VG2379SxxxN0SA wireless module Hardware specification

V1.0



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1. Overview

VG2379SxxxN0SA series of wireless modules, based on SEMTECH of SX1268 High-performance wireless transceiver chip design, a small size, low power consumption, Long-distance two-way wireless transceiver module. The module uses a high-precision active temperature-compensated crystal oscillator. Compared with ordinary passive crystal oscillator modules, It has better temperature stability Qualitative, the operating frequency deviation is almost not affected by changes in ambient temperature. This makes this module the best choice for wireless solutions in complex and harsh industrial environments.

SX1268 sub-GHz Wireless transceivers are ideal for long-range wireless applications. 4.2mA of effective receive current and is designed for battery-powered applications. Built-in up to +22 dBm high-efficiency power amplifier. The module can support LPWAN use case (G)FSK for LoRa® modulation and legacy use cases modulation mode, and has parameters The data is highly configurable to meet different application requirements in the industrial market and consumer market. LoRa® modulation is compatible with LoRaWAN Technical specifications issued by the Alliance. Suitable for systems that comply with radio regulations, including but not limited to Chinese regulatory requirements and ETSI EN 300 220 (434 MHz), its 410MHz _ arrive 810MHz Continuous frequency coverage support for China 490MHz frequency band and 780MHz Frequency band low power short range equipment.

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

Product main features:

- support LoRa and (G)FSK Modem
- High link budget: 162dB Maximum link budget
- High output power: up to +22dBm Output Power
- Low power consumption: less than 6mA The low receive current
- DC-DC and LDO Two power modes
- LORA In mode, the communication baud rate is from 0.018k bps arrive 62.5kbps Programmable
- High sensitivity: as low as -140dBm

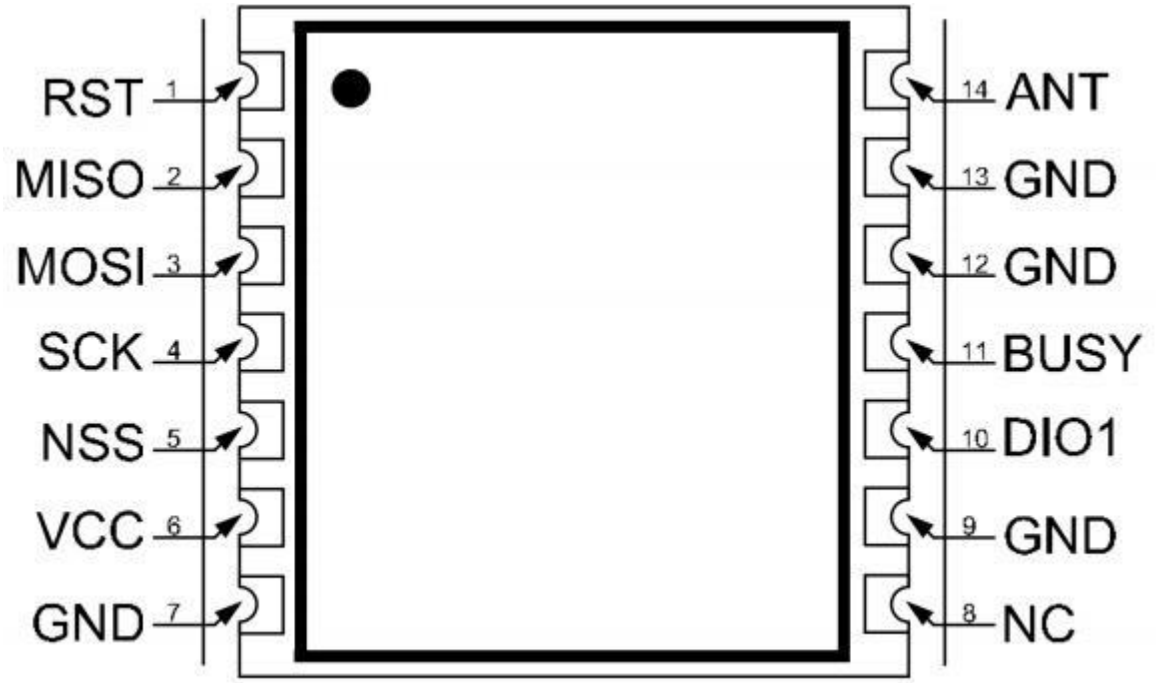
application:

