VG7669T160N0SA Wireless module

Hardware specification

V1.0

Content

1. overview

VG7669T160N0SA positioning and navigation module is a small volume and high performance BDS/GNSS full constellation positioning and navigation module. The positioning module is based on the fourth-generation low-power GNSS SOC single-chip AT6558R of Zhongke Microbase. The chip supports a variety of satellite navigation systems, including China BDS, US GPS, Russian GLONASS, EU GALILEO, Japan's QZSS, and satellite enhancement system SBAS (WAAS,EGNOS,GAGAN,MSAS).

The positioning and navigation module has the advantages of high sensitivity, low power consumption, low cost, etc., and is suitable for vehicle navigation, handheld positioning, wearable devices and other scenarios.

Main features of the product:

- Excellent positioning and navigation function, support BDS/GPS/GLONASS satellite navigation system
- Cold start capture sensitivity: -148dBm
- Tracking sensitivity:-162dBm
- Positioning accuracy: 2.5 m (CEP50)
- First positioning time: 32 seconds
- Low power consumption: continuous operation <25mA (@ 3.3V)
- Built-in antenna detection and antenna short-circuit protection function

Application:

- Car positioning and navigation
- Mobile phones, tablets, handheld devices
- Embedded positioning equipment
- wearable device

2. Electrical parameters

2.1. Limit parameters

Parameters	Symbol	Minimum	Maximum	Unit
Module supply voltage (VCC)	VCC	-0.3	3.6	V
Backup battery voltage (VBAT)	VBAT	-0.3	3.6	V
Digital input pin voltage	Vin	-0.3	VCC+0.2	V

2.2. Operating conditions

Parameters	Symbol	Minimum	Typical value	Maximum	Unit
Supply voltage	VCC	2.7	3.3	3.6	V
Operating current			23		mA
Sleep mode current (ON_OFF = 0)			20		uA
VCC peak current (excluding days Line)	Ipeak			100	mA
Backup power supply	VBAT	1.5	3.0	3.6	V
Backup power current	Ibat		10		uA
Input pin	Vil			0.2*VCC	V
	Vih	0.7*VCC			V
Output pin	Vol			0.4	V
	Voh	VCC-0.5			V
Active antenna output voltage	VCC_RF		3.3		V
Antenna short circuit	Iant short		50		mA

protection current power supply from VCC_RF(3.3V)					
Open circuit current of antenna Power supply from VCC_RF(3.3V)	Iant open		3		mA
Antenna gain	Gain	15		20	dB

2.3. Performance indicators

Indicators	Parameters
Signal reception	BDS/GPS/GLONASS/GALILEO/QZSS/SBAS
Number of RF channels	Three-channel radio frequency supports simultaneous reception of full constellation BDS, GPS and GLONASS
Cold start TTFF	≤ 35s
Hot Start TTFF	≤ 1s
Re-capture TTFF	≤ 1s
Cold start capture sensitivity	-148dBm
Hot start capture sensitivity	-156dBm
recapture sensitivity	-160dBm
Tracking sensitivity	-162dBm
Positioning accuracy	<2m (1 σ)
Speed measurement accuracy	<0.1m/s (1 σ)
Timing accuracy	<30ns (1 σ)
Location update rate	1Hz (default), maximum 10Hz
Serial port characteristics	Baud rate range: 4800bps ~ 115200bps, default 9600bps, 8 data bits, no check, 1 stop bit

Agreement	NMEA0183
Maximum height	18000m
Maximum speed	515m/s
Maximum acceleration	4g
Backup battery	1.5V ~ 3.6V
Power supply	2.7V ~ 3.6V
Typical power consumption of GPS & BDS	<25mA@3.3V
Storage temperature	-45 ~ +125 ℃
Operating temperature	-45 ~ +85 ℃
Dimensions	11.5mm x11.5mm x2.2mm

2.4. RF Related Characteristics

Parameters	Condition	Minimum	Typical value	Maximum	Unit
Input frequency	GPS		1575.42		MHz
	Galileo		1575.42		MHz
	BDS		1561.098		MHz
	GLONASS	1597.78	1602	1605.66	MHz

2.5. Output protocol

The module uses UART as the main output channel and outputs it according to the NMEA0183 protocol format. Please refer to CASIC Multimode Satellite Navigation Receiver Protocol Specification for specific information.

