Ra-01/Ra-02 LoRa Module User Manual

Notes

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1. Overview

Anxinke LoRa series modules (Ra-01/Ra-02) are designed and developed by Anxinke Technology. The radio frequency chip of this series of modules SX1278 mainly uses LoRa™ remote modem for ultra-long-distance spread spectrum communication. It has strong anti-interference and can Minimize current consumption. With the help of SEMTECH's LoRa™ patented modulation technology, SX1278 has a high sensitivity of over -148dBm, a power output of +20dBm, a long transmission distance and high reliability. At the same time, compared with traditional modulation technology, LoRa™ modulation technology also has obvious advantages in anti-blocking and selection, which solves the problem of distance, anti-interference and power consumption that traditional design solutions cannot simultaneously take into account.

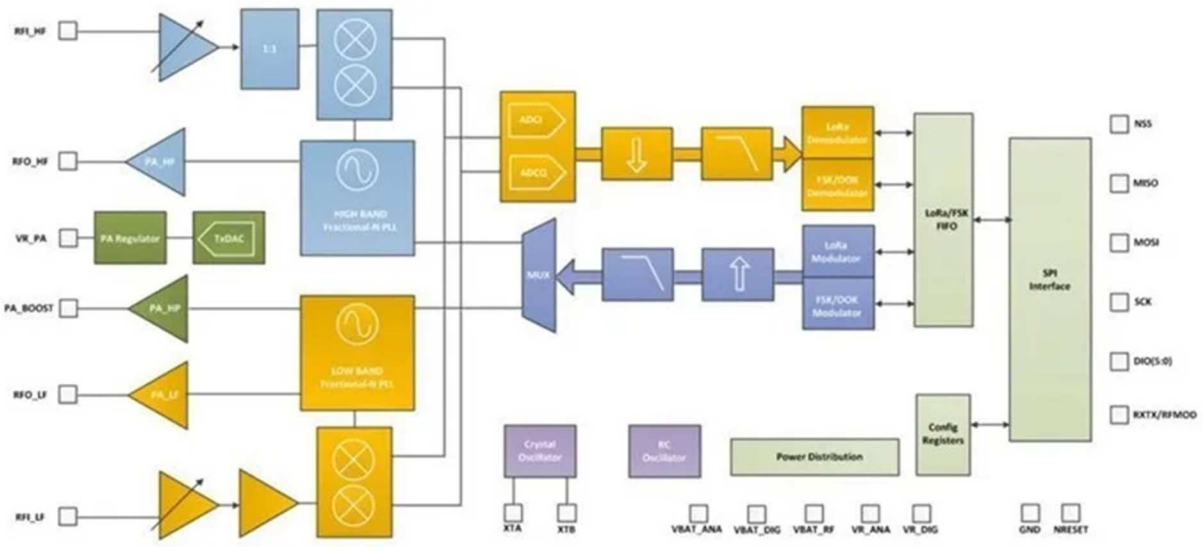


Figure 1 Functional block diagram of SX1278

1.1 Ra-01/Ra-02 module characteristics

• LoRa™ modem
• Support FSK, GFSK, MSK, GMSK, LoRa™ and OOK modulation methods
• Support frequency band 410MHz~525MHz
• The working voltage is 3.3V, the maximum output is +20dBm, and the maximum working current is 105mA
• It has low power consumption characteristics in the receiving state, the receiving current is 12.15mA, the standby current is 1.6mA
• High sensitivity: as low as -140dBm
• Small size double row stamp hole patch package
• The module adopts SPI interface, half-duplex communication, with CRC, up to 256-byte packet engine

1.2 Main parameters of Ra-01/Ra-02 module

Table 1 Ra-01/Ra-02 module parameter table

Category	**Parameters**
Package	SMD-16
Size	17*16*3.2(±0.2)mm
Frequency range	410~525MHz
Communication interface	SPI
Programmable bit rate	Up to 300Kbps
Maximum transmit power	20±1 dBi
Working voltage	2.7~3.6V, typical value 3.3V
Working temperature	-20~+70°C
Storage environment	-40~+125°C,<90%RH
Weight	0.45g

1.3 Recommended working environment

Working environment	Name	Minimum value	Typical value	Maximum value	Unit
Supply voltage	VDD	2.7	3.3	3.6	V
Working temperature	TOPR	-20	25	70	℃
IO level	VIO	2.7	3.3	3.6	V
Digital input low level	VIL	-	-	0.2	V
Digital input high level	VIH	0.8	-	-	V
Digital output low level	VoL	-	-	0.1	V
Digital output high level	VoH	0.9	-	-	V

1.4 Application

Automatic meter reading
Smart home and security system
Industrial monitoring and control
Home and building automation
Remote irrigation system
Wireless sensor data collection

