VG4131SxxxN0S1 wireless module

Hardware specification

V1.1

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1. Overview

VG4131SxxxN0S1 series of wireless modules, based on PANCHIP of PAN3020 High-performance wireless transceiver chip design ,It is a small size, low power consumption,Long-distance two-way wireless transceiver module.

PAN3020 is a device that works on 1GHz Multiple frequency bands below, such as 433MHz / 490MHz / 868MHz / 915MHz (hereinafter referred to as 433 frequency band, 490 band, 868 band and 915 band) A single-chip wireless transceiver chip for general ISM frequency bands. P AN3020 chip integrated RF transceiver, frequency synthesis oscillator, crystal oscillator, modem and other functional modules, and supports one-to-many networking and ACK communication mode. PAN3020 uses GFSK modulation, Transmit power, working channel and communication data rate are all configurable.

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.

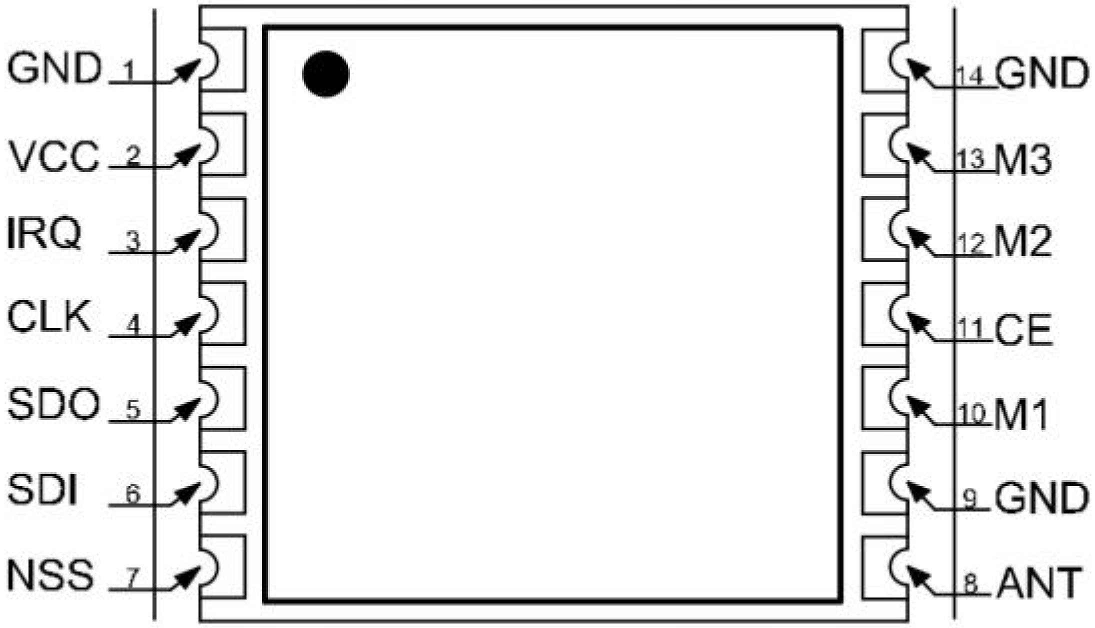
application:

1. Logistics tracking, warehouse inspection, electronic labels, etc.
2. substitute 232,485 perform wireless data communications
3. Wireless data collection and control of industrial instruments
4. AMR (water, electricity, gas) Three meter reading
5. Building and Residential (Smart Home) Control
6. Wireless remote control for consumer electronics products
7. Wireless Alarm and Security Systems
8. wireless sensor network

2. Technical parameters

Technical indicators	parameter	Remark
voltage range	2.2～3.6V	generally 3.3V
Frequency band range	433MHz, 490MHz, 868MHz, 915MHz	The applicable frequency band is determined by the module model
Output Power	1 ~20dBm	Programmable configuration
Wireless speed	40kbps～400Kbps@GFSK	Programmable configuration
Modulation	GFSK	
Receive sensitivity	-112dBm@40Kbps, GFSK	
Receive bandwidth	80kHz～800kHz@FSK	Programmable configuration
Emission current	85mA	Transmit power = 20dBm
receive current	18.5mA	
Sleep current	<2uA	
Driver interface	SPI	standard 4 Wire SPI, SPI Clock: <=8MHz CPOL = 0,CPHA = 0
Antenna impedance	50 ohm	
Antenna connection side Mode	Side stamp hole	
storage temperature	-40℃~+125℃	
Operating temperature	-40℃~+85℃	Industrial grade
Size	11.5x 10.0mm	

