Product name	Description	Version
MC-1612-G	Standalone multiple GNSS module	1.0

1 Introduction

LOCOSYS MC-1612-G is a complete standalone GNSS module. The module can simultaneously acquire and track multiple satellite constellations that include GPS, GLONASS, GALILEO, QZSS and SBAS. It features low power and small form factor. Besides, it can provide you with superior sensitivity and performance even in urban canyon and dense foliage environment.

This module supports hybrid ephemeris prediction to achieve faster cold start. One is self-generated ephemeris prediction (called EASY) that is no need of both network assistance and host CPU's intervention. This is valid for up to 3 days and updates automatically from time to time when GNSS module is powered on and satellites are available. The other is server-generated ephemeris prediction (called EPO) that gets from an internet server. This is valid for up to 14 days. Both ephemeris predictions are stored in the on-board flash memory and perform a cold start time less than 15 seconds.

2 Features

- MediaTek high sensitivity solution
- Support GPS, GLONASS, GALILEO and QZSS
- Capable of SBAS (WAAS, EGNOS, MSAS, GAGAN)
- Support 99-channel GNSS
- 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
- Up to 10 Hz update rate
- ±11ns high accuracy time pulse (1PPS)
- Indoor and outdoor multi-path detection and compensation
- Small form factor 16 x 12.2 x 2.2 mm
- SMD type with stamp holes; RoHS compliant
- ISO/TS 16949 quality control

3 Application

- Personal positioning and navigation
- Automotive navigation
- Marine navigation

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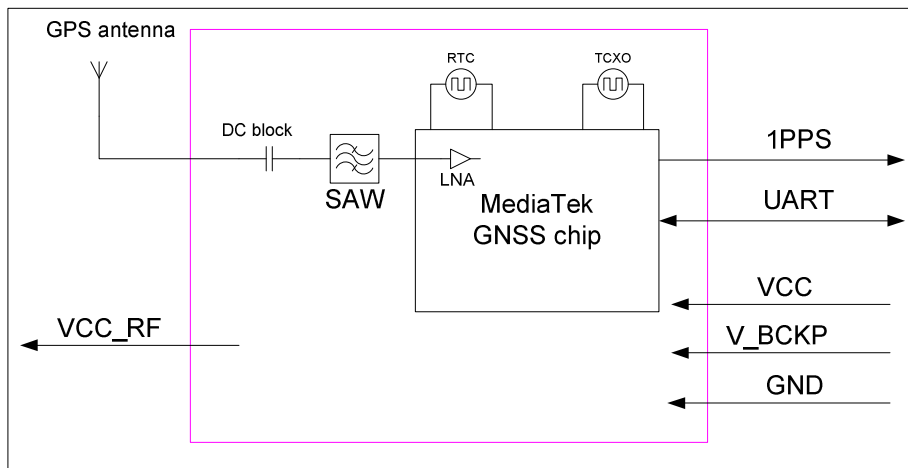☎ 886-2-8698-3698
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Fig 3-1 System block diagram.
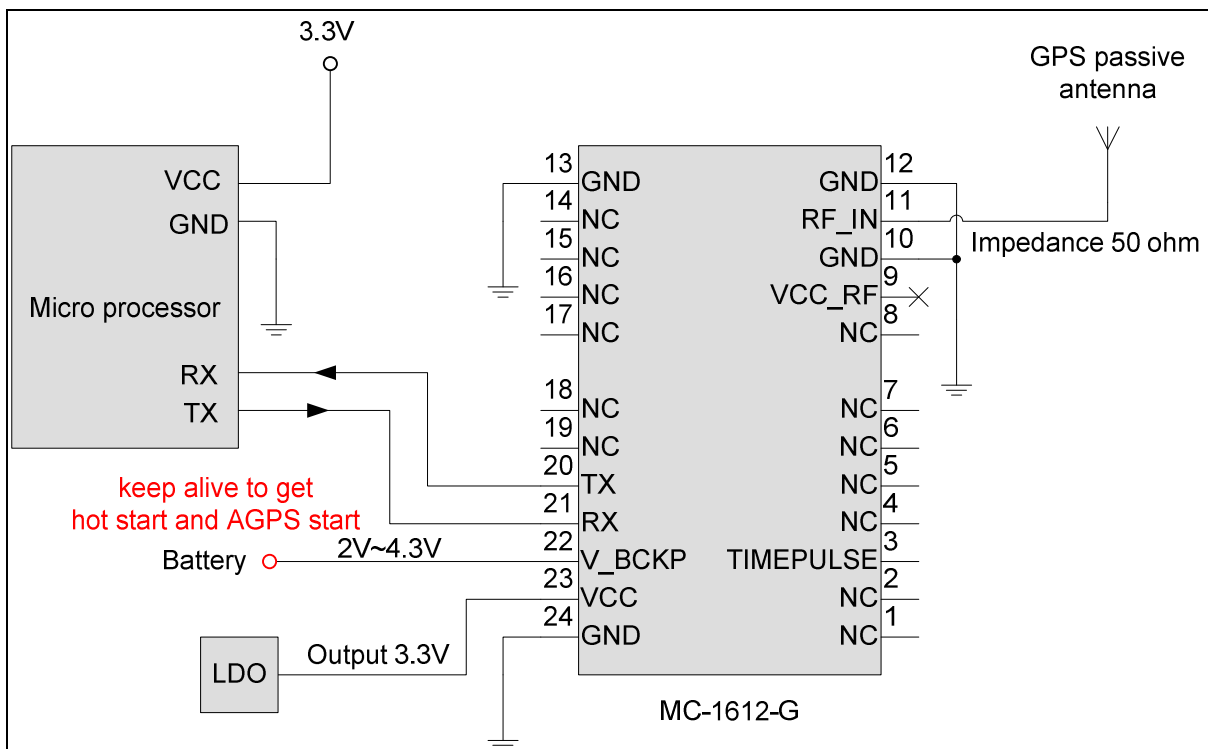
Fig 3-2 Typical application circuit that uses a passive antenna.

