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## Shenzhen Guoyun Technology Co., Ltd.

### GT-38 V1.0 Wireless Serial Communication Module User Manual

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## Version Information

GT-38 V1.0

## Release date

May 20, 2018



# 1 : General Description

GT-

## 1.1 Module characteristics

- ※ Long-distance wireless transmission (opening 1200 m / FU4 mode, air baud rate 1000bps)
- ※ Operating frequency range (433-458.5MHz, up to 255 communication channels)
- ※ Maximum 100mW (20dBm) transmit power (8-speed power can be set)
- ※ Four working modes to suit different applications
- ※ Built-in MCU for communication via serial port and external devices
- ※ The number of bytes sent at one time is up to 256 bytes.
- ※ Module supports one-to-one, one-to-many, many-to-many connections



## 1.2 Module overview

The GT-38 wireless serial communication module is a new generation of multi-channel embedded wireless data transmission module. The wireless working frequency band is 433-458.5MHz, and multiple channels can be set. The stepping speed is 100KHz, and there are a total of 255 channels. The module's maximum transmit power is 100mW (20dBm), the receiving sensitivity is -116dBm at 5000bps air baud rate, and the open distance can reach 1200m communication distance.

The module adopts stamp hole encapsulation and can be patch-welded. The module size is 26.7mm×12.9mm×6mm (including the antenna cap, excluding the spring antenna), which is very convenient for customers to embed in the application system. There is a PCB antenna holder ANT1 on the module. Users can use the 433M frequency band external antenna through the coaxial line. There is also an antenna welding hole ANT2 in the module to facilitate the user to solder the spring antenna. The user can select one of the antennas according to the requirements of use.

The module contains MCU inside, the user does not need to program the module separately, and various transparent transmission modes can only send and receive serial port data, which is convenient to use. The module adopts a variety of serial port transparent transmission modes, and the user can select with AT commands according to the usage requirements. Four modes FU1, FU2, FU3, and FU4 have an average operating current of 3.6mA, 80μA, 16mA, and 16mA in idle state, and the maximum operating current is 100mA (full power emission state).

