E108-GN02D User Manual

GK9501 Positioning module

成都亿佰特电子科技有限公司
Chengdu Ebyte Electronic Technology Co.,Ltd.

CONTENTS

Chapter 1 Overview

1.1 Introduction

E108-GN02D is a high-performance, high-integration, low-power, low-cost multi-mode satellite positioning and navigation module. It is small in size and low in power consumption. It can be used for GNSS positioning such as car navigation, smart wear, and drone flight control. Application. Provides hardware interface, supports UART communication and low power consumption mode. Support BDS/GPS/GLONASS/GALILEO/QZSS/SBAS and other satellite positioning.

The module adopts the integrated design of radio frequency baseband antenna, integrates DC/DC, LDO, radio frequency front end, low-power application processor, RAM, Flash storage, RTC and power management, etc. It is powered by button battery RTC and backup RAM. Reduce first positioning time. The module supports serial port to connect with other peripherals, and the operation is simple, and it will automatically start running after power on. Allow users to get started very quickly.

1.2   Features

- Support BDS/GPS/GLONASS/GALILEO/QZSS/SBAS multi-system joint positioning and single-system independent positioning;
- D-GNSS differential positioning, A-GNSS assisted positioning, ephemeris prediction, DR integrated navigation application, the fastest data update rate is 10Hz;
- 32-bit application processor, the highest frequency is 133MHz, supports dynamic frequency adjustment;

- Support PPS output, the default period is 1s;
- Built-in reset controller;
- Support UART communication;
- RTC: Support 32.768 KHz ± 20 ppm crystal oscillator, 1.1V RTC clock output, support external signal wake-up;
- Output format: Support NMEA0183 V4.1 and previous versions, the maximum fixed update frequency can reach 10Hz;
- High sensitivity: capture cold start -149dBm, hot start -162dBm, tracking -166dBm;

- Ultra-low power consumption: 35mA capture, low power consumption mode can be entered through the interface.
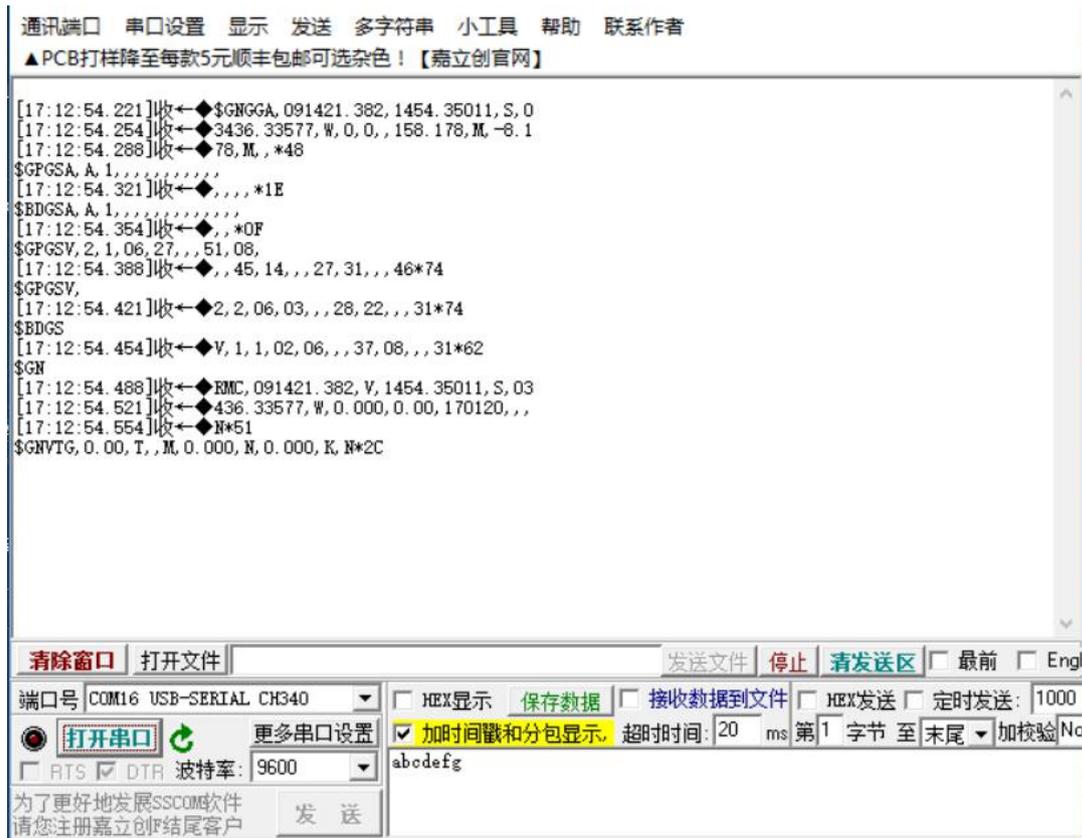
1.3 Application scenario