2 Interface definition

2.1 Ra-01/Ra-02 module pin diagram

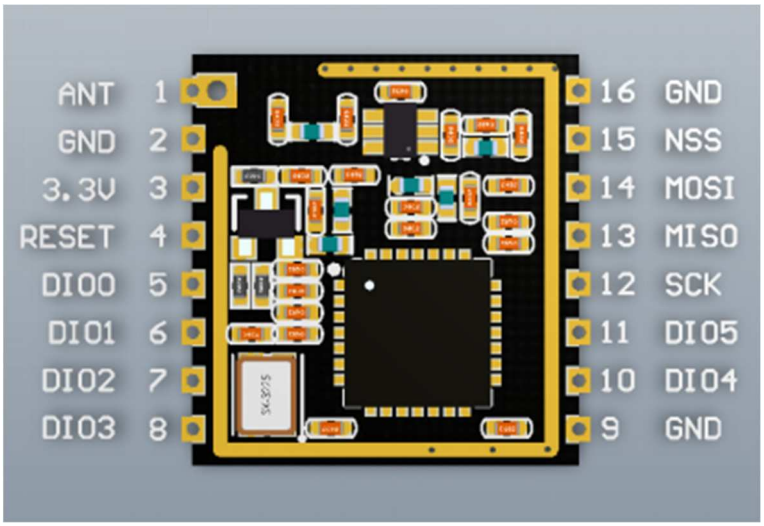


Figure 2 Ra-01 pin diagram

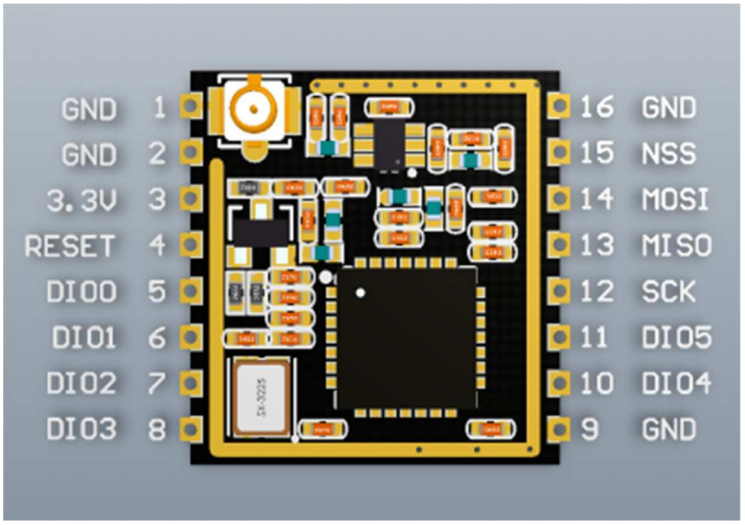


Figure 3 Ra-02 pin diagram

2.2 Ra-01/Ra-02 module pin function definition

Pin number	Pin number	Pin name	Function description
Ra-01	Ra-02		
1	-	ANT	Antenna
2	1, 2	GND	Ground
3	3	3.3V	3.3V power supply
4	4	RESET	Reset
5	5	DIO0	Digital IO0, software configuration
6	6	DIO1	Digital IO1 software configuration
7	7	DIO2	Digital IO2 software configuration
8	8	DIO3	Digital IO3 software configuration
9	9	GND	Ground
10	10	DIO4	Digital IO 4-piece configuration
11	11	DIO5	Digital IO5 software configuration
12	12	SCK	SPI clock input
13	13	MISO	SPI data output
14	14	MOSI	SPI data input
15	15	NSS	SPI chip select input
16	16	GND	Ground

