



# Ra-01H Specification

Version V1

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## Change History of Revision

Version	Date	Contents of Revision Change	Compilation	Verify
V0.9	2017.10.05	Initial release	Yang xiaofei	
V1.0	2019.10.29	Data update	Xie Yiji	

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## 1.Product Overview

Ai-Thinker lora Series Module (Ra-01H) designed and developed by Ai-Thinker .This module is used for long distance spread spectrum communication., Its RF chip SX1276 (as show as figure 1) Mainly used LoRa™ remote modem , for ultra-long-distance spread spectrum communication , strong anti-interference , can minimize current consumption. With the help of the SEMTECH the patent technology of LoRa™, SX1276 with -148dBm high sensitive , with +20dBm power output, long range transmission, high reliability. Meantime , relative traditional modulation technique , LoRa™ modulation technique has obvious advantages in anti-blocking and selection, It solves the problem that traditional design scheme can not consider distance, anti-interference and power consumption simultaneously.

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

### Features

- LoRa™ modem .
- Support FSK、GFSK、MSK、GMSK、LoRa™ and OOK mode
- Support 803/930MHz
- Operating voltage is 3.3V,maximum output +19dBm, the maximum output current is 105mA.
- Low power Consumption in a received stat,the received current is 12.15mA, stand-by current is 1.6mA
- High sensitivity: as low as -140dBm
- Small volume double row stamp hole patch package
- SPI interface, using half duplex communication, with CRC、 up to 256-byte packet engine

## Main parameters

### Charter 1.1 main parameters instruction

<b>Module name</b>	Ra-01H
<b>Package</b>	SMD-16
<b>Size</b>	17*16*3.2(±0.2)MM
<b>Antenna</b>	Compatible half hole weld tray (need to weld antenna)
<b>Spectrum range</b>	803~930MHz
<b>Working temperature</b>	-40°C ~ 85 °C
<b>Storage environment</b>	-40 °C ~ 125 °C , < 90%RH
<b>Power supply</b>	2.7~3.6V, typical value 3.3V, current over 200mA
<b>Support Interface</b>	SPI
<b>Programmable bit rate</b>	300kbps
<b>Certification</b>	REACH、RoHS

## 2. Electrical parameters

### Electrical character

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOPR	-40	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

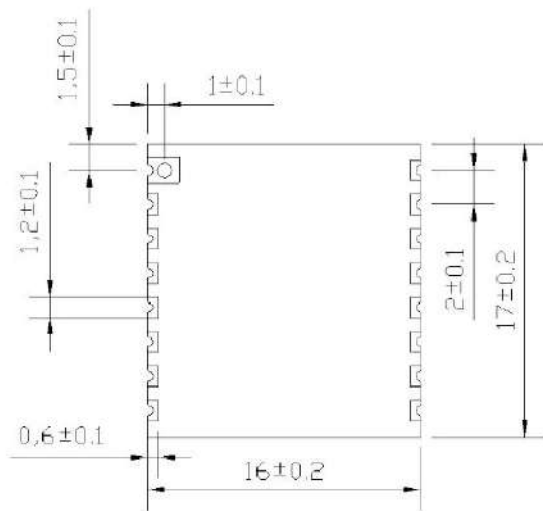
### • SPI Interface features

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

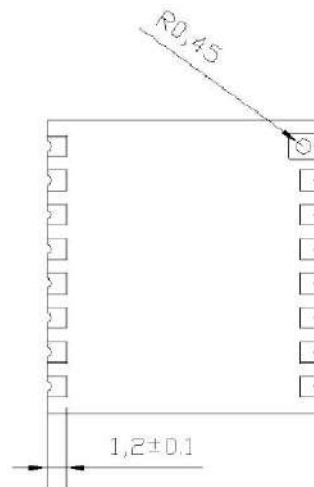
trise	SCK Rise time	-	-	5	-	ns
tfall	SCK Fall time	-	-	5	-	ns
tsetup	MOSI Time setting	Change from MOSI to the rising edge of SCK	30	-	-	ns
thold	MOSI Duration	From the rising edge of SCK to the change of MOSI	20	-	-	ns
tnsetup	NSS Set up time	From the falling edge of NSS to the rising edge of SCL	30	-	-	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



