VGdd79SxxxN0M1 wireless module

Hardware specification

V1.0

Table of contents

I. Overview

VGdd79SxxxN0M1 series of wireless modules, based on SEMTECH of LLCC68 High-performance wireless transceiver chip design, a small size, low power consumption,Long-distance two-way wireless transceiver module. LLCC68 sub-GHz Wireless transceivers are ideal for long-range wireless applications. 4.2mA effective receive current power consumption and is designed for battery-powered applications. LLCC68 built-in up to +22 dBm High-efficiency power amplifier; The module can support LPWAN use case LoRa (G)FSK for modulated and legacy use cases Modulation, The parameters are highly configurable to meet different application requirements for industrial and consumer use. LoRa® modulation method is compatible with LoRa Technologies released by the Alliance specification. This wireless module is suitable for systems that comply with radio regulations. including but not limited to ETSI EN 300 220, FCC CFR 47 No. 15 Part, Chinese law regulatory requirements and Japan ARIBT-108. Wireless transceiver supports from 150 MHz to 960 MHz of continuous frequency coverage, allowing it to support all major worldwide sub-GHz ISM frequency band.

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 FSK modem

. 151 dB maximum link budget

. Up to +22 dBm Output Power

. less than 5mA of low RX current

. Integrated DC-DC converter and LDO Two power supply modes

. LORA In mode, the communication baud rate is from 1.76 kbps to 62.5 kbps Programmable

