Maxdêtect
sense the world

Digital relative humidity & temperature sensor RHT04

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   *4 pins packaged and fully interchangeable

2. Description:

RHT04 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 RHT04 to be suited in all kinds of harsh application occasions. Single-row packaged with four pins, making the connection very convenient.

3. Technical Specification:

Model	RHT04	
Power supply	3.3-5.5V 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 -40~100Celsius
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)

5. Electrical connection diagram:
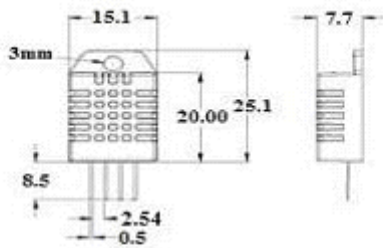
Pin sequence number: 1 2 3 4 (from left to right direction).

Pin	Function
1	VDD—power supply
2	DATA–signal
3	GND
4	GND
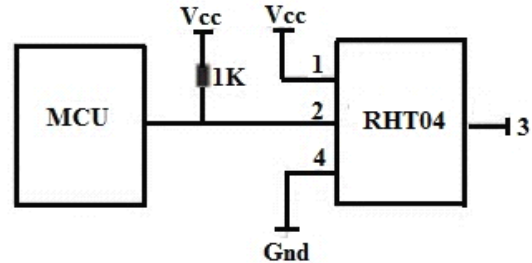
6. Operating specifications:

(1) Power and Pins

Power's voltage should be 3.3-5.5V 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 RHT04. (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 RHT04 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

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

When MCU send start signal, RHT04 change from standby-status to running-status. When MCU finishs sending the start signal, RHT04 will send response signal of 40-bit data that reflect the relative humidity and temperature to MCU. Without start signal from MCU, RHT04 will not give response signal to MCU. One start signal for one response data from RHT04 that reflect the relative humidity and temperature. RHT04 will change to standby status when data collecting finished if it don't receive start signal from MCU again.
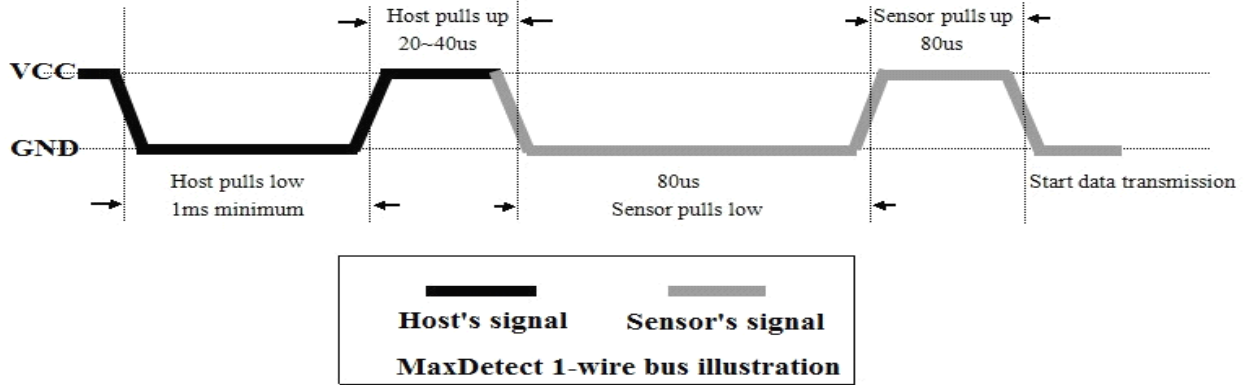
See below figure for overall communication process, the interval of whole process must beyond 2 seconds.

