Advanced Information **TECHNICAL DATA**

HTG3535PVBL

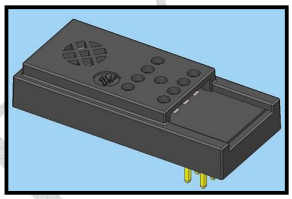
Compliant with RoHS regulations

ANALOG VOLTAGE RELATIVE HUMIDITY AND TEMPERATURE MODULE

Based on the rugged HUMIREL humidity sensor, HTG3535PVBL is a dedicated humidity and temperature plug and play transducer designed for OEM applications where a reliable and accurate measurement is needed. Direct interface with a micro-controller is made possible with the module's humidity linear voltage and direct NTC outputs. HTG3535PVBL is designed for high volume and demanding applications.

Main features

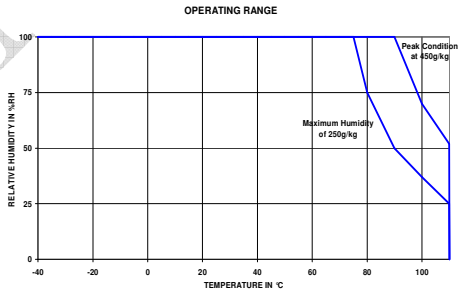
- **Suitable for small bulk assembly**
- **Product free from Lead, Cr (6+), Cd and Hg. Compliant with RoHS**
- Reliability not affected by repeated condensations
- **Full interchangeability. Better than +/-3% RH and +/-0.15°C**
- Demonstrated reliability and long term stability
- **Typical 1 to 3.6 Volt DC output for 0 to 100% RH at 5 V DC supply**
- **Humidity calibrated within +/- 3% RH @ 55% RH**
- **Temperature measurement through NTC 10 kΩ +/- 1% direct output**
- Ratiometric to voltage supply within the specified range
- **Alternate connector type: Contact factory.**



HTG3535PVBL : 5V Supply

Maximum ratings

Ratings	Symbol	Value	Unit
Storage Temperature	T_{stg}	- 40 to +125	°C
Supply Voltage (Peak)	V_{cc}	20	V_{dc}
Humidity Operating Range	RH	0 to 100	%RH
Temperature Operating Range	T_a	-40 to +110	°C
Maximum Output Current (Peak)	I_{peak}	5	mA
Maximum Power	Pd	25	mW



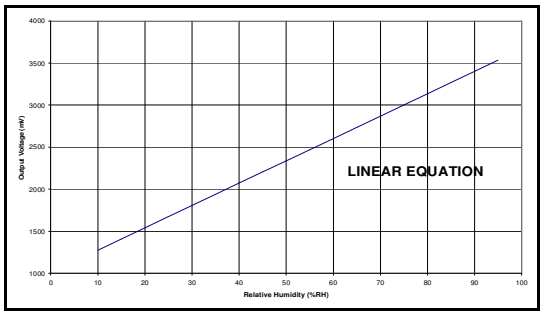
Electrical characteristics

(@T=23°C, @Vcc=5V, R_L>1MΩ unless otherwise noted)

Characteristics	Symbol	Min	Typ	Max	Unit
Humidity Measuring Range	RH	0		100	%RH
Relative Humidity Accuracy (10% to 95%RH)			±3	±5	%RH
Voltage Supply(1) (4)	V_{cc}	4.75	5	5.25	V_{dc}
Nominal Output @55%RH	V_{out}	2.42	2.48	2.54	V
Current Consumption	I_{cc}		3.2		mAdc
Temperature coefficient (10°C to 50°C)	T_{cc}		-0.05	-0.1	%RH/°C
Humidity Average Sensitivity	ΔmV/RH		+26		mV/%RH
Recovery time after 150 hours of condensation	t		10		s
Humidity hysteresis			+/-1		%RH
Output impedance	Z			50	Ω
Sink current capability (R_{L_Min} = 8 kOhms) (2)	I			1	mA
Warm up time	t_w		150		ms
Response Time (at 63% of signal) 33%RH to 75%RH(3)	τ		5	10	s

(1) Module is ratiometric to voltage supply.
(2) Conditions of sink current : Vout + 0.078V (3%RH) at Vout = 1.000V (Vout min).
(3) At 1m/s air flow.
(4) Maximum power supply ramp up time to VCC should be less than 20 ms.

