

## HTF3000LF PVH-3.3

### TEMPERATURE AND HUMIDITY MODULE

*Compliant with RoHS recommendations*

Based on the rugged HS1101LF humidity sensor, HTF3000LF PVH-3.3 is a dedicated humidity and temperature transducer designed for OEM applications where a reliable and accurate measurement is needed. It features a very small size for easy, cost-effective mechanical mounting. Direct interface with a micro-controller is made possible with the module's linear frequency output.

#### MAIN FEATURES

- ⇒ **One of the smallest humidity / temperature modules on the market**
- ⇒ **Compliant with RoHS regulation and most of Lead Free Soldering Process**
- ⇒ **Stable, proportional frequency output from 0 to 100% RH**
- ⇒ **Calibrated within +/- 3% RH @ 55% RH at 3.30 VDC**
- ⇒ **High quality thermistor**
- ⇒ Stable characteristics with temperature
- ⇒ High reliability and long term stability

#### HUMIDITY SENSOR SPECIFIC FEATURES

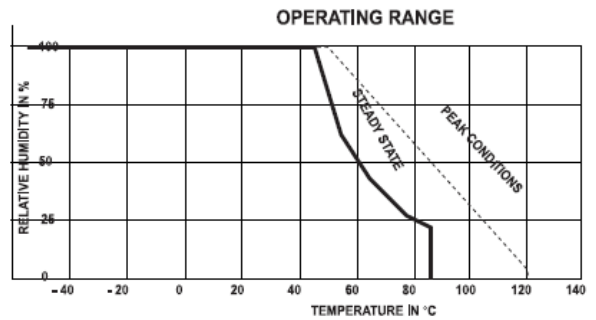
- ⇒ **Instantaneous de-saturation after long periods in saturation phase**
- ⇒ **Fast response time**
- ⇒ **High resistance to chemicals**
- ⇒ Not affected by water immersion
- ⇒ Part could be washed with distilled water
- ⇒ Patented solid polymer structure

#### TEMPERATURE SENSOR SPECIFIC FEATURES

- ⇒ **10 k $\Omega$  +/- 1% NTC temperature sensor**
- ⇒ Stable
- ⇒ High sensitivity

**MAXIMUM RATINGS**

| Ratings                     | Symbol | Value      | Unit |
|-----------------------------|--------|------------|------|
| Storage Temperature         | Tstg   | -40 to 105 | °C   |
| Storage Humidity Range      | RHstg  | 0 to 100   | % RH |
| Supply Voltage (Peak)       | Vs     | 16         | Vdc  |
| Humidity Operating Range    | RH     | 0 to 100   | % RH |
| Temperature Operating Range | Ta     | -40 to 85  | °C   |



