LoRa-Kit Specification

Version V1.0.0

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.0.0	2024.04.10	First Edition	ShiDao Teng	Hong Xu

Content

1. Product overview

LoRa-Kit is a development board designed by Ai-Thinker Co.,Ltd for LoRa module, which is equipped with STM32F103C8T6 chip and TB-05 module, The LoRa adapter pins are reserved for adapters such as Ra-01 and Ra-03, facilitating the development and testing of LoRa communication and low-power performance for the full series LoRa modules such as Ra-01/Ra-01S/Ra-01SC/Ra-03SCH.TB-05 module installed on LoRa-Kitcan cooperate with the small program developed by our company to configure the radio frequency parameters of LoRa module and realize the point-to-point pull distance test.In addition, the jumper pin reserved on the board can be used as a secondary development burning and low power evaluation test interface.

TB-05 is a BLE5.0 low power Tmall Genie Mesh Bluetooth module based on TLSR8250 chip design;The module supports Bluetooth module directly controlled by Tmall Genie and has Bluetooth mesh networking function; Devices communicate with each other through a peer-to-peer star network and Bluetooth broadcast to ensure timely response in the case of multiple devices.It is mainly used in intelligent lamp control, which can meet the requirements of low power consumption, low delay and short distance wireless data communication.

Applications: For LoRa communication and low power performance development and testing.

1.1. Characteristic

- DIP-30 Package
- Support Bluetooth Set LoRa node parameters
- Support band module work:

  The low-band range is 410MHz to 525MHz, and supports modules such as Ra-01, Ra-02, Ra-01S, and Ra-01SC

  High frequency range: 803 MHZ to 930MHz, and supports modules such as Ra-01H, Ra-01SH, Ra-01SCH, and Ra-03SCH
- Development board operating voltage: 5V
- Theoretical maximum transmitted power:

  The maximum transmitting power of modules such as Ra-01/Ra-02/Ra-01H is 20dBm; The maximum transmit power of modules such as Ra-01S/Ra-01SC/Ra-01SH/Ra-01SCH/ Ra-03SCH is 22dBm
- Supports point-to-point transparent data transmission
- Supports conversion boards such as Ra-01 and Ra-03
- Supports wireless wake up
- LoRa module supports FSK, GFSK, LoRa™ modulation

2. Main parameter

Table 1 Main parameter description

Model	LoRa-Kit
Package	DIP-30
Size	40.00*50.00(±0.2mm)
Antenna	Semicircle orifice,IPEX
Frequency range	LoRa low frequency module：410~525MHz；LoRa high frequency module:803~930MHz
Operation temperature	-20℃~ 70℃
Storage environment	-40℃~ 125℃，＜90%RH
Power supply	Power supply voltage 5V (Type-C port), power supply current ⩾ 500mA
Support interface	Type-C
Series Rate	Default 115200 bps

2.1. Electrostatic requirements

LoRa-Kit is electrostatic sensitive equipment that requires special precautions during handling.

Figure 1 ESD Anti-static diagram

2.2. Electrical characteristics

Table 2 Electrical characteristics

Parameter	Min.	Typical value	Max	Unit
Operating temperature	-20	-	+70	℃
Storage temperature	-40	-	+125	℃
Power supply	4.75	5	5.25	V

