

HCPV - 20XX - XX Series

HumiChip Voltage Output 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 kinds of connection types
- ◆ Confirmal Coating

Applications

- ◆ Smart Appliances
- ◆ HVAC control
- ◆ Industrial Process Control
- ◆ Medical
- ◆ Automotive
- ◆ Environment Monitoring

Description

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-20XW

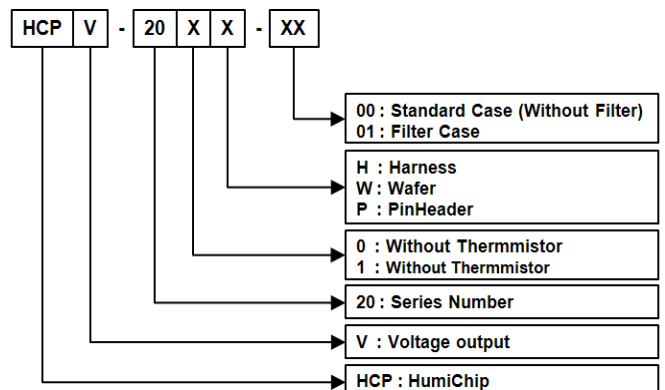


HCPV-20XP



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			±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 ($\tau_{63\%}$)			7.0		sec

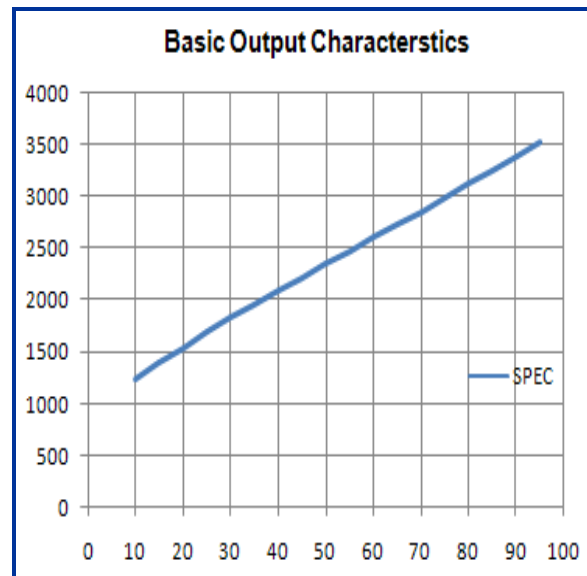
Temperature (°C)

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 Equation :

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

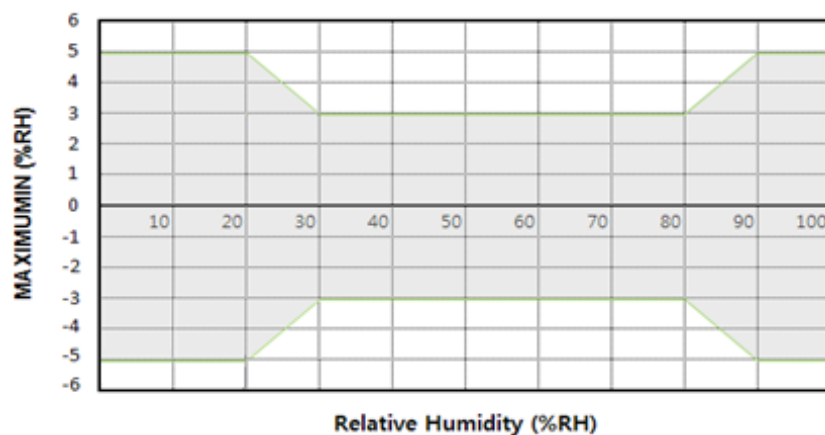
$$RH [\%] = -1.56 \times 10^{-9} \times V_{out}^3 + 1.205 \times 10^{-5} \times V_{out}^2 + 8.22 \times 10^{-3} \times V_{out} - 15.6$$

