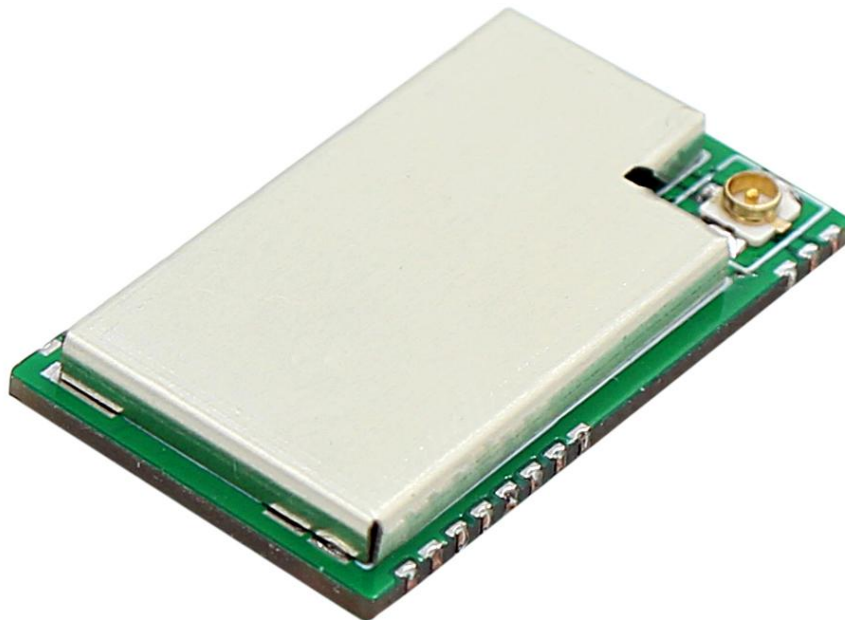


1. General

RF6610M series is a low cost, ultra-low power, high performance two way semi-duplex LoRa modulation transceiver with operation at 433Mhz, 868Mhz and 915Mhz. It integrates with 32 bit high speed low-powered MCU and high performance ASR6601. ASR6601 is a combo consisted of RF chip SX1262 and Arm Cortex M4 core MCU. Adopting high efficiency forward error correction with interleaving encoding (FEC) technology, it makes anti-interference ability and reception sensitivity greatly improved. That guarantees good performance in the harsh environment such as some industrial application. The FEC technology is advanced and unique in radio data communication field.

RF6610M has the UART interface, that make it is easy to implement wireless data transmission. It is flexible for users to set the baud rate, frequency, output power, air data rate etc parameters. The compact size makes it an ideal option for radio data communication application.



2. Features

- 5000 meters of communication distance (300bps)
- Output power: Max150mW (22dBm) (7 levels adjustable)
- Air data rate: 300 - 19200bps, can be configured through RF tool
- UART data rate: 1200 - 115200bps, can be configured through RF tool
- Frequency: 430MHz-510MHz, 868MHz, 902MHz-928MHz
- Working Current: 120mA(TX), 12mA(RX),2.0uA(Sleeping)
- parity of series COM: 8E1/8N1/8O1
- LoRa modulation
- Receive sensitivity: -148dBm(@600bps)
- UART/TTL
- Exceed 256 bytes data buffer
- Supply Voltage: 4.5V – 5.5V (2.1V – 3.7V optional)
- 125KHz-500KHz Channel spacing
- Dimension: 26.0mm *16.0mm *3.15mm

3. Application:

- Automated Meter Reading (AMR)
- Remote control, remote measurement system
- Access control
- Data collection
- Identification system
- IT household appliance
- Wireless alarm system

4. Maximum specification

Symbol	Parameter	Min	Max	Units
VCC	Supply Voltage	4.5	5.5	V
TOT	Operation Temperature	-30	85	°C
HOH	Operation Humidity	10%	90%	
TST	Storage Temperature	-55	125	°C

5. Pin-Out description:

RF6610M module has 14 pins. Refers to the Table 1:

