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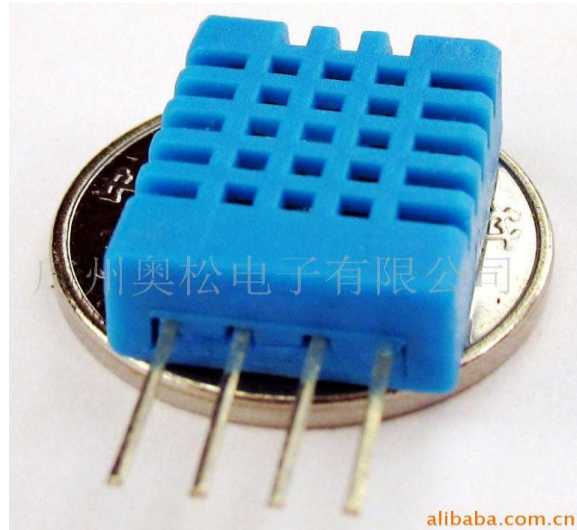
Digital-output relative humidity & temperature sensor/module

DHT11

Resisitive-type humidity and temperature module/sensor

1. Feature & Application:

* Full range temperature compensated   * Relative humidity and temperature measurement
* Calibrated digital signal   *Outstanding long-term stability   *Extra components not needed
* Long transmission distance   * Low power consumption   *4 pins packaged and fully interchangeable

2. Description:

DHT11 output calibrated digital signal. It utilizes 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(20m) enable DHT11 to be suited in all kinds of harsh application occasions.
Single-row packaged with four pins, making the connection very convenient.

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3. Technical Specification:

Model	DHT11
Power supply	3-5.5V DC
Output signal	digital signal via single-bus
Sensing element	Polymer resistor
Measuring range	humidity 20-90%RH; temperature -20~60Celsius
Accuracy	humidity +-4%RH (Max +-5%RH); temperature +-0.5Celsius
Resolution or sensitivity	humidity 1%RH; temperature 0.1Celsius
Repeatability	humidity +-1%RH; temperature +-0.5Celsius
Humidity hysteresis	+-1%RH
Long-term Stability	+-0.5%RH/year
Sensing period	Average: 2s
Interchangeability	fully interchangeable
Dimensions	size 12*15.5*5.5mm

