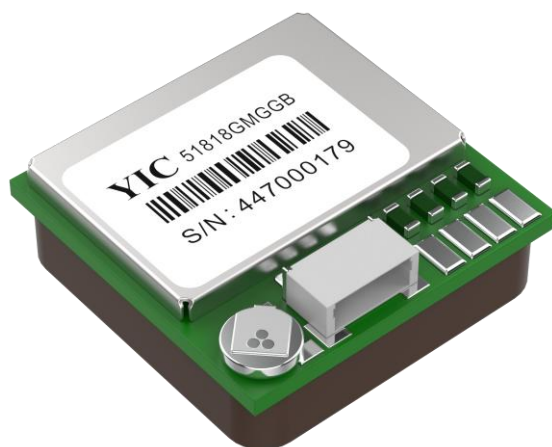




YIC51818GMGGB

Ultra Low Power & Multi-Constellation GNSS Antenna Module

Datasheet

Revision History

Date	Reversion	Description
2022/10/5	1.0	First Draft, Based on YIC51818GMGGB
2024/11/22	2.0	Description: Added a JST connector besides original soldering pads for I/O interface
2025/04/08	3.0	Description: Added Ordering Information 、 Cable Assembly Option

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1. Product Information

1.1 Product Description

The YIC51818GMGGB features multi-constellation and ultra-low power consumption, with a highly integrated GNSS receiver chip built in to support multi-system Cortex®-M4F.

The YIC51818GMGGB supports concurrent reception of four GNSS, (GPS, GLONASS, Galileo, and BeiDou) and augmentation systems (SBAS and QZSS). The multi-constellation enables the module to achieve an accuracy of approximately 1.5 meter and stable GNSS performance especially in challenging environments.

Applications

- Automotive Navigation
- Personal Positioning
- Fleet Management
- Marine Navigation

1.2 Product Features

- Multi-constellation GPS/GLONASS/Galileo/BeiDou, QZSS and SBAS
- Ultra-Low Power Consumption: 12 mA@3.3V
- Ultra High Track Sensitivity: -165dBm
- Multipath detection and suppression
- Works with passive and active antenna
- Extremely Fast TTFF at Low Signal Level (Cold start $\leq 24s$, Hot start $\leq 1s$)
- NMEA-0183 Compliant Protocol or Custom Protocol
- RoHS Compliant

