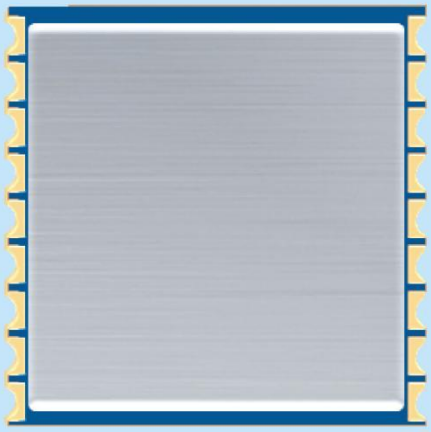
G-NiceRF®

GPS02-UBX

Four GNSS (GPS, GLONASS, Galileo, and BeiDou)
High Precision、 Low Drift、 Low Power

Product Specifcation



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Note: Revision History

Revision	Date	Comment
V1.0	2020-9	First release

1. Overview

GPS02-UBX module features the u-blox M10 standard precision GNSS platform and provides exceptional sensitivity and acquisition times for all L1 GNSS signals. The extremely low power consumption in continuous tracking mode allows great power autonomy for all battery-operated devices, such as asset trackers, without compromising on GNSS performance.

GPS02-UBX module supports concurrent reception of up to four GNSS (GPS, GLONASS, Galileo, and BeiDou). The high number of visible satellites enables the receiver to select the best signals. This maximizes the position accuracy, in particular under challenging conditions such as in deep urban canyons. In the firmware described here,however, the number of concurrently received GNSS is limited to three. u-blox Super-S (Super-Signal) technology offers great RF sensitivity.

It provides high sensitivity, high positioning accuracy, low power consumption and low cost positioning and navigation solutions for the manufacture of navigation and positioning terminal products such as vehicle, ship borne, handheld and wearable.

