Maxdêtect
sense the world

Digital relative humidity & temperature sensor RHT05

1. Feature & Application:

*High precision   *Outstanding long-term stability
*Capacitive type   *Extra components not needed
*Full range temperature compensated   *Long transmission distance, up to 100 meters
*Relative humidity and temperature measurement   *Low power consumption
*Calibrated digital signal   *Three-core shielded cable as outgoing line

2. Description:

RHT05 output calibrated digital signal. It applys exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability. Its sensing elements is connected with 8-bit single-chip computer.

Every sensor of this model is temperature compensated and calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of programme in OTP memory, when the sensor is detecting, it will cite coefficient from memory.

Small size & low consumption & long transmission distance(100m) enable RHT05 to be suited in all kinds of harsh application occasions.

3. Technical Specification:

Model	RHT05	
Power supply	3.3-6V DC	
Output signal	digital signal via MaxDetect 1-wire bus	
Sensing element for RH	Polymer humidity capacitor	
Sensing element for T	Apply Dallas DS18B20 for detecting temperature	
Operating range	humidity 0-100%RH;	temperature -40~120Celsius
Accuracy	**humidity +-2%RH**(Max +-5%RH);	temperature +-0.3Celsius
Resolution or sensitivity	humidity 0.1%RH;	temperature 0.1Celsius
Repeatability	humidity +-1%RH;	temperature +-0.2Celsius
Humidity hysteresis	+-0.3%RH	

Long-term Stability	+-0.5%RH/year
Interchangeability	fully interchangeable

4. Dimensions: (unit----mm)
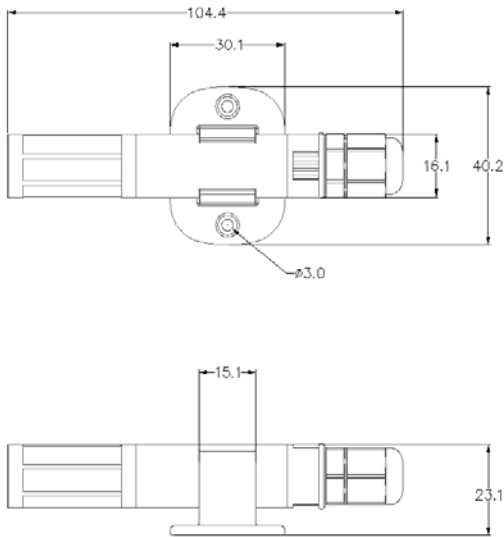
Pin	Function
1	Red wire----power supply
2	Yellow wire--signal
3	Black wire---GND

*Three-core shielded cable as outgoing line, the three cores are red wire, yellow wire, black wire.

5. Electrical connection diagram:

6. Operating specifications:

(1) Power and Pins

Power's voltage should be 3.3-6V DC. When power is supplied to sensor, don't send any instruction to the sensor within one second to pass unstable status. One capacitor valued 100nF can be added between VDD and GND for wave filtering.

(2) Communication and signal

MaxDetect 1-wire bus is used for communication between MCU and RHT05. (MaxDetect 1-wire bus is specially designed by MaxDetect Technology Co., Ltd. , it's different from Maxim/Dallas 1-wire bus, so it's incompatible with Dallas 1-wire bus.)

Illustration of MaxDetect 1-wire bus:
DATA=16 bits RH data+16 bits Temperature data+8 bits check-sum

Example: MCU has received 40 bits data from RHT05 as
      0000 0010 1000 1100   0000 0001 0101 1111   1110 1110
    16 bits RH data   16 bits T data   check sum
   Here we convert 16 bits RH data from binary system to decimal system,

0000 0010 1000 1100   →   652
    Binary system   Decimal system

RH=652/10=65.2%RH

Here we convert 16 bits T data from binary system to decimal system,

0000 0001 0101 1111   →   351
    Binary system   Decimal system

T=351/10=35.1℃

When highest bit of temperature is 1, it means the temperature is below 0 degree Celsius.

Example: **1**000 0000 0110 0101, T= minus 10.1℃
      16 bits T data

Sum=0000 0010+1000 1100+0000 0001+0101 1111=1110 1110

Check-sum=the last 8 bits of Sum=1110 1110

When MCU send start signal, RHT05 change from standby-status to running-status. When MCU finishs sending the start signal, RHT05 will send response signal of 40-bit data that reflect the relative humidity and temperature to MCU. Without start signal from MCU, RHT05 will not give response signal to MCU. One start signal for one response data from RHT05 that reflect the relative humidity and temperature. RHT05 will change to standby status when data collecting finished if it don't receive start signal from MCU again.

