- LoRa Spread Spectrum Mesh Self-Networking
- Listen Before Talk AES128 Encryption
- TTL/RS232/RS485 Multi-Level Interface

Product Specification

Catalogue

Note: Revision History

Revision	Date	Comment
V1.0	2023-11	First release
V1.1	2025-2	Frequency band modified
V1.2	2025-8	Update product description
V1.3	2026-7	Update Power level

1. Overview

The LoRaII module is the latest series of upgraded network wireless communication modules launched by Think for Wireless. It utilizes advanced LoRa spread spectrum frequency hopping technology. With its efficient receiving sensitivity, it greatly surpasses current FSK and GFSK products in terms of penetration capability and communication distance, and exhibits stronger anti-interference properties.

To cater to different customer needs, we have designed the firmware of this series of modules in a multi-functional, selectable manner. Users can switch between different working modes through PC software. In MESH mode, the routing modules have an automatic routing function, allowing users to form a network transmission with no blind spots or distance limitations by combining multiple modules. Additionally, users can encrypt wireless data with AES128 through PC software or serial port commands, ensuring more secure data transmission.

The LoRa611II-DZ module is designed with a 160mW output power and a compact embedded design, finding widespread application in industries requiring wireless remote transmission control.

The LoRa611II-DZ strictly follows lead-free manufacturing and testing processes, complying with RoHS and Reach standards.

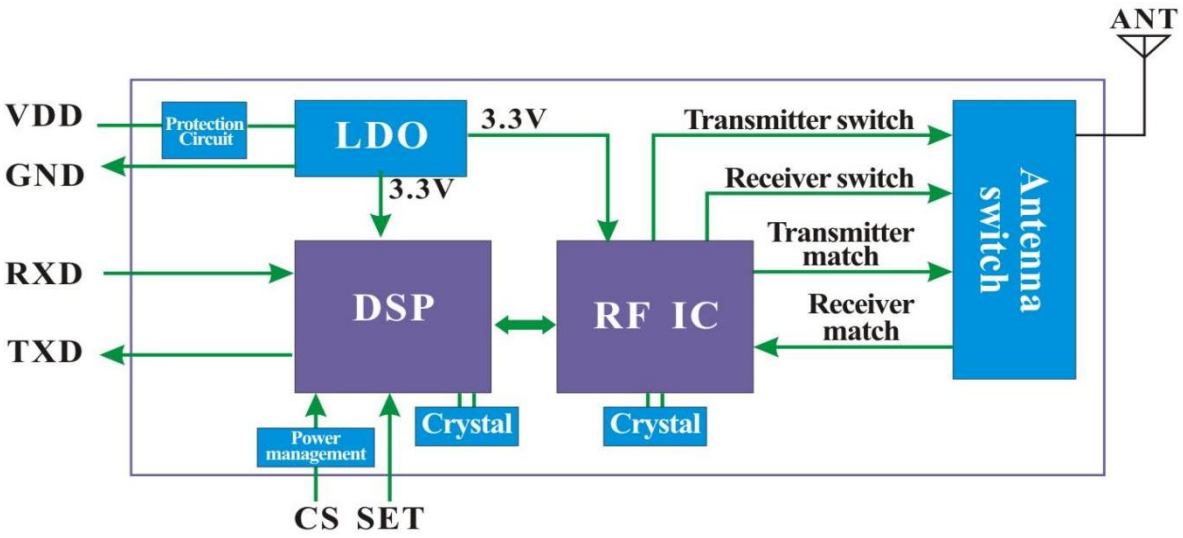
2. Features

- AES128 Data Encryption Method
- No Blind Spots, No Distance Limitations
- Single Module Open Field Transmission
- Distance 5Km @ Low Rate
- Operating Frequency Band: 433/470/868/915 MHz Options
- 40 Communication Channels in the Same Frequency Band
- Diverse Serial Port Parameter Settings
- Operating Voltage Range: 3.3 ~ 5.5V
- Selectable Hop Count in MESH Mode
- LBT (Listen Before Talk) Function Optional
- Node/Router/Node+Router Selection in MESH Mode
- Built-in Hardware Reset Protection Circuit
- LoRa Modulation Mode, TTL Level
- Sensitivity: -129 dBm @1.3Kbps
- Maximum Output Power: 160 mW (+22dBm)
- Operating Temperature Range: -40 ~ +85 ℃
- Optional CRC Verification

3. Applications

- Wireless Remote Control
- Remote Meter Reading
- Industrial Data Acquisition
- Home Automation Telemetry
- Wireless Data Communication
- Access Control Systems

4. Internal Block Diagram



5. Performance Parameters

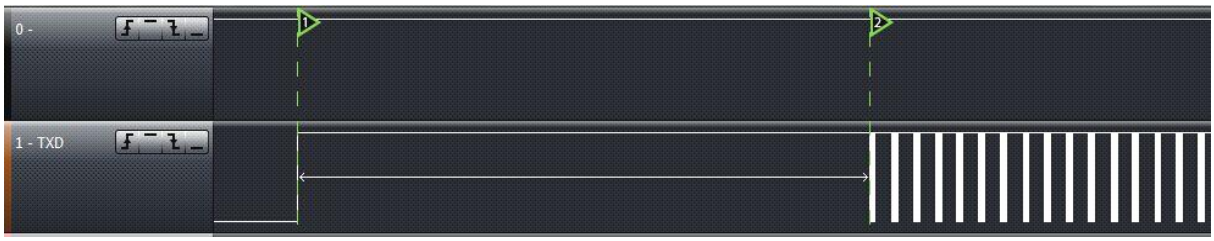
Parameter	Min	Typ	Max	Unit	Conditions
Operating Conditions					
Operating Voltage Range	3.3	5.0	5.5	V	
Operating Temperature Range	-40	25	+85	℃	
Current Consumption					
Receiving Current		< 9		mA	TTL/RS232 level
		< 13		mA	RS485 level
Transmitting Current		< 110		mA	
Sleep Current		< 220		uA	TTL/RS232 level
RF Parameters					
Frequency Range (Different Specifications)	414.92	433.92	453.92	MHz	@433MHz
	470.92	489.92	509.92	MHz	@470MHz
	849.92	868.92	888.92	MHz	@868MHz
	895.92	914.92	934.92	MHz	@915MHz
Modulation Rate	1312		62500	bps	@LoRa
Transmission Power Range	1		+22	dBm	Software 7-level adjustable
Receiving Sensitivity		-129		dBm	@1.3Kbps

★ **Note**: If lower sleep power consumption is required, please contact our company to switch to a version with a sleep current of 5uA or 15uA.

