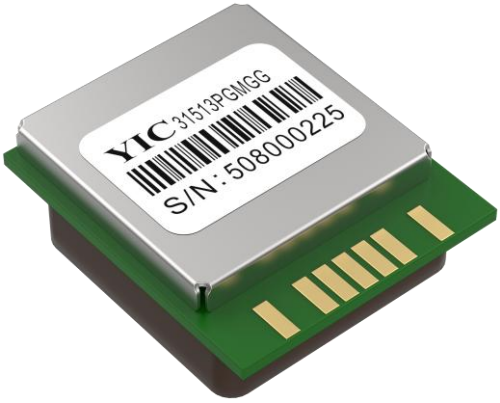
YIC



YIC31513PGMGG

Standard Precision Antenna Module

Datasheet

Revision History

Date	Reversion	Description
2022/1/12	1.0	First Draft, Based on YIC31513PGMGG

Directory

1. Product Information

1.1 Product Description

YIC31513PGMGG-C is a complete standalone GPS/GLONASS antenna module. The module is powered by GOKE chip, which provides superior sensitivity and performance even in urban canyon and dense foliage environment. The miniature size makes the module easy to integrate into portable device like PDAs, camera and vehicle locators.

Applications

- Wearable and portable devices
- Automotive Navigation
- Personal Positioning
- Fleet Management
- Mobile Phone Navigation
- Marine Navigation

1.2 Product Features

- Small size with antenna module
- Fast TTFF at low signal level
- Build on high performance, GOKE chip set
- Low power consumption: Max 45mA@3.3V
- Built-in high gain LNA
- NMEA-0183 compliant protocol
- Patch Antenna Size: 12x12x4mm
- Communication type: UART/TTL
- RoHS Compliant

1.3 Product Specifications

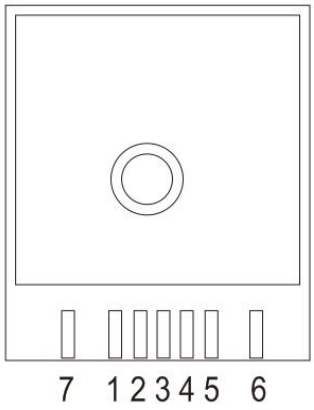
GPS Receiver		
Chip	GOKE	
Frequency	Code 66 search channels, 22 synchronous tracking channels GPS&, QZSS, GALILEO: L1 1575.42MHz C/A GLONASS: L1OF 1602MHz SBAS: WAAS, EGNOS, MSAS, GAGAN	
Update Rate	1Hz (default) , up to 10Hz	
Position Accuracy	Position	Dynamic: < 10m CEP @-130 dBm Static state: < 5m CEP @-130 dBm
	Accuracy of 1PPS Signal	Typical accuracy: ±40ns / Time pulse width 100ms
	Acceleration Accuracy	Without aid: 0.1m/s²
Startup Time	Cold start	35s typ @-130dBm
	Warm start	30s typ @-130dBm
	Hot start	1s typ @-130dBm
Sensitivity	Acquisition	-147dBm
	Re-acquisition	-156dBm
	Tracking	-165dBm
GNSS Operating limit	Altitude	18,000m
	Velocity	515m/s
	Acceleration	4G
Protocol Support	UART Port: TXD and RXD 9600bps (default), Baud rate supports 4800bps to 115200bps NMEA 0183 Protocol	
Environment	Operation temperature	-40°C ~ +85°C
	Storage temperature	-55°C ~ +125°C
Physical Characteristics	Size	15.2±0.30 ×13±0.20 ×6.43±0.20mm(H)
	Weight	Approx. 3.9g

1.4 DC Electrical Characteristics

Parameter	Min.	Typ.	Max.	Units
Input Voltage	2.8	3.3	4.3	Volt
Acquisition		30		mA
Tracking		28		mA
Backup Battery		20		uA
Low Level Output Voltage (VOL)			0.4	Volt
High Level Output Voltage (VOH)	2.4			Volt
Low Level Input Voltage (VIL)			0.8	Volt
High Level Input Voltage (VIH)	2			Volt
Low Level Output Current (IOL)		2		mA
High Level Output Current (IOH)		2		mA