2.3. Development board digital port features

Table 3 Development board digital port

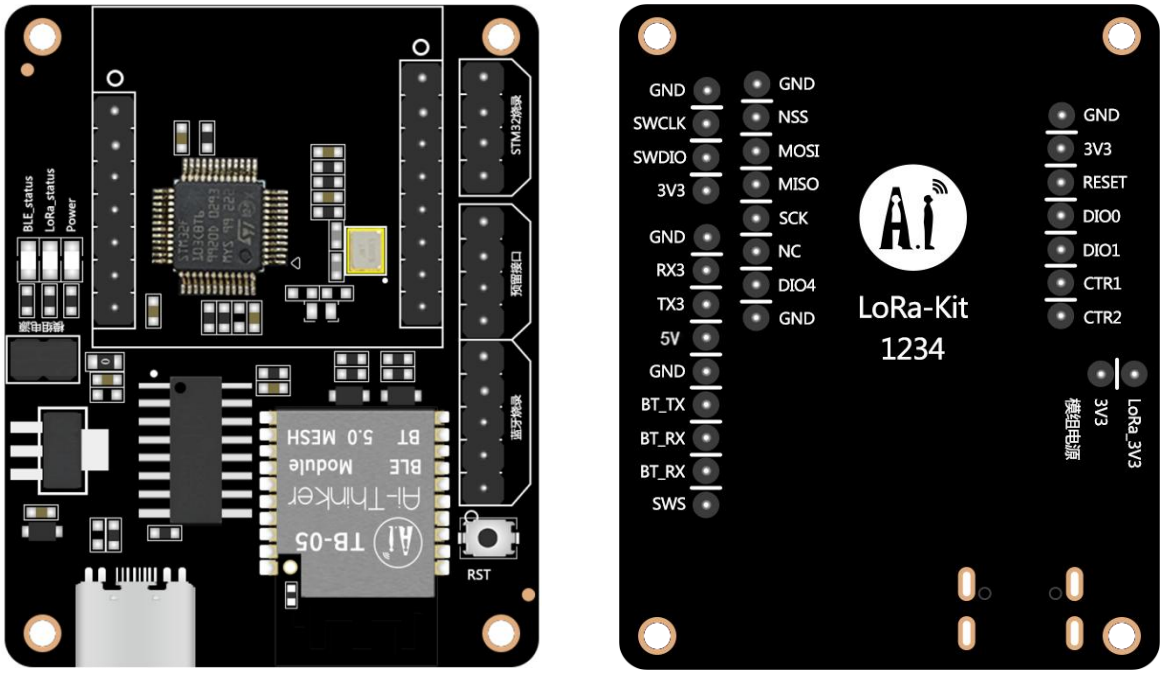
Description		Typical Value			Unit
Max. Operating Frequency		72			MHz
Port	**Name**	**Min.**	**Typical Value**	**Max.**	**Unit**
MCU Power Supply	VDD	-	3.3	-	V
IO electrical level	VIO	-	3.3	-	V
Input logic level is low	VIL	GND	-	0.35VDD	V
Input logic level is high	VIH	0.65VDD	-	VDD+0.5	V
Input logic level is low	VOL	VSS	-	0.35VDD	V
Input logic level is high	VOH	0.65VDD	-	VDD	V

2.4. RF Parameter table

Table 4 RF parameters

Model	Description		Theoretical value			Unit
	Mode	Frequency band	Min.	Typical Value	Max	
Ra-01	Output power	410~525MHz	-	-	20	dBm
Ra-02	Output power	410~525MHz	-	-	20	dBm
Ra-01H	Output power	803~930MHz	-	-	20	dBm
Ra-01S	Output power	410~525MHz	-	-	22	dBm
Ra-01SH	Output power	803~930MHz	-	-	22	dBm
Ra-01SC	Output power	410~525MHz	-	-	22	dBm
Ra-01SCH	Output power	803~930MHz	-	-	22	dBm
Ra-03SCH	Output power	803~930MHz	-	-	22	dBm

3. Appearance size



Front Back

Figure 2 Appearance of LoRa-Kit (The rendering is for reference only)

