

HTW-211 Voltage Output Sensor Module



Features

- ◆ Linear & Calibrated %RH Voltage Output.
- ◆ Rigid & Strong Molding Package
- ◆ Enhanced Inside Protection through Coated Materials
- ◆ Durability and Easy Installation
- ◆ Customized PTFE Filter and Temperature Output

Product Summary

HTW-211 is an accurate and reliable humidity measuring sensor module based on *HumiChip*®.

The humidity output of the sensor is temperature compensated and is in linear voltage which can be directly interfaced with a microcomputer with an ADC input. The specially designed mold package and coating materials are ensuring durability and reliability even in harsh environment.

Electrical Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	V _{cc}	4.75	5	5.25	V
Output Voltage Deviation(@Input Voltage)		-50	0	+50	mV
Humidity Average Sensitivity	ΔmV/RH		26.23		mV/%RH
Current Consumption ¹⁾	I _{cc}		0.75		mA

1) Typ. 25°C 50%RH R=10 kΩ

Environmental

Parameter	Symbol	Value	Unit
Storage Temperature Range	T _{stg}	-55 ~ 125	°C
Operating Temperature Range	T _s	-40 ~ 85	°C
Operating Humidity Range	RH	0 ~ 100	%RH

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Sensor Performance

RH% Characteristics

Humidity Characteristics	Symbol	Min.	Typ.	Max.	Unit
Output @50%RH & 5V(VCC)	H_V _{OUT}	2.274	2.350	2.428	V
Humidity Measuring Range ¹⁾	RH	0		100	%RH
Relative Humidity Accuracy ²⁾		-3		+3	%RH
Humidity Hysteresis		-2		+2	%RH
Temperature Coefficient	T _{cc}		-0.05		%RH/°C
Response Time (τ _{63%}) ³⁾			7.0		sec

- 1) Non condensation
- 2) Humidity range (20~80%RH)
- 3) Non PTFE Filter

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Temperature Characteristics

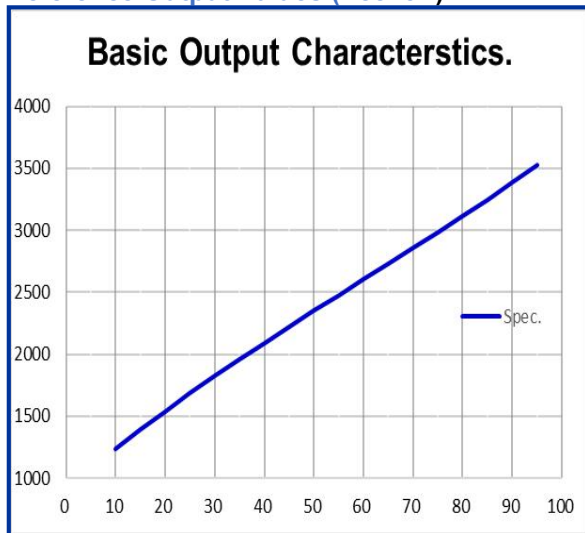
Temperature Characteristics		Symbol	Min.	Typ.	Max.	Unit
Temperature Measuring Range		T _a	-40		85	°C
Nominal Resistance @25°C		R	9.9	10.0	10.1	kΩ
Beat Value : B25/85		B	3346	3380	3414	K
Normal Resistance Tolerance @°C		T		1		%
B Value Tolerance		B		1		%
Response Time (τ _{63%})	Thermistor unit ¹⁾				<5	sec
	Module unit ²⁾				<115	sec

1) evaluates reaching time at 56.6°C which is 63.2% of 25°C → 75°C (Resistance Value of 56.6°C : 3.358 kΩ (Ref.)) -Non PTFE Filter

2) evaluates reaching time at 72.4°C which is 63.2% of 25°C → 75°C (Resistance Value of 72.4°C : 2.076 kΩ (Ref.)) -Non PTFE Filter

Humidity Look-up Table (@25°C)

Reference Output Values (V_{cc}=5V)