. High receiving sensitivity: as low as – 129 dBm

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

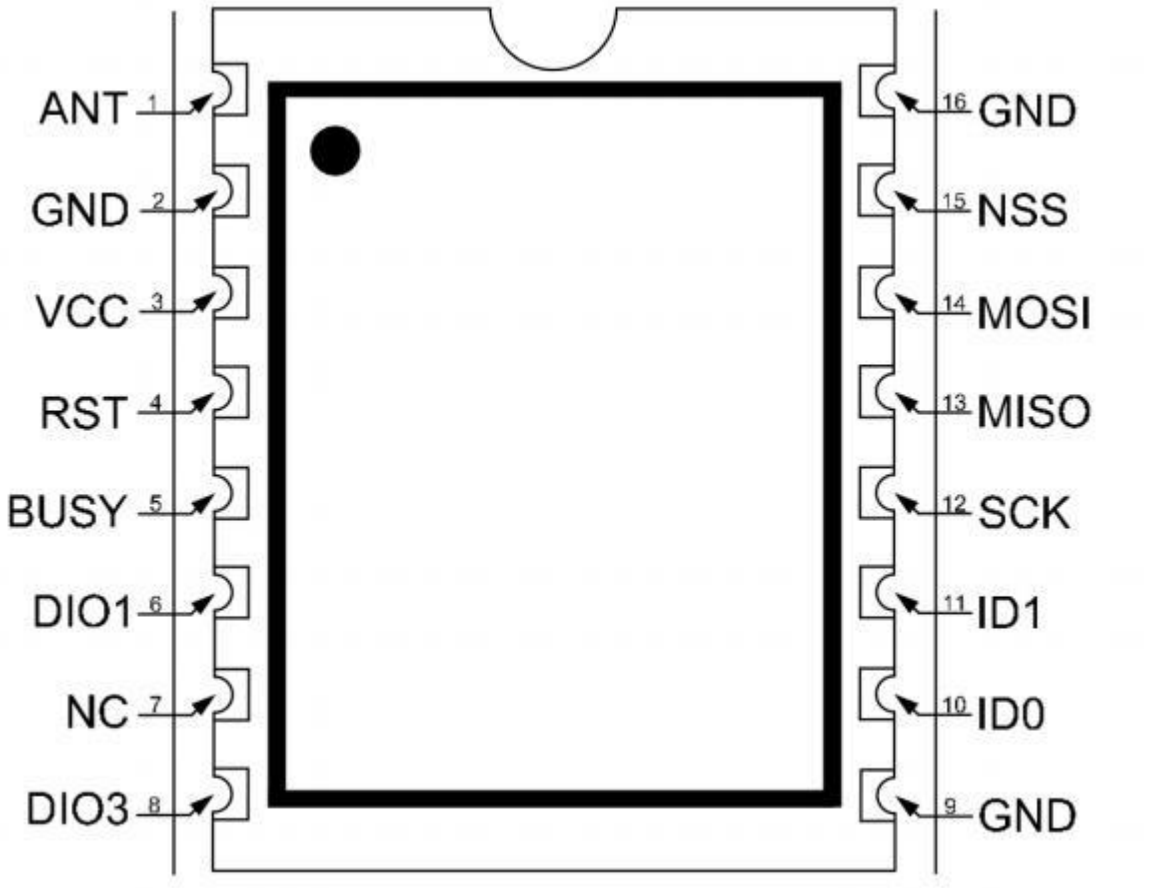
. Safety and Security Sensors

. Remote control application

2. Technical parameters

Technical indicators	parameter	Remark
voltage range	1.8～3.7V	generally 3.3V
Frequency band range	433MHz/490MHz/868MHz /915MHz	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 1.76kbps～62.5kbps@LoRa	Programmable configuration
Modulation	LORA, (G)FSK	recommend LORA
Crystal frequency	32MHz	Passive crystal oscillator
Receive sensitivity	-129dBm	LORA Modulation, BW=250K, SF=10
Receive bandwidth	4.8kHz～467kHz/FSK 125kHz, 250kHz, 500kHz/LoRa	Programmable configuration
Emission current	118mA	Transmit power= +22dBm
receive current	4.2mA	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	13.5x17.1*2.3mm	