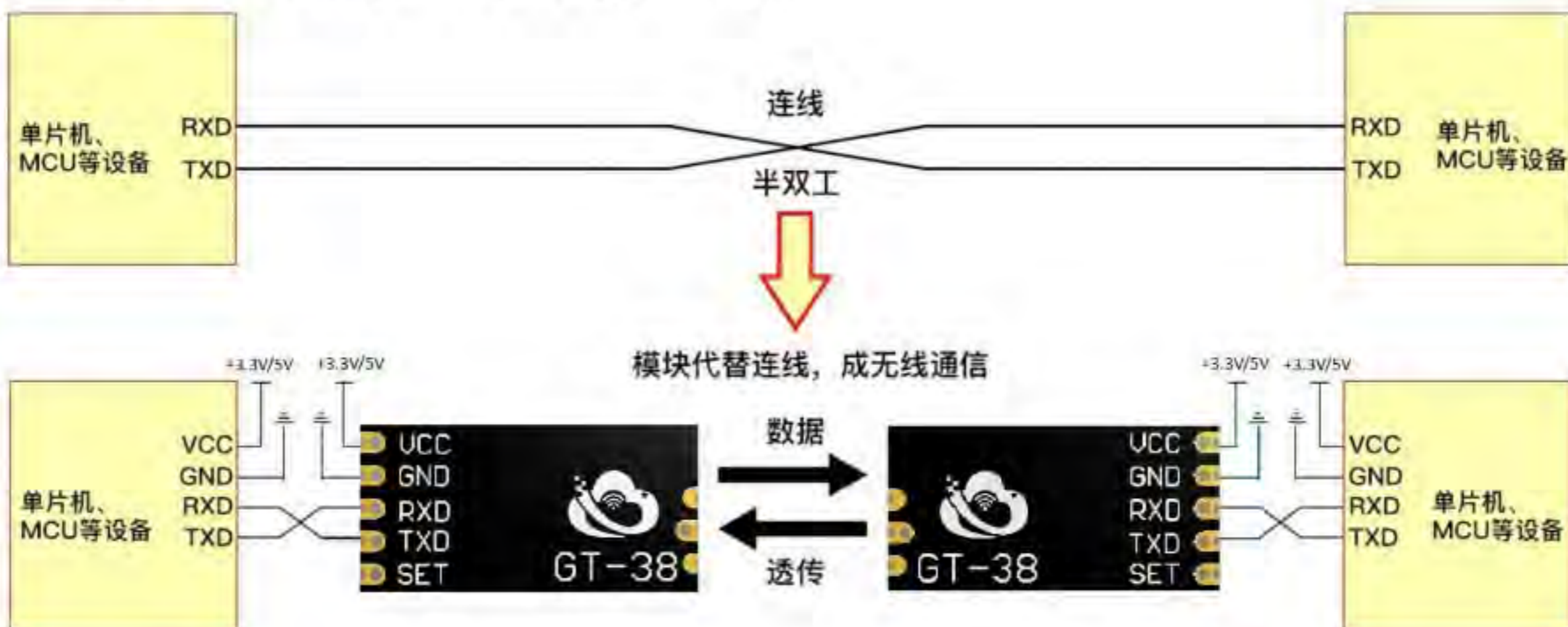
## 1.3 Basic parameters

Parameter name	Parameter value	Parameter name	Parameter value
model	GT-38	Module size	26.7×12.9×0.6mm
Chip solution	SI4438	Working frequency	433~458.5MHz
Communication Interface	UART 3.3V/5V TTL	Antenna interface	Spring antenna / antenna socket
Operating Voltage	3.2~5.5V	Sleep current	No sleep mode
Communication level	3.3V/5V	Working humidity	10%~90%
Transmit power	20dBm (MAX)	Operating temperature	-25°C~+75°C
Reference distance	1200m	storage temperature	-40°C~+85°C

## 2 : Connection instructions

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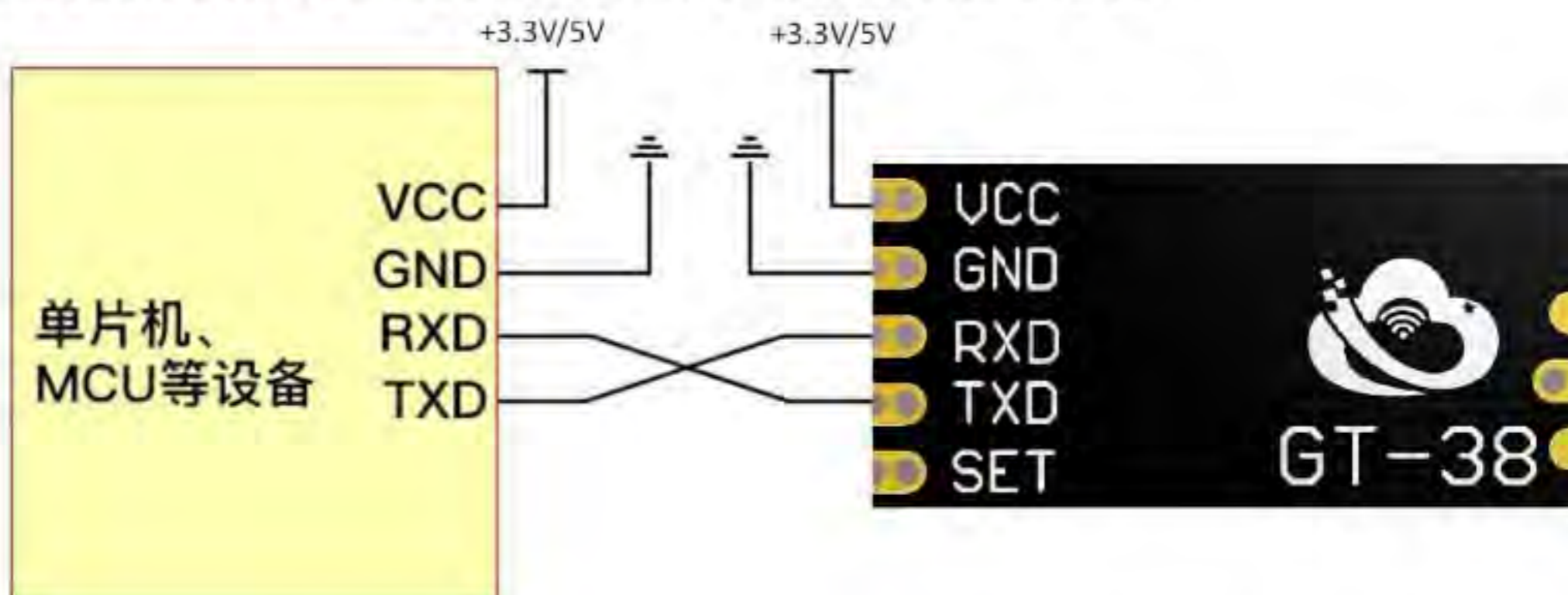
### 2.1 Introduction to working principle



#### Note:

As shown in the figure above, the GT-38 module is used to replace the physical connection when half-duplex communication. The device on the left sends the serial port data to the module. After receiving the serial port 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 be automatically received and the serial port data sent by the original left device is restored from TXD. The same is true from right to left. **Modules can only work in half-duplex mode and cannot send and receive data at the same time.**

### 2.2 Connection between module and MCU and other devices



The module can be connected to an MCU with a 3.3V or 5V power supply system. The serial port 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).