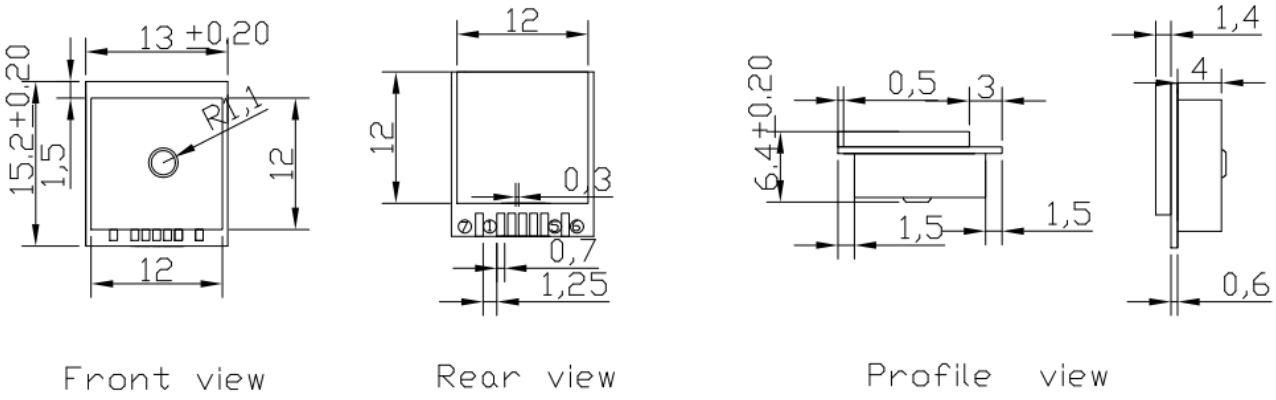
2. Technical Information

2.1 Module Pin Assignment



Pin No.	Pin Name	I/O	Remark
1.	VBAT	I	RTC Battery Input
2.	TXD	O	UART/TTL Serial Data Output ,Pull up (75KΩ) if not used
3.	RXD	I	UART/TTL Serial Data Input, Pull up (75KΩ) if not used.
4.	VCC	I	Module Power Supply
5.	GND	G	Ground
6.	PPS	O	Time Pulse(1PPS)
7.	GPIO1	I/O	General purpose I/O

2.2 Dimensions



3. Installation Guidelines

Introduction
Proper placement and installation of a GNSS antenna module significantly affects signal reception performance. This application note outlines key recommendations for integrating GNSS modules (especially those with built-in antennas) into a final product enclosure to ensure optimal positioning, minimum interference, and stable operation.

3-1 Prioritize Top or Upper Surface Placement

The GNSS antenna should face the sky directly, typically meaning the top side of the device enclosure. Avoid or minimize any obstruction above the antenna to ensure a clear line of sight to satellites.

3-2 Keep Away from Metal Parts

Avoid placing the GNSS antenna near internal metal components such as brackets, shielding covers, metal frames, battery packs, large metal housings, or bundled cables. Maintain a minimum distance of 1–2 cm from such structures; the farther, the better.

3-3 Avoid any High-Frequency Noise

Do not place the antenna close to noise-generating components, especially:

- Wi-Fi/Bluetooth modules
- Cellular transceivers (especially during transmission)
- High-speed digital circuits (e.g., CPUs, GPUs, data buses)
- Switching power supplies
- Motor drivers
- Display backlight drivers

These components emit electromagnetic interference that can overwhelm the weak GNSS signals.

3-4 Avoid Metal-Coated Plastic Enclosures

Some enclosures use metal spraying or electroplating for aesthetics or EMC reasons. These coatings may block satellite signals. Ensure the area directly above and around the antenna (at a certain radiation angle) is made of non-metallic materials such as pure plastic or glass.

3-5 Minimize Obstructions Around the Antenna

Avoid placing tall or dense components (e.g., battery packs, camera modules, speakers, or large connectors) directly above or around the antenna within a vertical angle of 5°–10°. These parts can block signal reception at low elevation angles.