- Vehicle positioning and navigation equipment;
- Wearable devices, such as GPS trackers, etc.;
- UAV positioning, industrial computers, etc.;
- Industry equipment that requires GNSS positioning or navigation；

Chapter 2   Quick start

This chapter is tested based on E108-GN02D:

1. Connect to a computer through a serial converter.
2. You can open the serial port assistant to view the data reported by the serial port, or use our naviTrack to view.

```
通讯端口  串口设置  显示  发送  多字符串  小工具  帮助  联系作者
▲PCB打样降至每款5元顺丰包邮可选杂色！【嘉立创官网】

[17:12:54.221]收←◆$GNGGA,091421.382,1454.35011,S,0
[17:12:54.254]收←◆3436.33577,W,0,0,,158.178,M,-8.1
[17:12:54.288]收←◆78,M,,*48
$GPGSA,A,1,,,,,,,,,,,
[17:12:54.321]收←◆,,,,*1E
$BDGSA,A,1,,,,,,,,,,,
[17:12:54.354]收←◆,,*0F
$GPGSV,2,1,06,27,,,51,08,
[17:12:54.388]收←◆,,45,14,,,27,31,,,46*74
$GPGSV,
[17:12:54.421]收←◆2,2,06,03,,,28,22,,,31*74
$BDGS
[17:12:54.454]收←◆V,1,1,02,06,,,37,08,,,31*62
$GN
[17:12:54.488]收←◆RMC,091421.382,V,1454.35011,S,03
[17:12:54.521]收←◆436.33577,W,0.000,0.00,170120,,,
[17:12:54.554]收←◆N*51
$GNVTG,0.00,T,,M,0.000,N,0.000,K,N*2C
```

When the baud rate is set to 9600 bps, data will be reported all the time after opening the serial port. The common output format is as follows:

GGA: time, location, number of satellites;

GSA: GPS receiver operating mode, satellites used for positioning, DOP value, positioning status;

GSV: visible GPS satellite information, elevation angle, azimuth angle, signal to noise ratio;

RMC: time, date, location, speed;

VTG: ground speed information;

For detailed meaning, please refer to the third section NMEA0183 protocol;

