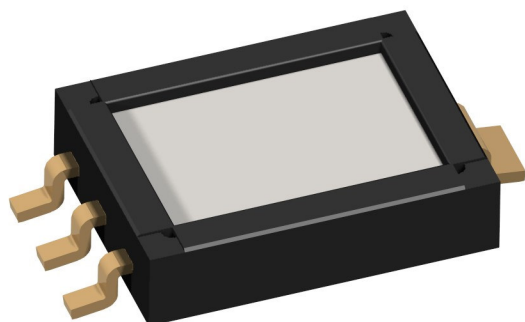


HTS2230 – Temperature and Relative Humidity Sensor



- Miniature Surface mount SMD package
- Lead free component
- Patented solid polymer structure
- Fast response time and very low temperature coefficient



DESCRIPTION

Based on a unique **capacitive cell for humidity** measurement and a **Negative Temperature Coefficient (NTC)** thermistor for temperature measurement, this dual-purpose relative humidity / temperature miniaturized sensor is designed for high volume, **cost sensitive applications with tight space constraints**. It is useful in all applications where **dew point, absolute humidity measurements** or humidity compensation are required.

FEATURES

- Full interchangeability with no calibration required in standard conditions
- Instantaneous desaturation after long periods in saturation phase
- Compatible with automatized assembly processes, including Pb free wave soldering and reflow processes ⁽¹⁾
- Individual marking for compliance to stringent traceability requirements
- Part may be washed with distilled water

(1) Soldering temperature profiles available on request

APPLICATIONS

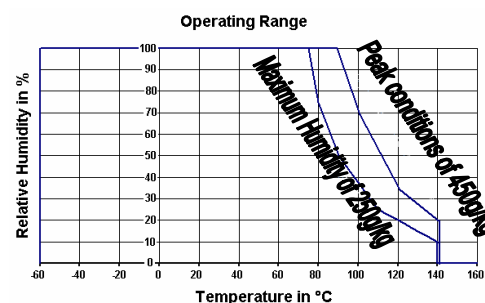
- Automotive
- Home Appliance
- Printers
- Meteorology

PERFORMANCE SPECS

MAXIMUM RATINGS

Ratings	Symbol	Value	Unit
Operating Temperature	Ta	-60 to 140	°C
Storage Temperature	Tstg	-60 to 140	°C
Supply Voltage (Peak)	Vs	10	Vac
Humidity Operating Range	RH	0 to 100	% RH

Peak conditions: less than 10% of the operating time.



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ELECTRICAL CHARACTERISTICS

(Ta=25°C, measurement frequency @10kHz unless otherwise noted)

Humidity Characteristics	Symbol	Min	Typ	Max	Unit
Humidity Measuring Range	RH	1		99	%RH
Supply Voltage	Vs			10	V
Nominal Capacitance @55%RH ⁽¹⁾	C	67	68	69	pF
Temperature coefficient (15°C-45°C)	T _{cc}		+/- 0.10		%RH/°C
Average Sensitivity from 33% to 75%RH	ΔC/%RH		0.13		pF/%RH
Leakage Current (V _{cc} =5V)	I			1	nA
Recovery time after 150 hours of condensation	tr		10		s
Humidity Hysteresis			+/-1		%RH
Long Term Stability	T		+/-0.5		%RH/yr
Time Constant (at 63% of signal, still air) 33%RH to 80%RH	τ		1	3	s
Deviation to typical response curve (10% RH to 90%RH)			+/-3		%RH