%RH	Vout(mV)	%RH	Vout(mV)
10	1235	55	2480
15	1390	60	2605
20	1540	65	2730
25	1685	70	2860
30	1825	75	2990
35	1960	80	3125
40	2090	85	3260
45	2220	90	3400
50	2350	95	3530

Polynomial Equations :

$$H_V_{out} [mV] = 8.439 \times 10^{-4} \times RH^3 - 0.1485 \times RH^2 + 34.16 \times RH + 908.5$$

$$RH [%] = -1.56 \times 10^{-9} \times V_{out}^3 + 1.205 \times 10^{-5} \times V_{out}^2 + 8.22 \times 10^{-3} \times V_{out} - 15.6$$

Linear Equations :

$$H_V_{out} [mV] = 26.23 \times RH + 1032$$

$$RH [%] = 0.03812 \times V_{out} - 39.36$$

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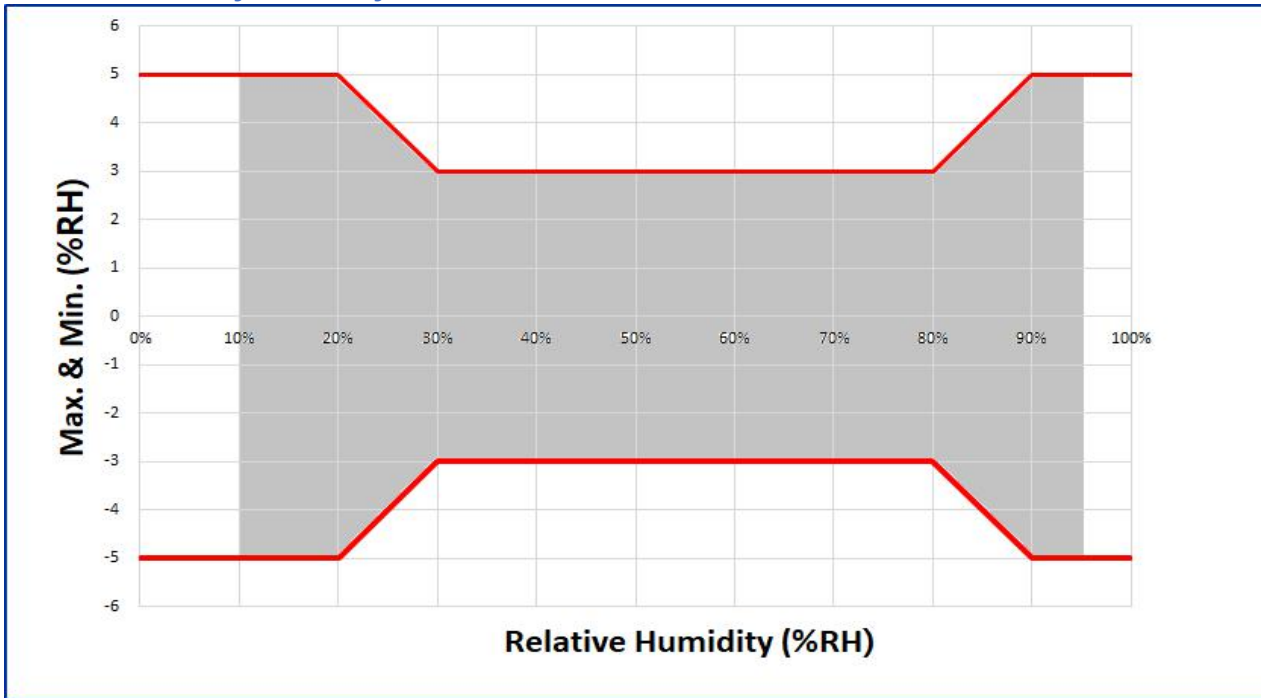
Address : Unit 1502, Hollywood Plaza, 610 Nathan Road, Mong Kok, Kln., H.K.

