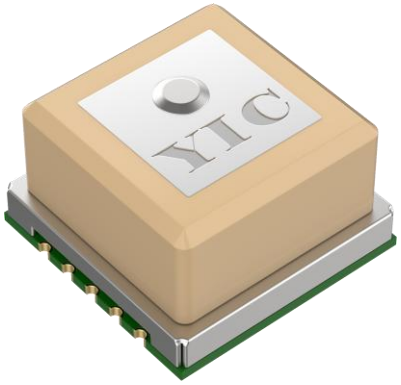
YIC



YIC51010GMSGGB

Multi-Constellation GNSS Antenna Module

Datasheet

www.yic.com.tw

Revision History

Date	Reversion	Description
2026/04/20	1.0	First Draft, Based on YIC51010GMSGGB
2026/11/18	2.0	Updated the product features section

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1. Product Information

1.1 Product Description

The YIC51010GMSGGB is a compact 10 × 10 × 5.9 mm surface-mount device (SMD) GNSS antenna module designed for space-constrained positioning applications. It integrates a high-performance MediaTek GNSS receiver, RF front-end, and patch antenna, providing an integrated GNSS solution with a minimal footprint.

Supporting concurrent reception of multiple GNSS constellations, including GPS, GLONASS, BeiDou (BDS), Galileo, QZSS, and SBAS, the YIC51010GMSGGB provides fast signal acquisition, excellent tracking sensitivity, and reliable positioning performance. Advanced signal processing provides multipath mitigation and jamming rejection in challenging signal environments.

Its compact dimensions and integrated antenna simplify GNSS integration in small and space-constrained device designs.

Applications

- Smart Watch
- Wearable Device
- Asset Tracker
- Drone

1.2 Product Features

- Build on high performance, low-power MediaTek chip set
- Ultra high Track sensitivity: -165dBm
- Multi-Constellation GNSS (GPS/GLONASS/BeiDou/Galileo)
- Supports for multi-GNSS including QZSS and SBAS ranging
- Supports BeiDou-3 signal
- Multipath detection and suppression
- Works with passive and active antenna
- Low power consumption: Max 30mA@1.8V
- NMEA-0183 compliant protocol or custom protocol
- Operating voltage: 1.7V~1.9V
- Patch Antenna Size: 9.0 x 9.0 x 4mm
- Small form factor: 10±0.2 x 10±0.2 x 6.4±0.3mm
- Interface type: SMD type with stamp holes
- Operating temperature -40 ~ +85ºC
- RoHS compliant (Lead-free)
- 1PPS Output
- Ultra-low weight of 1.8g
- AGPS support
- Jamming rejection

1.3 Product Specifications

Parameter	Specification
Power supply	Supply voltage: 1.7V~1.9V Typical: 1.8V
Power consumption	Acquisition: 30mA @VCC=VBAT=1.8V Tracking: 28mA @VCC=VBAT=1.8V Backup: 20uA @VBAT=1.8V
GNSS engine	GNSS engine has 47SVs channels and DSP accelerators
GNSS reception	GPS/QZSS: L1 C/A, L1C, BDS: B1I.B1C GLONASS: L1 GALILEO: E1 SBAS: WAAS, EGNOS, MSAS, GAGAN
Update rate	GNSS: 10Hz 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: 10 ns
Time to First Fix (TTFF)	Hot start: 1.0 s Cold start: 25 s AGPS: 1.5s
Sensitivity	Cold start: -149dBm Hot start: -155dBm Re-acquisition: -158dBm Tracking & navigation: -165dBm
GNSS Operating limit	Velocity 100m/s (10m/s Minimum) Altitude 10000m (80000m Maximum)
Datum	Default WGS-84, User definable

Parameter	Specification
UART Port	UART Port: TXD&RXD Supports baud rate from 9600bps to 961200bps, 115200bps by default. NMEA 0183 Protocol Ver.4.10 Supports batch data report mode
Temperature Range	Normal operation: -40°C ~ +85°C Storage temperature: -40°C ~ +125°C Humidity: 5% ~ 95%
Physical Characteristics	Size: 10±0.2x10±0.2x 6.4±0.3mm Weight: Approx. 1.8g
UART Port	UART Port: TXD&RXD Supports baud rate from 9600bps to 961200bps, 115200bps by default. NMEA 0183 Protocol Ver.4.10 Supports batch data report mode

2. Module Pin Assignment

The YIC51010GMSGGB module is equipped with 10pin pads that connect to your application platform.
It consists of a MediaTek AG series GNSS IC which includes the RF part and Base-band part, a patch antenna, a LNA, a SAW filter, a TCXO, a crystal oscillator.