**Note:** If you need to connect the resistor protection MCU in series, please connect the resistors that are not more than 200Ω in series at the serial port. It is recommended not to add resistors.

## 2.3 Connection between modules



## 2.4 Module connection to PC



# 3 : Wireless serial port transparent transmission GT-38

## 3.1 Serial port transparent transmission

The GT-38 module has four serial port transparent transmission modes, which are represented by FU1, FU2, FU3 and FU4. When using, each mode can only send and receive serial port data, no need to manage the wireless transmission part of the air, but **only in the same air baud rate can communicate with each other!** The system works in FU3 full-speed mode by default. This mode can automatically adjust the air baud rate according to the serial port baud rate, and the communication distance is the farthest at low baud rate.

**Different modes cannot transmit data to each other, and the user can select the optimal mode according to the actual situation.**

Modules are typically used in two or more connections to transfer data to each other in a half-duplex manner. At the same time, the transparent transmission mode, baud rate, and wireless communication channel must be set to the same. The factory default settings are FU3, 9600bps (8-bit data, no parity, 1 stop bit), and CH100 (443MHz). When using, it is generally not limited to the number of bytes sent continuously to the serial port of the module. However, in view of environmental interference and other factors, when a large amount of data is continuously transmitted at a time, some bytes may be lost. Therefore, the host computer should have mechanisms such as answering and resending to avoid information loss.

## 3.2 Four serial port transparent transmission modes

When the GT-38 module is shipped from the factory, the serial port transparent transmission mode defaults to FU3. At this time, the module works at full speed and the idle working current is about 16mA. In this mode, the module automatically adjusts the wireless transmission air baud rate according to the serial port baud rate. The corresponding relationship is shown in the following table:

Serial port baud rate	1200 bps	2400 bps	4800 bps	9600 bps	19200 bps	38400 bps	57600 bps	115200 bps
Wireless air baud rate	1000bps		5000bps		10000bps		100000bps	

In order to make the communication distance as far as possible, the serial port baud rate can be set to a low baud rate. If you are transferring large amounts of data for a short period of time, set the serial port baud rate to a high baud rate, but sacrifice the communication distance. The receiver sensitivity of the module under different air baud rates is shown in the following table:

Air baud rate	1000bps	5000bps	15000bps	58000bps	236000bps/250000bps
Wireless receiving sensitivity	-124dBm	-116dBm	-111dBm	-106dBm	-100dBm

In general, the communication distance is reduced by half for every 6 dBm of receiving sensitivity.

When the module "SET" pin is set low, the serial port transparent transmission mode can be set by the AT command (see the introduction in the following section).

The **FU1 mode is in the lower power saving mode**, and the idle working current of the module is about 3.6 mA. In this mode, the module can also be set as shown in the table above. The eight serial port baud rates are shown, but the air baud rate is unified to 250,000 bps and the communication distance is short.

The **FU2 mode is the power saving mode**, and the module's idle operating current is about 80μA. In this mode, the module only supports 1200 bps, 2400 bps. And the serial port baud rate of 4800 bps, the air baud rate is unified to 100000bps, and the communication distance is short. Cannot be set to other serial port baud in this moderate. At the same time, when set to FU2 mode in FU1 and FU3 modes, the serial port baud rate exceeding 4800 bps will be automatically reduced to 4800. Bps. In FU2 mode, only a small amount of data is transmitted (each packet is within 64 bytes), and the packet transmission interval should not be too short (preferably In more than 2 seconds), otherwise it will cause data loss.

The **FU4 mode is a super long-distance communication mode**. The serial port baud rate is fixed at 1200 bps and the air baud rate is 1000 bps. After switching from other modes to FU4, the serial port baud rate will be automatically converted to 1200bps. In this mode, only a small amount of data is transmitted (each packet is less than 32 bytes), and the packet transmission interval should not be too short (preferably more than 2 seconds), otherwise data loss will occur.

