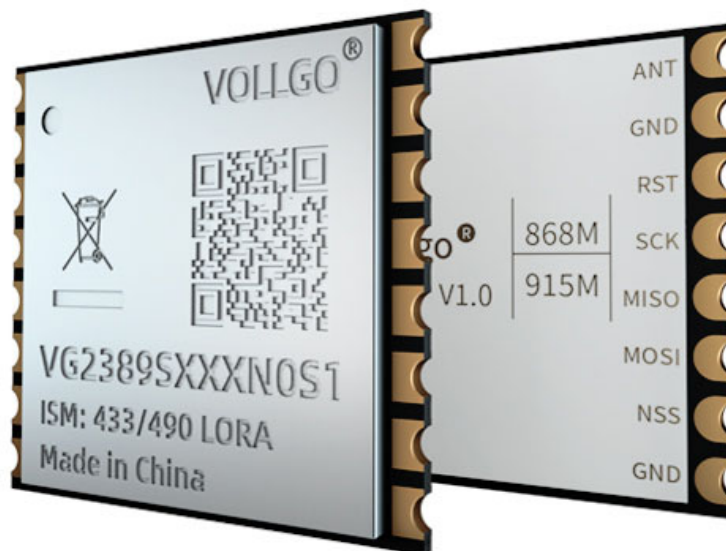


VG2389SxxxN0S1 Wireless module

Hardware specification

V01



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I .Application note

VG2389SxxxN0S1 series wireless module, based on SEMTECH's SX1278 high-performance wireless transceiver chip design, is a small, low-power, long-distance two-way wireless transceiver module.

The SX1278 transceiver uses LoRa® remote modem to provide ultra-long-distance spread spectrum communication and high anti-interference, while minimizing current consumption. Using Semtech's patented LoRa modulation technology SX1278 can achieve a sensitivity exceeding -148dBm. The combination of high sensitivity and an integrated +20 dBm power amplifier produces an industry-leading link budget, making it suitable for any application that requires range or robustness. Compared with traditional modulation technology, LoRa has significant advantages in terms of blocking and selectivity, which solves the trade-off problem between distance, anti-interference and energy consumption in traditional designs. These devices also support the high-performance (G) FSK mode of systems such as WMBus and IEEE802.15.4g. SX1278 provides excellent phase noise, selectivity, receiver linearity and IIP3, and compared with competing devices, the current consumption is significantly reduced.

The module integrates all RF-related functions and devices. Users do not need to have an in-depth understanding of RF circuit design, and can use this module to easily develop wireless solutions and wireless IoT devices with stable performance and high reliability.

Main features of the product:

- ORA® modem
- 168 dB maximum link budget
- +20 dBm-100 mW constant RF output and V power supply
- +14 dBm high efficiency power amplifier
- Programmable bit rate up to 300 kbps
- High sensitivity: as low as -148 dBm
- Bulletproof front end: IIP3=-11 dBm
- Excellent blocking immunity
- Low RX current 9.9 mA, 200 nA register reserved
- Fully integrated synthesizer with a resolution of 61hz
- FSK, GFSK, MSK, GMSK, LoRa® and OOK modulation
- Built-in bit synchronizer for clock recovery

- Preamble detection
- 127 dB dynamic range RSSI
- Automatic RF detection and CAD based on ultra-fast AFC
- Packet engine, up to 256 bytes, with CRC
- Built-in temperature sensor and low battery indicator

application:

- Smart meter
- Supply chain and logistics
- Building automation
- Agricultural sensor
- Smart City
- Retail store sensors
- Asset tracking
- Street lights
- Parking sensor
- Environmental sensor
- Medical care
- Safety and security sensors
- Remote control application

II. Technical parameter

Technical index	parameter	Remark
voltage range	1.8 ~ 3.7V	General application 3.0V/3.3V
Frequency Range	433MHz、490MHz	Applicable frequency band is determined by hardware
Output Power	-1 ~ 20dBm	Step value 1dBm
Wireless rate	1.2kbps ~ 300Kbps@FSK 0.018kbps ~ 37.5kbps@LoRa	Programmable configuration
Modulation	FSK, GFSK, MSK, GMSK, LoRa®, OOK	
Receiving sensitivity	-148dBm@LORA,SF=12,BW=7.8kHz	
Receive bandwidth	2.6kHz ~ 250kHz@FSK 7.8kHz ~ 500kHz@ LoRa	Programmable configuration
Emission current	120mA	Transmit power = 20dBm
Receive current	12mA@Bands 2&3	
Sleep current	<1uA	
Drive interface	SPI	Standard 4-wire SPI, SPI clock: <=10MHz CPOL = 0, CPHA = 0
Antenna impedance	50Ω	
Antenna connection method	Side stamp hole	
Operating temperature	-40°C ~ 85°C	

