

HCPV - 20XX - XX Series

HumiChip® Voltage Output Humidity Sensor

Features

- ◆ Relative humidity (and temperature for HCPV-201) Voltage output.
- ◆ Humidity calibrated within $\pm 3\%RH$
- ◆ Linearity is less than $\pm 3\%RH$
- ◆ Excellent Reliability – satisfies automotive requirements
- ◆ 3 types of connector
- ◆ Conformal Coating



HCPV-20XW

Product Summary

HCPV-20X is an accurate and reliable humidity (and temperature for HCPV-201) 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 temperature output (for HCPV-201 only) is direct from NTC thermistor and is in resistance which can be directly connected to microcomputer with an ADC input.



HCPV-20XP

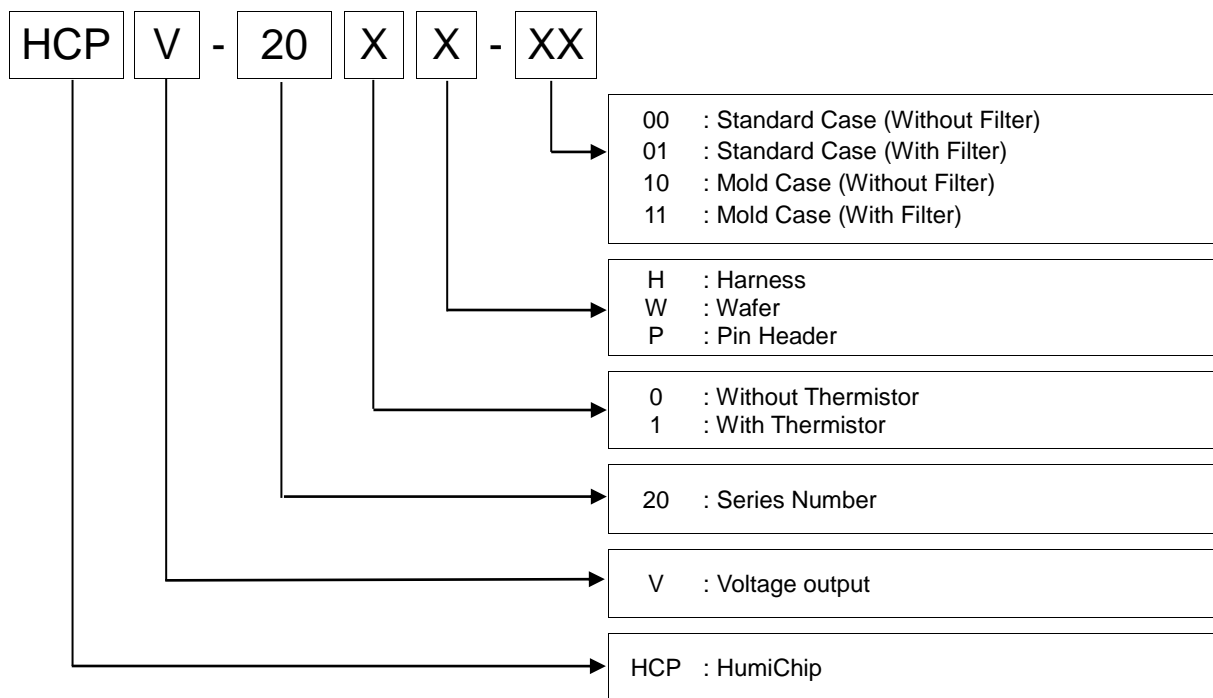
Application

- ◆ Smart Appliances
- ◆ HCPV Control
- ◆ Industrial Process Control
- ◆ Medical
- ◆ Automotive
- ◆ Environment Monitoring



HCPV-20XH

Part Number :



Electrical Specification

Parameter	Symbol	Value	Unit
Supply Voltage	V_{cc}	5.0	V
Current Consumption	I_{cc}	1.5	mA

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

Sensor performance

Relative Humidity (RH%)

Humidity Characteristics	Symbol	Min	Typ	Max	Unit
Supply Voltage	V _{CC}	4.75	5	5.25	V
Nominal Output @50%RH	H_V _{OUT}	2.232	2.350	2.468	V
Humidity Measuring Range	RH	0		100	%RH
Relative Humidity Accuracy		-5	±3	+5	%RH
Humidity Hysteresis			±2		%RH
Humidity Average Sensitivity			26.23		mV/%RH
Temperature Coefficient	T_{CC}		-0.05	-0.1	%RH/°C
Response Time (τ _{63%})			7.0		sec