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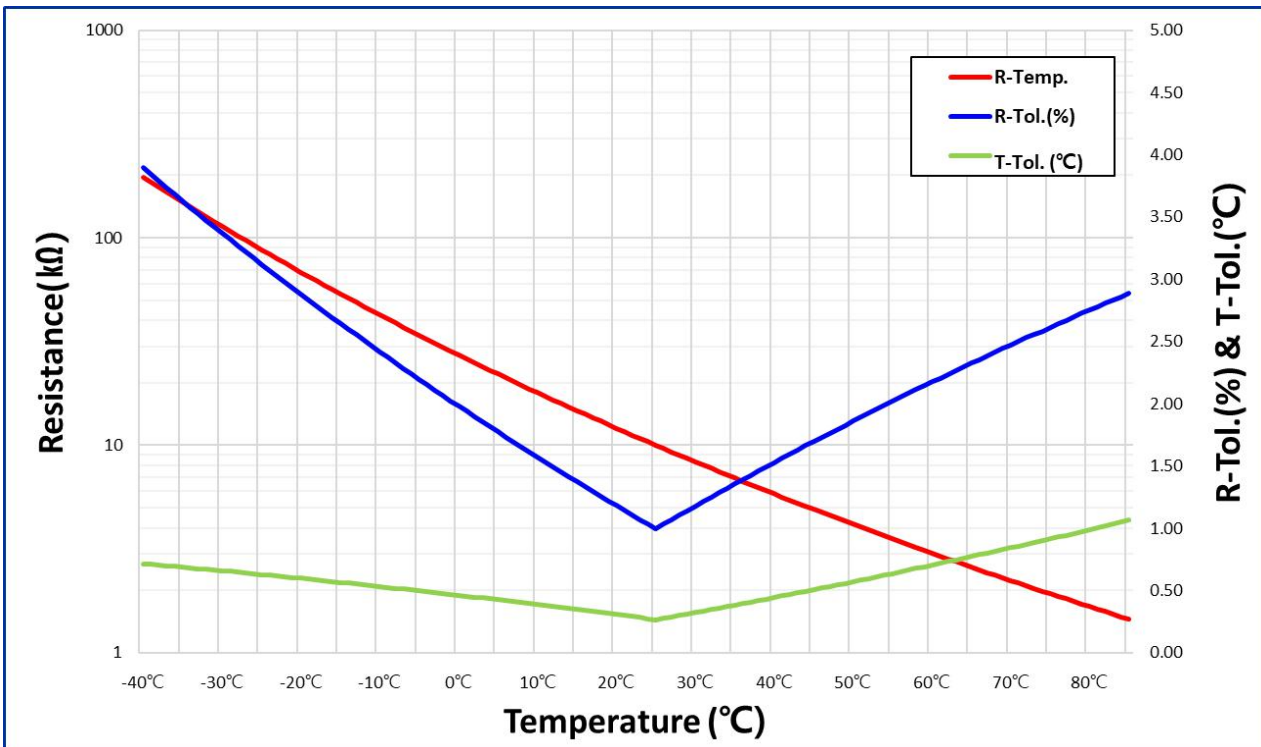
Email : sales@apollounion.com

Relative Humidity Accuracy



HTW-211 sensor module is able to measure accuracy humidity optimized within 10 to 95%RH. The sensor accuracy is $\pm 3\%$ RH in 30%~80%RH range, and $\pm 5\%$ RH in less than 30%RH and over 80%RH range.