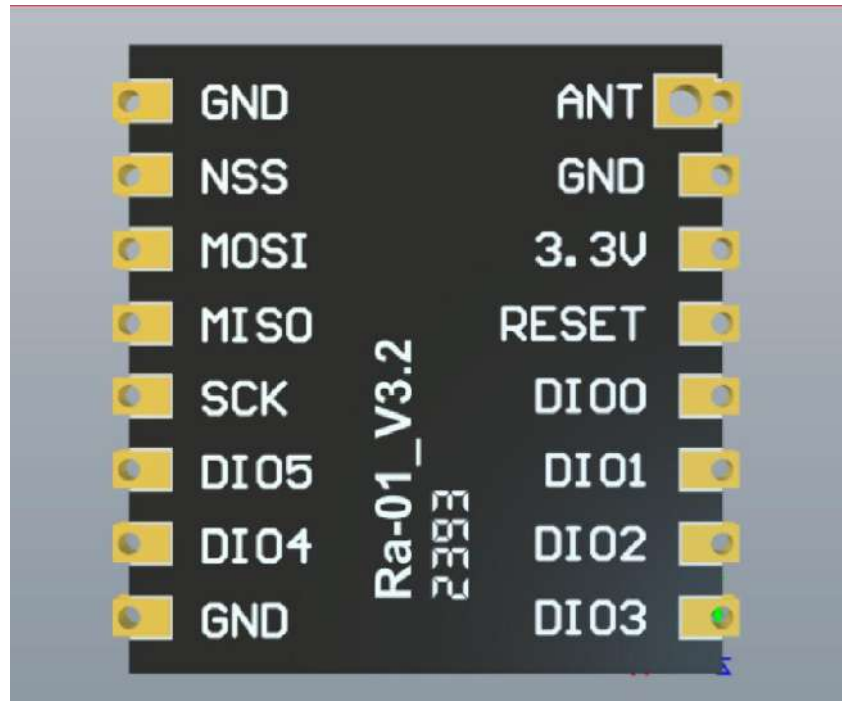
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## 4.Pin definition

Ra-01H module with 16 interface , show as the pin diagram, the pin function definition table is the interface definition.



Ra-01H Pin diagram

Table Pin function definition

No.	Name	Function instruction
1	ANT	Antenna
2	GND	Ground
3	3.3V	3.3V power supply (VDD)
4	RESET	Reset
5	DI00	Digital I00 software configuration
6	DI01	Digital I01 software configuration
7	DI02	Digital I02 software configuration
8	DI03	Digital I03 software configuration
9	GND	ground
10	DI04	Digital I04 software configuration
11	DI05	Digital I05 software configuration

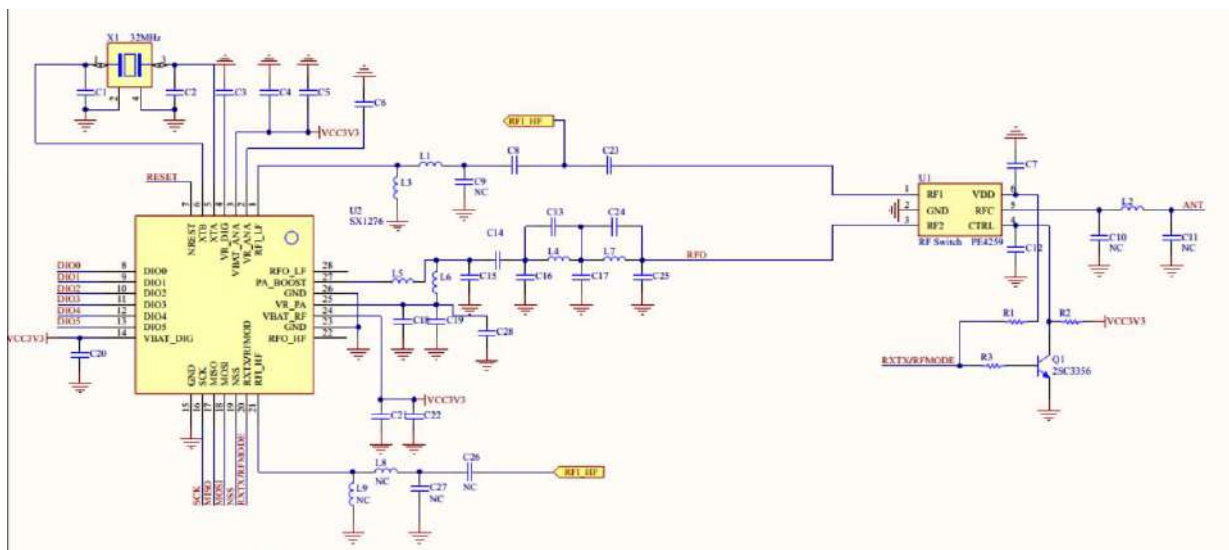
12	SCK	SPI clock input
13	MISO	SPI data output
14	MOSI	SPI data input
15	NSS	SPI Selection input
16	GND	ground