3. Pin location diagram



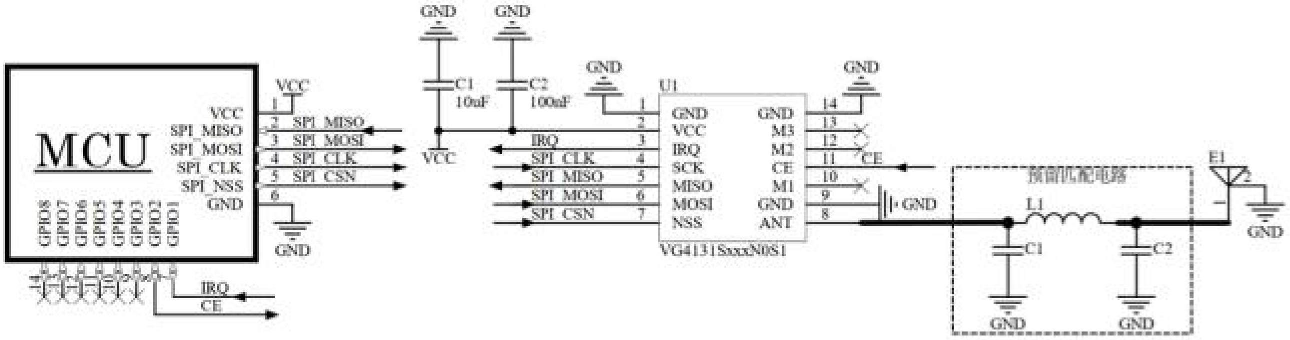
picture 1-1 top view

4. Pin description

number	pin	type	describe
1	GND	power supply	land
2	VCC	power supply	Positive pole of power supply
3	IRQ	O	NIRQ Interrupt output signal, output low level when an interrupt occurs
4	CLK	I	SPI interface SCLK clock input
5	SDO	O	SPI interface MISO data output
6	SDI	I	SPI interface MOSI data input
7	NSS	I	SPI interface CSN Select input
8	ANT	I/O	RF Signal input/output, connect 50Ω antenna
9	GND	power supply	land
10	M1	-	reserved
11	CE	I	Mode chip select signal.
12	M2	_	reserved
13	M3	-	reserved
14	GND	power supply	land

5. Hardware connection diagram

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.

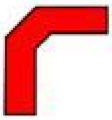
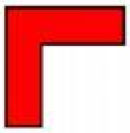
7. High-frequency digital traces, high-frequency analog traces, and high-current power traces should be kept away from the bottom of the module. If they have to pass under the module, they need to be routed.

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 interface RF 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. 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

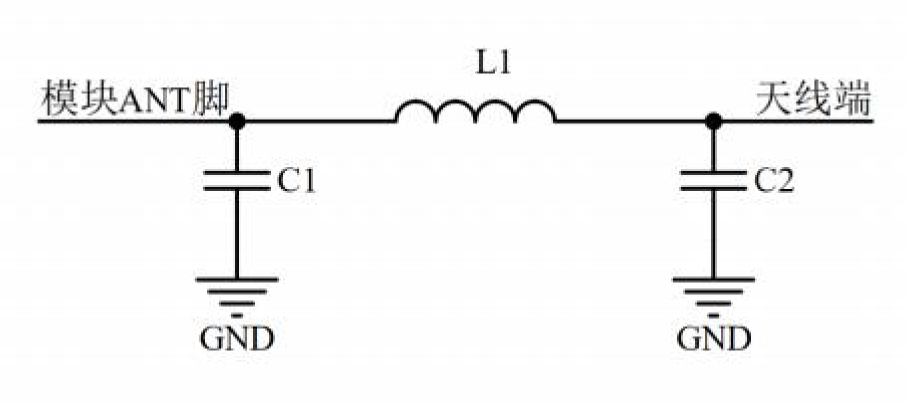
External antenna means the module passes IPEX Extension cord, Antennas with standard radio frequency interfaces such as SMA installed outside the product housing, Specifically include rod antenna, absorber Dish antenna, fiberglass antenna, etc. External antennas are basically standard products. In order 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).