6. Product Functional Description

1) Power-on Reset Self-Test:

When the module is first powered on and reset, the module's transmission and reception indicator lights will self-test by flashing three times (if the power light does not turn on, consider whether the module is damaged). The reset time is about 2 seconds, as shown in the following figure.



Note: If there is no need for this self-test to shorten the reset time, please contact our company for custom modifications to the program version.

2) Operating Modes:

The upgraded LoRa Pro series is compatible with all previous versions of our company's LoRa data transmission. Users can configure the module to the required operating mode based on their application needs using PC software. Below is a simple comparison between a few versions.

Model	Features	Maximum Bytes per Packet	Transmission Delay Time under Same Conditions	Encryption	Routing	LBT	Interoperability
Lola Basic Series	Transparent transmission module, No networking or encryption	200	Fastest	Simple Encryption	Not Supported	Not Supported	LoRa, LoRa_AES, LoRa_MESH not interoperable, LoRa II can be configured to interoperate separately with these three models
LoRa_AES Encryption Series	Module internally processes data with AES encryption	62	Slowest	AES	Not Supported	Not Supported	
LoRa_MESH Networking Series	Multiple modules can form a routed network for insufficient distances	150	Faster	Simple Encryption	Supported	Not Supported	
LoRa II Upgraded Series	Integration of the above three models' features, switchable via configuration software, supports AES encryption in MESH mode	227	Depends on Configuration	Optional	Supported	Supported	

Why is there a difference in wireless transmission time between different versions? We explain the delay time as follows:

LoRa Series: Based on the most basic transmission under LoRa modulation mode, in addition to the data content, it also needs to add: preamble, sync word, checksum, CRC, and other packet structure processing.

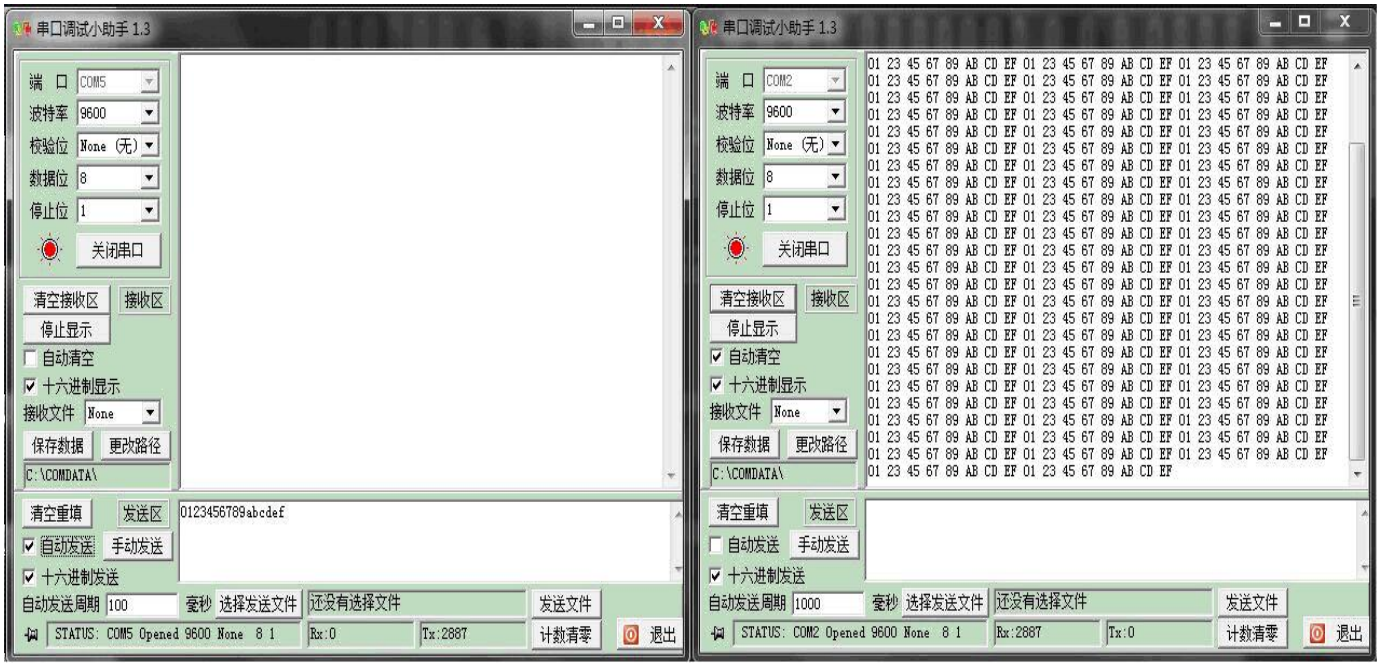
LoRa_AES Series: On top of the basic content mentioned above, an additional AES encryption part is included.

LoRa_MESH Series: Adds Mesh functionality to the LoRa series.

LoRa_II Series: Can be configured into the above three types, so the delay time will depend on the settings.