Some characteristic reference values for various modes are given below:

mode	FU1	FU2	FU3	FU4	Remarks
<b>Idle current</b>	3.6mA	80μA	16mA	16mA	average value
<b>Transmission delay</b>	15~25mS	500mS	4~80mS	1S	Send 1 byte
<b>Loopback test 1</b>	31mS	Serial porter 9600, send 1 byte			
<b>Loopback test 2</b>	31mS	Serial porter 9600, send 10 bytes			

Note: Loopback measurement delay refers to shorting the TX and RX pins of one module, sending serial port data to another module, from the beginning of sending the serial port data meter to the data of the return of the other module TX pin. time.

## 4 : Quick test

### 4.1 USB-TTL is connected to the module



Connect the wireless module GT-38 to the USB-TTL (as shown) and plug it directly into the PC's USB interface to debug the module.

## 4.2 Communication test first step

Download a serial port debugging assistant online, such as there is no computer it is recommended to use one (also included in the attached materials)

([https://pan.baidu.com/s/1uiR\\_iPcdMxYzeQd\\_RBAEzw](https://pan.baidu.com/s/1uiR_iPcdMxYzeQd_RBAEzw))

### Second step

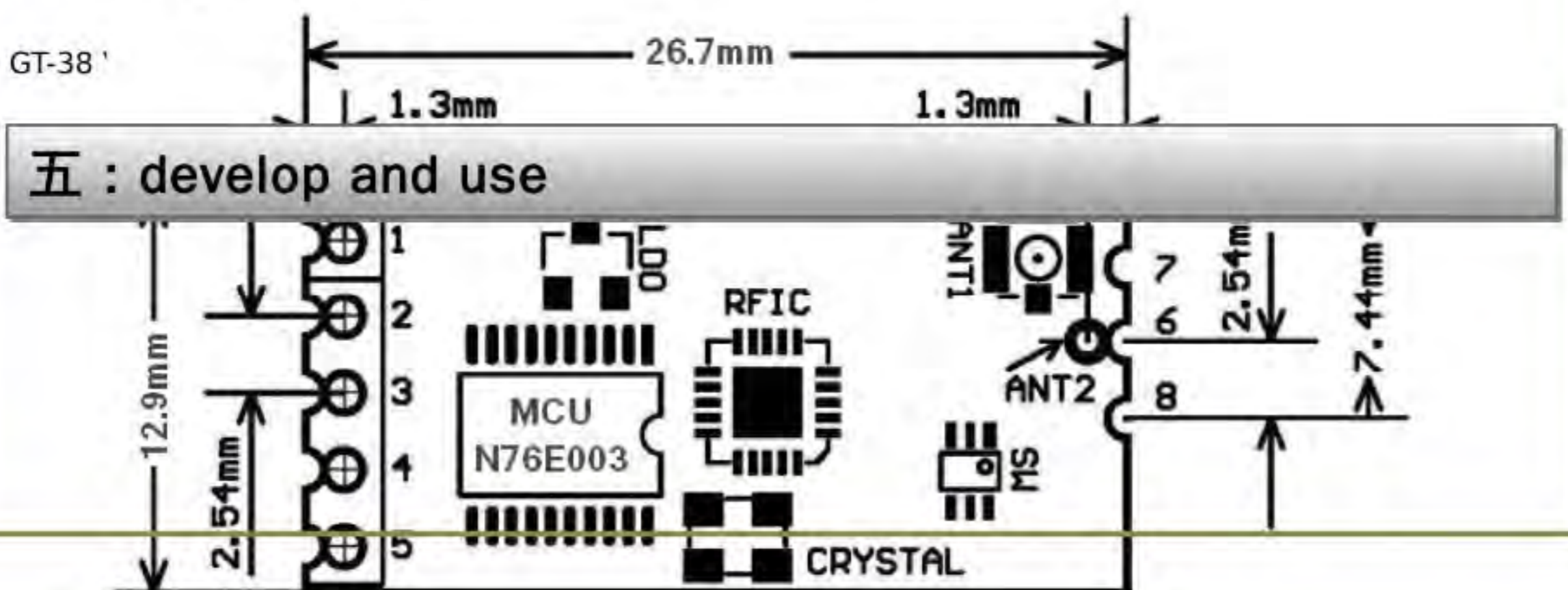
**Complete the steps in 4.1 ,  
Instructions :**

- ① Use USB-TTL connection module and computer ;
- ② If you do not know the module baud rate, you can enter the debug mode. (set the SET pin low) to send AT+RB, return OK+BXXX , the factory default baud rate is 9600 ;
- ③ Enter debug mode to send AT (with line feed), return OK. That is, the module works normally ;
- ④ For other AT commands, please refer to 6.3



