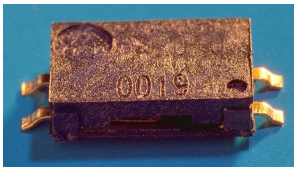
TEMPERATURE AND RELATIVE HUMIDITY SENSOR

HTS2030SMD

Meets RoHS regulations

*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.*

MAIN FEATURES

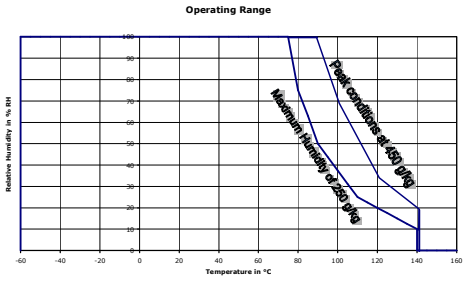


- **Miniature Surface mount SMD package**
- **Lead free components**
- **Full interchangeability** with no calibration required in standard conditions
- **Instantaneous desaturation** after long periods in saturation phase
- Compatible with automatized assembly processes, **including Pb free wave soldering and reflow processes** (1)
- High reliability and long term stability
- Patented solid polymer structure
- Suitable for linear voltage or frequency output circuitry
- Fast response time and very low temperature coefficient
- Part may be washed with distilled water
- Individual marking for compliance to stringent traceability requirements

(1) soldering temperature profiles available on request / contact us at application@humirel.com

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



CHARACTERISTICS

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

Characteristics	Symbol	Min	Typ	Max	Unit
Humidity measuring range	RH	1		99	%RH
Supply voltage	Vs			10	V
Nominal capacitance @ 55% RH*	C	177	180	183	pF
Temperature coefficient	Tcc			0.01	pF/°C
Averaged Sensitivity from 33% to 75% RH	ΔC /% RH		0.31		pF/% RH
Leakage current (Vcc = 5 Volts)	I			1	nA
Recovery time after 150 hours of condensation	tr		10		s
Humidity Hysteresis				+/-1	%RH
Long term stability	τ		+/-0.5		%RH/yr
Time constant (33 to 80 % RH, still air @ 63%)	ta		3	5	s
Deviation to typical response curve (10% to 90%) RH)			+/-2		%RH

***tighter specification available on request**

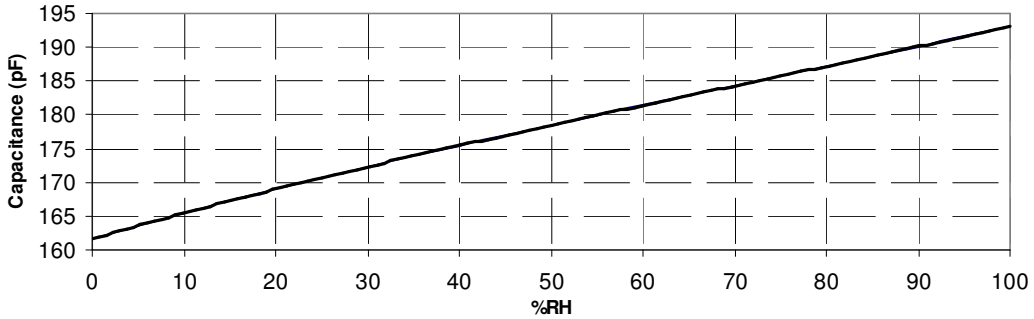
TYPICAL RESPONSE IN HUMIDITY

- **Polynomial response of HTS2030SMD:**

$$C\ (pF)=C@55\ \%*(\ 3.903\ 10^{-8}*RH^3-8.294\ 10^{-6}*RH^2+2.188\ 10^{-3}*RH+0.898)$$

Typical response look-up table (Polynomial Reference curve) "10kHz/1V"

RH (%)	0	5	10	15	20	25	30	35	40	45	50
Cp (pF)	161.6	163.6	165.4	167.2	169.0	170.7	172.3	173.9	175.5	177.0	178.5
RH (%)	55	60	65	70	75	80	85	90	95	100	
Cp (pF)	180	181.4	182.9	184.3	185.7	187.2	188.6	190.1	191.6	193.1	



- **Reversed Polynomial response of HTS2030SMD:**

$$RH\ (\%) = -3.4656\ 10^{+3}*X^3+1.0732\ 10^{+4}*X^2-1.0457\ 10^{+4}*X+3.2459\ 10^{+3}$$

With X=C(read) / C@55%RH

CHARACTERISTICS

Temperature sensor

Characteristics	Symbol	Min	Typ	Max	Unit
Nominal resistance @ 25°C			10		kΩ
Beta value : B25/100	B	3600	3730	3800	
Temperature measuring range	Ta	-60		140	°C
Nominal Resistance Toleranceat 25°C	Rn		2	3	%
B value tolerance	B		3		%
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 $R_T = R_N * e^{B\left(\frac{1}{T}-\frac{1}{T_N}\right)}$

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.

