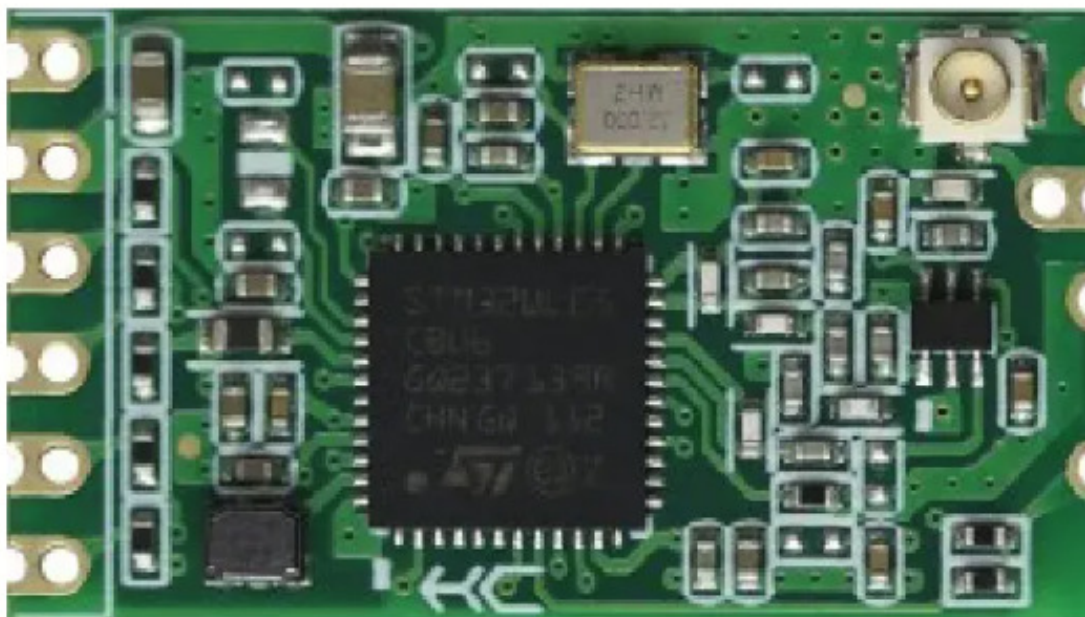


# HC-15 Wireless Serial Communication Module User Manual **V1.0**



LoRa technology long range wireless transmission (3500 m in open field/at [radio rate S1](#)) Operating frequency range (415.09-449.86 MHz, 50 communication channels)

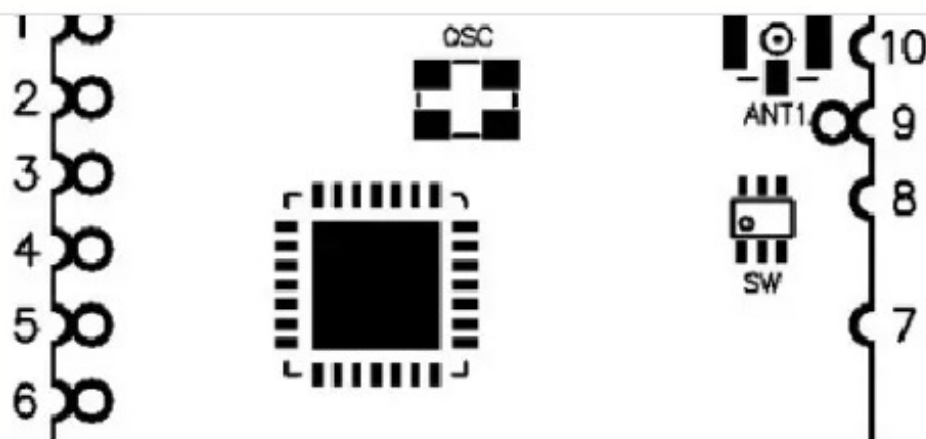
Built-in MCU, communicates with external devices through serial port, supports 1200~115200 serial baud rates.

## Products

HC-15 wireless serial communication module is a new generation of LORA wireless digital transmission module. The wireless working frequency band is 433MHz, and up to 50 communication channels can be set. The maximum transmitting power of the module is 130mW (22dBm), and it adopts advanced LoRa technology, the receiving sensitivity is as high as -140dBm under [the condition of wireless rate S1](#), and the communication distance is 3500 metres in open field.

