LoRa1278 Wireless Transparent Transmission Module with

UART Serial Communication

SPECIFICATION

Model No.: DL-RTS1278M

Version: V1.1

Before using this module, please read this document carefully, and pay attention to the following important matters:

This module is an electrostatic sensitive product. Please operate it on an anti-static workbench during installation and testing.

The module uses an external antenna by default. The antenna can be a wire antenna or a standard UHF antenna. You can choose a specific antenna according to the actual situation. If the terminal product uses a metal shell, be sure to install the antenna outside the metal shell. Otherwise, the RF signal will be seriously attenuated, which will affect the effective distance.

Metal objects and wires should be kept away from the antenna as much as possible.

When installing the module, nearby objects should be kept at a sufficient safety distance from the module to prevent short circuit damage.

This module should be used in a dry environment. Please do not make any liquid substance come into this module.

Please use an independent voltage regulator circuit to supply power to this module, and avoid sharing with other circuits. The tolerance of the power supply should not be less than 5%.

Limitations:

This module is intended to be embedded in the customer's terminal product application, and does not provide a casing itself. It is not recommended that the customer directly resell this module as a final product without permission.

This series of modules are in accordance with commonly used international standards. If there is any special certification needed, we can adjust certain indicators according to your needs.

This module cannot be applied to life rescue, life-support systems, or any occasion where personal injury or life threatening may cause by equipment failure. Any organization or individual carrying out the above-mentioned applications shall bear all risks at their own.

We will not be responsible for any direct or indirect damage, injury or loss of profits caused by products that use this module.

File Version Update Management

Date	File Version	Remark
2017-10-10	MT Version V1.0	Customized Edition
2018-9-30	UART Version V1.1	Standardized UART Transparent Transmission Module, Basic Function Edition

1. Brief Introduction

This DL-RTS1278M RF module is a high-performance wireless serial port LoRa module developed by DreamLnk for wireless meter reading and industrial remote control, it was embedded with high-speed low-power MCU and high-performance spread-spectrum RF chip SX1278, with LoRa spread-spectrum technology, while using efficient cyclic interleaving error correction coding, anti-interference and sensitivity are at the most advanced level in the industry.

It provides multiple channel selections, and can online modify the serial port rate, transceiver frequency, transmit power, RF rate and other parameters. The default frequency is 434.125MHz. The working voltage of DL-RTS1278M is 2.1-3.6V, and only consumes 13mA in the receiving state. DL-RTS1278M has four working modes, which can be arbitrarily switched between the modes. In the 1SEC cycle polling wake-up power saving mode (Polling mode), the reception consumes only tens of microamps. One 3.6V/3.6AH Lithium thionyl chloride battery can work for several years and is very suitable for battery-powered systems.

This RF module is a new generation of multi-channel embedded wireless data transmission module, which can set multiple channels, stepping to 1KHz, transmitting power up to 100mW, with product size of 32.1mm x 18.3mm x 6.0mm, very convenient for customers to embed in the system. DL-RTS1278M has low power consumption and is very suitable for battery-powered systems.

DL-RTS1278M RF module adopts spread spectrum modulation and efficient error correction coding, its coding gain is nearly 10dBm higher than traditional modulation methods (such as FSK, GFSK and PSK), and its anti-interference and sensitivity are at the most advanced level in the industry. At the same time, the code also includes reliable error detection capabilities, which can automatically filter out errors and false information, and truly realize a transparent connection, which is nearly double the distance of the traditional module under the same transmission power. Therefore, DL-RTS1278M is suitable for extremely harsh environments and occasions with strict requirements on distance.

DL-RTS1278M is equipped with dual 256Bytes large-capacity buffers. When the buffer is empty, users can transmit 256Bytes of data at one time. When the air baud rate is set to be greater than the serial port baud rate, unlimited length can be transmitted at one time. At the same time, DL-RTS1278M provides a standard UART/TTL interface, seven speeds and three interface verification methods. The external interface of DL-RTS1278M adopts transparent data transmission mode, which can adapt to standard or non-standard user protocols, and the received data is exactly what the transmitter sent.

It adopts the serial port to set the module parameters, with rich and convenient software programming setting options, including frequency point, air speed, and serial port speed, check method, etc.

There are two setting methods: one is the setting software “RF-Magic” provided by our company, it can be used directly on a PC serial port; the other is dynamic online setting, use the serial port

to send commands to dynamically modify (For details, please refer to the parameter setting chapter of DL-RTS1278M).

1.1 Features:

- 3000 meters transmission distance (0.81Kbps)
- Working frequency 433MHz, 470MHz, 868MHz, 915MHz optional
- -132dBm @ 810bps ultra-high sensitivity
- Maximum 100mW transmit power
- LoRa spread spectrum modulation
- Zero waiting to wake up, with wake-on-radio (WOR) function
- Efficient cyclic interleaving error correction coding
- Four working modes, standby current 2.5uA
- Built-in watchdog, ensure long-term reliable operation

1.2 Applications

- Wireless automatic meter reading
- Extremely long-distance data communication
- Wireless sensor network
- Industrial automation data collection
- Field data remote control and telemetry
- Various transmitters, flow meters and smart meters
- Building automation and security
- Monitoring and control of mining and petroleum equipment
- Environment, energy saving, temperature monitoring
- Intelligent transportation, intelligent power
- Consumer Electronics
- Intelligent robot
- Street light control