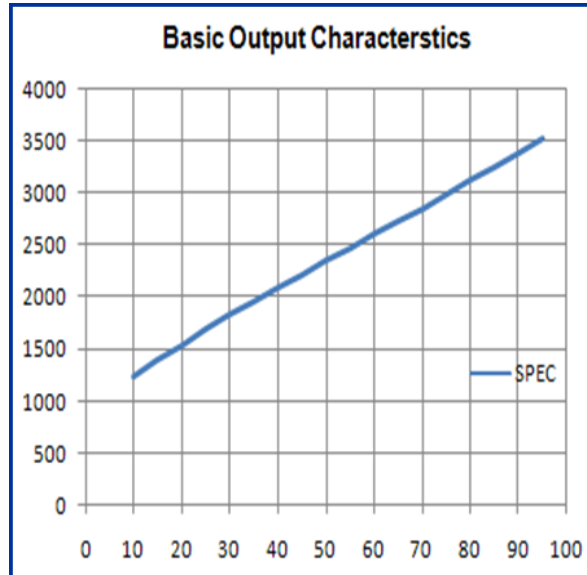
Temperature (°C)

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	3401	3435	3469	K
Normal Resistance Tolerance @°C	T		1		%
B Value Tolerance	B		1		%

Humidity Look-up Table (@25°C)

Reference Output Values (Vcc=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 :

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

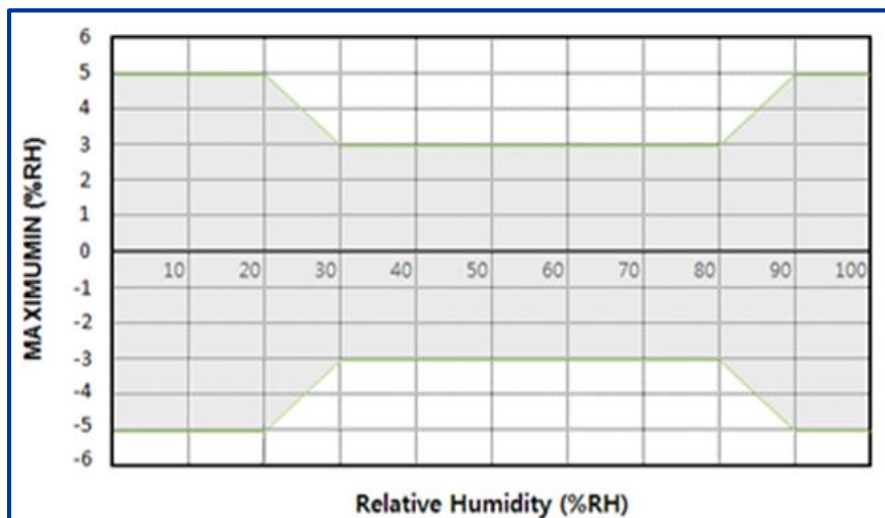
$$RH [\%] = -1.56 \times 10^{-9} \times V_{out}^3 + 1.205 \times 10^{-5} \times V_{out}^2 + 8.22 \times 10^{-3} \times V_{out} - 15.6$$

Linear Equations :