No.	Pin Symbol	Pin Function	Pin Description
1	PA4	GPIO	Reserved IO port
2	GND	Ground	connected to Common GND
3	PA13	GPIO	Reserved IO port
4	PA12	GPIO	Reserved IO port
5	PA8	GPIO	Reserved IO port
6	PA9	GPIO	Reserved IO port
7	PA15	GPIO	Reserved IO port
8	GND	Ground	connected to Common GND
9	NC		
10	NC		
11	GND	GND for Radio	The GND pin of radio
12	ANT	Radio pin	Radio signal output/input
13	GND	GND for Radio	The GND pin of radio
14	GND	Ground	connected to Common GND
15	GND	Ground	connected to Common GND
16	GND	Ground	connected to Common GND
17	NC		
18	NC		
19	GND	Ground	connected to Common GND
20	PA0	AUX	Data in/out indication
21	PA3	EN	Enable pin. Low level effective
22	RXD	Data input Pin	Data input pin, connect external MCU 's TXD.

RF6610M Embedded LoRa Transceiver module

23	TXD	Data Output Pin	Data output pin, connect external MCU 's RXD.
24	PA14	SET	Set pin
25	VCC	Power Supply	Power range 4.5V-5.5V(customized 2.1-3.6V)
26	GND	Ground	connected to Common GND

Table 1: Pin definition

6. Dimensions

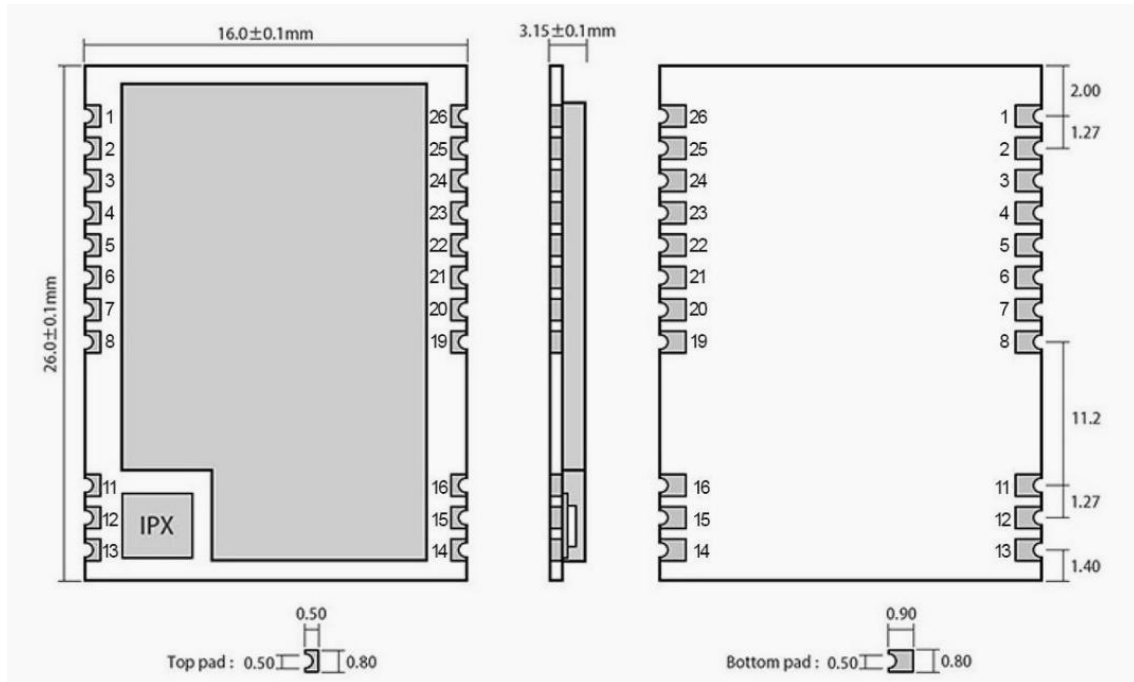


Figure 1: Dimension and Structure Diagram

7. Working mode

a. Transparent mode

Transparent mode is a straight forward communication in which the module receives from source and sends data to the destination through serial port (UART/TTL) at raw data format. Users don't need to care about the process of data inside the module. The PA1 pin of RF6610M will give indication about the data IN/OUT of serial port 2ms in advance in order to wake up the host.