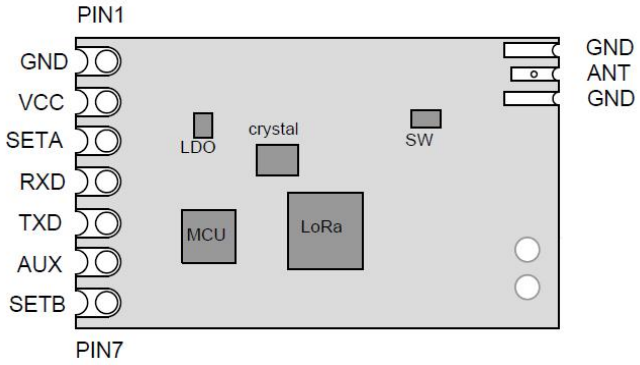
1.3 Technical parameters

No	Name	Parameters
1	Module size	18.3 * 32.3mm (exclude Antenna)
2	Place of origin	All imported components, origin: Japan, the United States, Germany
3	Production Process	SMT lead-free process, AOI automatic testing, in line with environmental certification standards
4	Interface	1*7*2.54mm, can use universal board and DuPont cable
5	Working frequency	The default is 434.125MHz, other frequencies can be customized 470-510MHz, 855-885MHz, 900-930MHz
6	Frequency step	1KHz setting step

7	Modulation	LoRa spread spectrum modulation
8	Transmit power	100mW@3.3V (0-7, 8 levels adjustable, each level increases by 3dBm, maximum 100mW
9	Receiving sensitivity	-132dBm@0.81Kbps， -118.5dBm@18.23K bps
10	Air transmission rate (occupied bandwidth)	0.81K/(BW125K) ， 1.46K/(BW125K) ， 2.6K/(BW125K) ， 4.56K/(BW125K)，9.11K/(BW250K)，18.23K/(BW500K)
11	Interface rate	1200 - 115200bps
12	Interface verification method	8N1/8E1/8O1
13	Interface buffer space	Double 256Bytes
14	Power supply	2.1~3.6V
15	Transmitting current (typical value)	100mA@100mW
16	Continuous receiving current	13mA@4.56Kbps, 15mA@18.23Kbps, @ Receiving rate (typical value)
17	Sleep current	2.5uA@3.3V (typical value), Max 4.0uA
18	Transmission distance	3000M @ 0.81Kbps; 2000M @ 9.11K bps (in an open air)
19	Antenna port impedance	50Ohm
20	Operating temperature	-40 ~ +85℃
21	Working humidity	10% ~ 90% (Relative humidity, non-condensing)

2. Function Description

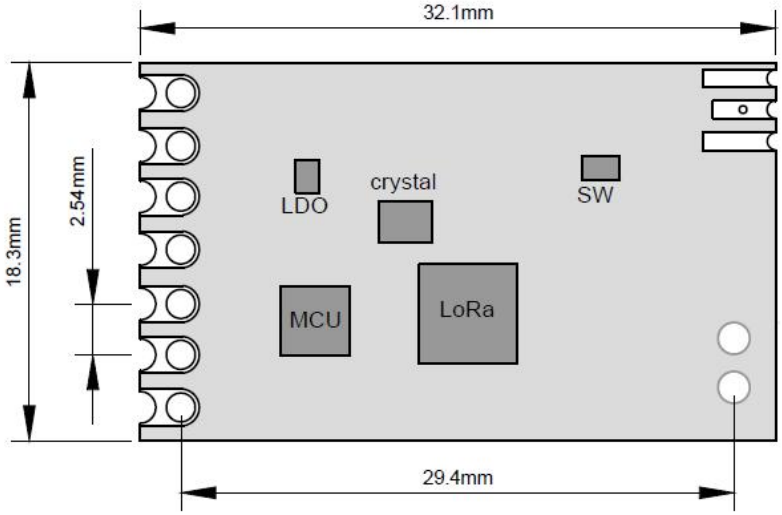
2.1 Pin definition



DL-RTS1278M module has totally 9 pins, which are defined as below table:

No	Name	Pin direction	Function
1	GND	-	Ground 0V
2	VCC	-	2.1~3.6V
3	SET_A	Input (with weak pull-up)	Parameter setting A, pull-up resistance is about 47K
4	RXD	Input (with weak pull-up)	UART input port, TTL level, pull-up resistance is about 47K
5	TXD	Output	Output UART output port, TTL level
6	AUX	Output	Data input and output instructions
7	SET_B	Input (very weak pull-up)	Parameter setting B, pull-up resistance is about 10M
8	NC	-	Grounded or Vacant
9	NC	-	Grounded or Vacant

2.2. Package Outline



Remark: Immersion Gold PCB with half hole stamp edge and surface mounting technology (SMT) as defaulted.

For industrial control applications, it is necessary to increase the mechanical strength and isolate the space from the application motherboard through standard 2.54mm header. While 7pin and 3pin headers are used for welding.