3. Pin Location Diagram

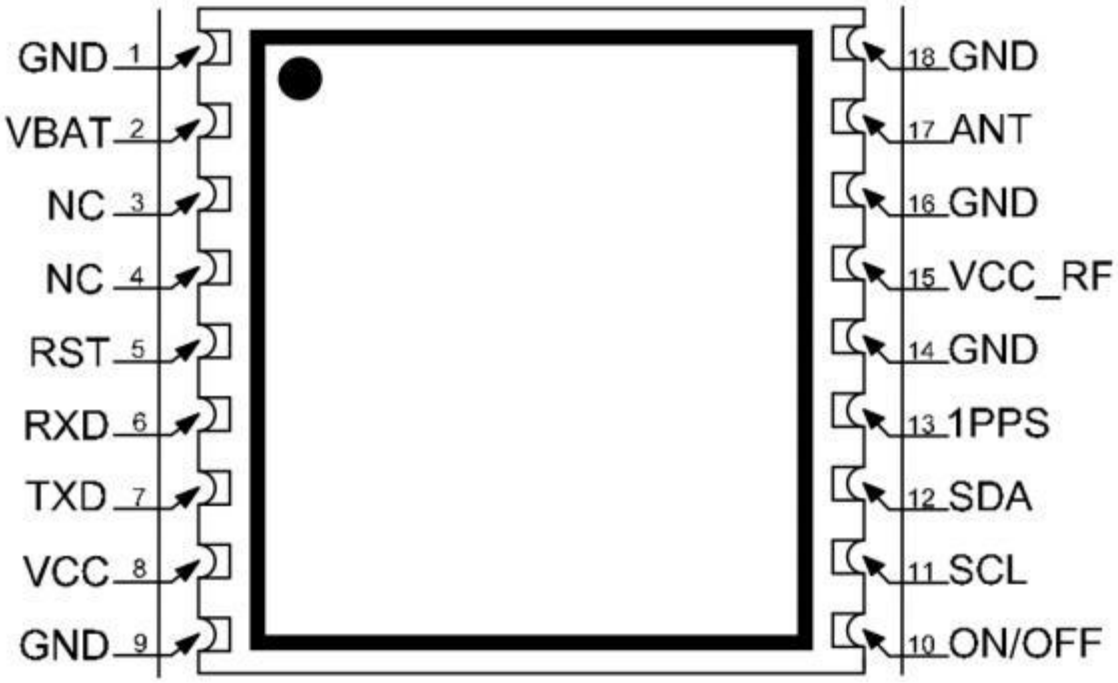


Figure 3-1 Top View

4. Pin description

Number	Pin	Type	Description
1	GND	I	Land
2	VBAT	I	RTC and SRAM backup power supplies provide 1.5~3.6V power supply to ensure module heat Start
3	NC	--	Internal suspended
4	NC	--	Internal suspended
5	RST	I	Module reset input, active low level, floating when not in use
6	RXD	I	Configure command input
7	TXD	O	Navigation data output, NMEA0183 protocol
8	VCC	I	Module power input, DC 3.3V
9	GND	I	Land
10	ON/OFF	I	Module shutdown control, active low level
11	SCL	O	I 2 c clock interface
12	SDA	I /O	I 2 c data interface
13	1PPS	O	Second pulse output, pulse rising edge aligned with UTC time
14	GND	I	Land
15	VCC_RF	O	The output power supply is 3.3V, which can supply power to the active antenna.
16	GND	I	Land
17	ANT	I	Antenna signal input
18	GND	I	Land