- Smart meter reading
- Supply chain and logistics
- Building automation
- agricultural sensors
- Smart City
- retail store sensors
- Asset tracking
- street lamp
- parking sensor
- environmental sensor
- medical insurance
- Safety and Security Sensors
- Remote control application

2. Technical parameters

Technical indicators	parameter	Remark
voltage range	1.8～3.7V	generally 3.3V
Frequency band range	433MHz/490MHz	The applicable frequency band is determined by the specific hardware module
Output Power	-3dBm to +22dBm	step value 1dBm
Wireless speed	0.6kbps～300Kbps@FSK 0.018kbps～62.5kbps@LoRa	Programmable configuration
Modulation	LORA, (G)FSK	recommend LORA
Crystal frequency	32MHz	Active temperature compensated crystal oscillator
Receive sensitivity	-137dBm	LORA Modulation, BW=125kHz, SF=12
Receive bandwidth	4.8kHz～467kHz/FSK 7.8kHz～500kHz/LoRa	Programmable configuration
Emission current	118mA	Transmit power= +22dBm
receive current	6mA	DC-DC model
Sleep current	<1uA	
Driver interface	SPI	standard 4 Wire SPI, SPI Clock: <=10MHz CPOL = 0, CPHA = 0
Antenna impedance	50 ohm	
Antenna connection method	stamp hole	
storage temperature	-55℃ ~+125℃	
Operating temperature	-40℃ ~+85℃	Industrial grade
Size	11.5x11.5mm	

3. Pin location diagram



picture 1-1 top view

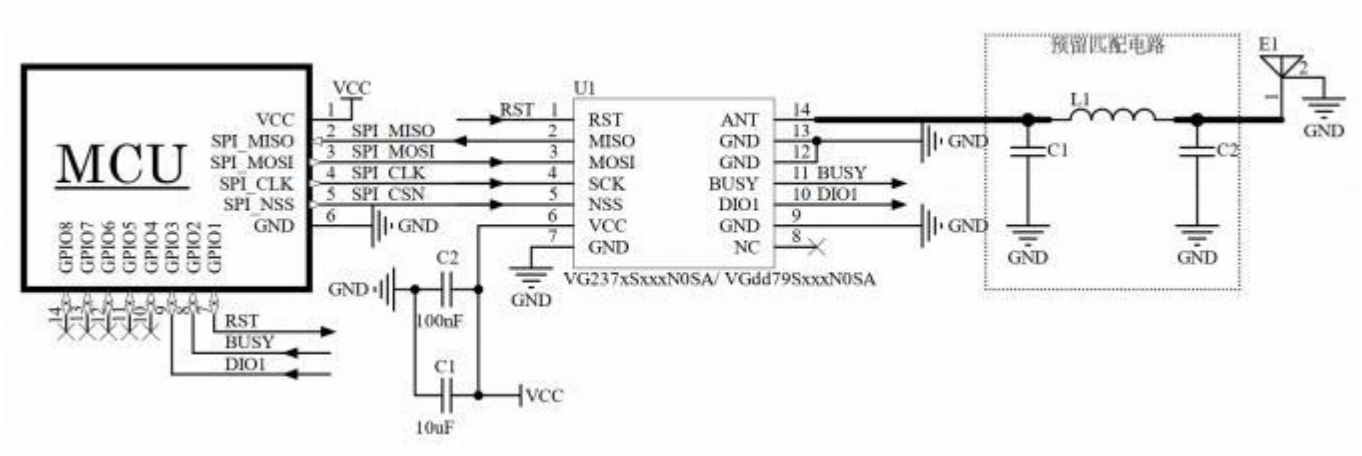
4. Pin description

number	pin	type	describe
1	RST	I	reset signal, Active low
2	MISO	O	SPI interface MISO data output
3	MOSI	I	SPI interface MOSI data input
4	SCK	I	SPI interface SCLK clock input
5	NSS	I	SPI interface SPI Chip Select
6	VCC	power supply	Positive pole of power supply
7	GND	power supply	land
8	NC	--	The module is floating inside
9	GND	power supply	land
10	DIO1	I/O	direct chip DIO1 number I/O pin, software configurable function
11	BUSY	O	Chip working status indication, busy status
12	GND	power supply	land
13	GND	power supply	land
14	ANT	I/O	RF signal input/output, catch 50Ω antenna

