TEMPERATURE AND HUMIDITY MODULE   HTF3000

Based on the rugged HS1101LF humidity sensor, HTF3000 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, proportional frequency output from 0 to 100% RH.**
⇨ **Calibrated within +/- 3% RH @ 55% RH at 5.00 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 kΩ+/- 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

OPERATING RANGE
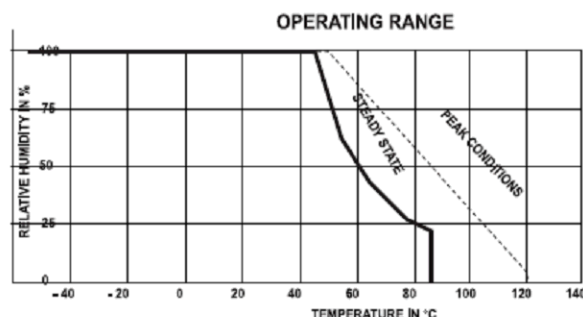
Chart1

CHARACTERISTICS

Humidity sensor(Ta =23°C, Vs=5.0Vdc, R_L >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	5.00	16	VdC
Nominal output @ RH = 55 % and 5. 0Vdc	Fout	6560	6600	6640	Hz
Current consumption at 16Vdc	Ic			0.1	mA
Voltage supply influence (4 to 7 Vdc)	RH		+/-1		% RH
Averaged Sensitivity from 10% to 95% RH	$\Delta Fout /\Delta$ RH	-10	- 12	-14	Hz/% RH
Humidity Hysteresis				+/-1	% RH
Long term stability			0.5		% RH/yr
Time constant (40 to 95% RH, 2m/s, @63 %)	τ			10	s

Relative Humidity Accuracy of HTF 3000 @ 23°C
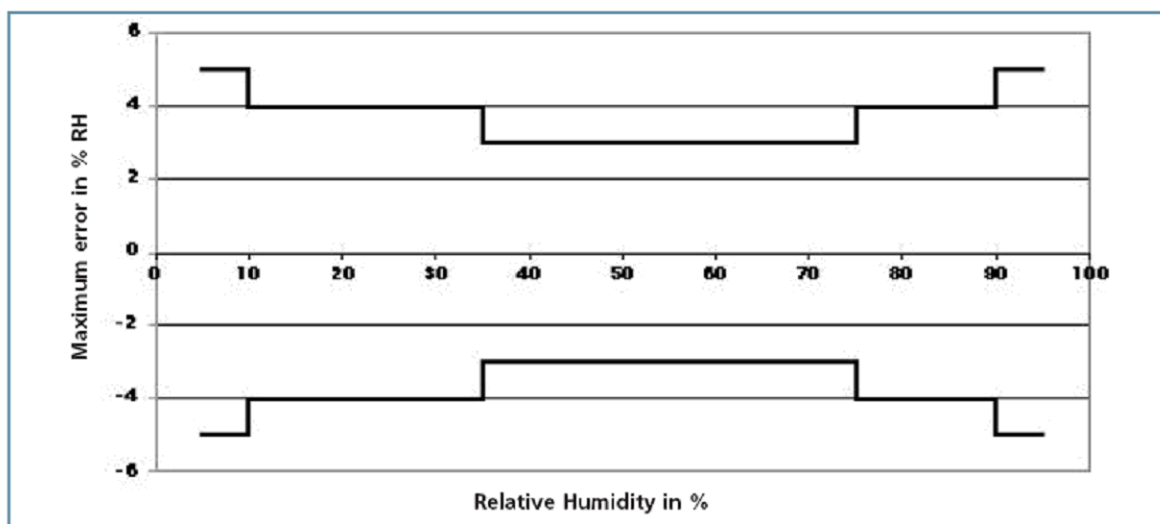
Chart 2

Modeled Signal output:

$Fout = 7314 - 16.79*RH + 0.0886*RH^2 - 0.000358* RH^3$
(Fout in Hz and RH in %)

