广州汇承信息科技有限公司
GUANGZHOU HC INFORMATION TECHNOLOGY CO.,LTD

User Manual for HC-02 Bluetooth Serial Port Module

Contents

Release Date: June 1, 2018   Version No.: V1.1b

Rev 1			
1.1b			

2017/11/30~			
www.hc01.comV1.1			

DRAWN BY:	Ling Xin	MODEL :	HC-02 Slave
CHECKED BY:	Eric Huang	Description:	Bluetooth 2.0 serial port module
APPD. BY:	SimonMok		
UART (Default)	**9600**	Bluetooth module	**HC-02、HC-05 、HC-06 、HC-08、HC-42**
PIN (Default)	**1234**	Radio module	**HC-12**
MODE	Slave	Module with bottom plate	**Parameter frame**	**HC-USB-P**
			USB converted to TTL	**HC-05-USB** **HC-06-USB** **HC-08-USB** **HC-12-USB**

1. Introduction of Module HC-02

1.1 Features

HC-02 UART communication module which is developed based on Bluetooth standard SPP and compatible with BLE, high stability and low power consumption. Users do not need to care about complicated wireless communication configuration and transmission algorithm, only need to connect to the device through TTL UART.

HC-02 slave module can be paired with mobile phones and connected for data transmission after being powered on. In addition, it can be connected to the HC-05 or HC-06 master module (PIN code is consistent, and default is 1234), which can replace a traditional serial port line, in this way, wiring work is omitted and flexible use realized.
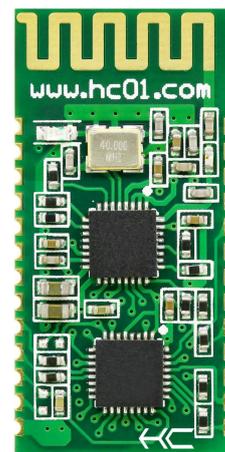
1.2 Basic parameters

Parameters	Value	Parameters	Value
Type	HC-02	Module dimensions	27*13mm
Operating band	2.4G	Data rate	2Mbps/SPP
Communication interface	UART 3.3V level	Antenna interface	Built-in PCB antenna
Operating voltage	3.0~3.6V	Communication current	30mA
Baud rate	1200~115200bps	Receiving sensitivity	-85dBm@2Mbps
Communication level	3.3V	Operating humidity	10%~90%
Transmission power	6dBm (max.)	Storage temperature	-40℃~+85℃
Reference range	10m	Operating temperature	-25℃~75℃

1.3 Products

Type	Communi-cation protocol	Operating band	Communi-cation range	Date rate	Product dimensions	Embedding mode	Product features
HC-06-USB	Bluetooth 2.0	2.4G	10m	2M bps	58*21*10 mm	USB2.0	PC virtual serial port matched by HC-06
HC-05	Bluetooth 2.0	2.4G	10m	2M bps	27*13*2 mm	Surface mounting	Abundant AT commands
HC-06	Bluetooth 2.0	2.4G	10m	2M bps	27*13*2 mm	Surface mounting	Easy use
HC-08	Bluetooth 4.0 BLE	2.4G	80m	1M bps	27*13*2 mm	Surface mounting /Direct insertion	Support for connection to Android and iPhone phones
HC-42	Bluetooth 5.0 BLE	2.4G	40m	2M bps at most	27*13*2 mm	Surface mounting	Support for connection to Android and iPhone phones