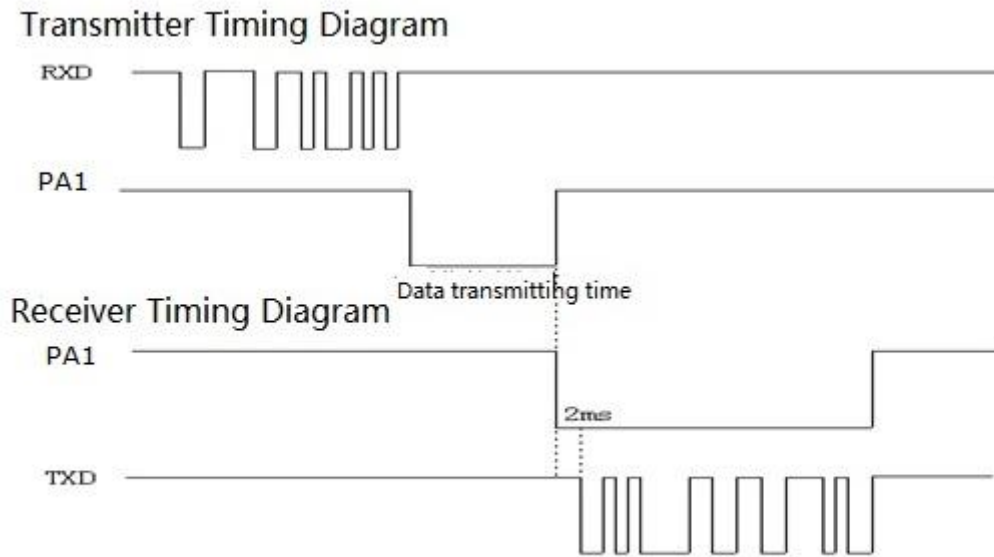


Figure 2: Timing Sequence in Transparent Mode

b. Star network mode

In this mode one RF6610M module needs to set as the central module and other modules should be node modules. For central module, it works at the full performance so its power consumption is the same as in the standard mode. As to node module, some functions of it are closed. If the PE1 pin is connected to logic high, the node module only keeps CAD wireless monitor to detect if there is any wireless signal coming and will not check if there is any data from the host through UART interface. If the node module sends data to the central module, the host needs to set PE1 pin to low to activate the node module and then transfers the data.

In the configuration tool, there is an option for Node ID which is used to set the ID of node module. If the ID of the node modules is 0x00 0x00, the node module will not make address detection. In other words all of the nodes will receive the data including address from central module. The data package of the first two bytes should be the node ID.

E.g. The Central module sends data '0x00 0x01 0x22 0x33 0x44 0x55', all of the node modules with ID '0x00 0x00' will receive the data '0x00 0x01 0x22 0x33 0x44 0x55'. If the ID of node module is larger than 0x00 0x00, the node module with ID the same as the one in the first two bytes of data package can receive the real data.

E.g. The Central module sends data '0x00 0x01 0x22 0x33 0x44 0x55', the module with ID '0x00 0x01' can get the data '0x22 0x33 0x44 0x55' and the first two byte ID will be filtered.

In order to guarantee the reliability of communication, the length of data package should not exceed 64 bytes.

8. Parameter Configuration

Through serial port or using setting tool ‘Rf-Tool’, users can configure relative parameters such as frequency, UART rate, air rate, checkout mode and so on.

It is very simply for configuration. Based on different requirement, all options can be selected visually. It is shown in Table 2 and Figure 3.

Parameter	Description
UART area	The values are fixed at 9.6k bps & no parity check.
RF frequency	It indicates the center frequency of RF carrier
RF mode	Standard mode, Low Power mode
RF_Factor	Lora spreading factor. Larger value means higher sensitivity but longer air transmission time
RF_BW	Lora bandwidth. Larger value means lower sensitivity. Recommended value: 125K.
Node ID	It is available in the Central/Node mode.
Net ID	Only the modules with the same network ID can communicate with each other. It can avoid interferences from irrelative modules
Power	It is used to set the output power of RF6610M. There are 7 power levels. The 7 means the max. output power---20dBm and 0 means the lowest output power.
Serial baud-rate	It defines the data rate between RF6610M and the host
Serial parity	It defines the parity check between RF6610M and the host
Breath	It is available in the Central/Node mode. It defines the Breath period of Node module.
Wake Timer	It is available for the Node module only. It defines the time of module waking up to receive the preamble from Central module.

