ZYM-GM7033-MF

GPS+GLONASS

Mouse

User's Manual

Revision History

Version	Date	Explain
P0.0	2021.6	First Release

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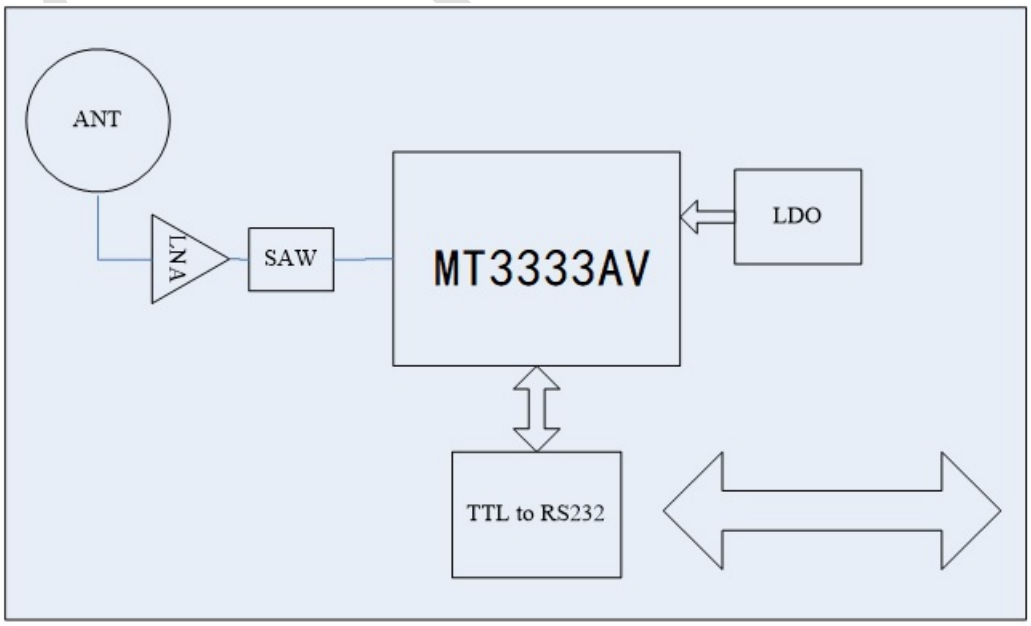
Usage Notice

Please read before you start to use the GNSS receiver:

- GNSS(Global Position System) is found and operated by US Department of defense. The Organization is responsible for accuracy and maintenance of the system with full authority. Any change that is made by the organization will affect accuracy and function of GNSS.
- For your driving security, we strongly suggest that you do not operate the device during driving.
- When satellite is navigating, if you are inside a building, tunnel or near huge blocks, it will affect GNSS satellite signal receiving. At this time, this device probably does not have positioning capability.
- If you have a speed alarm in your car, the signal receiving of this device will be interfered. If this situation happens, please stop using your speed alarm.
- Please do not expose this device to sun for a long time to avoid damage to internal precision circuit.



1. Introduction

1.1 Overview

The ZYM-GM7033 Smart GNSS Receiver is a total solution GNSS receiver, designed based on MediaTek.Inc SOC MT3333AV . This positioning application meets strict needs such as car navigation, mapping, surveying,security, agriculture and so on. Only clear view of sky and certain power supply are necessary to the unit. It communicates with other electronic utilities via compatible RS232 and saves critical satellite data by built–in backup memory. With low power consumption, the GM7033 tracks up to 99 satellites at a time, re-acquires satellite signals in 100 ms and updates position data every second.

Trickle-Power allows the unit operates a fraction of the time and Push-to-Fix permits user to have a quick position fix even though the receiver usually stays off.

1.2. Features

G-Mouse provides a host of features that make it easy for integration and use.

1. Use the advanced GNSS module, the module got high performance DSP core(32bit ARM RISC), allow users to design different applications, store in the module, to provide the most economic solution for anybody.

