

# HTF3000LF Temperature and Humidity Module

## DESCRIPTION

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



## 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 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
- ◆ 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	T <sub>stg</sub>	-40 to 105	°C
Storage Humidity Range	RH <sub>stg</sub>	0 to 100	% RH
Supply Voltage (Peak)	V <sub>s</sub>	16	Vdc
Humidity Operating Range	RH	0 to 100	% RH
Temperature Operating Range	T <sub>a</sub>	-40 to 85	°C



北京赛斯维测控技术有限公司  
 北京市朝阳区望京西路48号  
 金隅国际C座1002  
 电话：+86 010 8477 5646  
 传真：+86 010 5894 9029  
 邮箱：[sales@sensorway.cn](mailto:sales@sensorway.cn)  
<http://www.sensorway.cn>

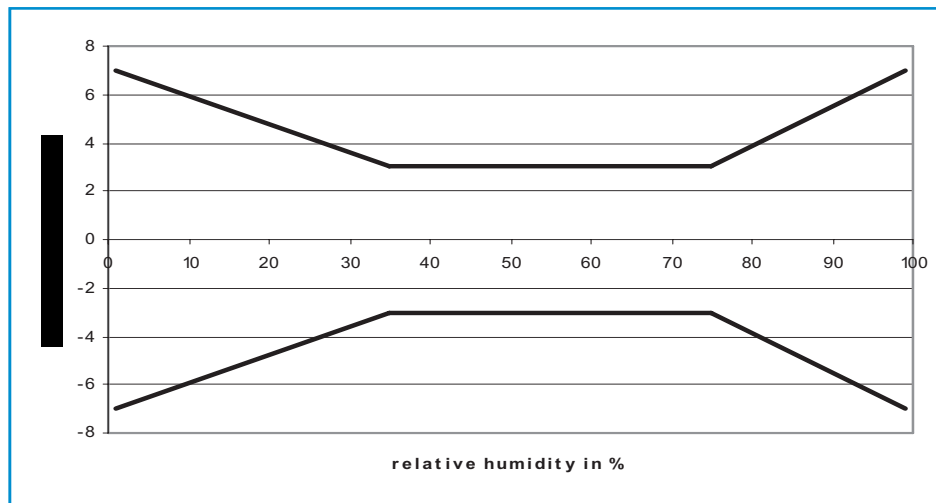


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Characteristics Humidity sensor (Ta = 25°C, Vs = 5.0 Vdc +/- 5%, RL > 100 KΩ unless otherwise stated)

Characteristics	Symbol	Min	Typ	Max	Unit
Relative Humidity Accuracy (10 to 95 % RH)	RH	Refer to Chart 2 on page 2			
Voltage Supply	Vs	3	3.30	16	VdC
Nominal Output @ RH = 55 % and 3.3Vdc	F <sub>out</sub>	6560	6600	6640	Hz
Current Consumption (Max at 16Vdc)	Ic		0.18	1	mA
Voltage Supply Influence (3 to 7Vdc)	RH		+/-1		% RH
Averaged Sensitivity from 33 % to 75 % RH	ΔF <sub>out</sub> / Δ 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 3000LF



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

Modeled Signal output:  $F_{out} = 7314 - 16.9 \cdot RH + 0.0886 \cdot RH^2 - 0.000358 \cdot RH^3$  (Fout in Hz and RH in %)

Modeled Reversed Equation:  $RH = 89.8 \cdot 10^{-10} \cdot F_{out}^3 - 15,7486 \cdot 10^{-5} \cdot F_{out}^5 + 0,80945 \cdot F_{out} - 1009$  (Fout in Hz and RH in %)

RH (%)	1	5	10	15	20	25	30	35	40	45	50
Fout (Hz)	7295	7230	7155	7080	7010	6945	6880	6820	6760	6705	6650
RH (%)	55	60	65	70	75	80	85	90	95	99	
Fout (Hz)	6600	6550	6500	6450	6400	6355	6305	6260	6210	6170	

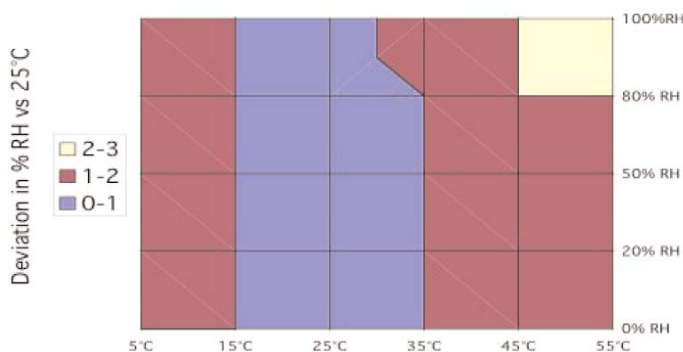


北京赛斯维测控技术有限公司  
 北京市朝阳区望京西路48号  
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 电话：+86 010 8477 5646  
 传真：+86 010 5894 9029  
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## Temperature influence on HTF3000LF humidity measurement



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	3346	3380	3413	
Temperature Measuring Range	Ta	- 40		85	°C
Nominal Resistance Tolerance at 25°C	Rn		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.

$$① \quad R_T = R_0 \cdot e^{B \left( \frac{1}{T} - \frac{1}{T_0} \right)}$$

$R_T$  NTC resistance in Ω at temperature T in K

$R_0$  NTC resistance in Ω at rated temperature in K

$T, T_0$  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.