4. Dimensions: (unit----mm)

正面	背面	侧面
1 2 3 4	4 3 2 1	
Front view	**Back view**	**Side elevation**

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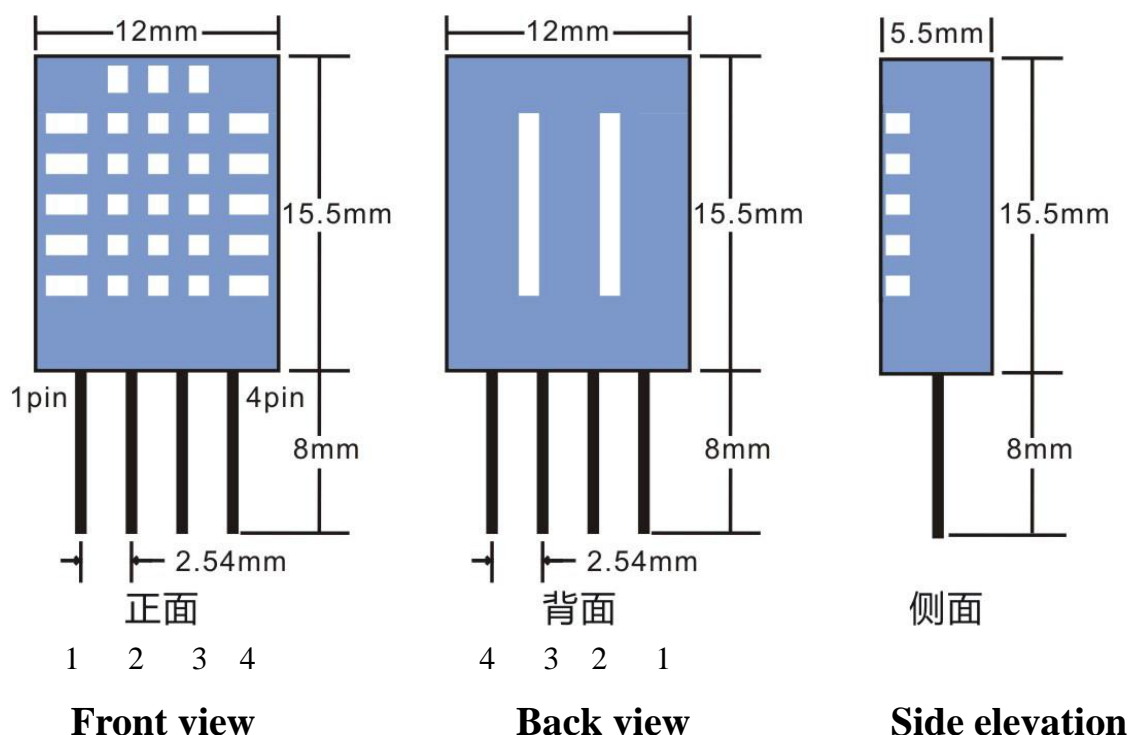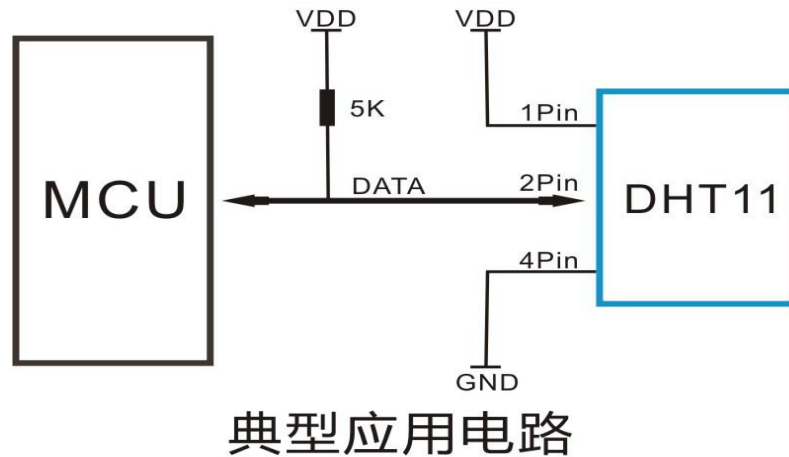Tell: +86-020-36380552, +86-020-36042809   Fax: +86-020-36380562

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5. Electrical connection diagram:

典型应用电路

3Pin-NULL, MCU=Microcomputer or single-chip computer

6. Operating specifications:

(1) Power and Pins

Power's voltage should be 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

Single-bus data is used for communication between MCU and DHT11, it costs 4mS for single time communication.

Data is comprised of integral and decimal part, the following is the formula for data. DHT11's decimal part is always zero because the resolution is 1%RH and 1 Celsius.

DHT11 send out higher data bit firstly!

  DATA=8 bit integral RH data+8 bit decimal RH data+8 bit integral T data+8 bit decimal T data+8 bit check-sum

If the data transmission is right, check-sum should be the last 8 bit of "8 bit integral RH data+8 bit decimal RH data+8 bit integral T data+8 bit decimal T data".

When MCU send start signal, DHT11 change from low-power-consumption-mode to running-mode. When MCU finishs sending the start signal, DHT11 will send response signal of 40-bit data that reflect the relative humidity

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and temperature information to MCU. Without start signal from MCU, DHT11 will not give response signal to MCU. One start signal for one time's response data that reflect the relative humidity and temperature information from DHT11. DHT11 will change to low-power-consumption-mode when data collecting finish if it don't receive start signal from MCU again.