3) Non MESH Data Transmission Mode:

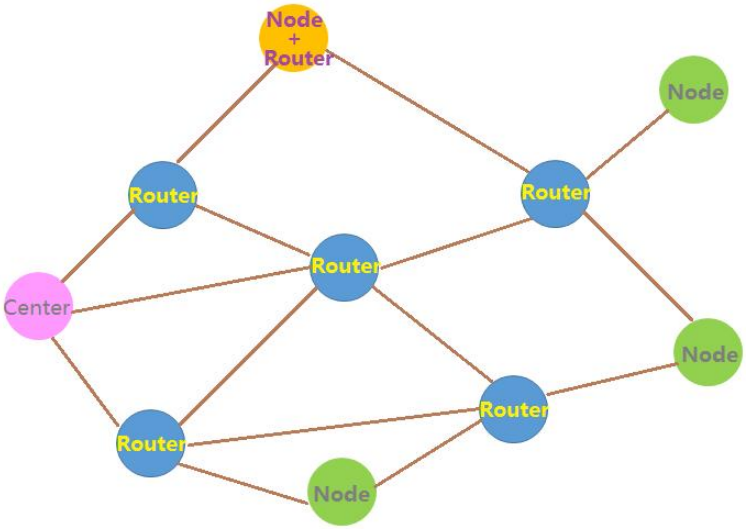
Parameter configuration under Non MESH working mode: Working Mode = Non MESH In this mode, after power-on reset (@ the CS and SET pins of the module are either left unconnected or pulled high), the module enters a ready-to-communicate state, where both the serial port and RF parts are in receive mode. When the serial port receives data at the correct baud rate, the module will automatically package the data received from the serial port and transmit it through the wireless circuit (this data packet has already been encrypted with simple encryption), at which point the red indicator light will flash. When the other module's wireless circuit receives the entire data packet, the blue indicator light will flash, and the module will unpack the air data and output it through the serial port (this data is decrypted, and is the original data transmitted by the serial port), making it a transparent transmission application between point-to-point and point-to-multipoint. The module itself uses a transparent transmission mechanism without any additional protocols, allowing users to conveniently send and receive data via the serial port. By using a USB converter board, the module can be directly connected to the PC side, using a serial port assistant to simulate the data transmission process, as shown in the figure below:



4) MESH Networking Transmission Mode

Parameter configuration under MESH networking mode: Working Mode = MESH Mode = “Node” or “Router” or “Node & Router”

In MESH mode, modules can be configured as nodes and routers to form an overall MESH network, achieving point-to-point and point-to-multipoint transmission. Modules set as Node mode function similarly to standard communication endpoint modules, while those set as Router mode will forward data within the same network, addressing the issue of insufficient single point-to-point transmission distance often encountered in practical applications. The number of routing hops can be configured as needed.



The module's default number of forwarding hops is unlimited to ensure that data is transmitted to every node in the network as much as possible, and the module's internal algorithm can prevent the nodes from outputting duplicate data. However, in a network with too many routes, multiple route data transmissions may cause wireless signal pollution in the environment. Therefore, when the transmission path is determined, users can set the number of hops as needed to limit the number of forwarding times. If the number of forwarding times of a data packet received by a router exceeds the set number of hops, the router will no longer forward that data packet.

Note:

- In the same MESH network, all modules including nodes, routers, and node + routers need to have different NODE IDs set.
- When hop=0, the number of hops is not limited. When Hop=n, the data packet can be forwarded a maximum of n times. When HOP>0, the number of hops set in modules within the same MESH network can be different.
- Modules with hop=0 cannot communicate with modules where hop>0.
- To communicate with older versions that do not have the hop count feature, set hop to 0.

5) MAES128 Data Encryption Transmission Mode

In the process of wireless communication, in addition to its own data encryption functionality, modules can additionally enable AES128 encryption. Users can freely read or change the module's AES128 key through PC software. Enabling AES128 encryption mode slightly increases the wireless transmission delay, but it offers the best protection for air data. Customers with high encryption requirements for transmitted data can enable the AES128 encryption functionality of the module.

6) LBT Function (Listen Before Talk)

When multiple transmitters are working at the same time, to ensure that they do not interfere with each other, the module checks if other transmitters are broadcasting in the environment before transmitting. If other transmitters are broadcasting, the module will temporarily not transmit until the other transmitters stop.

Special Note: Due to the limited internal data buffer of the module (200 bytes), if the channel remains busy and the serial port continues to transmit data to the module, the data will be overwritten.

7) Sleep State：

When the CS pin of the module is set high, the module enters sleep mode. In this state, it cannot perform parameter settings or data transmission. The module has the lowest power consumption in this state, with current reaching the micro ampere (uA) level.

8) CRC Verification

The module has activated the internal CRC verification of the wireless chip. For wireless data, the module also has a verification mechanism. However, it has been observed in practice that under extremely adverse conditions, interfered wireless data may bypass the above verifications, leading to the module outputting incorrect data. Therefore, the module provides a CRC verification function for users to utilize under these conditions.

Note: The CRC configurations of the communicating modules must be consistent.

7. Data Transmission Overview

To ensure the stability and accuracy of wireless data transmission, the following points should be noted during use:

1) Wireless Transmission Matching

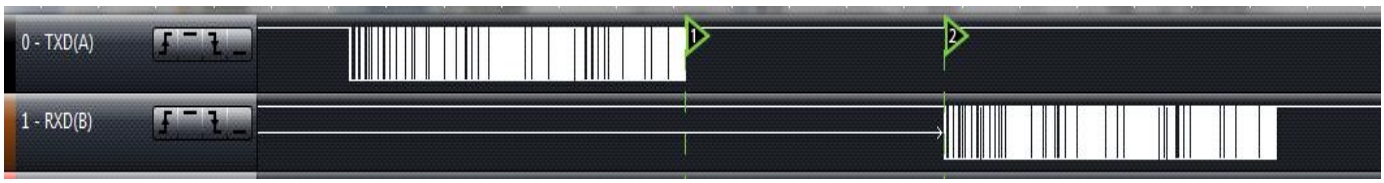
For RF modules:

In the same network to ensure normal communication, the frequency band, channel, RF rate, and AES key must all be set identically. If any one of these is different, the modules will not be able to communicate with each other. Additionally, the serial port parameters of the module must also be consistent with the serial port parameters of the device end, otherwise communication will not be possible.