Temperature Look-up Table R-T Characteristics & Tolerance



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TEMP.	RESISTANCE			RESIST.-TOL.		TEMP.-TOL.	
(°C)	(kΩ)			(%)		(°C)	
	MIN.	CENTER	MAX.	MAX.	MIN.	MAX.	MIN.
-40	188.0202	195.652	203.5731	3.89	3.90	0.71	0.72
-39	177.8044	184.9171	192.2951	3.84	3.85	0.69	0.73
-38	168.2141	174.8452	181.7195	3.78	3.79	0.66	0.74
-37	159.2069	165.391	171.7981	3.73	3.74	0.64	0.76
-36	150.7435	156.5125	162.486	3.68	3.69	0.62	0.77
-35	142.7877	148.171	153.7418	3.62	3.63	0.60	0.78
-34	135.3055	140.3304	145.5274	3.57	3.58	0.58	0.79
-33	128.2659	132.9576	137.8071	3.52	3.53	0.56	0.80
-32	121.6397	126.0215	130.5481	3.47	3.48	0.54	0.80
-31	115.4001	119.4936	123.7198	3.42	3.43	0.52	0.81
-30	109.5221	113.3471	117.294	3.36	3.37	0.50	0.82
-29	103.9894	107.5649	111.2522	3.31	3.32	0.49	0.82
-28	98.7725	102.1155	105.5611	3.26	3.27	0.47	0.82
-27	93.8512	96.9776	100.1981	3.21	3.22	0.46	0.82
-26	89.2071	92.1315	95.1423	3.16	3.17	0.44	0.83
-25	84.8227	87.5588	90.3741	3.12	3.12	0.43	0.83
-24	80.6819	83.2424	85.8755	3.07	3.08	0.42	0.83
-23	76.7698	79.1663	81.6295	3.02	3.03	0.41	0.83
-22	73.0722	75.3157	77.6204	2.97	2.98	0.40	0.82
-21	69.5761	71.6768	73.8336	2.92	2.93	0.39	0.82
-20	66.2694	68.2367	70.2554	2.87	2.88	0.38	0.82
-19	63.1477	64.9907	66.8807	2.83	2.84	0.37	0.81
-18	60.1923	61.919	63.6889	2.78	2.79	0.36	0.81
-17	57.3933	59.0113	60.6689	2.73	2.74	0.36	0.80
-16	54.7415	56.2579	57.8105	2.69	2.70	0.35	0.79
-15	52.2283	53.6496	55.104	2.64	2.65	0.35	0.79
-14	49.8456	51.1779	52.5406	2.59	2.60	0.34	0.78
-13	47.5859	48.8349	50.1117	2.55	2.56	0.34	0.77
-12	45.4422	46.6132	47.8097	2.50	2.51	0.33	0.76
-11	43.4078	44.5058	45.6271	2.46	2.47	0.33	0.75

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-10	41.4765	42.5062	43.557	2.41	2.42	0.32	0.74
-9	39.6345	40.5997	41.5843	2.37	2.38	0.32	0.74
-8	37.8855	38.7905	39.7131	2.32	2.33	0.31	0.73
-7	36.2244	37.0729	37.9374	2.28	2.29	0.30	0.72
-6	34.6461	35.4417	36.2519	2.23	2.24	0.29	0.71
-5	33.1462	33.8922	34.6515	2.19	2.20	0.29	0.71
-4	31.7202	32.4197	33.1313	2.15	2.16	0.28	0.70
-3	30.3641	31.02	31.6869	2.10	2.11	0.28	0.69
-2	29.074	29.689	30.314	2.06	2.07	0.27	0.68
-1	27.8465	28.4231	29.0088	2.02	2.03	0.27	0.67
0	26.678	27.2186	27.7675	1.98	1.99	0.27	0.66
1	25.569	26.076	26.5904	1.93	1.94	0.27	0.64
2	24.5123	24.9877	25.4698	1.89	1.90	0.27	0.63
3	23.5052	23.9509	24.4026	1.85	1.86	0.27	0.61
4	22.545	22.9629	23.3861	1.81	1.82	0.27	0.60
5	21.6294	22.0211	22.4175	1.77	1.78	0.27	0.58
6	20.756	21.123	21.4944	1.73	1.74	0.27	0.57
7	19.9227	20.2666	20.6143	1.69	1.70	0.27	0.55
8	19.1273	19.4495	19.7751	1.65	1.66	0.27	0.54
9	18.368	18.6698	18.9745	1.61	1.62	0.27	0.52
10	17.643	17.9255	18.2107	1.57	1.58	0.27	0.51
11	16.9494	17.2139	17.4807	1.53	1.54	0.27	0.49
12	16.287	16.5344	16.784	1.49	1.50	0.27	0.48
13	15.6541	15.8856	16.1189	1.45	1.46	0.26	0.46
14	15.0493	15.2658	15.4838	1.41	1.42	0.26	0.45
15	14.4712	14.6735	14.8772	1.37	1.38	0.26	0.43
16	13.9184	14.1075	14.2977	1.33	1.34	0.26	0.42
17	13.3898	13.5664	13.7439	1.29	1.30	0.26	0.40
18	12.8841	13.0489	13.2145	1.25	1.26	0.26	0.38
19	12.4002	12.554	12.7084	1.21	1.23	0.26	0.37
20	11.9371	12.0805	12.2244	1.18	1.19	0.26	0.35
21	11.4945	11.6281	11.7621	1.14	1.15	0.26	0.33
22	11.0703	11.1947	11.3195	1.10	1.11	0.27	0.32