1) Check bellow picture for overall communication process:

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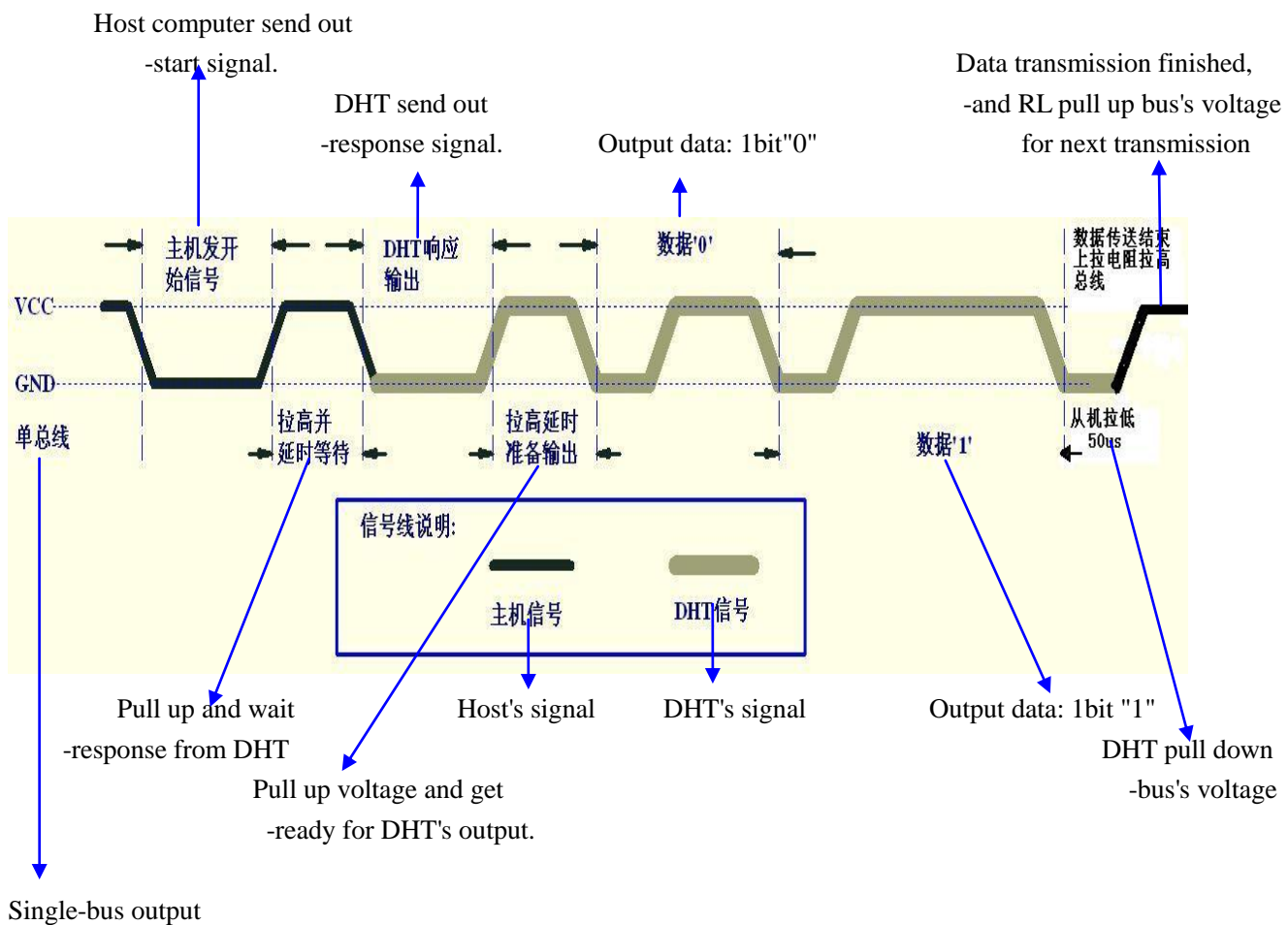
2) Step 1: MCU send out start signal to DHT11