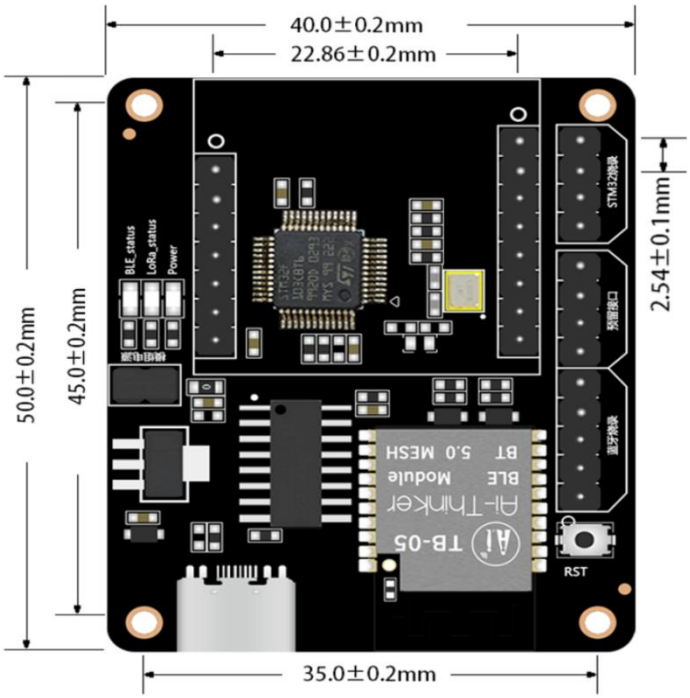
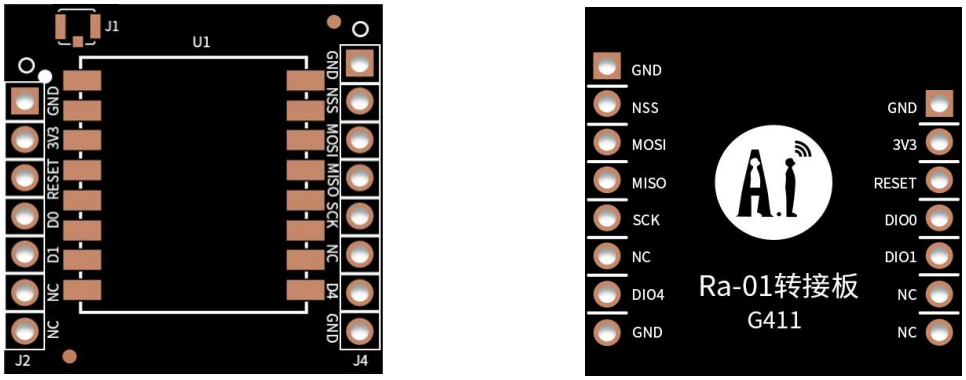


Figure 3 Size diagram



Front Back

Figure 4 Appearance of the Ra-01 (The rendering is for reference only.)

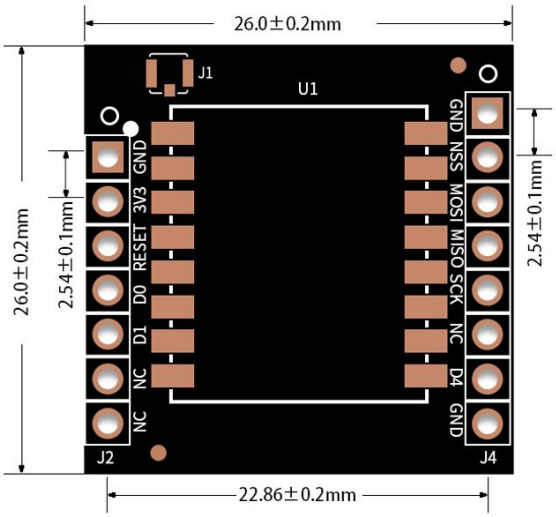
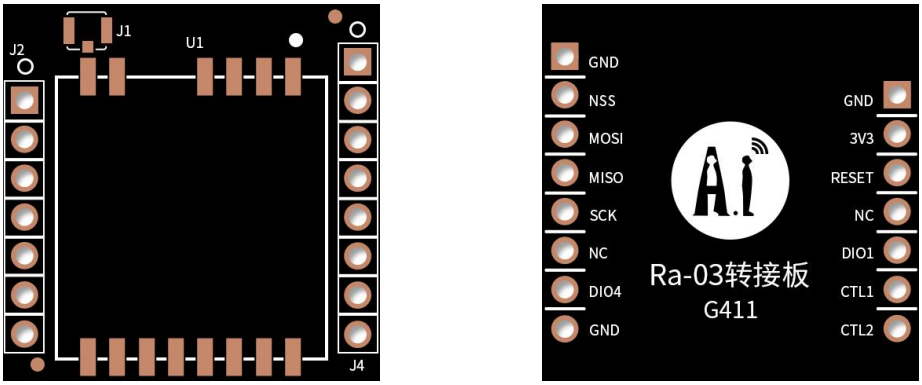


