

VG2392S240X0M3 wireless module

Hardware specification

V1.0



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1. Overview

VG2392S240X0M3 series of wireless modules, which are based on SEMTECH of SX1281 _ High-performance wireless transceiver chip designed with external power amplifier (PA) and low Noise amplifier (LNA), long-distance 2.4G _ LORA Two-way wireless transceiver module, maximum output power of the module 1W. SX1281 _ is a support LORA spread spectrum 2.4 Ultra-long-distance communication wireless transceiver chip in the GHz frequency band, which has the characteristics of high linearity and strong anti-interference. In order to further adapt to the complex application environment of the product and achieve further communication message distance, A high-efficiency power amplifier device is integrated inside the module. Compared to ordinary 2.4G Wireless module, with its greater transmit power and higher receiving sensitivity , makes it Better communication link budget capabilities.

The module integrates all radio frequency related functions and devices. Users can use this module to easily develop stable performance without having an in-depth understanding of radio frequency circuit design.Determined and highly reliable wireless solutions and wireless IoT devices.

Product main features:

- long distance 2.4G Send and receive communications
- Module integration PA , LNA amplifier
- High receiving sensitivity
- The transmit power is programmable, and the maximum transmit power can reach 30dBm (1W)
- Support both LoRa® , FLRC , (G) FSK equal modulation method
- Programmable data transfer rate

application:

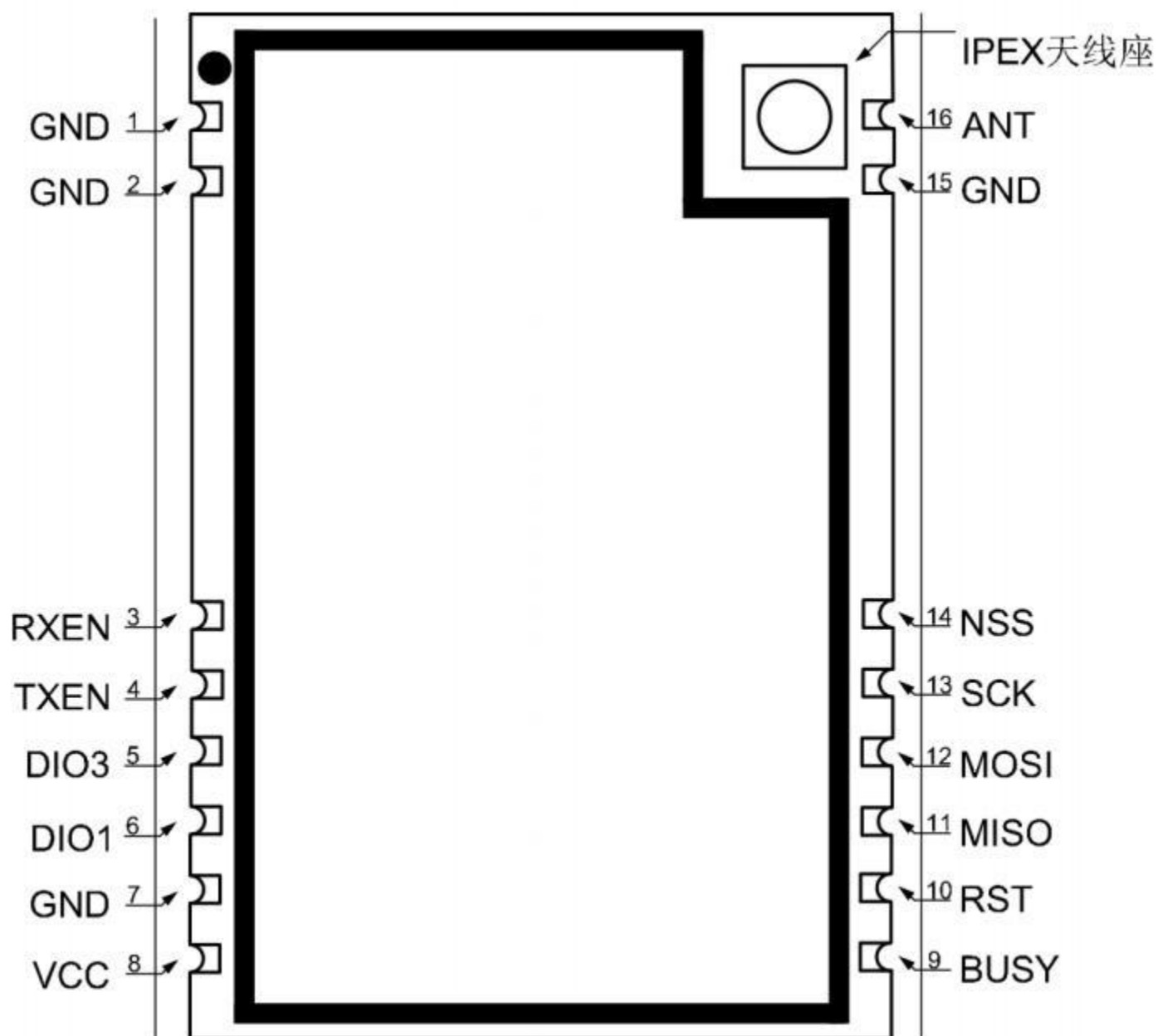
1. Home Automation and Appliances
2. IIoT Asset Management and Security
3. Radio controlled toys and drones
4. Smart agriculture
5. medical insurance