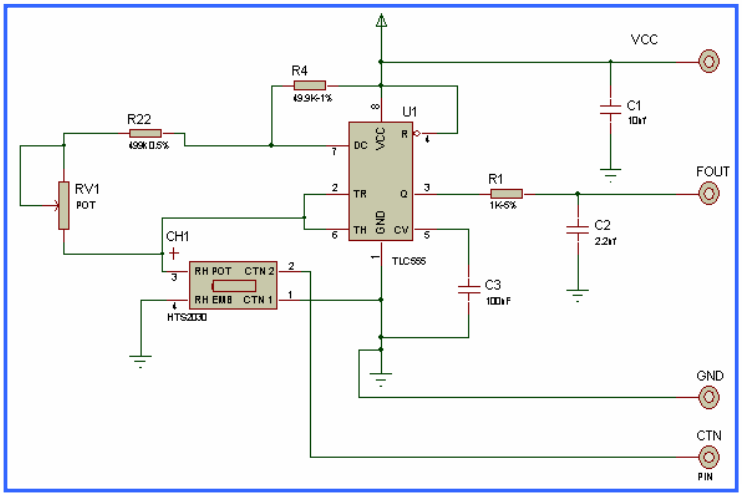
② For practical applications a more precise description of the real R/T curve may be required. Either more complicated approaches (e.g the Steinhart-Hart equation) are used or the resistance/ temperature relation as given in tabulated form. The below table has been experimentally determined with utmost accuracy for temperature increments of 1 degree.

Temperature look-up table

Temp °C	Resistance (Ohm)	Max. deviation	Temp °C	Resistance (Ohm)	Max. deviation	Temp °C	Resistance (Ohm)	Max. deviation	Temp °C	Resistance (Ohm)	Max. deviation
-40	262960	35403	**-5**	38279	2756	**30**	8178	296	**65**	2304	171
-39	247217	32777	**-4**	36455	2568	**31**	7866	294	**66**	2229	168
-38	232539	30358	**-3**	34731	2393	**32**	7568	292	**67**	2158	165
-37	218845	28130	**-2**	33100	2230	**33**	7283	290	**68**	2089	161
-36	206064	26075	**-1**	31557	2078	**34**	7011	287	**69**	2022	158
-35	194110	24178	**0**	30029	1932	**35**	6734	284	**70**	1960	155
-34	182852	22416	**1**	28627	1799	**36**	6484	281	**71**	1898	152
-33	172332	20791	**2**	27299	1675	**37**	6244	278	**72**	1839	149
-32	162498	19290	**3**	26042	1560	**38**	6015	275	**73**	1782	146
-31	153299	17905	**4**	24852	1452	**39**	5796	271	**74**	1727	143
-30	144790	16636	**5**	23773	1355	**40**	5575	267	**75**	1673	140
-29	136664	15444	**6**	22708	1261	**41**	5373	264	**76**	1622	138
-28	129054	14343	**7**	21698	1174	**42**	5180	260	**77**	1573	135
-27	121925	13325	**8**	20739	1093	**43**	4995	257	**78**	1526	132
-26	115243	12383	**9**	19829	1017	**44**	4817	253	**79**	1480	130
-25	109030	11516	**10**	18959	946	**45**	4636	248	**80**	1432	127
-24	103115	10705	**11**	18128	879	**46**	4473	245	**81**	1390	124
-23	97565	9953	**12**	17338	817	**47**	4316	241	**82**	1349	122
-22	92354	9257	**13**	16588	759	**48**	4166	237	**83**	1310	119
-21	87460	8612	**14**	15876	705	**49**	4021	233	**84**	1272	117
-20	82923	8020	**15**	15207	654	**50**	3874	229	**85**	1235	115
-19	78581	7463	**16**	14569	607	**51**	3737	225	**86**	1199	112
-18	74497	6947	**17**	13962	563	**52**	3606	221	**87**	1163	110
-17	70655	6468	**18**	13384	522	**53**	3481	217	**88**	1130	108
-16	67039	6023	**19**	12834	484	**54**	3360	213	**89**	1097	106
-15	63591	5606	**20**	12280	447	**55**	3237	208	**90**	1067	104
-14	60381	5222	**21**	11777	413	**56**	3126	204	**91**	1038	102
-13	57356	4865	**22**	11297	382	**57**	3019	200	**92**	1009	100
-12	54503	4533	**23**	10840	353	**58**	2917	197	**93**	982	98
-11	51813	4225	**24**	10404	325	**59**	2819	193	**94**	955	96
-10	49204	3932	**25**	10000	300	**60**	2720	189	**95**	927	94
-9	46767	3662	**26**	9600	300	**61**	2629	185	**96**	901	92
-8	44467	3411	**27**	9218	300	**62**	2542	182	**97**	877	90
-7	42296	3177	**28**	8853	299	**63**	2458	178	**98**	853	89
-6	40247	2960	**29**	8506	297	**64**	2378	175	**99**	830	87