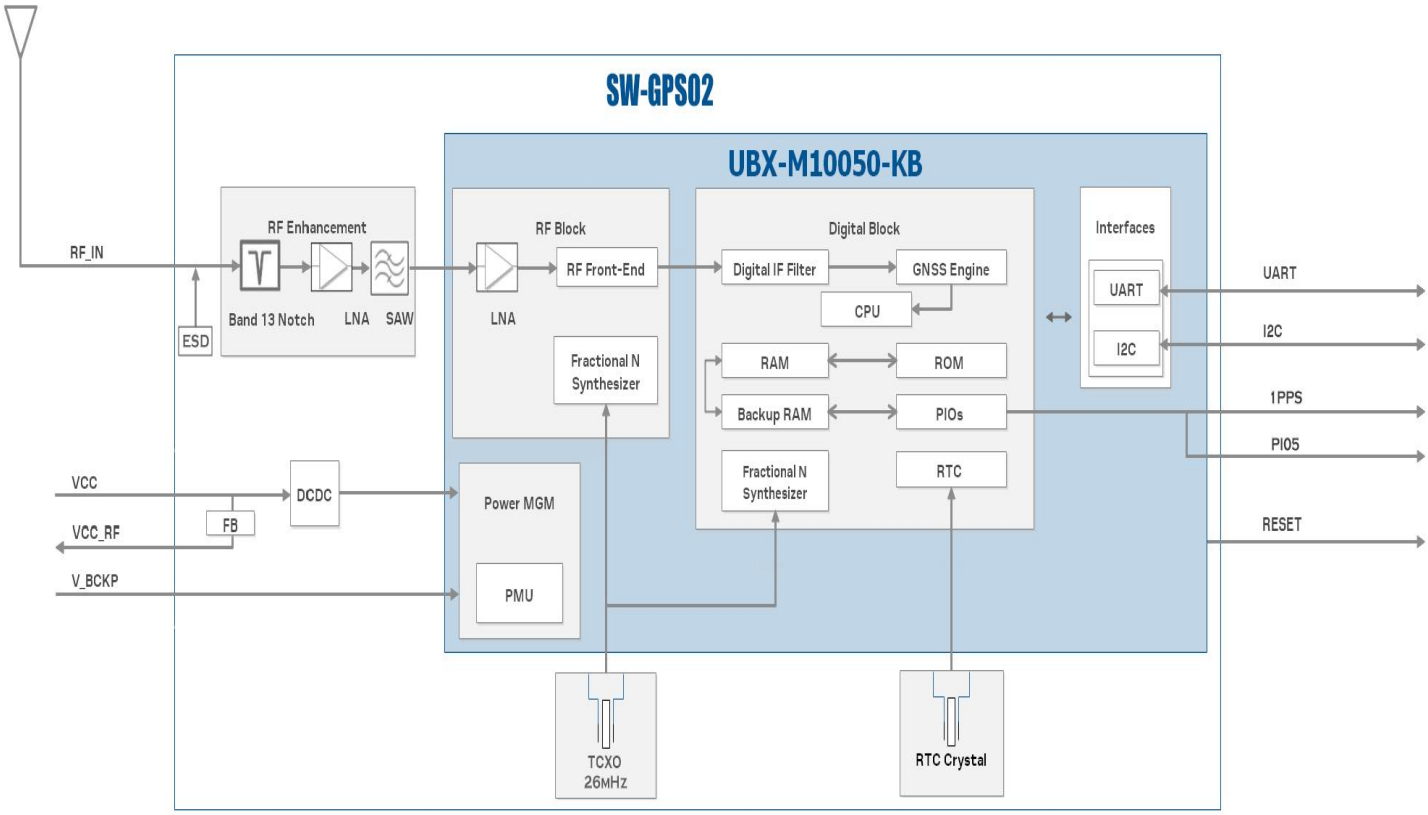
2. Features

- Support BDS B1I/B1C, GPS L1 C/A,GLO L1OF, Gal E1frequency point
- Support BDS/GPS/GLONASS/Galileo single-mode,dual-mode and multi-mode work, can switch between each other by command, default BDS/GPS/GLO tri-mode work
- Support power supply to active antenna
- With backup power input interface
- Support hot start
- Support external reset
- Support UART and I2C interface
- Cold start capture sensitivity up to -148dBm. Tracking sensitivity up to -166 dBm.
- Support A-GNSS assisted positioning

3. Applications

- Personal positioning and navigation products
- Vehicle, ship positioning and navigation
- Internet of Things
- Handheld portable device

4. Typical application circuit



5. Module interface description

1) Power supply

The module has three power input pins (VCC, V_BCKP and VDD_IO) and one power output pin (VCC_RF).

VCC is the main power supply of the module.

VCC_IO is the IO power supply of the module.

V_BCKP is the backup input power supply of the module, which supplies power to the RTC circuit when the main power supply VCC is cut off to ensure that key information is not lost, so as to realize the hot start function.

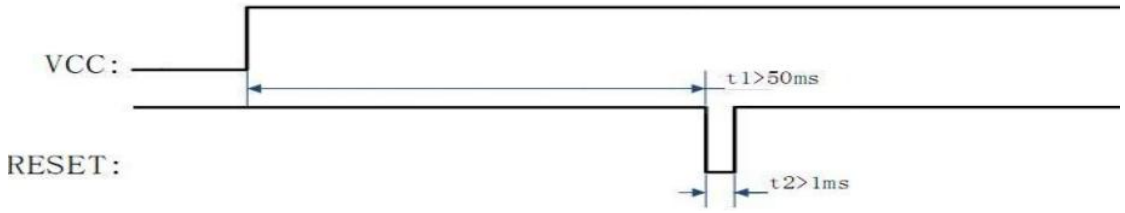
VCC_RF outputs 3.3V voltage value, which can be used to power the antenna or the external LNA of the module.

2) Antenna interface

The antenna interface (RF_IN pin) of the module can be directly connected to a multi-mode antenna. The interface adopts 50Ω impedance matching inside.

