTERN (TO IPC-7351A)**


| CHIP SIZE | DIMENSIONS (in millimeter) |                   |                   |
|-----------|----------------------------|-------------------|-------------------|
|           | Z <sub>max.</sub>          | G <sub>min.</sub> | X <sub>max.</sub> |
| 0402      | 1.55                       | 0.15              | 0.73              |
| 0603      | 2.37                       | 0.35              | 0.98              |
| 0805      | 2.76                       | 0.74              | 1.40              |
| 1206      | 3.91                       | 1.85              | 1.73              |
| 2010      | 5.93                       | 3.71              | 2.67              |

**STORAGE CURVE**

250 °C Drift (Storage) vs. Time

**LOAD LIFE STABILITY CURVES**

PVHT2010: 0.2 W/250 °C

**Note**

- Test performed on samples of 3 different values coming from different lots.

**PACKAGING**

ESD packaging available: waffle-pack and plastic tape and reel (low conductivity). Paper tape available upon request (for sizes 0402, 0603, 0805 and 1206).

| SIZE | MOQ | NUMBER OF PIECES PER PACKAGE |               |      | TAPE WIDTH |
|------|-----|------------------------------|---------------|------|------------|
|      |     | WAFFLE PACK<br>2" x 2"       | TAPE AND REEL |      |            |
|      |     |                              | MIN.          | MAX. |            |
| 0402 | 200 | 100                          | 100           | 5000 | 8 mm       |
| 0603 |     |                              |               |      |            |
| 0805 |     | 140                          |               | 4000 | 12 mm      |
| 1206 |     |                              |               |      |            |
| 2010 |     | 60                           |               | 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.

**GLOBAL PART NUMBER INFORMATION****GLOBAL PART NUMBERING: PVHT1206Y1001BGT63**

(Limited to 18 digits: If more digits are necessary a codification of some digits might be used)

|                      |                                              |                         |                                                                                                                                                                                                   |   |   |                                                              |   |                         |   |                                                                 |   |   |                                    |   |   |   |   |
|----------------------|----------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|--------------------------------------------------------------|---|-------------------------|---|-----------------------------------------------------------------|---|---|------------------------------------|---|---|---|---|
| P                    | V                                            | H                       | T                                                                                                                                                                                                 | 1 | 2 | 0                                                            | 6 | Y                       | 1 | 0                                                               | 0 | 1 | B                                  | G | T | 6 | 3 |
| GLOBAL MODEL<br>PVHT | SIZE<br>0402<br>0603<br>0805<br>1206<br>2010 | TCR<br>Z<br>Y<br>E<br>H | VALUE<br>The first three 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 |   |   | TOLERANCE<br>W = 0.05 %<br>B = 0.1 %<br>D = 0.5 %<br>F = 1 % |   | TERMINATION<br>G = gold |   | PACKAGING<br>1 or 2 digits: see codification of packaging table |   |   | OPTION<br>Leave blank if no option |   |   |   |   |



| <b>CODIFICATION OF PACKAGING</b>                                                                           |                                                  |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| <b>CODE</b>                                                                                                | <b>PACKAGING</b>                                 |
| <b>WAFFLE PACK</b>                                                                                         |                                                  |
| W                                                                                                          | 100 min., 1 mult                                 |
| WA                                                                                                         | 100 min., 100 mult (available only in size 1206) |
| <b>PLASTIC TAPE (standard tape for all sizes)</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 (Available for 0402, 0603, 0805 and 1206. Please consult Vishay Sfernice for 2010 size.)</b> |                                                  |
| PT                                                                                                         | 100 min., 1 mult                                 |
| PA                                                                                                         | 100 min., 100 mult                               |
| PB                                                                                                         | 250 min., 250 mult                               |
| PC                                                                                                         | 500 min., 500 mult                               |
| PD (not available for size 0402)                                                                           | 1000 min., 1000 mult                             |
| PE (not available for size 0402)                                                                           | 2500 min., 2500 mult                             |
| PF (not available for size 0402)                                                                           | Full tape (quantity depending on size of chips)  |



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