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

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

Relative Humidity Accuracy

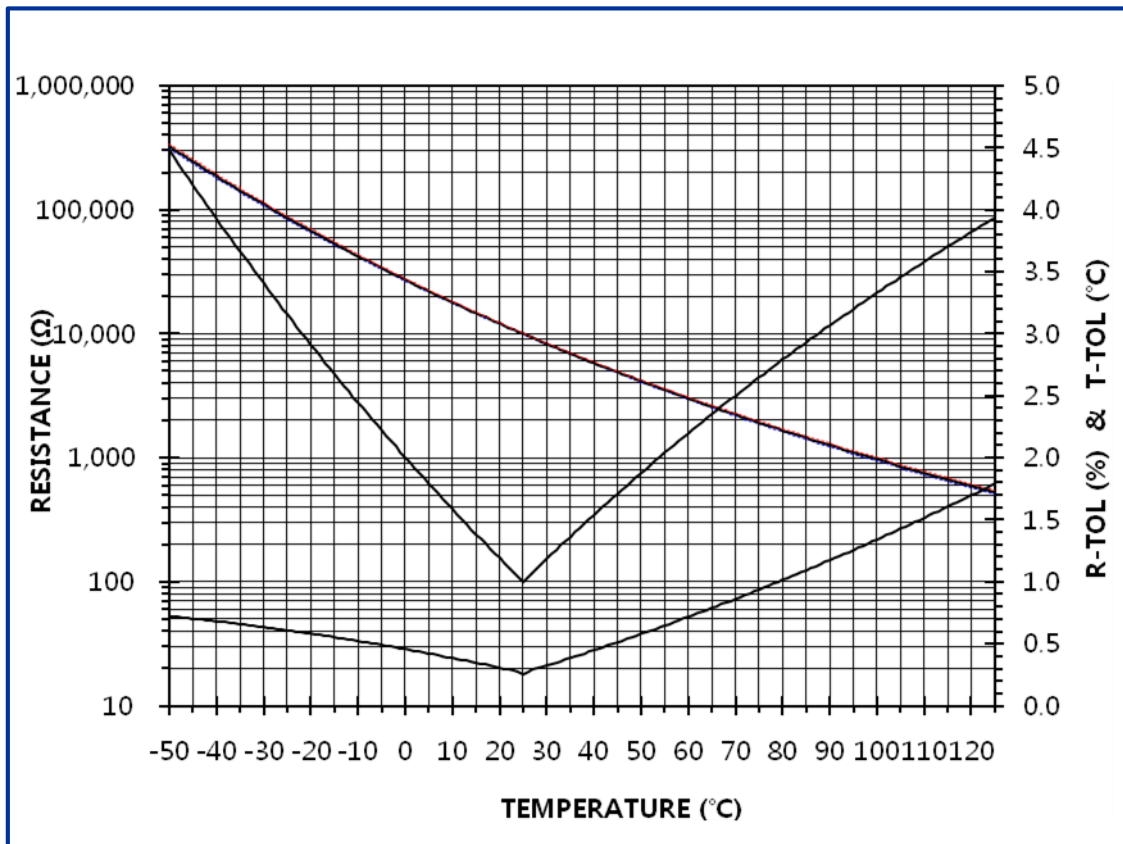


HCPV-20X series is able to measure accurate humidity for optimized of 20 to 95%RH.

The accuracy tolerance is $\pm 3\%RH$ for 30%~80%RH, and $\pm 5\%RH$ for less than 30%RH and over 80%RH.

Temperature Look-up Table

R-T Characteristics & Tolerance



TEMP.	RESISTANCE			RESIST.-TOL.		TEMP.-TOL.	
(°C)	(Ω)			(%)		(°C)	
	MIN	CENTER	MAX	MAX	MIN	MAX	MIN
-40	179350.70	186541.57	194001.4	4.00	3.85	0.69	0.67
-39	170118.14	176844.41	183818.3	3.94	3.80	0.69	0.67
-38	161406.70	167699.47	174220.1	3.89	3.75	0.69	0.66
-37	153184.75	159072.94	165170.9	3.83	3.70	0.68	0.66
-36	145422.69	150933.22	156636.9	3.78	3.65	0.68	0.65
-35	138092.81	143250.73	148586.4	3.72	3.60	0.67	0.65
-34	131169.19	135997.82	140990.1	3.67	3.55	0.67	0.64
-33	124627.53	129148.60	133820.3	3.62	3.50	0.66	0.64
-32	118445.11	122678.83	127051.2	3.56	3.45	0.66	0.63
-31	112600.62	116565.84	120658.6	3.51	3.40	0.65	0.63