Figure 5 Dimensions of the Ra-01



Front Back

Figure 6 Appearance of the Ra-03 converter board

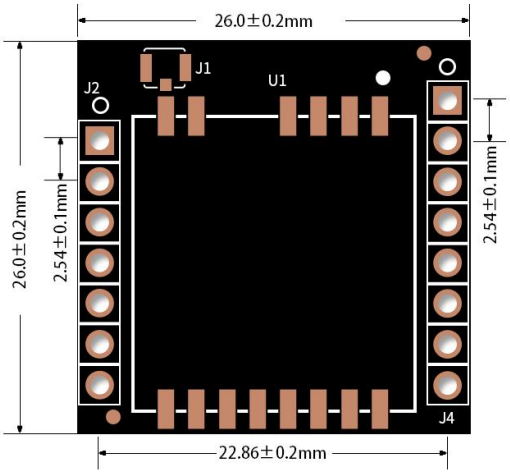


Figure 7 Dimensions of the Ra-03 adapter board

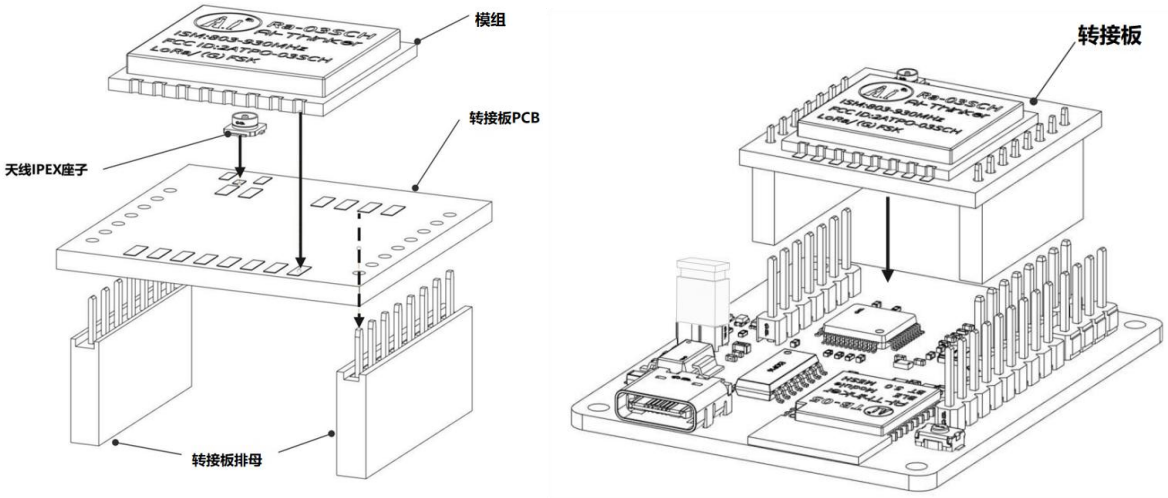


Figure 8 Schematic diagram of installation

Table 5 Correspondence table between adapter board and LoRa module

Adapter plate type	LoRa Module type
Ra-01 adapter board	Ra-01
	Ra-02
	Ra-01H
	Ra-01S
	Ra-01SH
	Ra-01SC
	Ra-01SCH
Ra-03 adapter board	Ra-03SCH

4. Pin definition

4.1. LoRa-Kit Pin definition

LoRa-Kit connects a total of 30 interfaces, such as the pin diagram, and the pin function definition table is the interface definition.