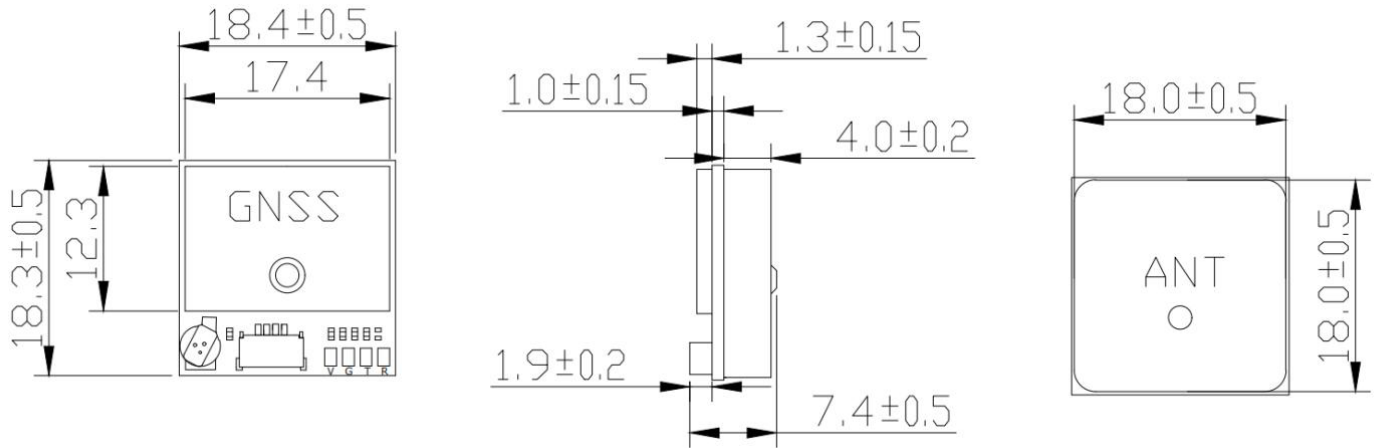
1.3 Product Specifications

GPS Receiver		
Chip	MediaTek	
GNSS Reception	GPS/QZSS	L1 1575.42MHz
	BeiDou	B1 1561MHz
	GLONASS	L1 1602MHz
	Galileo	E1 1575.42MHz
	SBAS	WAAS, EGNOS, MSAS, GAGAN
Update Rate	GNSS	10Hz Max. 1Hz by default
Position Accuracy	GNSS	1.5m CEP
	SBAS	1.5m CEP
Velocity & Time Accuracy	GNSS	0.01m/s CEP
	SBAS	0.05 m/s
Accuracy Time	Hot start	1 sec
	Cold start	24 sec
Sensitivity	Cold start	-148dBm
	Hot start	-155dBm
	Tracking	-165dBm
	Reacquisition	-158dBm
GNSS Operating limit	Velocity	515m/s
	Altitude	18,000m (Default), 80,000m in Balloon Mode
Protocol Support	UART Port: TXD and RXD 115200bps (default), Supports baud rate 9600bps to 921600bps NMEA 0183 Protocol	
Environment	Operation temperature	-40°C ~ +85°C
	Storage temperature	-55°C ~ +125°C
Physical Characteristics	Size	18.3±0.5 × 18.2±0.5 × 6.52±0.5mm
	Weight	Approx. 7.0g

1.4 DC Electrical Characteristics

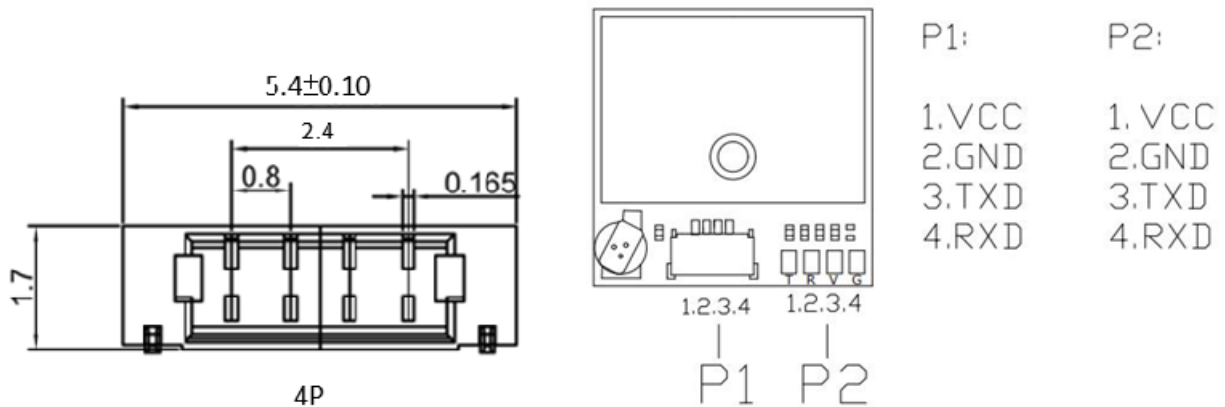
Parameter		Min.	Typ.	Max.	Units
Input Voltage		2.8	3.3	3.6	Volt
Power Supplier Current					
Acquisition	GPS/QZSS L1 + GL + GA + BD		11		mA
Tracking	GPS/QZSS L1 + GL + GA + BD		12		mA
Standby	GPS/QZSS L1 + GL + GA + BD		1.2		mA
UART Port Working Voltage					
Low Level Output Voltage (VOL)				0.4	Volt
High Level Output Voltage (VOH)		2.4			Volt
Low Level Input Voltage (VIL)				0.8	Volt
High Level Input Voltage (VIH)		2.1			Volt
Low Level Output Current (IOL)		10			uA
High Level Output Current (IOH)		-10			uA