3. Pin location diagram



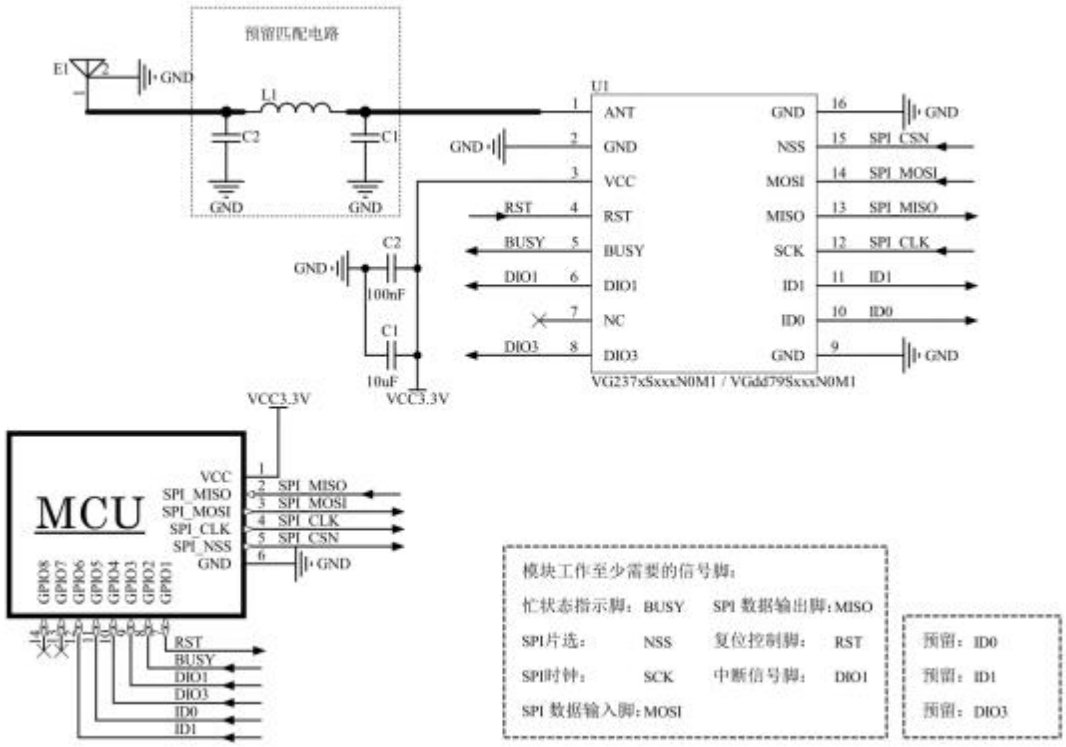
picture 3-1 top view

4. Pin description

number	pin	type	describe
1	ANT	I/O	RF Signal input/output, connect 50Ω antenna
2	GND	Power supply	land
3	VCC	power supply	Positive pole of power supply
4	RST	I	reset signal, Active low
5	BUSY	O	Chip working status indication, busy status
6	DIO1	I/O	direct chip DIO1 number I/O pin, software configurable function
7	NC	--	internal floating
8	DIO3	I/O	direct chip DIO3 number I/O pin, software configurable function
9	GND	power supply	land
10	ID0	O	Module frequency band type identification IO, combine ID0, ID1 The read level can determine the hardware module's Band type. 433 Frequency band module: ID0=0, ID1=0 490 Frequency band module: ID0=0, ID1=1 868 Frequency band module: ID0=1, ID1=0 915 Frequency band module: ID0=1, ID1=1
11	ID1	O	Module frequency band type identification IO, combine ID0, ID1 The read level can determine the hardware module's Band type. 433 Frequency band module: ID0=0, ID1=0 490 Frequency band module: ID0=0, ID1=1 868 Frequency band module: ID0=1, ID1=0 915 Frequency band module: ID0=1, ID1=1
12	SCK	I	SPI interface SCLK clock input
13	MISO	O	SPI interface MISO data output
14	MOSI	I	SPI interface MOSI data input
15	NSS	I	SPI interface SPI Chip Select
16	GND	power supply	land

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 power supply voltage range, If the maximum allowable power supply range of the module is exceeded, 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 ripple may be coupled to lines susceptible to interference through wires or ground planes. such as antennas, feeders, 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. If they have to pass under the module, they need to 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 hour, The spacing between ground copper and traces is 5.3mil
	The plate thickness is 1.2mm hour, The spacing between ground copper and traces is 5.1mil
	The plate thickness is 1.6mm hour, The spacing between ground copper and traces is 5mil
RF wiring adopts 25mil Line width	The plate thickness is 1.0mm hour, The spacing between ground copper and traces is 6. 3mil
	The plate thickness is 1.2mm hour, The spacing between ground copper and traces is 6mil
	The plate thickness is 1.6mm hour, The spacing between ground copper and traces is 5.7mil
RF wiring adopts 30mil Line width	The plate thickness is 1.0mm hour, The spacing between ground copper and traces is 7.6mil
	The plate thickness is 1.2mm hour, The spacing between ground copper and traces is 7.1mil
	The plate thickness is 1.6mm hour, 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. within use When setting up the 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 the product housing structure space is sufficient, the spring antenna should be Place the antenna 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 affects radio frequency signals.

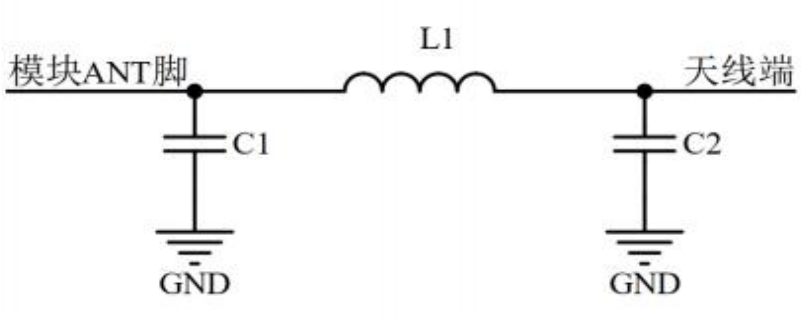
The absorption and shielding capabilities are very strong, which will seriously affect the communication distance. In addition, the antenna should be placed on the edge of the base plate as much as possible.

