

HTM1735LF – Temperature and Relative Humidity Module



- Suitable for direct board assembly
- Product free from Lead, Cr (6+), Cd and Hg
- Humidity calibrated within +/- 2% RH @ 55% RH
- Typical 1 to 3.6 Volt DC output for 0 to 100% RH at 5V DC supply
- Temperature measurement through NTC 10 kΩ +/- 3% direct output

DESCRIPTION

Based on the rugged HS1101LF humidity sensor, HTM1735LF is a dedicated humidity and temperature transducer designed for OEM applications where a reliable and accurate measurement is needed. Direct interface with a micro-controller is made possible with the module's humidity linear voltage and direct NTC outputs. HTM1735LF is designed for an optimized board to board connection.

FEATURES

- Full interchangeability
- High reliability and long term stability
- Not affected by repeated condensations
- Ratiometric to voltage supply within the specified range

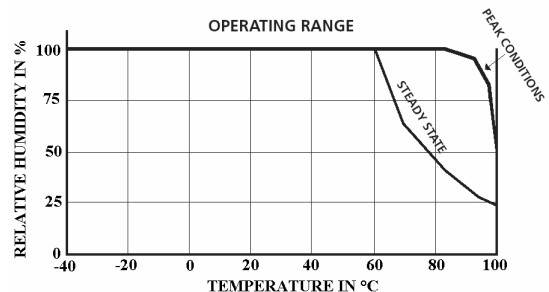
APPLICATIONS

- Reprography
- HVAC Controller
- ...

PERFORMANCE SPECS

MAXIMUM RATINGS

| Ratings | Symbol | Value | Unit |
|-------------------------------|-------------------|------------|------|
| Storage Temperature | Tstg | -40 to 105 | °C |
| Storage Humidity | RHstg | 0 to 100 | % RH |
| Supply Voltage (Peak) | Vs | 7 | Vdc |
| Humidity Operating Range | RH | 0 to 100 | % RH |
| Temperature Operating Range | Ta | -40 to 100 | °C |
| Maximum Output Current (Peak) | I _{Peak} | 5 | mA |
| Maximum Power | Pd | 20 | mW |



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ELECTRICAL CHARACTERISTICS

(Ta=25°C, Vs=5Vdc, RL>1MΩ unless otherwise stated)

| Humidity Characteristics | Symbol | Min | Typ | Max | Unit |
|--|----------------------------|------|--------|------|--------|
| Humidity Measuring Range | RH | 0 | | 100 | %RH |
| Relative Humidity Accuracy (10 to 95% RH) | RH | | +/-3 | +/-5 | %RH |
| Supply Voltage | Vs | 4.75 | 5.00 | 5.25 | Vdc |
| Nominal Output @55%RH (at 5Vdc) | Vout | 2.42 | 2.48 | 2.54 | V |
| Current Consumption | Ic | | 2.8 | 4 | mA |
| Temperature Coefficient (10 to 50°C) | Tcc | | -0.05 | -0.1 | %RH/°C |
| Average Sensitivity from 33% to 75%RH | $\Delta V_{out}/\Delta RH$ | | +26 | | mV/%RH |
| Sink Current Capability (RL = 33kΩ) | I | | | 150 | μA |
| Recovery Time after 150 hours of condensation | tr | | 10 | | s |
| Humidity Hysteresis | | | +/-1 | | %RH |
| Humidity Resolution | | | 0.4 | | %RH |
| Long Term Stability | T | | +/-0.5 | | %RH/yr |
| Time Constant (at 63% of signal, static) 33% to 75%RH ⁽¹⁾ | τ | | 5 | 10 | s |
| Output Impedance | Z | | 70 | | Ω |
| Warm Up Time | tw | | 200 | | ms |

⁽¹⁾ At 2m/s air flow

(Ta=25°C)

| Temperature Characteristics | Symbol | Min | Typ | Max | Unit |
|------------------------------------|----------------|------|------|------|------|
| Nominal Resistance @25°C | R | | 10 | | kΩ |
| Beta value: B25/100 | β | 3600 | 3730 | 3800 | |
| Temperature Measuring Range | Ta | -30 | | 80 | °C |
| Nominal Resistance Tolerance @25°C | R _N | | 2 | 3 | % |
| Beta Value Tolerance | β | | 3 | | % |
| Response Time | τ | | 10 | | s |