- Linear Equations :

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

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

- Relative Humidity Accuracy

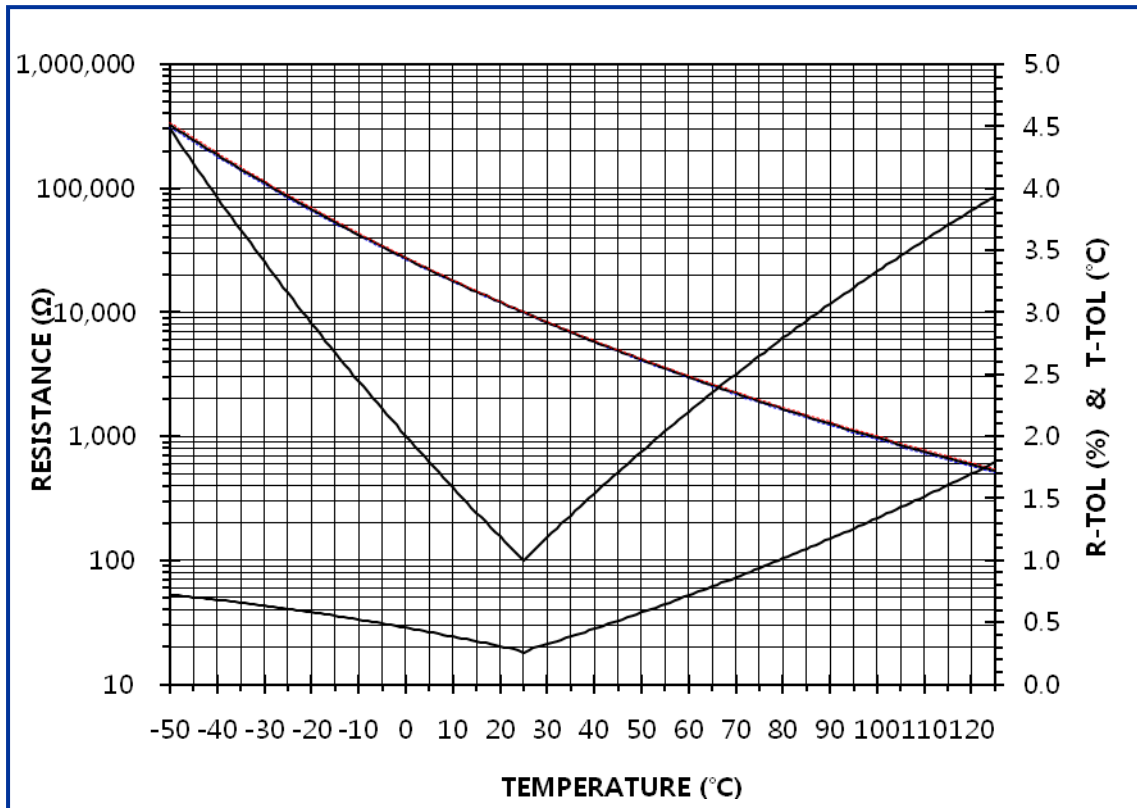


HCPV-20X series is able to measure accurate humidity for optimized of 20 to 95%RH.

The accuracy tolerance is $\pm 3\%RH$ for 30%~80%RH, and $\pm 5\%RH$ for less than 20%RH and over 90%RH.