2. Dimensions



3. Pin Assignment

3.1 Connect to Host



3.2 P1 - JST Connector

Pin NO.	Pin Name	I/O	Remark	Description
1.	VCC	I	Module Power Supply	4 Pole 0.8mm Pitch Connector
2.	GND	G	Ground	
3.	TXD	O	UART/TTL Serial Data Output	
4.	RXD	I	UART/TTL Serial Data Input	

3.3 P2 - Soldering Pads

Pin NO.	Pin Name	I/O	Remark
1.	VCC	I	Module Power Supply
2.	GND	G	Ground
3.	TXD	O	UART/TTL Serial Data Output
4.	RXD	I	UART/TTL Serial Data Input

4. Cable Assembly Option

The YIC51818GMGGB can be optionally equipped with the [J0408-A32-J0408-35](#) cable assembly to facilitate UART communication and power supply interfacing with the host system. Both cable length and connector pinout can be customized upon request to accommodate specific system integration requirements.

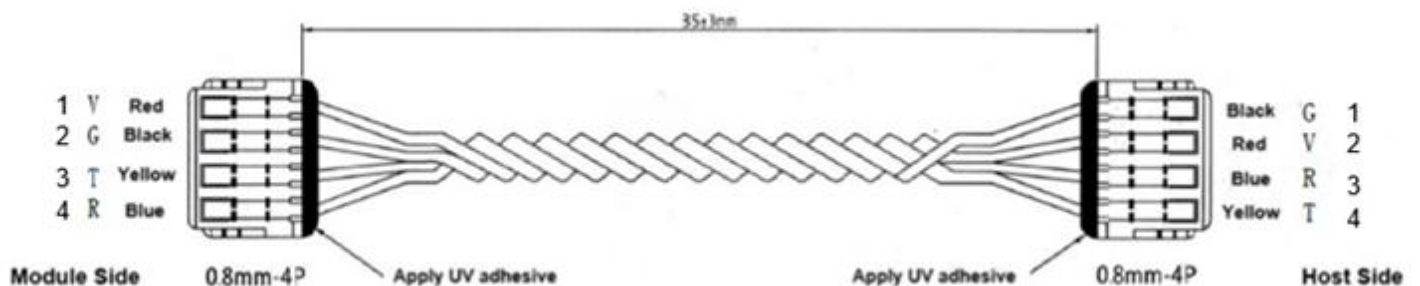


4.1 Cable Assembly Specification

	Specification
Connector Type	JST 0.8mm pitch 4-pin
Cable Length	35 ± 3 mm
Wire Type	Twisted pair
Fixing Method	UV adhesive on both ends

4.2 Pin Definitions for Module Side and Host Side

Pin Name	Module Side		Host Side	
	Pin NO.	Wire Color	Pin NO.	Wire Color
VCC	1	Red	2	Red
GND	2	Black	1	Black
TXD	3	Yellow	4	Yellow
RXD	4	Blue	3	Blue



5. Ordering Information

Ordering Number	Description
YIC51818GMGGB	GNSS module only
YIC51818GMGGB-C1	GNSS module with pre-installed cable assembly
YIC51818GMGGB-C2	GNSS module with cable assembly supplied separately



YIC51818GMGGB-C1



YIC51818GMGGB-C2

6. 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.

6-1 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.

6-2 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.

6-3 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.

6-4 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.

6-5 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.