5.3.3 external antenna

External antenna means the module passes IPEX Extension cord, Antennas with standard radio frequency interfaces such as SMA installed outside the product housing, Specifically include rod antenna, absorber 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 stick0R 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

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;
}
```

VGdd79SxxxN0M1 Series modules are based on LLCC68 chip manufacturing, Its driver software package is the same as SX12 62\SX1268 series compatible, Pay attention to the receiving bandwidth and LoRa The range of modulation spreading factors used. LLCC68 Supported bandwidth BW and spreading factor SF Listed below :

LoRa® Rx/Tx, BW = 125 -250 - 500 kHz

LoRa® SF = 5 - 6 - 7 - 8 - 9 for BW = 125 kHz

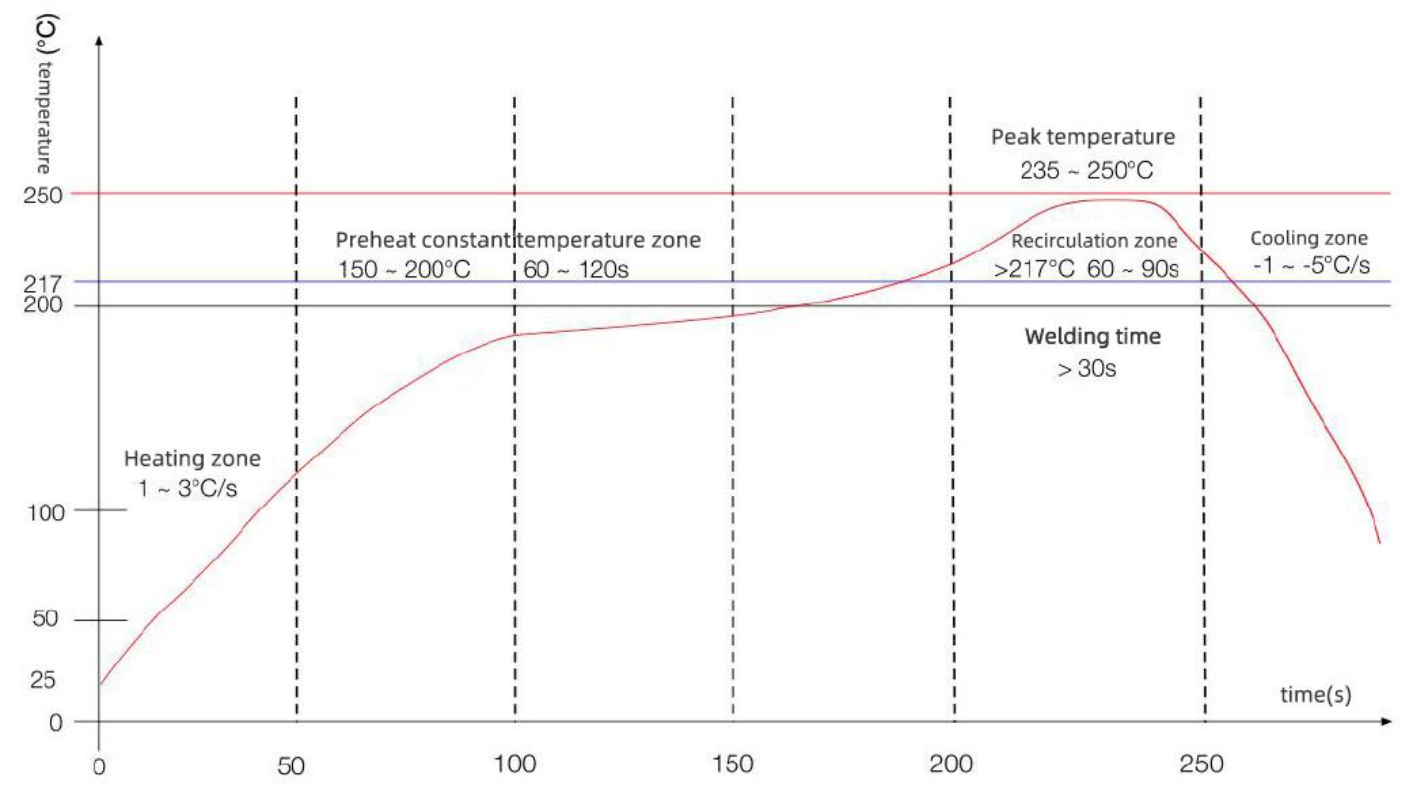
LoRa® SF = 5 - 6 - 7 - 8 - 9 - 10 for BW = 2 50 kHz

LoRa® SF = 5 - 6 - 7 - 8 - 9 - 10 - 11 for BW = 500 kHz

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 users pay attention when selecting the operating frequency point.

It is necessary to avoid the image frequency point of its 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

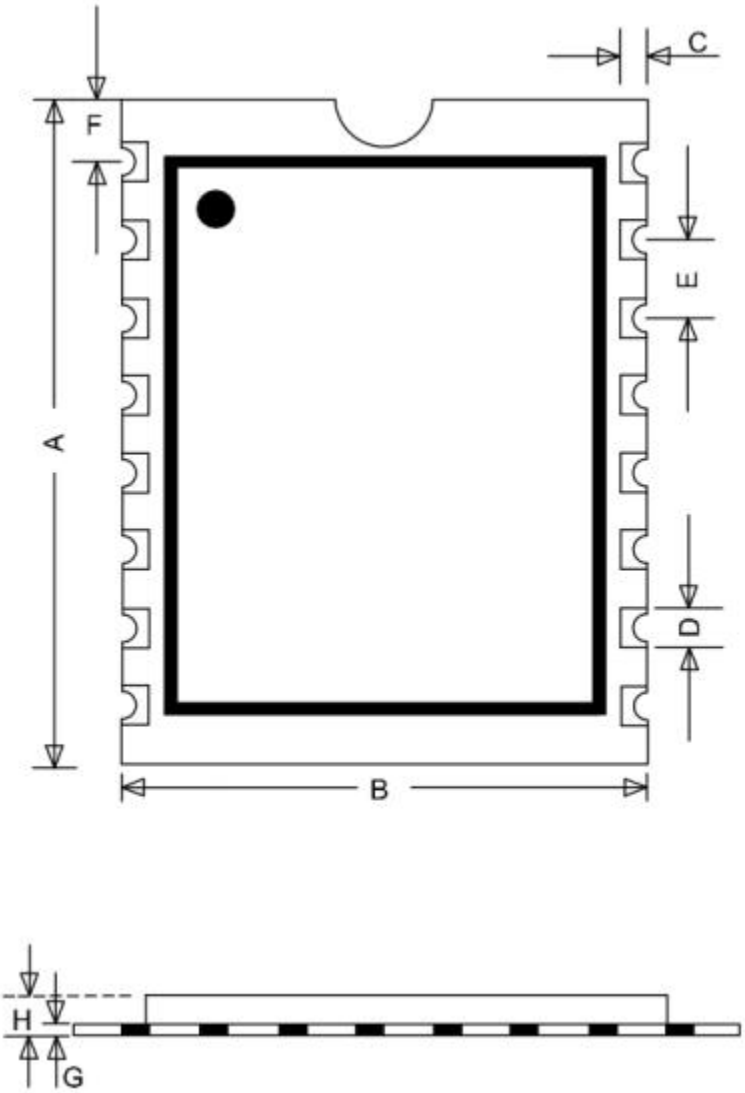
1,Anti-static measures are strictly followed, and bare hands are prohibited from touching the module during the production process.

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

3. 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	17.1	±0.5
B	13.5	±0.5
C	0.6	±0.1
D	1.2	±0.1
E	2.0	±0.1
F	1.6	±0.1
G	0.8	±0.1
H	2.3	±0.2

10. Version update instructions

Version	update content	Updated	illustrate
V1.0	first release	2022 Year 7 moon 20th	initial version

11. Procurement selection table

serial number	model	illustrate
1	VGdd79S433NOM1	433MHz Band, tape packaging\tray packaging
2	VGdd79S490NOM1	490MHz Band, tape packaging\tray packaging
3	VGdd79S868NOM1	868MHz Band, tape packaging\tray packaging
4	VGdd79S915NOM1	915MHz Band, tape packaging\tray 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 a guide for use. in this article 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.

13. Contact us

Company: Shenzhen Wojin Technology Co., Ltd.

Address: Sanhe Road, Gaofeng Community, Dalang Street, Longhua District, Shenzhen City 1 Wisdom Cloud Valley C Building 205-208

Telephone: 0755-23040053

Fax: 0755-21031236

Official website: www.vollgo.com

Business Cooperation: sales@vollgo.com