Temperature Look-up Table

R-T Characteristics & Tolerance



TEMP. (°C)	RESISTANCE (Ω)			RESIST.-TOL. (%)		TEMP.-TOL. (°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

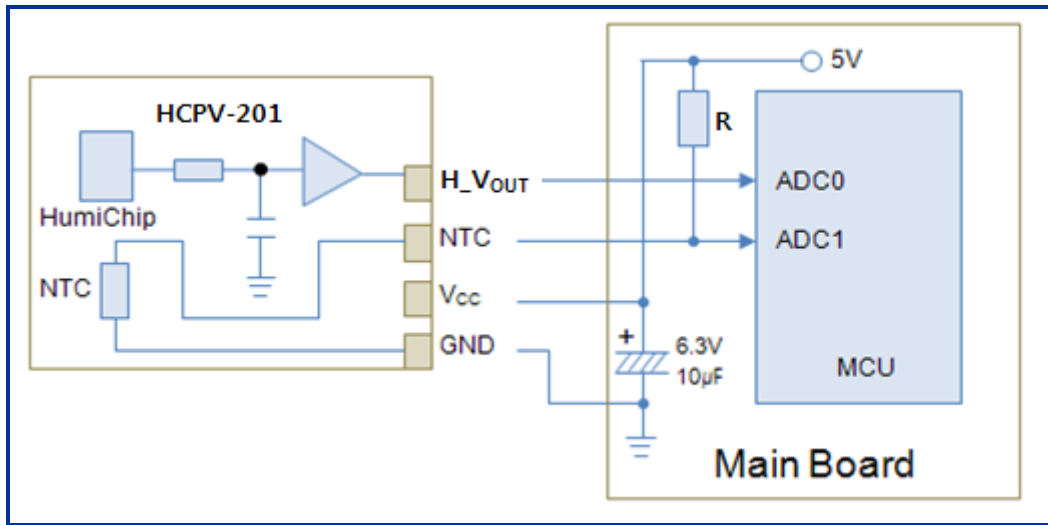
-29	101846.88	105326.56	108914.2	3.41	3.30	0.64	0.62
-28	96901.40	100161.74	103521.4	3.35	3.26	0.63	0.62
-27	92221.22	95276.44	98423.0	3.30	3.21	0.63	0.61
-26	87790.95	90654.31	93601.7	3.25	3.16	0.62	0.61
-25	83596.12	86279.98	89041.1	3.20	3.11	0.62	0.60
-24	79623.17	82139.07	84726.0	3.15	3.06	0.61	0.60
-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)