For ease of use, we recommend using the exclusive tool TaviTrack for debugging. For detailed usage, please refer to the "naviTrack User Manual".
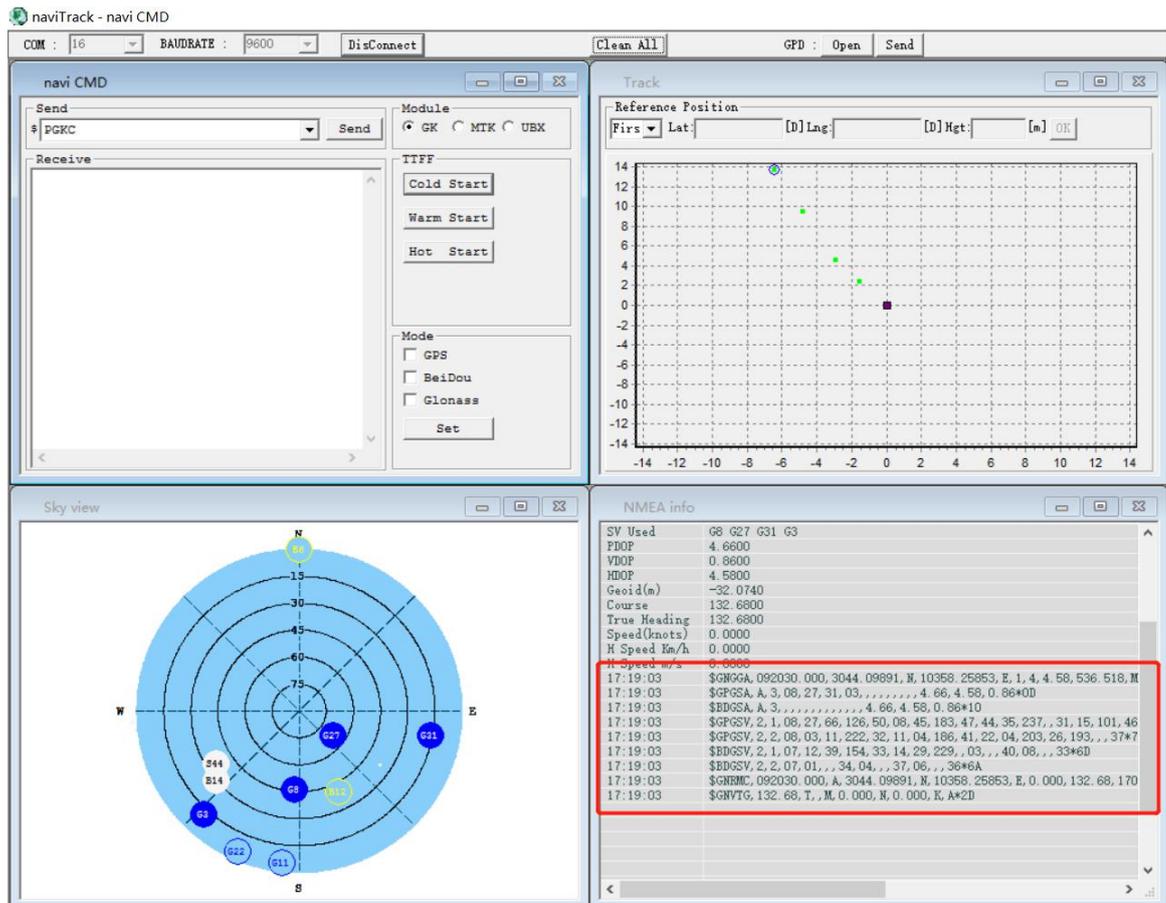
1. Run naviTrack. with administrator privileges, run the above page;

2. Select the corresponding com port and click connect. After the connection is successful, you can see the reported data in the NMEA window.

3. For detailed meaning, please refer to the description in the third section NMEA0183 protocol;

4. After the positioning is successful, you can get the latitude and longitude information in the $GPRMC field reported by the serial port. For more detailed tool usage information, please refer to the user manual in the toolkit。

Chapter 3 Specifications

3.1 GPS performance parameters

Category	Index item	Typical value	Unit
Positioning time (Test condition 1)	Cold start	27.5	S
	Hot Start	＜1	S
	Recapture	＜1	S

	A-GNSS	＜10	S
Sensitivity (Test condition 2)	Cold start	-149	dBm
	Hot Start	-162	dBm
	Recapture	-164	dBm
	track	-166	dBm
Precision (Test condition 3)	Horizontal positioning accuracy	2.5	m
	High positioning accuracy	3.5	m
	Speed positioning accuracy	0.1	m/s
	Timing accuracy	30	ns
Power consumption (Test condition 4)	Capture current	35	mA
	Tracking current	20	mA
Operating temperature	--	-35℃--85℃	--
storage temperature	--	-55℃--100℃	--
humidity	--	5%--95%RH(No condensation)	--

Note: The above result is GPS/Beidou dual mode working mode

[Test condition 1]: The number of receiving satellites is greater than 6, the signal strength of all satellites is -130dBm, and the average value is taken after 10 tests, and the positioning error is less than 10 meters.