Note: The default factory settings of our company are: serial port baud rate 9600bps, data bit 8 bits, stop bit 1 bit, no parity bit.

2) Delay in Data Transmission in Wireless Communication

In wireless communication, the transmitter starts transmitting only after receiving a certain amount of data from the terminal device, or after waiting a certain period without new data. The air transmission of data from the wireless transmitter to the wireless receiver also takes time. Therefore, there is a certain delay in data transmission from the transmitter to the receiver. Under the same conditions, this delay time is fixed (determined by the serial port rate, air rate, and the size of the transmitted data packet). The approximate relationship also depends on the chosen operating mode, as shown in the following table.



@ Non MESH Data Transmission Mode：

- **Non MESH Data Transmission Mode**

RF Communication Rate (bps)	1312	2375	1557	2932	4750	9501	17353	37500	62500
1 Byte Transmission Time (ms)	132	69	113	59	37	22	13	10	8
227 Bytes Transmission Time (ms)	1447	840	1141	646	425	220	134	61	40

- **AES Encryption Transmission Mode**

RF Communication Rate (bps)	1312	2375	1557	2932	4750	9501	17353	37500	62500
1 Byte Transmission Time (ms)	154	140	204	130	87	61	50	42	39
227 Bytes Transmission Time (ms)	1488	1320	1641	1116	884	666	577	500	481

- **MESH Networking Transmission Mode**

RF Communication Rate (bps)	1312	2375	1557	2932	4750	9501	17353	37500	62500
1 Byte Transmission Time (ms)	154	90	133	80	48	27	18	11	9
227 Bytes Transmission Time (ms)	1488	862	1820	657	436	223	137	63	41

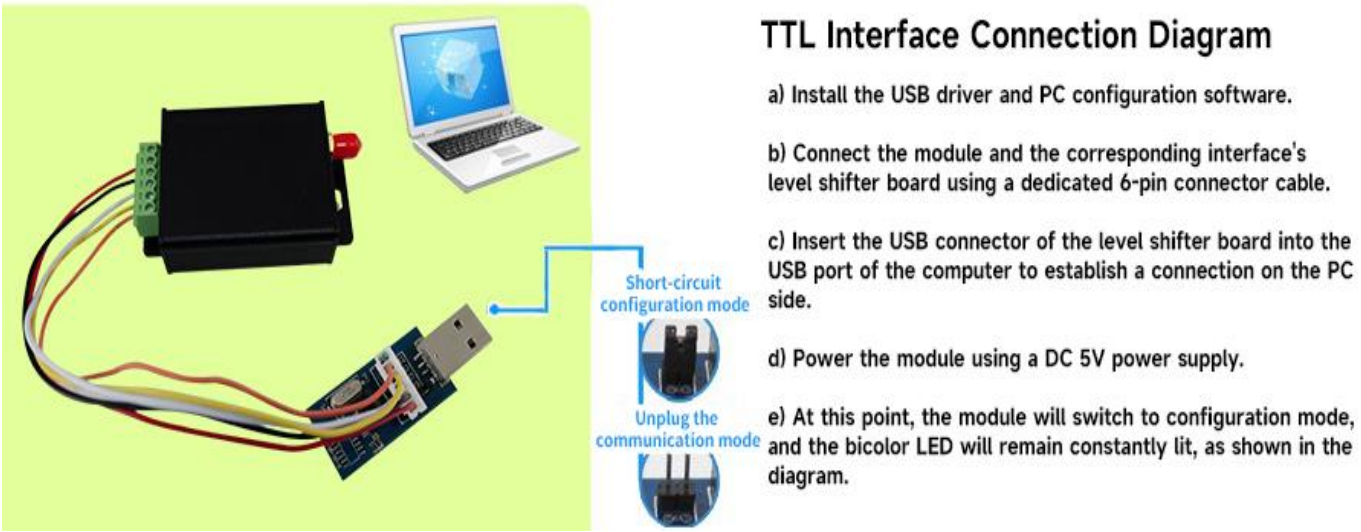
Note: If using the LBT (Listen Before Talk) feature, the transmission time will be longer than the above times, as additional random delays are introduced due to the LBT function.

3) Data Flow

The module has an internal data buffer and can send up to 227 bytes of data in a single transmission. LoRa communication can opt for a lower transmission rate to achieve longer communication distances. If the serial port transmission rate is too high compared to the slower wireless speed when sending large data packets, data loss may occur. Users can split the data into packets for transmission and ensure that the interval between serial port transmissions is greater than the current RF transmission time. Sending data from the serial port too quickly in succession may lead to data overflow and packet loss. When the length of data sent from the serial port exceeds the maximum bytes per packet, users need to split the data into packets for transmission and ensure that the interval between serial port transmissions is greater than the current RF transmission time.

8. Parameter Configuration

In the normal working state, pulling down the SET pin (or shorting it to ground) can switch the module to parameter configuration mode. When the user is connected to a USB converter board, simply short the jumper cap on it to enter configuration mode. In this mode, the module's red and blue transmission and reception indicator lights will remain on continuously, as shown in the following figure:



In configuration mode, users can configure the module's parameters through PC software. After opening the PC software, click to open the corresponding COM port (which can be checked in Device Manager), and the PC will read the parameters of the connected module and display the corresponding model and version information in the window. At the same time, the message 'Device Found!' will be shown in the status bar at the bottom. When the device is unplugged or there is no response, the status bar at the bottom will display the message 'Device Not Found!', and the product information box above will turn gray and become inactive. The PC interface when the module is successfully connected is as shown in the following figure.