The antenna output port is ① IPEX adapter and IPEX to SMA adapter cable; ② SMA female is used to connect standard rubber rod antenna or sucker antenna. You can design the interface according to your own product

Please request module packaging from our technical support: SMT packaging, DIP direct insert packaging (reference diagram)

Package file format description:

*.ASC format imported with Protel99se; *.DXF format imported with CAD; *.PCB format opened with PADS software;

DIP packaging

3. Working mode

The typical wireless transceiver coding is shown below

PREAMBLE (前导码)	SYNCWORD (同步码)	DATA + CRC with FEC (数据+ CRC 检错具有前向纠错)

The function of the preamble is to synchronize the target receiver clock with the transmitter. In normal mode, the length of the preamble is generally 8 symbol bits. For example, when working in the power saving mode, the preamble can also wake up the receiver. The transmitter must send a longer preamble to wake up the receiver in power saving mode and enter the normal working state. If the receiver is set to wake up every 1 second, then the receiver will wake up every 1 second to search for the preamble (tw), and the duration is generally less than 2 symbol bits. The transmitter first transmits the preamble for more than 1 second and then transmits the synchronization code after it, which means that during the wake-up period of the receiver, as long as the preamble is found in the channel, it can successfully detect and wake up reception under normal circumstances. The schematic diagram is shown in Figure 3.

DL-RTS1278M has four working modes: 1) normal mode; 2) wake-up mode; 3) power saving mode; 4) sleep mode. These four working modes are determined by the levels of SET_A and SET_B.

1) Normal mode (mode 1): SET_A = 0, SET_B = 0.

A) Transmitting: After the module RXD pin inputs the first byte, the module sets AUX low and starts to judge the level of SET_B. After the RXD pin receives the last byte, wait for another 2-3 Bytes time. If there is no data input, the module sets the AUX pin high and switches to the transmitting state, and then sends the preamble, synchronization code and data. After the transmission is completed, it switches to the corresponding state according to the levels of SET_A and SET_B.

In this mode, the module does not send a long preamble when sending data, so the receiver must be in mode 1 or mode 2, that is, continuous reception.

B) Receiving: The serial port is opened and the module is in a continuous receiving state. For example, after the module receives data from the current channel, after deinterleaving error correction and error detection to confirm that the data is correct, set AUX low and immediately output data from the serial port. Reset AUX high, after the serial port transmission is completed. Please refer to Figure 1 for the normal mode transceiver timing.

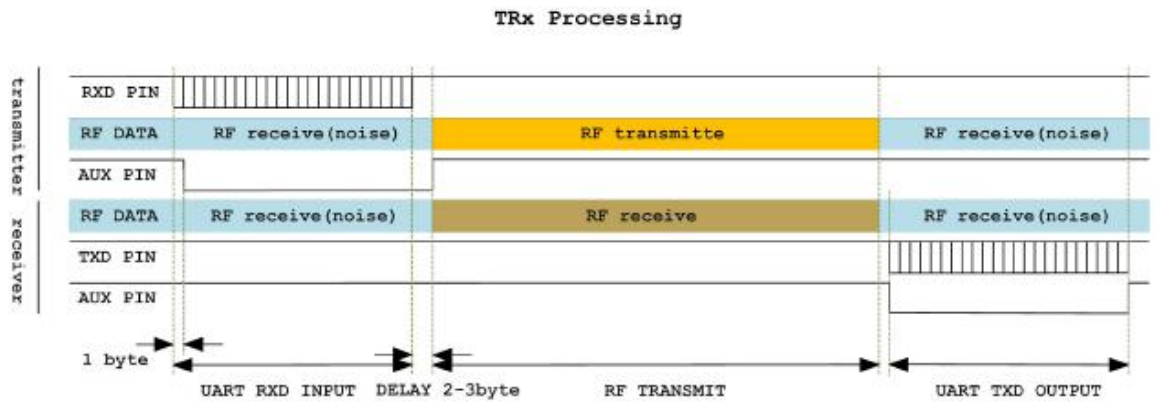


Figure 1 Sequence diagram in the Normal Mode

In some cases, the user needs to continuously transmit multiple packets with as little space as possible in the air. At this time, the AUX pin can be used. When the RXD pin receives data, the AUX pin will go low. When the transmission starts, the AUX will go high again. At this time, the user can Send the second packet of data through the RXD pin again, the module will not wait for 2-3Bytes after the first packet of data is sent wirelessly, but will send the data in the buffer immediately, as shown in Figure 2 as below:

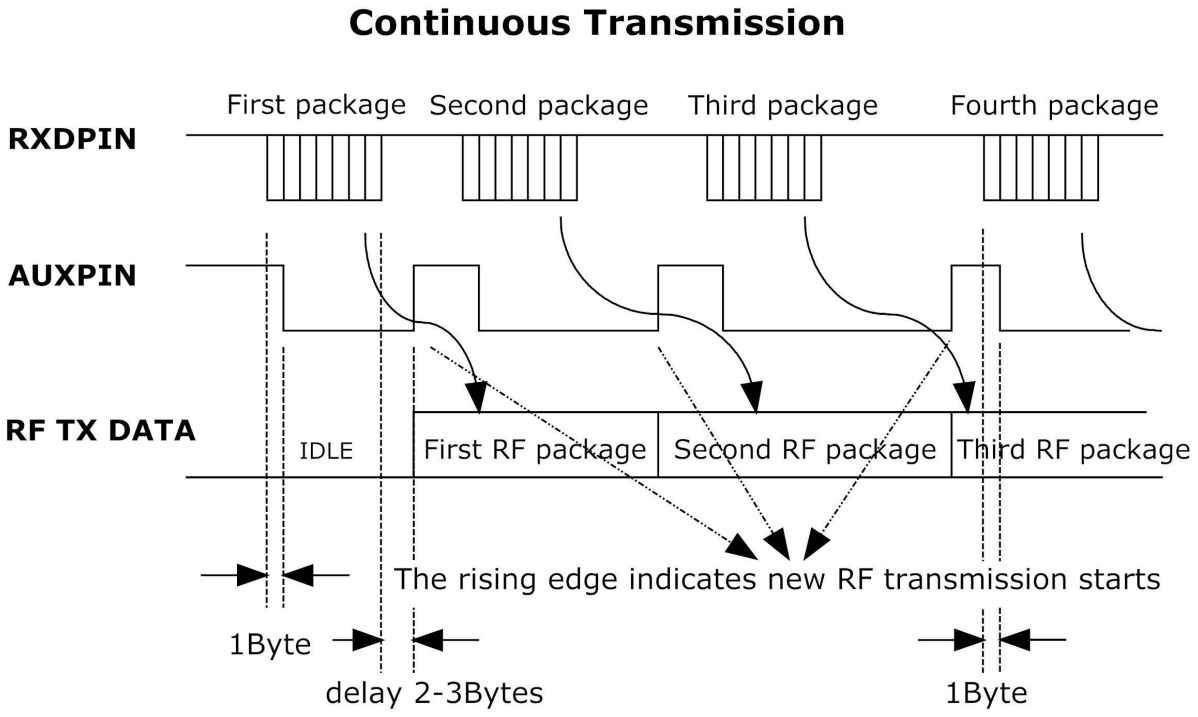


Figure 2: Sequence diagram of continuous multi-packet transmission in normal mode

2) Wake-up mode (mode 2): SET_A = 0, SET_B = 1.

A) Transmitting: After the module RXD pin inputs the first byte, the module sets AUX low and starts to judge the level of SET_B. After the RXD pin receives the last byte, wait for 2-3Bytes. If there is no data input, Then the module sets the AUX pin high and switches to the transmitting state, and then the length of the preamble is sent as a wake-up period (such as 1 second) plus the synchronization code, etc. After the transmission is completed, it turns to the corresponding state according to the level of SET_A and SET_B, and the schematic diagram of transmission See Figure 3.

In this mode, the module sends a longer preamble when sending data, so the receiver is in mode 1, mode 2 or mode 3 can receive data.

B) Receiving: The serial port is opened and the module is in a continuous receiving state. For example, after the module receives data from the current channel, after deinterleaving error correction and error detection to confirm that the data is correct, set AUX low and immediately output data from the serial port. Reset AUX high, after the serial port transmission is completed. The difference from mode 1 is that when the module receives in mode 2, it will add a byte of receive field strength (RSSI) at the end of the data every time a packet of data is received. For details, please refer to the application mode chapter.

3) Power saving mode (mode 3): SET_A = 1, SET_B = 0.

The serial port is in the closed state, the receiver turns on after a wake-up period (such as 1 second) and searches for the preamble in the channel. If not, it sleeps and waits for the next wake-up period before being awakened. If there is a preamble, it continues to receive. At the same time, monitor the preamble and wait for the synchronization code to arrive before receiving the data. After deinterleaving error correction and error detection to confirm that the data is correct, set AUX low to wake up the lower computer, wait for 5ms and then open the serial port and output the data. After the serial port output ends, close the serial port and set AUX high. If the mode setting is not changed, it will enter the immediate sleep state again and wait for the next wake-up cycle. The reception diagram of this mode is shown in Figure 3.