(1) Tighter specification available on request

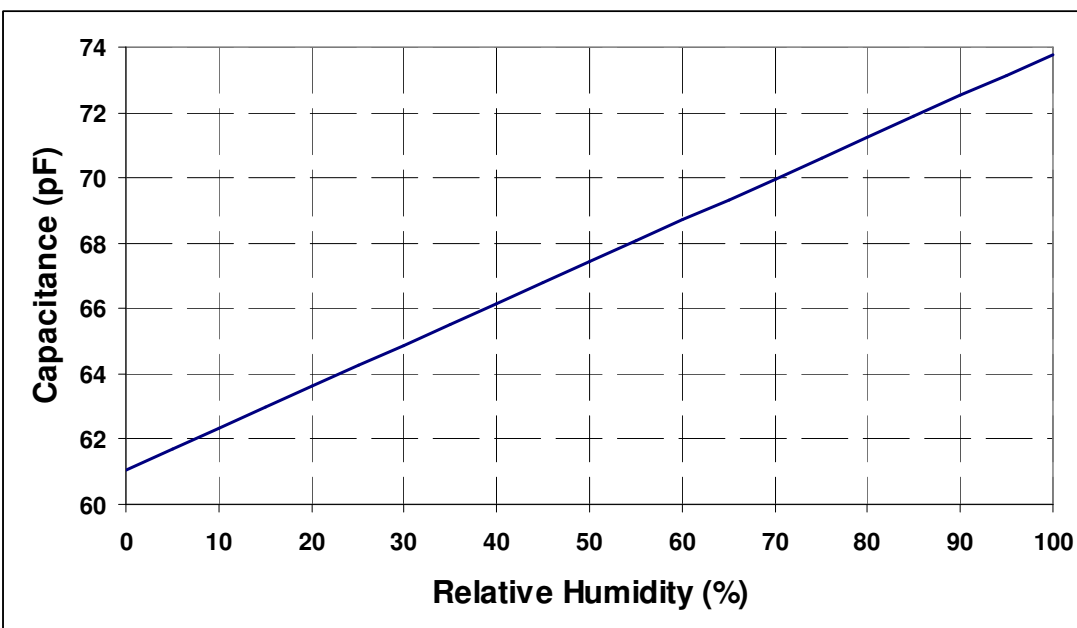
Temperature Characteristics	Symbol	Min	Typ	Max	Unit
Nominal Resistance @25°C	R		10		kΩ
Beta value: B25/100	β	3685	3800	3915	K
Temperature Measuring Range	Ta	-40		125	°C
Nominal Resistance Tolerance @25°C	R _N			1	%
Beta Value Tolerance	β		3		%
Response Time	τ		10		s

TYPICAL PERFORMANCE CURVES

HUMIDITY SENSOR

- Polynomial Response

$$C \text{ (pF)} = 1.03 \cdot 10^{-6} \cdot RH^3 - 1.64 \cdot 10^{-4} \cdot RH^2 + 1.34 \cdot 10^{-1} \cdot RH + 61.0 \text{ (with RH in \%)}$$



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• Typical Response Look-Up Table (Polynomial reference curve) @10kHz/1V

RH (%)	0	5	10	15	20	25	30	35	40	45	50
Cp (pF)		61.7	62.3	63.0	63.7	64.3	64.9	65.5	66.2	66.8	67.4
RH (%)	55	60	65	70	75	80	85	90	95	100	
Cp (pF)	68.0	68.7	69.3	70.0	70.5	71.2	71.8	72.5	73.1		

• Reverse Polynomial Response

$$RH (\%) = -4.0516 \cdot 10^{-3} C^3 + 8.2420 \cdot 10^{-1} C^2 - 47.879 C + 773.23 \text{ (with } C \text{ in pF)}$$

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".

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- Temperature look-up table

Temp (°C)	Resistance (Ω)	Temp (°C)	Resistance (Ω)	Temp (°C)	Resistance (Ω)	Temp (°C)	Resistance (Ω)
-40	224349	5	23510	50	3813	95	859
-39	212141	6	22483	51	3677	96	833
-38	200657	7	21505	52	3546	97	809
-37	189849	8	20574	53	3420	98	785
-36	179676	9	19688	54	3300	99	762
-35	170098	10	18843	55	3184	100	740
-34	161075	11	18039	56	3073	101	718
-33	152575	12	17272	57	2966	102	698
-32	144563	13	16542	58	2863	103	678
-31	137011	14	15845	59	2764	104	658
-30	129889	15	15181	60	2669	105	639
-29	123171	16	14547	61	2578	106	621
-28	116832	17	13943	62	2490	107	604
-27	110850	18	13367	63	2406	108	587
-26	105202	19	12816	64	2324	109	570
-25	99868	20	12291	65	2246	110	554
-24	94830	21	11790	66	2171	111	539
-23	90069	22	11311	67	2098	112	524
-22	85570	23	10854	68	2029	113	509
-21	81316	24	10417	69	1962	114	495
-20	77294	25	10000	70	1897	115	482
-19	73490	26	9601	71	1835	116	469
-18	69890	27	9220	72	1775	117	456
-17	66483	28	8856	73	1717	118	444
-16	63258	29	8507	74	1662	119	432
-15	60204	30	8174	75	1608	120	420
-14	57312	31	7855	76	1556	121	409
-13	54572	32	7550	77	1507	122	398
-12	51976	33	7258	78	1459	123	387
-11	49515	34	6979	79	1412	124	377
-10	47182	35	6712	80	1368	125	367
-9	44969	36	6456	81	1325		
-8	42870	37	6211	82	1283		
-7	40879	38	5976	83	1243		
-6	38989	39	5751	84	1204		
-5	37195	40	5535	85	1167		
-4	35492	41	5329	86	1131		
-3	33874	42	5131	87	1097		
-2	32338	43	4941	88	1063		
-1	30878	44	4759	89	1031		
0	29490	45	4585	90	999		
1	28171	46	4417	91	969		
2	26917	47	4257	92	940		
3	25724	48	4103	93	912		
4	24590	49	3955	94	885		

