VG8270SxxxN0S1 Wireless Module Hardware Specifications

V1.0

Content

1. Overview

VG8270SxxxN0S1 series wireless module is a compact, low-power, long-distance two-way wireless transceiver module based on AMICCOM 's A7169 high-performance wireless transceiver chip.

AMICCOM's A7169 device is a high performance, ultra-low power sub 1GHz ISM band RF transceiver. Its output up to 20 dBm transmit power and excellent receive sensitivity make it a good communication link budget. In addition, its ultra-low receiving current as low as 3.2mA is very suitable for battery-powered equipment application scenarios in the IoT industry.

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

Product main features

- Modulation method: FSK, GFSK
- Support working frequency band: 315/433/490/868/915MHz
- Programmable output power: -34 dBm to +20dBm
- Excellent receiving sensitivity: -118 dBm (@2Kbps, 490MHz)
- Deep sleep current: 0.3 uA
- Normal sleep current: 1.5 uA
- Ultra-low power consumption:
- Receiving working current (AGC Off) 434 MHz : 3.2mA
- Receive working current (AGC Off) 868MHz: 3.75 mA
- Transmit working current 490MHz: 94mA@19dBm
- Programmable data transmission baud rate: 2K bps to 500Kbps
- Wide working voltage: 2.1V ~ 3.6V
- Ultra-small size : 11.5 * 10.0 * 2.2 mm

application:

- Logistics tracking, warehouse inspection, electronic label, etc.
- Industrial Instrumentation Wireless Data Acquisition and Control
- Building and Home (Smart Home) Control
- Wireless remote control for electronic consumer products
- Wireless Alarm and Security System
- wireless sensor network

2. Main technical parameters

Technical indicators	parameter	Remark
voltage range	2.1 ~ 3.6V	Typically 3.3V
Frequency Range	315/ 433 /490/ 868 / 915MHz	The applicable frequency band is determined by the module model
Output Power	-3 4dBm to + 20dBm	Programmable configuration
wireless rate	2kbps ~ 500Kbps	Programmable configuration
Modulation	FSK/GFSK	
Crystal frequency	12.8MHz _ _	Passive crystal oscillator
Receive sensitivity	-1 18dBm _	2K bps , 490MHz
receive bandwidth	50kHz ~ 500kHz _	Programmable configuration
Emission current	94 mA	490MHz @19dBm
receive current	3.2mA	AGC Off , 434MHz
sleep current	0.3uA _	deep sleep
driver interface	SPI	3 - wire
Antenna characteristic impedance	50Ω _	
Antenna connection method	side stamp hole	
storage temperature	-55 ℃ ~ + 125 ℃	
Operating temperature	-40℃ ~ + 85℃	Industrial grade