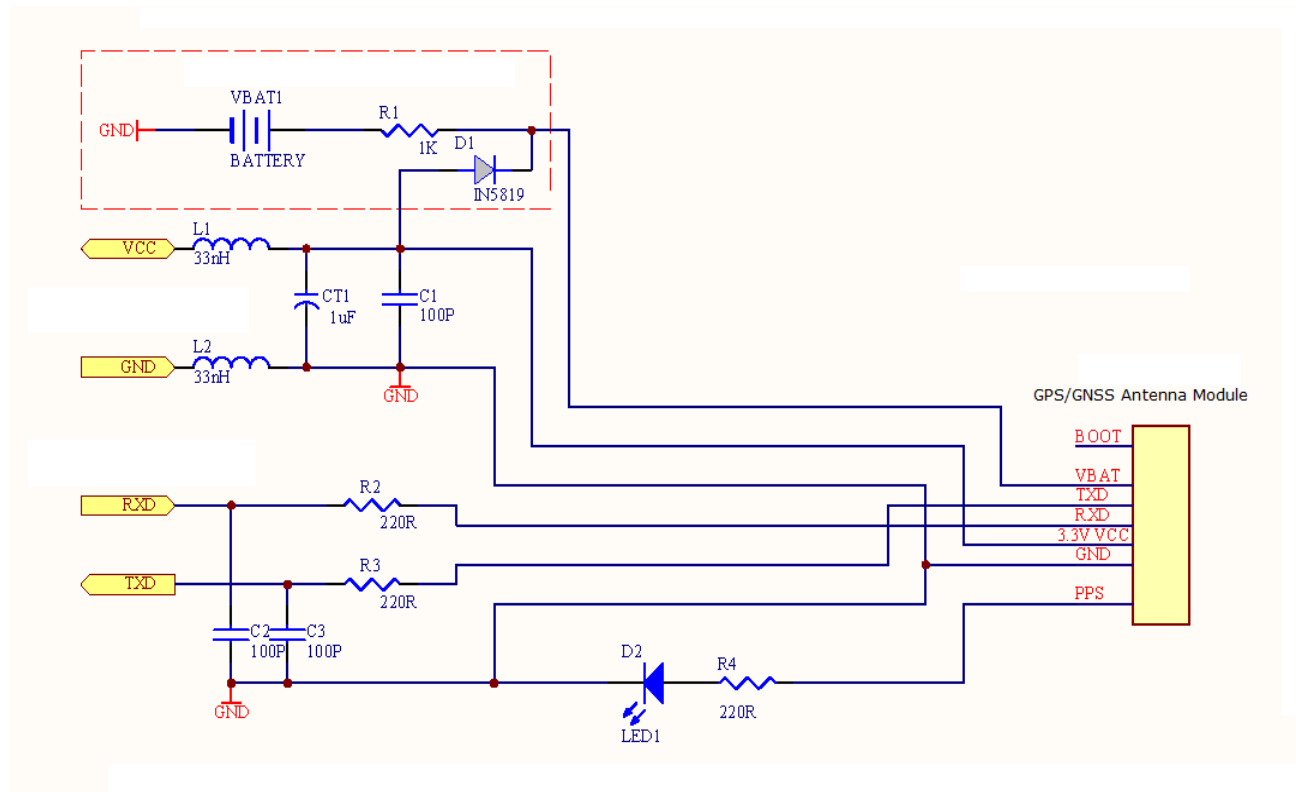
6-6 Ensure Clean and Stable Power Supply

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).

6-7 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.

7. Application Circuit : (Example)



8. Software Protocol

8.1 NMEA output message

NMEA	Description
\$GNGGA	Time, position, and fix related data of the receiver.
\$GNGLL	Position, time and fix status.
\$GNGSA	Used to represent the ID of satellites which are used for position fix. When GPS & GLONASS & Galileo & BDS satellites are used for positioning solutions, the ID of available positioning satellites is counted and output with multiple statements.
\$GPGSV \$GLGSV \$GAGSV \$GBGSV	Satellite information about elevation, azimuth and CNR, satellites are used in position solution, \$GPGSV sentence is used for GPS satellites, a \$GLGSV sentence is used for GLONASS satellites, \$GAGSV sentence is used for GALILEO satellites. And \$GBGSV sentence is used for BDS satellites.
\$GNRMC	Time, date, position, course and speed data.
\$GNVTG	Course and speed relative to the ground.
\$GNZDA	UTC, day, month and year and time zone.

8.2 GGA – Global Positioning System Fix Data

Time, position and fix related data for a GNSS receiver.

