# TEMPERATURE AND HUMIDITY MODULE

# HTF 3100

*Based on the rugged HTS2010SMD humidity sensor, HTF 3100 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.**
- **Stable, linear proportional frequency output from 0 to 99% RH.**
- **Calibrated within +/- 3% RH @ 55% RH.**
- **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.
- Patented solid polymer structure.

## TEMPERATURE SENSOR SPECIFIC FEATURES


- **10 K +/- 3% NTC temperature sensor**
- Stable
- High sensitivity

## MAXIMUM RATINGS

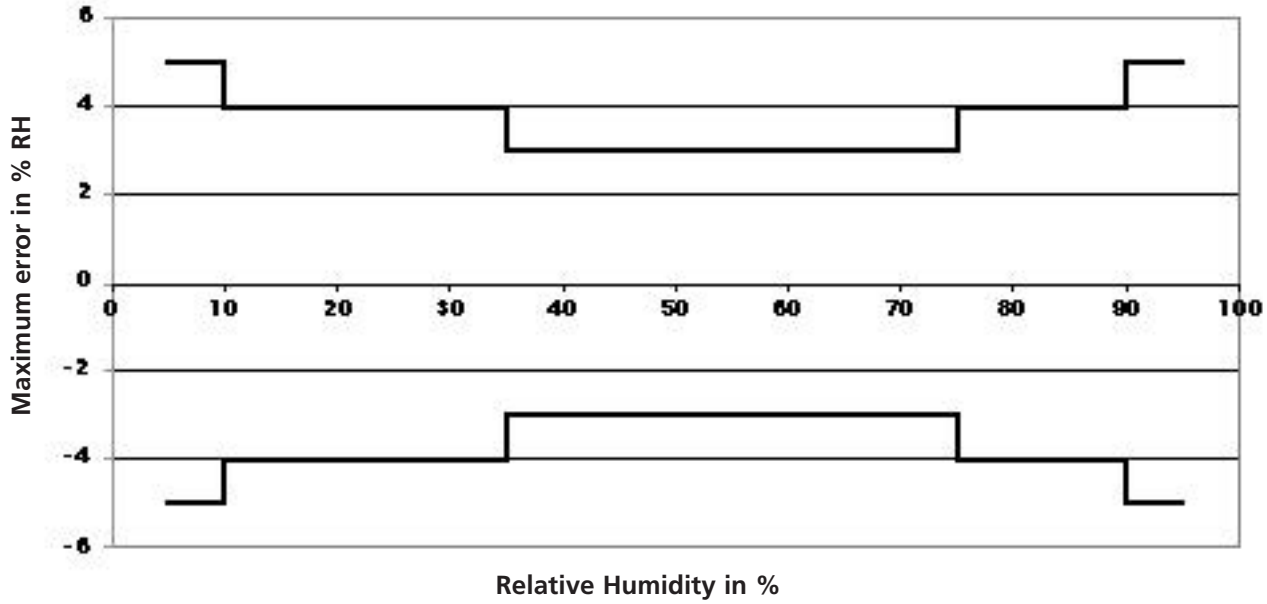
| Ratings | Symbol | Value | Unit |
|---|---|---|---|
| **Storage Temperature** | Tstg | -40 to 105 | °C |
| **Storage Humidity Range** | RHstg | 0 to 100 | % RH |
| **Supply Voltage (Peak)** | Vs | 16 | Vdc |
| **Humidity Operating Range** | RH | 0 to 99 | % RH |
| **Temperature Operating Range** | Ta | -40 to 85 | °C |