Size	11.5 x 10.0mm	

3. Pin Location Diagram

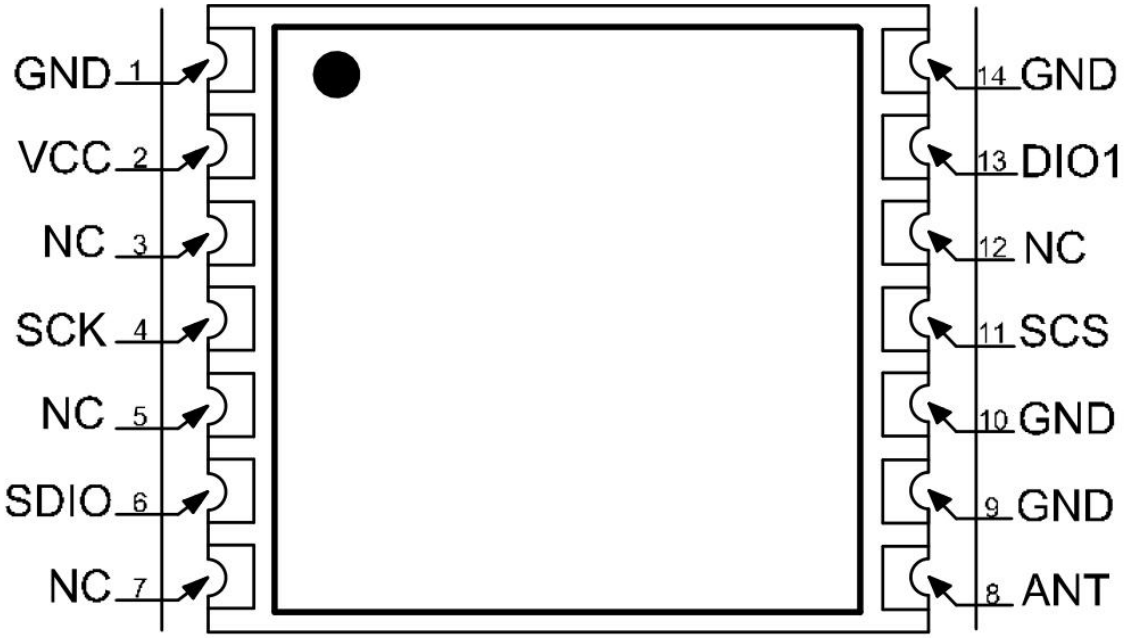


Figure 1-1 Top view

4. The pin description

Num	Pin	Type	Describe
1	GND	power supply	land
2	VCC	power supply	Positive power supply
3	NC	--	Internal suspension
4	SCK	I	SPI clock input
5	NC	--	Internal suspension
6	SDI O	I /O	SPI data input \ output
7	NC	--	Internal suspension
8	ANT	I/O	RF signal input/output, connect to 50Ω antenna
9	GND	power supply	land
10	GND	power supply	land
11	SCS	I	SPI interface chip select input
12	NC	--	Internal suspension
13	DIO1	I/O	Directly connected to the chip GPIO1 digital I/O pin, software configurable function
14	GND	power supply	land

5. Hardware design guidance and matters needing attention

5.1. Schematic diagram of hardware connection

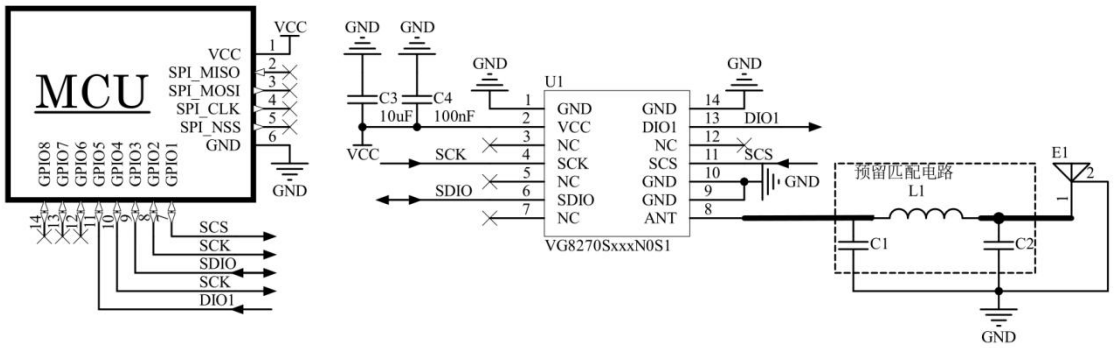


Figure 5-1 Programming development hardware connection

5.2. Power supply design and related matters needing attention

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, the module will be permanently damaged; the filter capacitor of the module power supply pin should be as close as possible to the module power supply pin.

2. In the power supply system of the module, the excessive ripple may be coupled to the line that is easily interfered by the wire or the ground plane, such as the sensitive signal line such as the antenna, feeder, clock line, etc., which may easily cause the radio frequency performance of the module to deteriorate, so We recommend using LDO as the power supply for the wireless module.