5. Hardware Design Guidance and Precautions

5.1. Schematic diagram of connection of 5.1 and application circuits

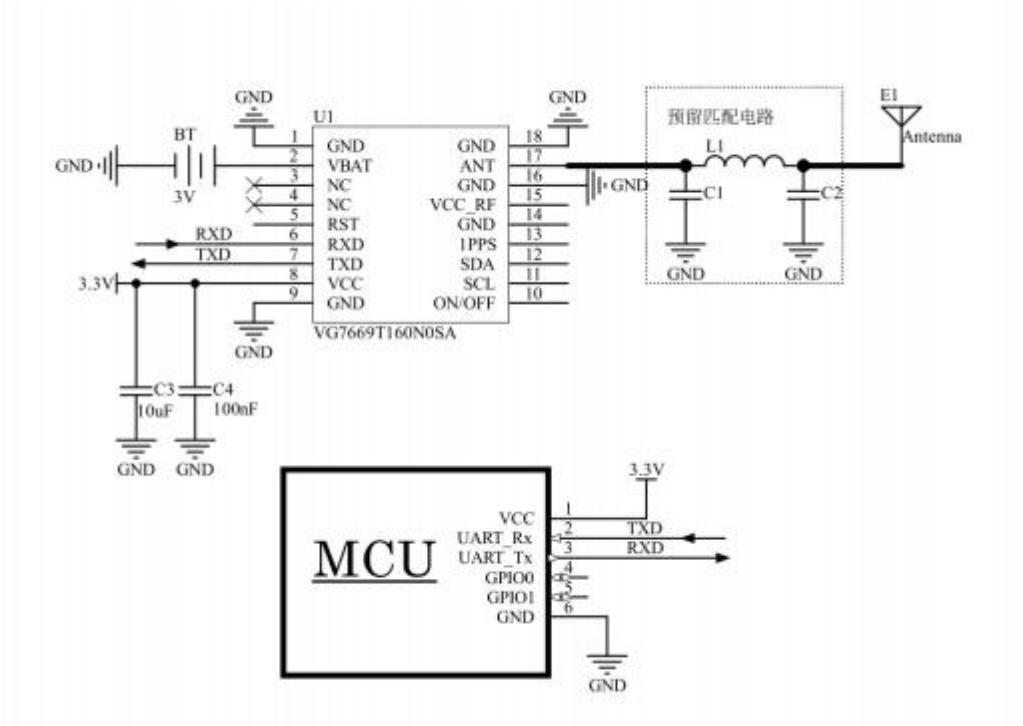


Figure 5-1 Passive Antenna Application Wiring Diagram

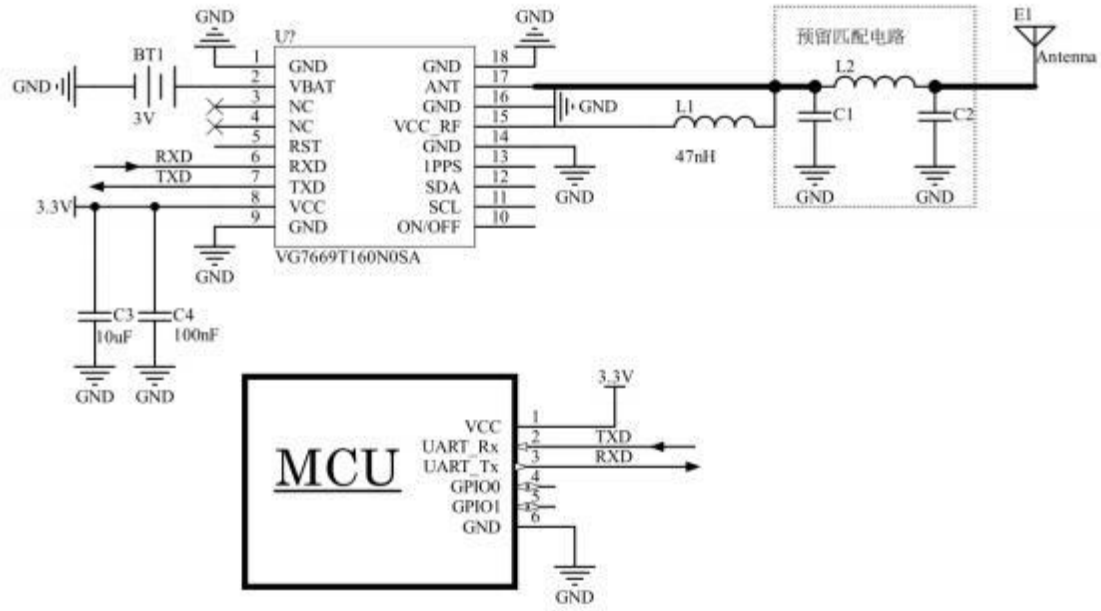


Figure 5-2 Active Antenna Application Wiring Diagram

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% of the current output margin.

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.

8. The module itself has an active antenna access, pull-out and short-circuit detection circuit. At the same time, when the antenna is accidentally short-circuited, the power supply current of the antenna is limited (50mA) to play a protective role. When the status of the above three antenna ports changes, corresponding information can be output from the serial port. Such

$GPTXT,01,01,01,ANTENNA SHORT*63

$GPTXT,01,01,01,ANTENNA OPEN*25

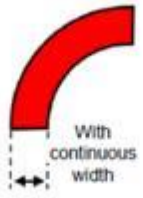
$GPTXT,01,01,01,ANTENNA OK *35

5.3. Antenna

5.3.1. Antenna routing