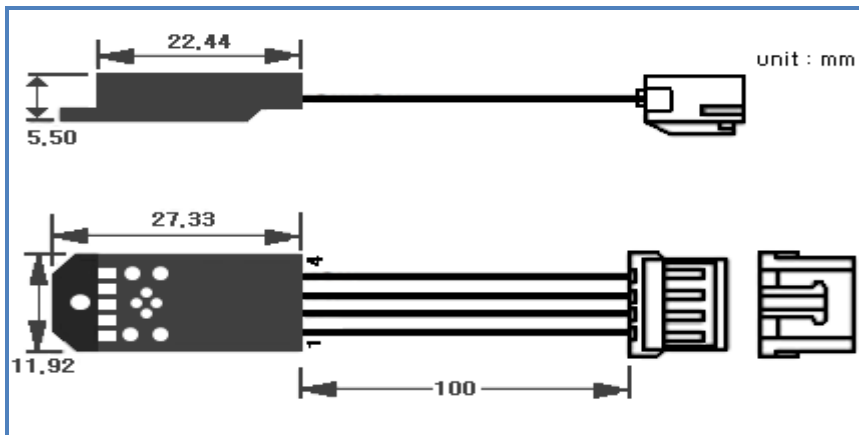


Reliability

No	Test Item	Test Condition	Test Criterion
1	Heat-Resistant	Left for 24 hours a RT 70°C, 4hours at 60°C, and after leaving for 12hours at the normal temperature, and confirm the operation.	< ± 5%RH
2	Cold Resistant	Left for 24 hours a RT -20°C, 4hours at 10°C, and after leaving for 12hours at the normal temperature, and confirm the operation.	< ± 5%RH
3	Humidity Resistance	Left for 48 hours a RT 40°C, RH 90~95% and after leaving for 12hours at the normal temperature, and confirm the operation.	< ± 5%RH
4	Vibration Resistance	Vibrating for 120 minutes, 1500cpm to X Y Z axial at 4mm seismic amplitude and after leaving for 12 hours at the normal temperature, and confirm the operation.	< ± 5%RH
5	Temperature Cycle	Define a cycle for 12 hours at RT -20°C, 12hours at RT 70°C, and after leaving for 12hours at the normal temperature, and confirm the operation.	< ± 5%RH
6	THB (Temperature Humidity with bias)	After Stressing 500 hours at 85°C, 85%RH, with bias applied to the device, and after leaving for 12 hours at the normal temperature, and confirm the operation_(Interim inspection at 300hours)	< ± 5%RH
7	Thermal shock	A cycle is exposed to -40°C, 85°C with 30minutes period time, undergo 300 cycles, and after leaving for 12 hours at the normal temperature, and confirm the operation.	< ± 5%RH

Dimensions

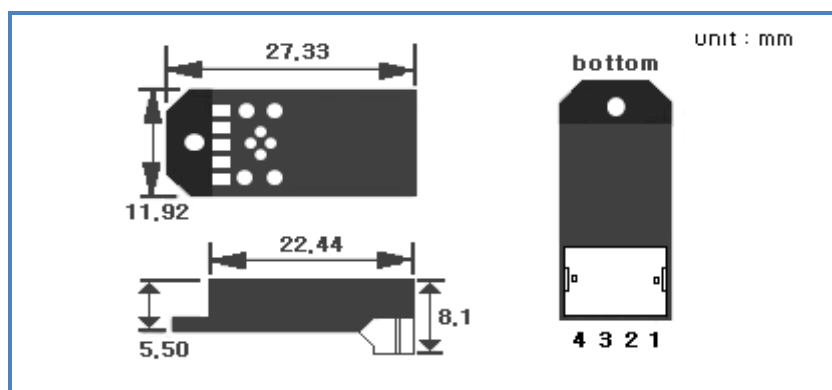
[HCPV-20XH]



PIN Out Assignment

NO.	Component parts	Material	NO.	Color	Function
1	Case	PC (Polycarbonate)	1	Black	GND
2	PCB	FR4	2	Red	V _{CC}
3	Harness	UL 1007-AWG#24	3	Green	NTC
4	Connector	[TYCO AMP] 917688-1 (2.54mm Pitch)	4	Yellow	H_V _{OUT}

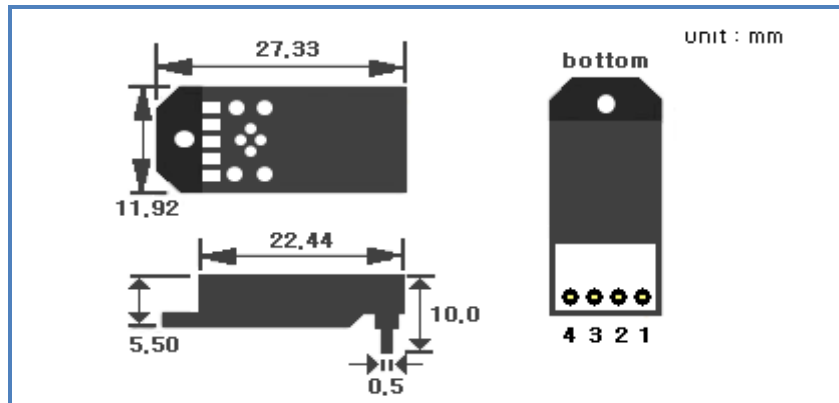
[HCPV-20XW]



PIN Out Assignment

NO.	Component parts	Material	NO.	Function
1	Case	PC (Polycarbonate)	1	GND
2	PCB	FR4	2	V _{CC}
3	Wafer	[Yeonho] 15001WR-04P (1.5mm Pitch)	3	NTC
			4	H_V _{OUT}

[HCPV-20XP]