3. When selecting the LDO voltage regulator chip, it is necessary to pay attention to the heat dissipation of the power supply and the driving capability of the LDO stable output current; considering the long-term stable operation of the whole machine, it is recommended to reserve more than 50% of the current output margin.

4. It is best to use a single LDO for the module to supply power; if a DC-DC power supply chip is used, an LDO must be added behind as the isolation of the module power supply to prevent the noise of the switching power supply chip from interfering with the working performance of the radio frequency.

5. If the communication line between the MCU and the module uses a 5V level, a 1K-5.1K resistor must be connected in series (not recommended, there is still a risk of damage) .

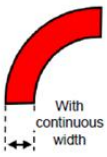
6. The RF module should be kept away from high-voltage devices as far as possible, because the electromagnetic waves of high-voltage devices will also have a certain impact on the RF signal.

7. High-frequency digital wiring, high-frequency analog wiring, and high-current power supply wiring should be avoided under the module as much as possible. If it is necessary to pass under the module, the wiring should be placed on another layer of the PCB bottom plate where the module is placed, and ensure that it is under the module. The copper is well grounded.

5.3. Antenna Design and Guidance

5.3.1 RF Design of Stamp Hole Interface

When the RF output interface of the module is selected in the form of a stamp hole, a 50ohm characteristic impedance trace is used to connect the antenna on the backplane PCB during design. Considering the attenuation of high-frequency signals, it should be noted that the length of the RF traces on the backplane PCB should be as short as possible. It is recommended that the longest trace length should not exceed 20 mm , and the trace width should be kept continuous; when turning, try not to take acute or right angles. , it is recommended to take a circular arc.

The first recommended way of turning the RF traces	
Second, the recommended way of turning the RF traces	
Bad way of turning RF traces , not recommended	

In order to ensure that the RF trace impedance of the backplane is 50 ohms, the following parameters can be adjusted according to different board thicknesses. The following simulation values are for reference only.

RF traces use 20mil line width	thickness is 1.0mm , the spacing between ground copper and traces is 5.3mil
	thickness is 1.2mm , the spacing between ground copper and traces is 5.1mil
	the board thickness is 1.6mm , the distance between ground copper and trace is 5mil
RF traces use 25mil line width	thickness is 1.0mm , the distance between ground copper and trace is 6.3mil
	the board thickness is 1.2mm , the distance between ground copper and trace is 6mil
	thickness is 1.6mm , the distance between ground copper and trace is 5.7mil
RF traces use 30mil line width	thickness is 1.0mm , the distance between ground copper and trace is 7.6mil
	thickness is 1.2mm , the distance between ground copper and trace is 7.1mil
	thickness is 1.6mm , the distance between ground copper and trace is 6.6mil

5.3.2 Internal Antenna

The built-in antenna refers to the antenna soldered on the PCB bottom plate and placed inside the product shell, including chip ceramic antenna, spring antenna, etc. When using the built-in antenna, the structure of the product and the installation position of the antenna have a great influence on the RF performance. Under the premise that the structure space of the product shell is sufficient, the spring antenna should be placed vertically upward as much as possible; Or the circuit board below the antenna can be hollowed out, because the metal has a very strong ability to absorb and shield RF signals, which will seriously affect the communication distance. In addition, the antenna should be placed on the edge of the bottom plate as much as possible.

5.3.3 External Antenna

External antenna refers to the antenna that the module is installed on the outside of the product casing through IPEX extension cable, SMA and other standard RF interfaces, including rod antenna, suction cup antenna, fiberglass antenna, etc. The external antenna is basically a standard product. In order to better choose an antenna suitable for the module, in the process of antenna selection, the parameters of the antenna should be selected as follows:

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

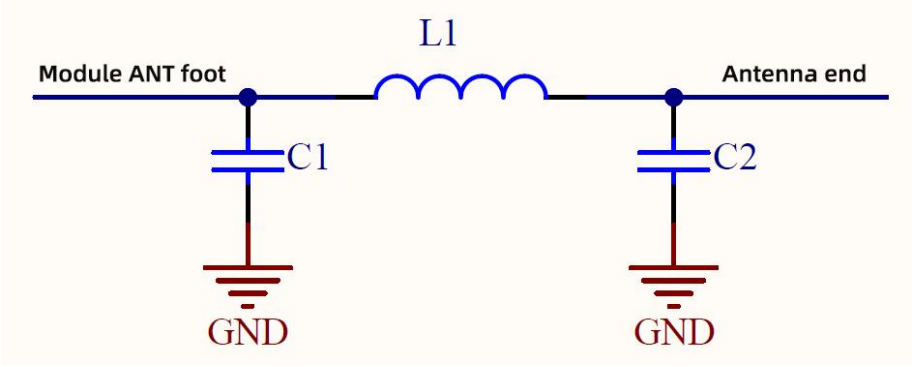
2. The input characteristic impedance of the antenna should be 50ohm.

3. The interface size of the antenna 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 frequency points used in the actual application of specific products) .

5.3.4 Antenna matching

The antenna is critical to the transmission distance of the RF module. In practical applications, in order to facilitate the user's later antenna matching adjustment. 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 a 0R resistor, and the components C1 and C2 do not need to be soldered. Otherwise, you need to use a network analyzer to measure the actual impedance of the antenna and perform matching to determine the values 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 longest trace length should not exceed 20 mm .