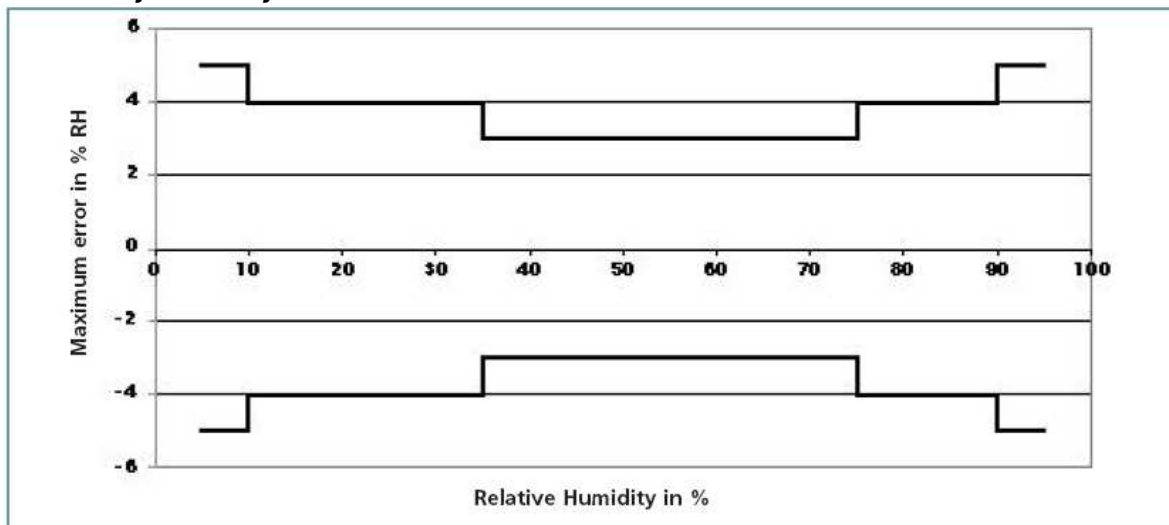
**Chart1**

**CHARACTERISTICS**

*Humidity sensor (Ta =23°C, Vs=5Vdc, RL >100KΩ unless otherwise stated)*

| Characteristics                            | Symbol                       | Min                        | Typ  | Max  | Unit    |
|--|------------------------------|----------------------------|------|------|---------|
| Relative Humidity accuracy (0 to 100 % RH) | RH                           | Refer to Chart 2 on page 2 |      |      |         |
| Voltage supply                             | Vs                           | 3.1                        | 3.3  | 3.6  | VdC     |
| Nominal output @ RH = 55 % and 5 Vdc       | Fout                         | 6419                       | 6455 | 6491 | Hz      |
| Current consumption (Max at 16Vdc)         | Ic                           |                            |      | 0.1  | mA      |
| Voltage supply influence (3 to 7 Vdc)      | RH                           |                            | +/-1 |      | % RH    |
| Averaged Sensitivity from 10% to 95% RH    | $\Delta F_{out} / \Delta RH$ | -9                         | - 11 | -12  | Hz/% RH |
| Humidity Hysteresis                        |                              |                            |      | +/-1 | % RH    |
| Long term stability                        |                              |                            | 0.5  |      | % RH/yr |
| Time constant (40 to 95% RH, 2m/s, @63 %)  | $\tau$                       |                            |      | 10   | s       |

**Relative Humidity Accuracy of HTF 3000LF PVH-3.3 @ 23°C**



**Chart 2**

## HTF3000LF PVH-3.3

Temperature And Humidity Module

### Suggested modeled Signal output:

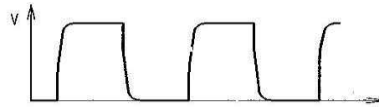
$$F_{out} = 7083 - 14.47 \cdot RH + 0.0736 \cdot RH^2 - 0.0003 \cdot RH^3$$

( $F_{out}$  in Hz and RH in %)

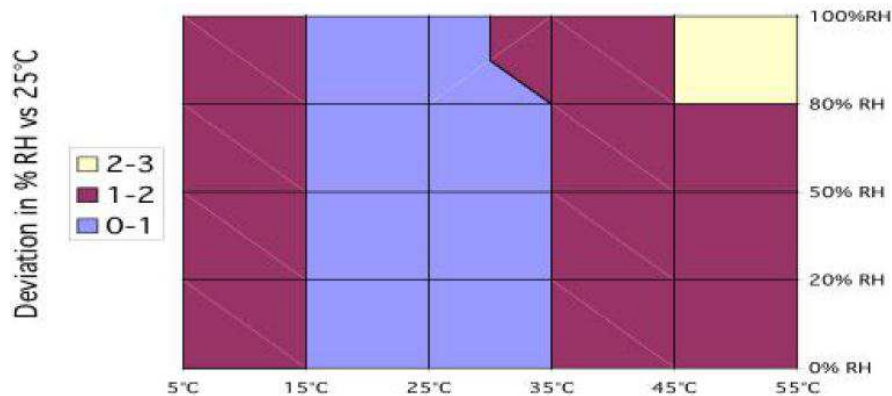
### Typical response look-up table at 3.3V (Polynomial Reference curve)

|                       |      |      |      |      |      |      |      |      |      |      |      |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|
| RH (%)                | 0    | 5    | 10   | 15   | 20   | 25   | 30   | 35   | 40   | 45   | 50   |
| F <sub>out</sub> (Hz) | -    | 7015 | 6945 | 6880 | 6820 | 6765 | 6705 | 6655 | 6600 | 6550 | 6505 |
| RH (%)                | 55   | 60   | 65   | 70   | 75   | 80   | 85   | 90   | 95   | 100  |      |
| F <sub>out</sub> (Hz) | 6455 | 6410 | 6360 | 6315 | 6270 | 6225 | 6180 | 6135 | 6085 | -    |      |

Output Voltage: High 4.8 V Min / Low 0.2 V Max with a duty cycle of 50% ±5%



### Temperature influence on HTF3000LF PVH-3.3 humidity measurement



Calibration data are traceable to NIST standards through CETIAT laboratory.

## CHARACTERISTICS

### Temperature sensor

| Characteristics                      | Symbol         | Min  | Typ  | Max  | Unit |
|--------------------------------------|----------------|------|------|------|------|
| Nominal resistance @ 25°C            |                |      | 10   |      | kΩ   |
| Beta value : B25/50                  | B              | 3600 | 3730 | 3800 |      |
| Temperature measuring range          | T <sub>a</sub> | -40  |      | 85   | °C   |
| Nominal Resistance Tolerance at 25°C | R <sub>n</sub> |      | 1    |      | %    |
| B value tolerance                    | B              |      | 1    |      | %    |
| Response Time                        | τ              |      | 10   |      | s    |

**Typical temperature output**

Depending on the needed temperature measurement range and associated accuracy, we suggest two methods to access to the NTC resistance values.

