Ra-06 Specification

Version V1

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Change History of Revision

Version	Date	Contents of Revision Change	Compilation	Verify
V1.0	2019.11.05	Initial release	Xie Yiji	

Contents

1.Product Overview

Ai-Thinker lora Series Module (Ra-06) designed and developed by Ai-Thinker Technology Co., Ltd. RA-06 module insert SX1278 RF chip and Huada ultra low power 32 bit kernel cortex M0+ MCU HC32l130F8UA,8K Byte Ram,64k Byte FLASH.The module is used for ultra-long-distance spread spectrum communication, and the radio-frequency chip sx1278. Sx1278 has a high sensitivity of over-148 dbm, a 20 dbm power output, a long transmission distance and a high reliability with semtech's lya ™ patent modulation technique. At the same time, with respect to the traditional modulation technology, the Lora ™ modulation technology has an obvious advantage in the anti-blocking aspect, and solves the problem that the traditional design scheme can not simultaneously balance the distance, the anti-interference and the power consumption.

Its application can be automatic meter reading, home building automation, security system, remote

irrigation system.

Features

- LoRa™ modem.

- With 8K Byte RAM and 64K Byte FLASH.

- Support FSK、GFSK、MSK、GMSK、LoRa™ and OOK mode.

- Frequency supports 410MHz~525MHz.

- Operating voltage is 3.3V,maximum output +20dBm.

- Low power consumption in a received state, the received current is12.15mA，stand-by current is 1.6mA.

- High sensitivity：as low as-140dBm.

- Small volume double row stamp hole patch for SMD package.

- Support second develop.

- SPI interface，using half duplex communication, with CRC、up to 256-byte packet engine.

Main parameters

Charter 1.1 main parameters instruction

Model	Ra-06
Package	SMD-20
Size	16*22.8*2.2(±0.2)MM
Antenna	Spring antenna
Frequency range	410MHz~525MHz
Operating Temperature	-20 ℃ ~ 70 ℃
Storage environment	-40 ℃ ~ 125 ℃ , < 90%RH
Power supply	2.7~3.6V，typical value 3.3V，current>300mA
Support Interface	SPI
Programmable bit rate	300kbps
Certification	REACH、RoHS

2. Electrical parameters

Electrical character

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOPR	-20	25	85	°C
Supply Votage	VDD	2.7	3.3	3.6	V

Digital port characteristics

Description		Typ		Unit	
Operating Cooperation		803~930		MHz	
IO	Name	Min	Typ	Max	Unit
IO level	VIO	2.7	3.3	3.6	V
Low input logic level	VIL	-	-	0.2	V
High input logic level	VIH	0.8	-	-	V
Low output logic level	VOL	-	-	0.1	V
High output logic level	VOH	0.9	-	-	V

SPI Interface features

Name	Description	Condition	Min	Typ	Max	Unit
Fsck	SCK frequency	-	-	-	10	MHz
tch	SCK High level time	-	50	-	-	ns

tcl	SCK Low level time	-	50	-	-	ns
trise	SCK Rise time	-	-	5	-	ns
tfall	SCK Fall time	-	-	5	-	ns
tsetup	MOSI Time setting	Change from MOSI to the rising edge of SCK	30	-	-	ns
thold	MOSI Duration	From the rising edge of SCK to the change of MOSI	20	-	-	ns
tnsetup	NSS Set up time	From the falling edge of NSS to the rising edge of SCL	30	-	-	ns
tnhold	NSS Time maintain	From the falling edge of SCL to the rising edge of NSS,normal mode	100	-	-	ns
tnhigh	Spi Access interval NSS High level time	-	20	-	-	ns
T_DATA	DATA maintenance and set up time	-	250	-	-	ns

