Product Overview

AM2305B is a temperature and humidity composite sensor with calibrated digital signal output, and uses a special digital module to collect

Set technology and temperature and humidity sensor technology to ensure that the product has high reliability and excellent long-term stability. Sensor output

A calibrated digital signal. The AM2305B is equipped with a newly designed ASIC chip and an improved MEMS half

Conductor capacitive humidity sensor and a standard on-chip temperature sensor have reached the advanced level in the industry. after

The improved new generation temperature and humidity sensor makes its performance more stable in harsh environments and within a larger measuring range

Maintain good accuracy. AM2305B is a single bus communication mode, and the signal transmission distance can reach more than 20 meters, making it a variety of

The best choice for even the most demanding applications. Single bus is 3-lead small. Volume, low power consumption, direct output

For the humidity and temperature information after temperature compensation, users do not need to calculate the digital output twice, nor do they need to input the humidity

With temperature compensation, accurate temperature and humidity information can be obtained. It is simple to use and convenient to connect. The special packaging form can be based on the user

To be provided on demand.

Scope of application

AM2305B is widely used in consumer, electronic, medical, automotive, industrial, meteorological and other fields, such as HVAC

Household appliances such as humidifiers and refrigerators, testing and detection equipment and other relevant temperature and humidity detection and control products.

图1. AM2305B

Sensor performance

relative humidity

参数	条件	最小	典型	最大	单位
分辨率	-	-	0.1	-	% RH
量程范围	extended[1]	0	-	99.9	% RH
精度[2]	-	-	±3	见图2	% RH
重复性	-	-	±1	-	% RH
互换性	-	完全互换			
响应时间[3]	1/e(63%)	-	<6	-	S
迟滞	-	-	-	-	% RH
漂移[4]	典型值	-	< 0.5	-	% RH/yr

表1. 湿度特性表

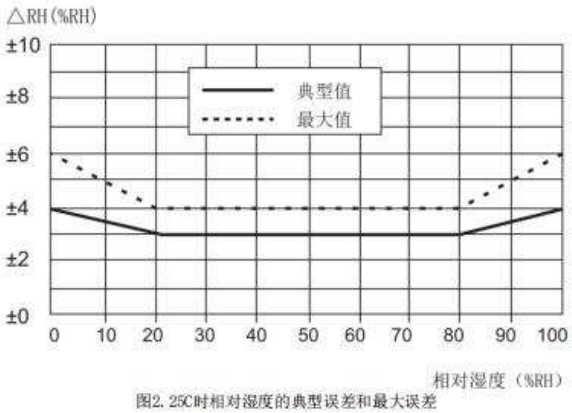


图2. 25C时相对湿度的典型误差和最大误差

电气特性

参数	条件	最小	典型	最大	单位
供电电压	-	3.3	5	5.5	V
功耗[5]	休眠	2	15	-	μA
	测量	-	1200	-	μA
	平均	-	600	-	μA
低电平输出电压	I_{OL}[6]	0	-	300	mV
高电平输出电压	Rp<25kΩ	90%	-	100%	VDD
低电平输入电压	下降	0	-	30%	VDD
高电平输入电压	上升	70%	-	100%	VDD
Rpu[7]	VDD = 5V VIN = VSS	1	5.1	100	VDD
输出电流	开	-	8	-	mA
	三态（关）	10	20	-	μA
采样周期	-	2	-	-	S

Temperature

温度

参数	条件	最小	典型	最大	单位
分辨率		-	0.1	-	℃
		-	16	-	bit
精度	-	-	±0.5	见图3	℃
量程范围	-	-40	-	80	℃
重复性	-	-	±0.2	-	℃
互换性	-	完全互换			
响应时间[4]	1/e（63%）	-	<10	-	S
漂移	-	-	±0.3	-	℃/yr

表3. 温度特性表

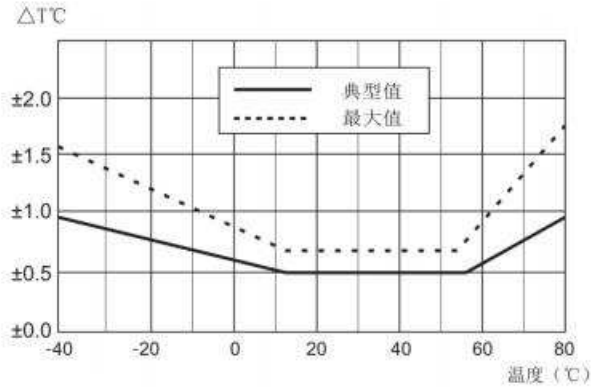


图3. 温度典型误差和最大误差

1. Normal operating range: 0-80% RH. If the range is exceeded, the sensor reading will have deviation (drift<3% RH after 200 hours under 90% RH humidity). Further scope of work

It is limited to - 40 – 80 ℃.