2. The main technical parameters

Technical indicators	parameter	Remark
voltage range	4.5~5.5V	generally 5.0V
Frequency Range	2.4 GHz	2400MHz - 2500MHz
Maximum output power Rate	30dBm (1W)	SX1281 _ The chip output power is set to 0 dBm , passing PA You can arrive later 30dBm _
Wireless speed	125~2000 Kbps @ FSK 260~1300 Kbps @ FLRC 0.476~202 Kbps @ LoRa	Programmable configuration
Modulation	LoRa®, FLRC , (G) FSK	recommend LoRa , FLRC
Receive sensitivity	-137dBm	LORA , SF 12, BW =203 kHz , CR =4/5
Receive bandwidth	300~2400 kHz @ FSK 300~1200 kHz @ FLRC 203~1625 kHz @ LoRa	Programmable configuration
Emission current	850 mA	Transmit power= 30dBm (1W)
receive current	13.5 mA	LoRa BW =203 KHz
Sleep current	15uA	SX1281 _ Configure to enter sleep mode at the same time TXEN =0, RXEN =0
Driver interface	SPI	standard 4 Wire SPI , SPI Clock: <=10 MHz , CPOL = 0, CPHA = 0
Antenna impedance	50 ohm	

Antenna connection method	IPEX -1 Seat, stamp half hole	Can be brought directly through the module IPEX Antenna buckle to connect external antenna or through stamp half hole to the antenna base on the user's own base plate
storage temperature	-40℃~+125℃	
Operating temperature	-40℃~ +85℃	Industrial grade
Size	29.9x20.5 mm	