The six general IO pin of SX1276 can be available in LoRa™ mode.

Their mapping depends on the configuration of the two registers RegDioMapping1 and RegDioMapping2.

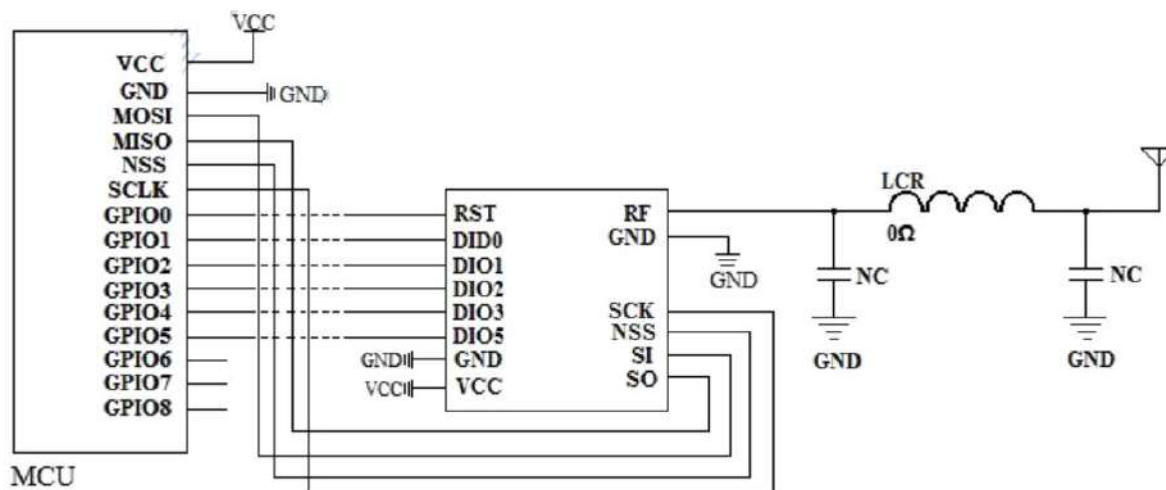
Operating Mode	DIOx Mapping	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0
All	00	ModeReady	CadDetected	CadDone	Fhss Change Channel	RxRimeout	RxDone
	01	ClkOut	PIILock	Valid Header	Fhss Change Channel	Fhss Change Channel	TxDone
	10	ClkOut	PIILock	PayloadCrc Error	Fhss Change Channel	CadDetected	CadDone
	11	-	-	-	-	-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