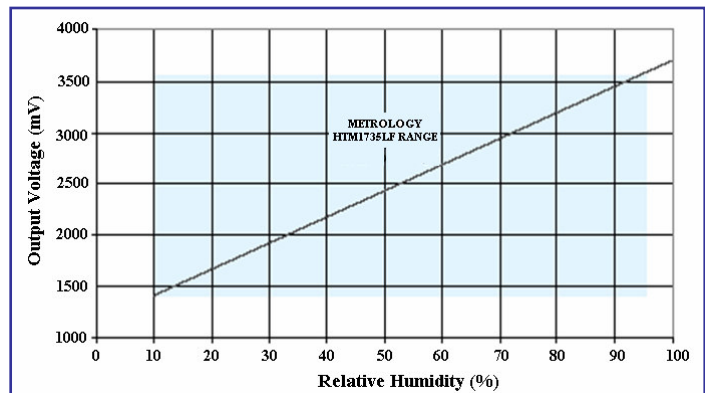
TYPICAL PERFORMANCE CURVES

HUMIDITY SENSOR

- Measurement Conditions

HTM1735LF is specified for accurate measurements within 10 to 95 %RH.

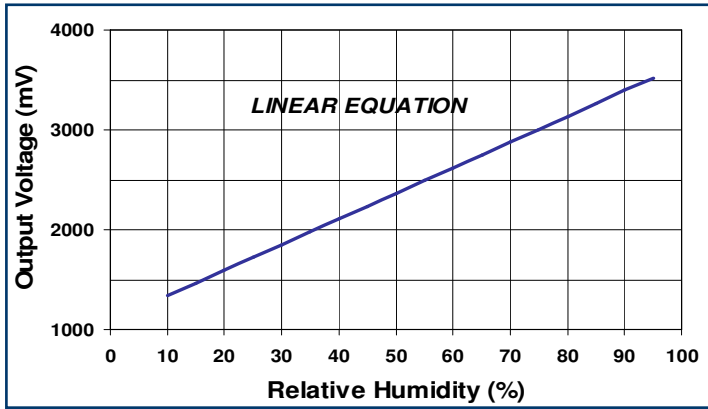
Excursion out of this range (< 10% or > 95% RH, including condensation) does not affect the reliability of HTM1735LF characteristics





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- HTM1735LF Modeled Linear Voltage Output (Vcc=5V)

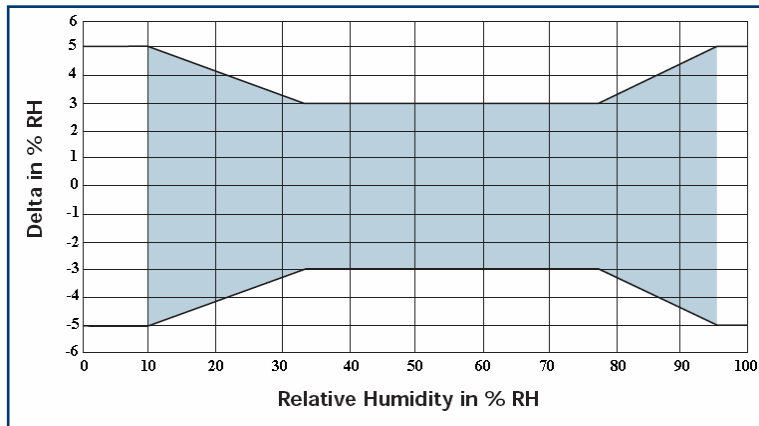


| RH (%) | Vout (mV) | RH (%) | Vout (mV) |
|--------|-----------|--------|-----------|
| 10 | 1325 | 55 | 2480 |
| 15 | 1465 | 60 | 2605 |
| 20 | 1600 | 65 | 2730 |
| 25 | 1735 | 70 | 2860 |
| 30 | 1860 | 75 | 2990 |
| 35 | 1990 | 80 | 3125 |
| 40 | 2110 | 85 | 3260 |
| 45 | 2235 | 90 | 3405 |
| 50 | 2360 | 95 | 3555 |

