PRODUCT SPECIFICATION

MODULE NO. GX-M310

CUSTOMER _____

ISSUED DATE _____

CUSTOMER SIGNATURE BAR

CUSTOMER	ADMISSION	APPROVAL

Signed by _____ **Approved by** _____

1. Product Information

1.1 Product Name

GX-M310

1.2 Product Description

GX-M310 is a compact, high performance, and low power consumption GNSS engine board. It uses the chipset which can track up to 66 channels at a time and perform fast TTFF in weak signal environments.

1.3 Product Features

MediaTek high sensitivity solution

Support 99-channel GPS&BEIDOU

Ultra low power consumption

Fast TTFF at low signal level

Built-in 12 multi-tone active interference canceller

Free hybrid ephemeris prediction to achieve faster cold start Built-in data logger

Built-in DC/DC converter to save power

Up to 10 Hz update rate

±11ns high accuracy time pulse (1PPS)

Capable of SBAS (WAAS, EGNOS, MSAS, GAGAN)

Support Japan QZSS

Indoor and outdoor multi-path detection and compensation

Small form factor 10.1 * 9.7 * 2.5mm ±0.2mm

SMD type with stamp holes RoHS compliant

1.4 Product Application

Automotive navigation

Personal positioning

Fleet management

Mobile phone navigation

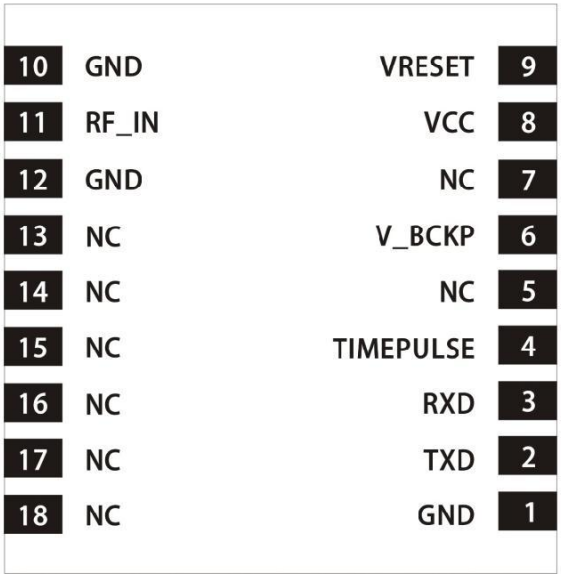
Marine navigation

2. Technical Specifications

GPS Receiver		
Chip	MediaTek MT3333 (Flash Version)	
Frequency	GPS, GALILEO, QZSS:L1 1575.42MHz, C/A code BEIDOU: B1 1561.098MHz	
Channels	Support 99 channels	
Update rate	1Hz default, up to 10Hz	
Sensitivity	Tracking	-162dBm, up to -165dBm (with external LNA)
	Cold Start	-143.5dBm, up to -148dBm (with external LNA)
Acquisition Time	Hot start (Open Sky)	< 1s (typical)
	Hot start (Indoor)	< 30s
	Cold Start (Open Sky)	32s (typical) without AGPS
		< 15s (typical) with AGPS (hybrid ephemeris prediction)
Position Accuracy	Autonomous	3m (2D RMS)
	SBAS	2.5m (depends on accuracy of correction data)
Max. Altitude	< 50,000 m	
Max. Velocity	< 515 m/s	
Protocol Support	NMEA 0183 ver 4.10	9600 bps, 8 data bits, no parity, 1 stop bits (default) 1Hz: GGA, GLL, GSA, GSV, RMC, VTG
Physical Characteristic		
Type	18 pin stamp holes	
Dimensions	10.1mm * 9.7 mm * 2.5mm ±0.2mm	