After the module is properly connected, it enters a state of 'configurable parameters'. Users can modify the module's related parameters through the PC interface, such as: operating frequency band, transmission and reception channels, air communication rate, transmission power; serial port baud rate, data bits, stop bits, parity bits; NET ID, NODE ID, key, etc. Then, by clicking the【SET】button, the module can be configured. After each successful parameter change, a 'OK' message will be sent back. The PC software should display a success prompt dialog box upon receiving the OK response; otherwise, it will display 'ERROR', indicating an operation error in a dialog box. If there is no response within 0.5 seconds after the PC sends a command, a communication error is assumed to have occurred, and an operation error dialog box should be displayed. The parameters set in this manner are saved even after power is lost. When the user clicks the

【READ】button, the module will return all the current parameter information of the module. Clicking the 【DEFAULT】button, will reset the module's parameters to factory default values.

The serial port and wireless-related parameters in the above-mentioned PC interface are the factory default values.)

In addition to the PC side, users can also read or modify the module's related parameters online through the UART interface. The serial port configuration commands must follow the protocol below:

Serial port baud rate = 9600 bps, Data bits = 8 Bits, Stop bits = 1 Bit, Parity bit = None

The format for configuration commands is: AA FA + Command + [Parameter]

The command is 1 byte, and the parameter is either 0 or HEX data.

All return values end with '\r\n'"

- **Command [AA]:**

Read the product model and version number of the module; this does not require [Parameters]. Configuration command: AA FA AA Return value: "LoRa611-DZ_VER3.0\r\n"

- **Command [01]:**

Read the current settings of the module; this does not require [Parameters]. Configuration command: AA FA 01 Return values in sequence: Transmission and Reception Channel — Operating Frequency Band — Air Communication Rate — Transmission Power — Serial Port Baud Rate — Serial Port Data Bits — Serial Port Stop Bits — Serial Port Parity Bit — NET ID — NODE ID — MESH — NODE — AES — Key\r\n

- **Command [02]:**

Restore module to factory default settings; this does not require [Parameters]. Configuration command: AA FA 02 Return command: "OK\r\n" or "ERROR\r\n" Default settings: Reception/Transmission Working Frequency = 433.92 MHz, Reception/Transmission Rate = 656 bps, Transmission Power = Level 7 (highest), Serial Port Baud Rate = 9600 bps, Serial Port Data Bits = 8 Bits, Serial Port Stop Bits = 1 Bit, Serial Port Parity Bit = None, NET ID = 00 00 00 00, NODE ID = 00 00, MESH = 00, NODE = 00, AES = 00, Key = 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00, LBT Enable = 0

- **Command [03]:**

Parameter setting command, carrying [Parameters] of 33 bytes in the following order: Transmission and Reception Channel — Operating Frequency Band — Air Communication Rate — Transmission Power — Serial Port Baud Rate — Serial Port Data Bits — Serial Port Stop Bits — Serial Port Parity Bit — NET ID — NODE ID — MESH — NODE — Key Type — 16-byte Key Configuration command: AA FA 03 XX XX XX XX XX XX …… XX XX XX XX XX XX XX XX XX XX Return command: "OK\r\n" or "ERROR\r\n"

1) **Channel: RF Frequency:**

Each frequency band is divided into 40 channels, with each adjacent channel differing by 1MHz. The specific corresponding frequencies are as shown in the table below:

Frequency Band	Channel	1	2	3	4	5	6	7	8	9	10
433	Frequency Band(MHz)	414.92	415.92	416.92	417.92	418.92	419.92	420.92	421.92	422.92	423.92
	Channel	11	12	13	14	15	16	17	18	19	20
	Frequency Band(MHz)	424.92	425.92	426.92	427.92	428.92	429.92	430.92	431.92	432.92	433.92
	Channel	21	22	23	24	25	26	27	28	29	30
	Frequency Band(MHz)	434.92	435.92	436.92	437.92	438.92	439.92	440.92	441.92	442.92	443.92
	Channel	31	32	33	34	35	36	37	38	39	40
	Frequency Band(MHz)	444.92	445.92	446.92	447.92	448.92	449.92	450.92	451.92	452.92	453.92
Frequency Band	Channel	1	2	3	4	5	6	7	8	9	10
470 490	Frequency Band(MHz)	470.92	471.92	472.92	473.92	474.92	475.92	476.92	477.92	478.92	479.92
	Channel	11	12	13	14	15	16	17	18	19	20
	Frequency Band(MHz)	480.92	481.92	482.92	483.92	484.92	485.92	486.92	487.92	488.92	489.92
	Channel	21	22	23	24	25	26	27	28	29	30
	Frequency Band(MHz)	490.92	491.92	492.92	493.92	494.92	495.92	496.92	497.92	498.92	499.92
	Channel	31	32	33	34	35	36	37	38	39	40
	Frequency Band(MHz)	500.92	501.92	502.92	503.92	504.92	505.92	506.92	507.92	508.92	509.92
Frequency Band	Channel	1	2	3	4	5	6	7	8	9	10
868	Frequency Band(MHz)	849.92	850.92	851.92	852.92	853.92	854.92	855.92	856.92	857.92	858.92
	Channel	11	12	13	14	15	16	17	18	19	20
	Frequency Band(MHz)	859.92	860.92	861.92	862.92	863.92	864.92	865.92	866.92	867.92	868.92
	Channel	21	22	23	24	25	26	27	28	29	30
	Frequency Band(MHz)	869.92	870.92	871.92	872.92	873.92	874.92	875.92	876.92	877.92	878.92
	Channel	31	32	33	34	35	36	37	38	39	40
	Frequency Band(MHz)	879.92	880.92	881.92	882.92	883.92	884.92	885.92	886.92	887.92	888.92
Frequency Band	Channel	1	2	3	4	5	6	7	8	9	10
915	Frequency Band(MHz)	895.92	896.92	897.92	898.92	899.92	900.92	901.92	902.92	903.92	904.92
	Channel	11	12	13	14	15	16	17	18	19	20
	Frequency Band(MHz)	905.92	906.92	907.92	908.92	909.92	910.92	911.92	912.92	913.92	914.92
	Channel	21	22	23	24	25	26	27	28	29	30
	Frequency Band(MHz)	915.92	916.92	917.92	918.92	919.92	920.92	921.92	922.92	923.92	924.92
	Channel	31	32	33	34	35	36	37	38	39	40
	Frequency Band(MHz)	925.92	926.92	927.92	928.92	929.92	930.92	931.92	932.92	933.92	934.92