The module adopts stamp hole package and can be soldered, the size of the module is 27.4mm×15.6mm×4mm (including antenna cap, excluding 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 coaxial cable, using the 433MHz band external antenna; module also has an antenna welding holes ANT2, convenient for users to weld the spring antenna. Users can select one of the antennas according to their requirements (only one of the antennas can be selected, two antennas cannot be connected at the same time)

The module contains LORA SOC, users do not need to program the module separately, various transmission modes just send and receive serial data, easy to use.



The HC-15 module can be soldered on a chip or on 2.54mm pitch pins and inserted directly into user's PCB. The module has a total of 10 pins and an RF antenna holder, ANT1,

as defined in the table below:

pinout	define	I/O Direction	instructions
1	VCC		Power input, DC3.0V-3.6V, required load capacity not less than 300mA
2	GND		public land
3	RXD	Serial Input	URAT input, internal 200 $\Omega$ resistor in series, high level voltage in line with VCC
4	TXD	serial output	URAT output, internal 200 $\Omega$ resistor in series, high level electrical Voltage in line with VCC
5	KEY	Input, Internal Pull-Up	setting control pin, internal 1K $\Omega$ resistor in series, active low
6	STA	exports	The high level voltage is generally slightly lower than the VCC voltage, and is internally connected in series with a 200 VCC voltage. $\Omega$ resistor, can be connected to MCU input pin, or external LEDs (This pin is busy indication output, normally output high level, when the module is busy output low level, when busy, please do not send data to the module serial port RXD pin)
7	NC		Temporarily non-functional, please hover
8	GND		public land
9	ANT	RF Input/Output	433MHz Antenna Pin, Spring Loaded Antenna
Manual 10	GND		public land
ANTI	ANT	RF Input/Output	IPEX20279-001E-03 Antenna Socket

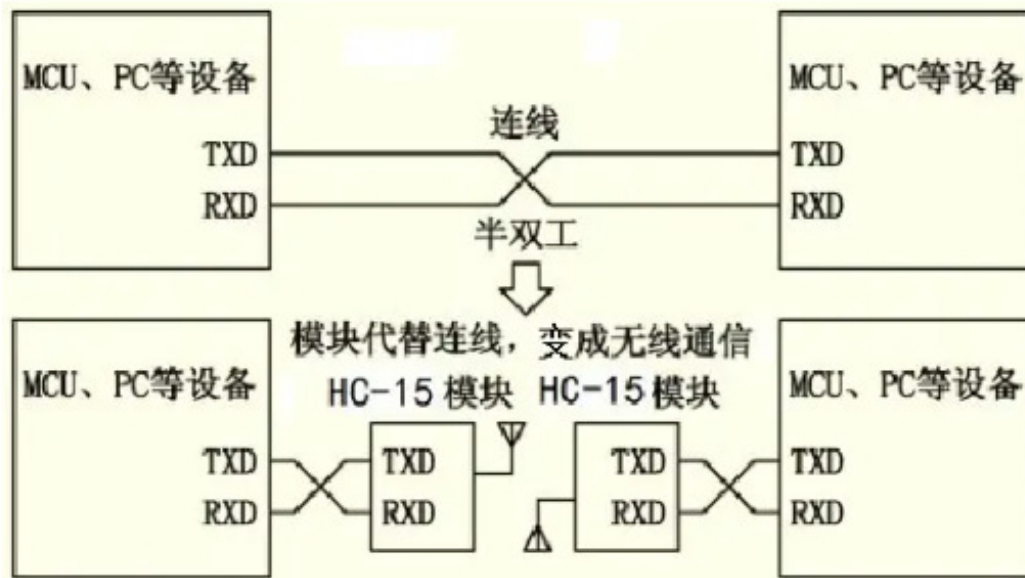
Pins 1-6 and 9 each have two pads, the outer half-hole pads are used for SMD soldering. The round hole pads on the inside of pins 1-6 are used for soldering 2.54mm pitch pins, which can be directly inserted into the user's PCB ; the pad on the inside of pin 9 is used for hand soldering the spring antenna when the module is SMD soldered.



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The working current of the module is 9mA in receiving state and 125mA in transmitting state. The working voltage is DC3.0V-3.6V, the load capacity of the power supply should be not less than 300mA, and a capacitor of not less than 47uF should be connected in parallel near the power pin of the module.

