VG3411SxxxN0S1 wireless module

Hardware specification

V1.1

Content

1. overview

VG3411SxxxN0S1 series wireless module, based on the design of CMT2300A high-performance wireless transceiver chip, is a two-way wireless transceiver module with small size, low power consumption and long distance.

The high integration of the CMT2300A simplifies the peripheral materials required in the system design. Sensitivity up to +20 dBm and -121 dBm optimizes the link performance of the application. It supports a variety of packet formats and encoding and decoding methods, making it flexible to meet the needs of various applications for different packet formats and encoding and decoding. In addition, the CMT2300A also supports 64-byte Tx/Rx FIFO, rich GPIO and interrupt configuration, Duty-Cycle operation mode, channel listening, high-precision RSSI, low voltage detection, power-on reset, low frequency clock output, manual fast frequency hopping, squelch output and other functions, making application design more flexible and realizing product differentiation design. The CMT2300A works from 1.8V to 3.6V. When the sensitivity of -121 dBm is reached, only 8.5 mA current is consumed, and the ultra-low power receiving mode can further reduce the receiving power consumption of the chip. 13dBm outputs only 23 mA transmission current.

The module integrates all radio frequency related functions and devices. Users can easily develop wireless solutions and wireless Internet of Things devices with stable performance and high reliability without in-depth understanding of radio frequency circuit design.

Application:

1. Automatic meter reading
2. Home Security and Building Automation
3. ISM band data communication
4. Industrial monitoring and control
5. Remote control and security system
6. Remote control key entry

7. Wireless sensor node

8. Label reader

2. technical parameters

Parameter	Description	Remark
Power Supply	1.8~3.6V	General 3.3V
Frequency range	433MHz, 490MHz, 868MHz, 915MHz	The applicable frequency band is determined by the hardware.
Output Power	-10 ~ ﹤ 20dBm	Programmable configuration
Wireless rate	0.5kbps~300Kbps@FSK	Programmable configuration
Modulation mode	OOK, (G)FSK	Programmable configuration
Receiving sensitivity	-121dBm	@2Kbps / FSK
Receiving bandwidth	50kHz~500kHz/FSK	Programmable configuration
Emission current	72mA	Transmit power = 20dBm
Received current	8.5mA@FSK	
Sleep current	<1uA	
Drive interface	SPI	3-wire SPI
Antenna impedance	50 ohms	
Antenna connection mode	Side Stamp Holes	
Storage temperature	-40 ℃ ~ +125 ℃	
Operating temperature	-40 ℃ ~ +85 ℃	Industrial grade
Size	11.5x10.0mm	