## 2. Connection Description

2.1 Operating Principle
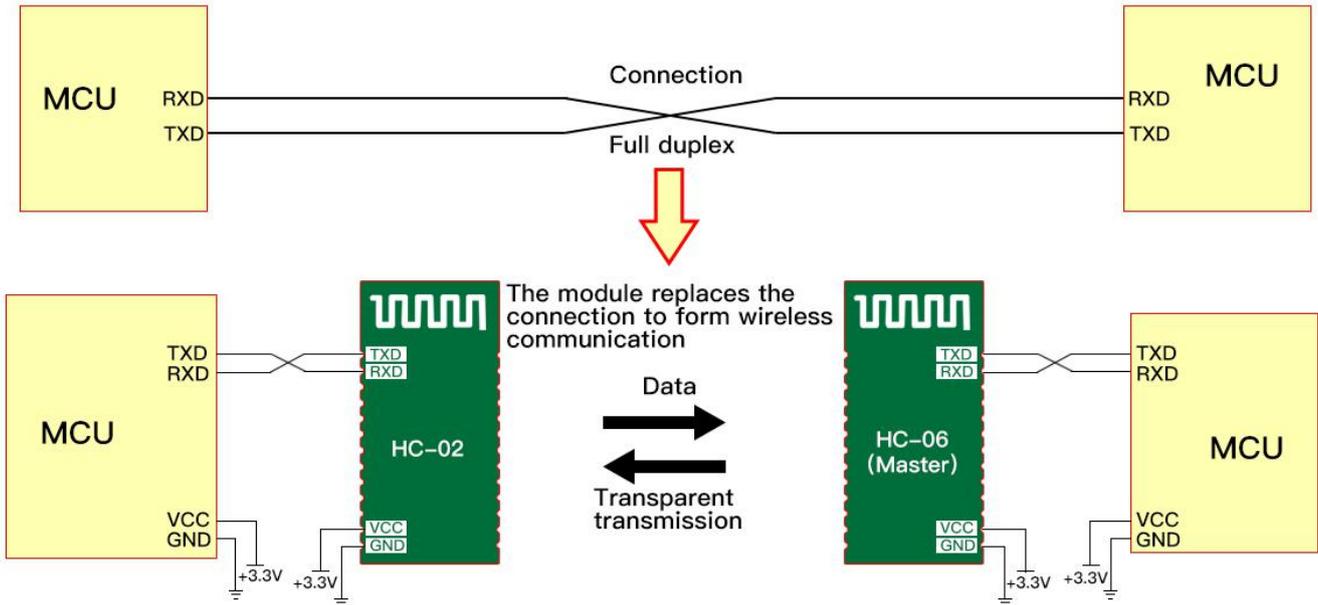
Note:

As shown in the figure above, the HC-02 module is used together with the HC-06 master **module** to replace the physical connection during full duplex communication. The equipment on the left sends UART data to the module. After receiving UART data, the RXD port of the module automatically sends the data to the air in the form of radio waves. The module on the right can automatically receive the data and restore the UART data originally sent by the left device from the TXD. The same is true from right to left.

2.2 Connection between the module and other equipment like MCU
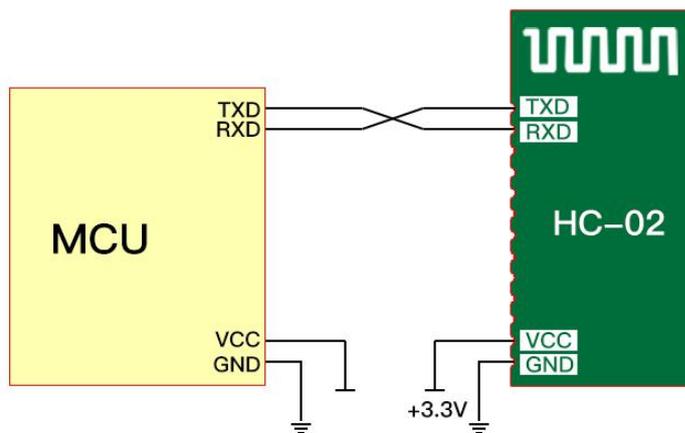
①: When the module is connected to the MCU with the power supply system of 3.3V, the serial ports can be cross - connected. (The RX of the module is connected to the TX of the MCU, and the TX of the module is connected to the RX of the MCU)

②: When the module is connected to an MCU with a power supply system of 5V, a 220Ω~1KΩ resistor can be connected in series to the RX pin end of the module and then to the TX pin of the MCU. The TX pin of the module is directly connected to the RX pin of the MCU, without connection to the resistor in series. (Note: Users are required to confirm that the MCU used recognizes the voltage of about 3.0V as high level, otherwise, a 3.3V/5V level conversion circuit is required.)

Note:

　　It must be noted that the module can be connected to 3.3V (3.0~3.6V) power supply only, instead of 5V. Direct connecting to 5V will result in damage to module. 5V power supply must be reduced to 3.3V through LDO before powering on the module.

Note:

　　If the power supply of the HC-02 module is controllable (that is, when the MCU works, power supply of HC-02 module is turned off, the serial port of the MCU will be connected to the serial port of the module, resulting in the abnormal operation of the HC-02 module when it is powered on.), the following hardware isolation circuit shall be added to the serial port connection of the MCU and the module (the part enclosed by the red dotted line):
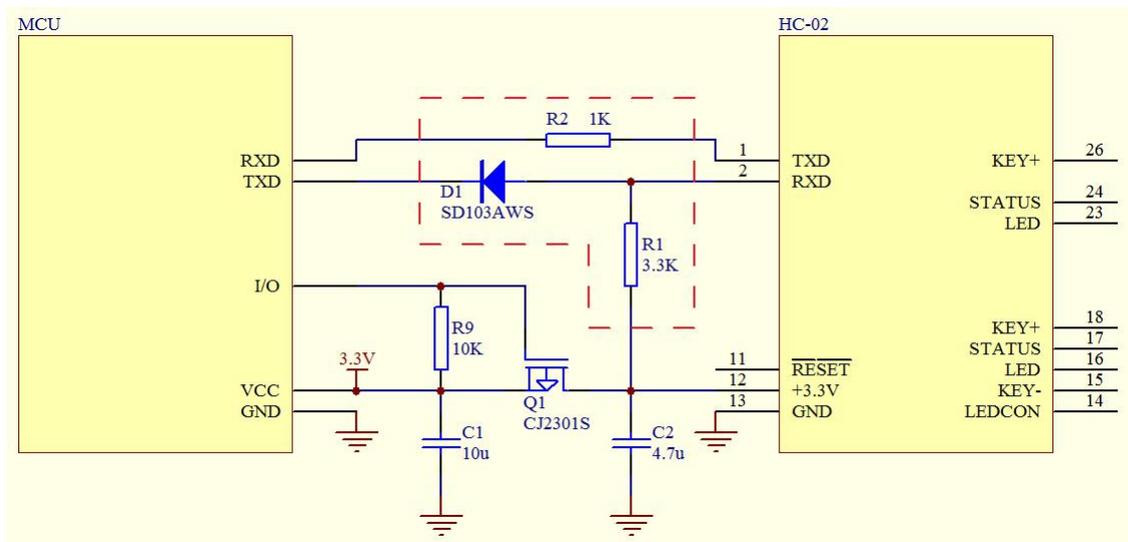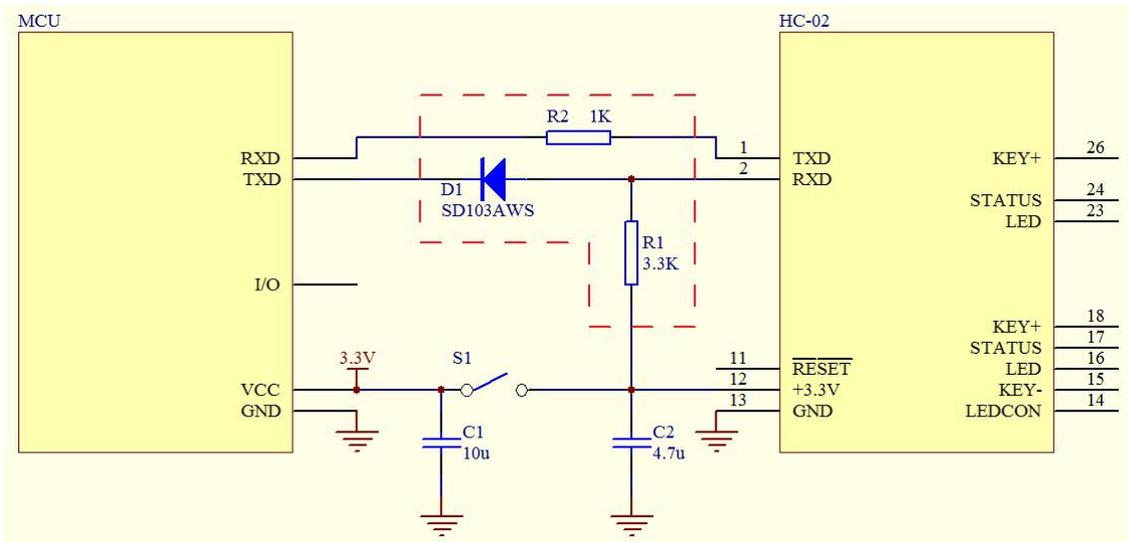
2.3 Connection between modules
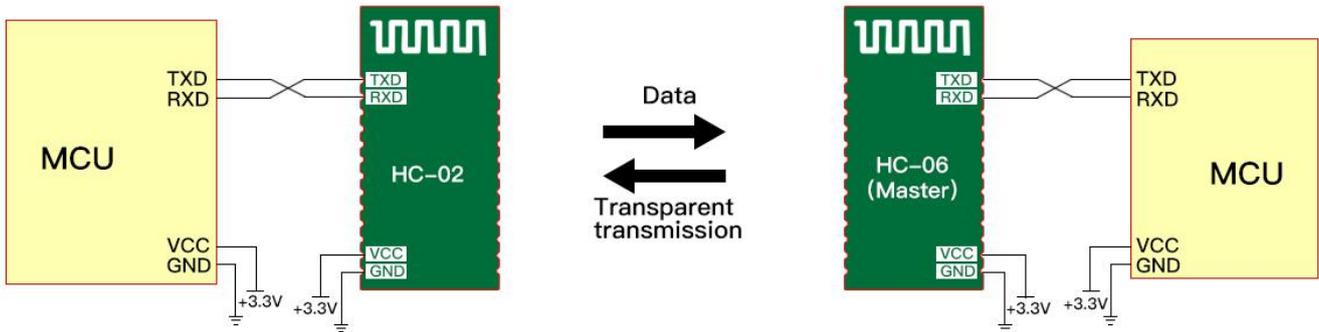
HC-06 is the master and HC-02 is the slave. They have the same PIN code (1234 by default) and can be automatically connected once power-on. After the first connection, the HC-06 master will automatically remember the matching object. If it is required to connect other modules, the pairing memory of the HC-06 master must be erased firstly. Slaves have no matching memory.

2.4 Connection between module and mobile phone
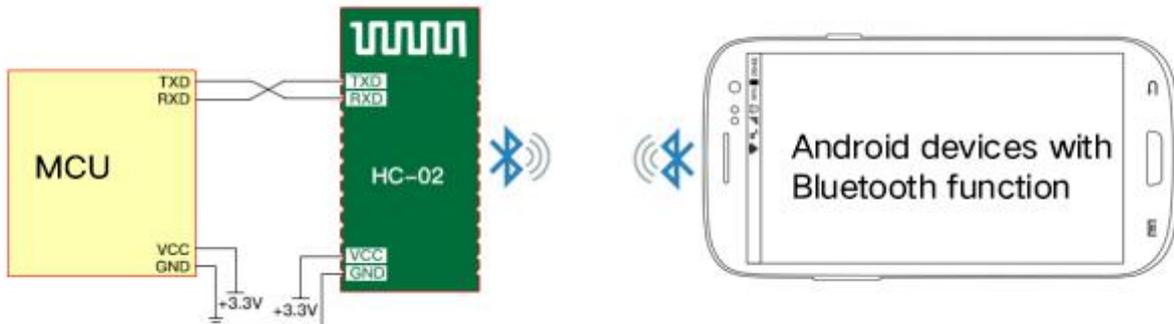
HC-02 can be connected with Bluetooth of Android phones, and Android Bluetooth assistant software can be used for communication test.
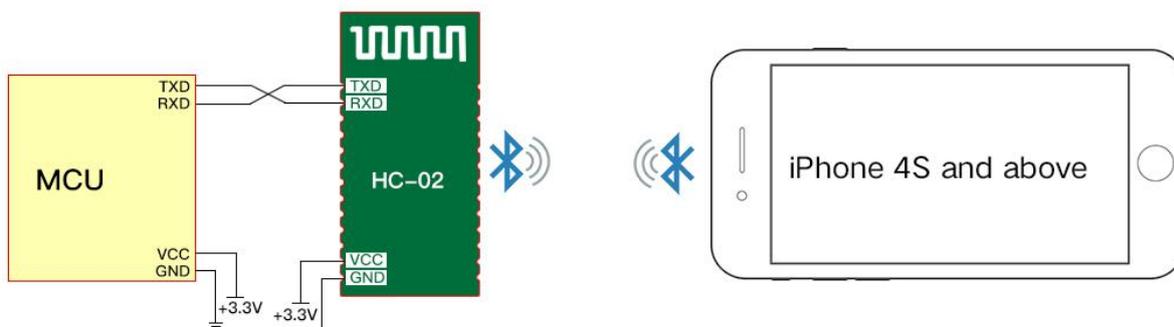
HC-02 can be connected to iPhone 4S and above, and downloading and installing Bluetooth BLE software is required for the communication test.
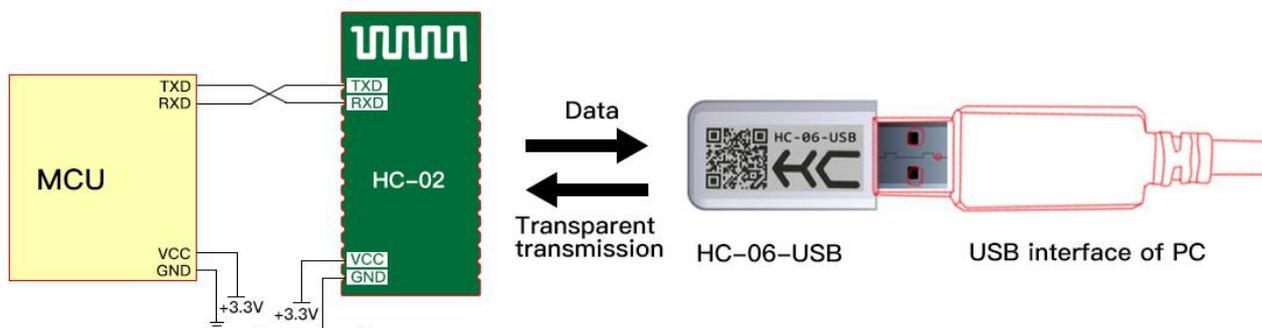
Note:

Proprietary Service UUID: 49535343-FE7D-4AE5-8FA9-9FAFD205E455

TX UUID: 49535343-1E4D-4BD9-BA61-23C647249616
RX UUID: 49535343-8841-43F4-A8D4-ECBE34729BB3

2.5 Connection between module and PC

To connect to the computer, HC-06-USB Bluetooth virtual serial port is required for HC-02.

HC-02 may be connected to the computer's built-in Bluetooth device for communication.

3. Rapid Testing

3.1 Connection between parameter frame and module
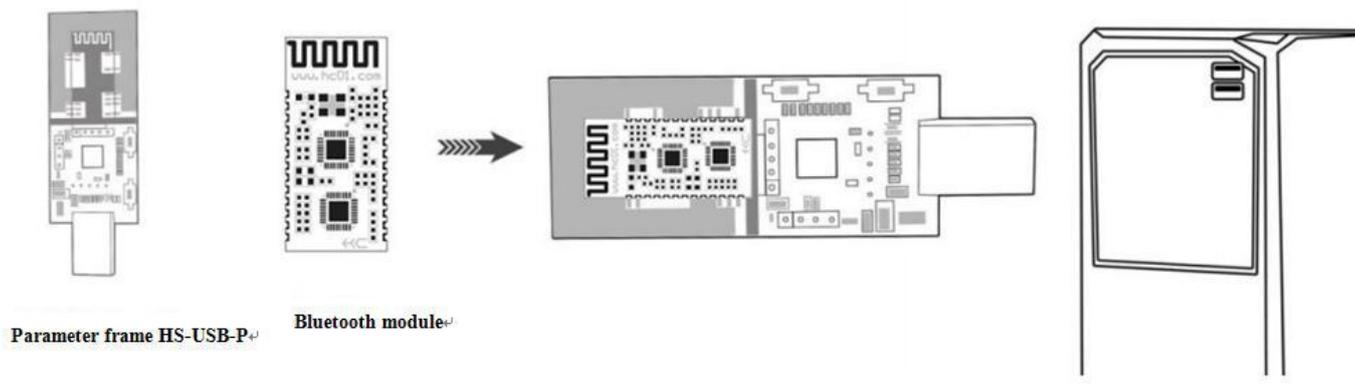
Put the HC-02 Bluetooth module into the HC-USB-P parameter frame, as shown in the figure. The module can be tested by plugging directly into the USB interface of the PC.

Note:

If the connection is not firm, an auxiliary tool clip can be used to clamp the module and the parameter frame.

4. Development and Application

4.1 Definition of pins

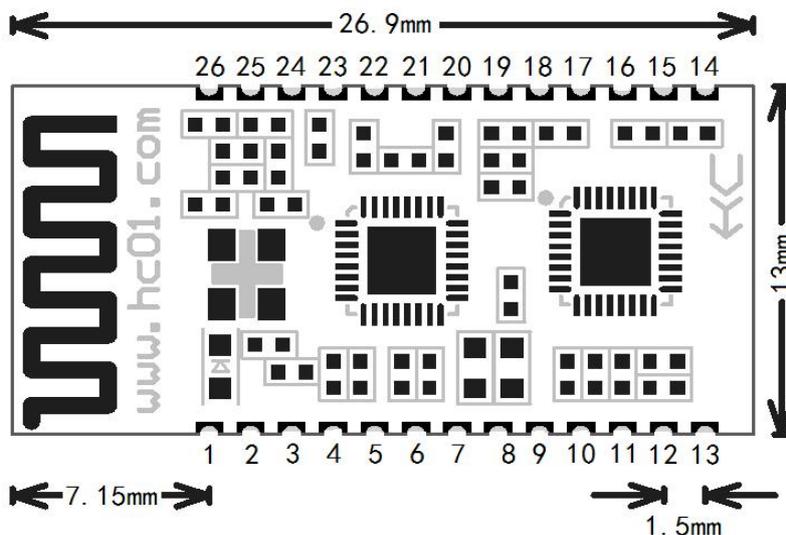| Pins	Definition	I/O	Remarks
1	TXD	O	URAT output port，3.3V TTL level
2	RXD	I	URAT input port，3.3V TTL level
3	NC	Floating	NC
4	NC	Floating	NC
5	NC	Floating	NC
6	NC	Floating	NC
7	NC	Floating	NC
8	NC	Floating	NC
9	NC	Floating	NC
10	NC	Floating	NC
11	RST	I, weak pull-up	Module reset pin, a low level of not less than 100ms required for reset
12	VCC	I	Power supply pin, DC 3.3V power supply required, power supply current not less than 100mA
13	GND	I	Module commons