2. This accuracy is the test accuracy of the sensor at 25 ℃ with 5V supply voltage during factory inspection. This value excludes hysteresis and nonlinearity and is only applicable to non condensing

Conditions.

three

The time required to reach 63% of the first order response at 25 ℃ and 1m/s airflow.

4 If there are volatile solvents, tape with pungent smell, adhesives and packaging materials around the sensor, the reading may be high. For details, please refer to relevant documents

Pieces. 5 The minimum and maximum values of power consumption are based on VDD=5V and

T<60 ℃. The average value is the number of measurements made every two seconds

Value. 6 Low level output current. 7 indicates pull-up resistance.

8 The response time depends on the thermal conductivity of the sensor substrate.

AM2305B User Guide

1. Expansion performance

1.1 Working conditions

The sensor has stable performance within the recommended operating range, as shown in Figure 4. Strips exposed beyond the normal range for a long time

The signal may drift temporarily (drift+3% RH after 60 hours), especially when the humidity is>80%. When

After returning to normal operating conditions, the sensor will slowly self recover to the calibration state. Refer to "Recovery place" in Section 2.3

To speed up the recovery process. Long time use under abnormal conditions will accelerate the aging of the product.

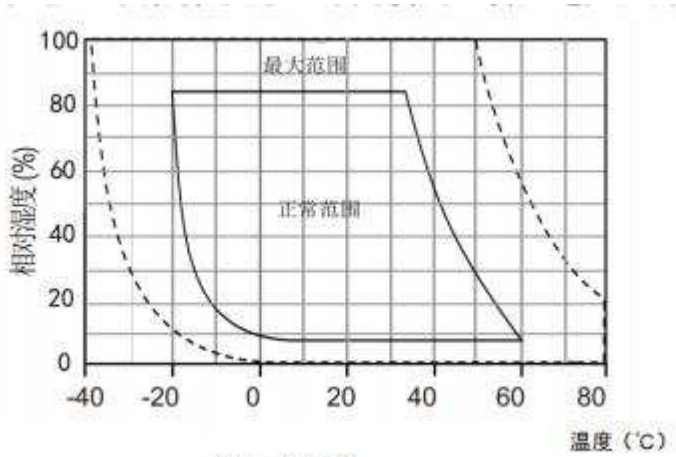


图4. 工作条件

1.2 RH accuracy at different temperatures

RH accuracy at 25 ° C is defined in Figure 2, and typical humidity errors at other temperature ranges are shown in Figure 5.

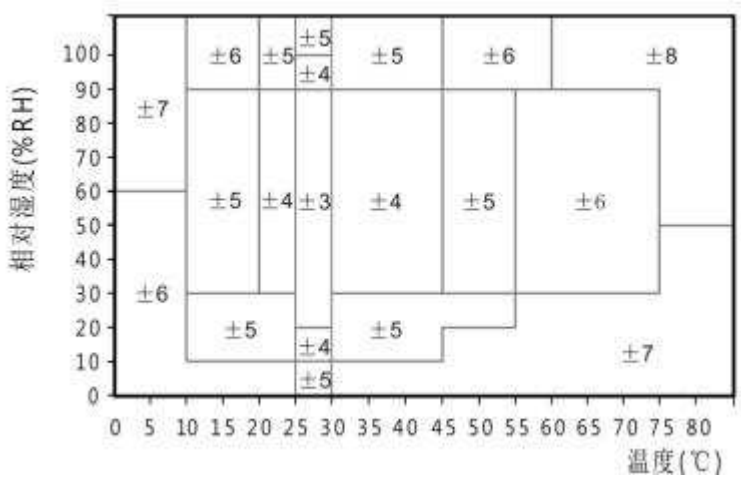


Figure 5.0 Typical Error of Corresponding Humidity in the Range of 80 ° C, Unit: (% RH)

Please note that the above errors are typical errors (excluding hysteresis) when using high-precision dew point instrument as reference instrument.