① 
$$R_t = R_n * e^{B \left( \frac{1}{T} - \frac{1}{T_n} \right)}$$

- $R_t$  NTC resistance in  $\Omega$ at temperature T in K
- $R_n$  NTC resistance in  $\Omega$ at rated temperature in K
- $T, T_n$  Temperature in K
- $B$  B value, material-specific constant of the NTC thermistor
- $e$  Base of natural logarithm ( $e = 2.71828$ )

The actual characteristic of an NTC thermistor can, however, only be roughly described by the exponential relation, as the material parameter B in reality also depends on temperature. So this approach is only suitable for describing a restricted range around the rated temperature or resistance with sufficient accuracy.

② For practical applications a more precise description of the real R/T curve may be required. Either more complicated approaches (e.g. the Steinhart-Hart equation) are used or the resistance/temperature relation as given in tabulated form. The below table has been experimentally determined with utmost accuracy for temperature increments of 1 degree.

| Temp °C | Resistance (Ohm) | Max. deviation | Temp °C | Resistance (Ohm) | Max. deviation | Temp °C | Resistance (Ohm) | Max. deviation | Temp °C | Resistance (Ohm) | Max. deviation |
|---------|------------------|----------------|---------|------------------|----------------|---------|------------------|----------------|---------|------------------|----------------|
| -40     | 262960           | 35403          | -5      | 38279            | 2756           | 30      | 8178             | 296            | 65      | 2304             | 171            |
| -39     | 247217           | 32777          | -4      | 36455            | 2568           | 31      | 7866             | 294            | 66      | 2229             | 168            |
| -38     | 232539           | 30358          | -3      | 34731            | 2393           | 32      | 7568             | 292            | 67      | 2158             | 165            |
| -37     | 218845           | 28130          | -2      | 33100            | 2230           | 33      | 7283             | 290            | 68      | 2089             | 161            |
| -36     | 206064           | 26075          | -1      | 31557            | 2078           | 34      | 7011             | 287            | 69      | 2022             | 158            |
| -35     | 194110           | 24178          | 0       | 30029            | 1932           | 35      | 6734             | 284            | 70      | 1960             | 155            |
| -34     | 182852           | 22416          | 1       | 28627            | 1799           | 36      | 6484             | 281            | 71      | 1898             | 152            |
| -33     | 172332           | 20791          | 2       | 27299            | 1675           | 37      | 6244             | 278            | 72      | 1839             | 149            |
| -32     | 162498           | 19290          | 3       | 26042            | 1560           | 38      | 6015             | 275            | 73      | 1782             | 146            |
| -31     | 153299           | 17905          | 4       | 24852            | 1452           | 39      | 5796             | 271            | 74      | 1727             | 143            |
| -30     | 144790           | 16636          | 5       | 23773            | 1355           | 40      | 5575             | 267            | 75      | 1673             | 140            |
| -29     | 136664           | 15444          | 6       | 22708            | 1261           | 41      | 5373             | 264            | 76      | 1622             | 138            |
| -28     | 129054           | 14343          | 7       | 21698            | 1174           | 42      | 5180             | 260            | 77      | 1573             | 135            |
| -27     | 121925           | 13325          | 8       | 20739            | 1093           | 43      | 4995             | 257            | 78      | 1526             | 132            |
| -26     | 115243           | 12383          | 9       | 19829            | 1017           | 44      | 4817             | 253            | 79      | 1480             | 130            |
| -25     | 109030           | 11516          | 10      | 18959            | 946            | 45      | 4636             | 248            | 80      | 1432             | 127            |
| -24     | 103115           | 10705          | 11      | 18128            | 879            | 46      | 4473             | 245            | 81      | 1390             | 124            |
| -23     | 97565            | 9953           | 12      | 17338            | 817            | 47      | 4316             | 241            | 82      | 1349             | 122            |
| -22     | 92354            | 9257           | 13      | 16588            | 759            | 48      | 4166             | 237            | 83      | 1310             | 119            |
| -21     | 87460            | 8612           | 14      | 15876            | 705            | 49      | 4021             | 233            | 84      | 1272             | 117            |
| -20     | 82923            | 8020           | 15      | 15207            | 654            | 50      | 3874             | 229            | 85      | 1235             | 115            |
| -19     | 78581            | 7463           | 16      | 14569            | 607            | 51      | 3737             | 225            | 86      | 1199             | 112            |
| -18     | 74497            | 6947           | 17      | 13962            | 563            | 52      | 3606             | 221            | 87      | 1163             | 110            |
| -17     | 70655            | 6468           | 18      | 13384            | 522            | 53      | 3481             | 217            | 88      | 1130             | 108            |
| -16     | 67039            | 6023           | 19      | 12834            | 484            | 54      | 3360             | 213            | 89      | 1097             | 106            |
| -15     | 63591            | 5606           | 20      | 12280            | 447            | 55      | 3237             | 208            | 90      | 1067             | 104            |
| -14     | 60381            | 5222           | 21      | 11777            | 413            | 56      | 3126             | 204            | 91      | 1038             | 102            |
| -13     | 57356            | 4865           | 22      | 11297            | 382            | 57      | 3019             | 200            | 92      | 1009             | 100            |
| -12     | 54503            | 4533           | 23      | 10840            | 353            | 58      | 2917             | 197            | 93      | 982              | 98             |
| -11     | 51813            | 4225           | 24      | 10404            | 325            | 59      | 2819             | 193            | 94      | 955              | 96             |
| -10     | 49204            | 3932           | 25      | 10000            | 300            | 60      | 2720             | 189            | 95      | 927              | 94             |
| -9      | 46767            | 3662           | 26      | 9600             | 300            | 61      | 2629             | 185            | 96      | 901              | 92             |
| -8      | 44467            | 3411           | 27      | 9218             | 300            | 62      | 2542             | 182            | 97      | 877              | 90             |
| -7      | 42296            | 3177           | 28      | 8853             | 299            | 63      | 2458             | 178            | 98      | 853              | 89             |
| -6      | 40247            | 2960           | 29      | 8506             | 297            | 64      | 2378             | 175            | 99      | 830              | 87             |

