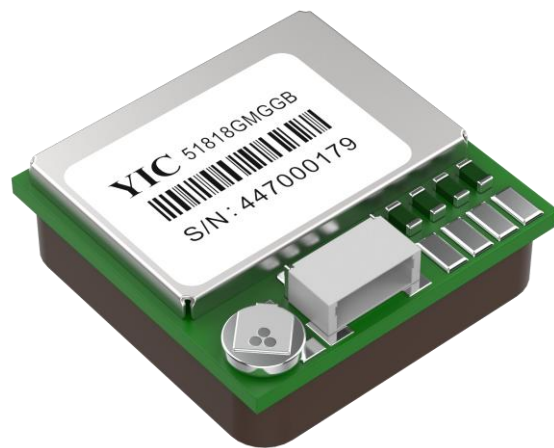


YIC



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

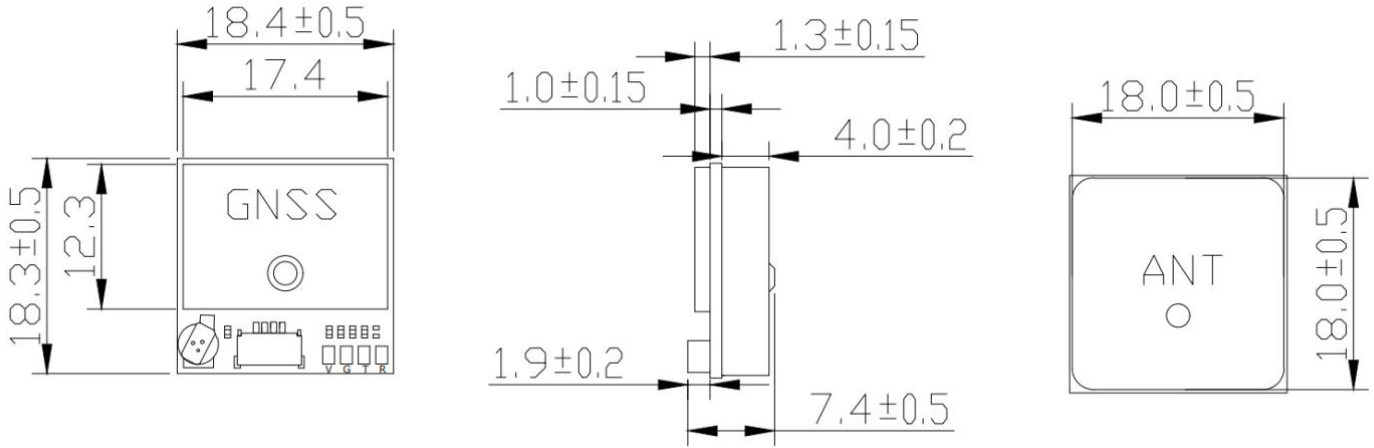
1.3 Product Specifications

| GPS Receiver | | |
|--------------------------|--|--|
| Chip | MediaTek | |
| GNSS Reception | GPS/QZSS | L1 C/A, L1C |
| | BeiDou | B1I |
| | GLONASS | L1 |
| | Galileo | E1 |
| | 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 |
| | 1PPS | 25 ns |
| 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 ~ +100°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

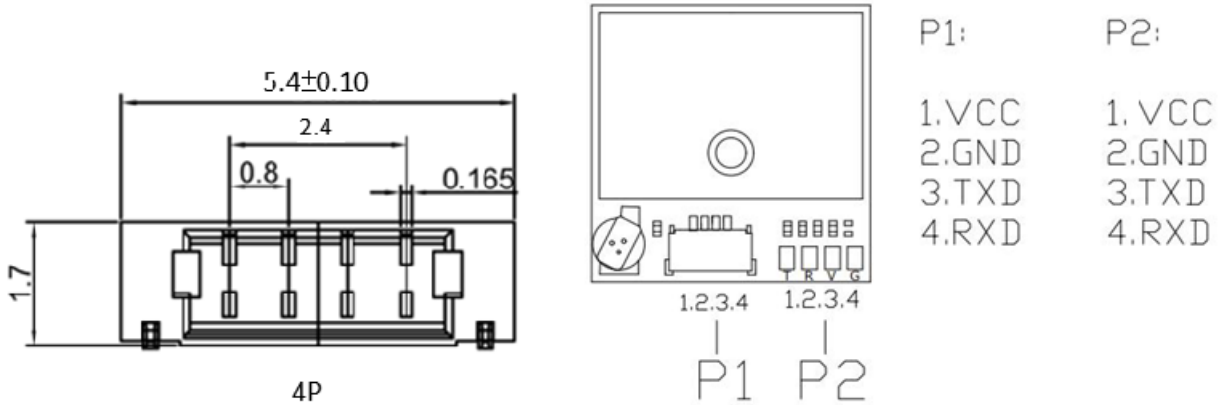
| Parameter | | Min. | Typ. | Max. | Units |
|---------------------------------|----------------------------|------|------|------|-------|
| Input Voltage | | 2.8 | 3.3 | 3.6 | Volt |
| Power Supplier Current | | | | | |
| Acquisition | GPS/QZSS L1 + GL + GA + BD | | 11 | | mA |
| Tracking | GPS/QZSS 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.