3 Ra-01/Ra-02 module package size drawing

3.1 Dimensions of Ra-01/Ra-02 modules.

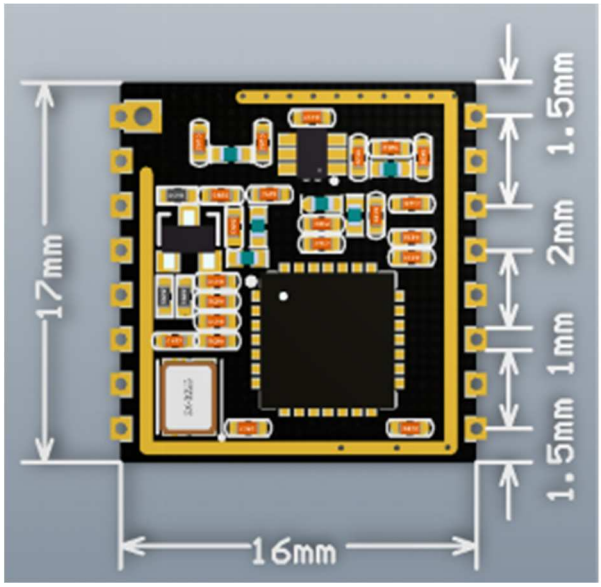


Figure 4 Plan view of Ra-01 module size

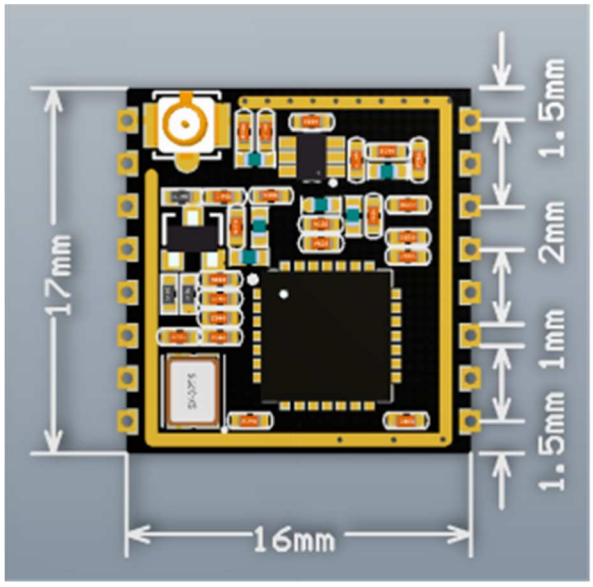
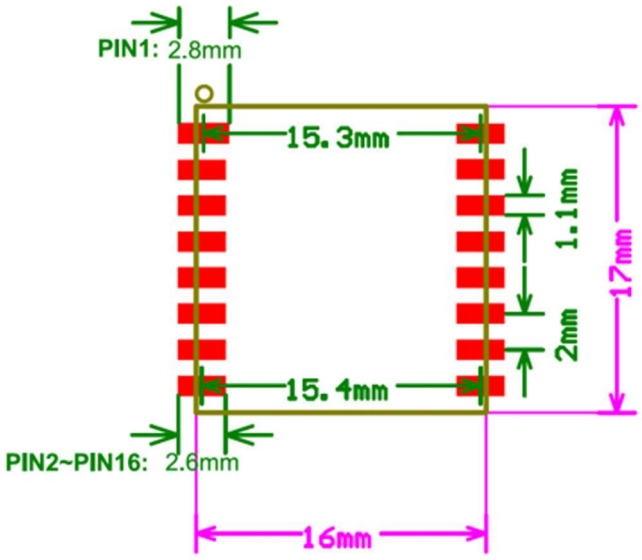


Figure 5 Plan view of Ra-02 module size

3.2 Ra-01/Ra-02 Module Size Comparison Table

Module model	Length (mm)	Width (mm)	Height (mm)	PAD size (mm)	Pin pitch (mm)	Shielding shell height (mm)	Board thickness (mm)
Ra-01	17	16	3.2 ±0.1	1x 1 (bottom layer), 1.778 x1.27 (antenna pad bottom layer)	2	2.2±0.1	1.0±0.1
Ra-02	17	16	3.2 ±0.1	1x 1 (bottom layer)	2	2.2±0.1	1.0±0.1

3.3 Ra-01/Ra-02 module PCB package drawing



Note: When laying out the board, try to put the module on the side of the board with the antenna facing outward. No components should be placed at or near the bottom of the antenna. The module should be as far away from power components and electromagnetic components as possible, such as thyristors, relays, inductors, buzzers, and horns.

Figure 6 Ra-01/Ra-02 module PCB package diagram

4. Welding temperature

4.1. Reflow soldering temperature

''Note that the temperature should not be too high when soldering the module. The reflow soldering temperature is shown in Table 5:

Incline heating TS Maximum value -TL	Maximum value 3℃/sec
Preheating Minimum temperature value (TS Min.) Typical temperature value (TS Typ.) Maximum temperature value (TS Max .) Time (TS)	150℃ 175℃ 200℃ 60~180 seconds
Inclined heating (TL to TP)	Maximum 3℃/sec
Duration/Temperature (TL)/Time (TL)	217℃/60~150 seconds
Peak temperature (TP)	Maximum temperature 260℃, lasting 10 seconds
Peak target temperature (TP target value)	260℃+0/-5℃
Actual peak value (tP) 5°C duration	20~40 seconds
Inclined cooling	Maximum 6℃/sec
Time required to adjust to the peak temperature from 25℃ (t)	Maximum 8 minutes