## Wireless serial port pass-through

A brief introduction to the principle of operation



As shown above, the HC-15 module is used in place of a physical link for half-duplex communication. The device on the left sends serial data to the module, and the module's RXD port receives the serial data and automatically sends it over the air in radio waves. The module on the right automatically receives and restores from TXD the serial data originally sent by the device on the left. The same is true from right to left. The modules can only work in half-duplex between them and cannot send and receive data at the same time.

The module has 8 wireless rates, different rates can not transmit data to each other, the default rate is S3, S1 is the lowest rate, this time the module's receiving sensitivity is the highest, the communication distance is the farthest. S1 is the lowest rate, when the module has the highest reception sensitivity and the farthest communication distance. The higher the rate is, the lower the reception sensitivity of the module is and the closer the communication distance is. Users can choose the optimal rate according to the actual situation.

Modules are generally used in pairs to send data to each other in half-duplex mode. There is a limit on the number of bytes that can be sent to the module's serial port at one time, and the default maximum is 1000 bytes for a packet, and more than 1000 will result in the loss of more than a portion of the data. In addition, in view of the environmental interference and other factors, once continuously send a large number of data, it is possible to lose some bytes. Therefore, it is better for the host computer to have mechanisms such as answering and retransmitting to avoid information loss.

The AT instruction is used to set the parameters of the module and switch the function of the module, and it takes effect only after exiting the setting state after setting. Meanwhile, the modification of parameters and functions will not be lost when power down.

### (1) Command mode entry

The first method of entry - in normal use (already powered up), pin 5 "KEY" is set low.

The second access method - power down, pin 5 "KEY" will be set low first and then re-power up.

Both methods enable the module to enter AT command mode, and release ("KEY" pin is not connected low) to exit command mode. After exiting the command mode, if the function of the module is changed, it will be cut to the corresponding function state.

The second way is fixed to enter command mode in serial format 9600, N, 1.

Note: After exiting the command mode, the module is in the reset state and must wait at least 250ms before entering the command mode again, otherwise the module may enter the command mode in the second way!

### (2) Description of instructions

#### ①Test communication

directives	responsive	instructions
AT	OK	AT command test

#### Example:

Queries whether the module has entered AT mode Send to module:

AT

Module side return: OK

#### ②Restore factory defaults

directives	responsive	instructions
AT+DEFAULT	OK+DEFAULT	Restore parameters such as serial port baud rate to factory defaults.

#### Example:

Sent to module: AT+DEFAULT

Module return: OK+DEFAULT

### ③Query or change serial port baud rate command

directives	responsive	clarification
AT+B?	OK+B:xxxx	Query Baud Rate
AT+Bxxxx	OK+B:xxxx	Setting the baud rate Default: 9600

Changes the serial port baud rate command. The baud rate can be set to 1200bps, 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps, and 115200bps The factory default is 9600bps.

To set the module serial port baud rate to 19200bps, please send the module command "AT+B19200", the module returns "OK+B19200".

### ④Query or change serial port parity bit command

directives	responsive	instructions
AT+PARITYBIT?	OK+PARITYBIT?	Query the parity bit of the module's serial port
AT+PARITYBITx		Setting the Parity Bit of the Module's Serial Port 0: no checksum (default) 1: Odd check 2: Even checking

#### Example:

Enquiry:

Send command AT+PARITYBIT?

Return command OK+PARITYBIT0

Setting:

Send command AT+PARITYBIT1

Return command OK+PARITYBIT1

#### ⑤Query or change serial port stop bit command

directives	responsive	instructions
AT+STOPBIT?	OK+STOPBIT?	Query the stop bit of the module's serial port
AT+STOPBITx		Setting the stop bit of the module's serial port 1: 1 (default) 2: 1.5 3: 2

#### Example:

##### Enquiry:

Send command AT+STOPBIT?

Return command OK+STOPBIT1

##### Setting:

Send command AT+STOPBIT3

Return command OK+STOPBIT3

#### ⑥Query or change the wireless channel of the module

directives	responsive	instructions
AT+C?	OK+C:xxx	Query the wireless channel of the Lora module
AT+Cxxx		Setting the Wireless Channel for the Lora Module

##### Query wireless channel

Send to module: AT+C?