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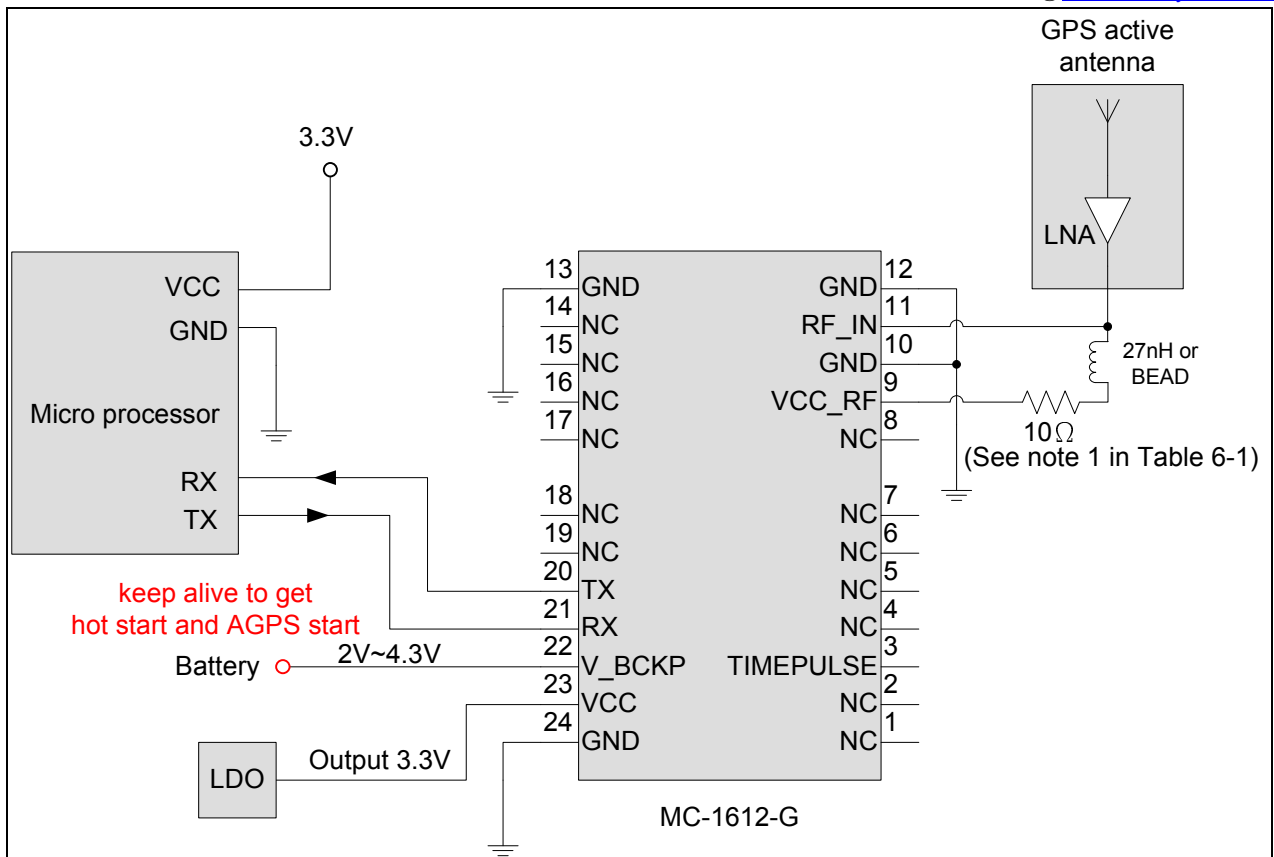
Fig 3-3 Typical application circuit that uses an active antenna.

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Fig 3-4 Typical application circuit that has supervisor of the external active antenna.
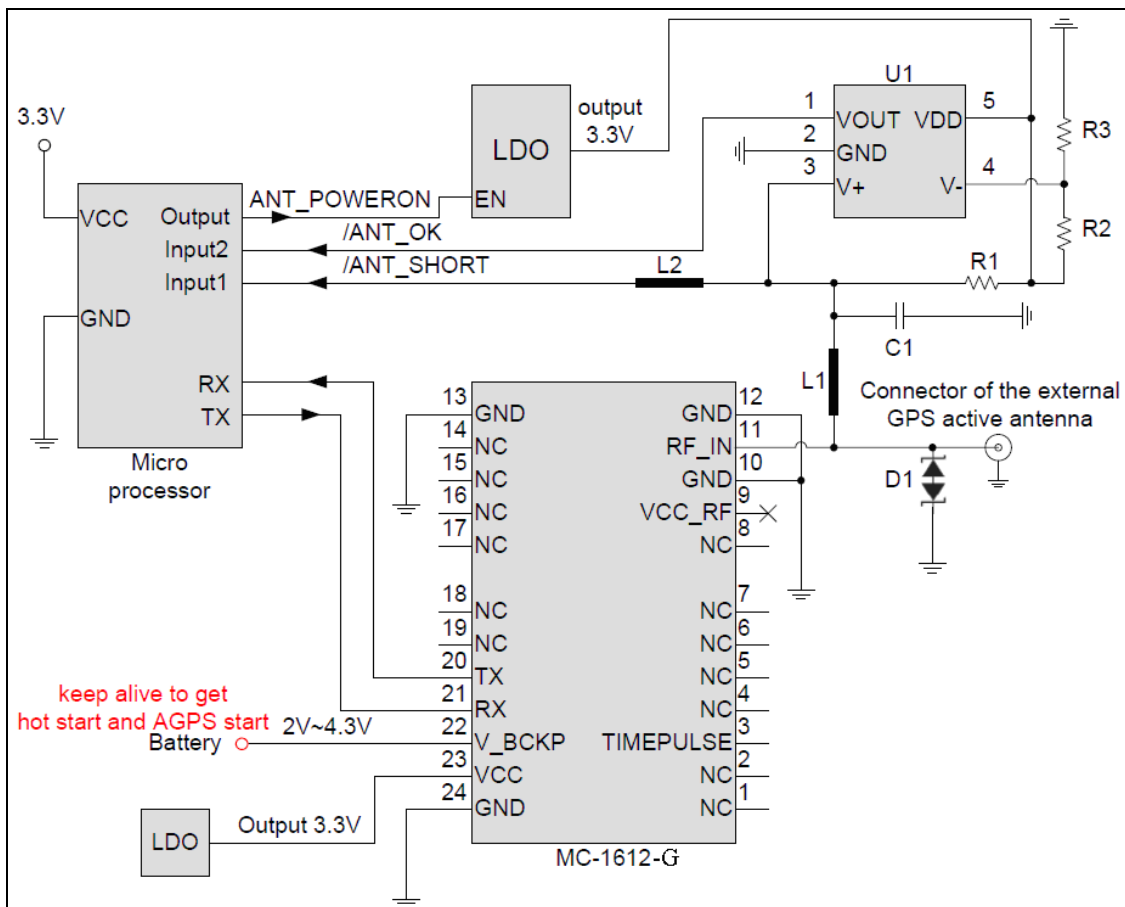
Logic table			
/ANT_SHORT	/ANT_OK	Status of the external GPS active antenna	Description
LOW	X	Short	Antenna is short.
HIGH	LOW	OK	Antenna is properly connected.
HIGH	HIHG	Open	Antenna is not connected