4.2. Reflow soldering curve graph

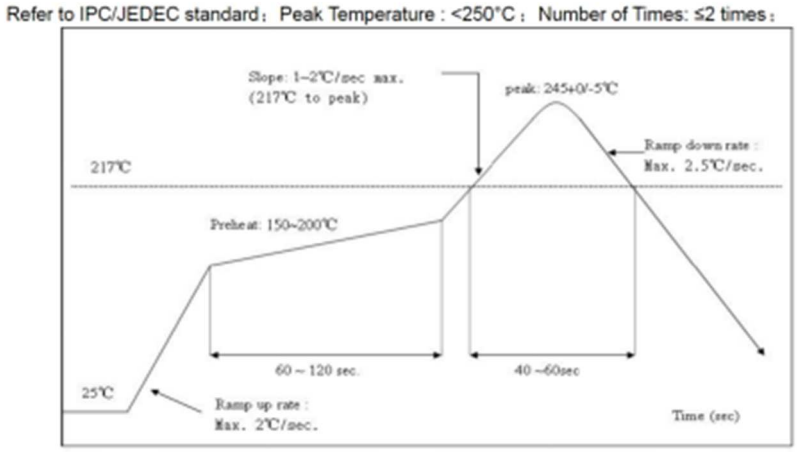


Figure 7 Recommended reflow soldering curve

5. Instructions for use

The working frequency of Anxinke LoRa series modules (Ra-01/Ra-02) is 433MHz. When using the module, the power supply current must be above 250mA. The module is connected to the MCU through the SPI interface, pay attention to the common ground. …

The connection diagram of Ra-01/Ra-02 module and MCU is shown in the figure below:

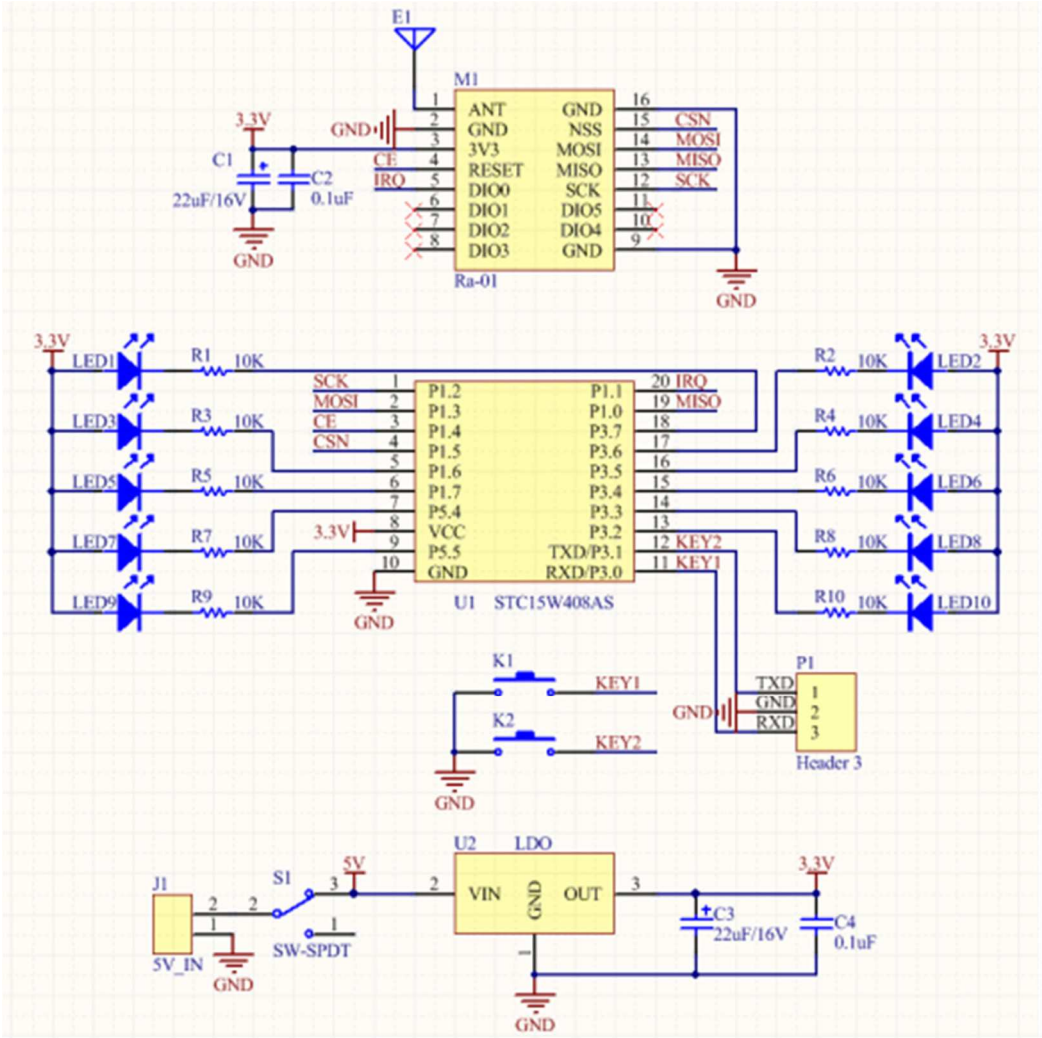


Figure 8 Module and MCU connection diagram