14	LEDCON	I	On - board LED lamp control pin, ground off LED lamp
15	KEY-	I, weak pull-up	AT Command Setting Foot (Note ③)
16	LED	O	Module operating status indicator output pin (Note ①)
17	STATUS	O	Module connection status indication output pin (Note ②)
18	KEY+	I, weak pull-down	AT command setting pin (Note ④)
19	NC	Floating	NC
20	NC	Floating	NC
21	NC	Floating	NC
22	NC	Floating	NC
23	LED	O	Module working status indicator output pin (note ① ⑤)
24	STATUS	O	Module connection status indication output pin (note ②⑤)
25	NC	Floating	NC
26	KEY+	I, weak pull-down	AT command setting pin (note ④⑤)

Note ①: Module working status indicator output pin, high level output, you shall connect resistors in series when the module is connected to LED.

Before connecting, it lights for 100ms every 200ms seconds. After connecting, the LED lights always.

Note ②: In order to assist the user in determining whether the module is connected, this pin can output a level signal to indicate.

This pin outputs a low level before the module is not connected. After the module is connected, the pin outputs a high level.

Note ③: Input pin, pull up inside. In the connected state, this pin is set to a low level and can enter the AT command setting mode. This pin is set high and returns to serial transmission mode.

Note ④: Input pin, pull down inside. In the connected state, this pin is set to a high level and can enter the AT command setting mode. This pin is set low and returns to serial transmission mode.

Note ⑤: Pins 23 / 24 and 26 are pins added to the new hardware and can be compatible with pins of HC-05. (The new version of hardware has a dot on the back of the module at the foot of 14. The old version of hardware does not have this dot.)

4.2 Embedding mode
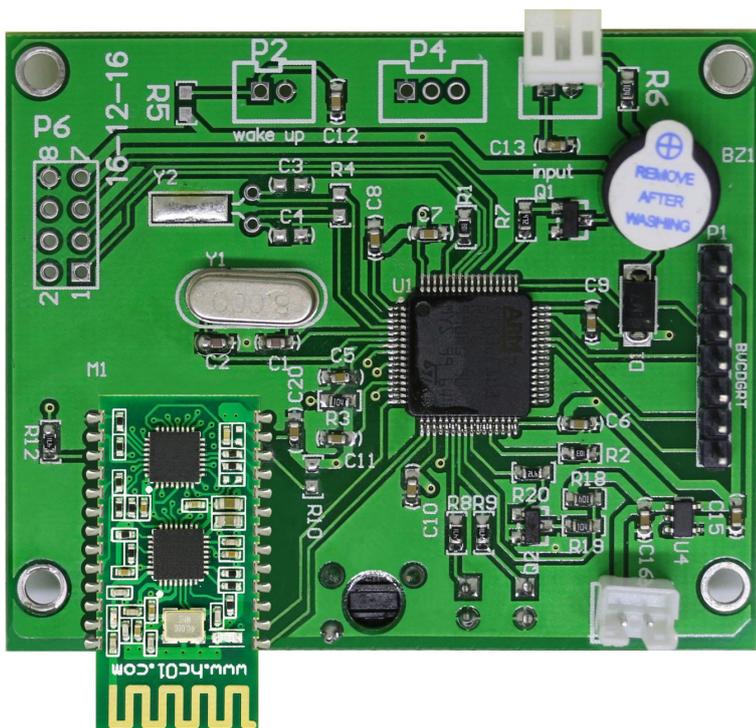
No copper can be applied and no wires can be routed under the antenna part of the module, otherwise the signal will be affected adversely. It is recommended that the bottom plate of the antenna may be hollowed out and the antenna be as close to the board as possible.

Stamp hole packaging mode is used, and the pin is defined as in Section 4.1.