2. Application information

2.1 Storage conditions and operating instructions

Humidity sensitivity level (MSL) is 1 according to IPC/JEDEC J-STD-020 standard. Therefore, it is recommended that

It shall be used within one year after shipment.

The temperature and humidity sensor is not an ordinary electronic component and needs to be carefully protected, which users must pay attention to.

Long term exposure to high concentration of chemical vapor will cause the sensor reading to drift. Therefore, it is recommended that the

The sensor shall be stored in the original package, including the sealed ESD bag, and meet the following conditions: temperature range 10 ℃-

50 ℃ (0-80 ℃ within a limited time); The humidity is 20-60% RH (without ESD encapsulated sensor).

For sensors that have been removed from their original packaging, we recommend storing them in metal

In the anti-static bag made of PET/AL/CPE.

In the process of production and transportation, the sensor should avoid contact with high concentration of chemical solvents and prolonged exposure

Exposed. Avoid contact with volatile glue, tape, sticker or volatile packaging materials, such as foam

Foil, foam material, etc. The production area shall be well ventilated.

2.2 Recovery treatment

As mentioned above, if the sensor is exposed to extreme operating conditions or chemical vapors, the reading will drift.

It can be restored to the calibration state through the following processing.

Drying: keep at 80-85 ℃ and<5% RH for 10 hours;

Rehydration: keep at 20-30 ℃ and>75% RH for 12 hours. nine

2.3 Temperature influence

The relative humidity of a gas depends largely on temperature. Therefore, when measuring humidity

Ensure that all sensors measuring the same humidity work at the same temperature. During the test, it shall be ensured to be tested

The sensor and the reference sensor are at the same temperature, and then compare the humidity readings.

In addition, when the measurement frequency is too high, the temperature of the sensor itself will rise and affect the measurement accuracy. If

To ensure its own temperature rise is lower than 0.1 ℃, the activation time of AM2305B shall not exceed 10% of the measurement time -

- It is recommended to measure the data every 2 seconds.

2.4 Materials for sealing and encapsulation

Many materials absorb moisture and will act as buffers, which increases response time and hysteresis. So the sensor

The surrounding materials shall be carefully selected. Recommended materials include: metal materials, LCP, POM (Delrin), PTFE

(Teflon), PE, PEEK， PP, PB, PPS,PSU, PVDF,PVF。

Materials for sealing and bonding (conservatively recommended): It is recommended to use the method filled with epoxy resin for electronic components

Or silicone. The gases released by these materials may also contaminate AM2305B (see 2.1). Therefore

Finally, assemble the sensor and place it in a well ventilated environment, or dry it at>50 ℃ for 24 hours to

It will release the polluted gas before packaging.

9 75% RH can be easily generated from saturated NaCl

3. Interface definition

引脚	名称	描述
1	VCC	供电电压
2	SDA	串行数据，双向口
3	GND	
4	NC	空脚

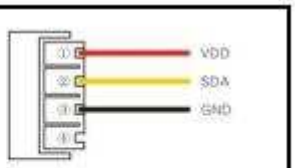


图7：AM2305B接线图

3.1 Power supply pins (VDD, GND)

The power supply range of AM2305B is 3.3-5.5V, and the recommended voltage is 5V.

4. Electrical characteristics

4.1 Absolute maximum rating

The electrical characteristics of AM2305B are defined in Table 2. The absolute maximum ratings are given in Table 4. In this case

Under these conditions, functional operation of the device is not desirable. Prolonged exposure to absolute maximum ratings may

It affects the reliability of the sensor.

参数	最小	最大	单位
VDD to GND	-0.3	5.5	V
数字I/O引脚 (SDA,SCL) to GND	-0.3	VDD+0.3	V
每个引脚的输入电流	-10	10	mA

ESD electrostatic discharge conforms to JEDEC JESD22-A114 standard (human body mode ± 4kV), JEDEC JESD22-

A115 (machine mode ± 200V). If the test conditions exceed the nominal limits, the sensor needs to add additional protective power

Road.

4.2 Input/output characteristics

Electrical characteristics, such as power consumption, high and low input and output voltages, depend on the power supply voltage. in order to

For smooth sensor communication, it is important to ensure that the signal design is strictly limited to the range given in Table 2

Inside).

5. Single bus communication

6.1 Typical single bus circuit

The typical application circuit of the connection between the microprocessor and AM2305B is shown in Figure 6. In the single bus communication mode, after SDA is pulled up

The I/O port of the microprocessor is connected.