2. High performance tracks up to 99 satellites.

3. High sensitivity (-165 dBm) for indoor fixes. The GM7033 GNSS module can acquire in only seconds even at low signal levels. As part of GM7033's patented multi-mode GNSS, the GM7033 GNSS module can track signal levels as low as -165 dBm. The GM7033 supports real-time navigation in urban canyons as well as high sensitivity acquisition needed for indoor environments.

4. Differential capability utilizes real-time RTCM corrections producing

1-5 meter position accuracy.

5. Compact design ideal for applications with minimal space.

6. A rechargeable battery sustains internal clock and memory. The battery is recharged during normal operation.

7. Built-in WAAS Demodulator.

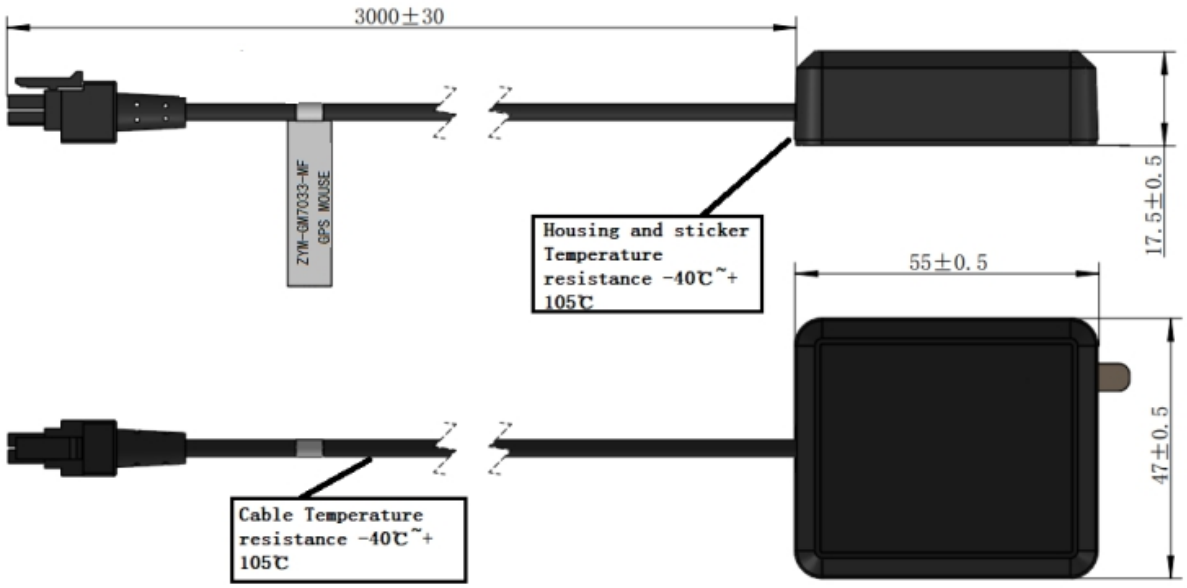
8. Water proof IP67 design for industry standard.

9. Built-in high gain 36mm*36mm*4mm ceramic patch-antenna.

1.3. Technical Specification

1.3.1. Outline,Pin connection

Outline: (mm)。



* General tolerances = ±0.3mm

1.3.2. Hardware Interface

The ZYM-GM7033 includes an antenna in a unique style waterproof gadget. Simply connector to one of the accessories linking to your main board or other devices.

RS232

1 RXD
2 GND
3 TXD
4 VCC

1.3.3. Environmental Characteristics

1)Working Temperature: -40~+85° C

2) Storage temperature: -40 ~+90° C

3) Humidity：≦95%

1.3.4. Electrical Characteristics

1) Input voltage: 5.0 +/- 10% V DC

2) Inpur current：<80mA

3) Backup battery: +3.0V DC (Inner Rechargeable Lithium battery).

1.3.5. Performance

1) Channels: 99

2) Update rate: 1 second.

3) Acquisition time (average)

Hot start: <1 second(open sky).

Cold start: <35 second(open sky).