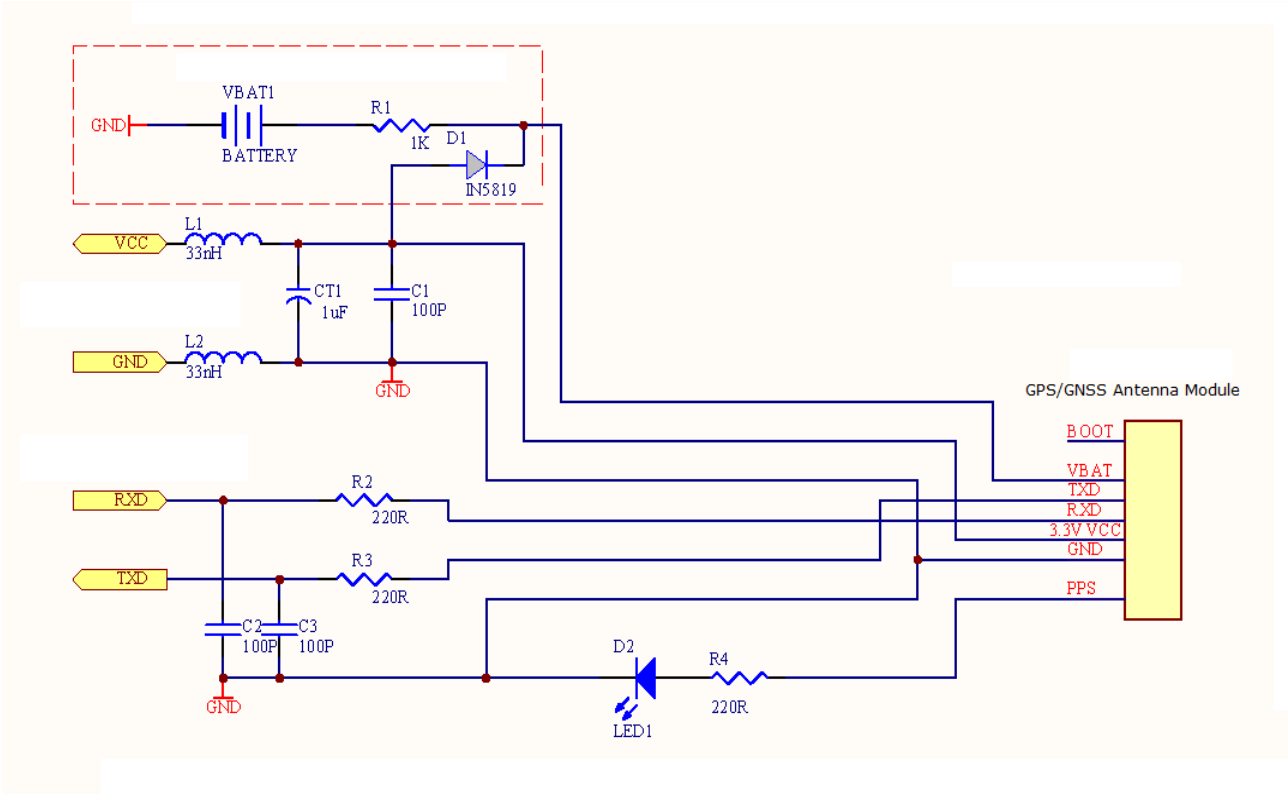
3-6 Ensure Clean and Stable Power Supply

Provide the module with a power source that has low ripple and stable voltage. It is recommended to use an LDO or a low-noise DC-DC converter, and place sufficient decoupling capacitors close to the module's power pins (as specified in the module datasheet).

3-7 Product Placement Recommendations

During the mechanical design of a product, the GNSS antenna module's placement should be pre-defined. Typically, a plastic cavity or grid structure is reserved in the enclosure to securely fit the module. The structure should be dimensioned to tightly hold the module in place. If additional fixation is needed, apply a small amount of adhesive to the backside of the module to ensure it stays firmly in position.

4. Application Circuit ：(Example)



5. Software Interface

Table 4.1 NMEA output message

NMEA	Description
GGA	Global positioning system fixed data
GLL	Geographic position - latitude/longitude
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

6. Protocol

6.1 GGA – Global Positioning System Fix Data

For example:

$xxGGA, 161229.487,3723.2475,N, 12158.3416,W, 1,07,1.0,9.0,M.0000*18

Field	Name	Example	Units	Description
1	Message ID	$xxGGA		GGA protocol header
2	UTC Position	161229.487		hhmmss.sss
3	Latitude	3723.2457		ddmm.mmmm
4	N/S indicator	N		N=north or S=south
5	Longitude	12158.3416		dddmm.mmmm
6	E/W Indicator	W		E=east or W=west
7	Position Fix Indicator	1		See Table 5.1-1
8	Satellites Used	07		Range 0 to 12
9	HDOP	1.0		Horizontal Dilution of Precision
10	MSL Altitude	9.0	meters	
11	Units	M	meters	
12	Geoids Separation		meters	
13	Units	M	meters	
14	Age of Diff.Corr.		second	Null fields when DGPS is not Used
15	Diff.Ref.Station ID	0000		
16	Check sum	*18		
18	<CR> <LF>			End of message termination