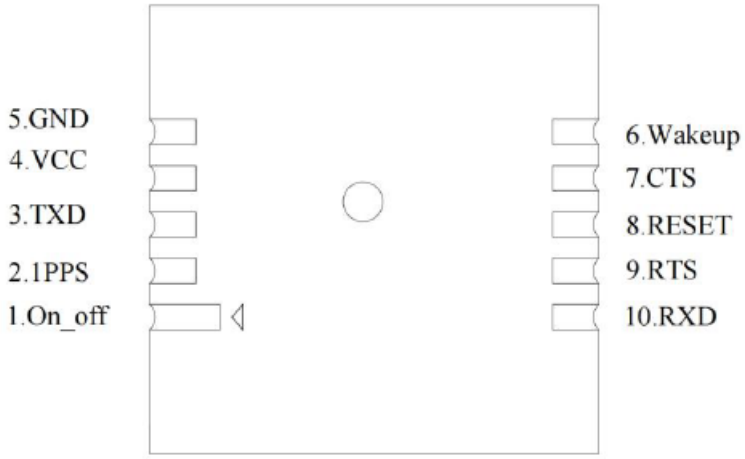


Figure 1: Pin Assignment

2.1 Pin Descriptions

Pin No.	Pin Name	Description	Remark
1	ON_OFF	Power State Control	
2	1PPS	PPS	
3	TXD	UART Serial Data output	Voltage range: 1.7V~1.9V
4	VCC	Module power supply	Voltage range: 1.7V~1.9V
5	GND	Ground	
6	WAKEUP	Power Status	
7	CTS	Interface Select 1	
8	RESET	Rest	
9	RTS	Interface Select 2	
10	RXD	UART Serial Data Iutput	

2.2 Power Supply

Regulated power for the YIC51010GMSGGB is required. The VCC Pin Need a stable DC voltage supply. Power supply ripple must be less than 30mV. The input voltage Vcc should be 1.7V~1.9V, Recommended power supply voltage is 1.8V . maximum current is 30mA. Suitable decoupling must be provided by external decoupling circuitry.

3.Mechanical Dimensions

This chapter describes the mechanical dimensions of the module

3.1 Mechanical Dimensions of the Module

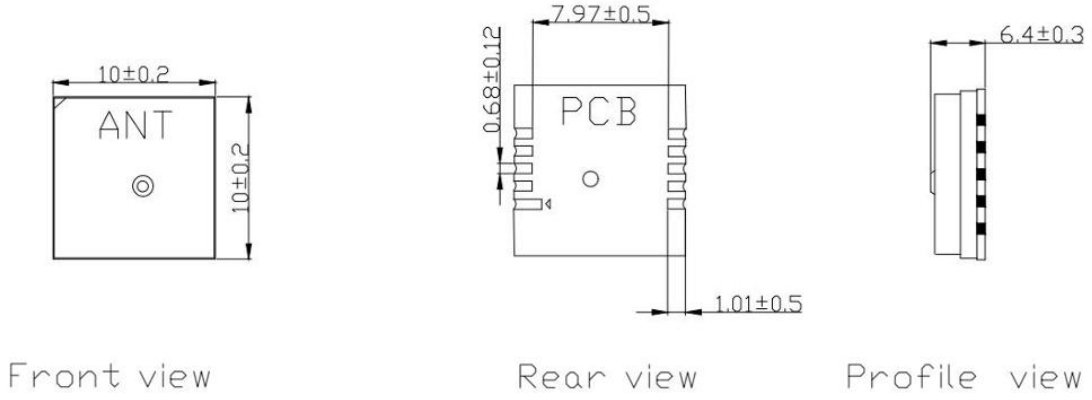


Figure 2: Mechanical Dimensions (Unit: mm)