Typical response look-up table at 5V (Polynomial Reference curve)

RH (%)	0	5	10	15	20	25	30	35	40	45	50
Fout (Hz)		7230	7155	7080	7010	6945	6880	6820	6760	6705	6650
RH (%)	55	60	65	70	75	80	85	90	95	100	
Fout (Hz)	6600	6550	6500	6450	6400	6355	6305	6260	6210	6160	

Output Voltage wave form

Temperature influence on HTF3000 humidity measurement

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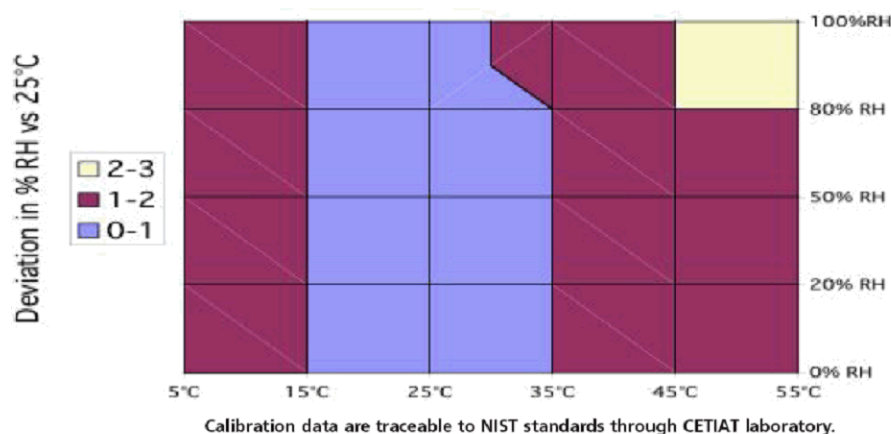
CHARACTERISTICS

Temperature sensor

Characteristics	Symbol	Min.	Typ	Max.	Unit.
Nominal resistance @ 25°C			10		kΩ
Beta value : B25/50	B	3346	3380	3413	
Temperature measuring range	Ta	-40		85	°C
Nominal Resistance Toleranceat 25°C	Rn		1		%
B value tolerance	B		1		%
Response Time	T		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 Ω at temperature T in K

R_N NTC resistance in Ω 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 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.

Temp °C	Rnominal Ω	Max Deviation Ω	Temp °C	Rnominal Ω	Max Deviation Ω	Temp °C	Rnominal Ω	Max Deviation Ω	Temp °C	Rnominal Ω	Max Deviation Ω
-40	195652	7921	3	23951	452	46	4754	83	89	1303	40
-39	184917	7378	4	22963	423	47	4597	82	90	1268	39
-38	174845	6874	5	22021	396	48	4446	81	91	1234	39
-37	165391	6407	6	21123	371	49	4301	80	92	1202	38
-36	156513	5974	7	20267	348	50	4161	79	93	1170	37
-35	148171	5571	8	19450	326	51	4026	77	94	1139	37
-34	140330	5197	9	18670	305	52	3896	76	95	1110	36
-33	132958	4849	10	17926	285	53	3771	75	96	1081	35
-32	126022	4527	11	17214	267	54	3651	74	97	1053	35
-31	119494	4226	12	16534	250	55	3535	73	98	1026	34
-30	113347	3947	13	15886	233	56	3423	72	99	999	34
-29	107565	3687	14	15266	218	57	3315	70	100	974	33
-28	102116	3446	15	14674	204	58	3211	69	101	949	32
-27	96978	3221	16	14108	190	59	3111	68	102	925	32
-26	92132	3011	17	13566	178	60	3014	67	103	902	31
-25	87559	2815	18	13049	166	61	2922	66	104	880	31
-24	83242	2633	19	12554	154	62	2834	65	105	858	30
-23	79166	2463	20	12081	144	63	2748	64	106	837	30
-22	75316	2305	21	11628	134	64	2666	63	107	816	29
-21	71677	2157	22	11195	125	65	2586	62	108	796	29
-20	68237	2019	23	10780	116	66	2509	60	109	777	28
-19	64991	1890	24	10382	108	67	2435	59	110	758	28
-18	61919	1770	25	10000	100	68	2364	58	111	740	27
-17	59011	1658	26	9634	100	69	2294	57	112	722	27
-16	56258	1553	27	9284	100	70	2228	56	113	705	26
-15	53650	1454	28	8947	100	71	2163	55	114	688	26
-14	51178	1363	29	8624	99	72	2100	54	115	672	25
-13	48835	1277	30	8315	99	73	2040	53	116	656	25
-12	46613	1197	31	8018	98	74	1981	52	117	640	24
-11	44506	1121	32	7734	98	75	1925	52	118	625	24
-10	42506	1051	33	7461	97	76	1870	51	119	611	24
-9	40600	985	34	7199	96	77	1817	50	120	596	23
-8	38791	923	35	6948	95	78	1766	49	121	583	23
-7	37073	865	36	6707	94	79	1716	48	122	569	22
-6	35442	810	37	6475	93	80	1669	47	123	556	22
-5	33892	759	38	6253	92	81	1622	46	124	544	22
-4	32420	712	39	6039	91	82	1578	46	125	531	21
-3	31020	667	40	5834	90	83	1535	45			
-2	29689	625	41	5636	89	84	1493	44			
-1	28423	586	42	5445	88	85	1452	43			
0	27219	549	43	5262	87	86	1413	42			
1	26076	514	44	5086	86	87	1375	42			
2	24988	482	45	4917	85	88	1338	41			