3.Appearance size
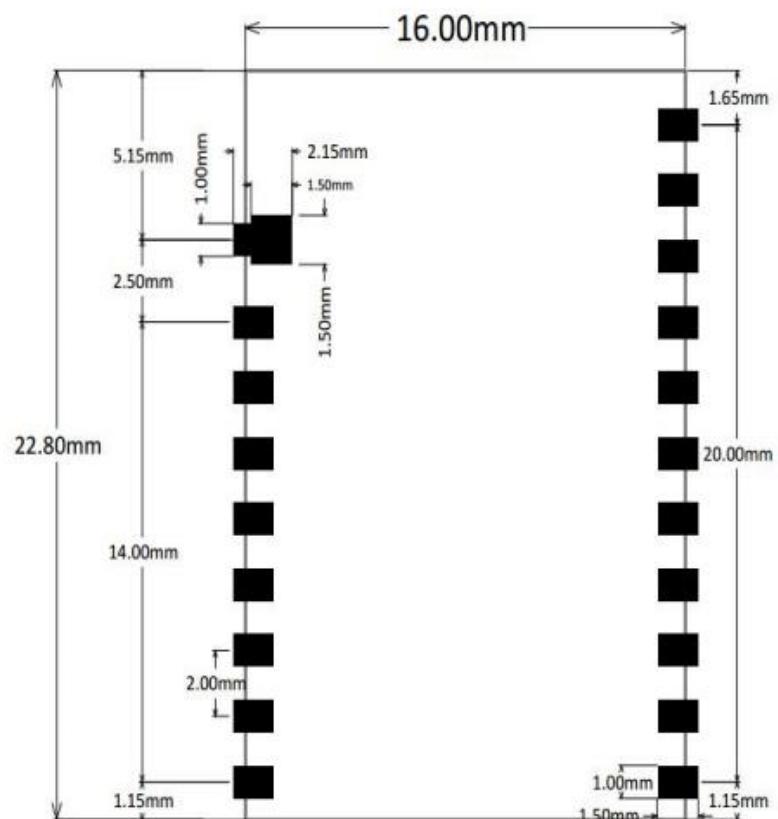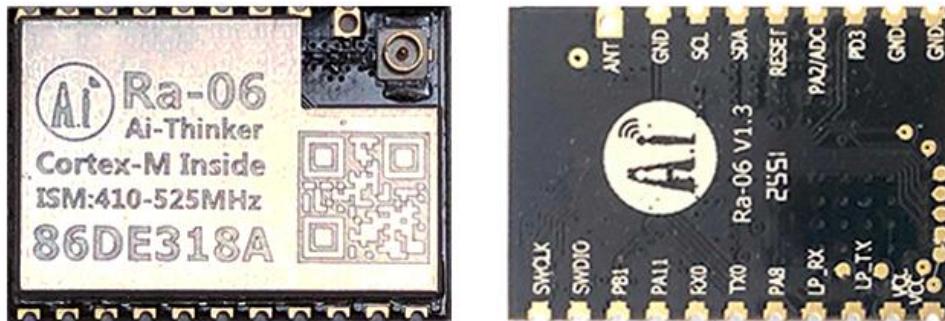
4.Pin definition

Ra-06 module with 20 interface，show as figure 2.1，table 2.2 is the interface definition.
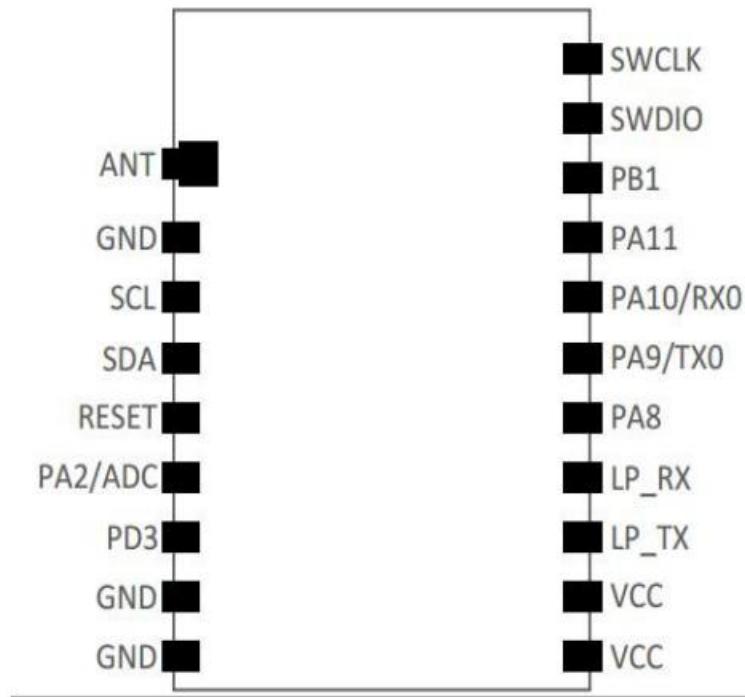
Figure 2.1   Ra-06   Pin diagram