3) Reset interface

The module has its own power-on reset circuit. If the user does not use the external reset function of the module, the nRESET pin can be left floating; if the user uses the external reset function, the module can be reset after the VCC voltage stabilizes for 50ms. Keep for more than 1ms, the timing is as follows:



4) 1PPS signal interface

Module 4 pin 1PPS is the second pulse signal output, 1PPS signal needs to be delayed for several seconds after the module realizes positioning.

5) UART interface

The serial port outputs NMEA data at the UTC second boundary, and the host computer can also switch the module's working mode and baud rate through the serial port. The baud rate range supported by the module is 4800bps ~ 921600bps. The default baud rate is 38400bps.

The data format is: 1 start bit, 8 data bits, 1 stop bit, no parity bit.

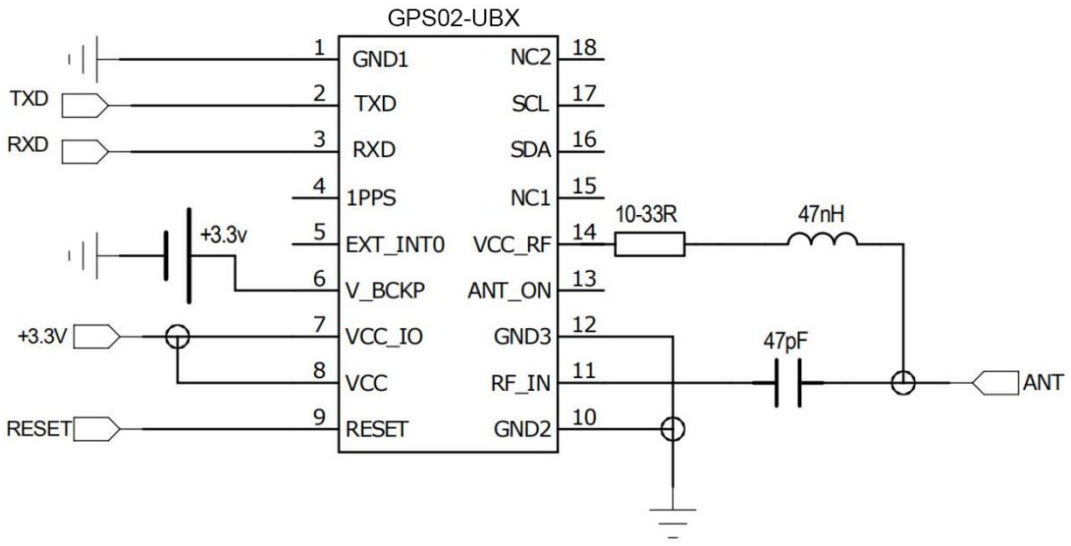
6. Performance parameters

Parameter	Description	Minimum	Typical	Maximum	Unit	Condition
Operating conditions						
Operating voltage range	VCC	2.7	3.3	3.6	V	
	V_BCKP	2.5	3.3	3.5	V	
Temperature	Work	-40		85	℃	
	Storage	-40		125	℃	
Current consumption						
Receive current			< 25		mA	@Dual mode，VCC=3.3V, V_BCKP=3.3V
Sleep current			< 35		uA	VCC=0V, V_BCKP=3.3V