## 5.Schematics



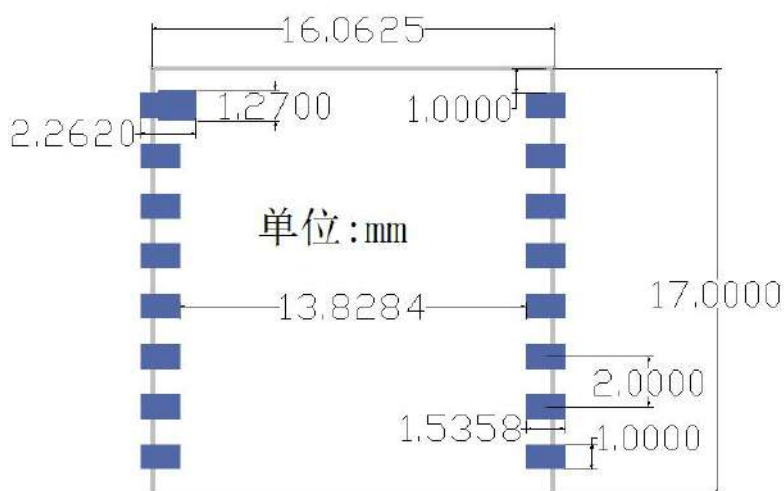
## 6.Design Guidance

### 1、Application Circuit



### 2、Recommended module package design size

Note: Below is the Ra-01H module package diagram, it is recommended to design the PCB board according to this diagram, so that the module can work normally on the PCB board; and pay attention to the design of the pad, the design of the pads on the PCB can not be offset from the corresponding pads of the module, and the expansion of the PCB pads relative to the module pads does not affect the use of the module.

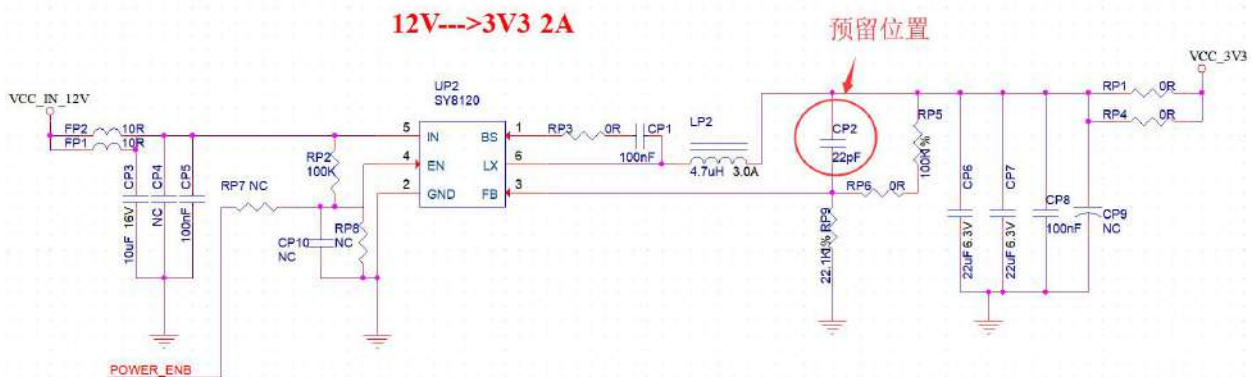


### 3、Antenna Install

- (1)、Ra-01H require to weld antenna, the module is compatible with the half-hole pad and the round-hole pad.
- (2)、In order to meet the performance of the antenna, metal parts are prohibited from being placed around the antenna.

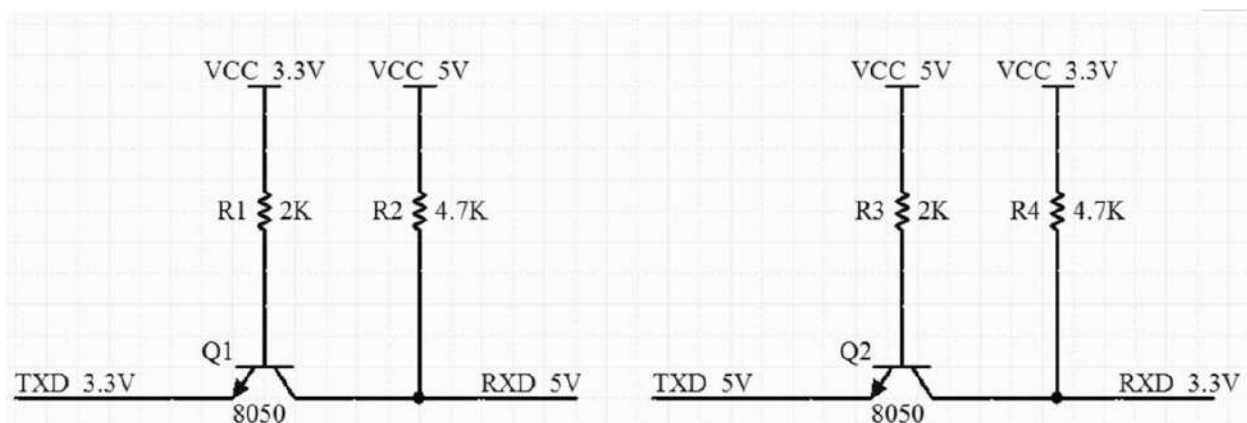
#### 4、Power Supply

- (1)、Recommended voltage 3.3 V, Peak:Current over 200mA .
- (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 interface is recommended to add ESD devices.