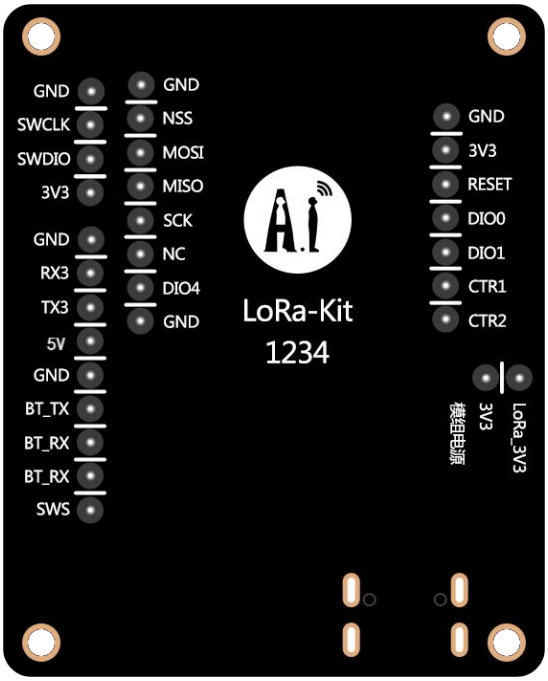


Figure 9 Schematic diagram of pin

Table 6 LoRa-Kit pin function definition table

NO.	Name	Function declaration
1	GND	Ground
2	3V3	3.3V power supply; The input current of the external power supply is recommended to be above 500mA
3	RESET	LORA_RESET:Reset pin of LoRa module
4	DIO0	LORA_DIO0: Digital IO0 software configuration for LoRa
5	DIO1	LORA_DIO1: Digital IO1 software configuration for LoRa
6	CTR1	CTR1:It is used to drive Ra-03SCH RF switches
7	CTR2	CTR2: It is used to drive Ra-03SCH RF switches
8	GND	Ground
9	DIO4	LORA_DIO4:Digital IO4 software configuration for LoRa
10	NC	NC
11	SCK	SPI_SCK: SPI clock input for the LoRa module
12	MISO	SPI_MISO: SPI clock input of LoRa module
13	MOSI	SPI_MOSI: SPI clock input of LoRa module
14	NSS	SPI_NSS: SPI clock input of LoRa module
15	GND	Ground
16	GND	Ground
17	SWCLK	SWCLK：STM32F103CBT6 Chip burning interface
18	SWDIO	SWDIO：STM32F103CBT6 Chip burning interface
19	3V3	3.3V power supply; The input current of the external power supply is recommended to be above 500mA
20	GND	Ground
21	RX3	UART3_RX: Reserved serial port
22	TX3	UART3_TX: Reserved serial port
23	5V	5V power supply; The input current of the external power supply is recommended to be above 500mA
24	GND	Ground
25	BT_TX	BLE_TX: STM32F103CBT6 and TB-05 COM port
26	BT_RX	BLE_RX: STM32F103CBT6 and TB-05 COM port
27	BT_RX	BLE_RX: TB-05 burn control pin
28	SWS	SWS: TB-05 burn control pin

29	LORA_3V3	3.3V power supply; The input current of the external power supply is recommended to be above 500mA
30	3V3	3.3V power supply; The input current of the external power supply is recommended to be above 500mA
Note: The jumper cap short-pins 29 and 30 power the Lora module.		