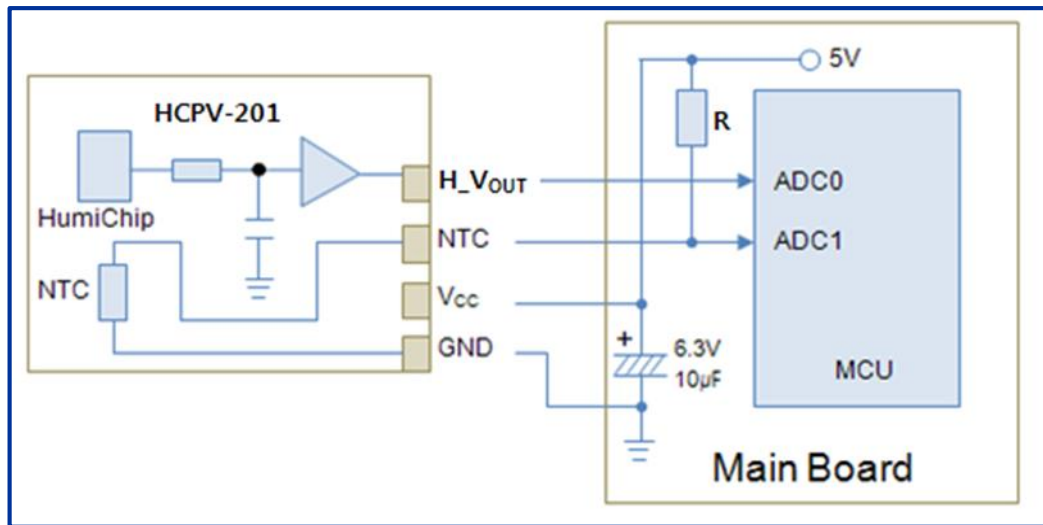
-30	107074.11	110788.38	114620.0	3.46	3.35	0.65	0.63
-29	101846.88	105326.56	108914.2	3.41	3.30	0.64	0.62
-28	96901.40	100161.74	103521.4	3.35	3.26	0.63	0.62
-27	92221.22	95276.44	98423.0	3.30	3.21	0.63	0.61
-26	87790.95	90654.31	93601.7	3.25	3.16	0.62	0.61
-25	83596.12	86279.98	89041.1	3.20	3.11	0.62	0.60
-24	79623.17	82139.07	84726.0	3.15	3.06	0.61	0.60
-23	75859.36	78218.06	80642.0	3.10	3.02	0.61	0.59
-22	72292.75	74504.31	76775.8	3.05	2.97	0.60	0.59
-21	68912.12	70985.91	73114.8	3.00	2.92	0.60	0.58
-20	65706.94	67651.72	69647.1	2.95	2.87	0.59	0.57
-19	62667.29	64491.24	66361.6	2.90	2.83	0.58	0.57
-18	59783.90	61494.66	63248.1	2.85	2.78	0.58	0.56
-17	57048.00	58652.72	60296.5	2.80	2.74	0.57	0.56
-16	54451.40	55956.74	57497.9	2.75	2.69	0.57	0.55
-15	51986.36	53398.56	54843.6	2.71	2.64	0.56	0.55
-14	49645.62	50970.51	52325.5	2.66	2.60	0.55	0.54
-13	47422.35	48665.37	49936.0	2.61	2.55	0.55	0.54
-12	45310.11	46476.37	47667.9	2.56	2.51	0.54	0.53
-11	43302.85	44397.12	45514.5	2.52	2.46	0.53	0.52
-10	41394.87	42421.62	43469.5	2.47	2.42	0.53	0.52
-9	39580.82	40544.21	41526.9	2.42	2.38	0.52	0.51
-8	37855.62	38759.58	39681.1	2.38	2.33	0.52	0.51
-7	36214.54	37062.70	37926.9	2.33	2.29	0.51	0.50
-6	34653.06	35448.88	36259.3	2.29	2.24	0.50	0.49
-5	33166.98	33913.65	34673.7	2.24	2.20	0.50	0.49
-4	31752.31	32452.83	33165.5	2.20	2.16	0.49	0.48
-3	30405.27	31062.48	31730.7	2.15	2.12	0.48	0.47
-2	29122.34	29738.86	30365.4	2.11	2.07	0.47	0.47
-1	27900.16	28478.47	29065.9	2.06	2.03	0.47	0.46
0	26735.58	27278.00	27828.6	2.02	1.99	0.46	0.45