Table 2: Parameter Specification

RF6610M Embedded LoRa Transceiver module

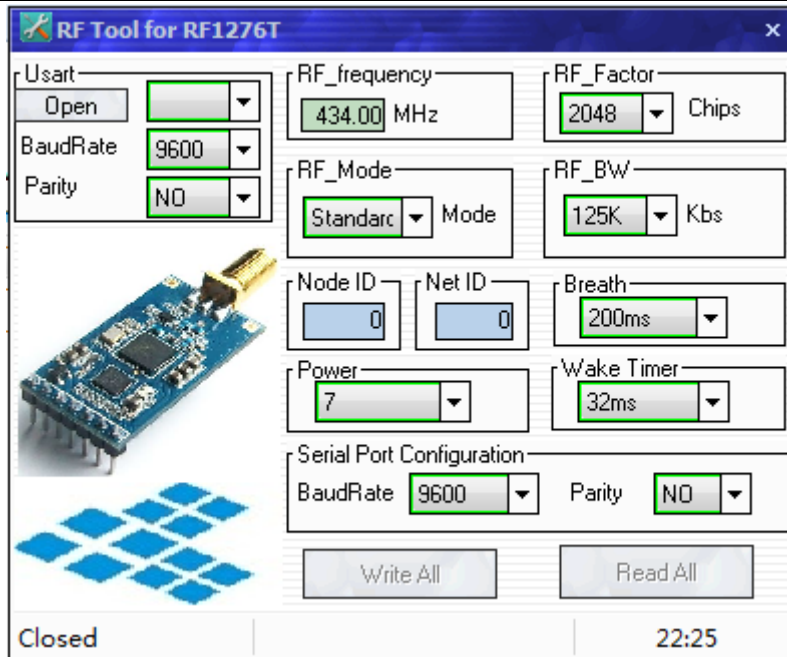


Figure 4: Interface of RF Tool

Users can configure the parameters (frequency, data rate, output power, RF Factor, RF Bandwidth etc.) through PC or in circuit.

◆ Setting through laptop. RF6610M port is UART/TTL. When RF6610M connecting with PC, users need to use USB adapter. AppconWireless provides USB adapter as accessory. The schematic is shown in Figure 4

Firstly users connect converter board to PC through DB9 cable and open 'RF Tool', then insert module into converter board. After that, the status column of 'RF tool' will give a indication 'Found Device'. Users then can read/write the module.

If users connect USB converter, USB drive "PL-2303_Driver_Installer" need be installed firstly. The drive has different version for different OS. USB converter has five wires with five different colors: Black, Red, Blue, Yellow, Green, Black wire is GND pin. Red wire is VCC pin. Blue wire is TXD pin. PE1 pin should be connected to GROUND.