MaxDetect 1-wire bus illustration

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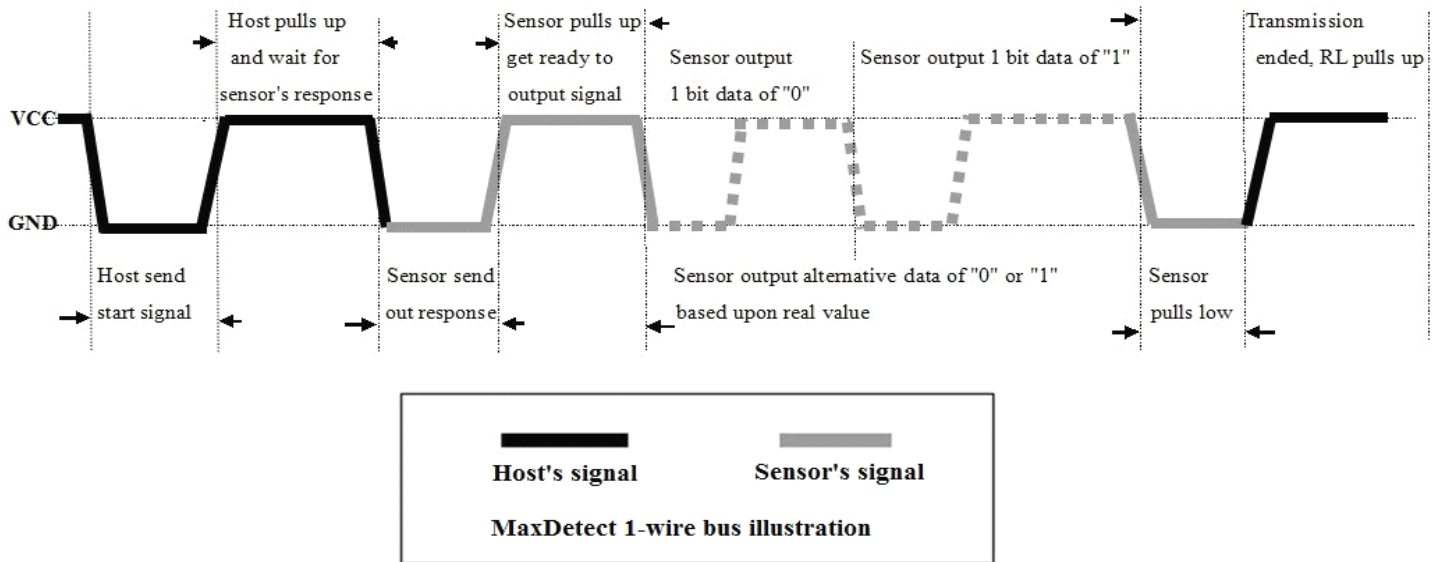
1) Step 1: MCU send out start signal to RHT04 and RHT04 send response signal to MCU
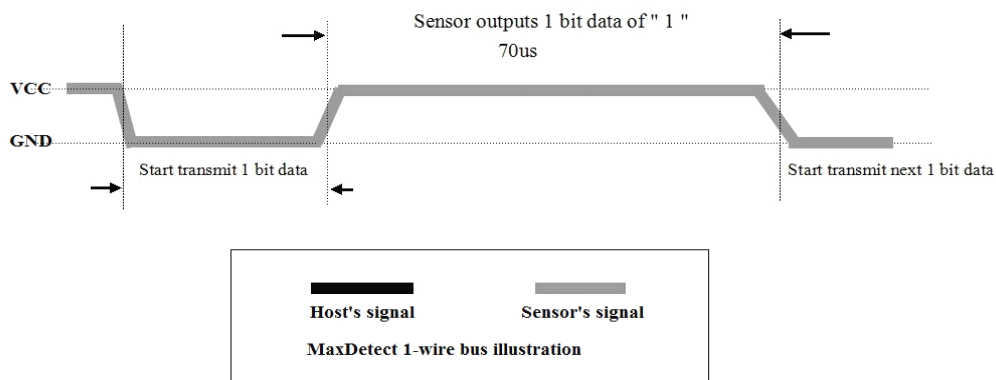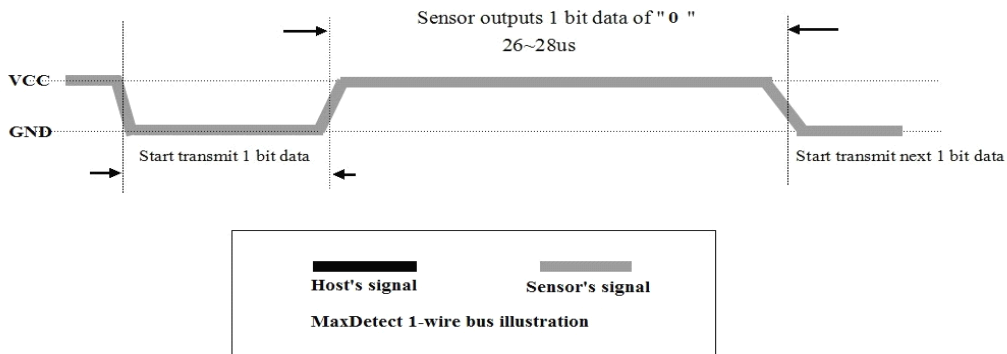
   Data-bus's free status is high voltage level. When communication between MCU and RHT04 begins, MCU will pull low data-bus and this process must beyond at least 1~10ms to ensure RHT04 could detect MCU's signal, then MCU will pulls up and wait 20-40us for RHT04's response.

   When RHT04 detect the start signal, RHT04 will pull low the bus 80us as response signal, then RHT04 pulls up 80us for preparation to send data. See below figure:

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MaxDetect 1-wire bus illustration

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2). Step 2: RHT04 send data to MCU

When RHT04 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:

MaxDetect 1-wire bus illustration

MaxDetect 1-wire bus illustration

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Attention:

If signal from RHT04 is always high-voltage-level, it means RHT04 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 RHT04 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 RHT04's sensitive-elements and debase RHT04's sensitivity.

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

Step one: Keep the RHT04 sensor at condition of Temperature 50~60Celsius, humidity <10%RH for 2 hours;

Step two: After step one, keep the RHT04 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.

RHT04 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 RHT04'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 RHT04 may cause personal injury.

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