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23	10.6637	10.7795	10.8955	1.06	1.07	0.27	0.30
24	10.2738	10.3815	10.4892	1.03	1.04	0.27	0.28
25	9.9	10	10.1	0.99	1.00	0.26	0.27
26	9.5343	9.6342	9.7342	1.03	1.04	0.28	0.27
27	9.1838	9.2835	9.3833	1.06	1.07	0.30	0.28
28	8.8477	8.947	9.0465	1.10	1.11	0.32	0.29
29	8.5254	8.6242	8.7234	1.14	1.15	0.33	0.29
30	8.2162	8.3145	8.4132	1.17	1.18	0.35	0.30
31	7.9204	8.0181	8.1162	1.21	1.22	0.36	0.31
32	7.6367	7.7337	7.8312	1.25	1.25	0.38	0.32
33	7.3647	7.4609	7.5576	1.28	1.29	0.40	0.32
34	7.1038	7.1991	7.2951	1.32	1.32	0.41	0.33
35	6.8534	6.9479	7.043	1.35	1.36	0.43	0.34
36	6.6131	6.7067	6.8009	1.39	1.40	0.45	0.34
37	6.3825	6.4751	6.5683	1.42	1.43	0.46	0.35
38	6.1611	6.2526	6.3449	1.45	1.46	0.48	0.36
39	5.9485	6.039	6.1302	1.49	1.50	0.50	0.36
40	5.7443	5.8336	5.9238	1.52	1.53	0.52	0.37
41	5.5474	5.6357	5.7248	1.56	1.57	0.53	0.38
42	5.3582	5.4454	5.5333	1.59	1.60	0.54	0.39
43	5.1764	5.2623	5.3492	1.62	1.63	0.56	0.41
44	5.0015	5.0863	5.172	1.66	1.67	0.57	0.42
45	4.8333	4.9169	5.0015	1.69	1.70	0.58	0.43
46	4.6715	4.7539	4.8373	1.72	1.73	0.59	0.45
47	4.5159	4.5971	4.6793	1.76	1.77	0.60	0.46
48	4.3661	4.4461	4.5271	1.79	1.80	0.61	0.48
49	4.222	4.3008	4.3806	1.82	1.83	0.62	0.49
50	4.0833	4.1609	4.2395	1.85	1.86	0.63	0.51
51	3.9498	4.0262	4.1036	1.89	1.90	0.64	0.52
52	3.8213	3.8964	3.9727	1.92	1.93	0.65	0.54
53	3.6975	3.7714	3.8465	1.95	1.96	0.66	0.56
54	3.5783	3.651	3.7249	1.98	1.99	0.67	0.58
55	3.4634	3.535	3.6076	2.01	2.03	0.68	0.60