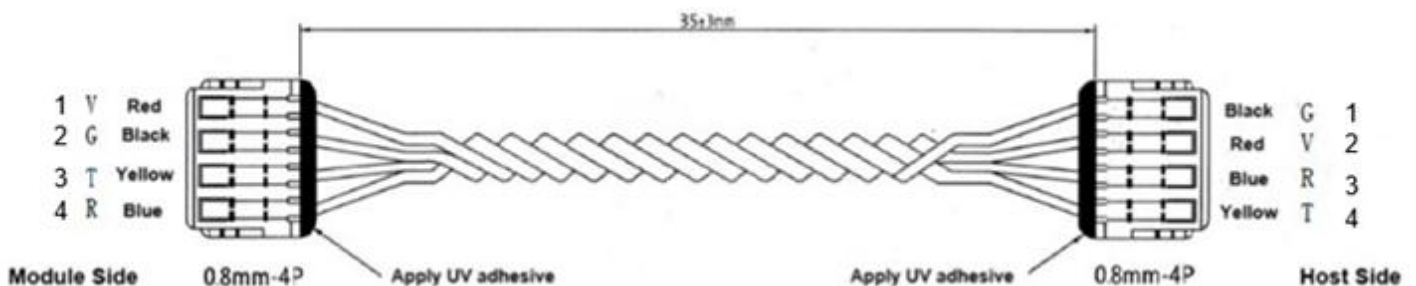


4.1 Cable Assembly Specification

| | 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 |

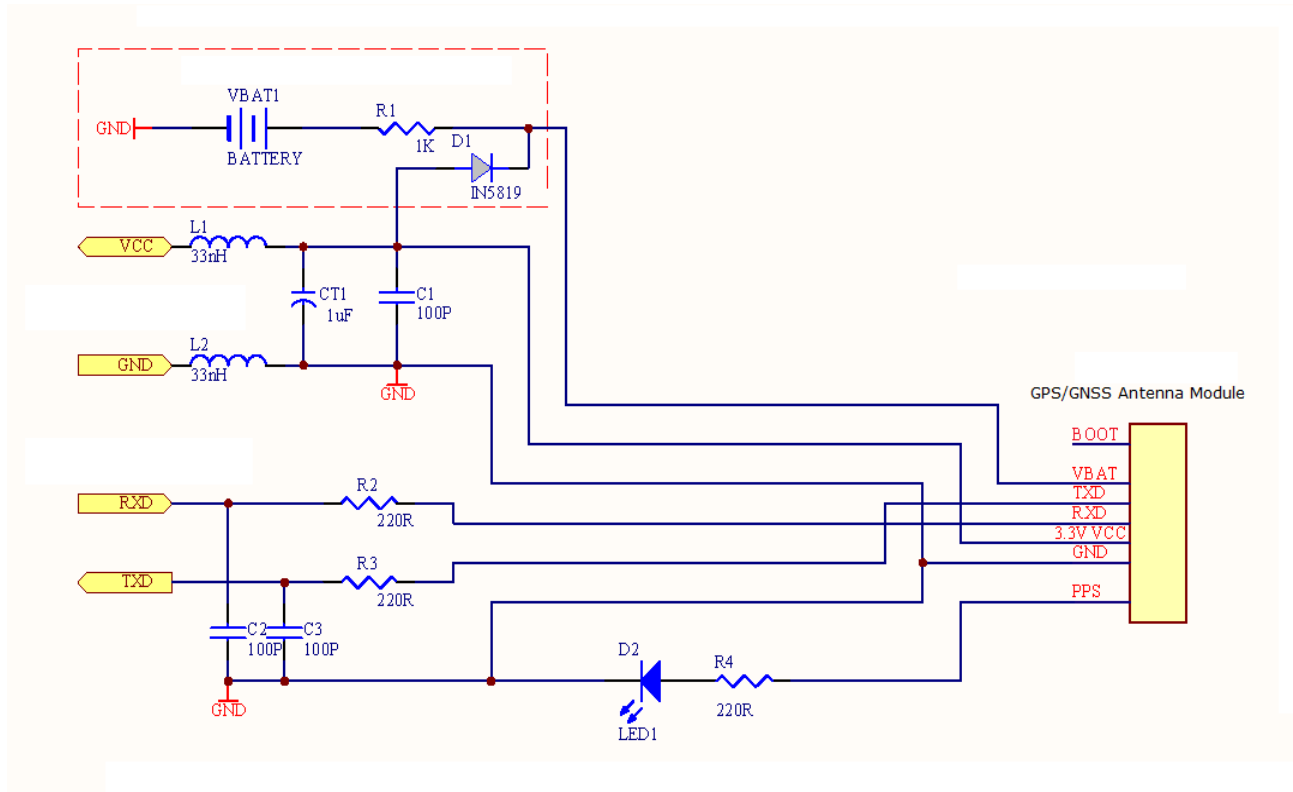


YIC51818GMGGB-C1



YIC51818GMGGB-C2

6. Application Circuit : (Example)



7. Software Protocol

7.1 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. |

7.2 GGA – Global Positioning System Fix Data

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

Structure:

\$GNGGA,hhmmss.sss,ddmm.mmmm,a,dddmm.mmmm,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 of 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 | |

7.3 GLL – Latitude/Longitude

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

Structure: \$GNGLL,ddmm.mmmm,a,dddmm.mmmm,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 | |

7.4 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,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 | |

7.5 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 | |

7.6 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,ddmmy,,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 | |

7.7 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 | |

7.8 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