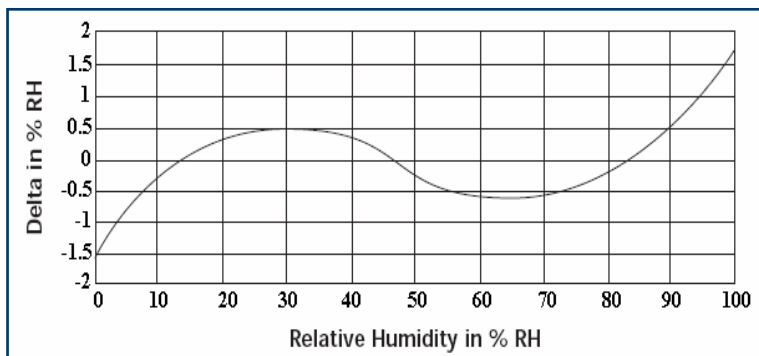
LINEAR EQUATION:

- $V_{out} = 25.68RH + 1079$
 - $RH = 0.03892 V_{out} - 41.98$
- (With V_{out} in mV and RH in %)

- Error Budget Conditions



- Linearity Error



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TEMPERATURE SENSOR

- Typical temperature output

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

$$R_T = R_N \times e^{\beta \left(\frac{1}{T} - \frac{1}{T_N} \right)}$$

- R_T NTC resistance in Ω at temperature T in K
- R_N NTC resistance in Ω at rated temperature T in K
- T, T_N Temperature in K
- β Beta value, material specific constant of NTC
- e Base of natural logarithm (e=2.71828)

① The exponential relation only roughly describes the actual characteristic of an NTC thermistor can, however, as the material parameter β in reality also depend on temperature. So this approach is 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 tabulation form. The below table has been experimentally determined with utmost accuracy for temperature increments of 1 degree.

Actual values may also be influenced by inherent self-heating properties of NTCs. Please refer to MEAS-France/Humirel Application Note HPC106 “Low power NTC measurement”.

- Temperature look-up table

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



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QUALIFICATION PROCESS

RESISTANCE TO PHYSICAL AND CHEMICAL STRESSES

- HTM1735LF has passed through qualification processes of MEAS-France/Humirel including vibration, shock, storage, high temperature and humidity.
- HTM1735LF contains circuit to protect its inputs and outputs against ElectroStatic Discharges (ESD) up to $\pm 15\text{kV}$, air discharge.
- Additional tests under harsh chemical conditions demonstrate good operation in presence of salt atmosphere, SO₂ (0.5%), H₂S (0.5%), O₃, NO_x, NO, CO, CO₂, Softener, Soap, Toluene, acids (H₂SO₄, HNO₃, HCl), HMDS, Insecticide, Cigarette smoke, this is not an exhaustive list.
- HTM1735LF is not light sensitive.

SPECIFIC PRECAUTIONS

- HTM1735LF is not protected against reversed polarity - Check carefully when connecting the device.

PACKAGE OUTLINE

PINOUT ASSIGNMENT

| Pin | Function |
|-----|----------------------|
| 1 | NTC – Temperature |
| 2 | Ground |
| 3 | Vcc – Voltage supply |
| 4 | Vout – Humidity |

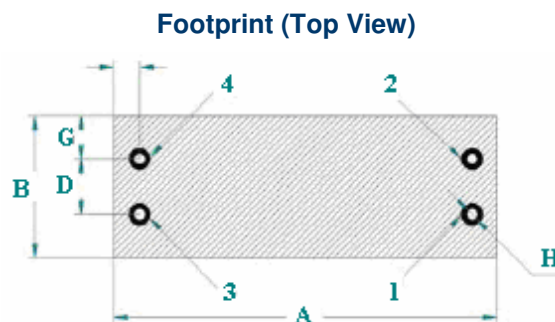
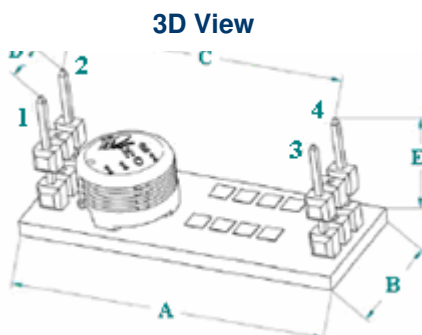
HTM1735LF STD PACKAGE OUTLINE