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56	3.3527	3.4231	3.4946	2.05	2.06	0.68	0.62
57	3.2461	3.3152	3.3856	2.08	2.08	0.69	0.64
58	3.1432	3.2113	3.2804	2.11	2.12	0.69	0.66
59	3.0441	3.111	3.179	2.14	2.15	0.70	0.68
60	2.9486	3.0143	3.0812	2.17	2.18	0.70	0.71
61	2.8578	2.9224	2.9881	2.20	2.21	0.72	0.71
62	2.7703	2.8337	2.8984	2.23	2.24	0.74	0.72
63	2.6858	2.7482	2.8118	2.26	2.27	0.76	0.73
64	2.6044	2.6657	2.7282	2.29	2.30	0.78	0.74
65	2.5259	2.5861	2.6476	2.32	2.33	0.80	0.75
66	2.4501	2.5093	2.5697	2.35	2.36	0.82	0.75
67	2.377	2.4351	2.4945	2.38	2.39	0.84	0.76
68	2.3064	2.3635	2.4218	2.41	2.42	0.86	0.77
69	2.2382	2.2943	2.3517	2.44	2.45	0.88	0.78
70	2.1724	2.2275	2.2839	2.47	2.47	0.90	0.79
71	2.1086	2.1627	2.2181	2.50	2.50	0.92	0.80
72	2.0469	2.1001	2.1545	2.52	2.53	0.93	0.81
73	1.9873	2.0396	2.093	2.55	2.56	0.95	0.82
74	1.9298	1.9811	2.0335	2.58	2.59	0.97	0.83
75	1.8741	1.9245	1.9761	2.61	2.62	0.98	0.85
76	1.8204	1.8698	1.9205	2.64	2.64	1.00	0.86
77	1.7684	1.817	1.8667	2.66	2.67	1.01	0.87
78	1.7181	1.7658	1.8147	2.69	2.70	1.03	0.89
79	1.6695	1.7164	1.7644	2.72	2.73	1.05	0.90
80	1.6225	1.6685	1.7157	2.75	2.76	1.06	0.92
81	1.5772	1.6224	1.6687	2.77	2.79	1.08	0.93
82	1.5334	1.5777	1.6232	2.80	2.81	1.10	0.94
83	1.4909	1.5345	1.5792	2.83	2.84	1.12	0.95
84	1.4499	1.4927	1.5365	2.85	2.87	1.14	0.96
85	1.4101	1.4521	1.4952	2.88	2.89	1.15	0.97

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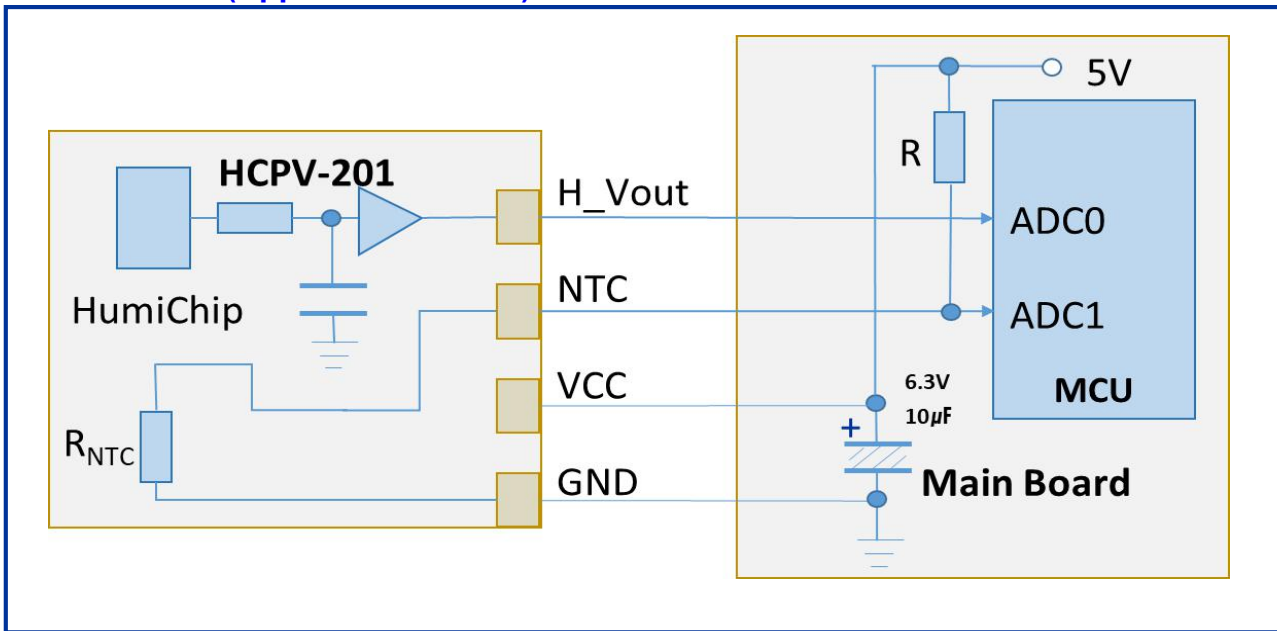
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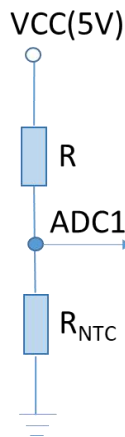
Basic Circuits (Application Circuit)