Table 7 LoRa adapter board corresponds to the pin of STM32F103C8T6 chip

STM32F103C8T6 Pin	LoRa adapter board
PB14	LORA_RESET
PB0	LORA_DIO0
PB1	LORA_DIO1
PA0/WKUP	LORA_DIO4
PA11	CTR1
PA12	CTR2
PA5	SPI_SCK
PA6	SPI_MISO
PA7	SPI_MOSI
PA4	SPI_NSS

Table 8 TB-05 module corresponds to the pins of the STM32F103C8T6 chip

STM32F103C8T6 Pin	TB-05 Module
PA3/UART2_RX	BLE_TX
PA2/UART2_TX	BLE_RX
PA1	TB-05_RST

4.2. Adapter pin definition

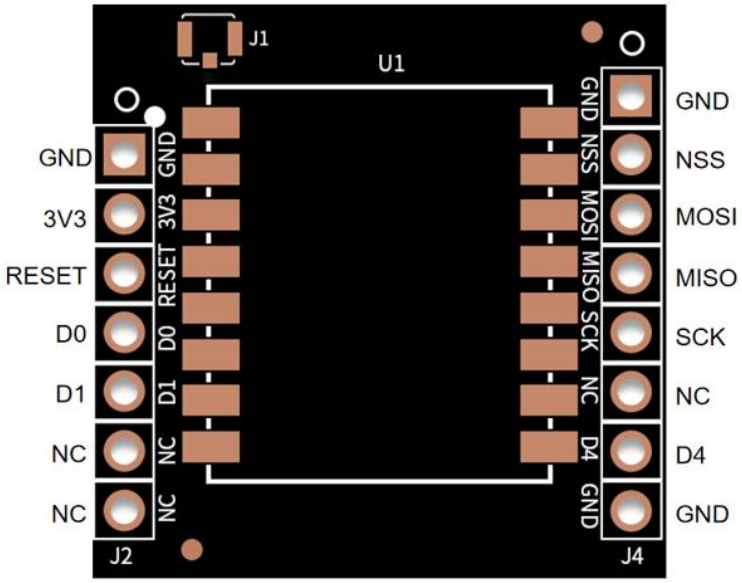


Figure 10 Connecting pins of the Ra-01 conversion board

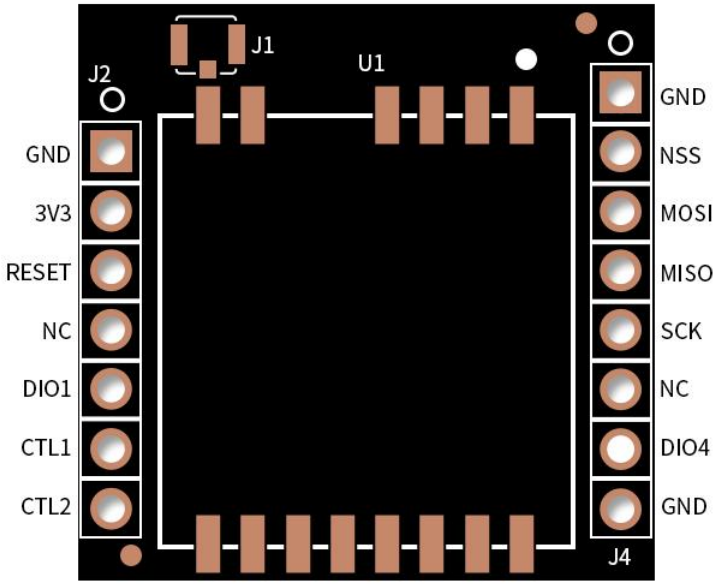


Figure 11 Connecting pins of the Ra-03 adapter plate

Table 9 Ra-01 Adapter pin definitions

No.	Name	Function description
1	GND	Ground
2	3V3	Typical value 3.3V power supply, current greater than 200mA
3	RESET	LoRa Module reset pin
4	DIO0	Digital IO0 software configuration
5	DIO1	Digital IO1 software configuration
6	NC	NC
7	NC	NC
8	GND	Ground
9	DIO4	Digital IO4 software configuration
10	NC	NC
11	SCK	SPI clock input
12	MISO	SPI data output
13	MOSI	SPI data input
14	NSS	SPI SR-IN SRAM
15	GND	Ground