1	25625.62	26134.32	26650.5	1.97	1.95	0.45	0.45
2	24567.46	25044.49	25528.2	1.93	1.90	0.45	0.44
3	23558.45	24005.71	24459.0	1.89	1.86	0.44	0.43
4	22596.08	23015.38	23440.1	1.85	1.82	0.43	0.43
5	21677.98	22070.99	22468.9	1.80	1.78	0.42	0.42
6	20801.91	21170.22	21542.9	1.76	1.74	0.42	0.41
7	19965.75	20310.83	20659.8	1.72	1.70	0.41	0.41
8	19167.50	19490.76	19817.5	1.68	1.66	0.40	0.40
9	18405.27	18708.00	19013.8	1.63	1.62	0.40	0.39
10	17677.27	17960.70	18246.8	1.59	1.58	0.39	0.38
11	16981.80	17247.08	17514.8	1.55	1.54	0.38	0.38
12	16317.25	16565.48	16815.8	1.51	1.50	0.37	0.37
13	15682.12	15914.30	16148.3	1.47	1.46	0.36	0.36
14	15074.97	15292.05	15510.7	1.43	1.42	0.36	0.35
15	14494.42	14697.32	14901.6	1.39	1.38	0.35	0.35
16	13939.21	14128.75	14319.4	1.35	1.34	0.34	0.34
17	13408.09	13585.09	13763.0	1.31	1.30	0.33	0.33
18	12899.93	13065.12	13231.1	1.27	1.26	0.32	0.32
19	12413.62	12567.70	12722.4	1.23	1.23	0.32	0.32
20	11948.11	12091.75	12235.9	1.19	1.19	0.31	0.31
21	11502.44	11636.24	11770.4	1.15	1.15	0.30	0.30
22	11075.65	11200.22	11325.0	1.11	1.11	0.29	0.29
23	10666.87	10782.74	10898.8	1.08	1.07	0.28	0.28
24	10275.25	10382.95	10490.7	1.04	1.04	0.28	0.28
25	9900.00	10000.00	10100.0	1.00	1.00	0.26	0.26
26	9533.22	9633.12	9733.1	1.04	1.04	0.28	0.28
27	9181.89	9281.55	9381.4	1.08	1.07	0.29	0.29
28	8845.27	8944.59	9044.1	1.11	1.11	0.30	0.30
29	8522.70	8621.56	8720.7	1.15	1.15	0.31	0.31
30	8213.51	8311.83	8410.5	1.19	1.18	0.33	0.33
31	7917.10	8014.78	8112.9	1.22	1.22	0.34	0.34

32	7632.87	7729.85	7827.3	1.26	1.25	0.35	0.35
33	7360.27	7456.47	7553.2	1.30	1.29	0.36	0.36
34	7098.78	7194.14	7290.0	1.33	1.33	0.38	0.37
35	6847.89	6942.35	7037.4	1.37	1.36	0.39	0.39
36	6607.12	6700.63	6794.8	1.41	1.40	0.40	0.40
37	6376.02	6468.54	6561.7	1.44	1.43	0.41	0.41
38	6154.15	6245.64	6337.9	1.48	1.46	0.43	0.42
39	5941.11	6031.54	6122.7	1.51	1.50	0.44	0.43
40	5736.51	5825.85	5916.0	1.55	1.53	0.45	0.45
41	5539.97	5628.19	5717.2	1.58	1.57	0.46	0.46
42	5351.14	5438.22	5526.2	1.62	1.60	0.48	0.47
43	5169.68	5255.60	5342.4	1.65	1.63	0.49	0.49
44	4995.28	5080.02	5165.7	1.69	1.67	0.50	0.50
45	4827.62	4911.18	4995.7	1.72	1.70	0.52	0.51
46	4666.41	4748.78	4832.1	1.75	1.73	0.53	0.52
47	4511.39	4592.55	4674.7	1.79	1.77	0.54	0.54
48	4362.27	4442.24	4523.2	1.82	1.80	0.56	0.55
49	4218.82	4297.58	4377.4	1.86	1.83	0.57	0.56
50	4080.80	4158.34	4236.9	1.89	1.86	0.58	0.58
51	3947.96	4024.30	4101.7	1.92	1.90	0.60	0.59
52	3820.10	3895.24	3971.5	1.96	1.93	0.61	0.60
53	3697.01	3770.95	3846.0	1.99	1.96	0.62	0.62
54	3578.48	3651.23	3725.1	2.02	1.99	0.64	0.63
55	3464.33	3535.89	3608.6	2.06	2.02	0.65	0.64
56	3354.38	3424.76	3496.3	2.09	2.06	0.67	0.66
57	3248.45	3317.67	3388.0	2.12	2.09	0.68	0.67
58	3146.38	3214.44	3283.6	2.15	2.12	0.70	0.68
59	3048.02	3114.93	3183.0	2.18	2.15	0.71	0.70
60	2953.20	3018.97	3085.9	2.22	2.18	0.72	0.71
61	2861.80	2926.44	2992.3	2.25	2.21	0.74	0.73
62	2773.66	2837.19	2901.9	2.28	2.24	0.75	0.74