Table 5.1-1 Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GPS & Glonass SPS Mode, fix valid
2	Differential GPS & Glonass, SPS Mode, fix valid
3	GPS & Glonass PPS Mode, fix valid

6.2 GLL – Latitude/Longitude

For example:
$xxGLL , 3723.2475, N,12158.3416, W,161229.487, A*2C

Field	Name	Example	Units	Description
1	Message ID	$xxGLL		GLL protocol header
2	Latitude	3723.2475		ddmm.mmmm
3	N/S Indicator	N		N=north or S=south
4	Longitude	12158.3416		dddmm.mmmm
5	E/W Indicator	W		E=east or W=west
6	UTC Position	161229.487		hhmmss.sss
7	Status	A		A=data valid or V=data not valid
8	Check sum	*2C		
9	<CR> <LF>			End of message temination

6.3 GSA – GPS & GLONASS DOP and Active Satellites

For example:

$xxGSA , A, 3, 07, 02, 26,27, 09, 04,15, , , , , , 1.8,1.0,1.5*33

Field	Name	Example	Units	Description
1	Message	$xxGSA		GSA protocol header
2	Mode 1	A		See Table 5.3-1
3	Mode 2	3		See Table 5.3-2
4	Satellite Used	07		Sv on Channel 1
5	Satellite Used	02		Sv on Channel 2
6	…	…		…
7	Satellite Used			Sv on Channel 66
8	PDOP	1.8		Position Dilution of Precision
9	HDOP	1.0		Horizontal Dilution of Precision
10	VDOP	1.5		Vertical Dilution of Precision
11	Check sum	*33		
12	<CR> <LF>			End of message termination

Table 6.3-1 Mode 1

Value	Description
1	Fix not available
2	2D
3	3D

Table 6.3-2 Mode2

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	Automatic-allowed to automatically switch 2D/3D

6.4 GSV – GPS & GLONASS Satellites in View

For example：

$xxGSV , 2, 1, 07, 07, 79,048, 42, 02, 51,062, 43, 26, 36,256, 42, 27, 27, 138,42*71

$xxGSV, 2, 2, 07, 09, 23,313, 42, 04, 19, 159, 41, 15,12,041, 42*41.

Field	Name	Example	Units	Description
1	Message ID	$xxGSV		GSV protocol header
2	Number of Message	2		Range 1 to 3
3	Message Number	1		Range 1 to 3
4	Satellites in View	07		
5	Satellite ID	07		Channel 1(Range 1 to 66)
6	Elevation	79	degrees	Channel 1(Maximum 90)
7	Azinmuth	048	degrees	Channel 1(True, Range 0 to 359)
8	SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
9	…			...
10	Satellite ID	27		Channel 4(Range 1 to 66)
11	Elevation	27	degrees	Channel 1(Maximum 90)
12	Azimuth	138	degrees	Channel 1(True, Range 0 to 359)
13	SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
14	Check sum	*71		
15	<CR> <LF>			End of message termination

6.5 RMC – Recommended Minimum Specific GNSS Data

For example:
$xxRMC, 161229.487, A, 3723.2475, N, 12158.3416, W, 0.13,309.62, 120598,, *10

Field	Name	Example	Units	Description
1	Message ID	$xxRMC		RMC protocol header
2	UTS Position	161229.487		hhmmss.sss
3	Status	A		A=data valid or V=data not valid
4	Latitude	3723.2475		ddmm.mmmm
5	N/S Indicator	N		N=north or S=south
6	Longitude	12158.3416		dddmm.mmmm
7	E/W Indicator	W		E=east or W=west
8	Speed Over Ground	0.13	Knots	
9	Course Over	309.62	Degrees	True
10	Ground			
11	Date	120598		Dummy
12	Magnetic variation		Degrees	E=east or W=west
13	Check sum	*10		
14	<CR> <LF> End of			End of message termination

6.6 VTG – Course Over Ground and Ground Speed

For example:
$xxVTG, 309.62, T, M, 0.13, N, 0.2, K*6E

Field	Name	Example	Units	Description
1	Message ID	$xxVTG		VTG protocol header
2	Course	309.62	Degrees	Measured heading
3	Reference	T		True
4	Course		Degrees	Measured heading
5	Reference	M		Magnetic
6	Speed	0.13	Knots	Measured horizontal speed
7	Units	N		Knots
8	Speed	0.2	Km/hr	Measured horizontal speed
9	Units	K		Kilometer per hour
10	Check sum	*6E		
11	<CR> <LF>			End of message termination