Table 10 Ra-03 Adapter pin definitions

No.	Name	Function description
1,8,15	GND	Ground
2	3V3	Typical value 3.3V power supply, current greater than 200mA
3	RESET	LoRa Module reset pin
4	DIO0	NC
5	DIO1	Digital IO1 software configuration
6	NC	It is used to drive Ra-03SCH RF switches
7	NC	It is used to drive Ra-03SCH RF switches
9	DIO4	Digital IO4 software configuration
10	NC	NC
11	SCK	SPI clock input
12	MISO	SPI data output
13	MOSI	SPI data input

5. Schematic

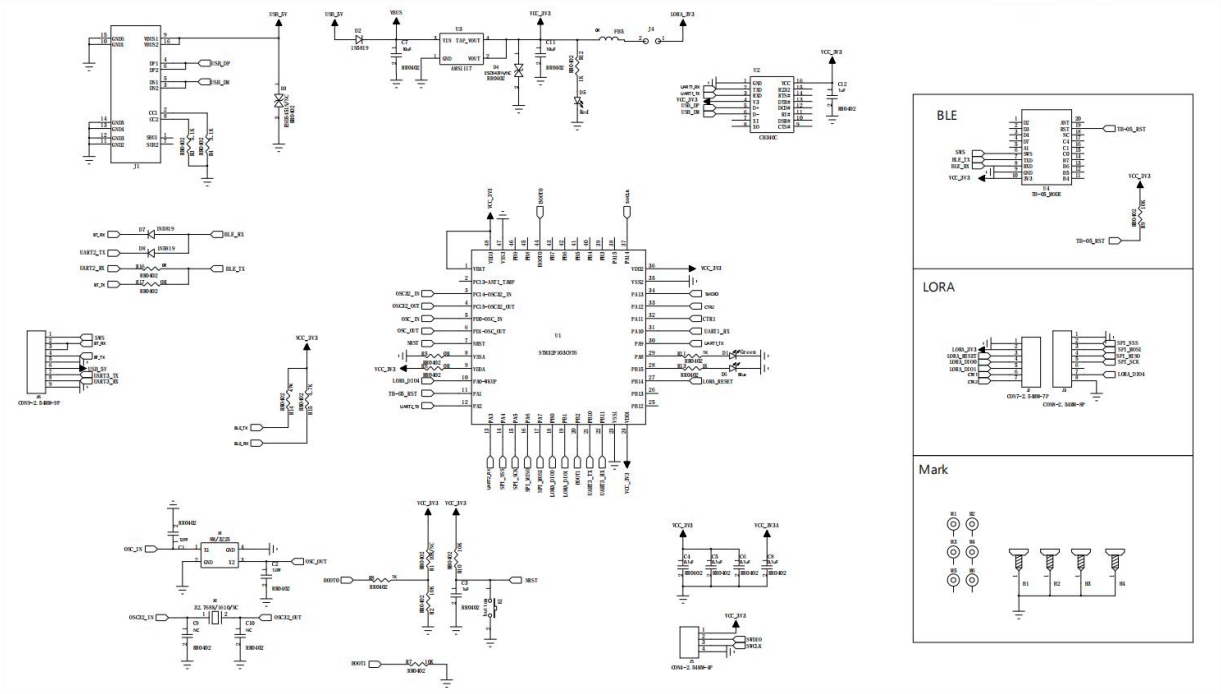


Figure 12 Schematic diagram of LoRa-Kit development board

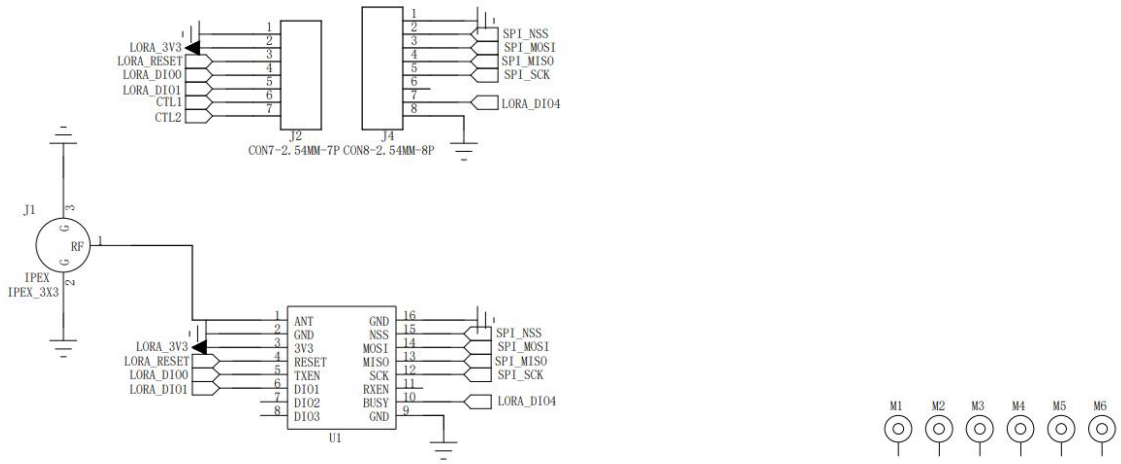


Figure 13 Schematic diagram of the Ra-01 switch board