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## 五 : develop and use

Pin	definition	I/O direction	Description
1	VCC	Power input, DC3.2V-5.5V, requires a load capacity of not less than 200mA.	Note: If the module is to be in the transmitting state for a long time, it is recommended to connect a 1N4007 diode in series when the power supply voltage exceeds 4.5V to avoid the module's built-in LDO heating.
2	GND	Public place	--
3	RXD	Input, internal 3.3k pull-up resistor	URAT input port, TTL level, internal serial high speed diode
4	TXD	Output	URAT output port, TTL level, internally connected 200Ω resistor
5	SET	Input, internal 10k pull-up resistor	Parameter setting control pin, active low, internal connected 1kΩ resistor
6	ANT	RF input / output	433MHz antenna pin
7	GND	Public place	--
8	GND	Public place	--
ANT1	ANT	RF input / output	IPEX20279-001E-03 antenna socket
ANT2	ANT	RF input / output	433MHz spring antenna welding hole

**Note:**

Pins 1–6 each have two pads, and the outer half-hole pads are used for patch bonding. Pin 6 on the inside of the pad ANT2 For module patch soldering, you can hand solder spring antenna. Pins 1–5 The round hole pads on the inside are used to solder 2.54mm pitch pins, which can be directly inserted into the user's PCB row.

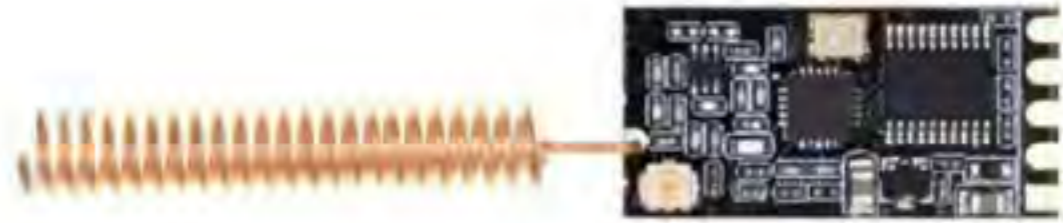


**ANT1: IPEX20279-001E-03 天线插座**

建议：在金属密闭空间，可使用天线座，将天线引接到开阔的环境下。



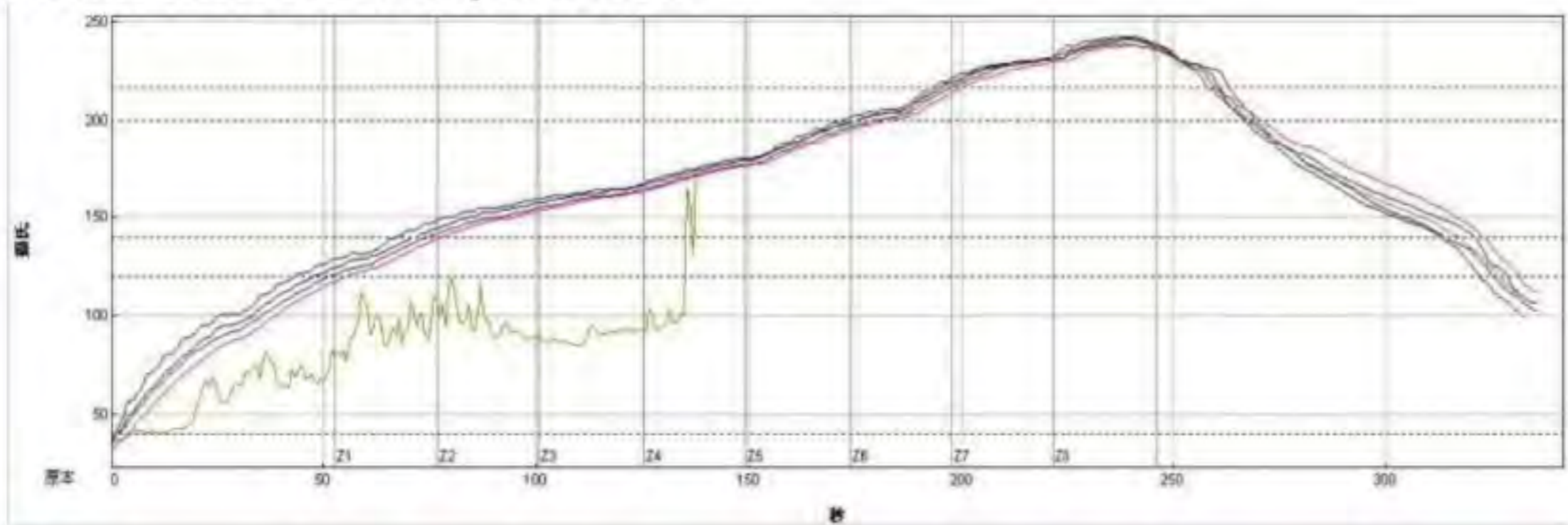




## 5.2 Embedding method

The GT-38 module integrates welded string holes and patch stamps, allowing users to select SMD patches or pin-embedded applications for their needs.