## CHARACTERISTICS

### *Humidity sensor* (Ta = 25°C, Vs = 13.5 Vdc , $R_L$ > 100 KΩ unless otherwise stated)

| Characteristics | Symbol | Min. | Typ. | Max. | Unit. |
|---|---|---|---|---|---|
| **Humidity metrology range** | RH | 10 | | 95 | % RH |
| **Relative Humidity accuracy (10 to 95 % RH)** | RH | | +/- 3 | +/- 5 | % RH |
| **Voltage supply** | Vs | 5 | 13.5 | 16 | VdC |
| **Nominal output @ RH = 55 %** | Fout | 6560 | 6600 | 6640 | Hz |
| **Current consumption** | Ic | | | 0.1 | mA |
| **Temperature coefficient (5 to 55°C )** | Tcc | | + 0.1 | | % RH/°C |
| **Averaged Sensitivity from 33 % to 75 % RH** | ΔFout /Δ RH | -11 | - 12.5 | -14 | Hz/% RH |
| **Sink current capability** | Is | | 100 | | µA |
| **Recovery time after 150 hours of condensation** | t | | 10 | | s |
| **Humidity Hysteresis** | | | +/-1.5 | | % RH |
| **Long term stability** | | | 0.5 | | % RH/yr |
| **Response time (33 to 76% RH, static, @63 %)** | τ | | 10 | | s |

## *Relative Humidity Accuracy of HTF 3100 @ 25°C*

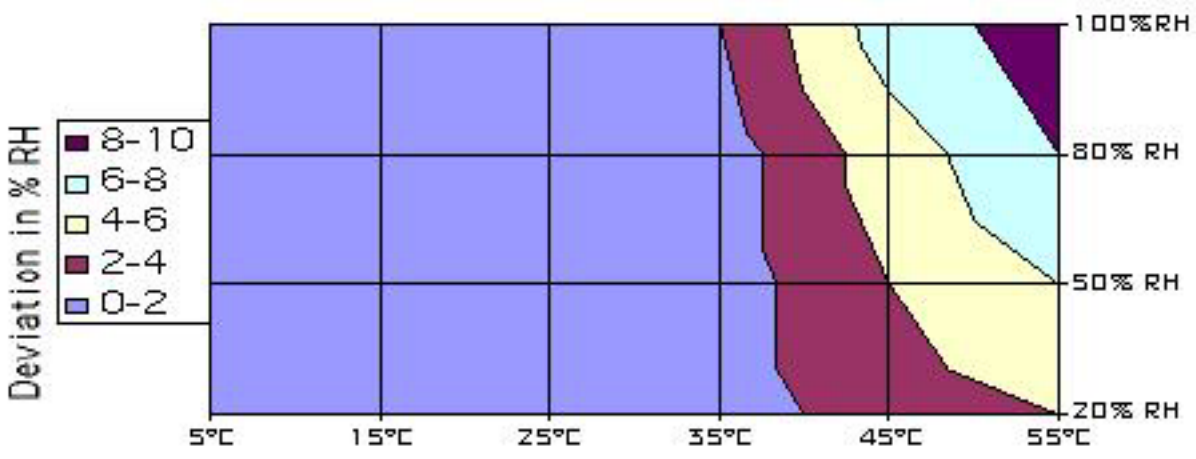



***Modeled Signal output*** *(Linear reference curve) :* $F_{out} = 7277 - 12.5*RH$ *with* $F_{out}$ *in Hz and RH in %*

## *Typical response look-up table (Polynomial Reference curve)*

| RH (%) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fout (Hz) | | | 7145 | 7085 | 7030 | 6970 | 6910 | 6845 | 6785 | 6725 | 6660 |
| RH (%) | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | |
| Fout (Hz) | 6600 | 6535 | 6470 | 6410 | 6340 | 6275 | 6210 | 6145 | 6075 | | |

## *Temperature influence on HTF3100 humidity measurement*




**Calibration data are traceable to NIST standards through CETIAT laboratory.**

# CHARACTERISTICS

## *Temperature sensor* (Ta = 25°C)

| Characteristics | Symbol | Min. | Typ. | Max. | Unit. |
|---|---|---|---|---|---|
| **Nominal resistance @ 25°C** | | | **10** | | **kΩ** |
| **Beta value : B25/100** | **B** | **3600** | **3730** | **3800** | |
| **Temperature measuring range** | **Ta** | **- 40** | | **85** | **°C** |
| **Nominal Resistance Tolerance at 25°C** | **Rn** | | **2** | **3** | **%** |
| **B value tolerance** | **B** | | **3** | | **%** |
| **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 Ωat temperature T in K