Reference BOM			
Part	Spec/value	Vendor	Remark
C1	18pF±5%, size 0402/0603		
D1	SUC0402-240E0R05P-LF	SFI	Input capacitance ≦ 0.5pF
L1	BEAD, 300R, size 0603 PBY16080T-301Y-N	YAGEO	Must use 0603 size or larger
L2	BEAD, 300R, size 0402/0603		
R1	10R±5%, size 0603		Must use 0603 size or larger
R2	1K±5%, size 0402/0603		
R3	100K±5%, size 0402/0603		
U1	MCP6001T-IOT	Microchip	
	SGM8541XN5/TR	SG Micro	

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4 GNSS receiver

Chip	MediaTek MT3333	
Frequency	GPS, GALILEO, QZSS: L1 1575.42MHz, C/A code	
	GLONASS: L1 1598.0625MHz ~ 1605.375MHz, C/A code	
Channels	Support 99 channels (33 Tracking, 99 Acquisition)	
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 (typical)
	Cold Start (Open Sky)	33s (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	< 18,000 m, up to 50,000m by request	
Max. Velocity	< 515 m/s	
Protocol Support	NMEA 0183 ver 4.10	9600 bps[1], 8 data bits, no parity, 1 stop bits (default)
		1Hz: GGA, GLL, GSA, GSV, RMC, VTG

Note 1: Both baud rate and output message rate are configurable to be factory default.

5 Software interface

5.1 NMEA output message

Table 5.1-1 NMEA output message

NMEA record	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

● **GGA--- Global Positioning System Fixed Data**

Table 5.1-2 contains the values for the following example:

$GPGGA,183015.000,2503.7123,N,12138.7446,E,2,16,0.68,123.2,M,15.3,M,0000,0000*66

Table5.1- 2 GGA Data Format

Name	Example	Units	Description

Message ID	$GPGGA		GGA protocol header
UTC Time	183015.000		hhmmss.sss
Latitude	2503.7123		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12138.7446		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	2		See Table 5.1-3
Satellites Used	16		Range 0 to 33
HDOP	0.68		Horizontal Dilution of Precision
MSL Altitude	123.2	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	*66		
<CR> <LF>			End of message termination

Table 5.1-3 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

● **GLL--- Geographic Position – Latitude/Longitude**

Table 5.1-4 contains the values for the following example:

$GPGLL,2503.7123,N,12138.7446,E,183015.000,A,D*59

Table 5.1-4 GLL Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPGLL		GLL protocol header
Latitude	2503.7123		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12138.7446		dddmm.mmmm
E/W indicator	E		E=east or W=west
UTC Time	183015.000		hhmmss.sss

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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	*59		
<CR> <LF>			End of message termination

- **GSA---GNSS DOP and Active Satellites**

Table 5.1-5 contains the values for the following example:

$GNGSA,A,3,18,193,21,09,12,22,27,15,25,14,,,1.44,0.68,1.27*2F

$GNGSA,A,3,76,72,77,75,66,65,,,,,,,1.44,0.68,1.27*12

Table 5.1-5 GSA Data Format

Name	Example	Units	Description
Message ID	$GNGSA		GSA protocol header
Mode 1	A		See Table 5.1-6
Mode 2	3		See Table 5.1-7
ID of satellite used	18		Sv on Channel 1
ID of satellite used	193		Sv on Channel 2
….			….
ID of satellite used			Sv on Channel N
PDOP	1.44		Position Dilution of Precision
HDOP	0.68		Horizontal Dilution of Precision
VDOP	1.27		Vertical Dilution of Precision
Checksum	*2F		
<CR> <LF>			End of message termination

Table 5.1-6 Mode 1

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

Table 5.1-7 Mode 2

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

- **GSV---GNSS Satellites in View**

Table 5.1-8 contains the values for the following example:

$GPGSV,3,1,11,18,67,344,48,09,55,031,50,42,54,142,40,193,47,174,45*4D

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$GPGSV,3,2,11,21,44,219,46,27,39,035,48,12,34,131,44,15,30,057,46*76

$GPGSV,3,3,11,22,27,319,47,14,22,285,42,25,19,171,40*44

$GLGSV,2,1,07,76,71,201,44,65,57,041,40,75,48,028,39,72,27,108,39*68

$GLGSV,2,2,07,66,25,333,43,77,17,207,37,81,02,280,29*5C

Table 5.1-8 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header (GPGSV and GLGSV)
Total number of messages[1]	3		Range 1 to 6
Message number[1]	1		Range 1 to 6
Satellites in view	11		
Satellite ID	18		Channel 1 (Range 01 to 196)
Elevation	67	degrees	Channel 1 (Range 00 to 90)
Azimuth	344	degrees	Channel 1 (Range 000 to 359)
SNR (C/No)	48	dB-Hz	Channel 1 (Range 00 to 99, null when not tracking)
Satellite ID	09		Channel 4 (Range 01 to 196)
Elevation	55	degrees	Channel 4 (Range 00 to 90)
Azimuth	031	degrees	Channel 4 (Range 000 to 359)
SNR (C/No)	50	dB-Hz	Channel 4 (Range 00 to 99, null when not tracking)
Checksum	*4D		
<CR> <LF>			End of message termination

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

● **RMC---Recommended Minimum Specific GNSS Data**

Table 5.1-9 contains the values for the following example:

$GNRMC,183015.000,A,2503.7123,N,12138.7446,E,0.01,34.92,270812,,,D*43

Table 5.1-9 RMC Data Format

Name	Example	Units	Description
Message ID	$GNRMC		RMC protocol header (GNRMC or GPRMC)
UTC Time	183015.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2503.7123		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12138.7446		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Speed over ground	0.01	knots	True
Course over ground	34.92	degrees	
Date	270812		ddmmyy

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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	*43		
<CR> <LF>			End of message termination

- **VTG---Course Over Ground and Ground Speed**

Table 5.1-10 contains the values for the following example:

$GPVTG,34.92,T,,M,0.01,N,0.02,K,D*07

Table 5.1-10 VTG Data Format

Name	Example	Units	Description
Message ID	$GPVTG		VTG protocol header
Course over ground	34.92	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	*07		
<CR> <LF>			End of message termination

5.2 Proprietary NMEA input/output message

Please refer to MTK proprietary message.