Each frequency band is divided into 40 channels, with each adjacent channel differing by 1MHz. The specific corresponding frequencies are as shown in the table below:

2) Working Frequency Band:

RF Frequency Center Point There are a total of 4 working frequency bands, as shown in the table below:

Parameters	01	02	03	04
Frequency Band	433 MHz	470 MHz	868 MHz	915 MHz
	414.92 ~ 453.92	470.92 ~ 509.92	849.92 ~ 888.92	895.92 ~ 934.92

Note: Different frequency bands require different matching networks and antennas. To ensure the communication performance of the module, the center frequency should not be changed arbitrarily.

3) Wireless Transmission Rate: The transmission speed of RF data

Set the wireless transmission rate, [parameter] occupies 1 byte.

Setting Range: 1312, 2375, 1557, 2932, 4750, 9501, 17353, 37500, 62500bps.

Parameters	3	4	5	6	7	8	9	10	11
Bit Rate (bps)	1312	2375	1557	2932	4750	9501	17353	37500	62500

4) Transmit Power:

This parameter affects communication distance (higher power results in greater communication range for the module). Set the transmit power, [parameter] occupies 1 byte.

Setting Range: Levels 0 to 7.

Power Level	0	1	2	3	4	5	6	7
Transmit Power	1.5dBm	4.5dBm	7.4dBm	10.3dBm	13.1dBm	15.7dBm	18.7dBm	21.3dBm

5) Transmit Power:

Serial Port Baud Rate Set the transmission rate of the serial interface, [parameter] occupies 1 byte.

Setting Range: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 76800, 115200 bps.

Parameter	0	1	2	3	4	5	6	7	8	9
Rate (bps)	1200	2400	4800	9600	14400	19200	38400	57600	76800	115200

6) Serial Port Data Bits

Set the data bits of the serial port, [parameter] occupies 1 byte.

Setting Range: 7 bits, 8 bits, 9 bits.

Parameter	1	2	3
Data Bits	7 bits	8 bits	9 bits

7) Serial Port Stop Bits

Set the stop bits of the serial port, [parameter] occupies 1 byte.

Setting Range: 1 bit, 2 bits.

Parameter	1	2
Stop Bits	1 bit	2bit

8) Serial Port Parity Bit

Set the parity bit (odd or even) of the serial port, [parameter] is 1 byte.

Setting Range: No, Odd, Even.

Parameter	1	2	3
Parity Check	No	Odd	Even

9) NET ID

Set the network ID of RF data packets, [parameter] is 4 bytes. The modules must have consistent NET IDs to communicate.

Setting Range: 00 00 00 00 ~ FF FF FF FF

10) NODE ID

In MESH mode, ensure that each module in the network has a unique NODE ID, otherwise communication will not be possible. Set the node ID of RF data packets, [parameter] is 2 bytes.

Setting Range: 00 00 ~ FF FF

11) Operating Mode:

Normal operating mode or MESH networking mode, [parameter] is 1 byte.

Setting Range: 00 01

Parameter	0	1
Operating Mode	Non MESH	MESH

Note: Modules with MESH networking function turned off and modules with MESH networking function turned on cannot communicate. To ensure communication, the MESH networking function configuration within the same network should be consistent.

12) Mode Selection:

Set the operating mode under MESH mode. This option is only effective when MESH networking function is enabled. [Parameter] is 1 byte.

Setting Range: 0~2.

Parameter	0	1	3
Operating Mode	Node	Router	Router + Node

13) Encryption Selection:

Configure whether to enable AES encryption, where [parameter] is 1 byte.

Configuration range: 00 01.

Parameter	0	1
AES Encryption	OFF	ON

14) Encryption Key:

Configure the wireless data encryption key, where [parameter] is 16 bytes.

Configuration range: 0 ~ FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Factory default value: 000102030405060708090A0B0C0D0E0F

- **Command [04]:**

When the module switches to configuration mode, RF will continuously monitor the surrounding signal strength. Users can obtain the module's current real-time signal strength by sending the corresponding command via the serial port.

Read command: AA FA 04 Response: Real-time Signal Strength\r\n (Displayed as characters, range 000~255) For example: "-032\r\n" indicates that the current signal strength value is -32dBm.

- **Command [05]:**

Read the current LBT (Listen Before Talk) parameters of the module. This command does not require any additional parameters.

Configuration command: AA FA 05

Response: LBT Enable\r\n For example, if the response is "01\r\n", it indicates that the idle detection is enabled.

- **Command [06]:**

Parameter configuration command with [parameter] as 1 byte, where the parameter is "idle detection enable."

Configuration command: AA FA 06 XX Response: "OK\r\n" or "ERROR\r\n"

For example, to enable LBT (Listen Before Talk), send the following hexadecimal command: AA FA 06 01

LBT Enable" means enabling Listen Before Talk (LBT) for idle detection.

The parameter for this command is 1 byte, and it has a configuration range of 0 to 1. To enable LBT, you would set the parameter to 1, and to disable it, you would set the parameter to 0. This command is used to configure whether LBT is enabled or disabled for idle detection.

Parameter	0	1
Listen Before Talk (LBT)	OFF	ON

- **Command [07]:**

Read the current setting of hops for the module. This command does not require any additional parameters.

