TEMPERATURE AND HUMIDITY MODULE HTF3000LF

RoHS Compliant

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 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 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

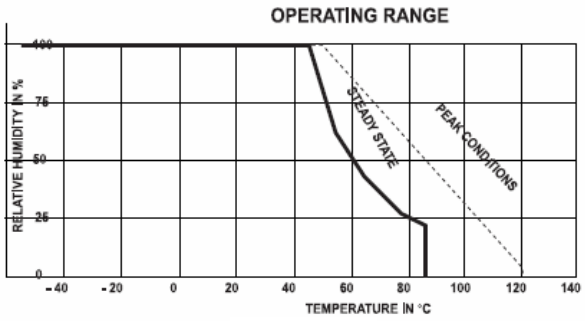


Chart1

CHARACTERISTICS

Humidity sensor(Ta =23°C, Vs=3.3Vdc, 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	3.30	16	VdC
Nominal output @ RH = 55 % and 3. 3Vdc	Fout	6560	6600	6640	Hz
Current consumption (Max at 16Vdc)	Ic		0.18	1	mA
Voltage supply influence (3 to 7 Vdc)	RH		+/-1		% RH
Averaged Sensitivity from 10% to 95% RH	ΔFout /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 @ 23°C

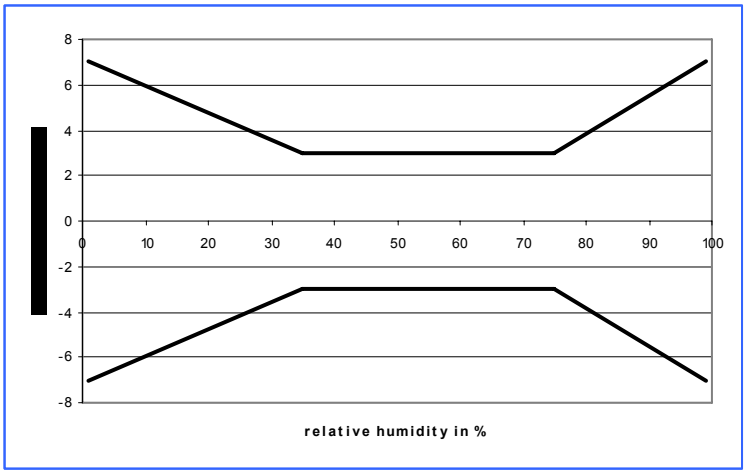


Chart 2

Modeled Signal output:

$Fout = 7314 – 16.79*RH + 0.0886*RH^2 - 0.000358* RH^3$

(Fout in Hz and RH in %)

Modeled Reversed Equation:

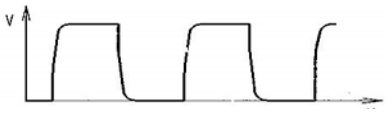
$RH = 89{,}8*10^{-10}*Fout^3 - 15{,}7486*10^{-5}*Fout^2 + 0{,}80945*Fout - 1009$

(Fout in Hz and RH in %)

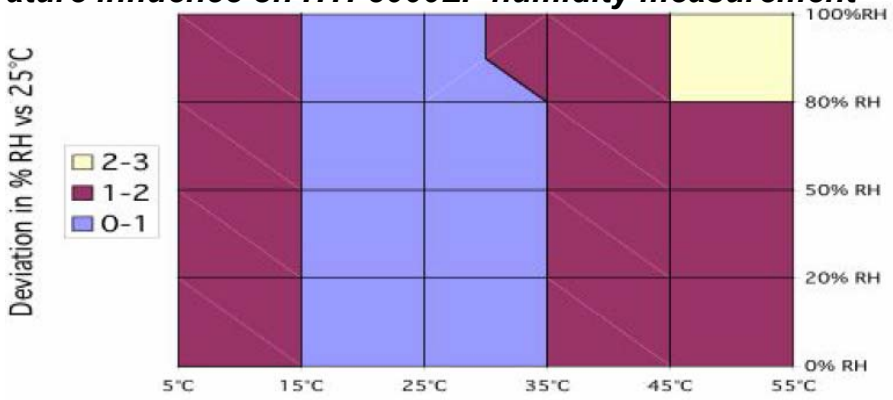
Typical response look-up table at 3.3V (Polynomial Reference curve)

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	

Output Voltage wave form



Temperature influence on HTF3000LF humidity measurement



Calibration data are traceable to NIST standards through CETIAT laboratory.

For demanding application, temperature coefficient could be compensated over operating temperature range using following formula :

$$Rh_{corr} = RH + 0.08 * (T – 25)$$

$$Fout_{Corr} = Fout -0{,}88 * (T – 25)$$

(T in °C, RH in %RH, Fout in Hz)

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 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.