北京赛斯维测控技术有限公司  
北京市朝阳区望京西路48号  
金隅国际C座1002

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传真：+86 010 5894 9029

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Temperature °C	Resistance (ohm)	Max. Deviation
-40	195652	7921
-39	184917	7378
-38	174845	6874
-37	165391	6407
-36	156513	5974
-35	148171	5571
-34	140330	5197
-33	132958	4849
-32	126022	4527
-31	119494	4226
-30	113347	3947
-29	107565	3687
-28	102116	3446
-27	96978	3221
-26	92132	3011
-25	87559	2815
-24	83242	2633
-23	79166	2463
-22	75316	2305
-21	71677	2157
-20	68237	2019
-19	64991	1890
-18	61919	1770
-17	59011	1658
-16	56258	1553
-15	53650	1454
-14	51178	1363
-13	48835	1277
-12	46613	1197
-11	44506	1121
-10	42506	1051
-9	40600	985
-8	38791	923
-7	37073	865
-6	35442	810
-5	33892	759
-4	32420	712
-3	31020	667
-2	29689	625
-1	28423	586
0	27219	549
1	26076	514
2	249	482

Temperature °C	Resistance (ohm)	Max. Deviation
3	23951	452
4	22963	423
5	22021	396
6	21123	371
7	20267	348
8	19450	326
9	18670	305
10	17926	285
11	17214	267
12	16534	250
13	15886	233
14	15266	218
15	14674	204
16	14108	190
17	13566	178
18	13049	166
19	12554	154
20	12081	144
21	11628	134
22	11195	125
23	10780	116
24	10382	108
25	10000	100
26	9634	100
27	9284	100
28	8947	100
29	8624	99
30	8315	99
31	8018	98
32	7734	98
33	7461	97
34	7199	96
35	6948	95
36	6707	94
37	6475	93
38	6253	92
39	6039	91
40	5834	90
41	5636	89
42	5445	88
43	5262	87
44	5086	86
45	4917	85

Temperature °C	Resistance (ohm)	Max. Deviation
46	4754	83
47	4597	82
48	4446	81
49	4301	80
50	4161	79
51	4026	77
52	3896	76
53	3896	75
54	3651	74
55	3535	73
56	3423	72
57	3315	70
58	3211	69
59	3111	68
60	3014	67
61	2922	66
62	2834	65
63	2748	64
64	2666	63
65	2586	62
66	2509	60
67	2435	59
68	2364	58
69	2294	57
70	2228	56
71	2163	55
72	2100	54
73	2040	53
74	1981	52
75	1925	52
76	1870	51
77	1817	50
78	1766	49
79	1716	48
80	1669	47
81	1622	46
82	1578	46
83	1535	45
84	1493	44
85	1452	43
86	1413	42
87	1375	42
88	1338	41

Temperature °C	Resistance (ohm)	Max. Deviation
89	1303	40
90	1268	39
91	1234	39
92	1202	38
93	1170	37
94	1139	37
95	1110	36
96	1081	35
97	1053	35
98	1026	34
99	999	34
100	974	33
101	949	32
102	925	32
103	902	31
104	880	31
105	858	30
106	837	30
107	816	29
108	796	29
109	777	28
110	758	28
111	740	27
112	722	27
113	705	26
114	688	26
115	672	25
116	656	25
117	640	24
118	625	24
119	611	24
120	596	23
121	583	23
122	569	22
123	556	22
124	544	22
125	531	21



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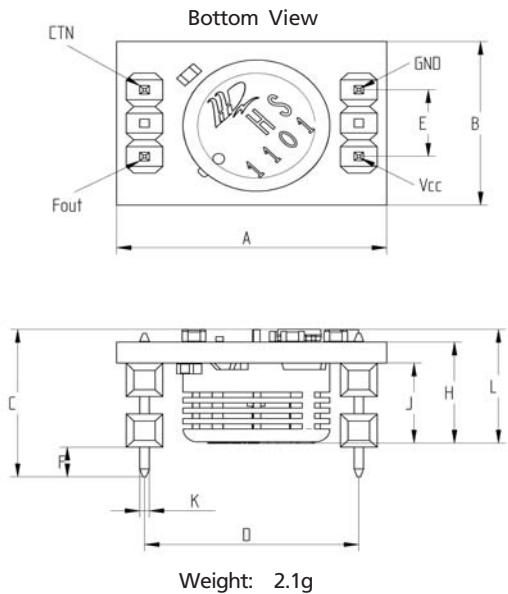
# HTF3000LF Temperature and Humidity Module