5.3 Examples to configure the power mode of GNSS module

The GNSS module supports different power modes that user can configure by issuing software commands.

5.3.1 Standby mode

User can issue software command to make GNSS module go into standby mode that consumes less than 500uA current. GNSS module will be awaked when receiving any byte. The following flow chart is an example to make GNSS module go into standby mode and then wake up.

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```
            ┌──────────┐
            │   Start  │
            └────┬─────┘
                 │
    ┌────────────▼────────────┐
    │  GPS module is powered on│
    │ and in normal operation  │
    │          mode            │
    └────────────┬────────────┘
                 │
    ┌────────────▼────────────┐         unsigned char StandbyMode[] = {"$PMTK161,0*28\x0D\x0A"};
    │   Change GPS to          │
    │    standby mode          │
    └────────────┬────────────┘
                 │
          ◇──────▼──────◇
          │   Wake up    │──────── Yes
          │ GPS module   │           │
          ◇──────────────◇           ▼
                 │            ┌────────────────┐
                No            │ Issue any byte │
                 │            │  to wake up    │
                 │            │  GPS module    │
                 │            └────────────────┘
                 │           GPS module will return {"$PMTK010,001*2E\x0D\x0A"}
                 │           and start normal operation.
            ┌────▼─────┐
            │   End    │
            └──────────┘
```

5.3.2 Periodic mode

When GNSS module is commanded to periodic mode, it will be in operation and standby periodically. Its status of power consumption is as below chart.
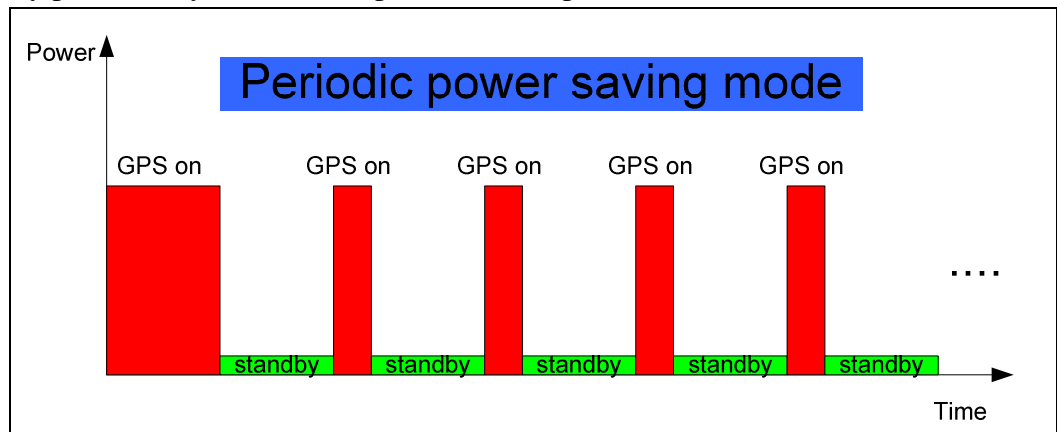
The following flow chart is an example to make GNSS module go into periodic mode

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and then back to normal operation mode.