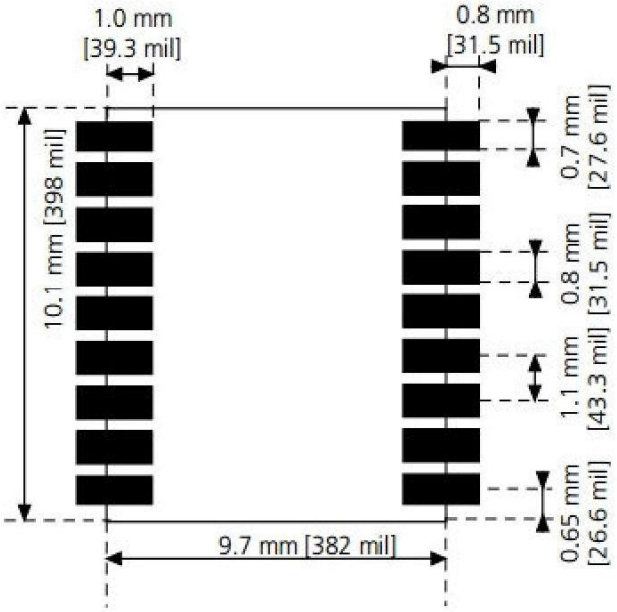
3. Technical Information

Module Pin Assignment



Pin NO.	Pin Name	I/O	Remark
1.	GND	G	Ground.
2.	TXD	O	Data Output
3.	RXD	I	Data Input
4.	TIMEPULSE	O	1 Pulse per second
5.	NC	N	Not connected
6.	V_BCKP	PWR	Backup battery supply voltage
7.	NC	N	Not connected
8.	VCC	PWR	Main power supply to the engine board.
9.	VRESET	I	Reset
10.	GND	G	Ground.
11.	RF_IN	RF	GPS antenna input
12.	GND	G	Ground.
13.	NC	N	Not connected
14.	NC	N	Not connected
15.	NC	N	Not connected
16.	NC	N	Not connected
17.	NC	N	Not connected
18.	NC	N	Not connected

Dimensions



4. NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a $ and with carriage return/line feed. GPS specific messages all start with $GPxxx where xxx is a three-letter identifier of the message data that follows. BEIDOU specific messages all start with $BDxxx where xxx is a three-letter identifier of the message data that follows. NMEA messages have a checksum, which allows detection of corrupted data transfers.

GX-M310 modules support the following NMEA-0183 messages: GGA, GLL,GSA, GSV, RMC and VTG.

4.1 NMEA output message

Table 3.1-1 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

4.1.1 GGA--- Global Positioning System Fixed Data

Table 3.1-2 contains the values for the following example:
$GPGGA,060406.000,2503.7148,N,12138.7451,E,2,17,0.71,116.7,M,15.3,M,0000,0000*6D

Table3.1- 2 GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Time	060406.000		hhmmss.sss
Latitude	2503.7148		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12138.7451		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	2		See Table 5.1-3
Satellites Used	17		Range 0 to 33
HDOP	0.71		Horizontal Dilution of Precision
MSL Altitude	116.7	mters	
Units	M	mters	
Geoid Separation	15.3	mters	
Units	M	mters	
Age of Diff. Corr.	0000	second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*6D		
<CR> <LF>			End of message termination

Table 3.1-3 Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3-5	Not supported
6	Dead Reckoning Mode, fix valid

4.1.2 GLL--- Geographic Position – Latitude/Longitude

Table 3.1-4 contains the values for the following example:
$GNGLL,2503.7148,N,12138.7451,E,060406.000,A,D*46

Table 3.1-4 GLL Data Format

Name	Example	Units	Description
Message ID	$GNGLL		GLL protocol header (GPGLL or GNGLL; GP indicates the device receives GPS satellites signal only and GN indicates the position is calculated with BEIDOU satellite signal)
Latitude	2503.7148		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12138.7451		dddmm.mmmm
E/W indicator	E		E=east or W=west
UTC Time	060406.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Mode	D		A=autonomous, D=DGPS, E=DR, N=Data not valid, R=Coarse Position, S=Simulator
Checksum	*46		
<CR> <LF>			End of message termination

4.1.3 GSA---GNSS DOP and Active Satellites

Table 3.1-5 contains the values for the following example:
$GNGSA,A,3,22,21,18,12,24,25,14,15,193,,,,1.18,0.71,0.95*2C
$GNGSA,A,3,205,207,210,202,201,203,209,208,,,,,1.18,0.71,0.95*1C

Table 5.1-5 GSA Data Format

Name	Example	Units	Description
Message ID	$GNGSA		GSA protocol header (GNGSA or GPGSA; GP indicates the device receives GPS satellites signal only and GN indicates the position is calculated with BEIDOU satellite signal).First row of GSA message contains GPS & QZSS satellites and second row of GSA message contains BEIDOU satellites.
Mode 1	A		See Table 5.1-6

Mode 2	3		See Table 5.1-7
ID of satellite used	22		Sv on Channel 1
ID of satellite used	21		Sv on Channel 2
N.			N.
ID of satellite used			Sv on Channel 12
PDOP	1.18		Position Dilution of Precision
HDOP	0.71		Horizontal Dilution of Precision
VDOP	0.95		Vertical Dilution of Precision
Checksum	*2C		
<CR> <LF>			End of message termination

Table 3.1-6 Mode 1

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

Table 3.1-7 Mode 2

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

4.1.4 GSV---GNSS Satellites in View

Table 3.1-8 contains the values for the following example:
$GPGSV,4,1,13,19,81,216,46,03,71,010,45,27,63,031,45,23,52,245,44*7B
$GPGSV,4,2,13,06,50,034,47,50,46,122,48,13,45,290,44,16,34,038,42*75
$GPGSV,4,3,13,11,28,184,35,07,15,320,35,07,15,320,35,31,10,124,39*73
$GPGSV,4,4,13,08,,,15*77
$BDGSV,2,1,08,08,79,307,38,07,73,100,40,10,70,345,37,03,65,190,39*6E
$BDGSV,2,2,08,02,44,241,36,04,33,110,42,09,04,199,29,01,,,34*53