Structure:

\$GNGGA,hhmmss.sss,ddmm.mmmmm,a,dddmm.mmmmm,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh

example: \$GNGGA,175258.000,2447.0870,N,12100.5221,E,2,15,0.7,95.2,M,19.6,M,,0000*72

Field	Name	Example	Description
1	UTC Time	175258.000	UTC of position in hhmmss.sss format, (000000.000 ~ 235959.999)
2	Latitude	2447.08700	Latitude in ddmm.mmmmm format Leading zeros transmitted
3	N/S Indicator	N	Latitude hemisphere indicator, 'N' = North, 'S' = South
4	Longitude	12100.52210	Longitude in dddmm.mmmmm format Leading zeros transmitted
5	E/W Indicator	E	Longitude hemisphere indicator, 'E' = East, 'W' = West
6	Quality Indicator	2	Quality Indicator 0: position fix unavailable 1: valid position fix, SPS mode 2: valid position fix, differential GPS mode 3: GPS PPS Mode, fix valid 6: Estimated (dead reckoning) Mode
7	Satellites Used	15	Number of satellites in use, (00 ~ 56)
8	HDOP	0.7	Horizontal dilution of precision, (0.0 ~ 99.9)
9	Altitude	95.2	mean sea level (geoid), (-9999.9 ~ 17999.9)
10	Geoidal Separation	19.6	Geoidal separation in meters
11	Age pf Differential GPS data		Age of Differential GPS data NULL when DGPS not used
12	DGPS Station ID	0000	Differential reference station ID, 0000 ~ 1023
13	Checksum	72	

8.3 GLL – Latitude/Longitude

Latitude and longitude of current position, time, and status.

Structure: \$GNGLL,ddmm.mmmmm,a,dddmm.mmmmm,a,hhmmss.sss,A,a*hh

For example: \$GNGLL,2447.0870,N,12100.5221,E,175258.000,A,D*42

Field	Name	Example	Description
1	Latitude	2447.08700	Latitude in ddmm.mmmmm format Leading zeros transmitted
2	N/S Indicator	N	Latitude hemisphere indicator 'N' = North 'S' = South
3	Longitude	12100.52210	Longitude in dddmm.mmmmm format Leading zeros transmitted
4	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
5	UTC Time	175258.000	UTC time in hhmmss.sss format (000000.000 ~ 235959.999)
6	Status	A	Status, 'A' = Data valid, 'V' = Data not valid
7	Mode Indicator	D	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode
8	Checksum	42	

8.4 GSA – GNSS DOP and Active Satellites

GNSS receiver operating mode, satellites used in the navigation solution reported by the GGA sentence and DOP values.

Structure: \$GNGSA,A,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x,x*hh

For example: \$GNGSA,A,3,21, 12,15,18,20,24,10,32,25,13,,,1.2,0.7,1.0,1*18

Field	Name	Example	Description
1	Mode	A	Mode 'M' = Manual, forced to operate in 2D or 3D mode 'A' = Automatic, allowed to automatically switch 2D/3D
2	Mode	3	Fix type 1 = Fix not available 2 = 2D 3 = 3D
3	Satellite used 1~12	21, 12, 15, 18, 20, 24, 10, 32,25, 13	01 ~ 32 are for GPS; 33 ~ 64 are for WAAS (PRN minus 87); 193 ~ 197 are for QZSS; 65 ~ 88 are for GLONASS (GL PRN) ; 01 ~ 36 are for GALILEO (GA PRN); 01 ~ 37 are for BDS (BD PRN). GPS, GLONASS, GALILEO and BDS satellites are differentiated by the. GNSS system ID in table 3. Maximally 12 satellites are included in each GSA sentence.
4	PDOP	1.2	Position dilution of precision (0.0 to 99.9)
5	HDOP	0.7	Horizontal dilution of precision (0.0 to 99.9)
6	VDOP	1.0	Vertical dilution of precision (0.0 to 99.9)
7	GNSS System ID	1	1 for GPS, 2 for GLONASS, 3 for GALILEO, 4 for BDS
8	Checksum	18	

8.5 GSV – GNSS Satellites in View

Number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value. Four satellites maximum per transmission.