4.Meanufacturing, Packaging and Ordering Information

4.1 Assembly and Soldering

YIC51010GMSGGB module is intended for SMT assembly and soldering in a Pb-free reflow process on the top side of the PCB. It is suggested that the minimum height of solder paste stencil is 100um to ensure sufficient solder volume. Pad openings of paste mask can be increased to ensure proper soldering and solder wetting over pads. It is suggested that the peak reflow temperature is 235~245ºC (for SnAg3.0Cu0.5 alloy). The absolute maximum reflow temperature is 260ºC. To avoid damage to the module when it is repeatedly heated, it is suggested that the module should be mounted after reflow soldering for the other side of PCB has been completed. Recommended reflow soldering thermal profile is shown below:

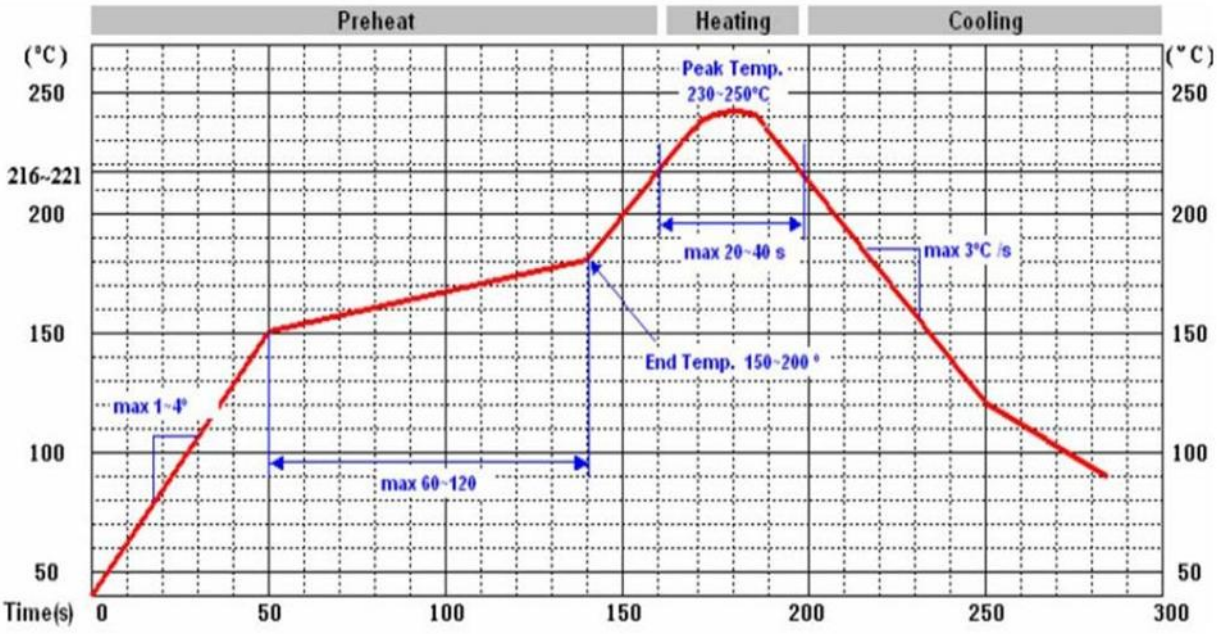


Figure 3: Recommended Reflow Soldering Thermal Profile

4.2 Moisture Sensitivity

YIC51010GMSGGB module is sensitive to moisture. To prevent YIC51010GMSGGB from permanent damage during reflow soldering, baking before reflow soldering is required in following cases:

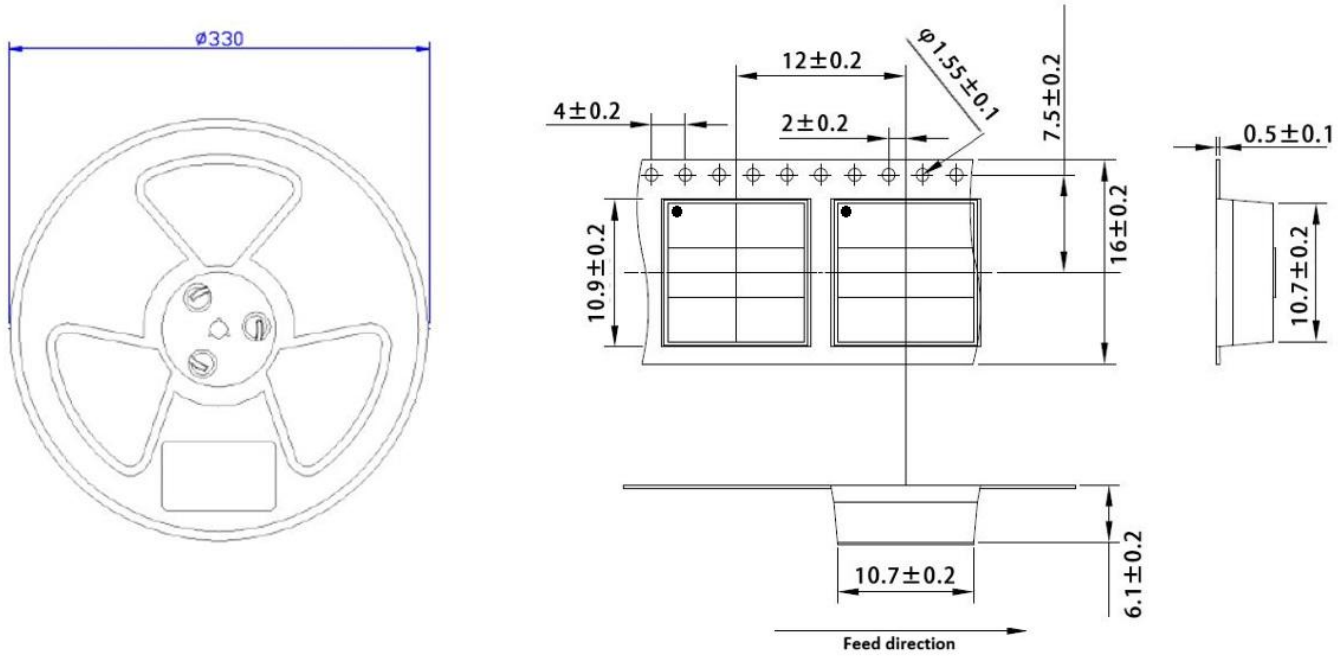
- Humidity indicator card: One or more indicating spots are no longer blue.
- The seal is opened and the module is exposed to excessive humidity.

YIC51010GMSGGB should be baked for 192 hours at temperature 40°C+5°C/-0°C and <5% RH in low-temperature containers, or 24 hours at temperature 125°C±5°C in high-temperature containers. Care should be taken that the plastic tape is not heat resistant. YIC51010GMSGGB should be taken out from the tape before preheating; otherwise, the tape maybe damaged by high-temperature heating.

4.3 ESD Protection

YIC51010GMSGGB module is sensitive to ESD and requires special precautions when handling. Particular care must be exercised when handling patch antenna, duo to the risk of electrostatic charges.

4.4 Packaging Information



Unit:mm

Quantity per reel: 500pcs

Figure 4: Tape and Reel Specifications

5. NMEA 0183 Protocol

The output protocol supports NMEA-0183 standard. The implemented messages include RMC, GGA, GSV ,GSA messages. The NMEA message output has the following sentence structure: $AACCC，c-c*hh.

5.1 The detail of the sentence structure is explained in Table 3.

Table 3: The NMEA sentence structure

Character	HEX	Description
“ $ ”	24	Start of sentence.
Aaccc		Address field. "aa" is the talker identifier. "ccc" identifies the sentence type.
“ , ”	2C	Field delimiter.
C – c		Data sentence block.
“ * ”	2A	Checksum delimiter.
Hh		Checksum field.
<CR><LF>	0D0A	Ending of sentence. (carriage return, line feed)

The formats of the supported NMEA messages are described as follows:
$GNGGA, $GNGLL, $GNGSA, $GPGSV, $GLGSV, $GAGSV, $GBGSV, $GNRMC, $GNVTG, $GNGST.

Table 4: Overview of NMEA messages

Message	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, a $GPGSV sentence is used for GPS satellites, a $GLGSVsentence is used for GLONASS satellites, a $GAGSV sentence is used for GALILEO satellites. And $BDGSV 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.
$GNGST	GNSS Psuedo-range Error Statistics.