4.3 Surface mounting and Furnace Temperature
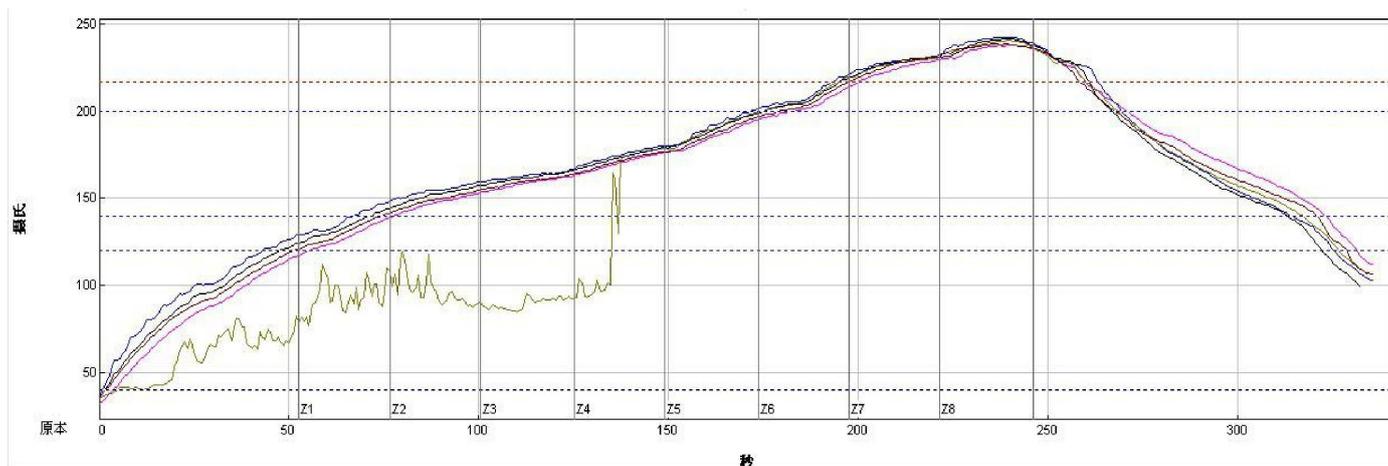

The manufacturer who firstly produces a large number of patches should check 20 - 30 pieces of modules, in order to check whether the furnace temperature is appropriate.

The furnace temperature of the patch boiler shall not exceed the reference figure temperature, the secondary patch shall be reduced by about 5 degrees, and the temperature may be reduced appropriately in summer.