See below figure for overall communication process, **the interval of whole process must beyond 2 seconds.**

MaxDetect 1-wire bus illustration
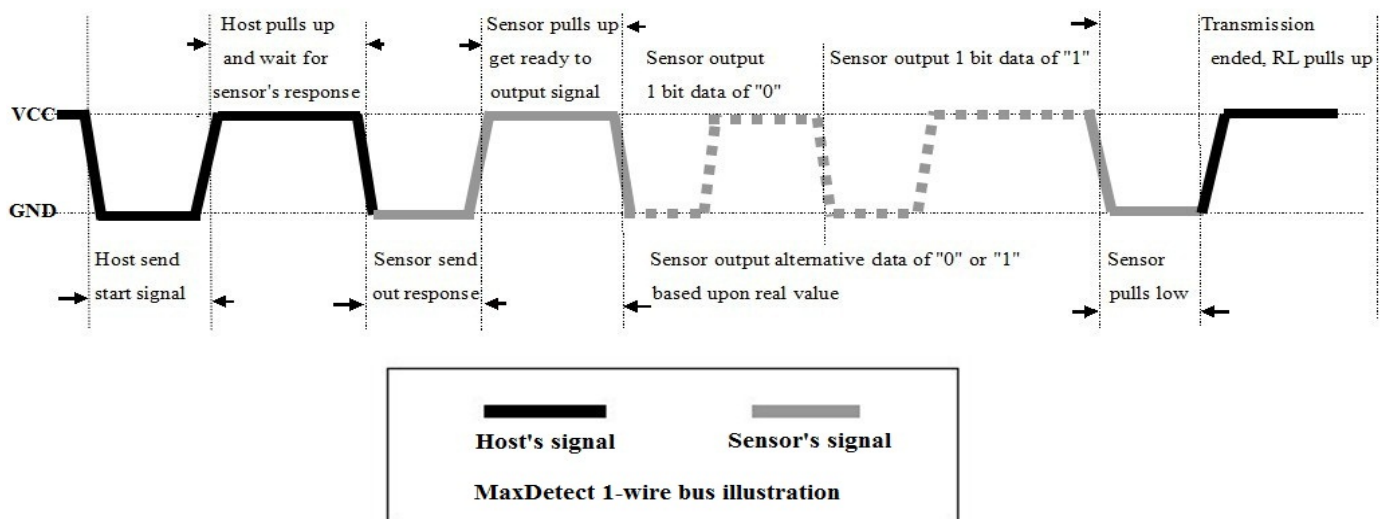
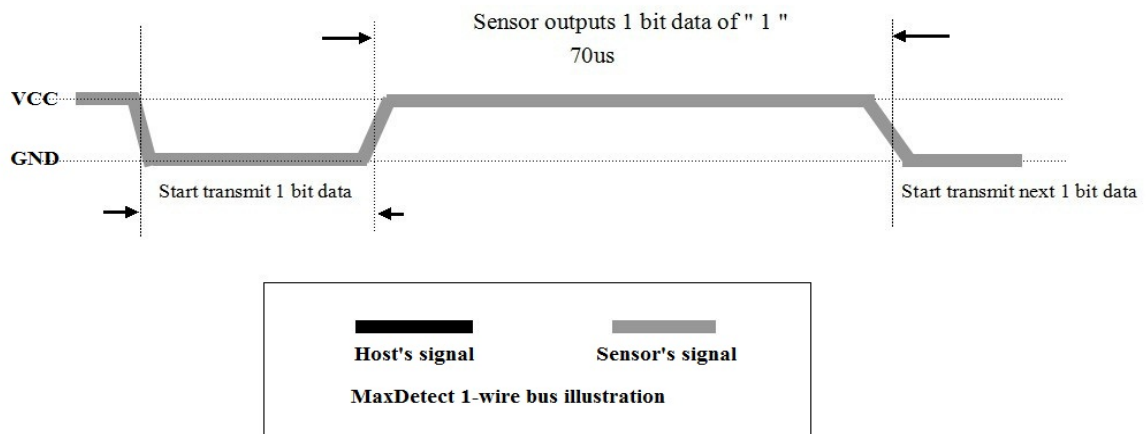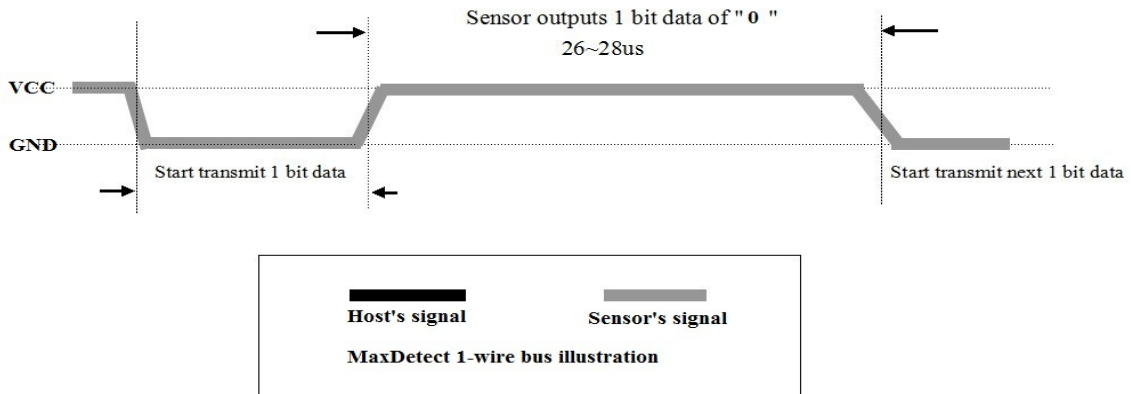1) Step 1: MCU send out start signal to RHT05 and RHT05 send response signal to MCU