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 wiring length of the baseboard PCB should be as short as possible. It is recommended that the longest wiring length should not exceed 20mm and the wiring width should be required.

Keep continuity; Try not to take acute or right angles when turning. It is recommended to take 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.Antenna Selection

The external antenna can be installed in the product shell through IPEX extension cord, 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.

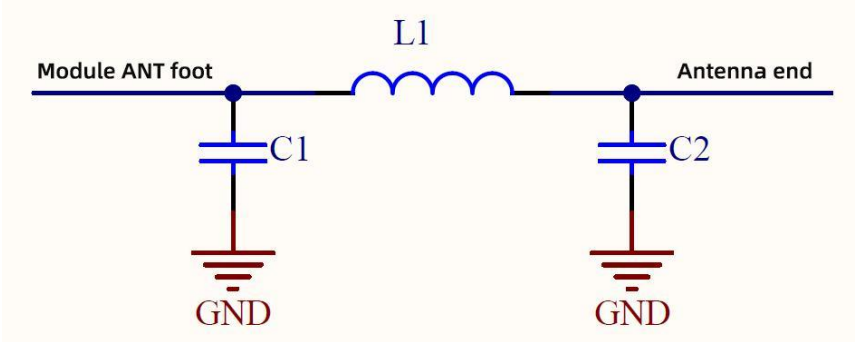
2. The input characteristic impedance of the antenna should be 50ohm.

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).

5.3.3. Antenna Matching

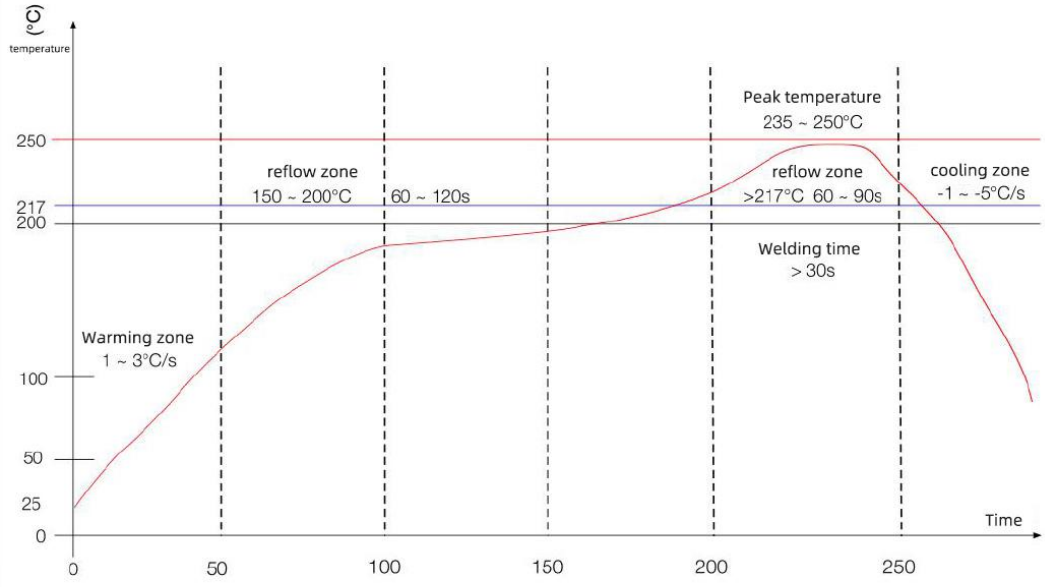
Antenna is very important to the transmission distance of RF module. In practical application, in order to facilitate the user's later antenna matching adjustment. It is recommended that the user reserve a simple π-type matching circuit between the antenna and the module ANT pin output when designing 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.