…	DIO2	I/O	Directly connected to the internal antenna switch of the module, transfer SetDio2AsR fSwitchCtrl(…) can be set
…	DIO3	I/O	The module is internally connected to the active crystal oscillator power pin and calls SX126xSetDio3 AsTcxoCtrl(…) setting

5. Hardware design guidance and precautions

5.1. Hardware connection diagram



picture 5-1 Programming Development Hardware Connection

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 supply voltage range. If it exceeds the maximum allowable power supply range of the module, it will cause Otherwise the module will be 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 susceptible to interference through wires or ground planes , such as antennas, feeders, and clocks.lines and other sensitive signal lines, It is easy to cause the RF performance of the module to deteriorate, so we recommend using LDO as the power supply for the wireless module.

3. Select LDO When installing a voltage stabilizing chip, you need to pay attention to the heat dissipation of the power supply and LDO Stable output current driving capability; considering the long-term stable

operation of the whole machine, it is recommended Recommended reservation More than 50% current output margin.

4. It is best to use one module separately LDO Stabilized power supply; if using DC-DC power supply chip, be sure to add one at the end LDO As isolation of the module power supply,Prevent the noise of the switching power supply chip from interfering with the working 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, still risk of damage).

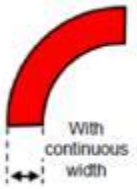
6. Keep the RF module as far away from high-voltage devices as possible, because the electromagnetic waves of high-voltage devices will also have a certain impact on RF signals.

7. High-frequency digital traces, high-frequency analog traces, and high-current power traces should be kept away from the bottom of the module as much as possible. If they must pass under the module, the traces must be routed.Put the module 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 stamp hole interfaceRF design

When selecting the module RF output interface in the form of a stamp hole, use a 50ohm characteristic impedance trace to connect to the base plate during design. Antenna on PCB. consider To attenuate high-frequency signals, you need to pay attention to the bottom plate PCB The length of RF traces must be as short as possible. It is recommended that the longest trace length does not exceed 20mm, and the trace width requires Maintain continuity; when you need to turn, try not to take sharp or right angles. It is recommended to take arcs.

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

In order to ensure that the impedance of the backplane RF trace is 50 Ohms, depending on the thickness of the board, Adjust according to the following parameters. The following simulation values, For reference only Test.

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

5.3.2 Built-in antenna

The built-in antenna refers to the one welded on PCB The antenna placed inside the product shell on the base plate specifically includes patch ceramic antennas, spring antennas, etc. While using the built-in When installing an antenna, the structure of the product and the installation position of the antenna have a great impact on the radio frequency performance. On the premise that there is sufficient structural space in the product shell, Spring antenna as much as possible Place it vertically upward; copper cannot be laid around the base plate where the antenna is placed, or the circuit board under the antenna can be hollowed out because metal absorbs radio frequency signals.The reception and shielding capabilities are very strong, which will seriously affect the communication distance. In addition, the antenna should be placed on the edge of the base plate as much as possible.

5.3.3 external antenna

External antenna means the module passes IPEX Extension cable, SMA and other standard radio frequency interfaces installed outside the product shell, including rod antennas, absorbers Dish antenna, fiberglass antenna, etc. External antennas are basically standard products. In order to better choose an antenna suitable for the module, during the antenna selection process,Line parameter selection, The following should be noted:

1. The working frequency of the antenna and the working frequency of the corresponding module should be consistent.

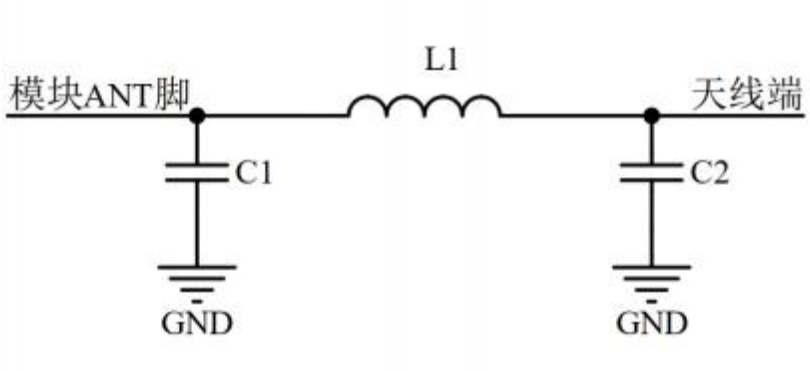
2. The input characteristic impedance of the antenna should be 50ohm.