Package Outline

| Dim | Min (mm) | Max (mm) |
|-----|-----------|----------|
| A | 34 | 36 |
| B | 12.5 | 13.5 |
| C | 30.25 Typ | |
| D | 5.08 Typ | |
| E | 13.1 Typ | |

Footprint Outline

| Dim | Min (mm) | Max (mm) |
|-----|------------|----------|
| A | 34 | 36 |
| B | 12.5 | 13.5 |
| D | 5.08 Typ | |
| F | 2.36 Typ | |
| G | 3.94 Typ | |
| H | Ø 1.02 Typ | |





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HTM1735LF SMD PACKAGE OUTLINE

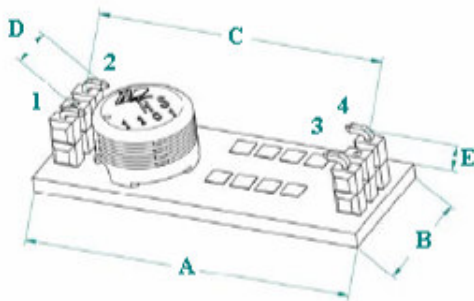
Package Outline

| Dim | Min (mm) | Max (mm) |
|-----|-----------|----------|
| A | 34 | 36 |
| B | 12.5 | 13.5 |
| C | 30.25 Typ | |
| D | 5.08 Typ | |
| E | 6.65 Typ | |

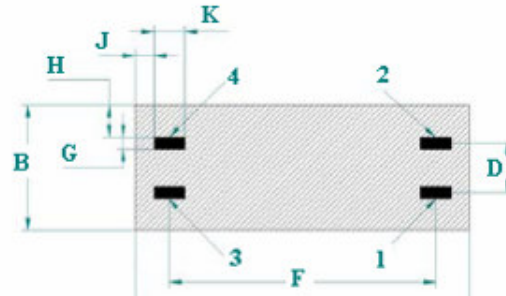
Footprint Outline

| Dim | Min (mm) | Max (mm) |
|-----|----------|----------|
| F | 27.81Typ | |
| G | 1.27 Typ | |
| H | 3.33 Typ | |
| J | 2.04 Typ | |
| K | 3.18 Typ | |

3D View



Footprint (Top View)

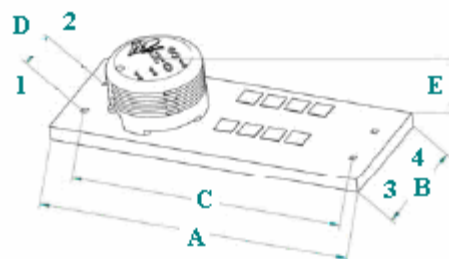


HTM1735LF SR PACKAGE OUTLINE

Package Outline

| Dim | Min (mm) | Max (mm) |
|-----|-----------|----------|
| A | 34 | 36 |
| B | 12.5 | 13.5 |
| C | 30.25 Typ | |
| D | 5.08 Typ | |
| E | 6.65 Typ | |

3D View



HTM1735LF – Temperature and Relative Humidity Module

ORDERING INFORMATION

HPP805D033: HTM1735LF STD (THROUGH HOLE BOARD-TO-BOARD CONNECTION)

HPP805D034: HTM1735LF SR (WITH HOLES FOR CUSTOMIZED WIRING)

HPP805035: HTM1735LF SMD (SMD BOARD-TO-BOARD CONNECTION)

Customer Service contact details

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| Revision | Comments | Who | Date |
|----------|-------------------------------|-----------|--------|
| K | Standardized datasheet format | D.LE GALL | May 08 |

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