```
┌──────────┐
│  Start   │
└──────────┘
     │
     ▼
┌────────────────────────┐
│ GPS module is powered on│
└────────────────────────┘
     │
     ▼
┌─────────────────────────────┐          unsigned char PeriodicMode[] =
│ Change GPS to periodic mode │          {"$PMTK225,2,3000,12000,18000,72000*15\x0D\x0A"};
│ with 3000ms on and 12000ms  │          Note: minimum on time is 2000ms.
│ standby if position fix is  │                maximum standby time is 518400000ms (6 days)
│ available, otherwise        │
│ (18000, 72000) ms will be   │          GPS module will return message
│ applied.                    │          "$PMTK001,225,3*35\x0D\x0A"
└─────────────────────────────┘          if command is accepted.
     │
     ▼
   ◇ Set GPS to normal ◇────── Yes
     operation mode?                │
     │                             ▼
     No                      ◇ GPS is in ◇── Yes ──┌──────────────────┐
     │                         standby now           │ Issue any byte to│
     │                             │                  │ GPS and wait it  │
     │                             No                 │ awake            │
     │                             │                  └──────────────────┘
     │                             ▼                           │
     │                      ┌──────────────────┐               │
     │                      │ Issue command of │◄──────────────┘
     │                      │ normal operation │
     │                      │ mode             │
     │                      └──────────────────┘
     │                             │        unsigned char NormalMode[] =
     │                             │        {"$PMTK225,0*2B\x0D\x0A"};
     │                             │
     │                             │        GPS module will return message
     │                             │        "$PMTK001,225,3*35\x0D\x0A"
     │                             │        if command is accepted.
     ▼                             ▼
┌──────────┐              ┌──────────┐
│   End    │              │   End    │
└──────────┘              └──────────┘
GPS is in periodic mode    GPS is in normal mode
```
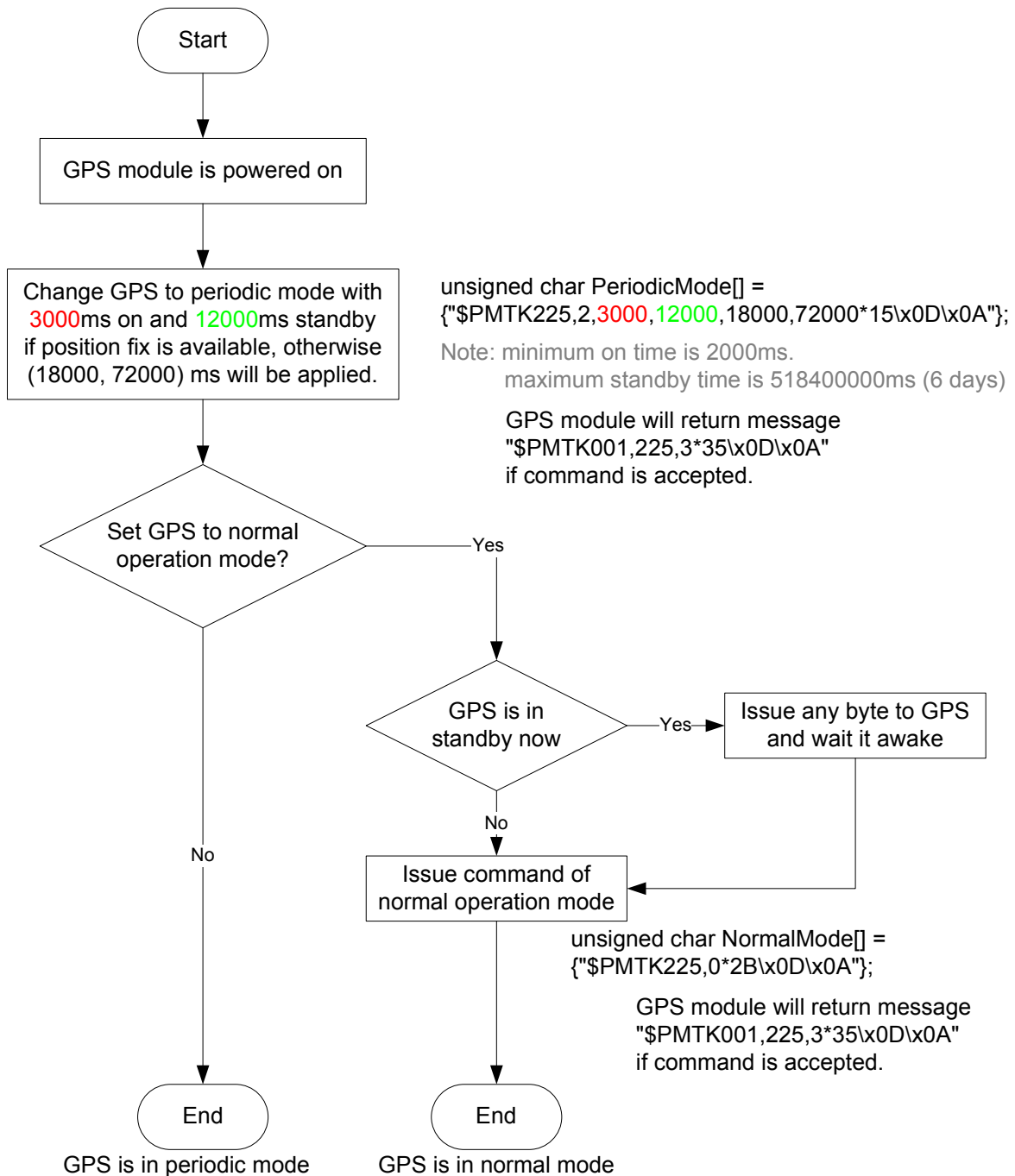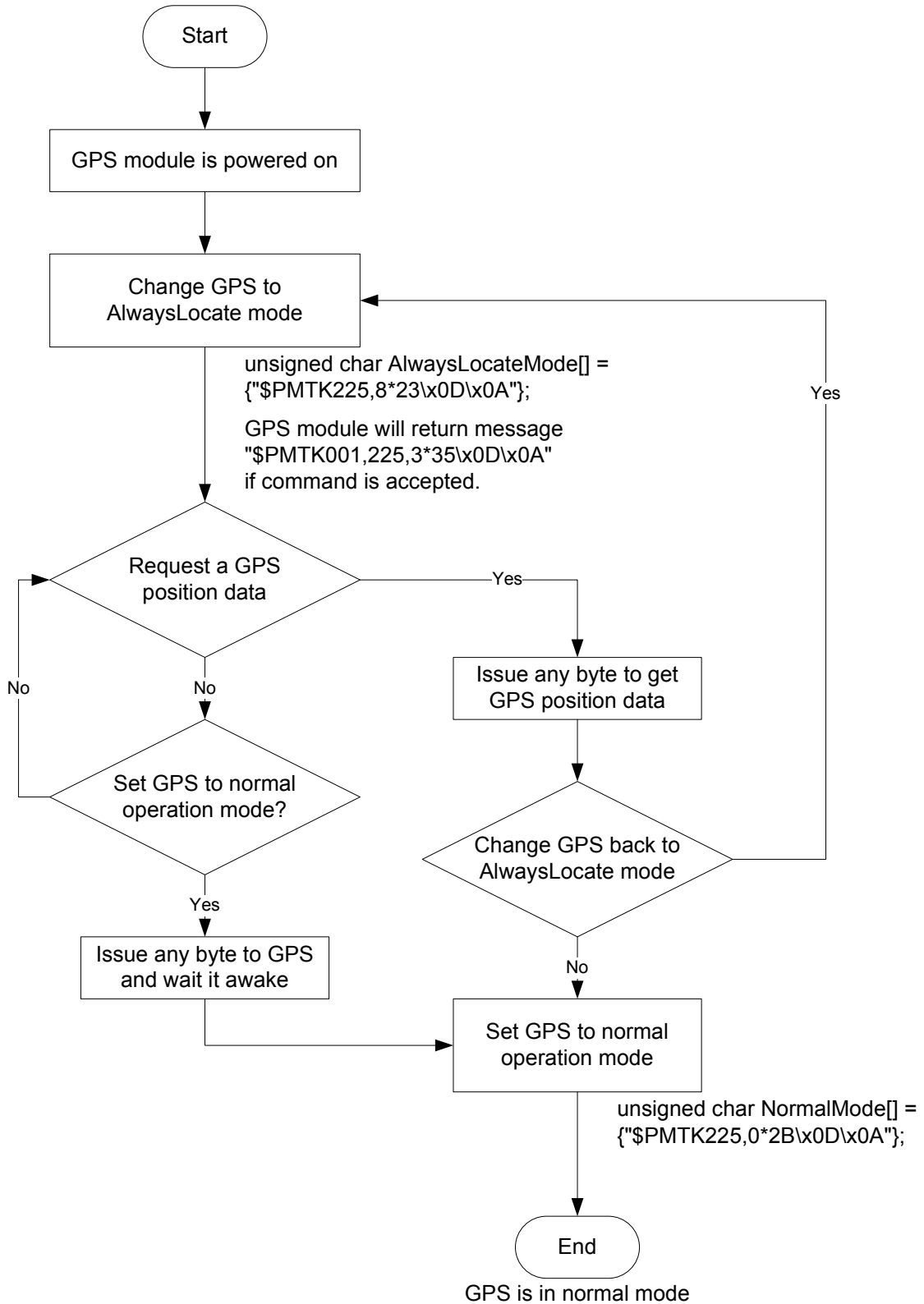
5.3.3 AlwaysLocate^{TM} mode

AlwaysLocate^{TM} is an intelligent controller of periodic mode. Depending on the environment and motion conditions, GNSS module can adaptively adjust working/standby time to achieve balance of positioning accuracy and power consumption. In this mode, the host CPU does not need to control GNSS module until the host CPU needs the GNSS position data. The following flow chart is an example to make GNSS module go into AlwaysLocate^{Tm} mode and then back to normal operation mode.

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Note: AlwaysLocate^{TM} is a trade mark of MTK.