5-3 π matching circuit

6. Considerations for Programming Development

7. Reflow soldering curve



Heating zone — Temperature: 25 ~ 150℃ Time: 60 ~ 90s Heating slope: 1 ~ 3℃/s
Preheating constant temperature zone — Temperature: 150 ~ 150℃ Time: 60 ~ 120s
Reflow soldering zone—Temperature: >217℃ Time: 60 ~ 90s; Peak temperature: 235 ~ 250℃ Time: 30 ~ 70s
Cooling zone - temperature: peak temperature: ~180℃ cooling slope -1 ~ -5℃/s
Solder - Tin Silver Copper Alloy Lead Free Solder (SAC305)

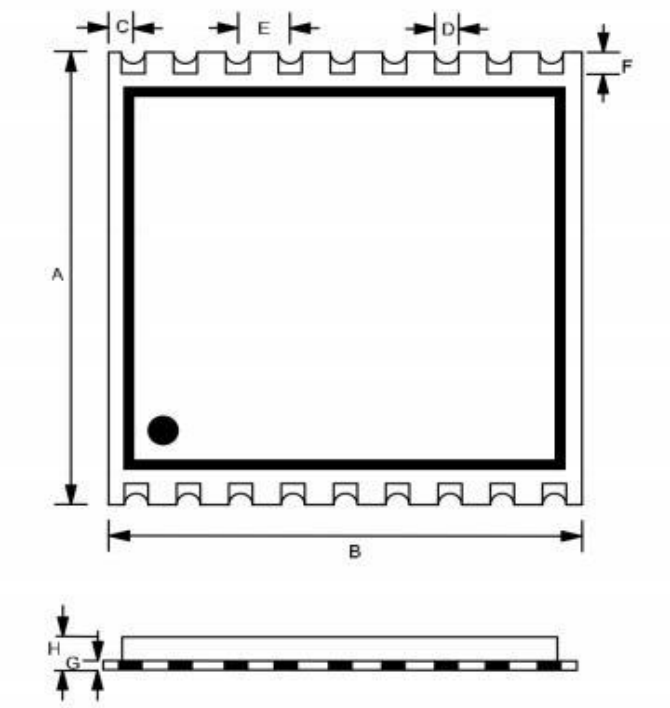
8. Electrostatic damage warning

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 prohibit bare hands from touching the module 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	11.5	± 0.5
C	1.26	± 0.1
D	1.5	± 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	9 May 2022

11. Purchase Selection Table

Number	Model	Description
1	VG7669T160N0SA	The module does not have its own backup battery and antenna, braided with packaging \tray packaging

12. Statement

1. Due to product version upgrade or other reasons, the contents of this document will be updated from time to time. Unless otherwise agreed, this document serves as a guide for use only, and the statements, information and recommendations herein do not constitute any express or implied warranty.

2. The Company reserves the final interpretation and modification of all the information provided, subject to change without prior notice.

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