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PROCESS

HTS2230 sensors have been tested through a complete sequence process taking in account many of the requirements of the JEDEC standard including:

- Solder heat and solderability including lead free process
- Pb free wave soldering and reflow soldering process(260°C) + DI water clean at 45°C
- ESD - Electrostatic Discharge – Air Gun +-10kV(IEC 1000)
- Salt Atmosphere JESD22-A107-A
- Temperature Cycling - 40°C / +125°C for 168 hours
- High Temperature / Humidity Operating Life - 93%RH / 60°C for 168 hours
- Low Humidity storage life - RH < 10%/23°C for 168 hours
- Resistance to immersion in water at ambient temperature and 80°C
- High temperature storage 120°C for 168 hours
- Resistance to many chemicals linked to home appliances/automotive or consumer applications

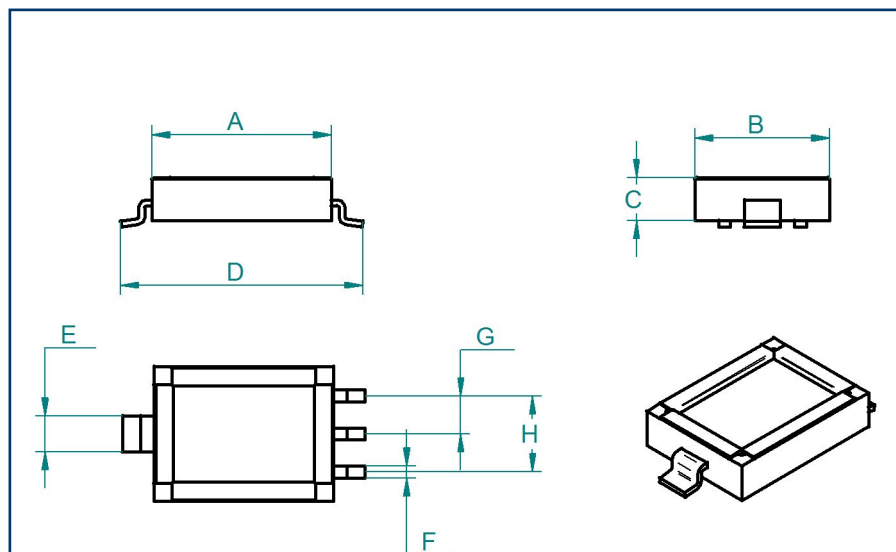
ENVIRONMENTAL AND RECYCLING

HTS2230 sensors are lead free components and are compatible with Pb Free soldering processes.
HTS2230 sensors are free from Cr (6+), Cd and Hg.

SOLDERING INSTRUCTIONS

We recommend taking specific attention to soldering conditions to get the best performance of MEAS-France/Humirel sensors. See Application Note.

PACKAGE OUTLINE



Dim	Typ (mm)
A	6.00 ± 0.25
B	4.50 ± 0.25
C	1.45 ± 0.25
D	8.10 ± 0.30
E	1.20 ± 0.10
F	0.40 ± 0.10
G	1.27 ± 0.10
H	2.54 ± 0.20

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