Size	13.5x12.0mm	
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I .Pin location map

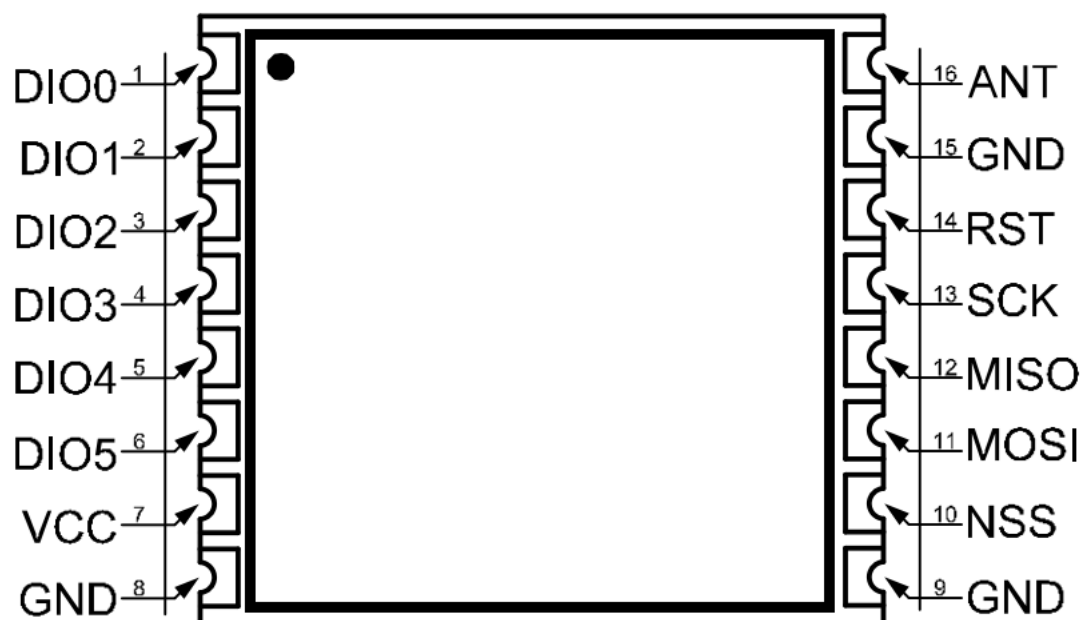


Figure 1-1 Top view

IV.Pin description

Num	Pin	Types	describe
1	DIO0	I/O	Directly connected to the chip DIO0 digital I/O pin, software configurable function
2	DIO1	I/O	Directly connected to the chip DIO1 digital I/O pin, software configurable function
3	DIO2	I/O	Directly connected to the chip DIO2 digital I/O pin, software configurable function
4	DIO3	I/O	Directly connected to the chip DIO3 digital I/O pin, software configurable function
5	DIO4	I/O	Directly connected to the chip DIO4 digital I/O pin, software configurable function
6	DIO5	I/O	Directly connected chip DIO5 digital I/O pin, software configurable function
7	VCC	power supply	Power supply-positive
8	GND	power supply	Power supply-positive
9	GND	power supply	Power supply-positive
10	NSS	I	SPI interface NSEL selection input
11	MOSI	I	SPI interface MOSI data input
12	MISO	O	SPI interface MISO data output
13	SCK	I	SPI interface SCLK clock input
14	RST	I/O	Reset pin
15	GND	power supply	Power supply-negative
16	ANT	I/O	RF signal input/output, connected to a 50Ω antenna