$R_N$ NTC resistance in Ωat 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 parame ter 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.

| Temperature °C | Resistance (ohm) | Max. Deviation |
|---|---|---|
| -40 | 262960 | 35403 |
| -38 | 232539 | 30358 |
| -36 | 206064 | 26075 |
| -34 | 182852 | 22416 |
| -32 | 162498 | 19290 |
| -30 | 144790 | 16636 |
| -28 | 129054 | 14343 |
| -26 | 115243 | 12383 |
| -24 | 103115 | 10705 |
| -22 | 92354 | 9257 |
| -20 | 82923 | 8020 |
| -19 | 78581 | 7463 |
| -18 | 74497 | 6947 |
| -17 | 70655 | 6468 |
| -16 | 67039 | 6023 |
| -15 | 63591 | 5606 |
| -14 | 60381 | 5222 |
| -13 | 57356 | 4865 |
| -12 | 54503 | 4533 |
| -11 | 51813 | 4225 |
| -10 | 49204 | 3932 |
| -9 | 46767 | 3662 |
| -8 | 44467 | 3411 |
| -7 | 42296 | 3177 |
| -6 | 40247 | 2960 |
| -5 | 38279 | 2756 |
| -4 | 36455 | 2568 |
| -3 | 34731 | 2393 |

| Temperature °C | Resistance (ohm) | Max. Deviation |
|---|---|---|
| -2 | 33100 | 2230 |
| -1 | 31557 | 2078 |
| 0 | 30029 | 1932 |
| 1 | 28627 | 1799 |
| 2 | 27299 | 1675 |
| 3 | 26042 | 1560 |
| 4 | 24852 | 1452 |
| 5 | 23773 | 1355 |
| 6 | 22708 | 1261 |
| 7 | 21698 | 1174 |
| 8 | 20739 | 1093 |
| 9 | 19829 | 1017 |
| 10 | 18959 | 946 |
| 11 | 18128 | 879 |
| 12 | 17338 | 817 |
| 13 | 16588 | 759 |
| 14 | 15876 | 705 |
| 15 | 15207 | 654 |
| 16 | 14569 | 607 |
| 17 | 13962 | 563 |
| 18 | 13384 | 522 |
| 19 | 12834 | 484 |
| 20 | 12280 | 447 |
| 21 | 11777 | 413 |
| 22 | 11297 | 382 |
| 23 | 10840 | 353 |
| 24 | 10404 | 325 |
| **25** | **10000** | **300** |

| Temperature °C | Resistance (ohm) | Max. Deviation |
|---|---|---|
| 26 | 9600 | 300 |
| 27 | 9218 | 300 |
| 28 | 8853 | 299 |
| 29 | 8506 | 297 |
| 30 | 8178 | 296 |
| 31 | 7866 | 294 |
| 32 | 7568 | 292 |
| 33 | 7283 | 290 |
| 34 | 7011 | 287 |
| 35 | 6734 | 284 |
| 36 | 6484 | 281 |
| 37 | 6244 | 278 |
| 38 | 6015 | 275 |
| 39 | 5796 | 271 |
| 40 | 5575 | 267 |
| 41 | 5373 | 264 |
| 42 | 5180 | 260 |
| 43 | 4995 | 257 |
| 44 | 4817 | 253 |
| 45 | 4636 | 248 |
| 46 | 4473 | 245 |
| 47 | 4316 | 241 |
| 48 | 4166 | 237 |
| 49 | 4021 | 233 |
| 50 | 3874 | 229 |
| 51 | 3737 | 225 |
| 52 | 3606 | 221 |
| 53 | 3481 | 217 |