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			

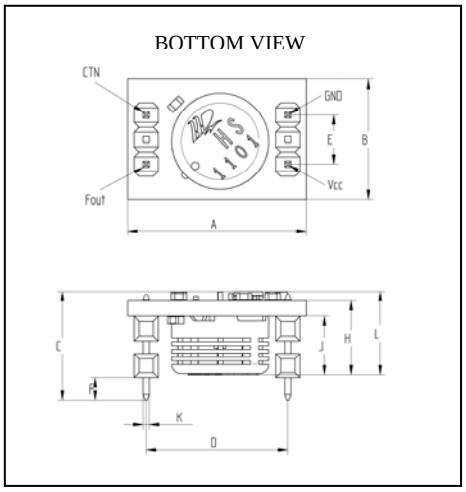
QUALIFICATION PROCESS

Resistance to physical and chemical stresses

- ⇨ ***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, SO2 (0.5%, H2S (0.5%), 03, NOx, NO, CO, CO2, Softener, Soap, Toluene, acids (H2SO4, HNO3,HCI), HMDS, Insecticide, Cigarette smoke,….
- ⇨ ESD : HTF3000LF is able to sustain a minimum of ±8KV (contact discharge)

PACKAGE OUTLINE HTF3000LF PVH

HTF3000LF PVH

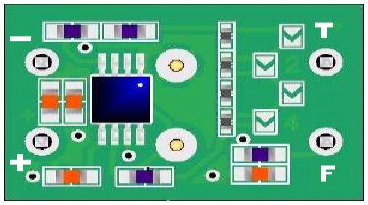


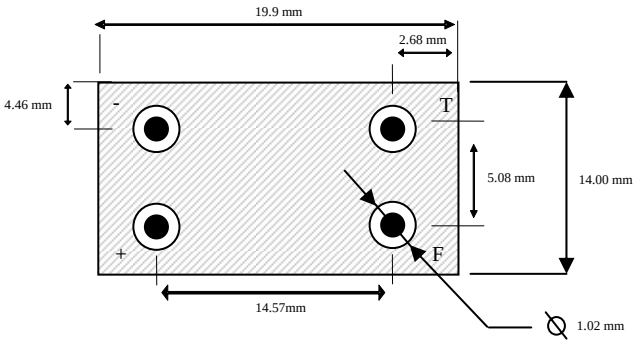
Dim	A	B	C	D	E	F
Min	17.9	12.0	12.0	14.37	4.88	1.76
Max	18.9	13.0	13.0	14.77	5.28	2.76
Dim	**J**	**H**	**L**	**K**		
Min	5.6	7.2	8.0	0.54		
Max	6.6	8.2	9.4	0.74		

Dimensions in millimeters

Weight : 2.1g

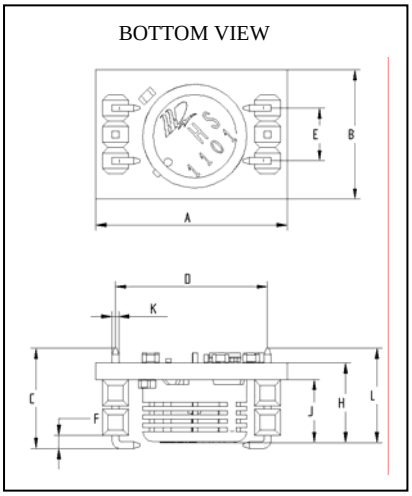
Recommended Through Hole FootPrint





Ordering information: HPP808H031

HTF3000LF SMD

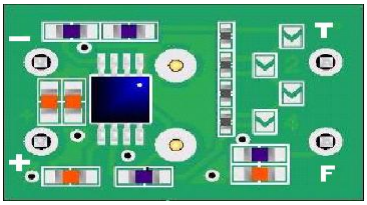


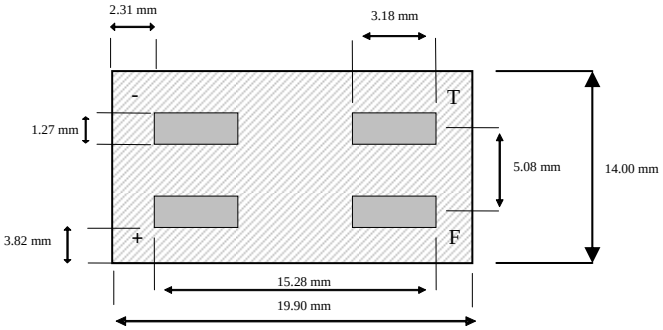
Dim	A	B	C	D	E	F
Min	17.9	12.0	9.15	14.37	4.88	0.8
Max	18.9	13.0	10.15	14.77	5.28	2.8
Dim	**J**	**H**	**L**	**K**		
Min	5.6	7.2	8.4	0.54		
Max	6.6	8.2	9.8	0.74		

Dimensions in millimeters

Weight : 2.1g

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