63	2688.66	2751.10	2814.7	2.31	2.27	0.77	0.75
64	2606.68	2668.03	2730.5	2.34	2.30	0.78	0.77
65	2527.59	2587.87	2649.3	2.37	2.33	0.80	0.78
66	2451.28	2510.50	2570.89	2.41	2.36	0.81	0.80
67	2377.64	2435.81	2495.16	2.44	2.39	0.83	0.81
68	2306.56	2363.71	2422.03	2.47	2.42	0.84	0.82
69	2237.95	2294.08	2351.39	2.50	2.45	0.86	0.84
70	2171.70	2226.84	2283.14	2.53	2.48	0.87	0.85
71	2107.74	2161.89	2217.20	2.56	2.50	0.89	0.87
72	2045.96	2099.14	2153.48	2.59	2.53	0.90	0.88
73	1986.28	2038.51	2091.90	2.62	2.56	0.92	0.90
74	1928.63	1979.92	2032.36	2.65	2.59	0.93	0.91
75	1872.92	1923.29	1974.81	2.68	2.62	0.95	0.93
76	1819.09	1868.54	1919.15	2.71	2.65	0.96	0.94
77	1767.05	1815.62	1865.33	2.74	2.67	0.98	0.96
78	1716.75	1764.44	1813.27	2.77	2.70	1.00	0.97
79	1668.12	1714.95	1762.91	2.80	2.73	1.01	0.99
80	1621.10	1667.07	1714.18	2.83	2.76	1.03	1.00
81	1575.62	1620.76	1667.03	2.85	2.79	1.04	1.02
82	1531.63	1575.95	1621.39	2.88	2.81	1.06	1.03
83	1489.07	1532.59	1577.22	2.91	2.84	1.08	1.05
84	1447.89	1490.62	1534.46	2.94	2.87	1.09	1.06
85	1408.05	1450.00	1493.05	2.97	2.89	1.11	1.08

Basic Circuits (Application Circuit)

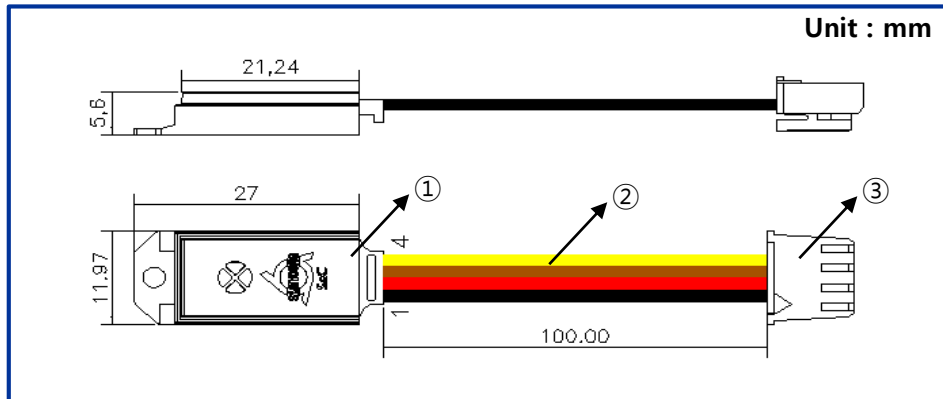


Reliability

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

Dimensions

[HCPV-20XH]



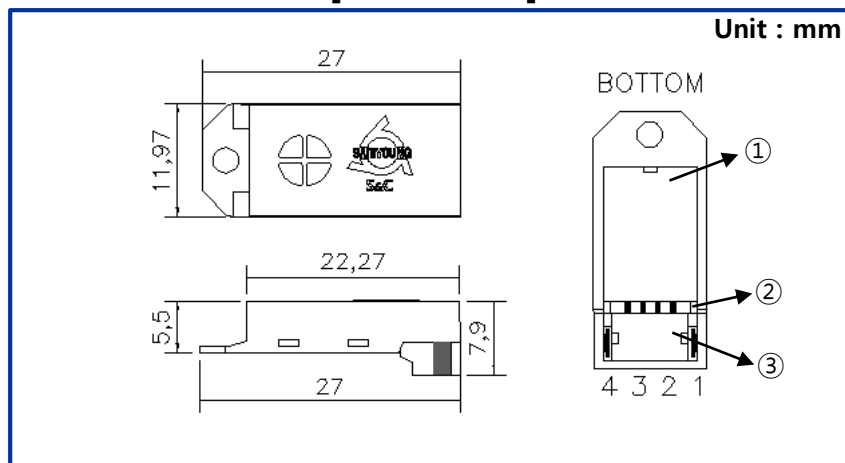
Parts

NO.	Component parts	Material
①	Case	PC (Polycarbonate)
	PCB	FR4
②	Harness	UL 1007-AWG#24
③	Connector	[YEONHO] SMH250-04

PIN Out Assignment

NO.	Color	Function
1	Black	GND
2	Red	V _{CC}
3	Brown	NTC
4	Yellow	H_V _{OUT}

[HCPV-20XW]