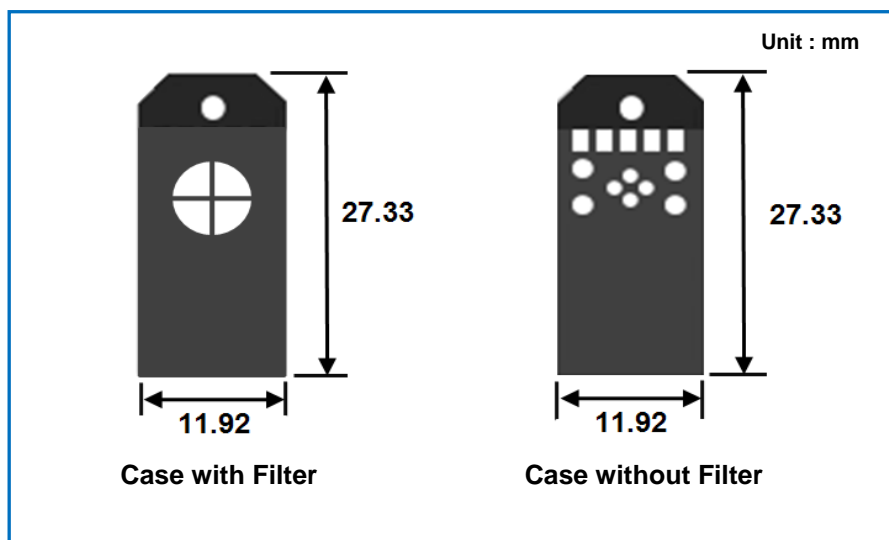


PIN Out Assignment

NO.	Component parts	Material
1	Case	PC (Polycarbonate)
2	PCB	FR4
3	PinHeader	Pin Header (2mm Pitch)