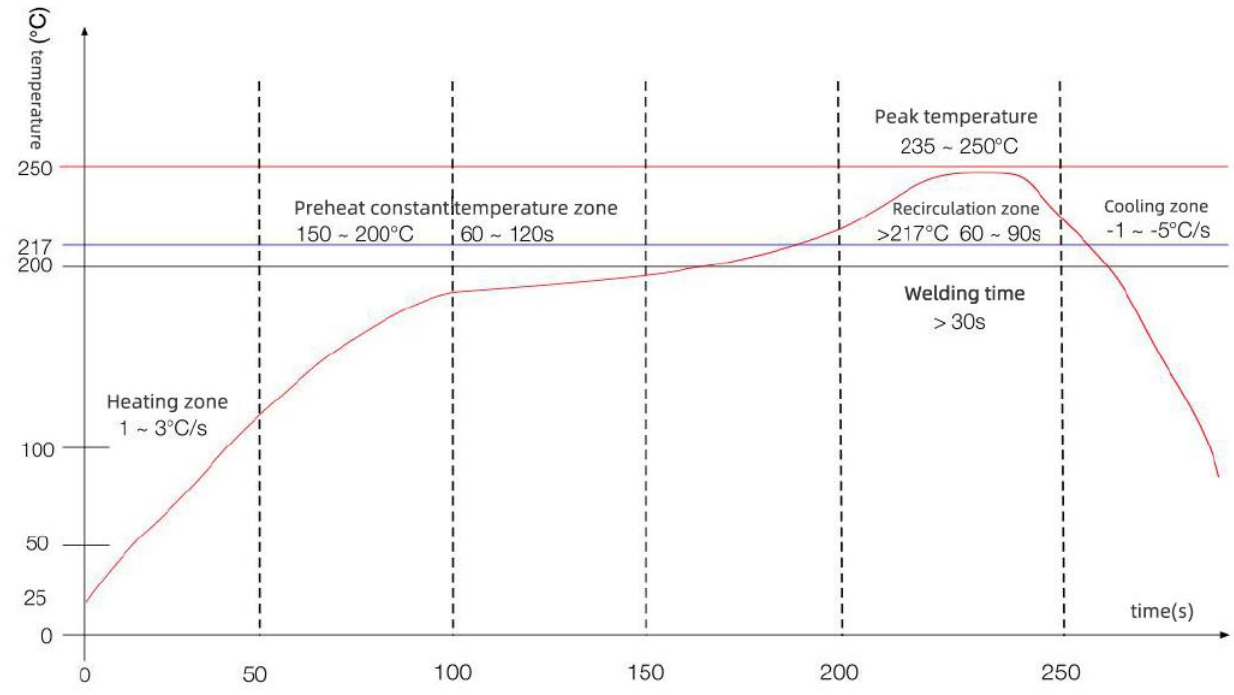


5 - 2 π type matching circuit

6. Programming development considerations

Generally speaking, the receiving sensitivity of the RF chip is relatively poor at the integer multiple operating frequency of its crystal oscillator. It is recommended that users avoid the mirror frequency point of the module crystal oscillator when selecting the operating frequency point, that is, the integer multiple frequency of the crystal oscillator frequency. Point, the crystal frequency of this module is 12.8 MHz .

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)

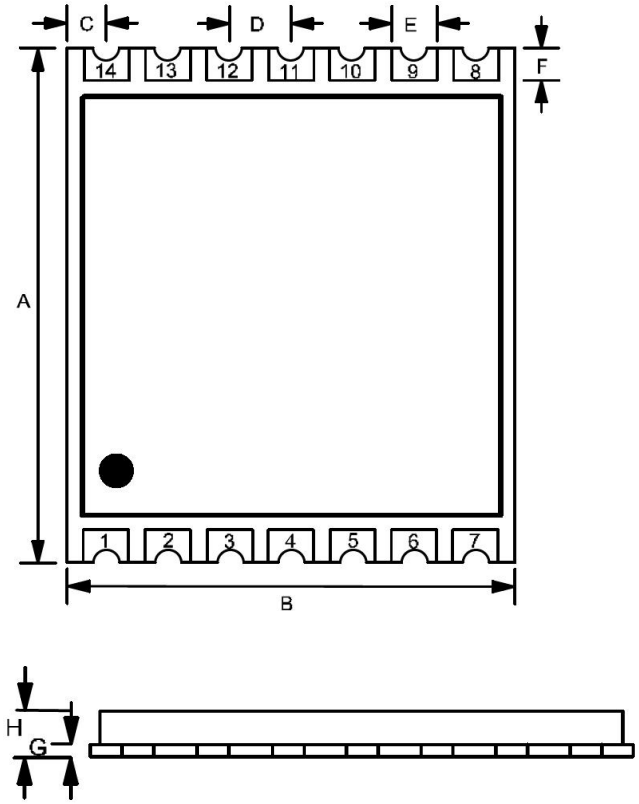
8. Electrostatic damage warning

The RF module is a high-voltage electrostatic sensitive device, in order to prevent damage to the module by static electricity

1、Strictly follow anti-static measures, and do not touch the module with bare hands during production.
2、Modules should be placed in a placement area that can prevent static electricity.
3、The anti-static protection circuit at the high voltage input should be considered in product design.

9. Packaging information

Mechanical Dimensions (unit:mm)



Numbering	Dimensions (mm)	Error (mm)
A	11.5	±0.5
B	10	±0.5
C	0.88	±0.1
D	1.37	±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	principal
V1.0	first release	February 6, 2022	Dyming _

11. Purchase selection table

Number	model	Instruction
1	VG8270S315N0S1	315MHz frequency band , tape packing\pallet packing
2	VG8270S433N0S1	433MHz frequency band , tape packing\pallet packing
3	VG8270S490N0S1	490MHz frequency band, tape packing\pallet packing
4	VG8270S868N0S1	868MHz frequency band, tape packing\pallet packing
5	VG8270S915N0S1	915MHz frequency band, tape packing\pallet packing

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.

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13. Contact us

Company: Shenzhen Wojin Technology Co., Ltd.

Address: Room 205-208, Building C, Smart Cloud Valley, No. 1, Sanhe Road, Gaofeng Community, Dalang Street, Longhua District, Shenzhen

Tel: 0755-23040053

Fax: 0755-21031236

Official website: www.vollgo.com

Business cooperation: sales@vollgo.com