[Test condition 2]: The external LNA has a noise figure of 0.8, the number of received satellites is greater than 6, and the received signal strength value is locked within five minutes or without losing lock.

[Test condition 3]: Open and unobstructed environment, continuous 24 hours power-on test, 50% CEP.

[Test condition 4]: The number of receiving satellites is greater than 6, and the signal strength of all satellites is -130dBm.

3.2 Basic parameters

Category	Description
letter of agreement	Support NMEA0183 V4.1 and previous versions, the maximum fixed update frequency can reach 10Hz
Supported positioning system	BDS/GPS/GLONASS/GALILEO/QZSS/SBAS
Support peripheral interface	UART (TXD/RXD)
Low power consumption	Support
Periodic low power consumption	Support
Direct low power consumption	Support
Parameter setting software	Support
Certification	Pending
Module size	22*20*5.8mm(L*W*H)
interface	6P wiring seat, spacing 1.0mm

power supply	VCC (3-5.5V)	
Serial port	Communication level	2.8V—3.3V（2.8V）
	Baud rate (bps)	9600~921600，default 9600
	Data bit	8bit
	Stop bit	1

Chapter 4   Size and pin definition

22*20*5.8mm

22mm long

20mm wide

5.8mm in height
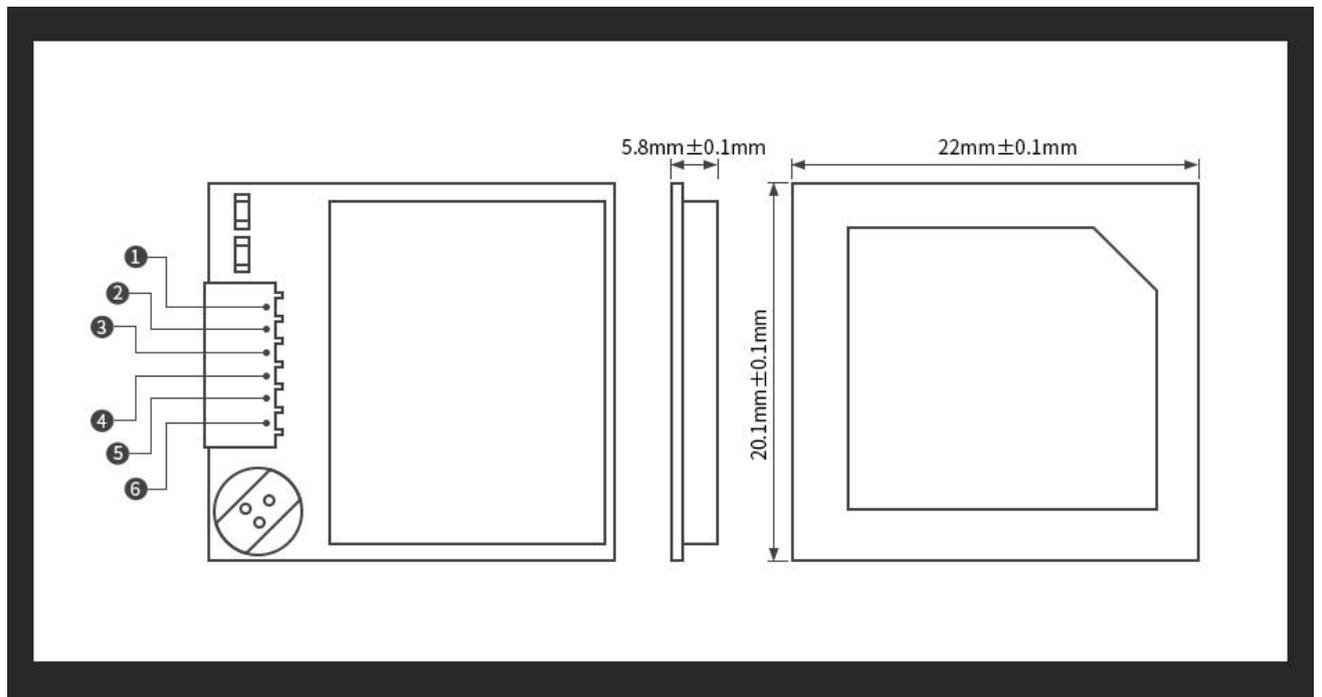
Pin number	Name	Description
1	CE	Power enable terminal, can be pulled down to enter low power consumption mode (default is high)
2	1PPS	1PPS output, users can set frequency, duration, etc. through commands
3	GND	Module power ground wire
4	TXD	UART output (2.8V level)