V. Hardware connection diagram

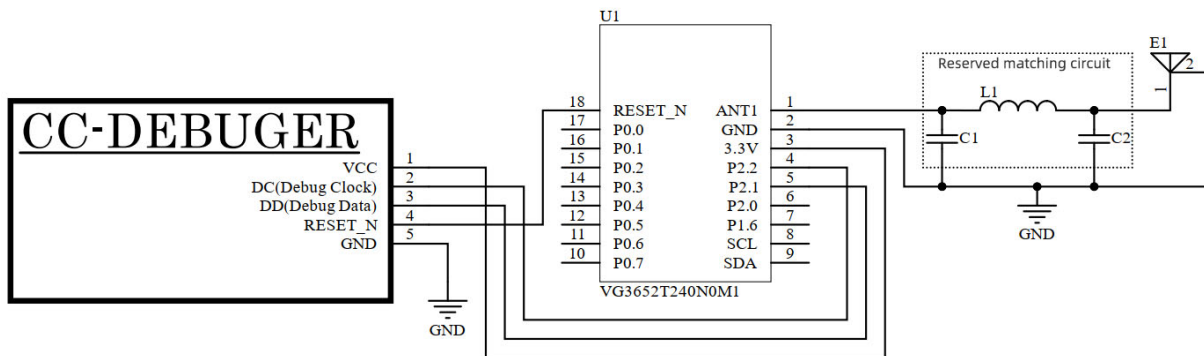
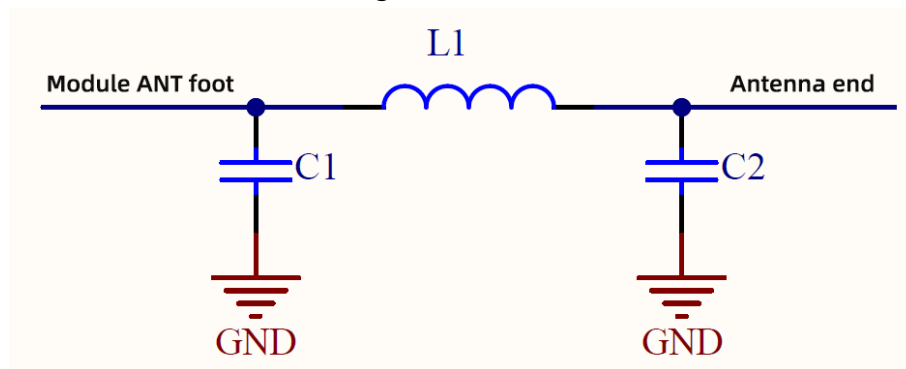


Figure 5-1 Programming development hardware connection

VI. Antenna matching

The antenna is very important to the transmission distance of the radio frequency module. In practical applications, it is convenient for users to adjust the antenna matching later. It is recommended that users reserve a simple π -type matching circuit between the antenna and the ANT pin output of the module when designing the schematic diagram. If the antenna is already a standard 50Ω , the component L1 is attached with $0R$ resistance, and the components C1 and C2 do not need to be soldered. Otherwise, a network analyzer needs to be used to measure the actual impedance of the antenna and match to determine the value of C1, L1, and C2. The trace from the ANT pin of the module to the antenna end should be as short as possible. It is recommended that the trace width be at least 0.5MM and the length should not exceed 30MM.