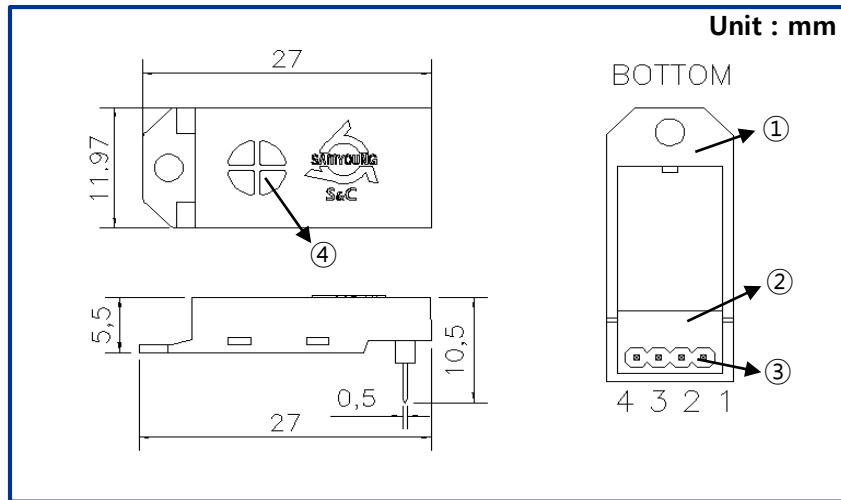
Parts

NO.	Component parts	Material
①	Case	PC (Polycarbonate)
②	PCB	FR4
③	Connector	[Yeonho] 15001WR-04P (1.5mm Pitch)

PIN Out Assignment

NO.	Function
1	GND
2	V _{CC}
3	NTC
4	H_V _{OUT}

[HCPV-20XP]



Parts

NO.	Component parts	Material
①	Case	PC (Polycarbonate)
②	PCB	FR4
③	Pin Header	Pin Header (2mm Pitch)
④	Filter Material	PTFE (Por size : 3 μ m)