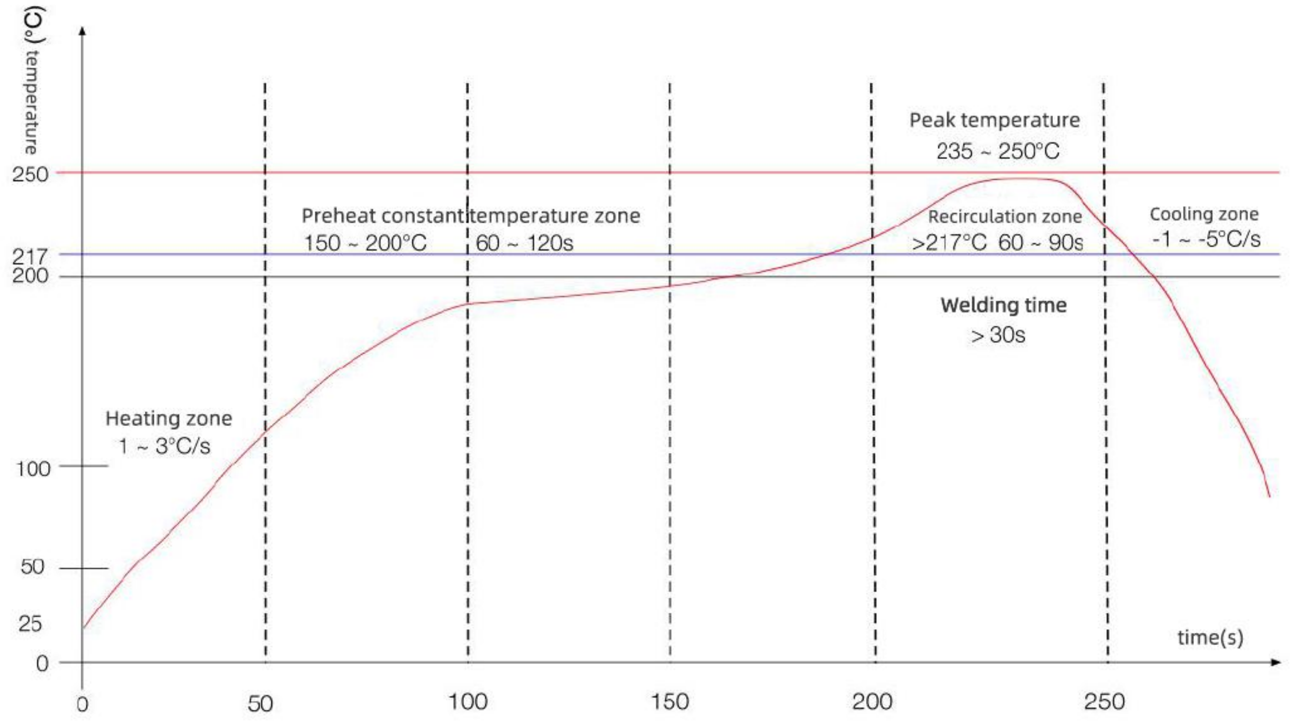
5.3.4 Antenna matching

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 module ANT A simple π-type matching circuit is reserved between the pin outputs. If the antenna is already standard 50Ω , Components L1 stick 0R resistance, device C1,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 determine C1,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. 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)

7. Static electricity damage warning

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

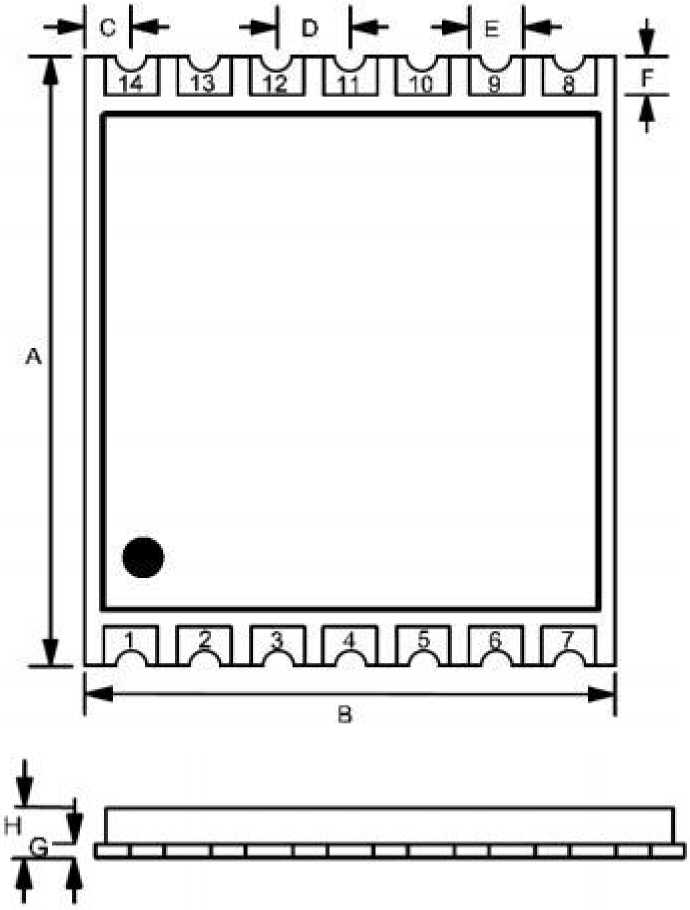
1, Anti-static measures are strictly followed, and bare hands are prohibited from touching the module during the production process .

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.

8. Packaging information

Mechanical dimensions (unit: mm)



serial number	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

9. Version update instructions

Version	update content	Updated	principal
V1.0	first release	2020 Year 1 moon 6th	DropLin
V1.1	Update hardware design related considerations	2020 Year 12 moon 2nd	Dying

10. Procurement selection table

number	model	illustrate
1	VG4131S433N0S1	433MHz Band, tape packaging\tray packaging
2	VG4131S490N0S1	490MHz Band, tape packaging\tray packaging
3	VG4131S868N0S1	868MHz Band, tape packaging\tray packaging
4	VG4131S915N0S1	915MHz Band, tape packaging\tray packaging

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

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