3.Pin location diagram



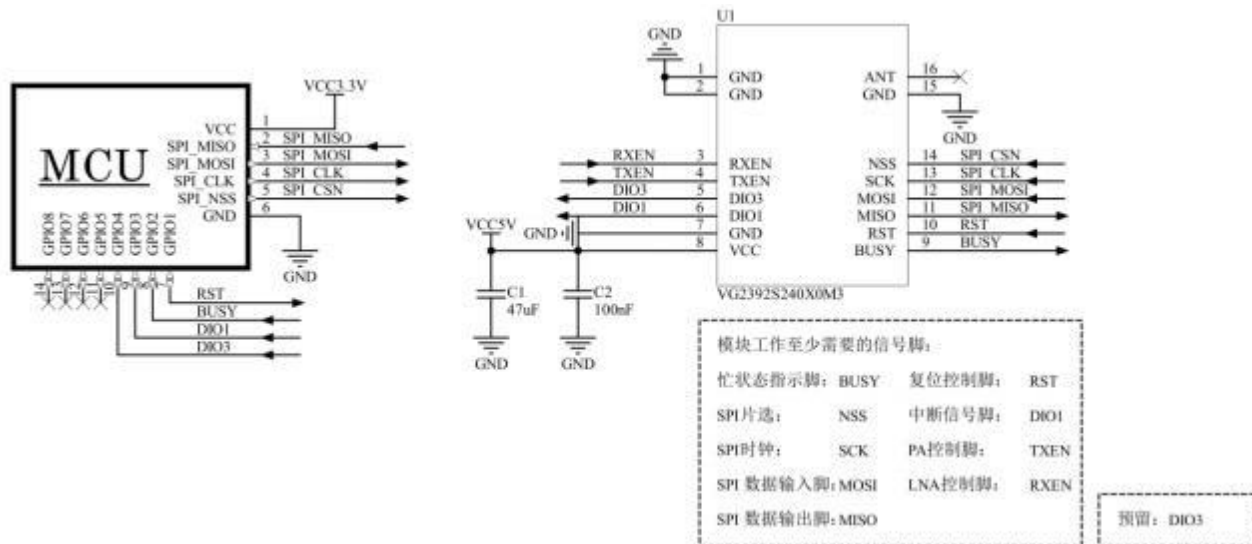
picture3-1 front view

4. Pin description

number	pin	type	describe
1	GND	power supply	land
2	GND	power supply	land
3	TXEN	I	module PA Control foot, when launching TXEN =1; RXEN =0, in sleep mode TXEN =0; RXEN =0
4	RXEN	I	module LNA Control pin, when receiving TXEN =0; RXEN =1, in sleep mode TXEN =0; RXEN =0
5	DIO 3	I/O	direct chip DIO 3 number I/O pin, software configurable function
6	DIO 1	I/O	direct chip DIO 1 number I/O pin, Software configurable function, generally used as data transmission and reception interrupt signal foot
7	GND	power supply	land
8	VCC	power supply	Positive pole of power supply
9	BUSY	0	Chip working status indication, busy status
10	RST	I	Reset signal, active low level
11	MISO	0	SPI interface MISO data output
12	MOSI	I	SPI interface MOSI data input
13	SCK	I	SPI interface SCLK clock input
14	NSS	I	SPI interface SPI Chip Select
15	GND	power supply	land
16	ANT	I/O	Antenna external interface, matching 50 Ω antenna

5. Hardware design guidance and considerations

5.1. Hardware connection diagram



picture 5-1. MCU Connection diagram

5.2. Power supply design and related precautions

1. Please pay attention to the correct connection of the positive and negative poles of the power supply. And ensure that the power supply voltage is within the recommended power supply voltage range. If it exceeds the maximum allowable power supply range of the module, it will cause the module to malfunction.

The module is permanently damaged; the filter capacitor of the module power pin should be as close as possible to the module power pin.

2. In the module power supply system, excessive ripples may be coupled to lines that are susceptible to interference through wires or ground planes. Such as antennas, feeders, clock lines, etc.

Sensitive signal lines can easily cause the module's radio frequency performance to deteriorate, so we recommend using LDO as the power supply for the wireless module.

3. When selecting a voltage stabilizing chip, you need to pay attention to the heat dissipation of the power supply and the driving ability of the voltage stabilizing chip to stabilize the output current. Considering the long-term stable operation of the whole machine, it is recommended to pre-install the voltage stabilizing chip. Keep More than 50% current output margin.
4. It is best to use a separate regulated power supply for the module; if DC - DC power chip, Pay attention to the ripple switching noise of the power supply and prevent the switching power supply chip from The noise interferes with the operating performance of the radio frequency.
5. MCU If the communication line between the module and the module is used 5V level, must be connected in series 1K-5.1K resistor (not recommended, there is still a risk of damage).
6. Keep the RF module as far away from high-voltage devices as possible, because the electromagnetic waves of high-voltage devices will also have a certain impact on RF signals.
7. High-frequency digital traces, high-frequency analog traces, and high-current power traces should be kept away from the bottom of the module. If they have to pass under the module, they need to be placed on the module. Blocky PCB Another layer of the bottom board, and ensure that the copper underneath the module is well grounded.

5.3. Antenna design and guidance

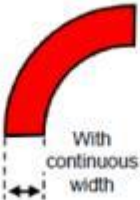


5.3.1. Onboard IPEX Antenna base

The module comes with IPEX 1st generation antenna base, users can easily pass IPEX 1 generation transfer SMA RF coaxial extension cable external 2.4G glue stick antenna or suction cup antenna.



5.3.2. Stamp hole interface RF design

ohm characteristic impedance trace to connect to the base plate during design. Antenna on the PCB . requires attention base plate PCBRF traces need to be as short as possible, 2.4G Signals are sensitive to trace length. It is recommended that the longest trace length does not exceed 10 mm , and the trace width needs to maintain continuity; When you need to turn, try not to take sharp or right angles. It is recommended to take arcs.