| 5 | RXD | UART input (2.8V level) |
| 6 | VCC | Module power supply (3V—5.5V) |

Chapter 5 Hardware Design

- It is recommended to use a DC stabilized power supply to power the module, the power supply ripple should not exceed 30mV, and the module must be reliably grounded;

- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module;

- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, it will cause permanent damage to the module;

- The serial ports TXD and RXD are LVTTL levels. If connected to a PC, RS232 level conversion is required. User can use this serial port

- Receive positioning information data and software upgrades.

- This module is a temperature-sensitive device, and drastic changes in temperature will reduce its performance. Try to stay away from high-temperature airflow and high-power during use.

- Heating device

- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, and the whole machine is conducive to long-term stable operation;

- The module should be as far away as possible from power supply, transformer, high frequency wiring and other parts with large electromagnetic interference;

- Assuming that there are devices with large electromagnetic interference around the module, it will greatly affect the performance of the module. According to the intensity of the interference, it is recommended to stay away from the module. If the situation permits, proper isolation and shielding can be done；

Chapter 6   Working Mode

1. Please refer to "GK9501 Input and Output Format" in the data package for the command format of related software functions of the module.

2. This module supports AGPS settings. For detailed setting methods, please refer to the "Goke AGPS User Manual" in the information package.

Chapter 7 Related Models

Product number	IC	Support satellite	Package form	Size mm	Interface
E108-GN01	GK9501	BDS/GPS/GLONASS/GALILEO/QZSS/SBAS	SMD	16*12*2.4	UART/GPIO
E108-CN02	GK9501	BDS/GPS/GLONASS/GALILEO/QZSS/SBAS	SMD	10.1*9.7*2.4	UART/GPIO
E108-CN02D	GK9501	BDS/GPS/GLONASS/GALILEO/QZSS/SBAS	DPI	22*20*5.8	UART

Chapter 8 Bulk Packaging
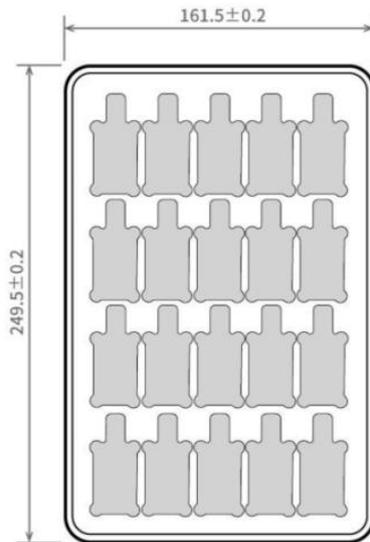
Unit: mm
Each Layer: 20 pcs
Each Package: 5 layers

Revision history

Version	Date	Description	Issued by
1.0	2020-08-28	initial version	----

About us

Technical support: support@cdebyte.com

Documents and RF Setting download link:：www.ebyte.com

Thank you for using Ebyte products! Please contact us with any questions or suggestions: info@cdebyte.com

----

Official hotline:028-61399028

Web: www.ebyte.com

Address: B5 Mould Park, 199# Xiqu Ave, High-tech District, Sichuan, China