Special instructions for single bus communication:

1. In typical application circuit, it is recommended to use 5.1K pull-up resistor when the length of connecting wire is less than 30m, and when it is greater than 30m

Reduce the resistance of the pull-up resistance according to the actual situation.

2. When 3.3V voltage is used for power supply, the length of connecting wire shall not be greater than 100cm. Otherwise, the line voltage drop will cause transmission

Inadequate power supply of sensor causes measurement deviation.

3. The minimum time interval between reading sensors is 2S; The reading interval is less than 2s, which may cause the temperature and humidity not

Or communication failure. When the sensor is initially powered on, wait for more than 2s before reading the sensor,

To override the sensor's erratic state.

4. The temperature and humidity values read each time are the results of the last measurement. To obtain real-time data, it is necessary to read continuously

Take it twice. It is recommended to read the sensor for several times continuously, and the interval between each reading of the sensor is more than 2 seconds

Accurate data

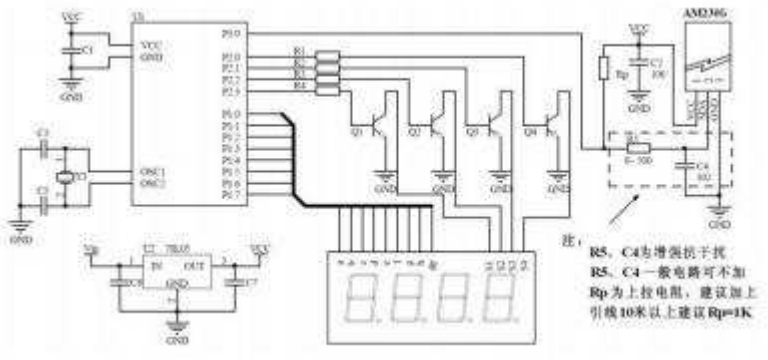


Figure 22: Typical circuit of AM2305B single bus (when single bus is selected, pin ④ should be grounded, or pulled down as soon as power is on)

6.2 Temperature single bus communication protocol

◎ Single bus description

The AM2305B device adopts simplified single bus communication. Single bus means only one data line, data exchange and control in the system

The system is completed by data line. The device (microprocessor) is connected to the data line through an open drain or tri state port to allow

When the device does not send data, it can release the bus and let other devices use the bus; Single bus usually requires an external

5.1k Ω pull-up resistance, so that when the bus is idle, its state is high. Because they are master-slave structures, only the master

The sensor will only respond when the host calls the sensor, so the host must strictly follow the single bus sequence when accessing the sensor. If

In case of sequence confusion, the sensor will not respond to the host.

◎ Single bus transmission data definition

SDA is used for communication and synchronization between microprocessor and AM2305B. It adopts single bus data format and transmits 40 digits at a time

According to the report, high position first out. The specific communication sequence is shown in Figure 23, and the communication format is described in the table

◎ Single bus data calculation example

Example 1: The 40 bit data received is:

00000010 10010010 00000001 00001101 10100010

Humidity high 8-digit humidity low 8-digit temperature high 8-digit temperature low 8-digit check digit calculation:

00000010+10010010+0000001+00001101=10100010 (check digit)

Receive data correctly:

Humidity: 00000010 10010010=0292H (hex)=2 × 256+9 × 16+2=658

=>Humidity=65.8% RH

Temperature: 0000000 1 00001101=10DH (hex)=1 × 256+0 × 16+13=269

=>Temperature=26.9 ℃

◎ Special instructions:

When the temperature is lower than 0 ℃, the highest position of temperature data is 1. Example: - 10.1 ℃ means 10000000 01100101

Temperature: 00000000 01100101=0065H (hex)=6 × 16+5=101

=>Temperature=- 10.1 ℃

Example 2: The received 40 bit data is:

00000010 10010010 00000001 00001101 10110010

Humidity high 8-digit humidity low 8-digit temperature high 8-digit temperature low 8-digit check digit calculation:

00000010+10010010+00000001+00001101=10100010≠10110010

(Verification error)

The data received this time is incorrect. Give up and receive the data again.

6.3 Single bus communication timing

See Table 10 for detailed timing signal characteristics, and Fig. 24 for single bus communication timing diagram.