RF6610M Embedded LoRa Transceiver module

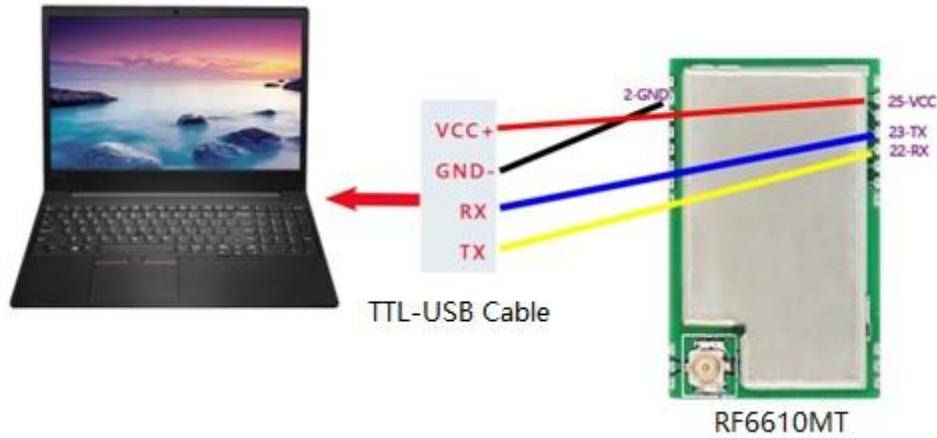


Figure 5: The connection diagram

◆ Setting in circuit . Users also can use microcontroller to change the default parameters. The work mechanism is the same as the laptop.

Sync word		ID code		Header	Command		Length	Data	CRC	End code	
0xAF	0xAF	0x00	0x00	0XAF	XX	YY	LEN	XXXX	CS	0X0D	0X0A

RF6610M Command Structure

Notes: 1. The ID code is 0x00 0x00 in command.

2. In command code, XX in sending command is 0x80 and in response command is 0x00. YY is the command type. The work mode of

YY	TYPE	YY	TYPE	YY	TYPE	YY	TYPE	YY	TYPE
0x01	write	0x02	read	0x03	standard	0x04	Central	0x05	Node

Command Type and Value

3. Length refers to the data bytes between Length byte and CRC byte which the two bytes are not calculated in the length.

4. Data refers to the detailed parameters which need to be changed.

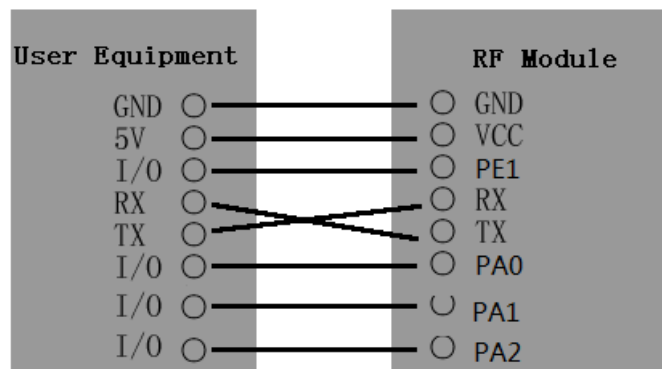
Baudrate	Parity	Frequency	RF_Factor	Mode	RF_BW	ID	Net ID	Power
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Parameter Sequence in Data Section

9. Application Schematic:

The connection schematic between RF6610M and MCU or terminal is shown as below.

The parameter of RF6610M's serial port must match with MCU or terminal's (RF6610M has the same serial port baud rate and parity style with MCU or terminal). Two or more RF6610Ms in a system should have the same parameters such as TX/RX frequency, air data rate and RF channel.



- Caution:**
1. When RF6610M is installed, make sure the antenna is far away from device to enhance the performance.
 2. RF6610M should have the same common ground with MCU or terminal. Otherwise it may cause the module abnormal performance.
 3. When RF6610M works normal, DO NOT touch the module and antenna.

Figure 6: Connection between Module and Device (TTL/UART port)

10. Order information

- a) RF6610MT- 433
- b) RF6610MT- 868
- c) RF6610MT-915

11. Q&A:

Questions and Answers	
Can not communicate between two devices	1. The communication protocol is different between two modules, for instance: data rate and checkout.
	2. The frequency or RF data rate is different between two communicated modules.
	3. They are not the same kind products.
	4. The connection between module and terminal is wrong.
	5. The module is wrong.
	6. The setting of EN is wrong.
	7. The communication distance exceeds the range, or the connection of antenna is bad.
Short communication distance	1. The supply voltage exceeds range
	2. The ripple of power is too big.
	3. The connection of antenna is bad or it is a wrong kind of antenna
	4. Antenna is too close to the surface of metal or the ground
	5. Receiving circumstance is very bad, for instance buildings and strong interference.
	6. There is interference of the same frequency
Receive wrong data	1. Wrong setting of COM, for example, Baud rate is wrong
	2. The connection of UART is wrong.
	3. The cable to the UART is too long.

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