   Data-bus's free status is high voltage level. When communication between MCU and DHT11 begin, program of MCU will transform data-bus's voltage level from high to low level and this process must beyond at least 18ms to ensure DHT11 could detect MCU's signal, then MCU will wait 20-40us for DHT11's response.
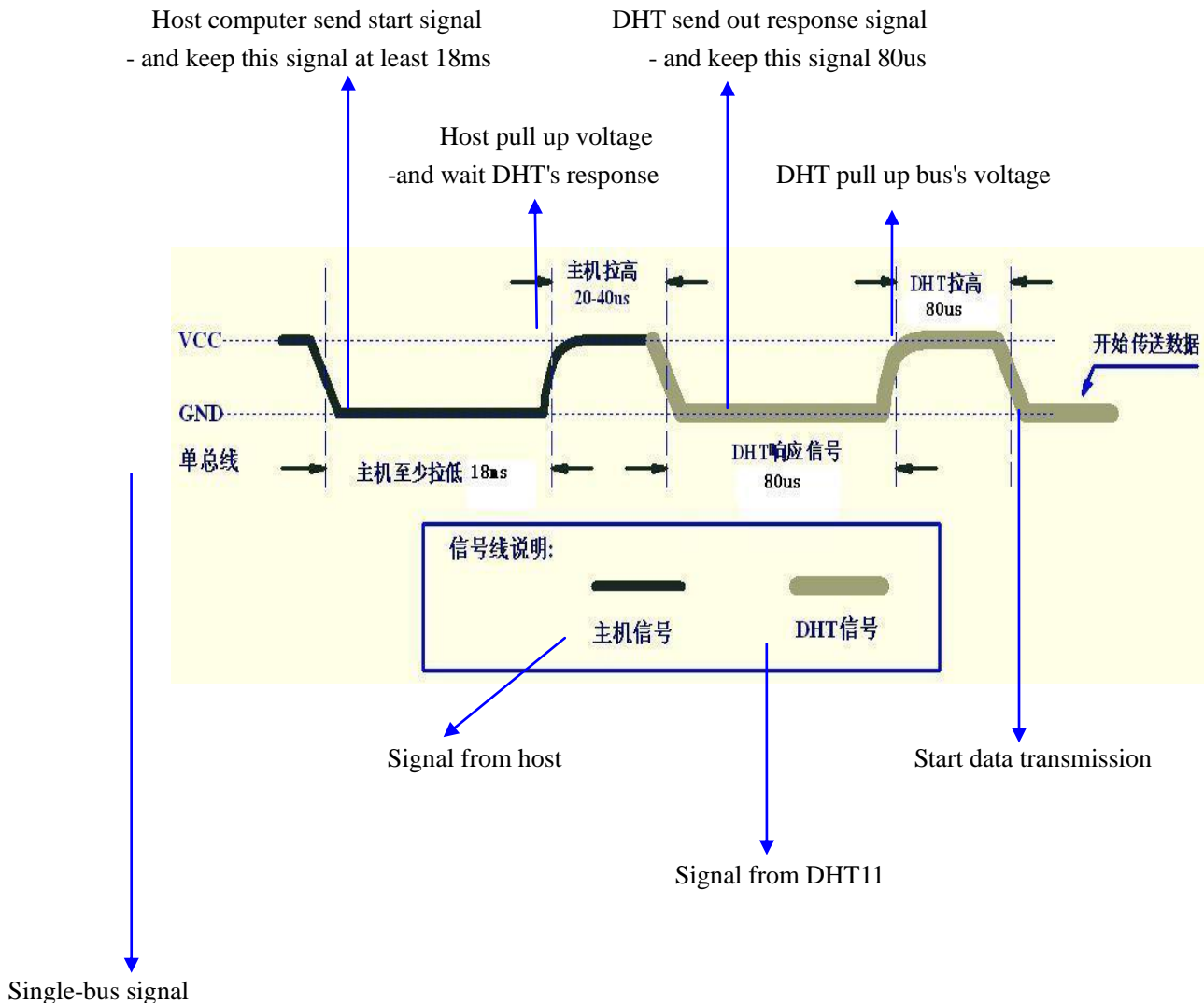   Check bellow picture for step 1:

Host computer send start signal
- and keep this signal at least 18ms

DHT send out response signal
- and keep this signal 80us

Host pull up voltage
-and wait DHT's response

DHT pull up bus's voltage

Signal from host

Start data transmission

Signal from DHT11

Single-bus signal

Step 2: DHT11 send response signal to MCU

   When DHT11 detect the start signal, DHT11 will send out low-voltage-level signal and this signal last 80us as response signal, then program of DHT11 transform data-bus's voltage level from low to high level and last 80us for DHT11's preparation to send data.
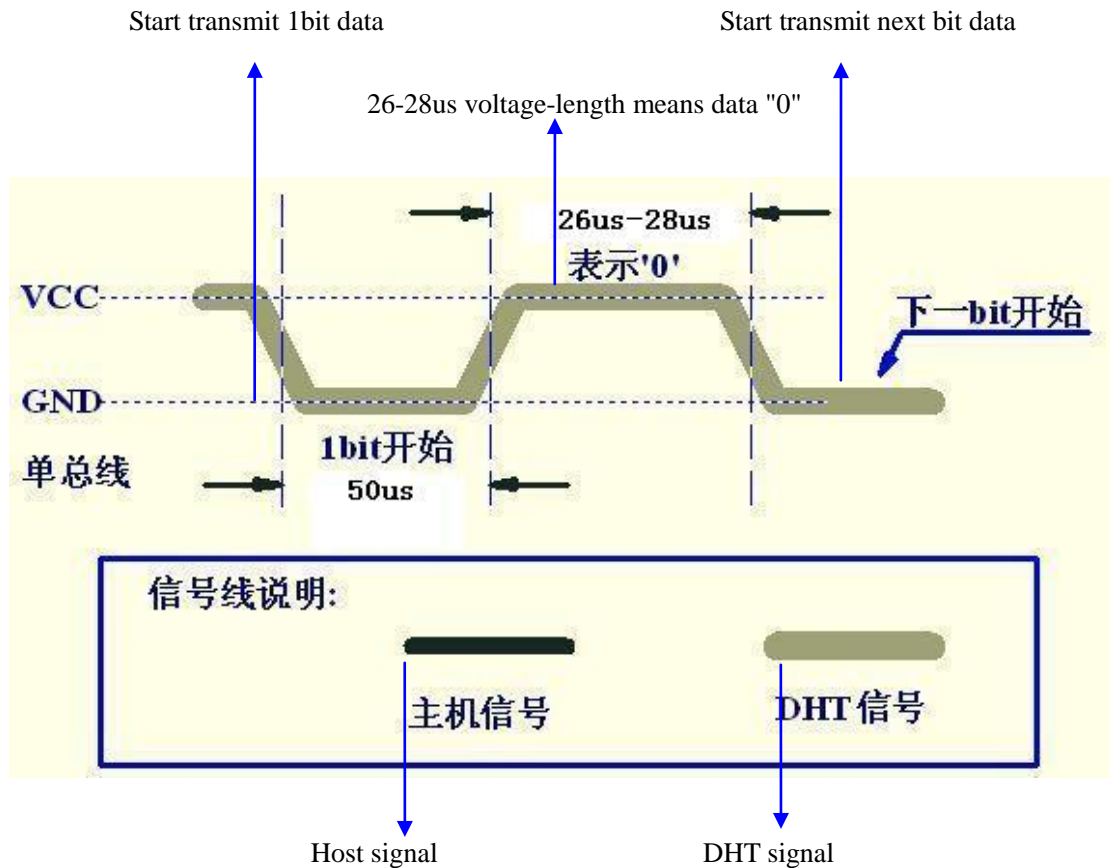
   Check bellow picture for step 2:

Start transmit 1bit data   Start transmit next bit data

26-28us voltage-length means data "0"