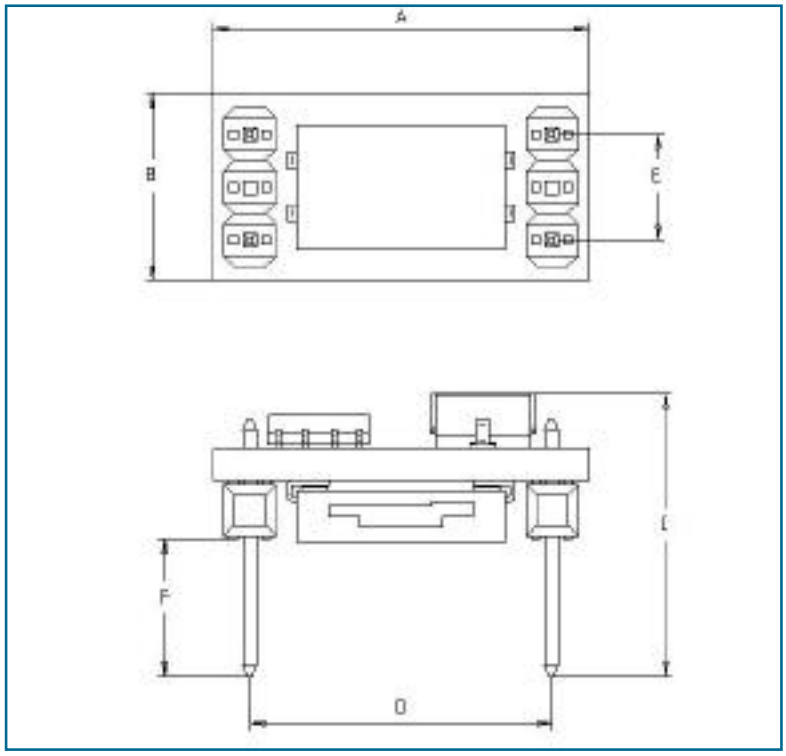
| Temperature °C | Resistance (ohm) | Max. Deviation |
|---|---|---|
| 54 | 3360 | 213 |
| 55 | 3237 | 208 |
| 56 | 3126 | 204 |
| 57 | 3019 | 200 |
| 58 | 2917 | 197 |
| 59 | 2819 | 193 |
| 60 | 2720 | 189 |
| 61 | 2629 | 185 |
| 62 | 2542 | 182 |
| 63 | 2458 | 178 |
| 64 | 2378 | 175 |
| 65 | 2304 | 171 |
| 66 | 2229 | 168 |
| 67 | 2158 | 165 |
| 68 | 2089 | 161 |
| 69 | 2022 | 158 |
| 70 | 1960 | 155 |
| 71 | 1898 | 152 |
| 72 | 1839 | 149 |
| 73 | 1782 | 146 |
| 74 | 1727 | 143 |
| 75 | 1673 | 140 |
| 77 | 1573 | 135 |
| 79 | 1480 | 130 |
| 81 | 1390 | 124 |
| 83 | 1310 | 119 |
| 85 | 1235 | 115 |

# QUALIFICATION PROCESS

## *Resistance to physical and chemical stresses*

- ***HTF3100*** has passed through qualification processes of HUMIREL including vibration, shock, storage, high temperature and humidity, ESD.
- Additional tests under harsh chemical conditions demonstrate good operation in presence of salt atmosphere, SO2 (0.5%, H2S (0.5%), 03, NOx, NO, CO, CO2, Softener, Soap, Toluene, acids (H2SO4, HNO3, HCl), HMDS, Insecticide, Cigarette smoke, a non exhaustive list.
- **HTF3100** is not light sensitive.

# PACKAGE OUTLINE HTF3100




| Dim | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| **Min** | 17.5 | 8.5 | 13.4 | 14.37 | 4.88 | 6.1 | |
| **Max** | 18.5 | 9.5 | 14.4 | 14.77 | 5.28 | 7.1 | |

Dimensions in millimeters

**Connector type : upon request, customized connectors are available**
to be mated with your female connector or PCB

## ORDERING INFORMATION :

**HTF3100 : Humidity Frequency output + NTC (Temperature direct output)**

*HUMIREL WEB SITE*
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