5.2 GGA-Global Positioning System Fixed 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
For 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	

5.3 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	

5.4 GSA-GNSS DOP and Active Satellite

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,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	Latitude	Mode	A
2	N/S Indicator	Mode	3
3	Longitude	Satellite used 1~12	21, 12, 15, 18, 20, 24, 10, 32, 25, 13
4	E/W Indicator	PDOP	1.2
5	UTC Time	HDOP	0.7
6	Status	VDOP	1.0
7	Mode Indicator	GNSS System ID	1
8	Checksum	Checksum	18

5.5 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.
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	

5.6 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	

5.7 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	

5.8 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,175258.000,22,06,2017,00,00*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	22		UTC time: day (01~31)
3	UTC Month	06		UTC time: month (01~12)
4	UTC Year	2017		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

5.9 ZDA – GST – GNSS Psuedo-range Error Statistics

GNSS Psuedo-range Error Statistics.

Structure: $--GST,hhmmss.sss,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>

For example: $GNGST,044032.000,2.1,1.9,1.7,29.2,1.9,1.8,6.4*4F

Field	Name	Example	Units	Description
1	UTC time	044032.000		UTC time of position
2	Rms value	2.1	meters	RMS value of standard deviation of the ranges
3	Standard deviation	1.9	meters	Standard deviation of semi-major axis of error-ellipse
4	Standard deviation	1.7	meters	Standard deviation of semi-minor axis of error-ellipse
5	Orientation	29	degrees	Orientation of semi-major axis of error ellipse, degrees from true north
6	Deviation of latitude	1.8	meters	Standard deviation of latitude error
7	Deviation of longitude	6.4	meters	Standard deviation of longitude error

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	
6			
7			

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

Table 6: VTG Data Format

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

6. Appendix References

Terms and Abbreviations

Abbreviation	Description
AGNSS	Assisted GNSS
AIC	Active Interference Cancellation
CEP	Circular Error Probable
DGPS	Differential GPS
EASY	Embedded Assist System
EGNOS	European Geostationary Navigation Overlay Service
EPO	Extended Prediction Orbit
ESD	Electrostatic Discharge
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
GGA	GNSS Fix Data
GLL	Geographic Position – Latitude/Longitude
GLONASS	Global Navigation Satellite System
GSA	GNSS DOP and Active Satellites
GSV	GNSS Satellites in View
HDOP	Horizontal Dilution of Precision
I/O	Input / Output
Kbps	Kilo Bits Per Second
LNA	Low Noise Amplifier
MSAS	Multi-Functional Satellite Augmentation System
MOQ	Minimum Order Quantity
NMEA	National Marine Electronics Association
PDOP	Position Dilution of Precision
PMTK	MTK Proprietary Protocol
PPS	Pulse Per Second
PRN	Pseudo Random Noise Code
QZSS	Quasi-Zenith Satellite System
RHCP	Right Hand Circular Polarization
RMC	Recommended Minimum Specific GNSS Data
SBAS	Satellite-based Augmentation System
SAW	Surface Acoustic Wave
SPDT	Single-Pole Double-Throw
TTFF	Time To First Fix
UART	Universal Asynchronous Receiver & Transmitter
VDOP	Vertical Dilution of Precision
VTG	Course over Ground and Ground Speed, Horizontal Course and Horizontal Velocity
WAAS	Wide Area Augmentation System
Inom	Nominal Current

Imax	Maximum Load Current
Vmax	Maximum Voltage Value
Vnom	Nominal Voltage Value
Vmin	Minimum Voltage Value
VIHmax	Maximum Input High Level Voltage Value
VIHmin	Minimum Input High Level Voltage Value
VILmax	Maximum Input Low Level Voltage Value
VILmin	Minimum Input Low Level Voltage Value
VImax	Absolute Maximum Input Voltage Value
VImin	Absolute Minimum Input Voltage Value
VOHmax	Maximum Output High Level Voltage Value
VOHmin	Minimum Output High Level Voltage Value
VOLmax	Maximum Output Low Level Voltage Value
VOLmin	Minimum Output Low Level Voltage Value