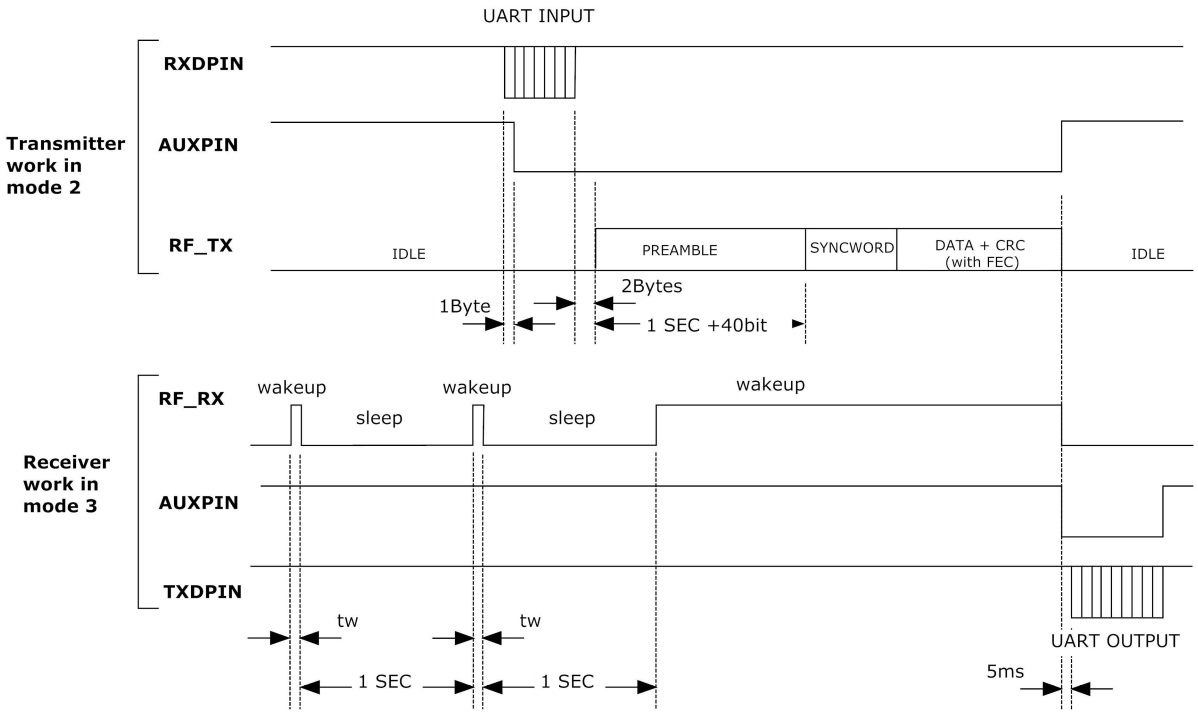


Figure 3: Schematic diagram of transmitting in mode 2 state and receiving in mode 3 state

4) Sleep mode (mode 4): SET_A=1, SET_B=1.

The serial port is closed, the external interface level is maintained, and the module is in a sleep state. In this mode, the module's radio frequency circuit, CPU main clock and peripherals are all closed by the software, but the watchdog and low-frequency clock are still working, and the CPU periodically wakes up for a very short time to clear the watchdog timer and check the module status. The average power consumption in this mode is only about 2.5uA.

In addition, the setting of the module is completed in sleep mode. For the specific process, see the chapter of parameter setting.

4. Application method:

The four modes of DL-RTS278M are converted by the high and low levels of SET_A and SET_B. The four modes can be converted at will. The connection diagram between the module and the lower computer is shown in Figure 5. The SET_A and SET_B of DL-RTS278M have weak pull-up resistors, but they cannot be Vacant during normal operation and must have a clear level, otherwise the

module may be unstable.

The user's host computer can be directly connected to the DL-RTS1278M, but it must be noted that the interface level must be close to the DL-RTS1278M. Generally, the error should not exceed ±0.3V, otherwise it will cause a large current sink or source. For example, the power supply of DL-RTS1278M is 3.3V, so the user's MCU power supply should be in the range of 3.0-3.6V.

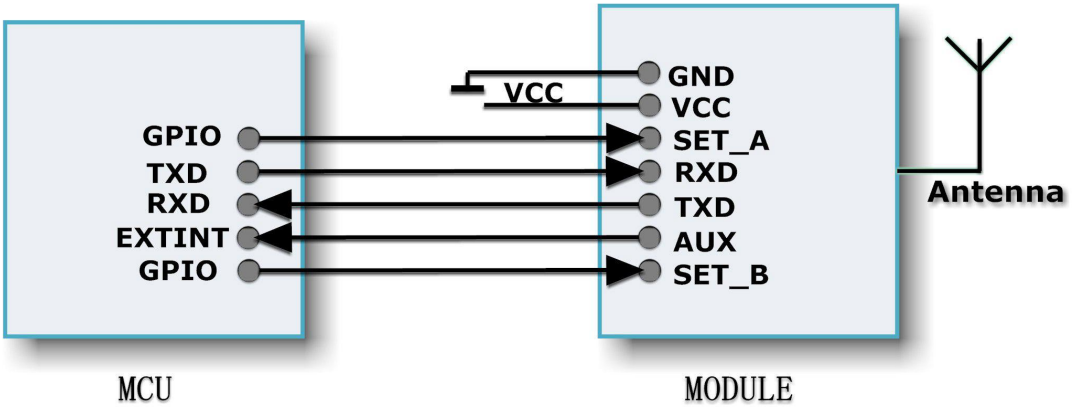


Figure 4: Connection diagram between the module and the MCU

The sleep mode of DL-RTS1278M is realized by software. The interface of the module maintains the corresponding level during sleep, and can quickly switch various states. It only takes 20uS from sleep to wake up, which means that the module is in sleep state. After low SET_A pin, it can input data to the module through UART port within 20uS.

It should be noted that during the receiving or sending process of the module, even if the module is set to mode 3 or 4, the module must execute the receiving or sending process before entering the power saving mode or sleep mode. Using this feature, when the module is in mode 3 or Module 4 status, the user sets low SET_A pin to wake up the module and input data through RXD. After the module receives the first byte, it immediately sets AUX low (see Figure 1), and judges the level of SET_B pin. If high, a longer preamble is sent to wake up the receiver of the other party before transmitting data, and a normal preamble is sent if it is low. If the user needs to put the module to sleep after transmission, after AUX is low, set the SET_A pin to sleep, instead of waiting for the module to send data wirelessly, the module will automatically detect the SET_A pin after the data is sent, and if it is high, it will immediately Go to sleep.

DL-RTS1278M has two 256Bytes buffers for sending and receiving. After receiving the data at the UART port, two conditions will prompt DL-RTS1278M to start sending data wirelessly:

1) After the RXD pin receives the data, wait for 2-3 bytes. No data is received. For example, with a serial port baud rate of 9600bps, the time for 2-3 bytes is about 2-3ms.

2) The data received by the RXD pin is larger than or equal to 99 bytes (users can customize the word Section length). At this time, DL-RTS1278M will immediately encode and send the 99 bytes of data in the receive buffer. At this time, the RXD pin can still receive serial data. After the 99-byte data is sent, if there is data in the receiving buffer, DL-RTS1278M will send the remaining data together no matter how much data there is.