Table 2.2 Pin function definition

No.	Name	Function instruction
1	ANT	Antenna
2	GND	Ground
3	SCL	I2C clock input
4	SDA	I2C Data interaction
5	RESET	Reset
6	PA2/ADC	ADC sampling outlet
7	PD3	Common IO Port
8	GND	Ground

9	GND	Ground
10	VCC	Power
11	VCC	Power
12	LP_TX	Common IO Port
13	LP_RX	Common IO Port
14	PAB	Common IO Port
15	PA9/TX0	UART data send port
16	PA10/RX0	UART data receive port
17	PA11	Common IO Port
18	9B1	Common IO Port
19	SWDIO	SWD program download port
20	SWCLK	

The six general IO pin of SX1278 can be available in LoRa™ mode.
Their mapping depends on the configuration of the two registers RegDioMapping1 and RegDioMapping2.

Operating Mode	DIOx Mapping	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
All	00	ModeReady	CadDetected	CadDone	Fhss Change Channel	RxRimeout	RxDone
	01	ClkOut	PllLock	Valid Header	Fhss Change Channel	Fhss Change Channel	TxDone
	10	ClkOut	PllLock	PayloadCrc Error	Fhss Change Channel	CadDetected	CadDoe
	11	-	-	-	-	-	-

5.Schematics
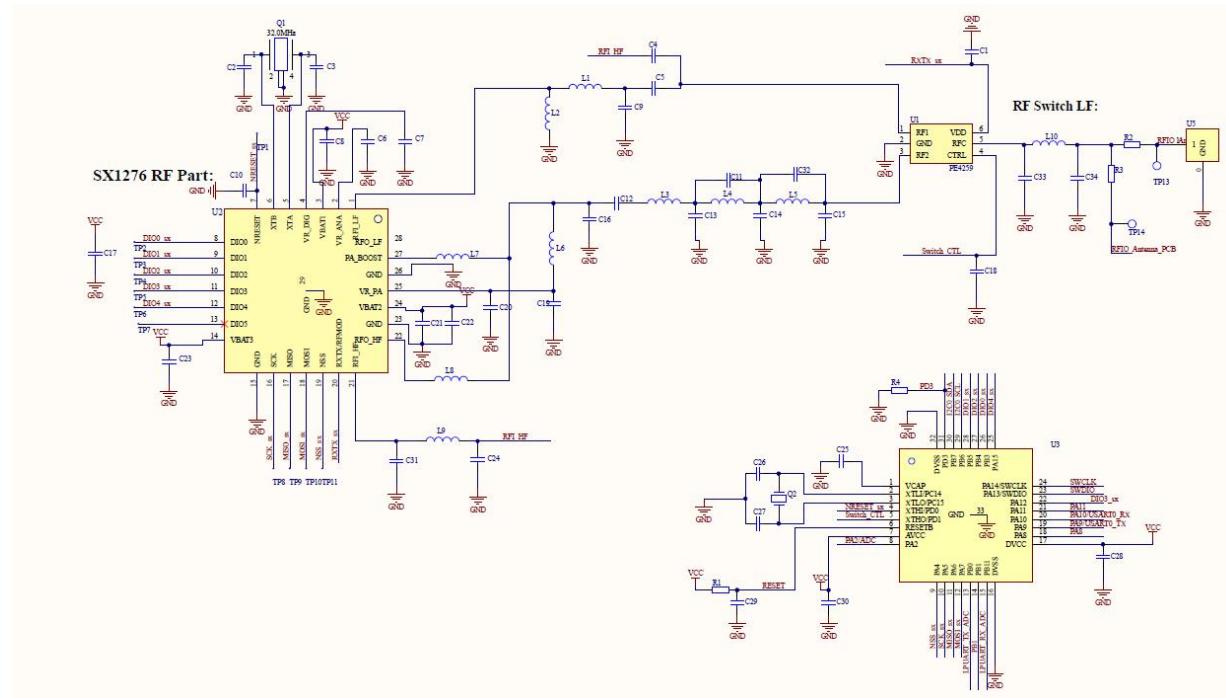

6.Design Guidance

1)Application Circuit
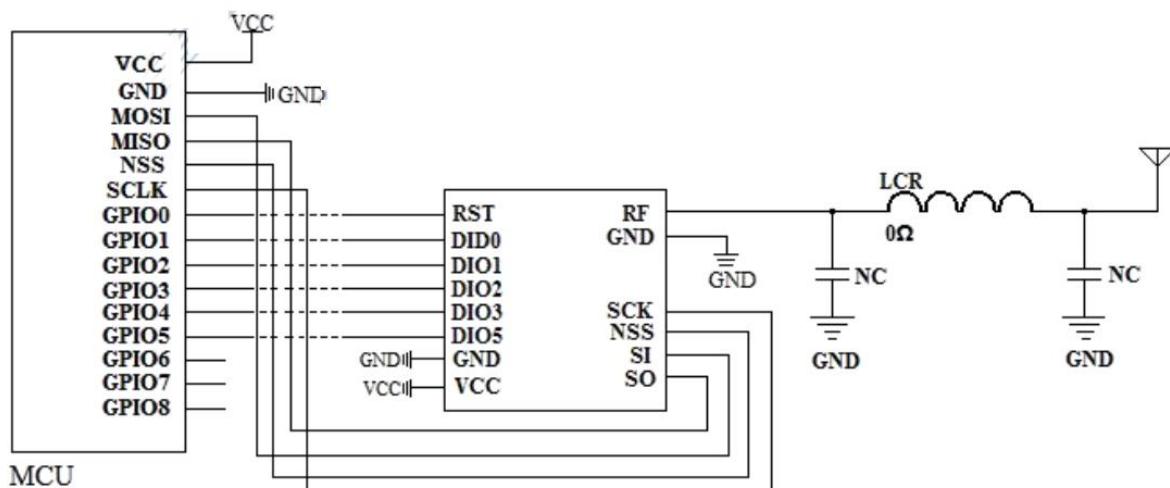
2)Antenna Install

（1）、Ra-06 is required to use external antenna，the module is compatible with the half-hole pad,the round-hole pad and IPEX.

（2）、In order to meet the performance of the on-board antenna, metal parts are prohibited from being placed around the antenna.

3) Power Supply

（1）、Recommended   voltage 3.3 V, Peak:Current over 300mA .

（2）、It is recommended to use the LDO power supply；If DC-DC is used, the ripple is controlled within 30 mV.

（3）、DC-DC power supply circuit is recommended to reserve the position of the dynamic response capacitor, and the output ripple can be optimized when the load change is large.