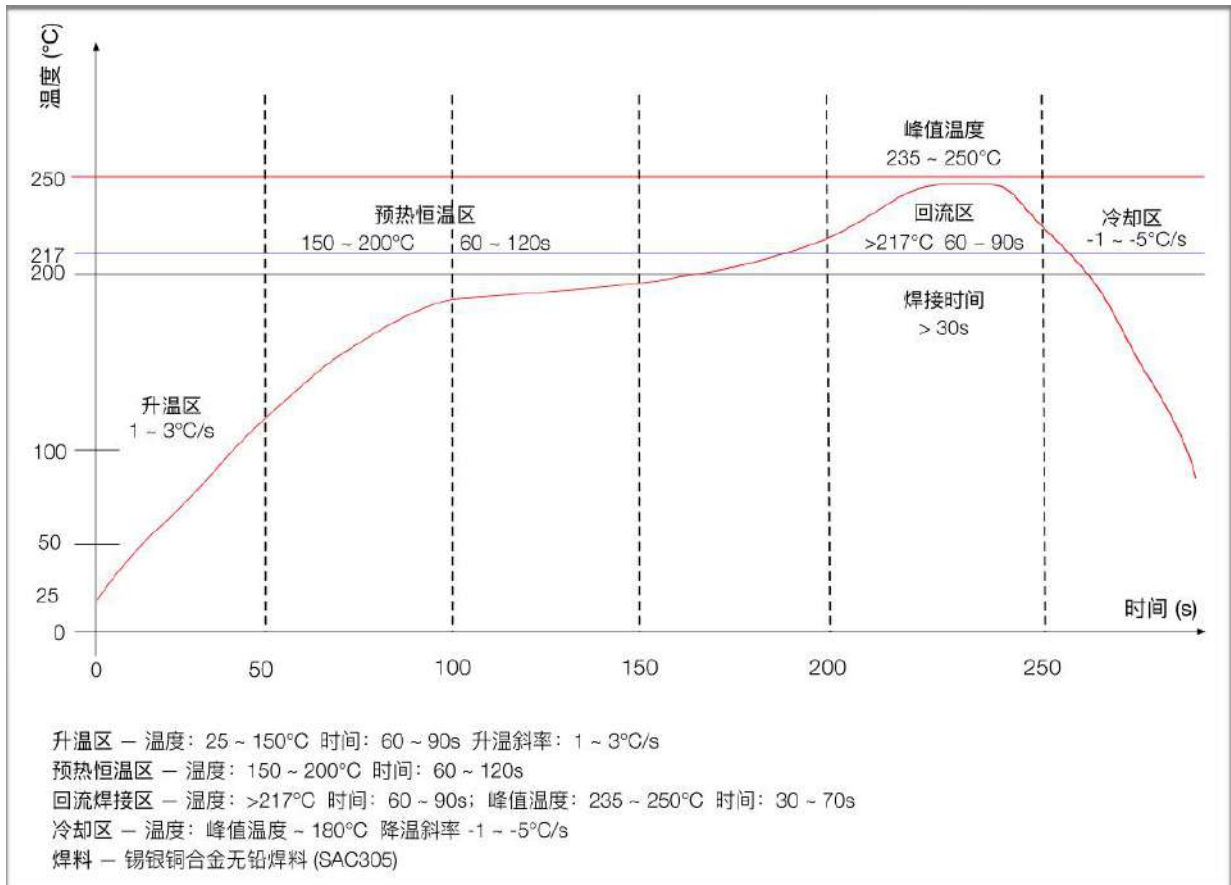
#### 5、GPIO

- (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 switching 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



## 8.Package Information

As shown below, the packing of Ra-01H is a tape.



## 9.Contacts

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

Developer DOCS: <https://docs.ai-thinker.com>

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

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