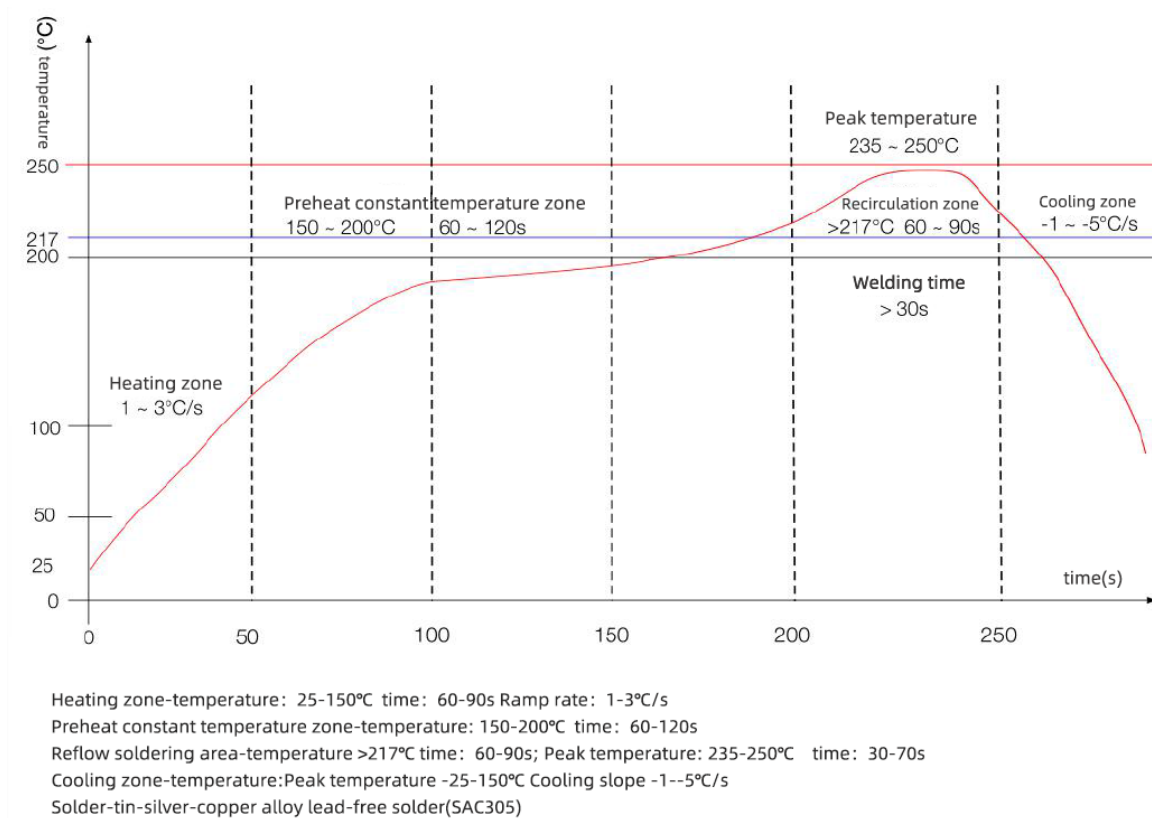


6-1 π -type matching circuit

VII. Precautions for programming development

none

VIII. Reflow soldering curve



IX. Electrostatic damage warning

The radio frequency module is a high-voltage electrostatic sensitive device, in order to prevent static electricity from damaging the module

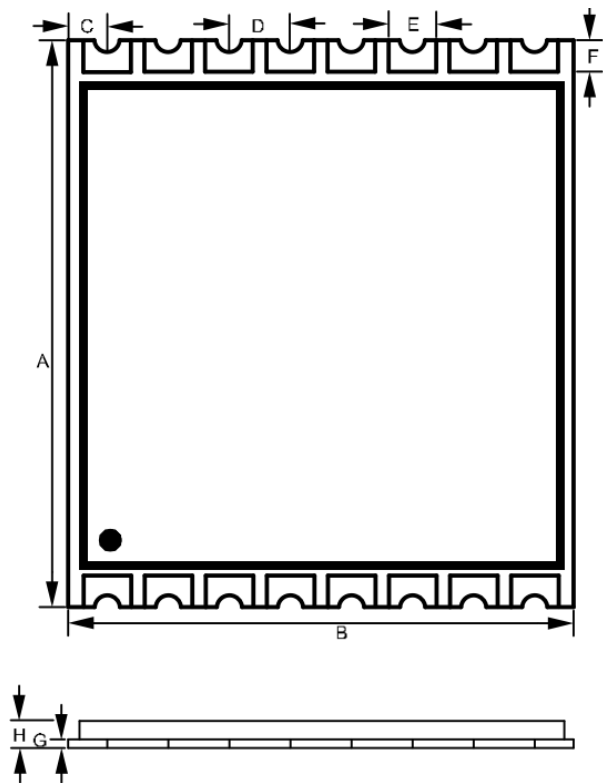
1. Strictly follow anti-static measures, and it is forbidden to touch the module
2. with bare hands during the production process.
3. The module should be placed in a place where static electricity can be
4. prevented.



3. The anti-static protection circuit at the high voltage input should be considered when designing the product.

X.Package information

X. I Mechanical Dimensions(unit:mm)



serial number	size(mm)
A	13.5
B	12.0
C	0.9
D	1.45
E	1.0
F	0.6
G	0.8
H	2.2

Tolerance: $\pm 0.1\text{mm}$

XI. Version update instructions

Version	Update content	Updated	Principal
V01	First release	January 6, 2020	DropLin

XII. Procurement Selection Table

Number	Model	Instruction
1	VG2389S433N0S1-B\D	433MHz frequency band, taping packaging\independent packaging
2	VG2389S490N0S1-B\D	490MHz frequency band, tape packaging\independent packaging

XIII.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, this article
All statements, information and suggestions in the do not constitute any express or implied guarantee.
2. The company reserves the right of final interpretation and modification of all the materials provided, and subject to change without notice.

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