（4）、3.3V power jack advise to add ESD components.
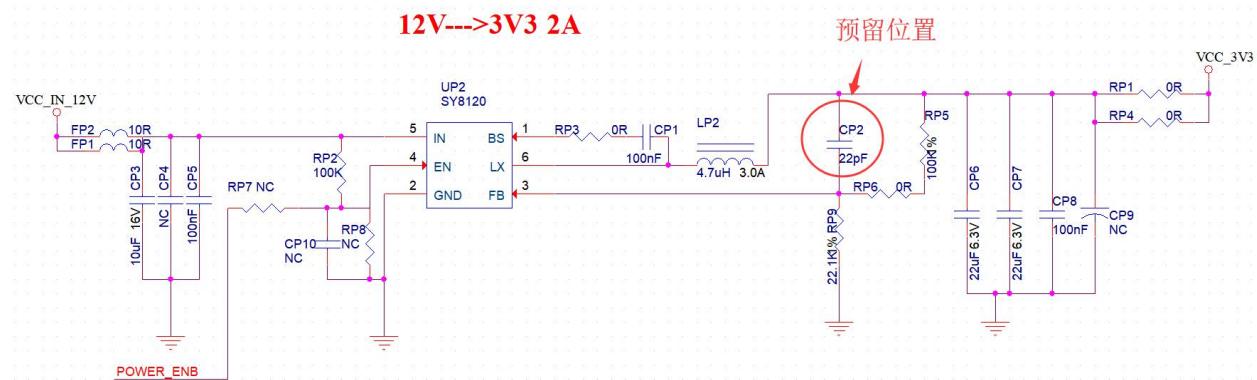
4) GPIO

(1).   There's a few GPIO port design outside the module，if require to use recommand the IO port to tadem the resistance for 10 to 100 ohmic.This can suppress overshoot ，It's even more stable on both sides.It would help both EMI and ESD.

（2）.Special IO's pull up and down，should refer to the direction of use
   in Specification, here will affect the startup configuration of the module.

（3）.IO port of module is 3.3V,if master control and the IO level of module
   doesn't match,required to add Level swithing circuit.

（4）.If IO port connected to out-ring interface directly，pin or other etc，recommended to reserved ESD
   device near the terminal of IO circuit line .