Return from module

side: OK+C:xx

##### Setting the wireless channel

Send to module: AT+C028

Module side return:

OK+C:28

### P.S. Wireless channel and frequency correspondence

reproa ch	frequen cy (MHz)	reproa ch	frequen cy (MHz)	reproa ch	frequen cy (MHz)	reproa ch	frequen cy (MHz)	reproa ch	frequen cy (MHz)
1	415.09	11	422.41	21	429.73	31	435.83	41	442.54
2	415.70	12	423.63	22	430.34	32	436.44	42	443.15
3	416.31	13	424.24	23	430.95	33	437.05	43	443.76
4	416.92	14	424.85	24	431.56	34	437.66	44	444.37
5	417.53	15	425.46	25	432.17	35	438.27	45	445.59
6	418.14	16	426.07	26	432.78	36	438.88	46	446.20
7	419.36	17	426.68	27	433.39	37	440.10	47	446.81
8	420.58	18	427.29	28	434.00	38	440.71	48	447.42
9	421.19	19	427.90	29	434.61	39	441.32	49	448.64
10	421.80	20	429.12	30	435.22	40	441.93	50	449.86

### ⑦Query or change the wireless rate of the module

directives	responsive	instructions
AT+S?	OK+S:x	Query the wireless rate of the Lora module
AT+Sx		Setting the wireless rate of Lora module Modification range of wireless rate:1~8 Default:3

### Example:

Query wireless rate

Send to module: AT+S?

Return from module

side: OK+S:x

Setting the wireless rate

Send to module: AT+S1

Return from module

The module has 8 wireless rates, different rates can not transmit data to each other, S1 is the lowest rate, this time the slowest communication speed, wireless receiving

The highest sensitivity and the longest communication distance. The higher the rate, the closer the communication distance, the user can choose the optimal rate according to the actual situation.



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Wireless rate	rate is 9600, other baud rates need to be measured by users).	Serial communication speed (time after transmission from the transmitting end that the message is received at the receiving end)
1	-140dBm	Sending 1 byte, the message is received after about 2.5 seconds; sending 10 bytes, the message is received after about 3.2 seconds; sending 20 bytes, the message is received after about 3.9 seconds; sending 40 bytes, the message is received after about 5.2 seconds. Sending more than 40 bytes will be received in packets (up to 40 bytes per packet) and the first message will be received after 5.2 seconds. 1 packet, with subsequent delayed reception by the number of bytes per packet (max. 40 bytes/4.9 seconds)
2	-137dBm	Send 1 byte, receive the message after about 1.35 seconds; send 10 bytes, receive the message after about 1.7 seconds; send 20 bytes, receive the message after about 2.05 seconds; send 40 bytes, receive the message after about 2.9 seconds. Sending more than 40 bytes will be received in packets (up to 40 bytes per packet) and the message will be received after 2.9 seconds. Receive the 1st packet, subsequent packets are received with a delay according to the number of bytes in each packet (max. 40 bytes/2.7 seconds)
3	-134dBm	Sending 1 byte, the message will be received after about 0.75 seconds; sending 10 bytes, the message will be received after about 0.95 seconds; sending 40 bytes, the message will be received after about 1.5 seconds; sending 80 bytes, the message will be received after about 2.35 seconds. Sending more than 80 bytes will be received in packets (up to 80 bytes per packet) 2.35 seconds After the 1st packet is received, subsequent packets are received with a delay according to the number of bytes per packet (max. 80 bytes/2.1 seconds)
4	-131.5dBm	Sending 1 byte, the message will be received after about 0.45 seconds; sending 10 bytes, the message will be received after about 0.55 seconds; sending 40 bytes, the message will be received after about 0.9 seconds; sending 80 bytes, the message will be received after about 1.25 seconds. Sending more than 80 bytes will be received in packets (up to 80 bytes per packet) 1.25 seconds After the 1st packet is received, subsequent packets are received with a delay according to the number of bytes per packet (maximum 80 bytes/1.0 second)
5	-129dBm	Sending 1 byte, the message will be received after about 0.3 seconds; sending 10 bytes, the message will be received after about 0.37 seconds; sending 80 bytes, the message will be received after about 0.8 seconds; sending 160 bytes, the message will be received after about 1.25 seconds. Sending more than 160 bytes will be received in packets (up to 160 bytes per packet) 1.25 seconds After the 1st packet is received, subsequent packets are received with a delay according to the number of bytes per packet (max. 160 bytes/0.9 sec.)