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).

5.3.4 Antenna matching

Antennas are critical to the transmission distance of RF modules. In practical applications, it is to facilitate users' later antenna matching adjustments. It is recommended that users design schematics When the antenna and moduleANTA simple π-type matching circuit is reserved between the pin outputs. If the antenna is already standard 50Ω, ComponentsL1 stick 0R resistance, deviceC1,C2 No welding is required, otherwise you need to use a network analyzer to measure the actual impedance of the antenna and match it to determineC1,L1,C2 The value of . module ANT The trace from the pin to the antenna end should be as short as possible. It is recommended that the longest trace length does not exceed 20mm.



5-2 π type matching circuit

6. Precautions for programming development

1), radio frequency chip DIO2 The pin is used inside the module to switch the radio frequency signal to control the driver. When programming the driver software, it needs to be set. DIO2 work status, just call the function SetDio2AsRfSwitchCtrl(…). During normal operation, the radio frequency chip will automatically switch according to the wireless working mode.

DIO2 output signal.

```
void SX126xInit( DioIrqHandler dioIrq )
{
    SX126xReset( );
    SX126xWakeup( );
    SX126xSetStandby( STDBY_RC );

#ifdef USE_TCXO
    CalibrationParams_t calibParam;

    SX126xSetDio3AsTcxoCtrl( TCXO_CTRL_1_7V, RADIO_TCXO_SETUP_TIME << 6 );
    calibParam.Value = 0x7F;
    SX126xCalibrate( calibParam );

#endif

    SX126xSetDio2AsRfSwitchCtrl( true );
    OperatingMode = MODE_STDBY_RC;
}
```

2) The module uses an active temperature compensated crystal oscillator and a radio frequency chip. DIO3 The pin is used to provide power to the crystal oscillator. When programming the driver software, you need to set DIO3 The function is as follows, Open the macro definition in the software USE_TCXO, and call the function SX126xSetDio3AsTcxo Ctrl() can set its function.

```
void SX126xInit( DioIrqHandler dioIrq )
{
    SX126xReset( );
    SX126xWakeup( );
    SX126xSetStandby( STDBY_RC );

#ifdef USE_TCXO
    CalibrationParams_t calibParam;

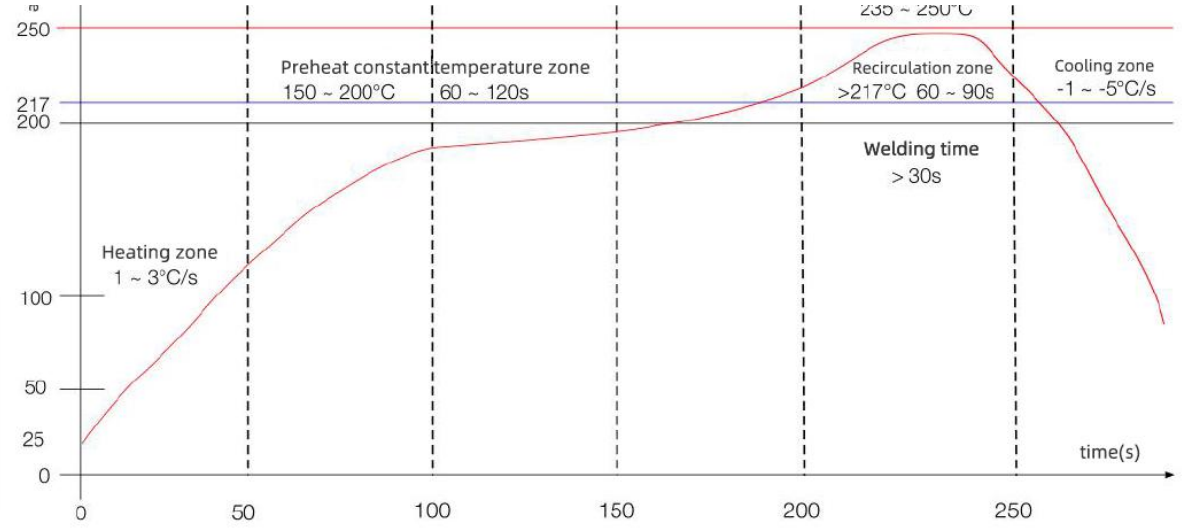
    SX126xSetDio3AsTcxoCtrl( TCXO_CTRL_3_3V, RADIO_TCXO_SETUP_TIME << 6 );
    calibParam.Value = 0x7F;
    SX126xCalibrate( calibParam );

#endif

    SX126xSetDio2AsRfSwitchCtrl( true );
    OperatingMode = MODE_STDBY_RC;
}
```