SUGGESTED FREQUENCY OUTPUT CIRCUITS

Note: R22=499kΩ /
R4=49.9kΩ / R1=1 kΩ /
RV1=50 kΩ potentiometer /
C1=10nF / C2=2.2nF / C3=100nF



Typical response look-up table (Humidity output)

RH (%)	0	5	10	15	20	25	30	35	40	45	50
Fout (Hz)			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		

QUALIFICATION PROCESS

HTS2030SMD sensors have been qualified through a complete qualification 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***
- ***Mechanical shock JESD-22-B104-A***
- ***Vibration - Variable frequency(20 to 2000Hz) JESD-22-B103-A***
- ***Marking permanency***
- ***ESD - Electrostatic Discharge –Air Gun +-15kV(IEC 1000)***
- ***Salt Atmosphere JESD22-A107-A***
- ***Temperature Cycling - 40°C / +125°C***
- ***High Temperature / Humidity Operating Life - 93%RH / 60°C for 1000 hours***
- ***Low Humidity storage life - RH < 10%/23°C - 1000 hours***
- ***Resistance to immersion in water at ambient temperature and 80°C***
- ***High temperature storage 140°C for 168 hours.***
- ***Resistance to many chemicals linked to home appliances/automotive or consumer applications.***

ENVIRONMENTAL AND RECYCLING

HTS2030SMD sensors are lead free components and are compatible with Pb Free soldering processes. HTS2030SMD sensors are free from Cr (6+), Cd and Hg.

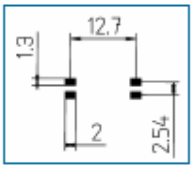
SOLDERING INSTRUCTIONS

See Application Note. To get it, please contact: application@humirel.com

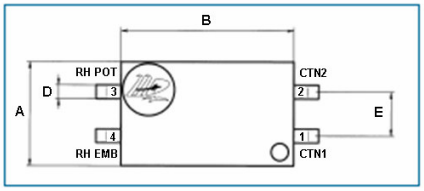
PACKAGE OUTLINE HTS2030SMD GULL WING

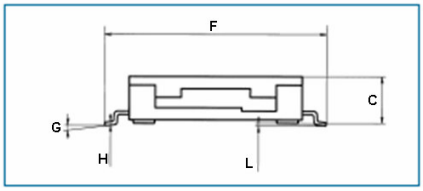
(JLEAD option also available)

Dimensions in millimeters

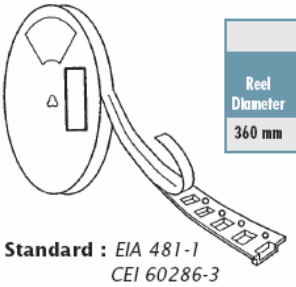


FOOTPRINT

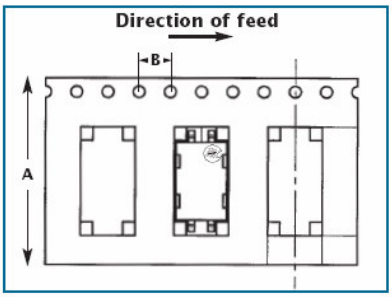


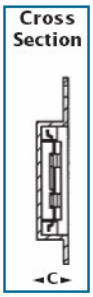


Dimension	A	B	C	D	E	F	G	H	L
mm (typical)	6	10	2.7	0.8	2.54	13.4	0-7°	0.2	0.1



	A	B	C
Reel Diameter	Reel Width	Carrier Tape	Carrier Tape Pitch	Carrier Tape Depth
360 mm	30.4 mm	24 mm	4 mm	4 mm





ORDERING INFORMATION of HTS2030SMD:

- **HPP804B130: TUBE M.P.Q. OF 78 PIECES**
- **HPP804B131: TAPE AND REEL M.P.Q. OF 1500 PIECES**

TEMPERATURE AND RELATIVE HUMIDITY SENSORS

Revision	Comments	Who	Date
B	RoHS logo added, Measurement Specialties logo updated, mechanical dimensions updated	D. LE GALL	December 07
C	Pinout added on package outline schematic	D. LE GALL	January 08

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