### Patch furnace temperature

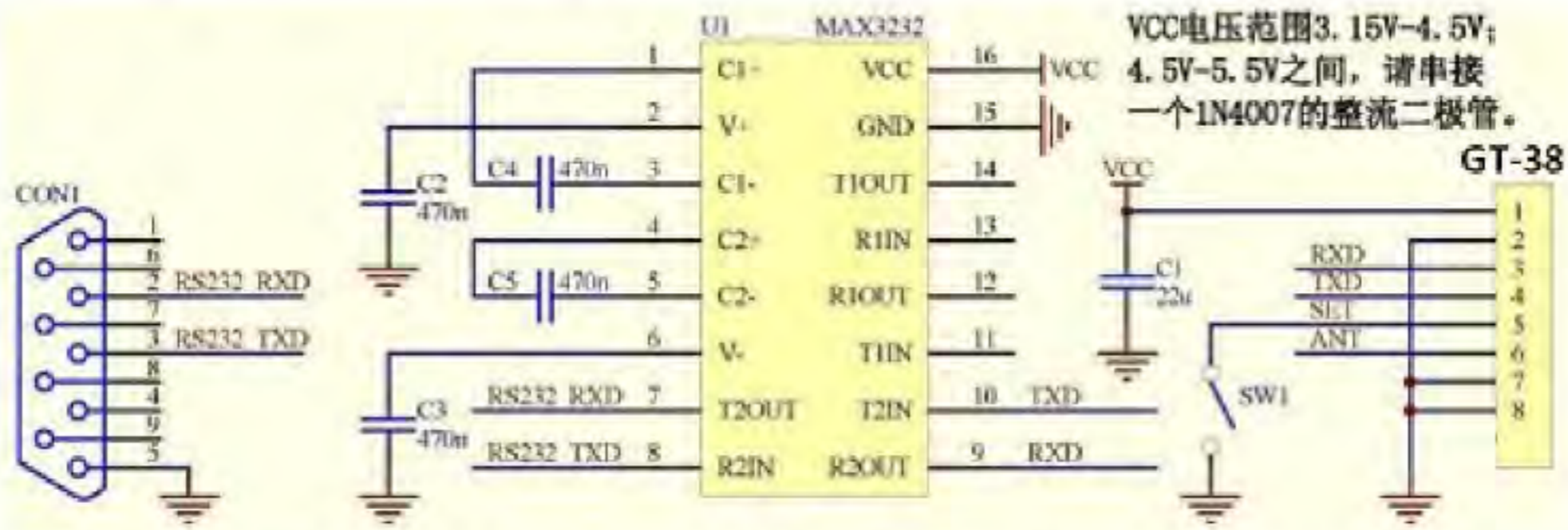


It is recommended that the manufacturer of the first large-scale patch production first pass 20~30 modules to check whether the furnace temperature is suitable.

It is recommended that the temperature of the SMT boiler should not exceed the temperature of the reference picture, the secondary patch should be reduced by about 5 degrees, and the temperature can be lowered appropriately in the summer.