    Data-bus's free status is high voltage level. When communication between MCU and RHT05 begins, MCU will pull low data-bus and this process must beyond at least 1~10ms to ensure RHT05 could detect MCU's signal, then MCU will pulls up and wait 20-40us for RHT05's response.

    When RHT05 detect the start signal, RHT05 will pull low the bus 80us as response signal, then RHT05 pulls up 80us for preparation to send data. See below figure:

Host's signal   **Sensor's signal**

MaxDetect 1-wire bus illustration

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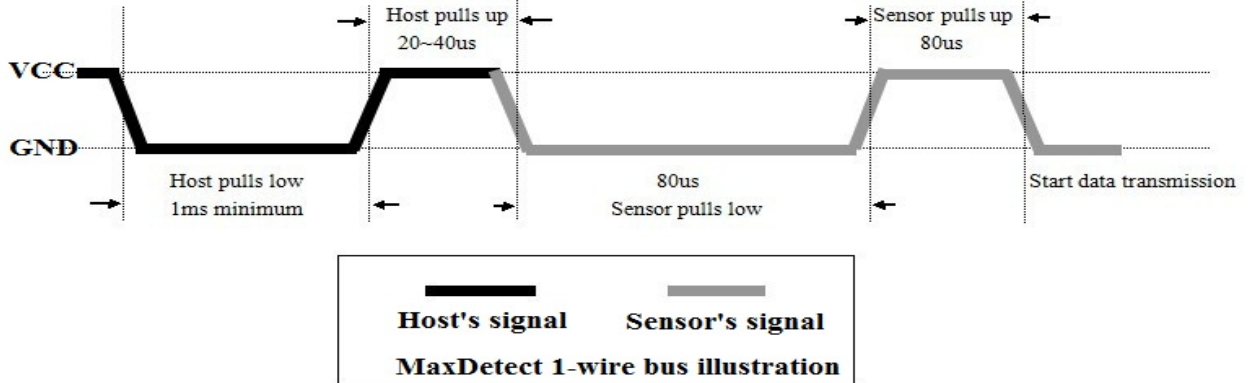
2). Step 2: RHT05 send data to MCU

When RHT05 is sending data to MCU, every bit's transmission begin with low-voltage-level that last 50us, the following high-voltage-level signal's length decide the bit is "1" or "0".   See below figures:

Host's signal   **Sensor's signal**

MaxDetect 1-wire bus illustration

Host's signal   **Sensor's signal**

MaxDetect 1-wire bus illustration

Attention:

If signal from RHT05 is always high-voltage-level, it means RHT05 is not working properly, please check the electrical connection status.

7. Electrical Characteristics:

Items	Condition	Min	Typical	Max	Unit
Power supply	DC	3.3	5	6	V
Current supply	Measuring	1		1.5	mA
	Stand-by	40	Null	50	uA
Collecting period	Second		2		Second

8. Attentions of application:

(1) Operating and storage conditions

We don't recommend the applying RH-range beyond the range stated in this specification. The RHT05 sensor can recover after working in abnormal operating condition to calibrated status, but will accelerate sensors' aging.

(2) Attentions to chemical materials

Vapor from chemical materials may interfere RHT05's sensitive-elements and debase RHT05's sensitivity.

(3) Disposal when (1) & (2) happens

Step one: Keep the RHT05 sensor at condition of Temperature 50~60Celsius, humidity <10%RH for 2 hours;

Step two: After step one, keep the RHT05 sensor at condition of Temperature 20~30Celsius, humidity >70%RH for 5 hours.

(4) Attention to temperature's affection

Relative humidity strongly depend on temperature, that is why we use temperature compensation technology to ensure accurate measurement of RH. But it's still be much better to keep the sensor at same temperature when sensing.

RHT05 should be mounted at the place as far as possible from parts that may cause change to temperature.

(5) Attentions to light

Long time exposure to strong light and ultraviolet may debase RHT05's performance.

(6) Attentions to connection wires

The connection wires' quality will effect communication's quality and distance, high quality shielding-wire is recommended.

(7) Other attentions

* Welding temperature should be bellow 260Celsius.

* Avoid using the sensor under dew condition.

* Don't use this product in safety or emergency stop devices or any other occasion that failure of RHT05 may cause personal injury.