4.4 Reference connection circuit

4.4.1 The module is connected to the 5V single-chip microcomputer system and requires level conversion (if the MCU works at 5V and the UART RXD inputs a voltage above 3.0V to recognize a high level, a level conversion circuit needs to be added; If the voltage above 2.0V is input to the UART RXD, it will be recognized as high level, and no level conversion circuit is required), please refer to the following wiring method:
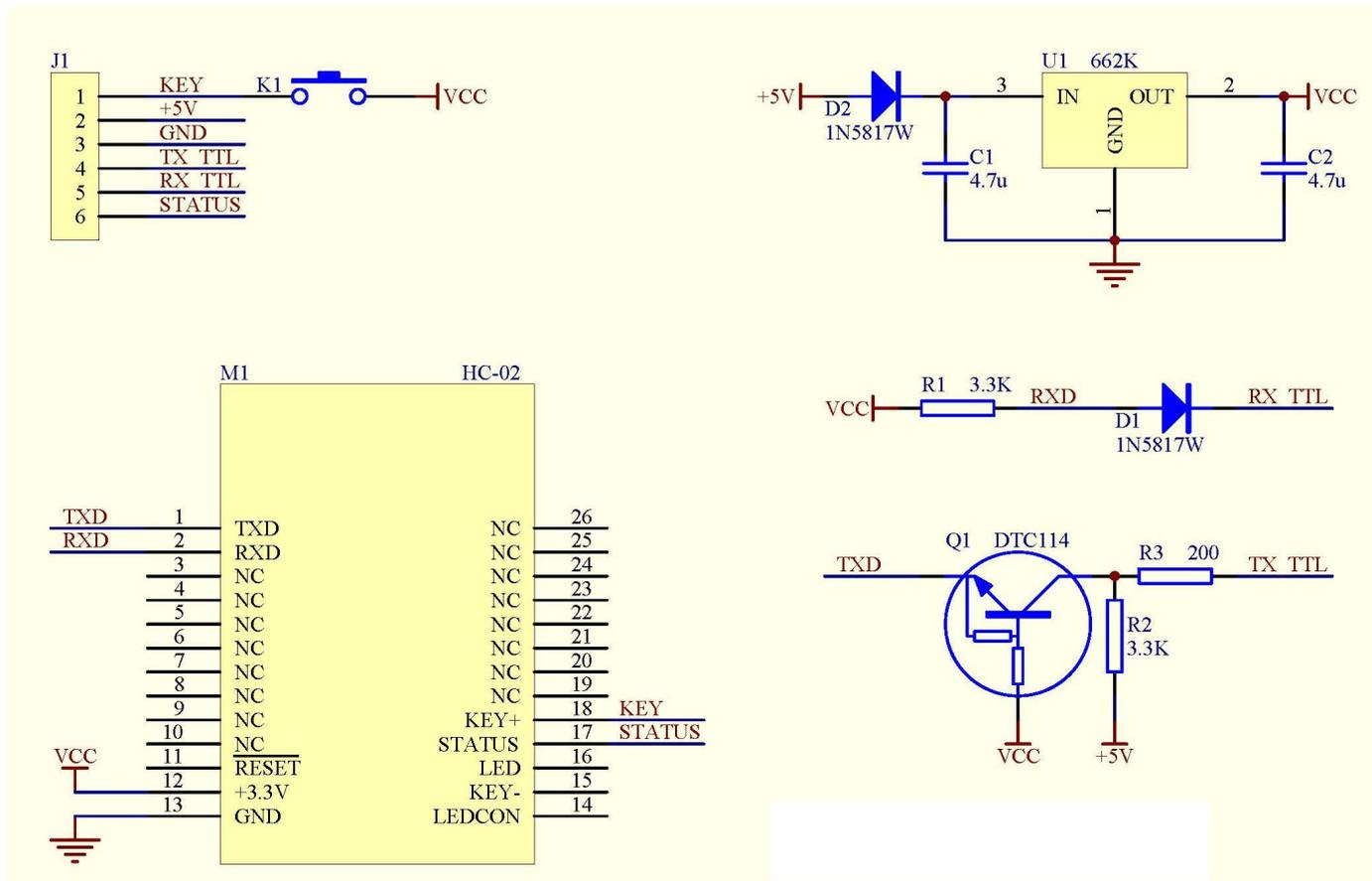
4.4.2 When the module is connected to 3.3V single-chip computer system, serial port shall be cross-connected (when the module is connected to 5V MCU system and level conversion is not required, please connect 1K resistors in series before cross - connecting):
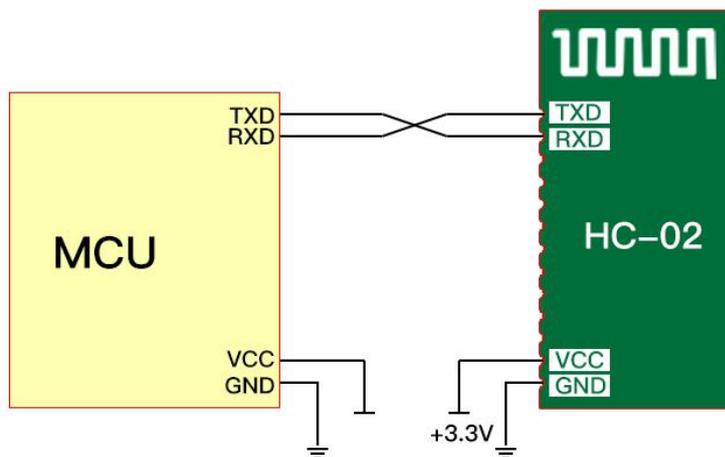
4.4.3 When the power supply of the module is controlled, a hardware isolation circuit should be added for the connection with the serial port of the single chip microcomputer (the part enclosed by the red dotted line below) , so as to prevent the serial port of the single chip microcomputer from being connected to the module before the module is powered on, resulting in abnormal power-on operation of the module:
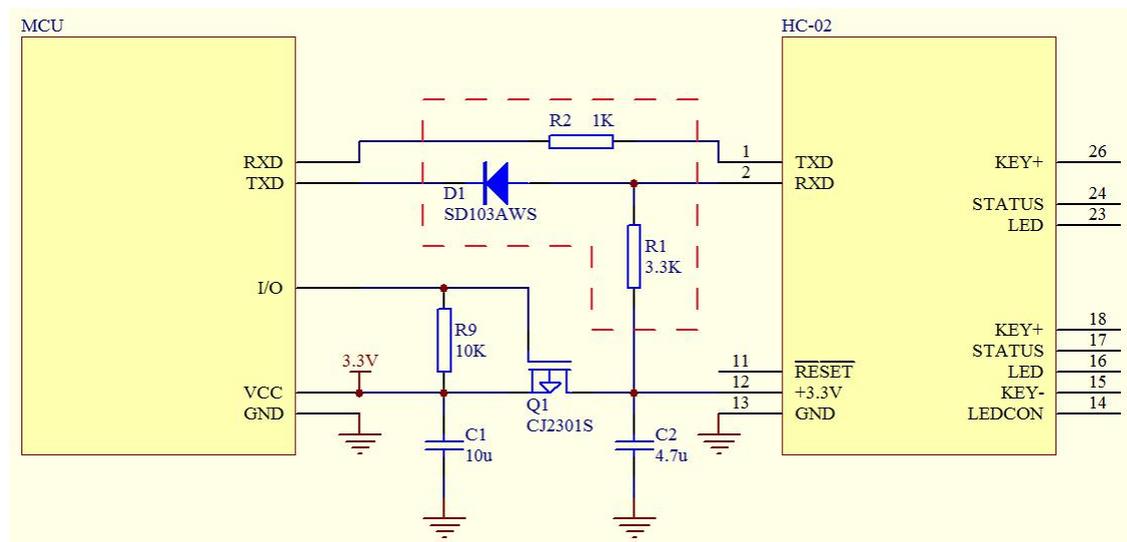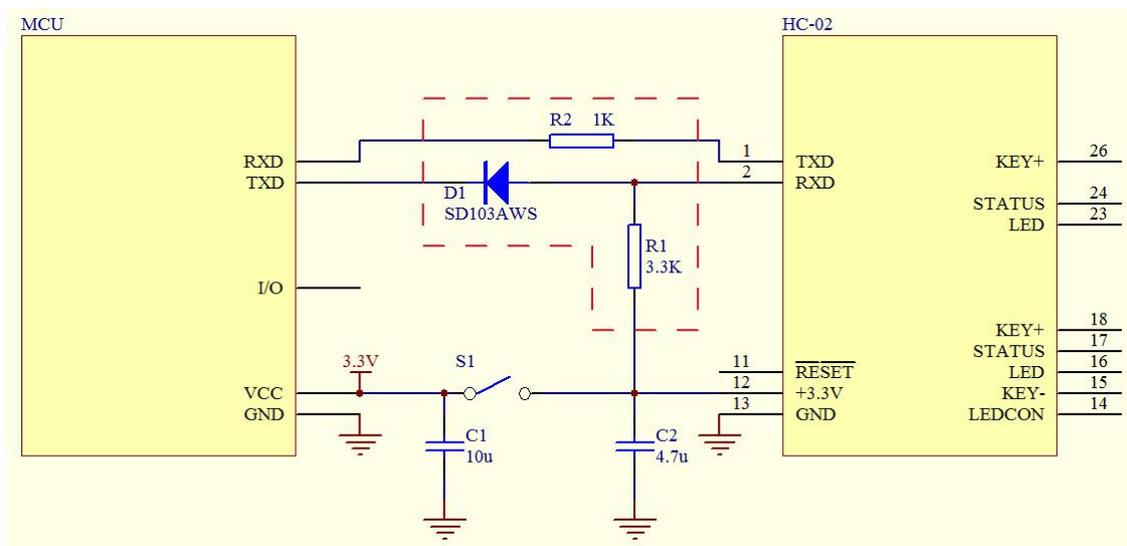
5. AT Command

5.1 Method entering AT command mode

When the module is powered on and disconnected, it is in AT command mode. In addition, by setting the module pin18 pin KEY+ (pin18 and pin26 of the new hardware version) high in the connected state, it is also in AT command mode.