As mentioned earlier, when DL-RTS1278M sends data, SET_A is low, and the level of SET_B determines whether to send a longer preamble to wake up the receiver of the other party.

During normal reception, SET_A is low, and the level of SET_B determines whether to output the field strength. If SET_B is low, the module receives normally; if SET_B is high, the module will increase one byte of field strength information, after each packet of data output:

$$RSSI\ [dBm] = -137 + RSSI\_value$$

It is important to note that DL-RTS1278M is sent in packets for larger data. If the receiving end outputs field strength, a field strength byte will be added after each small packet.

In a battery-powered circuit, the slave module (such as a water meter) can normally be set in mode 3. When the main module (such as a collector or a receiver) sends data in mode 2, the slave module wakes up and receives the data. Use the AUX pin to wake up the lower computer MCU, and then output the data. After the MCU receives the data, it can switch from the module to mode 1 to respond to the main module. If the master module receives the response, it can also be switched to mode 1. At this time, the master and slave modules are in normal mode, which can realize high-speed data transmission. If the main module receives the response, but there is no subsequent data exchange, the slave can switch to mode 3 in the power saving mode again, waiting for the next wake-up, and the main module can switch to the mode 4 sleep state.

Because power saving is achieved by periodically waking up from sleep and then waking up, the power consumption in the power-saving mode is related to the wake-up cycle and the time to search for the preamble (tw) of each wake-up, as well as the static power consumption of sleep. The user can set the wake-up period online from 50ms to 5s. The time of each search preamble is related to the rate of radio frequency transmission, and the rate of radio frequency transmission is also configurable. At a rate of 4.56Kbps, the average wake-up search preamble time is about 2.1 ms. The lifespan of the battery in power saving mode can be calculated by the following formula:

Lifespan =

$$\frac{\text{Battery capacity mAH}}{\text{(Search preamble time/(Wakeup period + Search preamble time))*Receive current + Sleep current}}$$

For example: the battery is 3.6V/3.6AH ER18505 lithium ion battery, DL-RTS1278M receives 13mA current and sleep current 2.5uA. The radio frequency transmission rate is 4.56Kbps, the wake-up period is 1SEC, then the battery life is:

$$\frac{3600\text{mAH}}{\text{(2.1ms/(1000ms+2.1ms))*13.0mA+ 0.0025mA}} \approx 121037\text{Hour} \approx 13.81\text{Year}$$

Taking into account the self-discharge of the battery, the capacity difference under different currents, the temperature and the sleep power consumption and normal use of the client MCU, a 3.6V/3.6AH ER18505 lithium ion battery has a service life of more than several years under normal conditions. It should be noted that although lithium sub-ion batteries have the advantages of relatively low self-discharge and large capacity, general lithium sub-ion batteries have passivation, which shows that the internal resistance will gradually increase under discharge at a small current, so it is necessary to make a super capacitor with low leakage current, such as 0.47F/5V, to be connected in parallel to reduce internal resistance and improve instant power supply capability.

The working mode of the power saving mode is very suitable for water and gas heat meter reading, data acquisition systems and other occasions that are not used too frequently but require long-term work with batteries.

5. Parameter Setting

DL-RTS1278M is quite flexible to use, and different options can be set according to your needs.

You can use the software RF_Config as below for developing and setting:

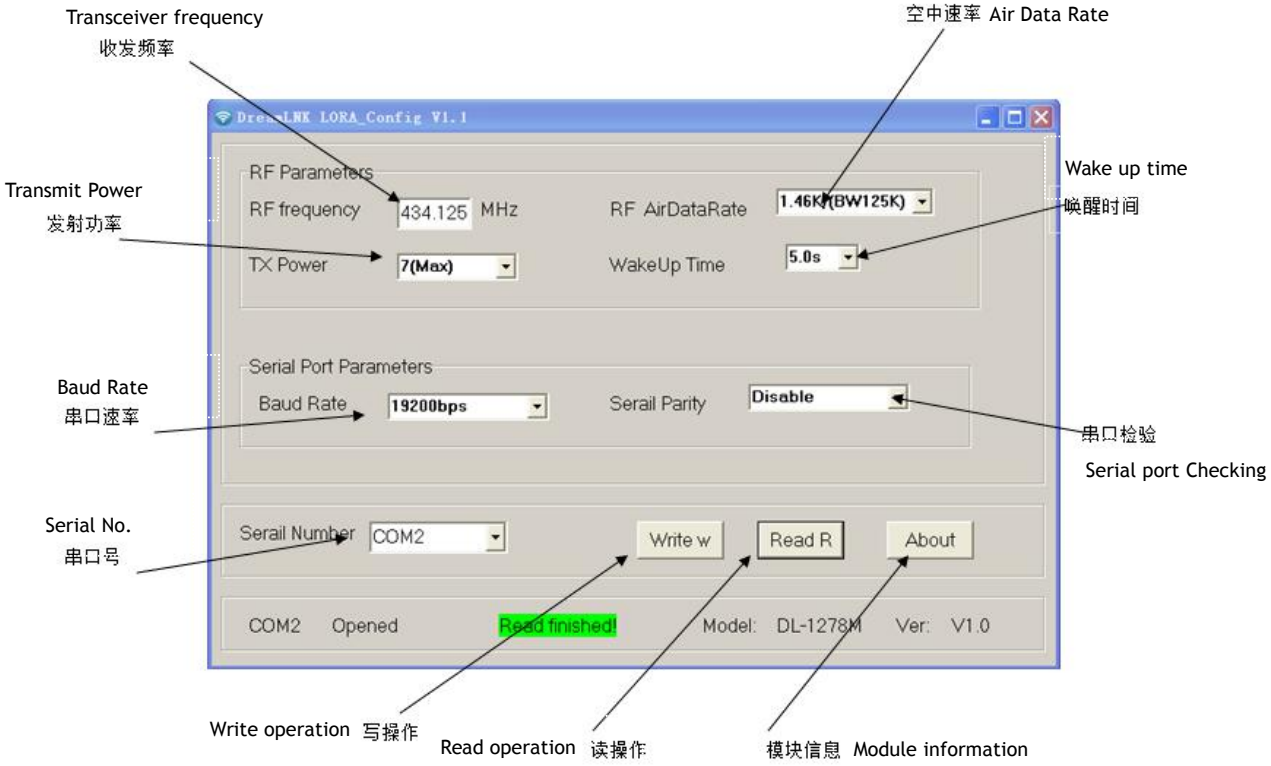


Figure 5 RF-Magic Software for Basic Parameter Configuration

You can set the serial port parameters, serial port validation, transmit and receive frequency, air rate, and output power. There are two ways of setting. First, the software RF-Magic developed by us to set the transceiver module is shown in Figure 5, which is modified by PC. The setting with RF-Magic software is done through the UART/TTL port of the module (4, 5PIN), so you must connect the UART to RS232 interface conversion board to the PC to complete the setting, or use the serial port conversion board or USB conversion board provided by us, see Figure 6.

The setting method is as follows:

1) First connect the communication cable, click RF_Config to open the software, and then turn on the module power, and finally insert the module into the test board. At this time, the status

bar of the software should display Found Device (searching module), then you can perform the corresponding read and write operations.

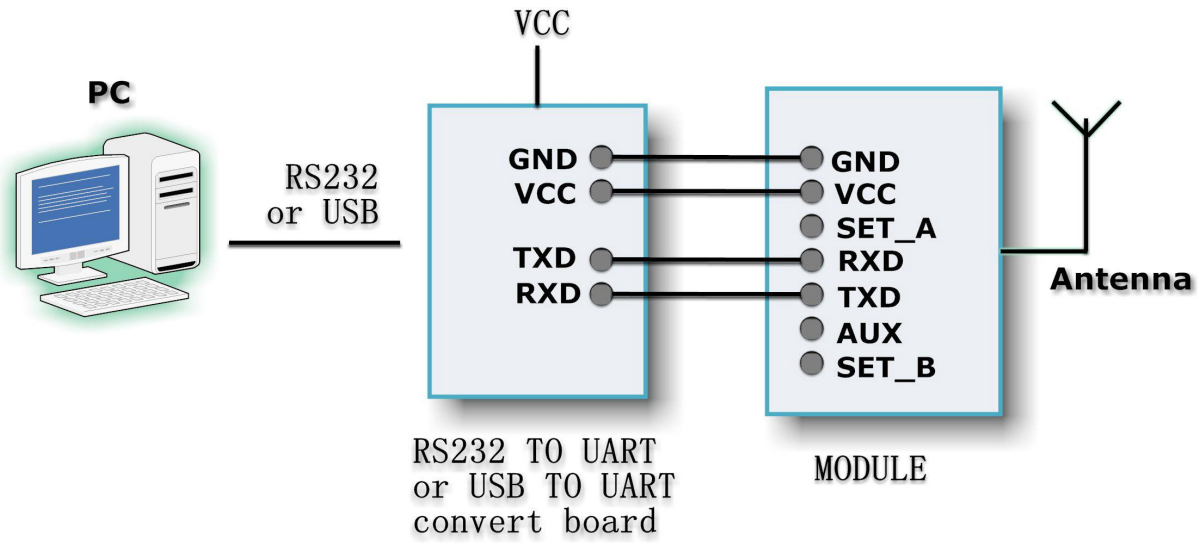


Figure 6. Schematic diagram of debugging connection to PC

Figure 7. Configuration Tools and Accessories

2) Modify online: Online software settings are also done through the module's UART / TTL port (4, 5PIN). When the module is powered on for 500ms, the module can work normally. When setting, you should first switch the other modes of the module (such as mode 1, 2, 3) to mode 4, and the module enters the sleep mode. After about 10ms, you can set it. When the serial port input port (RXD) enters the setting command, the module can be woken up again. At this time, regardless of the state of the UART port, the module automatically changes the UART port to 9600bps, which is invalid. If the setting command is correct, it will respond to the response

command. After that, the module will automatically reset and re-initialize. After 500ms, the module will run on the set parameters. If the input setting command is wrong, the module will not make any response, but it can still cause a reset and re-initialization. You can reset the module after the module sleeps for a long time or when it needs to be restarted.

The setting of DL-RTS1278M adopts HEX code, the baud rate is 9600, invalid check mode, there are two setting commands, the format is as follows:

1) Read setting commands: 0xFF, 0x56, 0xAE, 0x35, 0xA9, 0x55, 0xF0.

Response: 0x24, module model, version number, frequency, air rate, transmit power, serial port rate, serial port validation, wake-up time.