Level switching circuit

7.Reflow Welding Curve

升温区 — 温度：25～150°C 时间：60～90s 升温斜率：1～3°C/s
预热恒温区 — 温度：150～200°C 时间：60～120s
回流焊接区 — 温度：>217°C 时间：60～90s；峰值温度：235～250°C 时间：30～70s
冷却区 — 温度：峰值温度～180°C 降温斜率 -1～-5°C/s
焊料 — 锡银铜合金无铅焊料 (SAC305)
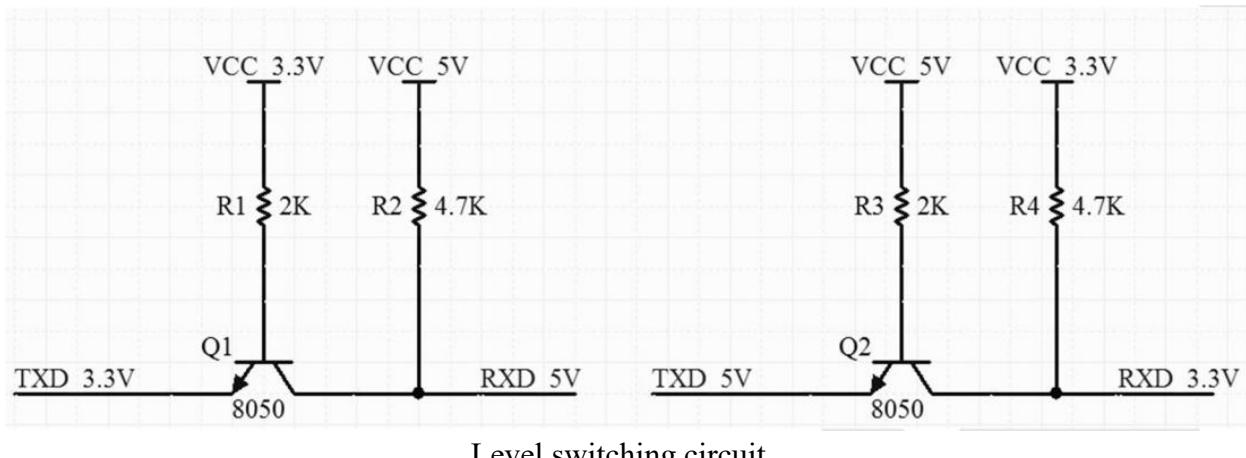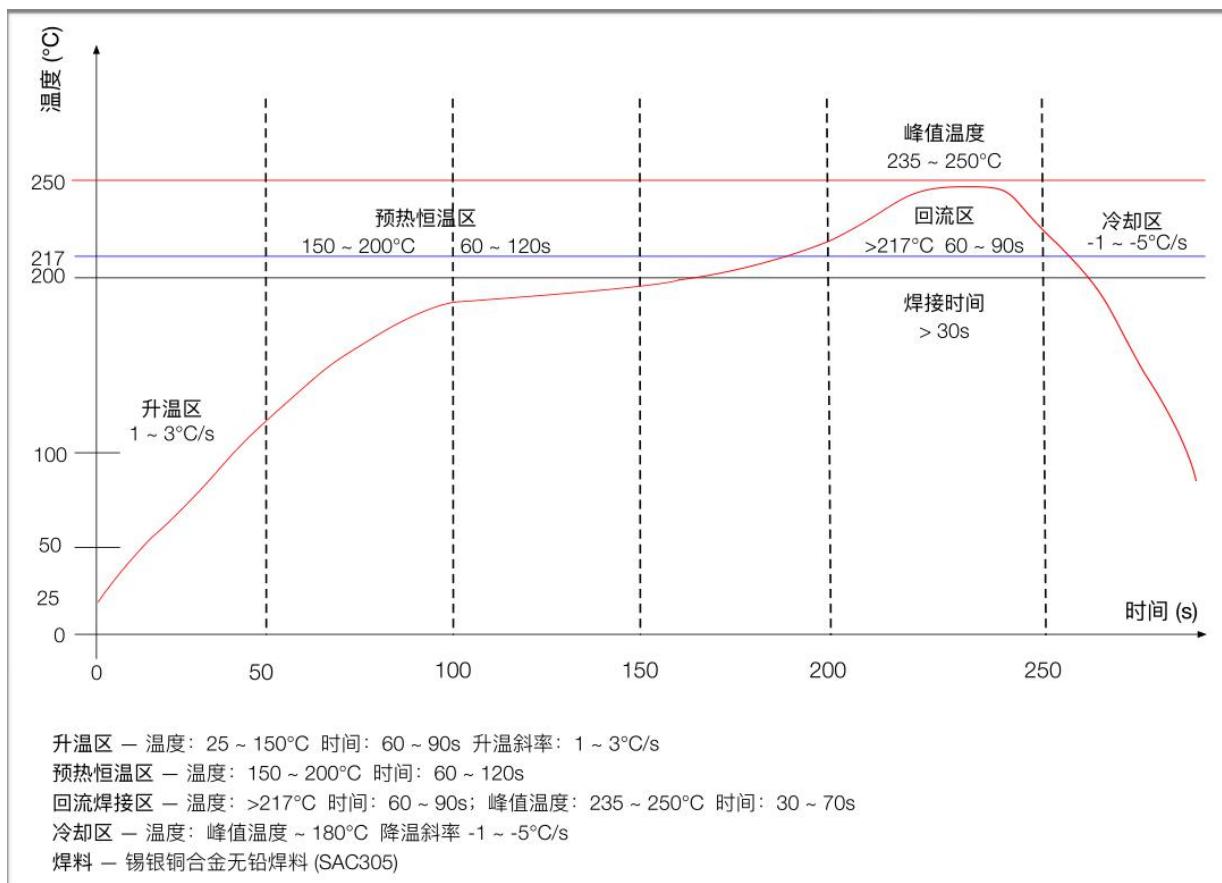
8.Package Information

As shown below,the packing of Ra-06 is a tape.

9.Contacts

Company website：https://www.ai-thinker.com

Developer Wiki：http://wiki.ai-thinker.com

Company forum：http://bbs.ai-thinker.com

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