<p>The primary recommended turning method for RF cabling</p>	
<p>The second recommended RF wiring turning method</p>	
<p>A poor way to turn RF cables, not recommended</p>	

In order to ensure that the RF wiring on the backplane is 50 Ohm can be adjusted according to the following parameters according to different plate thicknesses. The following simulation values are for reference only.

RF wiring adopts 20 milLine width	The plate thickness is 1.0mm _ When , the spacing between ground copper and traces is 5.3 mil
	The plate thickness is 1.2mm _ When , the spacing between ground copper and traces is 5.1 mil
	The plate thickness is 1.6mm _ When , the spacing between ground copper and traces is 5 mil
RF wiring adopts 25 milLine width	The plate thickness is 1.0mm _ When , the spacing between ground copper and traces is 6.3 mil _
	The plate thickness is 1.2mm _ When , the spacing between ground copper and traces is 6 mil
	The plate thickness is 1.6mm _ When , the spacing between ground copper and traces is 5.7 mil
RF wiring adopts 30 milLine width	The plate thickness is 1.0mm _ When , the spacing between ground copper and traces is 7.6 mil
	The plate thickness is 1.2mm _ When , the spacing between ground copper and traces is 7.1 mil
	The plate thickness is 1.6mm _ When , the spacing between ground copper and traces is 6.6mil _ _

5.3.3 Choice of external antenna

External antenna means the module passes IPEX Extension cord, Antennas with standard radio frequency interfaces such as SMA installed outside the product shell, including rod antennas and suction cup antennas wire, fiberglass antenna, etc. External antennas are basically standard products. In order to better choose an antenna suitable for the module, the parameters of the antenna should be selected during the antenna selection process.

When choosing, you should pay attention to the following:

1. The working frequency of the antenna and the working frequency of the corresponding module should be consistent.
2. The input characteristic impedance of the antenna should be 50 ohm .
3. The size of the antenna interface should match the size of the antenna interface of the module .
4. The standing wave ratio (VSWR) of the antenna is recommended to be less than 2, and the antenna should have a suitable frequency bandwidth (covering the frequencies used in the actual application of specific products).

6. Precautions for programming development

The module has been integrated PA & LNA power amplifier components, So the chip output power is set to 0dBm _ That' s it, the maximum setting value should not exceed 5 dBm , otherwise easy Damage inside the module PA device.

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/*!
 * \brief Defines the output power in dBm
 *
 * \remark The range of the output power is [-18..+13] dBm
 */
#define TX_OUTPUT_POWER 0

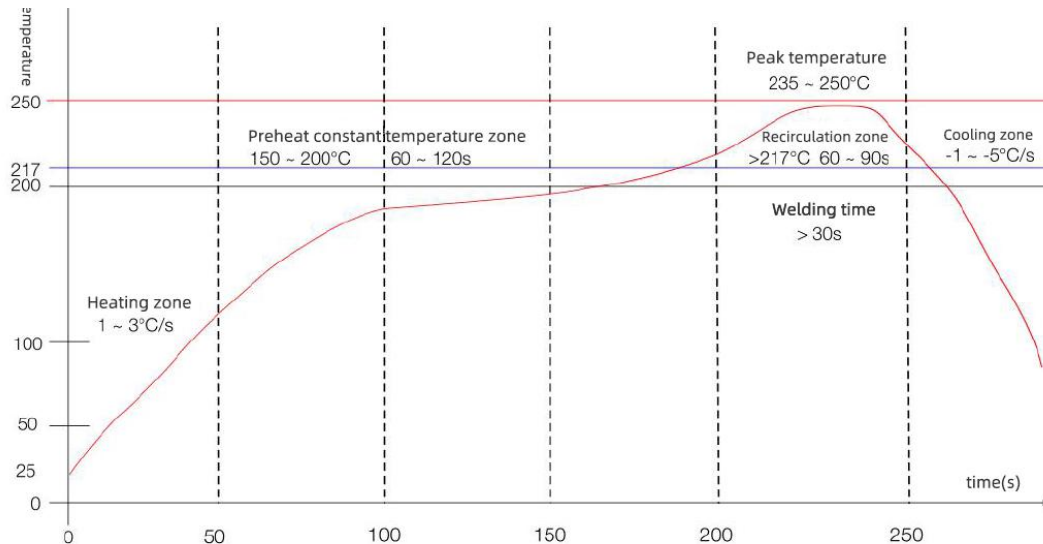

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ModularTXENfeet andRXENThe pin is inside the control modulePA & LNAThe logic control pin of the device, please pay attention to the module when using it.TXENandRXENpin control level.