Table 3.1-8 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header(GPGSVL or BDGSV; GP indicates the device receives GPS satellites signal only and BD indicates the position is

			calculated with BEIDOU satellite signal)
Total number of messages1	4		Range 1 to 6
Message number1	1		Range 1 to 6
Satellites in view	13		
Satellite ID	19		Channel 1 (Range 01 to 237), GPS Satellites ID : 01~32,SBAS Satellites ID : 33~64, QZSS Satellites ID:193~196, &BEIDOU Satellites ID : 01~32
Elevation	81	degrees	Channel 1 (Range 00 to 90)
Azimuth	216	degrees	Channel 1 (Range 000 to 359)
SNR (C/No)	46	dB-Hz	Channel 1 (Range 00 to 99, null when not tracking)
N.	N.	N.	N.
Satellite ID	23		Channel 4 (Range 01 to 237) , GPS Satellites ID : 01~32,SBAS Satellites ID : 33~64, QZSS Satellites ID:193~196, &BEIDOU Satellites ID : 01~32
Elevation	52	degrees	Channel 4 (Range 00 to 90)
Azimuth	245	degrees	Channel 4 (Range 000 to 359)
SNR (C/No)	44	dB-Hz	Channel 4 (Range 00 to 99, null when not tracking)
Checksum	*7B		
<CR> <LF>			End of message termination

1. Depending on the number of satellites tracked multiple messages of GSV data may be required.

4.1.5 RMC---Recommended Minimum Specific GNSS Data

Table 3.1-9 contains the values for the following example:
$GNRMC,060406.000,A,2503.7148,N,12138.7451,E,0.01,0.00,180313,,,D*78

Table 3.1-9 RMC Data Format

Name	Example	Units	Description
Message ID	$GNRMC		RMC protocol header (GNRMC or GPRMC; GP indicates the device receives GPS satellites signal only and GN indicates the position is calculated with BEIDOU satellite signal)
UTC Time	060406.000		hhmmss.sss

Status	A		A=data valid or V=data not valid
Latitude	2503.7148		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12138.7451		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Speed over ground	0.01	knots	True
Course over ground	0.00	degrees	
Date	180313		ddmmyy
Magnetic variation		degrees	
Variation sense			E=east or W=west (Not shown)
Mode	D		A=autonomous, D=DGPS, E=DR, N=Data not valid,R=Coarse Position, S=Simulator
Checksum	*78		
<CR> <LF>			End of message termination

4.1.6 VTG---Course Over Ground and Ground Speed

Table 3.1-10 contains the values for the following example:
$GPVTG,0.00,T,,M,0.01,N,0.02,K,D*3B

Table 3.1-10 VTG Data Format

Name	Example	Units	Description
Message ID	$GPVTG		VTG protocol header
Course over ground	0.00	degrees	Measured heading
Reference	T		True
Course over ground		degrees	Measured heading
Reference	M		Magnetic
Speed over ground	0.01	knots	Measured speed
Units	N		Knots
Speed over ground	0.02	km/hr	Measured speed
Units	K		Kilometer per hour

Mode	D		A=autonomous, D=DGPS, E=DR, N=Data not valid,R=Coarse Position, S=Simulator
Checksum	*3B		
<CR> <LF>			End of message termination

4.2 Operating Modes

Send commands to select the different mode of operation.

Command	Operating Mode
PMTK353,0,0,0,0,1	BD only mode
PMTK353,1,0,0,0,0	GPS only mode
PMTK353,1,0,0,0,1	GPS + BD mode

4.3 Proprietary NMEA input/output message

Please refer to MTK proprietary message.

4.4 Examples to configure the update rate of GNSS module

The GNSS module supports up to 10Hz update rate that user can configure by issuing software commands. Note that the configurations by software commands are stored in the battery-backed SRAM that is powered through VBACKUP pin. Once it drains out, the default/factory settings will be applied.

Due to the transmitting capacity per second of the current baud rate, GNSS module has to be changed to higher baud rate for high update rate of position fix. The user can use the following software commands to change baud rate.

Baud rate	Software command
default	$PMTK251,0*28<CR><LF>
4800	$PMTK251,4800*14<CR><LF>
9600	$PMTK251,9600*17<CR><LF>
19200	$PMTK251,19200*22<CR><LF>
38400	$PMTK251,38400*27<CR><LF>
57600	$PMTK251,57600*2C<CR><LF>
115200	$PMTK251,115200*1F<CR><LF>