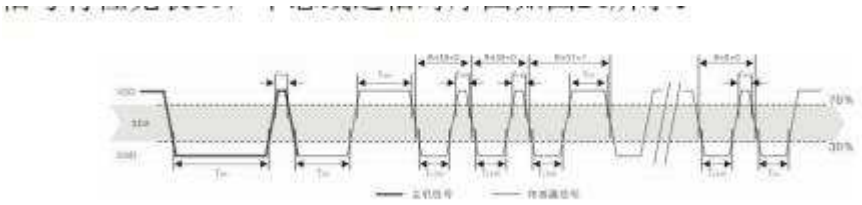


Figure 24: AM2305B Single Bus Communication Timing

Note: The temperature and humidity data read by the host from the AM2305B is always the previous measurement value. If the interval between the two measurements is very long, please read it twice consecutively and take the second value as the real-time temperature and humidity value,

The minimum interval between two simultaneous readings is 2S.

6.4 Example of peripheral reading steps

The communication between the host and the sensor can read data through the following three steps.

Step 1

After the AM2305B is powered on (after the AM2305B is powered on, wait for at least 2s to get over the unstable state, during which time the device will not read

It can send any command), test the ambient temperature and humidity data, and record the data. After that, the sensor will automatically enter the sleep state.

The SDA data line of the AM2305B is pulled up by the pull-up resistor and remains high. At this time, the SDA pin of the AM2305B is in the input state

The external signal is detected at all times.

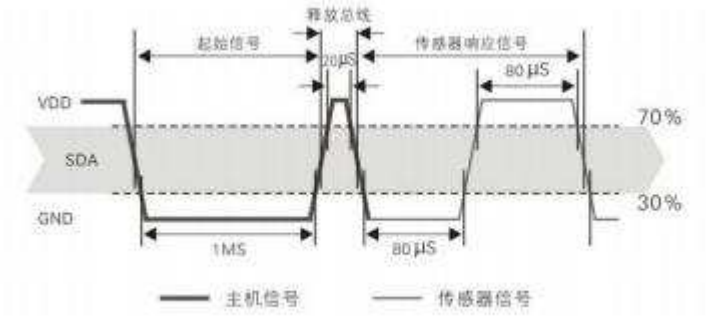
Step 2:

The I/O of the microprocessor is set to output, and the low level is output at the same time, and the low level holding time cannot be less than 1ms

After the I/O of the processor is set to the high level, it is set to the input mode immediately, and the bus is released. After the host releases the bus, AM2305B

Send the response signal, that is, output the low level of 80 microseconds as the response signal, and then output the high level of 80 microseconds to inform the peripheral

Prepare to receive data, and the signal transmission is shown in Figure 25



Step 3:

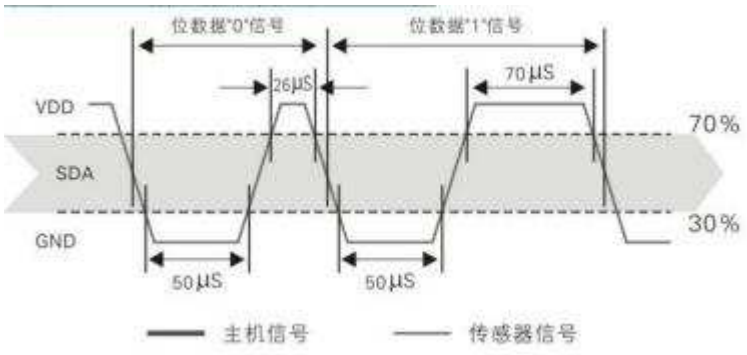
After the AM2305B sends the response, the data bus SDA continuously outputs 40 bits of data, and the microprocessor

The flat change receives 40 bits of data.

The format of bit data "0" is: 50 microseconds of low level plus 26-28 microseconds of high level;

The format of bit data "1" is: 50 microseconds of low level plus 70 microseconds of high level;

Bit data "0" bit data "1" format signal is shown in Figure 26



Single bus decomposition sequence diagram

After the data bus SDA of AM2305B outputs 40 bits of data, it continues to output low level data for 50 microseconds and then turns to input state

The pull-up resistance then becomes high. At the same time, AM2305B retests the ambient temperature and humidity data internally, records the data, and concludes the test record

Beam, the microcontroller automatically enters the sleep state. The MCU wakes up the sensor again only after receiving the starting signal of the host

Enter the working state.

6.5 Peripheral Reading Flow Chart

The flow diagram of AM2305B sensor reading single bus is shown in Figure 27, and our company also provides the reading code

For example, customers who need to download, please log on our website (www.aosong. com) to download this manual

Code description is not provided.