The control logic is listed below:

model	TXEN	RXEN
emission	1	0
take over	0	1
hibernate	0	0

7. Reflow soldering curve



Heating zone-temperature: 25-150°C time: 60-90s Ramp rate: 1-3°C/s
 Preheat constant temperature zone-temperature: 150-200°C time: 60-120s
 Reflow soldering area-temperature >217°C time: 60-90s; Peak temperature: 235-250°C time: 30-70s
 Cooling zone-temperature: Peak temperature -25-150°C Cooling slope -1~-5°C/s
 Solder-tin-silver-copper alloy lead-free solder(SAC305)

8. Static electricity damage warning

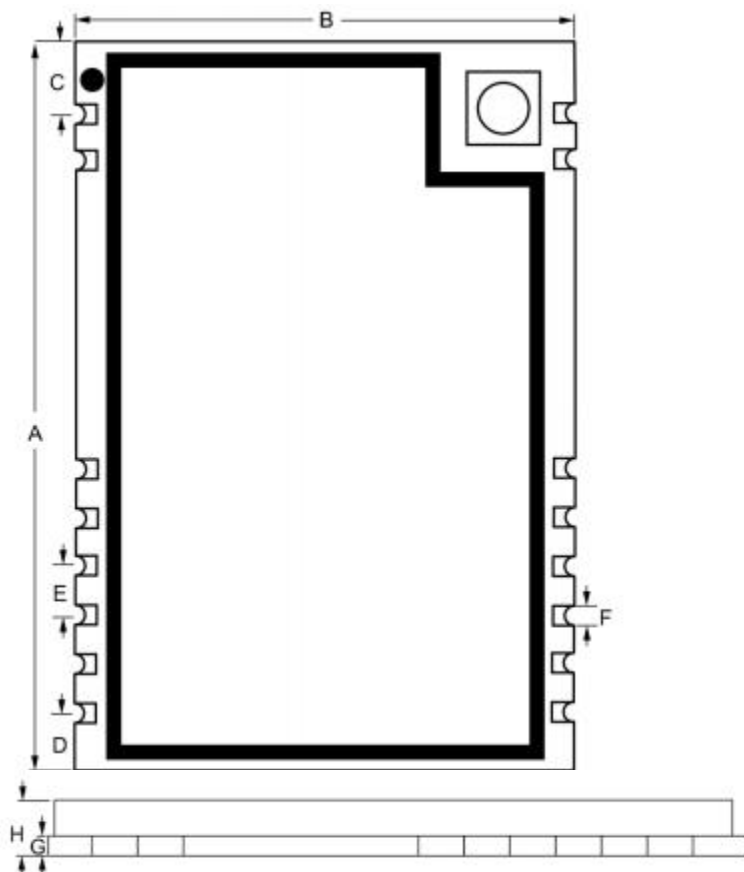
The RF module is a high-voltage electrostatic sensitive device. To prevent static electricity from damaging the module

- 1, Strictly follow anti-static measures, and it is prohibited to touch the module with bare hands during the production process.
- 2, Modules should be placed in a placement area that prevents static electricity.
3. The anti-static protection circuit at the high-voltage input should be considered during product design.



9. Packaging information

Mechanical dimensions (unit: mm)



serial number	Dimensions (mm)	Error (mm)
A	29.9	± 0.5
B	20.5	± 0.1
C	3.0	± 0.1
D	2.3	± 0.1
E	2.0	± 0.1
F	1.2	± 0.1
K	0.8	± 0.1
G	1.0	± 0.1
H	2.8	± 0.2

10. Version update instructions

Version	update content	Updated
V1.0	initial version	2022 Year 11 moon 29th

11. Procurement selection table

number	model	illustrate
1	VG 2392S240X0M3	Tape packaging\pallet packaging

12. Statement

1. Due to product version upgrade or other reasons, The content of this document will be updated from time to time. Unless otherwise agreed, this document is only used as a guide.

All statements, information and recommendations in do not constitute any express or implied warranty.

2. The company reserves the right of final interpretation and modification of all information provided, and is subject to change without prior notice.

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