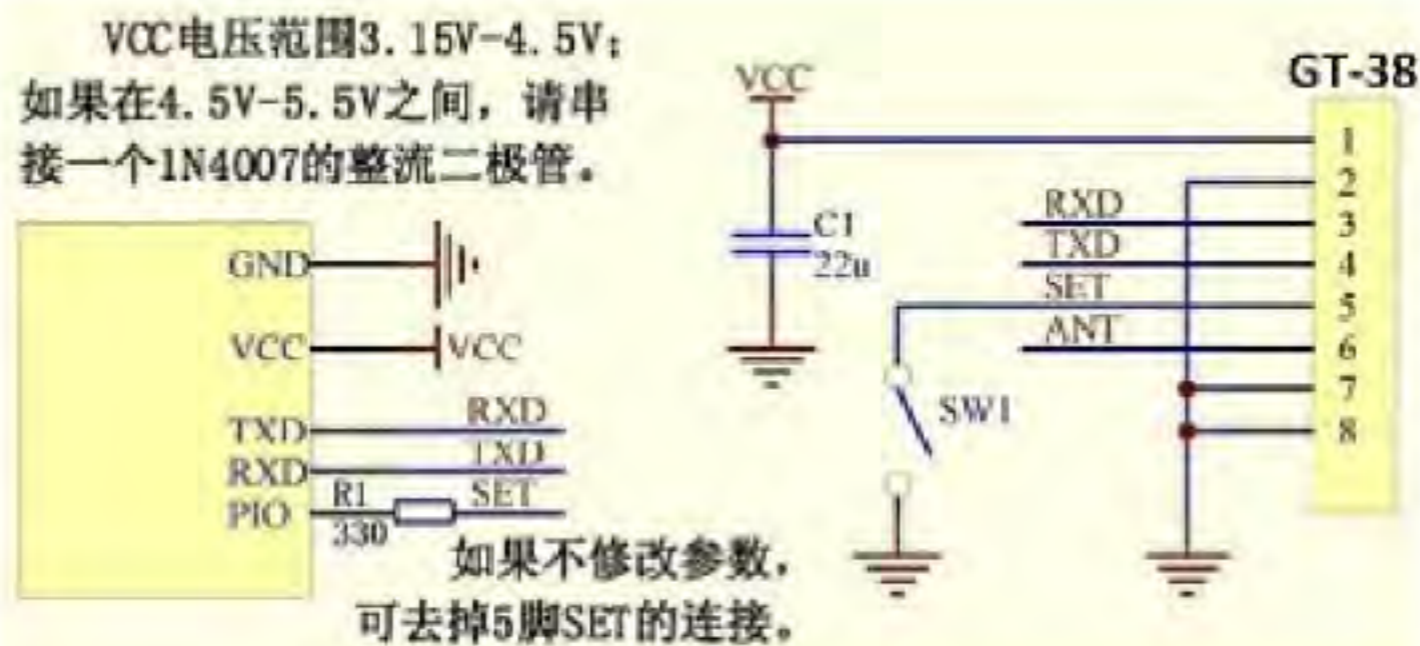
## 5.3 Reference connection circuit

### ① GT-38 模块与电脑串口的连接



“SET”脚通过开关 SW1 接地可以进入参数设置状态，悬空则退出。

### ② GT-38 模块与 MCU 串口的连接



MCU 中“SET”控制脚平时请置高阻状态或高电平输出，进行参数设置时请置低电平。

The AT command is used to set the parameters of the module and the function of the switch module. After setting, it needs to exit the set state to take effect. At the same time, the parameters and functions are modified, and the power loss will not be lost.

## 6.1 Method of entering the AT command

The first way to enter - in normal use (already powered), set the 5th pin "SET" low;

The second way to enter - power off, the fifth pin "SET" is set low and then re-powered.

Both of these modes can cause the module to enter the AT command mode, and release (the "SET" pin is not connected to the low level) to exit the command mode. After exiting the command mode, if the module function is changed, the corresponding function state will be cut.

**Note: Both modes are fixed to enter the command mode in the serial port format (8-bit data, no parity, 1 stop bit).**

## 6.2 Default factory parameters

The serial port baud rate is 9600bps, the communication channel is C100, and the serial port transparent transmission mode is FU3.

## 6.3 AT Instruction introduction

### 6.3.1 Test communication

instruction	response	Description
AT	OK	test

### 6.3.2 Change the serial port baud rate command

instruction	response	Description
AT+Bxxxx	OK+Bxxxx	After setting the baud rate with the AT command, you do not need to set it again after power-on. You can save the baud rate after power-off.

Change the serial port baud rate command. The baud rates can be set to 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 8400 bps, 57600 bps, and 115200 bps. The factory default is 9600bps.

**Example: Set the serial port baud rate of the module to 19200bps. Please send the module command "AT+B19200" and the module returns "OK+B19200".**

### 6.3.3 Change the channel for wireless communication

instruction	response
AT+Cxxx	OK+Cxxx

Change the channel for wireless communication from 000 to 254. The default value for the wireless channel is 100 and the operating frequency is 443MHz. The channel stepping is 100KHz, the channel 0 operating frequency is 433.0MHz, and the channel 200 operating frequency is 453.0MHz.

**example:**

Set the module to work on channel 21, please send the module command "AT+C021", the module returns "OK+C021". After exiting the command mode, the module operates on channel 21 and operates at 435.1 MHz.