3. Pin Location Diagram

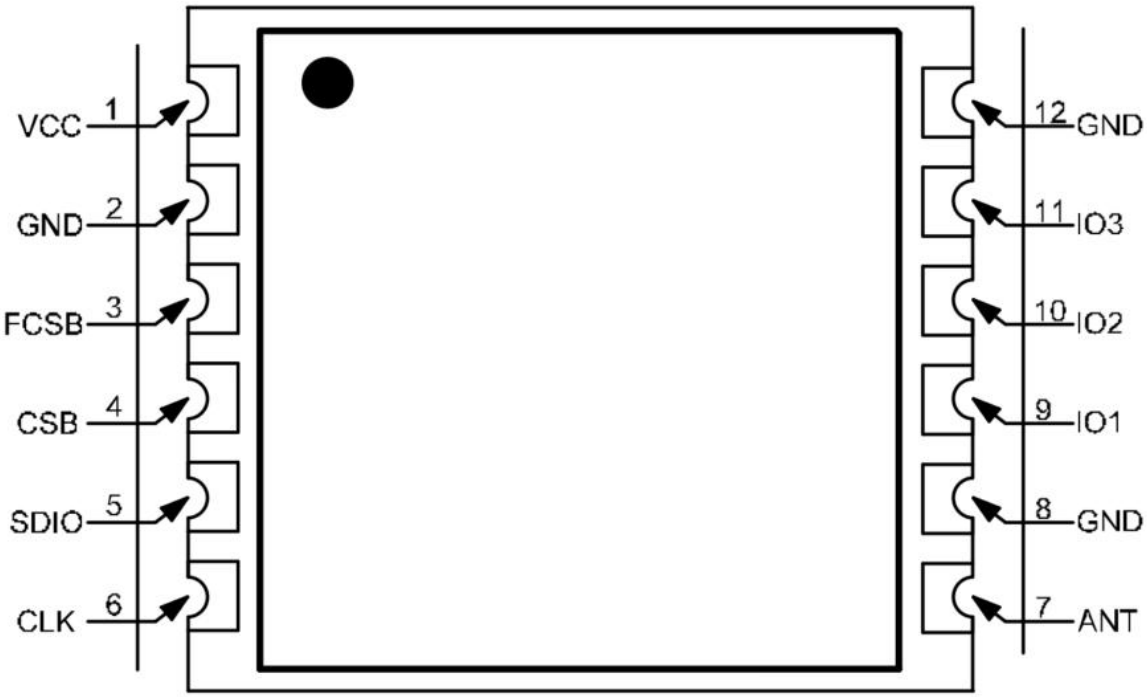


Figure 1-1 Top View

4. pin description

Number	Name	Type	Description
1	VCC	Power Supply	Power Supply-Positive
2	GND	Power Supply	Land
3	FCSB	I	SPI Access FIFO Chip Selection
4	CSB	I	SPI interface SPI chip selection
5	SDIO	I /O	SPI interface data input and output
6	CLK	I	SPI interface SCLK clock input
7	ANT	I /O	RF signal input/output, connected to 50 Ω antenna
8	GND	Power Supply	Land
9	IO1	I /O	Direct connection chip IO1 digital I/O pin, software configurable function
10	IO2	I /O	Direct connection chip IO2 digital I/O pin, software configurable function
11	IO3	I /O	Direct connection chip IO3 digital I/O pin, software configurable function
12	GND	Power Supply	Land

5. Hardware design guidance

5.1 Application circuit

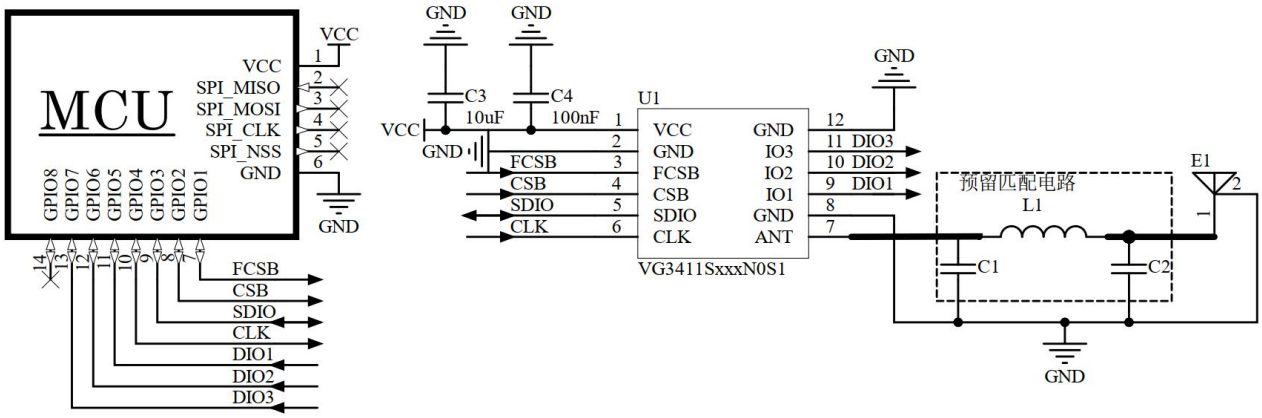


Figure 5-1 Programming and Developing Hardware Connections

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 in 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 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 vulnerable to interference through wires or ground planes, such as sensitive signal lines such as antennas, feeders, clock lines, etc., which may easily cause the RF performance of the module to deteriorate. Therefore, we recommend LDO as the power supply for wireless modules.

3. When selecting LDO voltage stabilizing chip, attention should be paid to the heat dissipation of power supply and the driving ability of LDO to stabilize output current. Considering the long-term stable operation of the whole machine, it is recommended to reserve more than 50% current output allowance.

4. It is better to use an LDO to supply power to the module alone. If a DC-DC power supply chip is used, an LDO will be added at the back 1 the isolation of the module power supply to prevent the noise of the switching power supply chip from interfering with the working performance of radio frequency.

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

6. The radio frequency 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 radio frequency signals.

7. High-frequency digital wiring, high-frequency analog wiring and high-current power supply wiring should avoid the lower part of the module as far as possible. If it is necessary to pass through the lower part of the module, the wiring should be placed on the other layer of PCB bottom plate where the module is placed, and the copper layer under the module should be well grounded.

5.3, Antenna Design and Guidance

5.3.1 RF Design of Stamp Hole Interface

When selecting the module RF output interface in the form of a stamp hole, a 50ohm characteristic impedance trace is used to connect the antenna on the PCB board during the design. Considering the attenuation of high frequency signals, it is necessary to pay attention to the fact that the RF trace length of the PCB of the base plate should be as short as possible. It is suggested that the longest trace length should not exceed 20mm, and the trace width should be continuous. When turning is required, try not to walk at acute angles or right angles, and it is recommended to walk at arc lines.