Host signal   DHT signal

Single-bus signal

Step 3: DHT11 send data to MCU

    When DHT11 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".
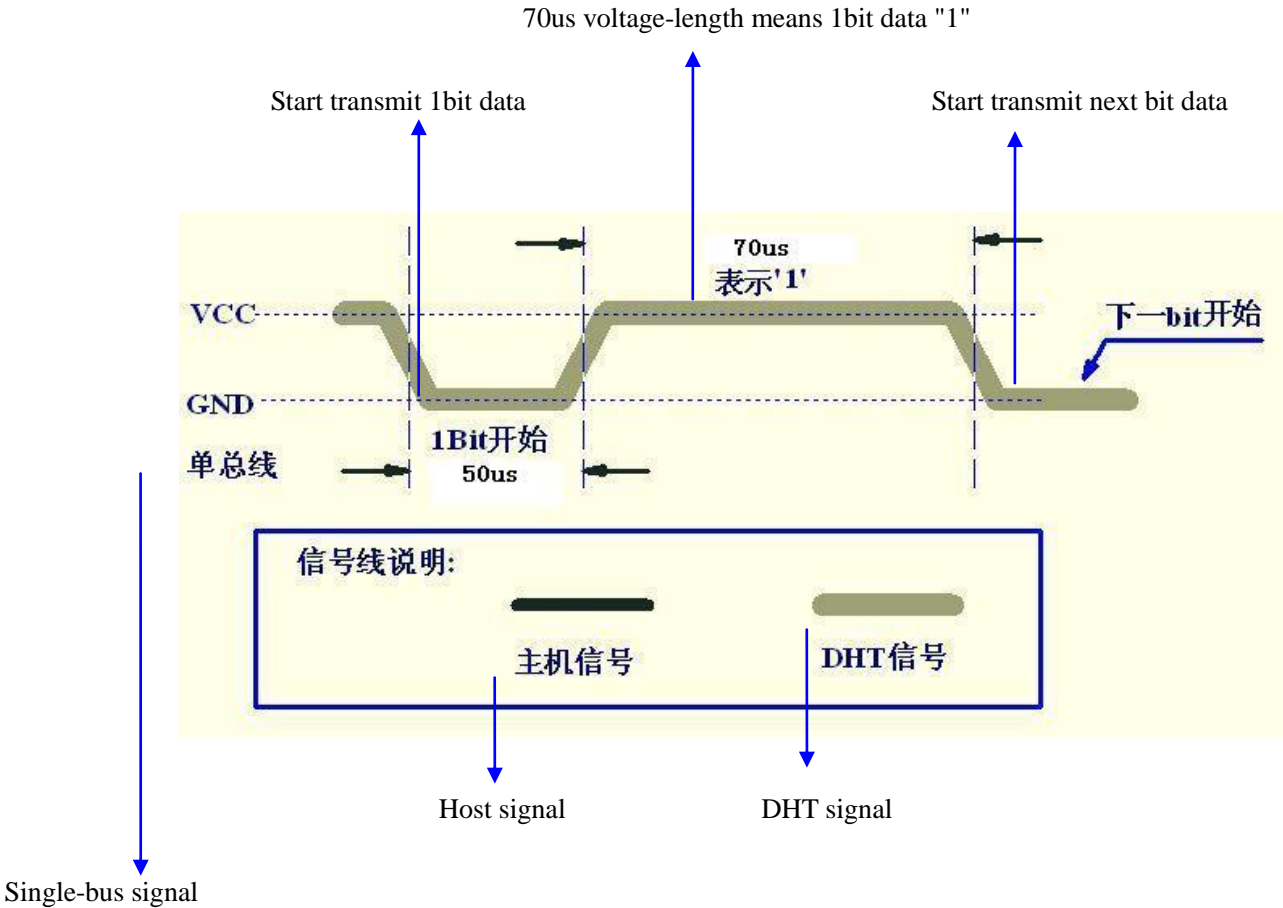   Check bellow picture for step 3:

70us voltage-length means 1bit data "1"

Start transmit 1bit data

Start transmit next bit data

Host signal   DHT signal

Single-bus signal

   If signal from DHT11 is always high-voltage-level, it means DHT11 is not working properly, please check the electrical connection status.

7. Electrical Characteristics:

Item	Condition	Min	Typical	Max	Unit
Power supply	DC	3	5	5.5	V
Current supply	Measuring	0.5		2.5	mA
	Stand-by	100	Null	150	uA
	Average	0.2	Null	1	mA
Collecting period	Second	1			Second

*Collecting period should be : >1 second.

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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 DHT11 sensor can recover after working in non-normal operating condition to calibrated status, but will accelerate sensors' aging.

(2) Attentions to chemical materials

Vapor   from chemical materials may interfere DHT11's sensitive-elements and debase DHT11's sensitivity.

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

Step one: Keep the DHT11 sensor at condition of Temperature 50~60Celsius, humidity <10%RH for 2 hours;

Step two: After step one, keep the DHT11 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.

DHT11 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 DHT11'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 DHT12 may cause personal injury.