Configuration command: AA FA 07 Response: Hops\r\n

For example, if the response is "02\r\n," it indicates that the hops are set to 2.

- **Command [08]:**

This is a command to set the hop count, where the [parameter] is 1 byte, and the parameter is "forwarding hops."

Configuration command: AA FA 08 XX Response: "OK\r\n" or "ERROR\r\n"

For example, to set the forwarding hops to 2, you would send the following hexadecimal command: AA FA 08 02 Forwarding hops: The [parameter] is 1 byte.

Configuration range: 0 to 16.

- **Command [09]:**

Read the current CRC (Cyclic Redundancy Check) enable parameter of the module. This command does not require any additional parameters.

Configuration command: AA FA 09 Response: CRC Enable\r\n

For example, if the response is "01\r\n," it indicates that the CRC functionality is enabled.

- **Command [0A]:**

This is a command to set the CRC (Cyclic Redundancy Check) enable parameter, where the [parameter] is 1 byte, and the parameter is "CRC Enable."

Configuration command: AA FA 0A XX Response: "OK\r\n" or "ERROR\r\n"

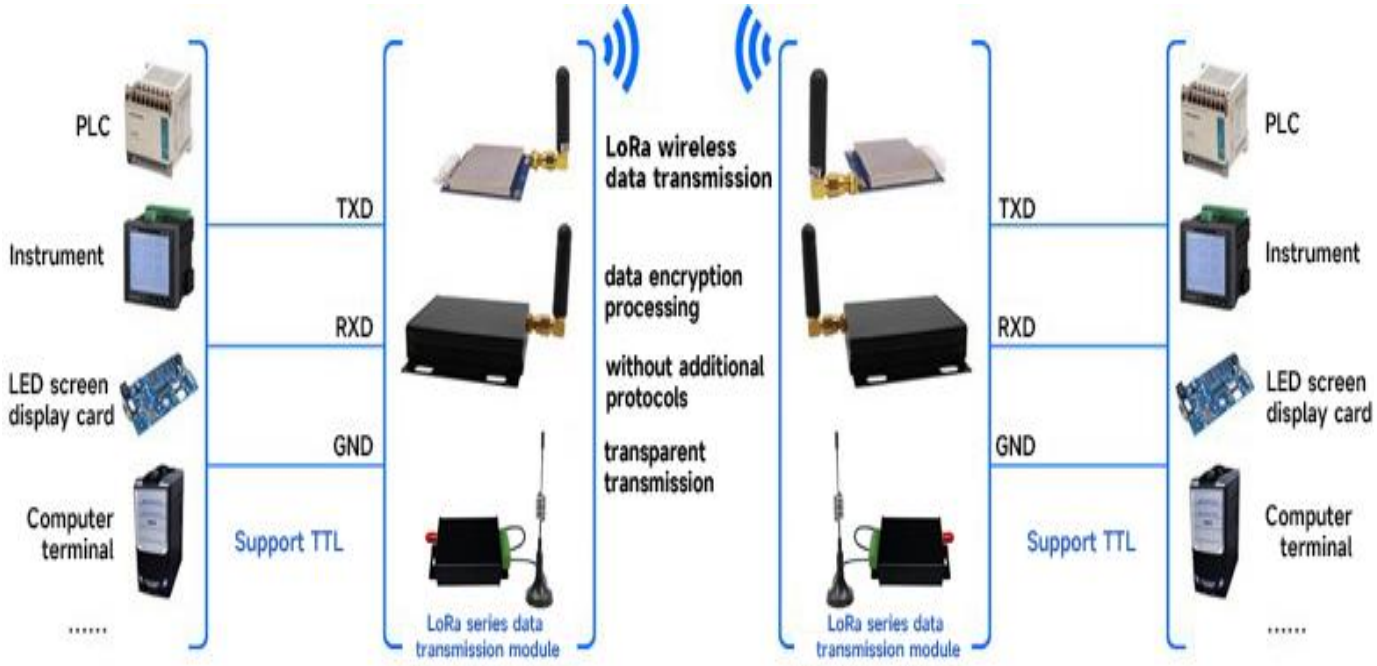
For example, to enable CRC, you should send the following hexadecimal command: AA FA 0A 01

CRC Enable: Enable/Disable CRC, where [parameter] is 1 byte.

Configuration range: 0 to 1.

Parameter	0	1
CRC Enable	OFF	ON

9. Typical Application Circuit



10. Pin Definitions

Pin Index	Pin Definition	Description
1	VCC	Connect to the positive power supply (External 3.3-5.5V).
2	GND	Connect to the power supply ground.
3	TXD/A+	Serial communication data transmission
4	RXD/B-	Serial communication data reception
5	SET	Enable configuration parameters (Low level enables parameter configuration, default high-level output).
6	CS	Floating or high for operational mode, low for sleep mode. Note: This function is only valid for TTL/RS232 levels; RS485 levels should be left floating.

11. Peripheral Accessories

1) Antenna

The antenna is a vital component of the communication system, and its performance directly affects the system's performance. The module requires an antenna impedance of 50 ohms. Common types of antennas include coil antennas, and you can also use SMA connectors to adapt to straight/bent/foldable antennas, or other types like small suction cup antennas. Users can choose antennas based on their specific application environments. To ensure the module operates in its optimal state, we recommend using antennas provided by our company.