2) Write setting commands: 0xFF, 0x56, 0xAE, 0x35, 0xA9, 0x55, 0x90 frequency, air rate, transmit power, serial port rate, serial port validation, wake-up time

Response: 0x24, module model, version number, frequency, air rate, transmit power, serial port rate, serial port validation, wake-up time

The parameters are shown in HEX as below table:

Parameter	Bytes	Description
Module model	1	The model code of DL-RTS1278M is 14 in decimal, and the module model is solidified in FLASH and cannot be set
Version number	1	Current version, range 0-255, the version number is fixed in FLASH and cannot be set
Frequency	3	Unit KHz, such as 433.920MHz is expressed as 0x06, 0x9F, 0x00
Air rate	1	0.81K，1.46K，2.6K，4.56K，9.11K，18.23Kbps表示为0x00，0x01，0x02，0x03，0x04，0x05
Transmit power	1	0 to 7, expressed as 0x00 to 0x07. Transmit power increases 3dBm for each number increased. The maximum setting is 7, the transmit power is about 20dBm
Serial port rate	1	1200，2400，4800，9600，19200，38400，57600，115200bps expressed as 0x00，0x01，0x02，0x03，0x04，0x05，0x06，0x07
Serial port verification	1	0x00 is invalid verification, 0x01 is odd verification, 0x02 is even verification
Wake-up time	1	50ms，100ms，200ms，400ms，600ms，1s，1.5s，2s，2.5s，3s，4s，5s are expressed as 0x00 to 0x0b

Table 3 Module Parameter Setting Table

For example, set the module to the frequency of 433.92MHz, the air rate of 4.56K bps, the transmit power of 100mW, the serial port rate of 9600bps, invalid checking, and the wake-up time of 1S

Write setting as：0xFF，0x56，0xAE，0x35，0xA9，0x55，0x90，0x06，0x9F，0x00，0x03，0x07，0x03，0x00，0x05

Response: 0x24，0x0a，0x01，0x06，0x9F，0x00，0x03，0x07，0x03，0x00，0x05

6. Notice in Module Application:

Considering the complexity of over-the-air transmission and some characteristics inherent in wireless data transmission, the following issues should be considered:

1) Network application of DL-RTS1278M module

The communication channel of DL-RTS1278M is half-duplex, which can complete one-to-one and one-to-many communication.

These two methods need to set up a master station first, the rest are slave stations, and all stations must set up a unique address. The coordination of communication is controlled by the master station. The master station uses a data frame with an address code to send data or commands. All slave stations receive all and compare the received address code with the local address code. If the address is different, the data is discarded. No response, if the address code is the same, the received data will be transmitted. The network must ensure that at any instant, only one radio station in the same frequency communication network is in the sending state to avoid mutual interference.

Multiple channels can be set, so multiple networks can coexist in one area.

2) Data delay in wireless communication

Since the wireless communication transmitter receives a certain amount of data from the terminal device, or waits for a certain period of time without new data

before transmitting, there is a delay of tens to hundreds of milliseconds from the wireless communication transmitter to the wireless communication receiver (which is determined by the serial port rate, the air rate, and the size of the data packet). In addition, it takes a certain time from the wireless communication receiving end to the terminal device, but the delay time is fixed under the same conditions.

3) Error control

The DL-RTS1278M module has strong anti-interference ability, and it already contains powerful error correction and detection capabilities in the encoding. However, under extremely severe conditions or the field strength of the receiving place is already in the critical state of its reception, it is inevitable that there will be no reception or packet loss. At this time, you can increase the development of the link layer protocol of the system, such as adding sliding window and packet loss retransmission functions like TCP / IP, which can greatly improve the reliability and flexibility of the wireless network.

4) Application environment

The electromagnetic interference of the application environment will affect the actual distance of the remote control. Electromagnetic wave interference is divided into main board power supply interference, TFT screen data cable interference, Flash data exchange interference; and airborne carrier frequency interference, noise interference, high-power signal source interference, etc.;

Factors such as the size of the product, the internal space, and the plating of the shell will cause the attenuation of the wireless signal, which will affect the remote control distance. Usually the narrow internal space of the product is not conducive to the extension of the antenna. The outer shell should avoid metal or metal plating as much as possible. The antenna should be wounded along the inner wall of the outer shell.

5) Antenna selection

The antenna is an important part of the communication system, and its performance directly affects the indicators of the communication system. We must pay attention to its electrical performance, when we selecting an antenna, such as frequency bandwidth, gain, and whether its rated power can meet the system design requirements. The type of antenna is also important, we should make sure the selected antenna pattern meets the requirements of radio coverage in the system design;

7. Contact us

Shenzhen DreamLnk Technology Co., Ltd

★ Data collection, Smart home, Internet of Things applications, Wireless remote-control technology, Remote active RFID, Antennas ★

Office Add.: Room 603, Unit C, Zone A, Huameiju Business Center, Xinhu Rd., Bao'an District, Shenzhen, Guangdong Province, China

Factory Add.: 5th Floor, Building B, Huazhi Innovation Valley, No. 7 Yuhua Street, 138 Industrial Zone, Tangxia Town, Dongguan, Guangdong Province, China

TEL.: +86-755-29369047 **FAX**: +86-755-27844601

Mobile: +86 13760215716 **Wechat**: wsj_james

E-mail: james@dreamlnk.com **Web**: www.iot-rf.com