Structure: \$GPGSV , x , x , xx , xx , xx , xx , xx , ... , xx , xx , xx , xx , xx , x*hh

For example: \$GPGSV , 4,1 , 13 , 02,72 , 109 , 43,24 , 69,035 , 48,18 , 52,330 , 42,21 , 49,246 , 43 , 1*69

Field	Name	Example	Description
1	Number of message	4	Total number of GSV messages to be transmitted (1-5)
2	Sequence number	1	Sequence number of current GSV message
3	Satellites in view	13	Total number of satellites in view (00 ~ 20)
4	Satellite ID	02	01 ~ 32 are for GPS; 33 ~ 64 are for WAAS (PRN minus 87); 193 ~ 197 are for QZSS; 65 ~ 88 are for GLONASS (GL PRN) ; 01 ~ 36 are for GALILEO (GA PRN); 01 ~ 37 are for BDS (BD PRN). GPS, GLONASS, GALILEO and BDS satellites are differentiated by the GNSS system ID in table 3. Maximally 12 satellites are included in each GSA sentence
5	Elevation	72	Satellite elevation in degrees, (00 ~ 90)
6	Azimuth	109	Satellite azimuth angle in degrees, (000 ~ 359)
7	SNR	43	C/No in dB (00 ~ 99) Null when not tracking
8	Signal ID	1	1 for L1/CA
9	Checksum	69	

8.6 RMC – Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data provided by a GNSS navigation receiver.

Structure: \$GNRMC,hhmmss.sss,A,dddmm.mmmm,a,dddmm.mmmm,a,x.x,x.x,ddmmyy,,,a*hh For example:
\$GNRMC,175258.000,A,2447.0870,N,12100.5220,E,000.0,000.0,220617,,,D*75

Field	Name	Example	Description
1	UTC time	175258.000	UTC time in hhmmss.sss format (000000.00 ~ 235959.999)
2	Status	A	Status 'V' = Navigation receiver warning 'A' = Data Valid
3	Latitude	2447.08700	Latitude in dddmm.mmmmm format Leading zeros transmitted
4	N/S indicator	N	Latitude hemisphere indicator 'N' =North 'S' = South
5	Longitude	12100.52210	Longitude in dddmm.mmmmm format Leading zeros transmitted
6	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
7	Speed over ground	000.0	Speed over ground in knots (000.0 ~ 999.9)
8	Course over ground	000.0	Course over ground in degrees (000.0 ~ 359.9)
9	UTC Date	220617	UTC date of position fix, ddmmyy format
10	Mode indicator	D	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode
11	checksum	75	

8.7 VTG – Course Over Ground and Ground Speed

The actual course and speed relative to the ground.

Structure: \$GNVTG,x.x,T,,M,x.x,N,x.x,K,a*hh

For example: \$GNVTG,000.0,T,,M,000.0,N,000.0,K,D*16

Field	Name	Example	Description
1	Course	000.0	True course over ground in degrees (000.0 ~ 359.9)
2	Speed	000.0	Speed over ground in knots (000.0 ~ 999.9)
3	Speed	000.0	Speed over ground in kilometers per hour (000.0 ~ 1800.0)
4	Mode	D	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode
5	Checksum	16	

8.8 ZDA – TIME AND DATE

UTC, day, month, year and local time zone

Structure:

\$GNZDA,hhmmss.sss,xx,xx,xxxx,xx,xx*hh<CR><LF>

For example:

\$GNZDA,175258.000,30,08,2022,00,00*46<CR><LF>

Field	Name	Example	Units	Description
1	UTC time	175258.000		UTC time in hhmmss.ss format (000000.00 ~ 235959.99)
2	UTC Day	30		UTC time: day (01 ~ 31)
3	UTC Month	28		UTC time: month (01 ~ 12)
4	UTC Year	2022		UTC time: year (4 digit format)
5	Local zone hour	00		Local zone hours (00 ~ +/- 13)
6	Local zone minutes	00		Local zone minutes (00 ~59)
7	Checksum	46		Checksum

★ZDA is optional