QUALIFICATION PROCESS
Resistance to physical and chemical stresses

⇨ *HTF3000* has passed through qualification processes of HUMIREL 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%), 03, NOx, NO, CO, CO2, Softener, Soap, Toluene, acids (H2SO4, HNO3,HCl), HMDS, Insecticide, Cigarette smoke,….
⇨ ESD : HTF3000 is able to sustain a minimum of ±8KV (contact discharge)

PACKAGE OUTLINE HTF3000
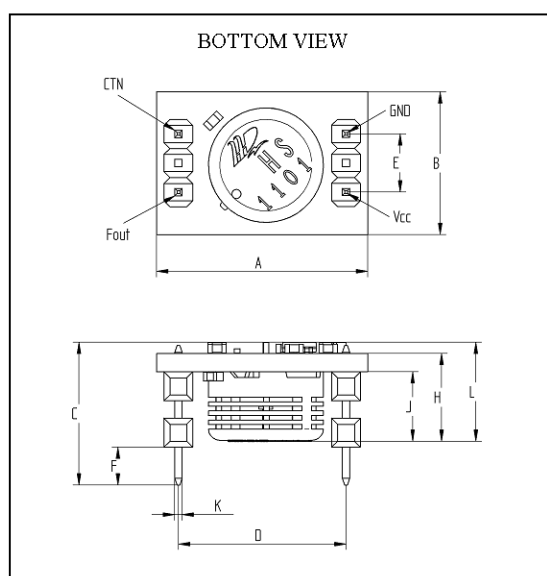
Dim	A	B	C	D	E	F
Min	17.9	12.0	12.0	14.37	4.88	2.8
Max	18.9	13.0	13.0	14.77	5.28	3.8

Dim	J	H	L	K
Min	5.6	7.2	8.0	0.54
Max	6.6	8.2	9.4	0.74

Dimensions in millimeters

Soldering information

Hand soldering :

➢ Temperature of the soldering iron must be kept under 350°C.
➢ Duration of the soldering operation less than 3 seconds

Automatic soldering :

➢ Standard Wave soldering process.

Ordering information: HPP808H031

Revision	Who	date	comments
0	K. BENDHIA	Dec 2005	Document creation (Preliminary)
A	K. BENDHIA	Dec 2005	Modification of NTC 1% instead of 3%
B	K. BENDHIA	Dec 2005	Correction & addition of values in look up table (page 2)