5.2 Defaulted factory parameters

Baud rate: 9600N81,

Bluetooth name: HC-02,

PIN code: 1234.

5.3 Introduction of AT command

5.3.1 Test communication

Command	Response	Remark
AT	OK	Test

5.3.2 Modify UART communication baud rate

Command	Response	Remark
AT+BAUD1	OK1200	The module supports the highest serial baud rate of 115200bps.

After setting the baud rate with AT command, the baud rate can be saved by power down, and no setting is required for the next power up. The module does not support verification settings!

Note:

When HC-02 module communicates with other Bluetooth master devices in two directions, the maximum transmission rate is about 2K Byte per second, beyond which codes may be missed. The maximum unidirectional transmission rate is around 5K Byte per second, beyond which codes may be missed. In addition, continuous data (e.g. files) can only be transmitted in one direction, and it is recommended to transmit with a maximum baud rate of 115200bps. At the same time, two-way transmission of continuous data will leak codes.

Example:
Transmit: AT+BAUD2
Return: OK2400

Baud rate code as follows:
1--------- 1200
2--------- 2400
3--------- 4800
4--------- 9600 (Default value)
5--------- 19200
6--------- 38400
7--------- 57600
8--------- 115200

5.3.3 Modify Bluetooth name

Command	Response	Remark
AT+NAMEname	OKsetname	Parameter name: The current name to be set is the one searched by Bluetooth, not more than 16 characters.

Example:

Transmit: AT+NAMEbill_gates

Return: OKsetname

The Bluetooth name is modified as bill_gates

The parameters can be saved by power-down and only need to be modified once, and the name cannot exceed 16 digits or visible characters.

5.3.4 Modify Bluetooth PIN code

Command	Response	Remark
AT+PINxxxx	OKsetPIN	The default pairing password of the module is 1234. Parameters can be saved by power-down and only need to be modified once.

Parameter xxxx: It is PIN code to be set, 4 digits. When the adapter or mobile phone is connected to the Bluetooth slave and the window asking for a pairing password pops up, you can manually enter this parameter to connect to the slave. If the PIN code is correct after the Bluetooth module master searches for the slave, it will automatically pair.

Example:

Transmit: AT+PIN8888

Return: OKsetPIN

The default PIN code of the module is 1234. Parameters can be saved by power-down and only need to be modified once.

5.3.5 Acquire AT command version command

Command	Response
AT+VERSION	www.hc01.comV1.1 20171130

5.3.6 LED on/off command

Command	Response	Remark
AT+LED0	LED OFF	AT+LED0 OFF
AT+LED1	LED ON	AT+LED1 ON

Note:

The LED on/off command is only valid for the LED inside the module and will not affect the LED outside the module pin16 or pin23 (new hardware) !

5.3.7 Modify Bluetooth address command

Command	Response
AT+ADDRxxxxxxxxxxxx	OK+ADDR=xxxxxxxxxxxx

Parameter xxxxxxxxxxxx: 12-digit Bluetooth address (0~H hexadecimal number)

Example:

To change the Bluetooth address of the module to 201710101234, you can in the command state:

Transmit: AT+ADDR201710101234

Return: OK+ADDR=201710101234

The Bluetooth address of the module is modified successfully.

5.3.8 Query module parameter command

Command	Response
AT+RX	OK+NAME=HC-02 OK+PIN=1234 OK+ADDR=xxxxxxxxxxxx OK+BAUD=9600

After querying the module parameters, the Bluetooth name, pairing password, Bluetooth address and UART baud rate will be returned in turn.

5.3.9 Parameter recovery default command

Command	Response
AT+DEFAULT	OK

Restore Bluetooth name, PIN code, Bluetooth address and UART baud rate to default value.

5.3.10 Module reset command

Command	Response
AT+RESET	OK

The module executes the reset action.

6. About HC

Guangzhou HC Information Technology Co., Ltd was established in September 2008 and is a pioneer in the field of wireless data transmission. For more than ten years, HC has always adhered to independent research and development and provided wireless data transmission solutions for the majority of technology companies. HC series modules are exported to various countries across the world, and the cumulative sales have reached tens of millions of pieces. With the advantages of stable performance, easy embedding and low packet loss rate, it has been well received by technical experts from all over the world. Among them, the HC-05 and HC-06 Bluetooth serial port modules are the classic works called wireless data transmission products, which have been far ahead in sales for more than ten years, witnessing a market share of more than 40 %. The self-made stamp packaging method has now been widely used by the industry.

In recent years, through continuous innovation, HC has successively developed wireless serial port modules of various working systems, forming four series of serial port products mainly including Bluetooth 2.0, Bluetooth 4.0 BLE, Wireless 433MHz and WIFI, as well as supporting products.

We will not forget our initiative mind, so as to achieve our ultimate goal. HC always sticks to the philosophy of " gathering information and carrying dreams" and do its best to contribute to the wireless data transmission field and society.

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