HTG3535PVBL Modeled Voltage Output (Vcc=5V)



Reference Output Values

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

LINEAR EQUATION

$V_{out} = 26.23RH + 1032$

$RH = 0.03812\ V_{out} - 39.36$

with V_{out} in mV and RH in %

POLYNOMIAL EQUATION

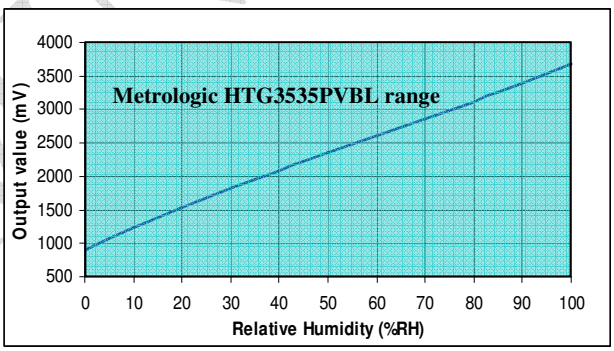
$V_{out} = 8.43E^{-4}RH^3 - 0.1485RH^2 + 34.16RH + 909$

$RH = -1.564E^{-9}\ V_{out}^3 + 1.205E^{-5}\ V_{out}^2 + 8.22E^{-3}\ V_{out} - 15.6$

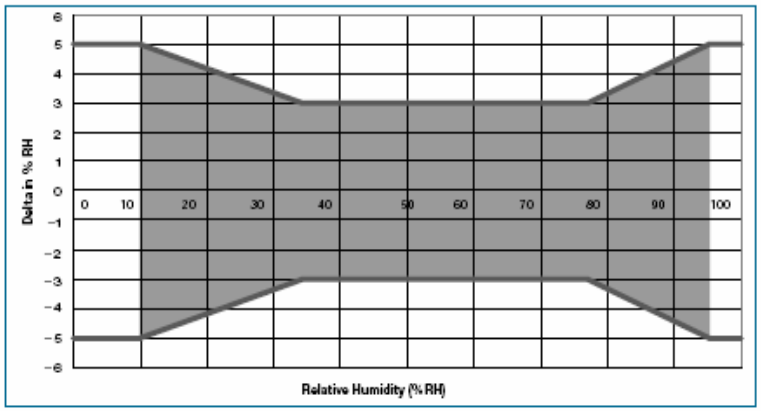
with V_{out} in mV and RH in %

Measurement Conditions

- HTG3535PVBL is specified for maximum accuracy measurements within 10 to 95 %RH.
- Excursion out of this range (< 10% or > 95% RH, including condensation) does not affect the reliability of HTG3535PVBL characteristics



Error Budget Conditions at 23°C



HTG3535PVBL ERROR LIMITS

CHARACTERISTICS

Temperature sensor

Characteristics	Symbol	Min.	Typ	Max.	Unit.
Nominal resistance @ 25°C	R	9.9	10	10.1	kΩ
Beta value : B25/50	B	3346	3380	3414	K
Temperature measuring range	T_a	-40		110	°C
Nominal Resistance Toleranceat 25°C	R_n		1		%
B value tolerance	B		1		%
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) $$R_T = R_N * e^{\beta(\frac{1}{T}-\frac{1}{T_N})}$$

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)

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) Actual values may also be influenced by inherent self-heating properties of NTCs. Please refer to Humirel Application Note HPC106-0 "Low power NTC measurement"

(3) 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.

Temp (°C)	Resistance (Ohms)	Max Deviation (Ohms)
-40	195652	7776
-39	184917	7245
-38	174845	6753
-37	165391	6296
-36	156513	5871
-35	148171	5477
-34	140330	5111
-33	132958	4771
-32	126022	4454
-31	119494	4160
-30	113347	3886
-29	107565	3631
-28	102116	3394
-27	96978	3173
-26	92132	2968
-25	87559	2776
-24	83242	2597
-23	79166	2430
-22	75316	2274
-21	71677	2129
-20	68237	1993
-19	64991	1867
-18	61919	1748
-17	59011	1638
-16	56258	1535
-15	53650	1438
-14	51178	1348
-13	48835	1263
-12	46613	1184
-11	44506	1110
-10	42506	1040
-9	40600	975
-8	38791	914
-7	37073	856
-6	35442	803
-5	33892	753
-4	32420	706
-3	31020	661
-2	29689	620
-1	28423	581