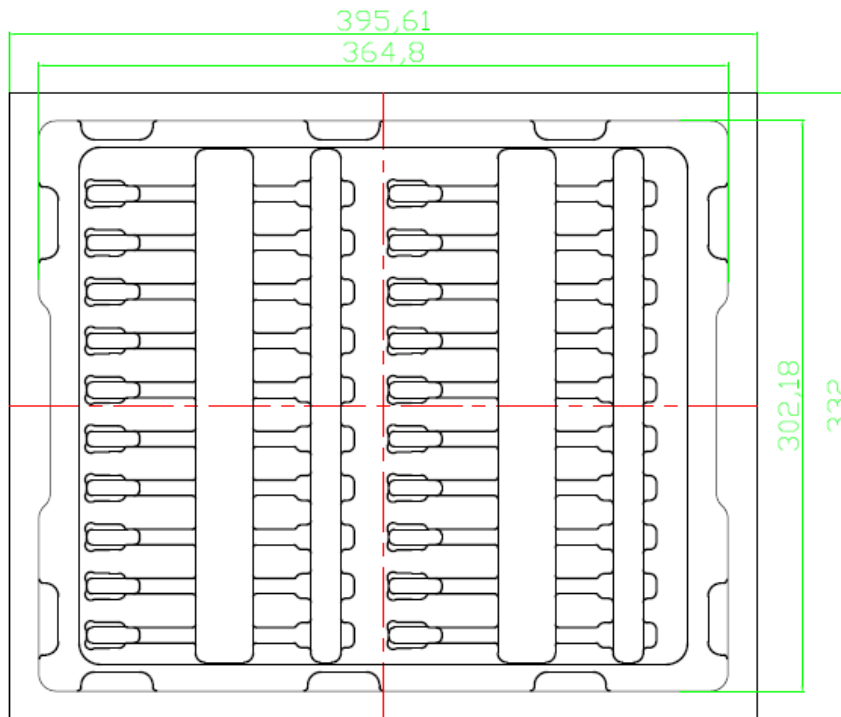
PIN Out Assignment

NO.	Function
1	GND
2	V _{CC}
3	NTC
4	H_V _{OUT}

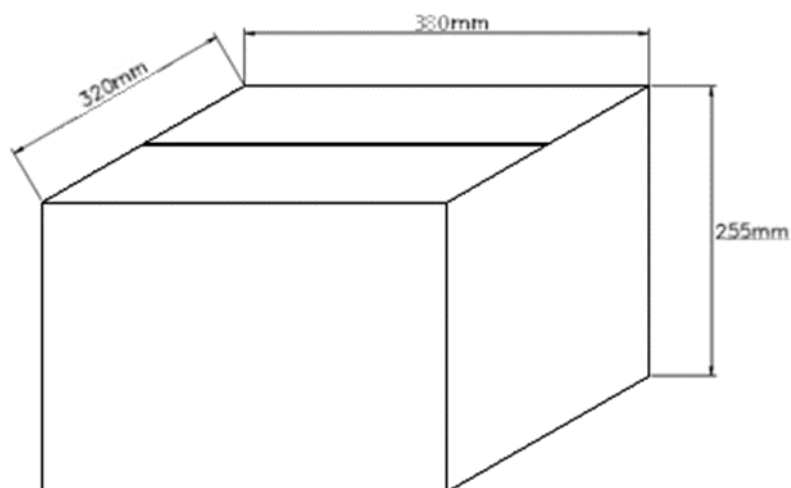
Packaging 1 : HCPV-20XH-XX

Packaging Tray : 20 pcs / 1Tray

Unit : mm

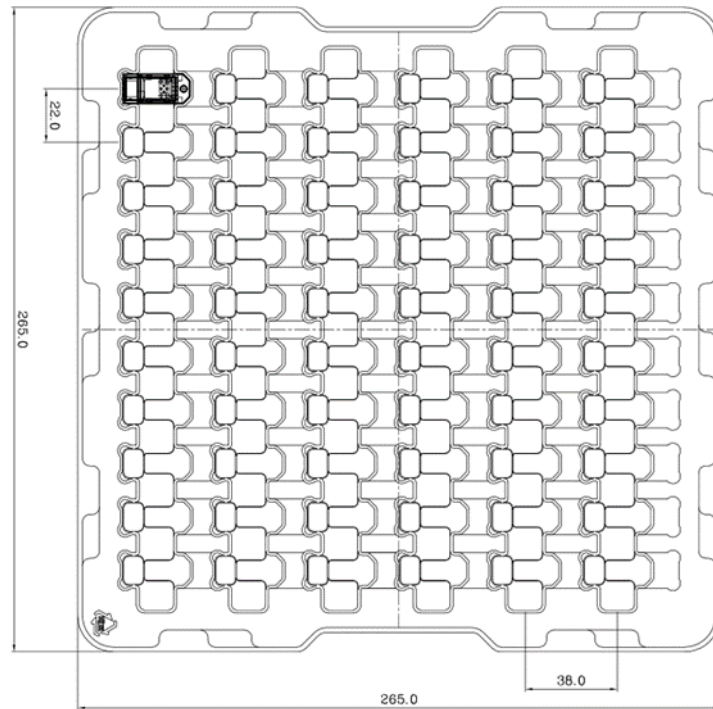


Packaging Box : 400 pcs (20 Trays x 20 pcs)

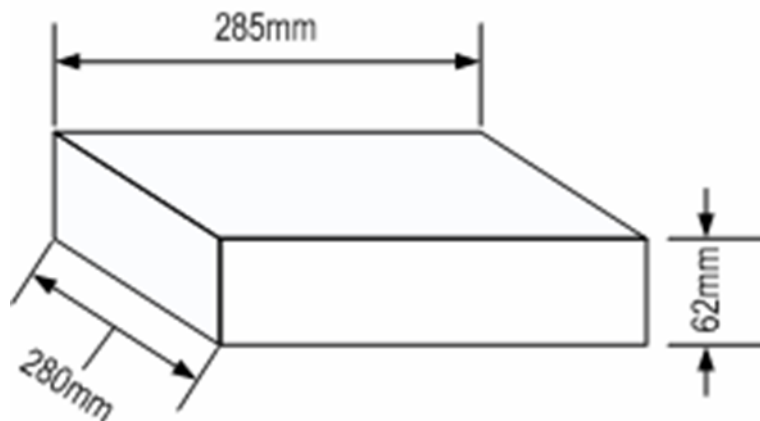


Packaging 2 : HCPV-20XW/P-XX

Packaging Tray : 60 pcs



Packaging Box : 240 pcs (4 Trays x 60 pcs)



Revision History

Date	Version	Page(s)	Changes
	1.0		First Release
20 Aug 2012	1.5	2	Combined 3 kinds of output type
22 Jan 2016	1.6	ALL	Logo, font, Dimensions, format modification



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This Application Guide should be used only for intended and authorized application of HumiChip®.

Please consult with SAMYOUNG S&C for any specific application requirements and for detailed datasheet.

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