The First Recommended RF Route Turning Method	
Secondly, the recommended RF route turning method	
The worse RF route turning method is not recommended.	

In order to ensure that the RF trace impedance of the base plate is 50 ohms as far as possible, it can be adjusted according to the following parameters according to different plate thicknesses. The following simulation values are for reference only.

RF trace adopts 20mil linewidth	When the plate thickness is 1.0mm, the spacing between the grounding copper and the trace is 5.3mil.
	When the plate thickness is 1.2mm, the spacing between the grounding copper and the trace is 5.1mil.
	When the plate thickness is 1.6mm, the spacing between the grounding copper and the trace is 5mil.
The RF trace adopts 25mil linewidth	When the plate thickness is 1.0mm, the spacing between the grounding copper and the trace is 6.3mil.
	When the plate thickness is 1.2mm, the spacing between the grounding copper and the trace is 6mil.
	When the plate thickness is 1.6mm, the spacing between the grounding copper and the trace is 5.7mil.
Radio frequency wiring adopts 30mil linewidth	When the plate thickness is 1.0mm, the spacing between the grounding copper and the trace is 7.6mil.
	When the plate thickness is 1.2mm, the spacing between the grounding copper and the trace is 7.1mil.
	When the plate thickness is 1.6mm, the spacing between the grounding copper and the trace is 6.6mil.

5.3.2 Built-in Antenna

The built-in antenna refers to the antenna soldered on the PCB base plate and placed inside the product shell, specifically including patch 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 radio frequency performance. On the premise that the structural space of the product shell is sufficient, the spring antenna should be placed vertically upward as far as possible. Copper cannot be laid around the bottom plate where the antenna is placed, or the circuit board under the antenna can be hollowed out, because the metal has a very strong ability to absorb and shield radio frequency 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

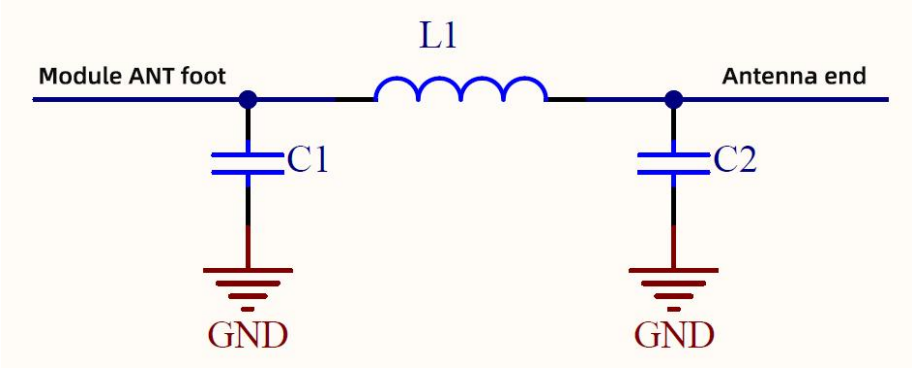
External antenna refers to the antenna that the module is installed outside the product shell through IPEX extension cable, SMA and other standard radio frequency interfaces, specifically including rod antenna, suction cup antenna, glass fiber reinforced plastic antenna, etc. External antennas are basically standard products. In order to better select an antenna suitable for modules, the parameters of the antenna should be selected in the process of antenna selection. Attention should be paid to the following:

1. The working frequency of the antenna shall 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 interface size of the module.
4. The standing wave ratio (VSWR) of the antenna is recommended to be less than 2, and the antenna should have appropriate frequency bandwidth (covering the frequency points used in the actual application of specific products).

5.3.4 Antenna Matching

Antenna is very important to the transmission distance of RF module. In practical application, in order to facilitate the user's later antenna matching adjustment. It is recommended that the user reserve a simple π -type matching circuit between the antenna and the module ANT pin output when designing the schematic diagram. If the antenna is already a standard 50 Ω, the component L1 is affixed with 0R resistor, and the devices C1 and C2 do not need to be welded, otherwise the actual impedance of the antenna needs to be measured by a network analyzer and matched to determine the values of C1,L1 and C2. The wiring from the

ANT pin of the module to the antenna end should be as short as possible, and it is recommended that the longest wiring length should not exceed 20mm.