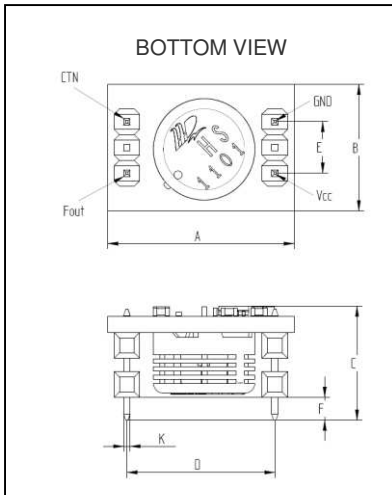
**QUALIFICATION PROCESS**

**Resistance to physical and chemical stresses**

- ⇒ HTF3000LF PVH-3.3 has passed through qualification processes of MEAS FRANCE including vibration, shock, storage, high temperature and humidity
- ⇒ Additional tests under harsh chemical conditions demonstrate good operation in presence of salt atmosphere, SO2 (0.5%, H2S (0.5%), O3, NOx, NO, CO, CO2, Softener, Soap, Toluene, acids (H2SO4, HNO3,HCl), HMDS, Insecticide, Cigarette smoke,....
- ⇒ ESD : HTF3000LF PVH-3.3 is able to sustain a minimum of ±8KV (contact discharge)

**PACKAGE OUTLINE**

**HTF3000LF PVH-3.3**

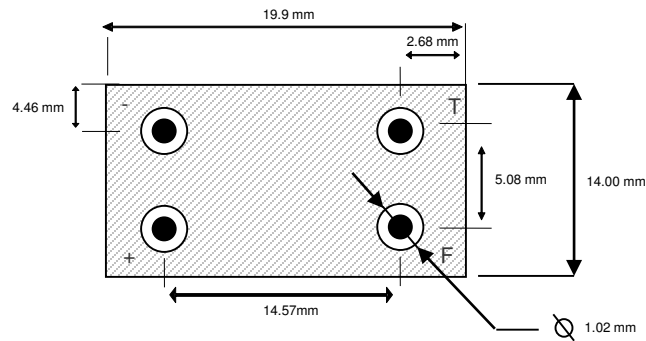


| Dim | A    | B    | C    | D     | E    | F    | K    |
|-----|------|------|------|-------|------|------|------|
| Min | 17.9 | 12.0 | 10.7 | 14.25 | 4.80 | 1.76 | 0.54 |
| Max | 18.9 | 13.0 | 11.7 | 14.95 | 5.40 | 3.76 | 0.74 |

Dimensions in millimeters

**Weight:** 2.1g

**Recommended Through Hole FootPrint**



**Ordering information: HPP808H035 for HTF3000LF PVH-3.3**  
**Storage: Tube M.Q.P of 48 parts; Box M.Q.P of 1008 parts (21 tubes)**

## SOLDERING INFORMATION

### **HTF3000LF PVH-3.3:**

Hand soldering or wave soldering.

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