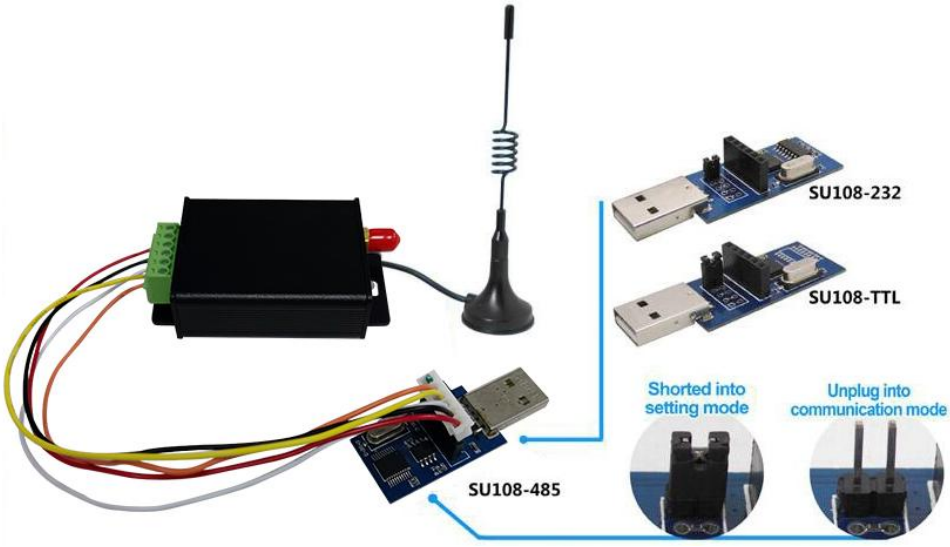
During the antenna usage process, it is important to follow the following principles to ensure the optimal communication range of the module:

Try to keep the antenna away from the ground surface and ideally away from obstacles in the vicinity.

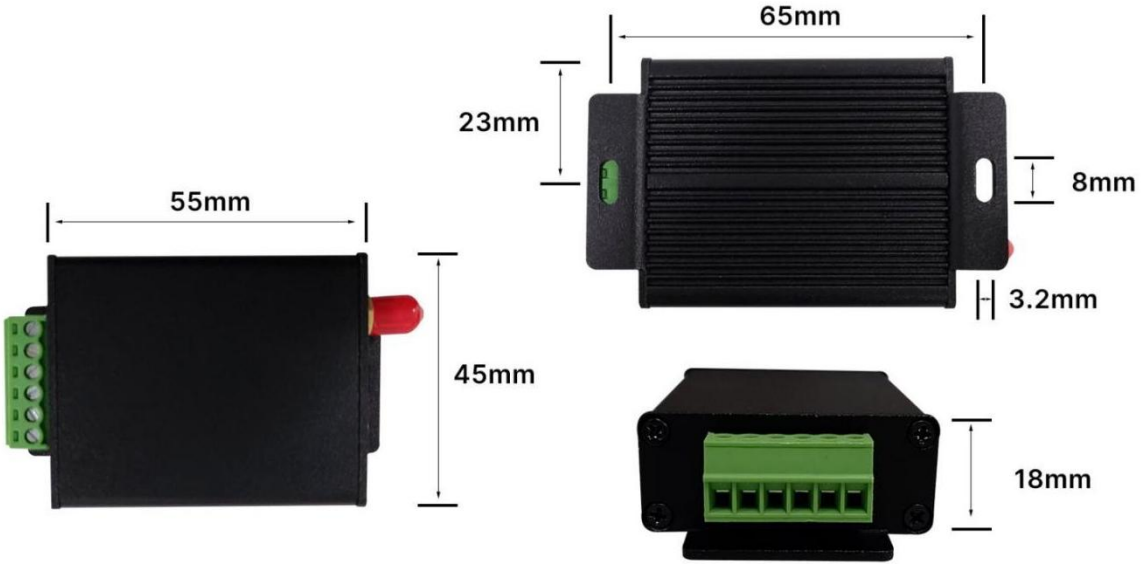
If you are using a suction cup antenna, straighten the cable as much as possible, and ensure that the suction cup base adheres to a metallic object.

2) USB Level Conversion Board

The module needs to communicate with a PC for parameter configuration, data transmission, and other applications (selectable via jumpers). Our company offers a USB to TTL/232/485 level conversion board that is compatible with the module. This allows users to conveniently and quickly communicate with a PC for various purposes. The product is shown in the following figure:



12. Mechanical Dimensions (Unit: mm)



13. Product Ordering Information

If the customer requires a module with TTL level and operates in the 433MHz frequency band, the order model would be: LoRa611-DZ-TTL-433. Currently, this product is available in the following models:

Order Model	Product Type
LoRa611-DZ-TTL-433	TTL level interface, 433MHz frequency
LoRa611-DZ-232-433	RS-232 level interface, 433MHz frequency
LoRa611-DZ-485-433	RS-485 level interface, 433MHz frequency
LoRa611-DZ-TTL-470	TTL level interface, 470MHz frequency
LoRa611-DZ-232-470	RS-232 level interface, 470MHz frequency
LoRa611-DZ-485-470	RS-485 level interface, 470MHz frequency
LoRa611-DZ-TTL-868	TTL level interface, 868MHz frequency
LoRa611-DZ-232-868	RS-232 level interface, 868MHz frequency
LoRa611-DZ-485-868	RS-485 level interface, 868MHz frequency
LoRa611-DZ-TTL-915	TTL level interface, 915MHz frequency
LoRa611-DZ-232-915	RS-232 level interface, 915MHz frequency
LoRa611-DZ-485-915	RS-485 level interface, 915MHz frequency

14. Frequently Asked Questions

a) Why can't the modules communicate properly?

1）Check for incorrect power connections, ensure the modules are operating normally, and check if the modules are damaged (do the LEDs light up after power on?).

2）Verify if the modules are in the correct communication mode (CS and SET both set to high).

3）Check if the frequency band, channel, and air rate settings are consistent across all modules.

b) Why is the transmission distance short?

1）High power supply ripple or nearby interference at the same frequency.

2）Mismatched or incorrectly installed antennas.

3）Harsh environmental conditions with strong interference sources.

c) Why is received data incorrect?

1）Ensure that the module's voltage level interface matches the connected device.

2）Verify if the module's serial port parameters match those of the connected device.

3）Check for poor data interfaces on the module.