```
                        ┌─────────┐
                        │  Start  │
                        └─────────┘
                             │
                             ▼
                ┌─────────────────────────┐
                │ GPS module is powered on │
                └─────────────────────────┘
                             │
                             ▼
                ┌─────────────────────────┐
                │   Change GPS to         │◄──────────────┐
                │   AlwaysLocate mode     │               │
                └─────────────────────────┘               │
```

unsigned char AlwaysLocateMode[] =
{"$PMTK225,8*23\x0D\x0A"};

GPS module will return message
"$PMTK001,225,3*35\x0D\x0A"
if command is accepted.

Request a GPS position data — Yes → Issue any byte to get GPS position data

Request a GPS position data — No → Set GPS to normal operation mode?

Set GPS to normal operation mode? — No → Request a GPS position data

Set GPS to normal operation mode? — Yes → Issue any byte to GPS and wait it awake

Issue any byte to get GPS position data → Change GPS back to AlwaysLocate mode

Change GPS back to AlwaysLocate mode — Yes → Change GPS to AlwaysLocate mode

Change GPS back to AlwaysLocate mode — No → Set GPS to normal operation mode

Issue any byte to GPS and wait it awake → Set GPS to normal operation mode

Set GPS to normal operation mode

unsigned char NormalMode[] =
{"$PMTK225,0*2B\x0D\x0A"};

End

GPS is in normal mode

5.4 Data logger

The GNSS module has internal flash memory for logging GNSS data. The configurations

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include time interval, distance, speed, logging mode, and … etc. For more information, please contact us.

5.5 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
Factory 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>

Note: <CR> means Carriage Return, i.e. 0x0D in hexadecimal. <LF> means Line Feed, i.e. 0x0A in hexadecimal.

If the user does not want to change baud rate, you can reduce the output NMEA sentences by the following software commands.

NMEA sentence	Software command
Factory default	$PMTK314,-1*04<CR><LF>
Only GLL at 1Hz	$PMTK314,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*29<CR><LF>
Only RMC at 1Hz	$PMTK314,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*29<CR><LF>
Only VTG at 1Hz	$PMTK314,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*29<CR><LF>
Only GGA at 1Hz	$PMTK314,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*29<CR><LF>
Only GSA at 1Hz	$PMTK314,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0*29<CR><LF>
Only GSV at 1Hz	$PMTK314,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0*29<CR><LF>
Only ZDA at 1Hz	$PMTK314,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0*29<CR><LF>
RMC, GGA, GSA at 1Hz and GSV at 0.2Hz	$PMTK314,0,1,0,1,1,5,0,0,0,0,0,0,0,0,0,0,0,0,0*2C<CR><LF>
If the command is correct and executed, GNSS module will output message	

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$PMTK001,314,3*36<CR><LF>

After the GNSS module is changed to higher baud rate or reduced NMEA sentence, the user can configure it to high update rate of position fix by the following commands.

Interval of position fix	Software command
Every 100ms (10Hz)[1]	$PMTK220,100*2F<CR><LF>
Every 200ms (5Hz)	$PMTK220,200*2C<CR><LF>
Every 500ms (2Hz)	$PMTK220,500*2B<CR><LF>
Every 1000ms (1Hz)	$PMTK220,1000*1F<CR><LF>
Every 2000ms (0.5Hz)[2]	$PMTK220,2000*1C<CR><LF>
If the command is correct and executed, GNSS module will output message $PMTK001,220,3*30<CR><LF>	

Note 1: The minimum interval of position fix is 100ms, i.e. the maximum update rate is 10Hz.

Note 2: The current consumption is the same with the update rate of 1Hz.
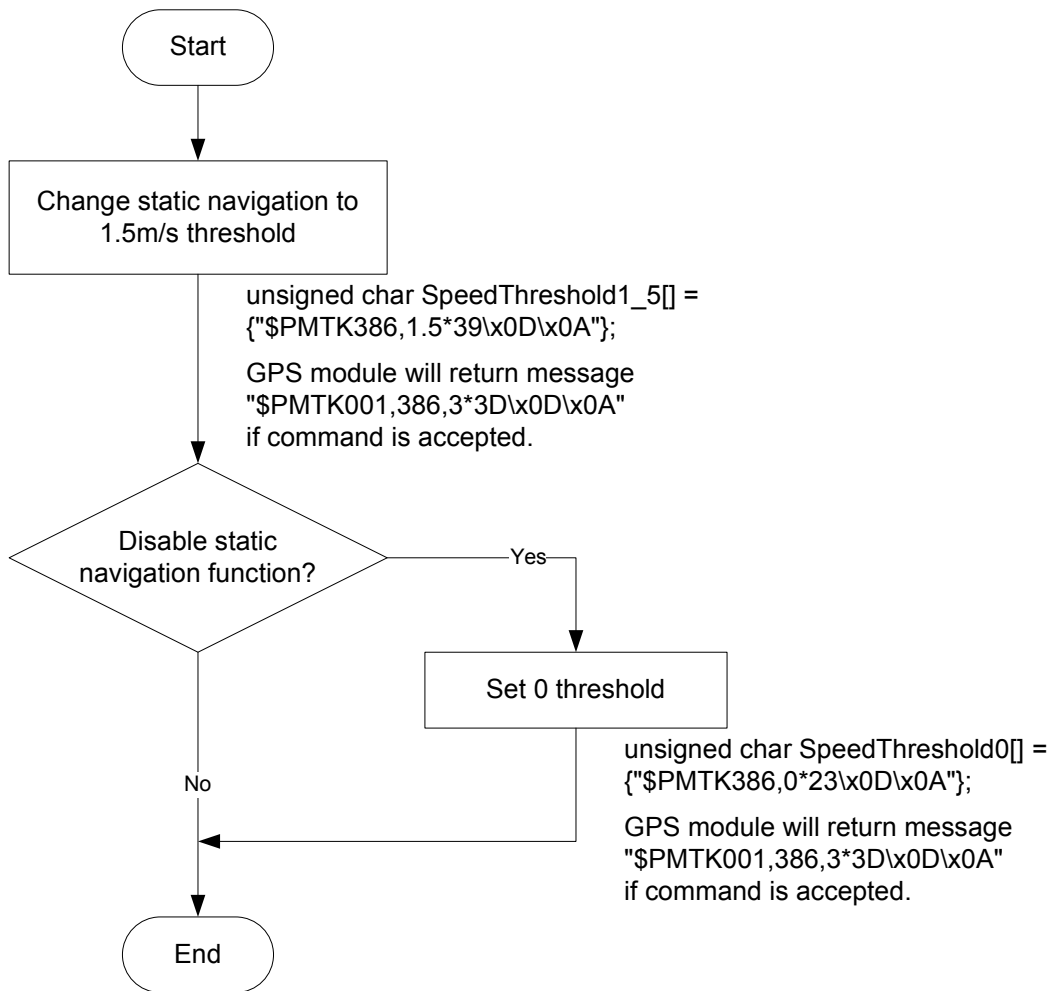
5.6 Configure the static navigation parameter

The output position of GNSS module will keep the same and output speed will be zero if the actual speed is below the threshold of the static navigation parameter. This is useful for different applications. For example, the car stopped at a red light will get stationary GNSS position if the threshold is 1.5m/s. It is better to disable this function by setting threshold to 0 for pedestrian navigation. This function is default disabled.

The format of the software command is as below.

$PMTK386,speed threshold*checksum<CR><LF>

The unit of speed threshold is meter per second. The range of speed threshold is from 0.1m/s to 2.0m/s. Value 0 is to disable the function.
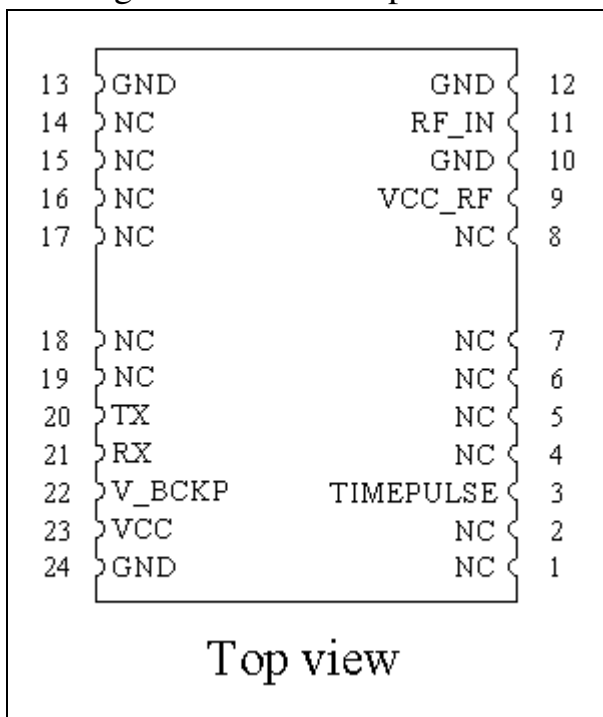
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Start

Change static navigation to
1.5m/s threshold

unsigned char SpeedThreshold1_5[] =
{"$PMTK386,1.5*39\x0D\x0A"};

GPS module will return message
"$PMTK001,386,3*3D\x0D\x0A"
if command is accepted.

Disable static
navigation function?

Yes

Set 0 threshold

unsigned char SpeedThreshold0[] =
{"$PMTK386,0*23\x0D\x0A"};

GPS module will return message
"$PMTK001,386,3*3D\x0D\x0A"
if command is accepted.

No

End

6 Pin assignment and descriptions