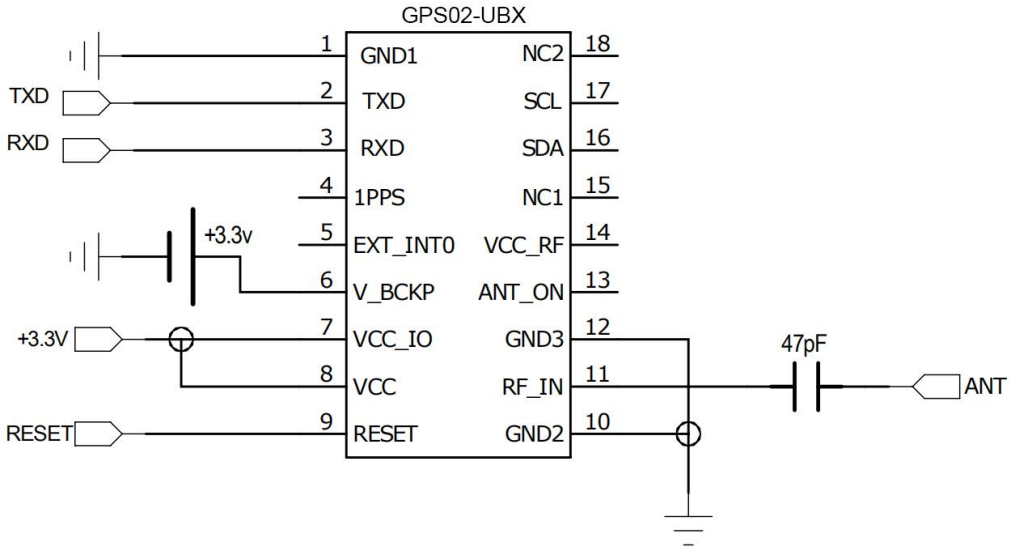
Radio frequency parameters						
Positioning accuracy	Level		< 3		m	@Open land
	Elevation		< 4.5		m	
Speed Measurement accuracy			<0.1		m	
Sensitivity	capture		-148		dBm	
	track		-166		dBm	
External antenna gain				30	dB	
Speed measurement accuracy			< 0.1		m/s	
First fix time TTFF	Cold start		< 28		s	
	Hot Start		1		s	
	Recapture		1		s	
Serial port parameters						
Serial baud rate		4800	38400	921600	bps	
Data update rate	Single mode		1	20	Hz	Default 1 Hz
	Three mode			10		

7. Typical application circuit

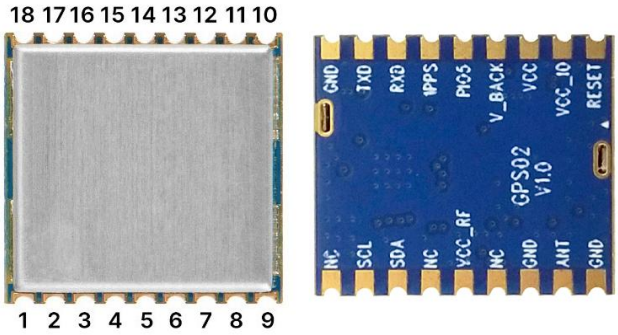
- The active antenna connection method is as follows:



➢ The passive antenna connection method is as follows:



