



HYT.R.411.P2032.0.KK.SA.S

Fast Responding Humidity and Temperature Module

Ideal for weather balloons and drones

Benefits & Characteristics

- Fast response time
- Precise measurement at low temperatures at high altitudes
- Excellent RH/T reproducibility
- Fully factory-calibrated, exchangeable module
- Digital I²C interface



For actual size, see mechanical dimensions

Technical Data

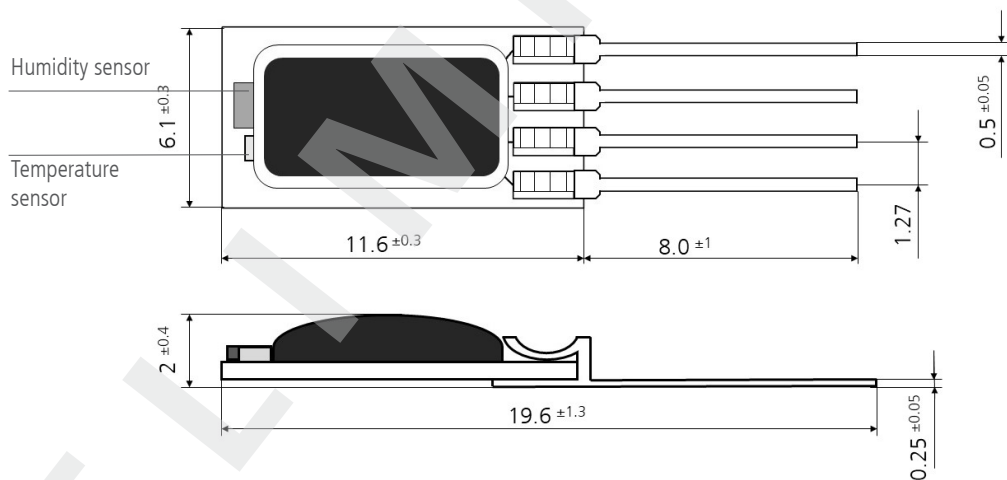
Operating temperature range:	-80 °C to +50 °C
Operating humidity range:	0 % RH to 100 % RH
Hysteresis:	< ±1 % RH
Linearity error:	< ±1 % RH
Temperature error:	0.05 % RH/K (0 °C to +60 °C)
Operating voltage:	2.1 V to 3.6 V
Current consumption (nominal):	< 20 µA at 10 Hz measuring rate
Digital interface:	I ² C, address 0x28; 32 bit for humidity and temperature
Operating voltage (limits):	-0.3 V to 4 V
Storage conditions	-20 °C to + 50 °C



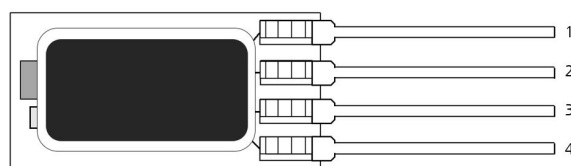
	Humidity	Temperature
Accuracy	±2 % RH at 23 °C (0 % RH to 90 % RH)	±0.5 K (-80 °C to 0 °C) ±0.2 K (0 °C to +50 °C)
Reproducibility	±0.2 % RH	±0.1 K
Resolution	0.04 % RH	0.015 °C
Response time t_{63}	< 0.5 s at 23 °C	< 2 s
Long-term drift:	< 0.5 % RH/a at +23 °C, 30 - 70 % RH (laboratory conditions)	< 0.05 K/a
Measuring principle	Capacitive polymer humidity sensor	Pt1000

Custom calibration available on request.

Mechanical Dimensions



Pin Assignment



1	2	3	4
SDA	GND	VDD	SCL



I²C Communication

The address has always to be sent as the first byte after the start condition, the eighth bit indicating the direction of the following data transfer (R=read=1 and W=write=0).
Address byte:

MSB								LSB
0	1	0	1	0	A1	A0		R/W
fixed						variable		
address								

Default address: 28 (A1 = A0 = 0)

To start the measurement at the HYTR411 module it is necessary to reset the module first. This will be done by sending the command 'Power on reset'.

S	address + W	A	Op-Code	N	P
S	0101000 0	0	0x88	1	P

After power on reset the measured values (humidity and temperature) can be read by the following command.

S	Address+W	A	Op-Code	A	S	Address+R	A	Data	Data	Data	Data	N	P
S	0101000 0	0	0x40+offset	0	S	0101000 1	0	Byte 1	Byte 2	Byte 3	Byte 1	1	P

With the following values of the offset.

Value	Offset
Humidity	0x00
Temperature	0x24
Status	0x20

The I²C interface supports an automatic address-increment. That means both values, humidity and temperature, can be read with one command.

Calculation of temperature and humidity from the received data:

The 4 bytes of each value has to be interpreted as a signed 32 bit value, transmitted with low byte first. To mark negative values, the 2's complement is used. The values are transmitted in a fixed point format.

Value	Integer	Fractional
Humidity	24 bit	8 bit



Example of humidity:

Received values: 0x35 0x3e 0x00 0x00 fractional: 0x35
 32bit: 0x00003e35 -> integer part: 0x00003e
 Humidity value = 0x3e + 0x35 / 2^8 = 62 + 0,207 = 62,207
 = 62,207 % rH

Example of positive temperature:

Received values: 0xd1 0x1a 0x00 0x00 fractional: 0xd1
 32bit: 0x00001ad1 -> integer part: 0x001a
 Temperature value = 0x1a + 0xd1 / 2^8 = 26 + 0,8164 = 26,8164
 = 26,8164 °C

Example of negative temperature:

Received values: 0xcf 0xf0 0xff 0xff
 32bit: 0xffff0cf -> 2's complement 0x0000f31
 -> integer part: 0x000f fractional: 0x31
 = 0xf + 0x31 / 2^8 = 15 + 0,1914 = 15,1914 + the negative sign
 = -15,1914 °C

Status:

Offset	Bit	Name	Explanation
0x20	0	RunBit	
	1	CDC active	Warning: traffic on interface may enhance noise in measurement
	2	RDC ready	
	3		
	4	AutoBoot busy	
	5	POR_CDC_DSP_COLL	If a CDC sequence is triggered while DSP is still active an Initial Reset is provoked
	6	POR_Flag_Config	One or more configuration bits toggled by interferences and has provoked a power-on-reset.
	7	POR_Flag_Wdog	A watchdog overflow has been detected and has provoked a power-up reset. Perhaps the firmware has hung up in an unwanted endless loop or, more likely, a CDC/RDC trigger signal has been lost.
0x21	0	Comb_Err	
	1	Err_Ovfl	An overflow error occurred when the CDC unit was busy
	2	Mup_Err	A particular kind of TDC error occurred when the CDC unit was busy
	3	RDC_Err	Some kind of error occurred when the RDC unit was busy
	4-7	n.c.	
0x22	0	C_PortError0 (PC0)	In the CDC unit, one or several ports are affected by some error like a short-circuit to ground. May also be a charge/ discharge resistivity too big, a capacitance too big, or an ill-defined precharge/fullcharge/discharge time.
		
	5	C_PortError7 (PC5)	
	6	C_PortError Internal Reference	
	7	n.c.	



Order Information

Product name	HYT.R411.P2032.0.KK.SA.S
Order code	153690

Additional Documents

Application Note*:	Document name: AHHYTM_E
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