3), Generally speaking, The receiving sensitivity of the RF chip is relatively poor at the operating frequency point that is an integer multiple of its crystal oscillator. It is recommended that the user pay attention when selecting the operating frequency point.It is necessary to avoid the image frequency point of the module crystal oscillator, that is, the integer multiple frequency point of the crystal oscillator frequency. The crystal oscillator frequency of this module is 32MHz.

7. Reflow soldering curve



Heating zone-temperature: 25-150℃ time: 60-90s Ramp rate: 1-3℃/s
Preheat constant temperature zone-temperature: 150-200℃ time: 60-120s
Reflow soldering area-temperature >217℃ time: 60-90s; Peak temperature: 235-250℃ time: 30-70s
Cooling zone-temperature:Peak temperature -25-150℃ Cooling slope -1--5℃/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. In order to prevent static electricity from damaging the module

1, Anti-static measures are strictly followed, and bare hands are prohibited from touching the module during the production process.

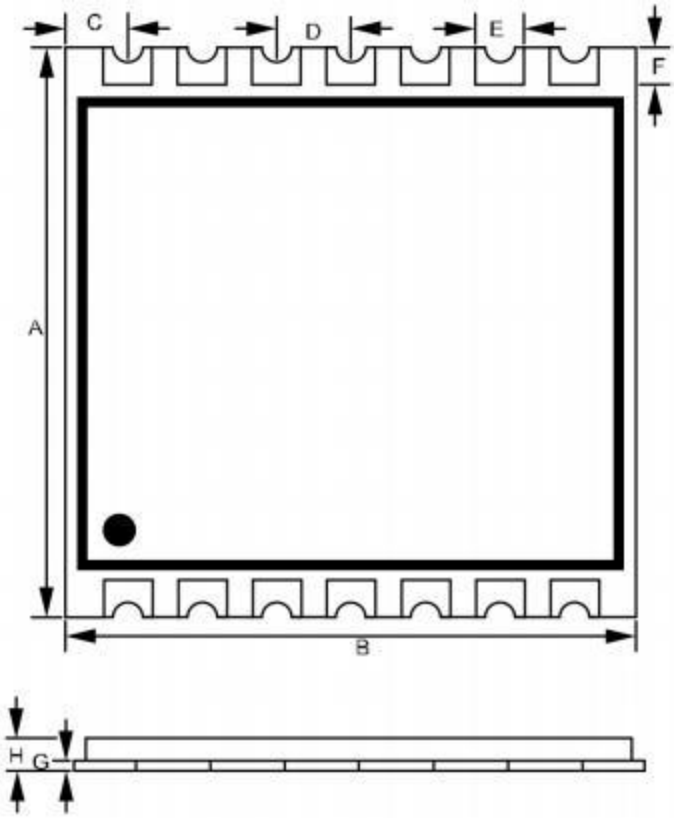
2, Modules should be placed in a placement area that prevents static electricity.

3. Theanti-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	11.5	±0.5
B	11.5	±0.5
C	1.26	±0.1
D	1.5	±0.1
E	1.0	±0.1
F	0.65	±0.1
G	0.8	±0.1
H	2.2	±0.2

10. Version update instructions

Version	update content	Updated	maintain
V1.0	first release	2021 Year 12 moon 11th	Dying

11. Procurement selection table

number	model	illustrate
1	VG2379S433NOSA	433MHz frequency band, Tape packaging\pallet packaging
2	VG2379S490NOSA	490MHz frequency band, Tape packaging\pallet packaging

12. Statement

1. Due to product version upgrades 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.The representations, information and advice contained therein do not constitute any express or implied warranty.

2. The company reserves the right of final interpretation and modification of all information provided, and any changes will be made without prior notice.

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