8. Pin definition



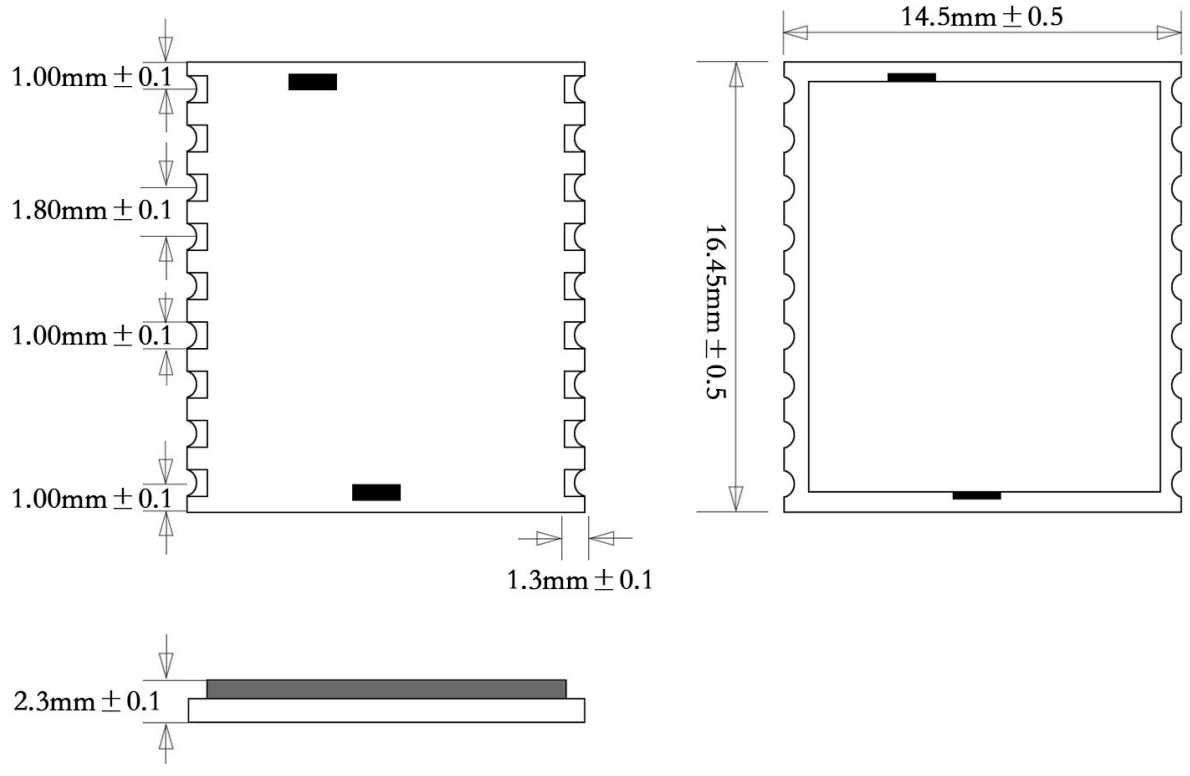
Pin number	Pin definition	I/O	Level standard	Description
1、10、12	GND	—		Power ground
2	TXD	O	0-3.5 V	Data output, status output
3	RXD	I	0-3.5 V	Control command reception
4	1PPS	O	0-3.5 V	Second pulse output
5	PIO5	I	0-3.5 V	Reserved interface
6	V_BCKP	I	2.5-3.5 V	Backup power input
7	VCC_IO	—	3.0-3.5 V	IO power input
8	VCC	—	3.0-3.5 V	Main power input
9	nRESET	I	0-3.5 V	External reset, active low. The reset pin is external to the module and cannot be connected to a ground capacitor.
11	RF_IN	I		Antenna Input
14	VCC_RF	O	VCC	3.3V output, powered by the module to the antenna, the antenna working current is recommended not to exceed 20mA

13、15、18	NC	—		
16	SDA	I/O	0-3.5 V	Data signal of two-wire DDC interface
17	SCL	I	0-3.5 V	Clock signal of two-wire DDC interface

9. Recommended antenna index

Item		Active antenna	Passive antenna
Frequency range	BDS	1561.098 ± 2.046 MHz	1561.098 ± 2.046 MHz
	GPS	1575.42 ± 1.023 MHz	1575.42 ± 1.023 MHz
	GLONASS	1602.0 ± 4 MHz	1602.0 ± 4 MHz
Input resistance		50Ω	50Ω
Gain		<30dB	-
In-band gain flatness		≤1.5dB	-
Noise Figure		≤1.5dB	-
Input standing wave		≤1.5	≤1.5
Output standing wave		≤2	≤2
Out-of-band rejection: 1568 ± 30MHz		≤30dB	-
Recommend working voltage		3.0V±0.3	-
Temperature range		-40~85℃	-40~85℃