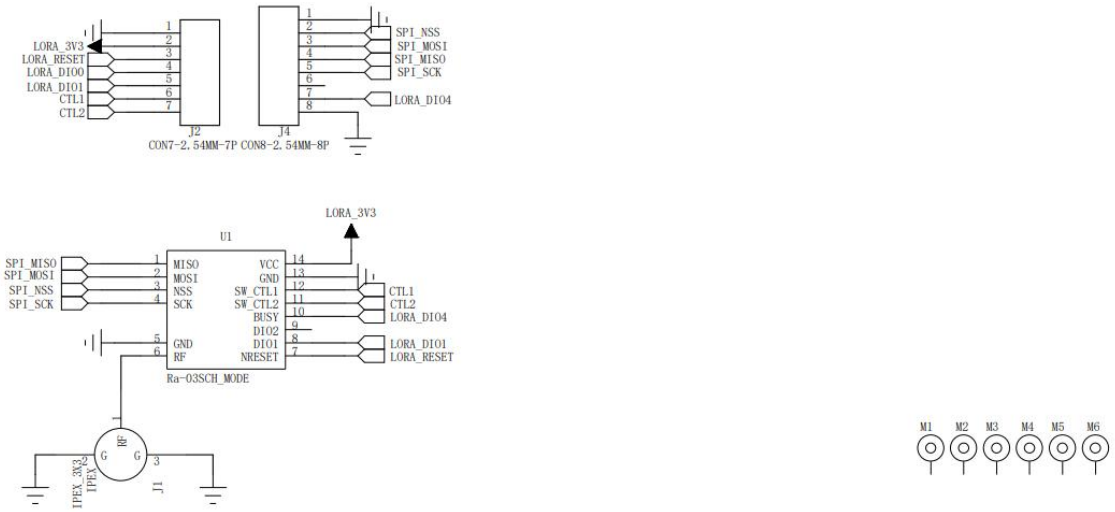


Figure 14 Schematic diagram of the Ra-03 switch board

6. Storage conditions

Products sealed in moisture-proof bags should be stored in a non-condensing atmospheric environment of <40 ° C /90%RH.

The module has a moisture sensitivity level MSL of level 3.

After the vacuum bag is unsealed, it must be used within 168 hours at 25±5℃/60%RH.

7. Product packaging information

Table 8 Packaging information

Packing list	Packing way	Quantity per pack (Electrostatic bag)
LoRa-Kit	Foam + electrostatic bag	1pcs

8. Contact us

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