6	-126.5dBm	<p>Sending 1 byte, the message will be received after about 0.23 seconds; sending 10 bytes, the message will be received after about 0.27 seconds; sending 80 bytes, the message will be received after about 0.55 seconds; sending 160 bytes, the message will be received after about 0.85 seconds. Sending more than 160 bytes will be received in packets (up to 160 bytes per packet) 0.85</p> <p>The 1st packet is received after seconds, and subsequent packets are received with a delay according to the number of bytes in each packet (maximum 160 bytes/0.5</p>
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#### ⑧ Query module firmware version information

directives	responsive	instructions
AT+V	www.hc01.com HC-15V1.0 2024.09.30	Return to official website URL and firmware version number

Example:

Send to module: AT+V

Module-side return: www.hc01.com HC-15V1.0 2024.09.30

#### ⑨ Get the basic parameters of the module

directives	clarification
AT+RX	<p>Returns the current module's serial baud rate, wireless channel, wireless rate, and wireless transmitter, in that order.</p> <p>Power and other information.</p>

Example:

Send to module: AT+RX

Module side return: OK+B:9600

ok+c:28 ok+s:3

ok+p:22dbm

#### ⑩Query or change the wireless transmit power of the module

directives	responsive	clarification
AT+P?	OK+P:X	Query Transmit Power
AT+PX	OK+P:X	Setting the transmit power Setting range: -6~22dBm Default: 22dBm

The factory default setting is **22dBm** for maximum transmit power and longest communication distance.

The transmit power is set to **-6dBm** for the smallest transmit power.

#### Example:

Query radio frequency

Send module command      \*\* AT+ P?

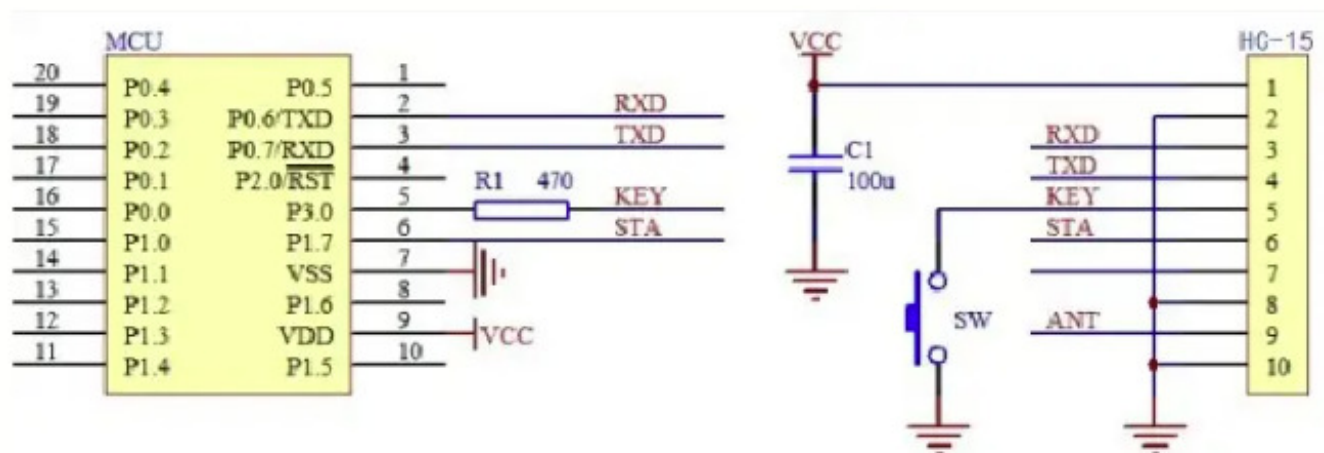
The module returns      \*\* OK+

P:22dBm      Setting the radio frequency

Send module command      \*\* AT+ P-5

The module returns      \*\* OK+P:-5dBm

#### HC-15 Module and MCU Serial Port Connection



The "KEY" pin in MCU should be set to high resistance or high level output normally, and should be set to low level for parameter setting;

STA" in MCU is configured as an input pin or left unconnected.