10. Mechanical size (unit： mm)

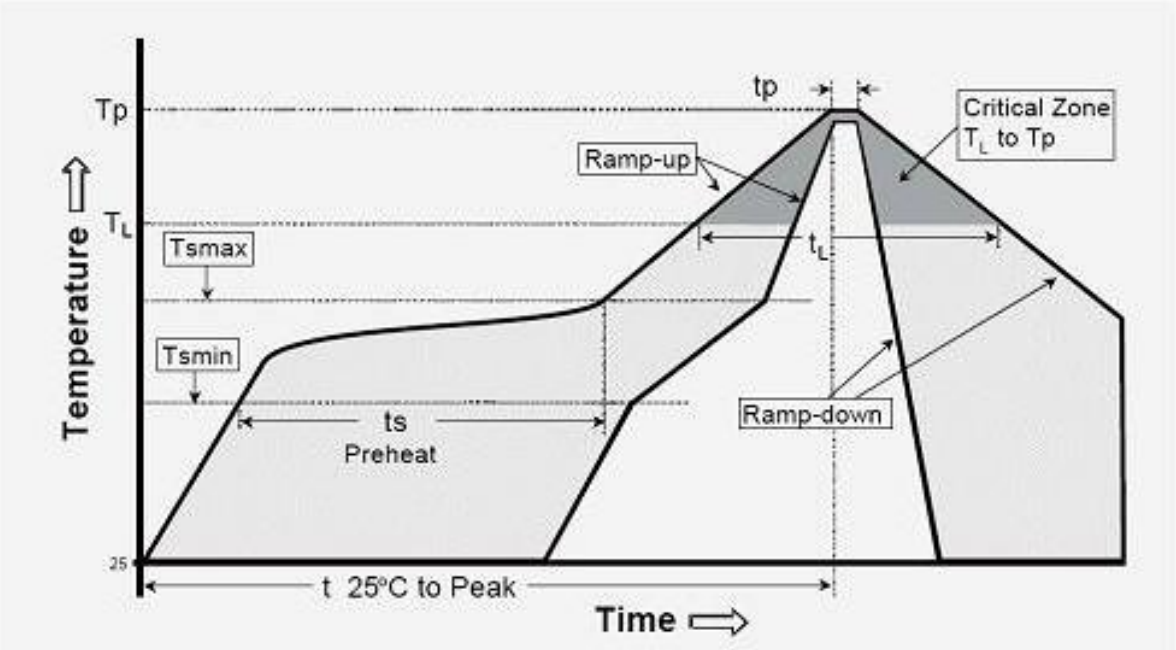


11. Precautions:

1) The radio frequency circuit on the module contains electrostatic sensitive components. Please pay attention to electrostatic protection during soldering, installation and transportation. Please do not touch the RF_IN pin with bare hands, otherwise the module may be damaged.
2) In product application, the transmission line connected to the RF_IN terminal should be controlled with 50Ω impedance. Do not run at right angles or sharp angles, and try not to replace the signal layer. The adjacent layer below the connection line should have a complete ground plane. If the design is limited, at least ensure that the area corresponding to the label area has a complete ground plane. If there are other strong interference sources on the board, it is recommended to add a shield to the interference source. If the interference source frequency is close to the navigation signal frequency of the module, it is recommended to install a SAW filter at the front end of the module RF_IN.
3) Try to control the module's VCC power supply ripple within 100mV, and avoid interference on the power supply.
4) Please ensure that the baud rate set by the host computer and the module is consistent.
5) It is recommended to select an active antenna with quality guaranteed BDS B1/GPS L1/GLONASS L1 frequency point (the user can select the corresponding frequency point antenna according to the working mode), and ensure that the antenna is powered.
6) Please control the temperature and operation method when soldering the module to avoid damage to the module.

Appendix: Furnace temperature graph

We recommend you should obey the IPC related standards in setting the reflow profile:



IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness >=2.5mm)
The ramp-up rate (Tl to Tp)	3℃/s (max.)
preheat temperature - Temperature minimum (Tsmin) - Temperature maximum (Tsmax) - preheat time (ts)	 150℃ 200℃ 60~180s
Average ramp-up rate(Tsmax to Tp)	3℃/s (Max.)
- Liquidous temperature(TL)	217℃
- Time at liquidous(tL)	60~150 second
peak temperature(Tp)	245+/-5℃