Temp (°C)	Resistance (Ohms)	Max Deviation (Ohms)
0	27219	545
1	26076	511
2	24988	479
3	23951	449
4	22963	421
5	22021	394
6	21123	369
7	20267	346
8	19450	324
9	18670	303
10	17926	284
11	17214	266
12	16534	249
13	15886	232
14	15266	217
15	14674	203
16	14108	190
17	13566	177
18	13049	165
19	12554	154
20	12081	144
21	11628	134
22	11195	125
23	10780	116
24	10382	108
25	10000	100
26	9634	100
27	9284	100
28	8947	99
29	8624	99
30	8315	98
31	8018	98
32	7734	97
33	7461	96
34	7199	96
35	6948	95
36	6707	94
37	6475	93
38	6253	92
39	6039	91

Temp (°C)	Resistance (Ohms)	Max Deviation (Ohms)
40	5834	90
41	5636	89
42	5445	88
43	5262	86
44	5086	85
45	4917	84
46	4754	83
47	4597	82
48	4446	81
49	4301	79
50	4161	78
51	4026	77
52	3896	76
53	3771	75
54	3651	73
55	3535	72
56	3423	71
57	3315	70
58	3211	69
59	3111	67
60	3014	66
61	2922	65
62	2834	64
63	2748	63
64	2666	62
65	2586	61
66	2509	60
67	2435	59
68	2364	58
69	2294	57
70	2228	56
71	2163	55
72	2100	54
73	2040	53
74	1981	52
75	1925	51
76	1870	50
77	1817	49
78	1766	48
79	1716	47

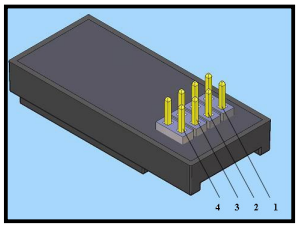
Temp (°C)	Resistance (Ohms)	Max Deviation (Ohms)
80	1669	47
81	1622	46
82	1578	45
83	1535	44
84	1493	43
85	1452	43
86	1413	42
87	1375	41
88	1338	40
89	1303	40
90	1268	39
91	1234	38
92	1202	37
93	1170	37
94	1139	36
95	1110	36
96	1081	35
97	1053	34
98	1026	34
99	999	33
100	974	32
101	949	32
102	925	31
103	902	31
104	880	30
105	858	30
106	837	29
107	816	29
108	796	28
109	777	28
110	758	27

Resistance to physical and chemical stresses

- HTG3535PVBL contains circuits to protect its inputs and outputs against Electrostatic discharges (ESD) up to ±15kV, air discharge.
- HTG3535PVBL is protected against EMC interferences.
- HTG3535PVBL is protected against reverse polarity.
- Additional tests under harsh chemical conditions demonstrate good operation in presence of salt atmosphere, SO_2 (0.5%), H_2S (0.5%), O_3, NO_x, NO, CO, CO_2, Softener, Soap, Toluene, acids (H_2SO_4, HNO_3, HCl), HMDS, Insecticide, Cigarette smoke, a non exhaustive list.
- HTG3535PVBL is not light sensitive.

Pin Out Assignment and Package Outline

HTG3535PVBL 3D VIEW

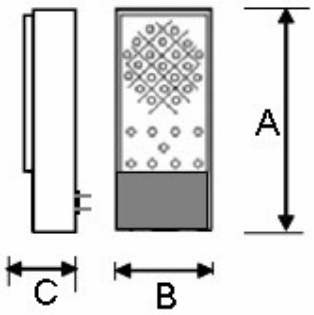


Pin Out Assignment

Pin	Function
1	Ground
2	Vcc – Voltage Supply
3	NTC – Temperature
4	Vout – Humidity

Mating Connector: CLT 104 Series
Alternate connector type: Contact factory

HTG3535PVBL Package Outline



Package Outline

Dim	Typ (mm)
A	27 ± 0.25
B	11.9 ± 0.2
C	6 ± 0.3

Color: Black
Weight: 1.8g

ORDERING INFORMATION:

Reference : HPP815G535 for HTG3535PVBL

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