Temperature Calculator

$$T(°C) = \frac{1}{8.61393E-04 + (2.56377E-04 \times \ln(R_{NTC})) + (1.68055E-07 \times (\ln(R_{NTC}))^3)} - 273.15$$

R=10 kΩ



$$V_{ADC1} = \frac{R_{NTC}}{R + R_{NTC}} \times VCC(mV)$$

Temp.(°C)	Temp _{cal.}	Dev.	R _{NTC} (kΩ)	ADC1(mV)
-40	-40.000	0.000	195.652	4757
-30	-29.846	-0.154	113.347	4595
-20	-19.781	-0.219	68.237	4361
-10	-9.793	-0.207	42.506	4048
0	0.195	-0.195	27.219	3657
10	10.117	-0.117	17.926	3210
20	20.042	-0.042	12.081	2736
25	25.000	0.000	10.000	2500
30	29.975	0.025	8.315	2270
40	39.924	0.076	5.834	1842
50	49.934	0.066	4.161	1469
60	60.002	-0.002	3.014	1158
70	69.932	0.068	2.228	911
80	79.913	0.087	1.669	715
85	84.906	0.094	1.452	634

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Reliability

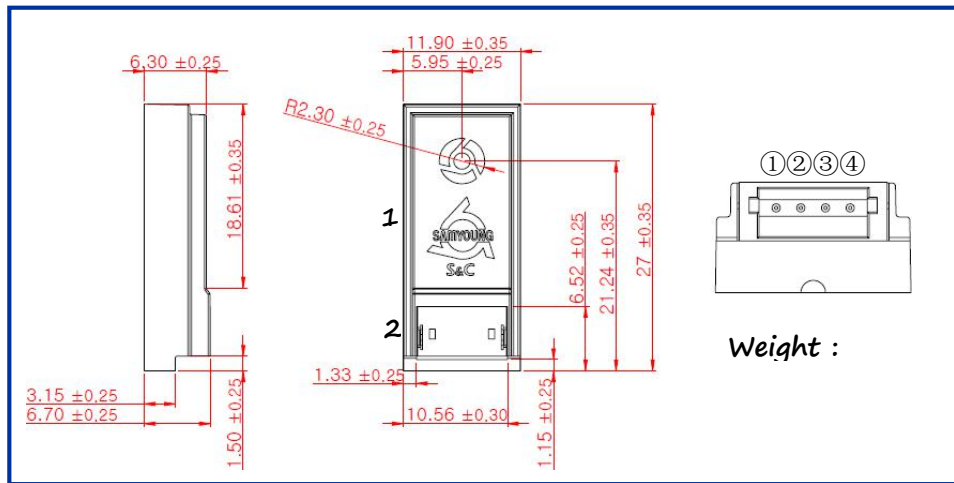
No.	Test Item	Test Condition	Test Criterion
1	High Temperature Storage Life	After Stressing 500 hours at 90°C, and after leaving for 24 hours at the normal temperature, and confirm the operation.	Deviation < ±5%RH
2	Low Temperature Storage Life	After Stressing 500 hours at -30°C, and after leaving for 24 hours at the normal temperature, and confirm the operation.	Deviation < ±5%RH
3	Temperature & Humidity Storage	After Stressing 500 hours at 85°C, 85%RH, with bias applied to the device, and after leaving for 24 hours at the normal temperature, and confirm the operation.	Deviation < ±5%RH
4	Thermal shock	A cycle is exposed to -40°C, 100°C with 30minutes period time, undergo 500 cycles, (Transition time : max 10 sec.) and after leaving for 24 hours at the normal temperature, and confirm the operation.	Deviation < ±5%RH