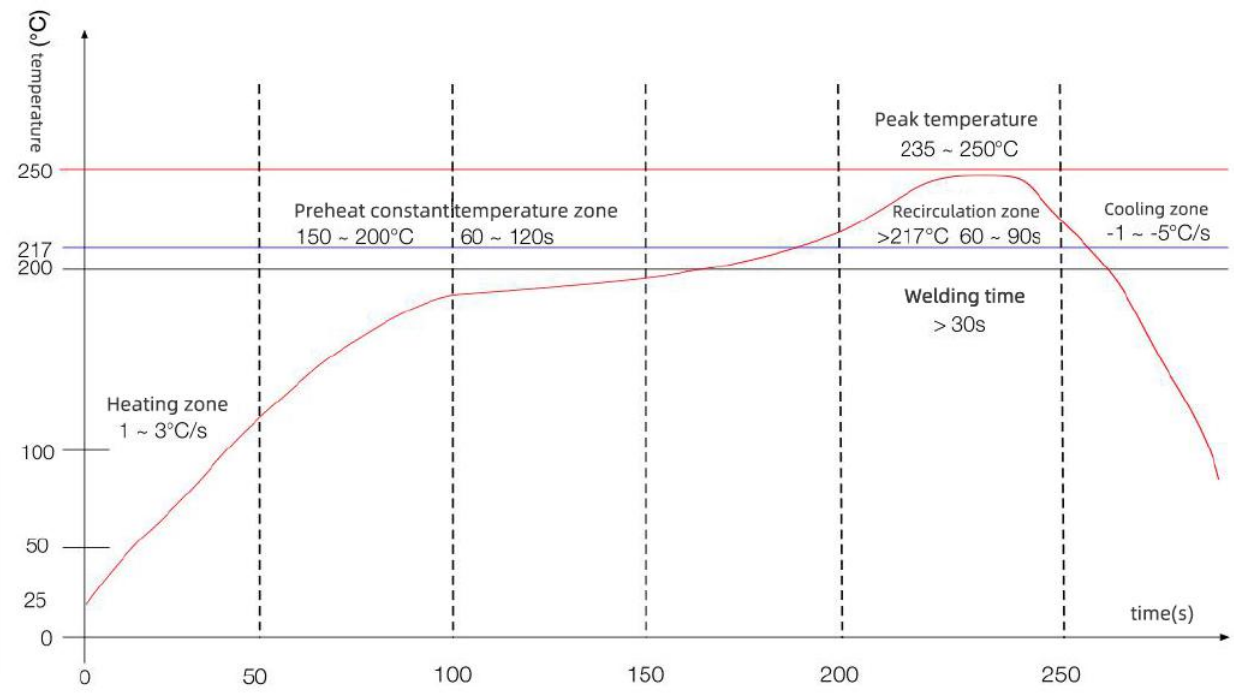


5-2 π matching circuit

6. Programming development

The driver interface of the RF chip is a three-wire SPI, that is, the SDIO port of the RF chip can be used as both a data input port and a data output port.

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 radio frequency module is a high-voltage electrostatic sensitive device to prevent static electricity from damaging the module.

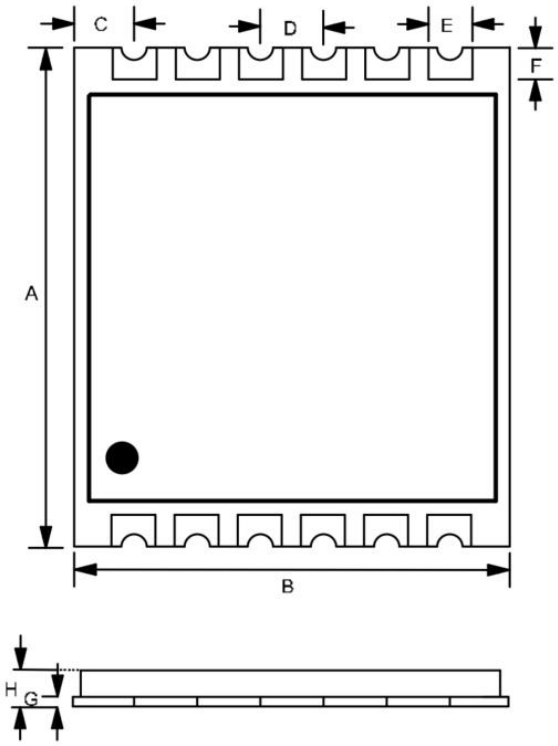
1、Strictly follow anti-static measures, and it is forbidden to touch the module with bare hands during the production process.

2、The module 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. encapsulation information

Mechanical dimensions (unit:mm)



No.	Dimensions (mm)	Error (mm)
A	11.5	± 0.5
B	10.0	± 0.5
C	1.37	± 0.1
D	1.45	± 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	Update date
V1.0	First release	6 Jan 2020
V1.1	Matters needing attention in updating hardware design	10 December 2021

11. Ordering Information

Index	Part Number	Description
1	VG3411 S433N0S1	433MHz band, braided package \tow package
2	VG3411 S490N0S1	490MHz band, braided package \tow package
3	VG3411 S868N0S1	868MHz band, braided package \tow package
4	VG3411 S915N0S1	915MHz band, braided package \tow package

12. Statement

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