**note:**

Since the wireless receiving sensitivity of the GT-38 module is relatively high, when the serial port baud rate is greater than 9600 bps, it is recommended to stagger 5 adjacent channels for use. When

the serial port baud rate is not greater than 9600 bps, if short distance (within 10 meters) communication, it is recommended to stagger 5 adjacent channels.

#### 6.3.4 Change module serial port transparent transmission mode

instruction	response	Description
AT+FUx	OK+FUx	After setting the transparent transmission mode with the AT command, you can select the four modes FU1, FU2, FU3 and FU4.

The default mode of the module is FU3. The serial port transparent transmission mode of the two modules must be set to the same for normal communication. For details, please refer to the introduction of the "Wireless Serial Port Transparent Transmission" section above.

**example:**

**The module command "AT+FU1" is sent, and the module returns "OK+FU1".**

#### 6.3.5 Set the module's transmit power level

instruction	Description
AT+Px	OK+Px

Set the transmit power level of the module, x can take 1-8, the corresponding module transmit power is as follows :

x value	1	2	3	4	5	6	7	8
Module transmit power (dBm)	-1	2	5	8	11	14	17	20

The factory default setting is 8, the transmission power is the largest, and the communication distance is the farthest. The transmit power level is set to 1, and the transmit power is minimum. In general, the transmission distance is reduced by half for every 6 dB of transmit power.

**example:**

**The module command "AT+P5" is sent, and the module returns "OK+P5". After exiting the command mode, the module transmit power is +11dBm.**

#### 6.3.6 Get the single parameter of the module

instruction	response	Description
AT+Ry	OK+(y Specified parameter)	y is any of B, C, F, and P, which means: baud rate, Communication channel, serial port transparent transmission mode, and transmission power.

**example 1:**

Send the module command "AT+RB". If the module returns "OK+B9600", the serial port baud rate of the module is 9600bps.

**Example 2:**

The module command "AT+RC" is sent. If the module returns "OK+RC100", the communication channel of the module is queried to 100.

**Example 3:**

Send the module command "AT+RF". If the module returns "OK+FU3", the module is queried to work in serial port transparent transmission mode 3.

**Example 4:**

The module command "AT+RP" is sent. If the module returns "OK+RP: +20 dBm", the module's transmit power is queried to +20 dBm.

#### 6.3.7 Get all the parameters of the module

instruction	Description
AT+RX	Return to the serial port transparent transmission mode of the current module, the serial port baud rate, Communication channel, transmission power and other information.

Example: Send the module command "AT+RX",  
 The module returns "OK+FU3  
 OK+B9600  
 OK+C100  
 OK+RP: +20 dBm".

### 6.3.8 Set the number of data bits, parity bits and stop bits for serial communication

instruction	Description
AT+Uxxx	Set the data digits, parity bits, and stop bits for serial communication. In the check digit, N stands for no parity, O stands for odd parity, and E stands for even parity. In the stop bit, 1 represents 1 stop bit, 2 represents 2 stop bits, and 3 represents 1.5 stop bits.

example:

To set the serial port format to 8-bit data bit, odd parity, 1 stop bit, please send the module command "AT+U801", the module returns "OK+U801".

### 6.3.9 Query module firmware version information

instruction	response	Description
AT+V	guoyunkeji GT-38	Return to the official website URL and firmware version number

### 6.3.10 Set sleep mode

instruction	response	Description
AT+SLEEP	OK+SLEEP	After receiving the instruction, the module enters sleep mode when exiting the AT command, and the working current is about 22μA. At this time, the module cannot perform serial port data transmission. Entering the AT setting state again will automatically exit the sleep mode.

example:

When the data is not transmitted wirelessly, in order to save power, the module command "AT+SLEEP" is sent, and the module returns "OK+SLEEP".

### 6.3.11 Restore the serial port baud rate, communication channel, and serial port transparent transmission mode to the factory default values.

instruction	response	Description
AT+DEFAULT	OK+DEFAULT	Restore the serial port baud rate, communication channel, and serial port transparent transmission mode to the factory default values.

example:

Send to the module "AT+DEFAULT", the module returns "OK+DEFAULT", restore the factory defaults. Serial port baud rate is 9600bps, communication channel is C100 and the serial port transmission mode is FU3.

#### Precautions

1 Do not directly connect the LEDs and resistors between the TX cable of the module and the power supply. Otherwise, the serial communication of the module may be affected.

2 When using MCU to dynamically modify the module parameters, after setting the 5th pin "SET" to low level, wait for 40mS before sending the AT finger to the module.

After setting the 5th pin "SET" to a high level, it will wait for 80mS before entering the serial port transparent transmission mode.