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Dimensions

Parts Dimensions

Unit : mm



NO.	Component parts	Spec.	Qty.	Color	Maker	Remark
1	Case	PC (Polycarbonate)	1	BLACK		
	PCB	FR4	1			
	Sensor	HumiChip	1		SAMYOUNG S&C	
2	Wafer	15001WR-04	1	WHITE	YEONHO	①GND ②VCC ③NTC ④H_Vout

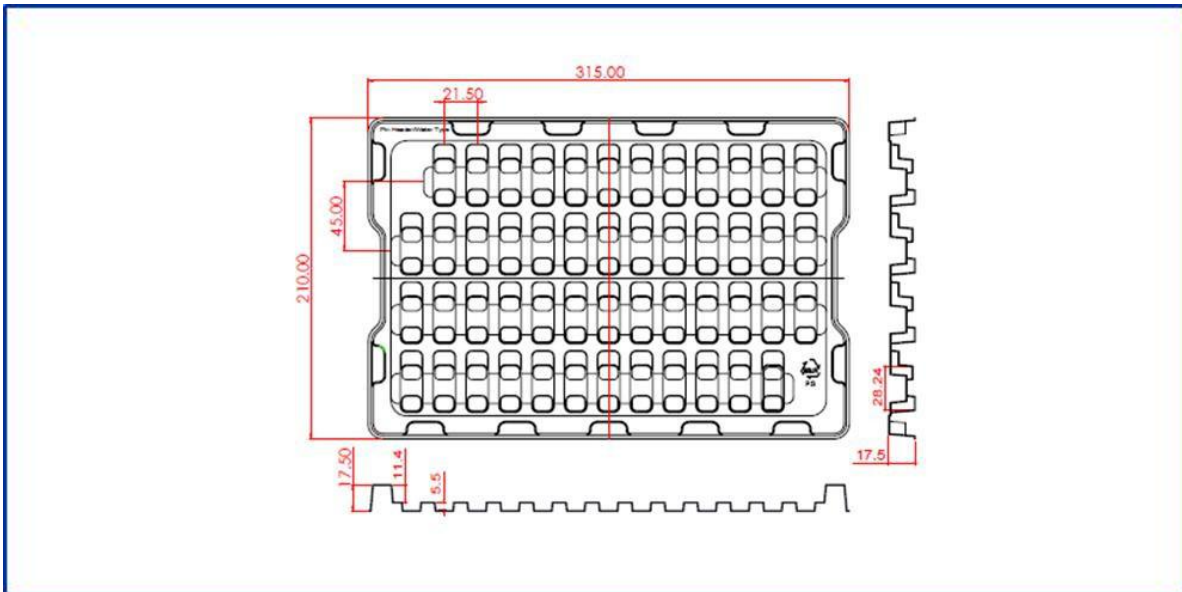
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Packaging

Type	Quantity(pcs.)		S	
	Tray	Out box	Tray	Out box
HTW-211	50	800 (50×16)	315×210×17.5	350×260×230

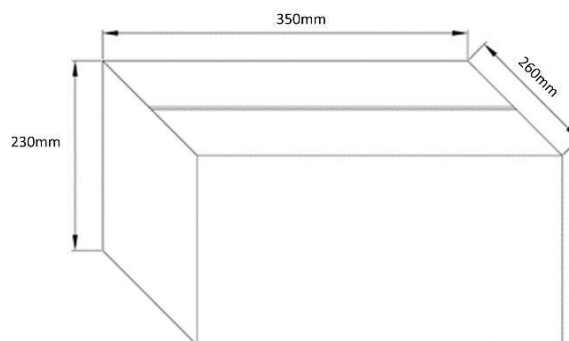
Tray

50 pcs / 1Tray (PS, 315×210×17.5 mm)



Box

Out box



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Revision History

Date	Version	Page(s)	Changes
Mar. 09	0.7		First Release

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