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

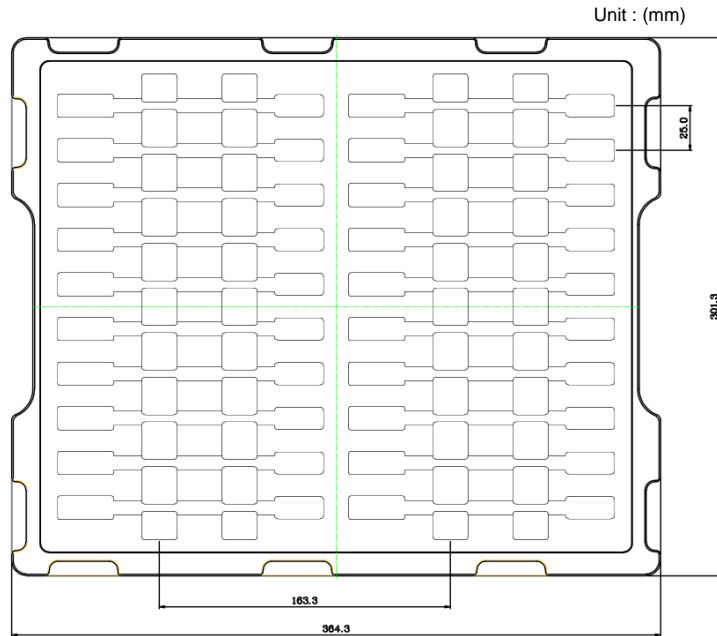
CASE



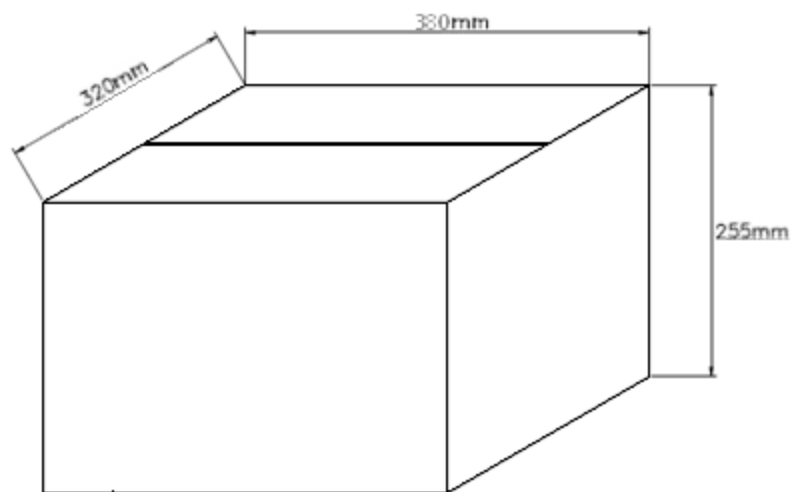
- ▶ Filter
- Material: PTFE
- Por Size: 3um

Packaging 1 : HCPV-20XH-XX

Packaging Tray : 20 pcs

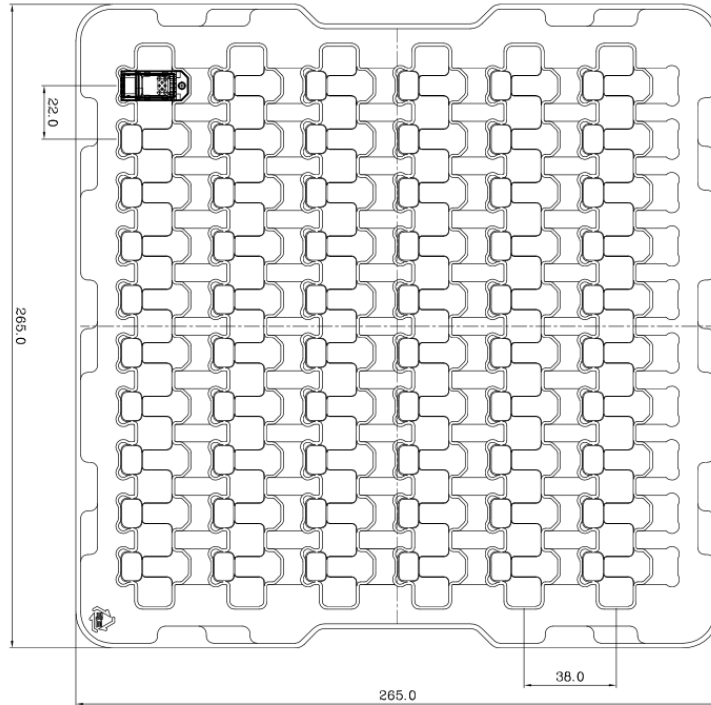


Packaging Box : 300 pcs (15 Trays x 20 pcs)

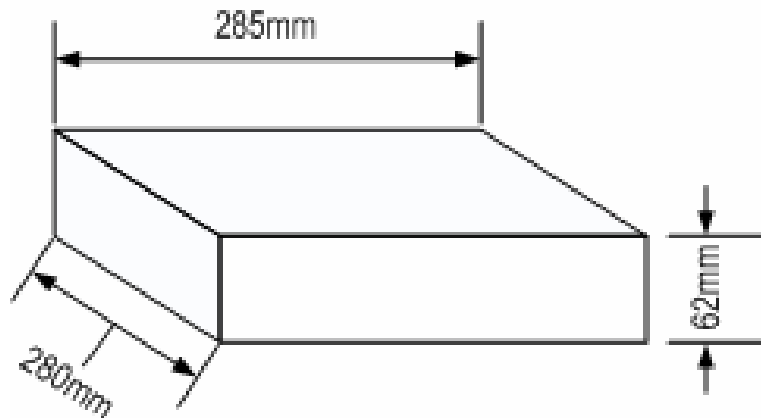


Packaging 2 : HCPV-20XW/P-XX

Packing Tray : 60 pcs



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





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