```
13  GND              GND  12
14  NC             RF_IN  11
15  NC               GND  10
16  NC            VCC_RF   9
17  NC                NC   8


18  NC                NC   7
19  NC                NC   6
20  TX                NC   5
21  RX                NC   4
22  V_BCKP     TIMEPULSE   3
23  VCC               NC   2
24  GND               NC   1
```

Top view

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Table 6-1 Pin descriptions

Pin #	Name	Type	Description	Note
1	NC		Not connected	
2	NC		Not connected	
3	TIMEPULSE	O	Time pulse (1PPS, default 100 ms pulse/sec when 3D fix is available)	
4	NC		Not connected	
5	NC		Not connected	
6	NC		Not connected	
7	NC		Not connected	
8	NC		Not connected	
9	VCC_RF	O	Output voltage for active antenna	1
10	GND	P	Ground	
11	RF_IN	I	GNSS RF signal input	
12	GND	P	Ground	
13	GND	P	Ground	
14	NC		Not connected	
15	NC		Not connected	
16	NC		Not connected	
17	NC		Not connected	
18	NC		Not connected	
19	NC		Not connected	
20	TX	O	Serial output (Default NMEA)	
21	RX	I	Serial input (Default NMEA)	
22	V_BCKP	P	Backup battery supply voltage **This pin must be powered to enable the module.**	2
23	VCC	P	DC supply voltage	
24	GND	P	Ground	

<Note>

1. VCC_RF does not have short circuit protection.

2. In order to get the advantage of hybrid ephemeris prediction, this pin must be always powered during the period of effective ephemeris prediction.

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7 DC & Temperature characteristics

7.1 Absolute maximum ratings

Parameter	Symbol	Ratings	Units
Input Voltage	VCC	4.3	V
Input Backup Battery Voltage	V_BCKP	4.3	V
Operating Temperature Range	Topr	-40 ~ 85	℃
Storage Temperature Range	Tstg	-40 ~ 85	℃

7.2 DC Electrical characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VCC		3.0	3.3	4.3	V
Input Backup Battery Voltage	V_BCKP		2.0		4.3	V
VCC_RF Output Voltage	VCC_RF			VCC		V
Supply Current	Iss	VCC = 3.3V, w/o active antenna, Peak Acquisition Tracking Standby		36 $25^{(2)}$ 570	$150^{(1)}$	mA mA mA uA
Backup Battery Current	Ibat	VCC = 0V		7		uA
High Level Input Voltage	V_{IH}		2.0		3.6	V
Low Level Input Voltage	V_{IL}		-0.3		0.8	V
High Level Input Current	I_{IH}	no pull-up or down	-1		1	uA
Low Level Input Current	I_{IL}	no pull-up or down	-1		1	uA
High Level Output Voltage	V_{OH}		2.4		3.3	V
Low Level Output Voltage	V_{OL}				0.4	V
High Level Output Current	I_{OH}			2		mA
Low Level Output Current	I_{OL}			2		mA

Note 1. This happens when downloading AGPS data to MC-1612-G.

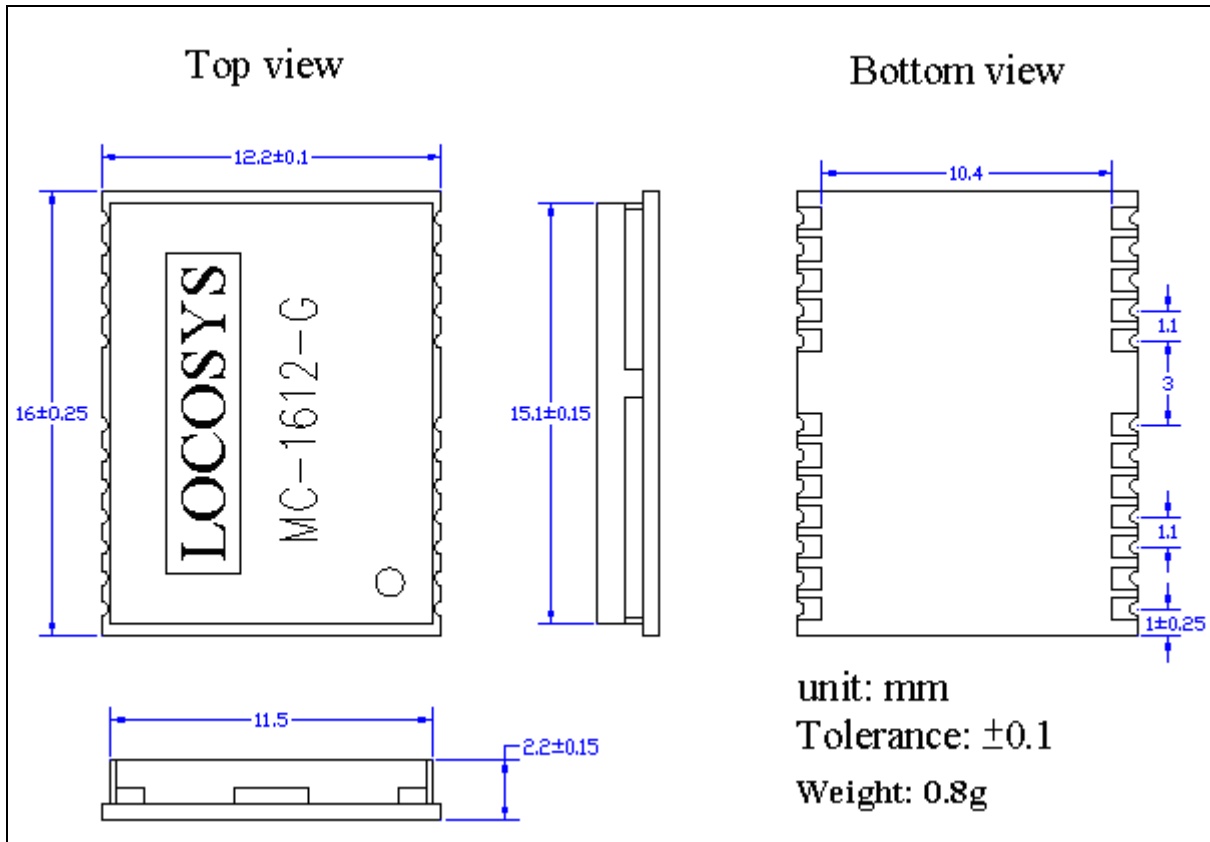Note 2. Measured when position fix (1Hz) is available, input voltage is 3.3V and the function of self-generated ephemeris prediction is inactive.
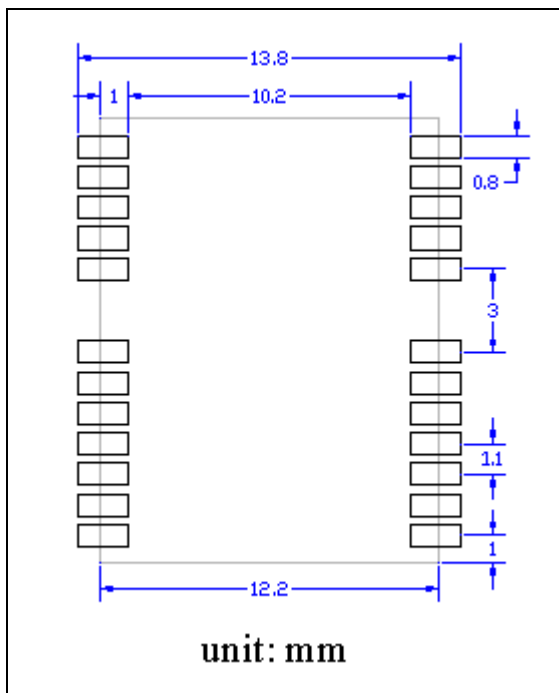
7.3 Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	Topr	-40	-	85	℃
Storage Temperature	Tstg	-40	25	85	℃

8 Mechanical specification

8.1 Outline dimensions

8.2 Recommended land pattern dimensions

9 Reel Packing information

1. 10 sprocket hole pitch cumulative tolerance ±0.2
2. Camber not to exceed 1mm in 100mm
3. A0 and B0 measured on a plane 0.3mm above the bottom of the pocket
4. K0 measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
5. pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.
6. Component load per 13"reel: 1000 pcs

A0	13.50 ±0.1
B0	16.40 ±0.1
D0	Ø1.5
E1	1.75 ±0.1
K0	2.70 ±0.1
P0	4.0 ±0.1
P1	24.00 ±0.1
P2	2.0 ±0.10
T	0.3 ±0.10
W	24.0 ±0.30

Document change list

Revision 1.0

- First release on February 19, 2013.