## Qualification Process

### Resistance to physical and chemical stresses

- HTF3000LF 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, SO<sub>2</sub> (0.5%), H<sub>2</sub>S (0.5%), O<sub>3</sub>, NO<sub>x</sub>, NO, CO, CO<sub>2</sub>, Softener, Soap, Toluene, acids (H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>, HCl), HMDS, Insecticide, Cigarette smoke.
- ESD: HTF3000LF is able to sustain a minimum of +/- 8KV (contact discharge)

## Package Outline HTF3000LF PVH



Dim	A	B	C	D	E	F
Min	17.9	12.0	12.0	14.37	4.88	1.76
Max	18.9	13.0	13.0	14.77	5.28	2.76

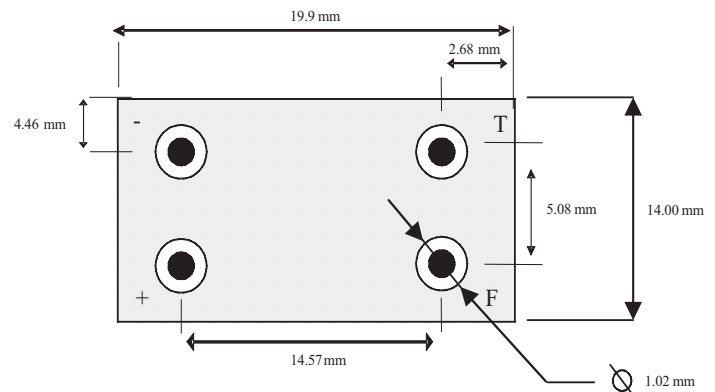
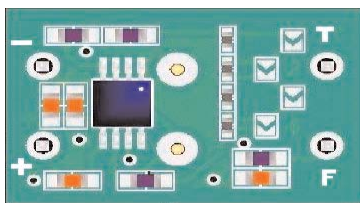
Dim	J	H	L	K
Min	5.6	7.2	8.0	0.54
Max	6.6	8.2	9.4	0.74

Dimensions in millimeters



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## Recommended Through Hole FootPrint



## Ordering Information: HPP808H031



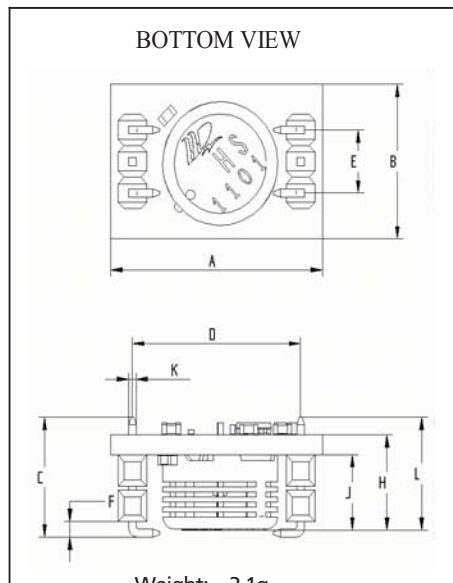
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- ESD: HTF3000LF is able to sustain a minimum of +/- 8KV (contact discharge)

## Package Outline HTF3000LF SMD



Dim	A	B	C	D	E	F
Min	17.9	12.0	9.15	14.37	4.88	0.8
Max	18.9	13.0	10.15	14.77	5.28	2.8

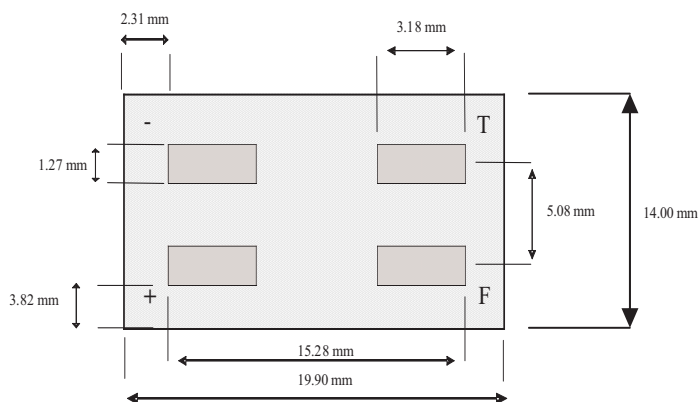
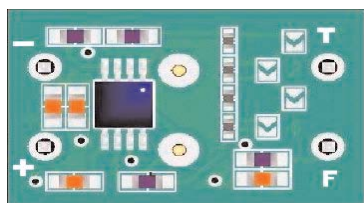
Dim	J	H	L	K
Min	5.6	7.2	8.4	0.54
Max	6.6	8.2	9.8	0.74



Dimensions in millimeters

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## Recommended SMD FootPrint



## Ordering Information: HPP808H033

## 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 Tin-Lead or Lead Free Wave Soldering Process
- Recommended Reflow Profile as per Humirel specification