4) Position accuracy:

Position: <10m 90% no SA

Velocity: 0.1 m/sec no SA

Time: 1 second synchronized GNSS time

5) Dynamic Conditions:

Altitude: 50,000m max

Velocity: 500 m/sec (1,000 knots) max

Acceleration: 4G max

1.3.6. Interfaces

1) Dual channel RS232 compatible level, with user selectable baud rate (9600-Default, 4800, 19200, 38400)

2) NMEA 0183 Version 4.1ASCII output (GGA, GSA, GSV, RMC, option GLL,VTG).

2. Operational Characteristics

2.1. Initialization Setup

After the initial self-test is complete, the G-mouse will begin the process of satellite acquisition and tracking. The acquisition process is fully automatic and, under normal circumstances, will take approximately 35 seconds to achieve a position fix (15 seconds if ephemeris data is know). After a position fix has been calculated, valid position and time information will be transmitted over the output channel(s).

The G-Mouse utilizes initial data such as last stored position, data and time as well as satellite orbital data to achieve maximum acquisition performance. If significant inaccuracy exists in the initial data, or if the orbital data is obsolete, it may take a long time to achieve a navigation solution. The G-mouse Auto-locate feature is capable of automatically determining a navigation solution without intervention from the host system. However, acquisition performance can be improved if the host system initialized the G-mouse following the occurrence of one or more of the following events:

1)The GNSS receiver is not in use for more than 3 months or transportation over distances further than 500 kilometers.

2)Failure of the external memory battery without system standby power.

2.2. Navigation

After the acquisition process is complete, the G-Mouse will begin sending valid navigation information over its output channels. These data include:

1) Latitude/longitude/altitude

2) Velocity

3) Date/time

4) Satellite ,receiver status and Error estimates

3. Appendix A Software Protocol

A.1 NMEA Transmitted Message

NMEA is the standard of GNSS protocol. Cynosure GNSS receiver supports several NMEA sentences: GGA, GSV, GSA, RMC, VTG, ZDA, GLL and GRS. This data set includes the complete PVT (position, velocity, time) solution computed by the GNSS receiver.

Each sentence has a prefix beginning with a '$' and ends with a carriage return/line feed sequence and can be no longer than 80 characters of visible text (plus the line terminators). There is a provision for a checksum at the end of each sentence which may or may not be checked by the unit that reads the data. The checksum field consists of a '*' and two hex digits representing an 8 bit exclusive OR of all characters between, but not including, the '$' and '*'. A checksum is required on some sentences.

Different prefix indicates the global position satellite systems for sentences GRS, GSA and GSV:

$GP for GPS-only

$BD for BEIDOU2-only

$GL for GLONASS-only

$GN is for GNSS, combination of different global position satellite system.

GGA - Global Positioning System Fix Data

ID	GGA (support NMEA version 3.01/4.00/4.10)	
Description	Time, position and fix related data for a GPS receiver	
Format	$GPGGA,hhmmss.fff,llll.lllll,a,yyyyy.yyyyy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>	
Content (Shown in sequence)	hhmmss.fff	Hour Minute Second .fraction (UTC)
	llll.lllll	Latitude
	a	N or S (North or South)
	yyyyy.yyyyy	Longitude
	a	E or W (East or West)
	x	GNSS Quality Indicator - 0 - fix not available - 1 - GNSS fix - 2 - Differential GNSS fix (values above 2 are 2.3 features) - 3 = PPS fix - 4 = Real Time Kinematic - 5 = Float RTK - 6 = estimated (dead reckoning) - 7 = Manual input mode - 8 = Simulation mode
	xx	Number of satellites in view, 00 - 12
	x.x	Horizontal Dilution of precision (meters)
	x.x	Antenna Altitude above/below mean-sea-level (geiod) (in meters)
		Units of antenna altitude, meters
	M	Geoidal separation, the difference between the WGS-84 earth
	x.x	ellipsoid and mean-sea-level (geoid), "-" means mean-sea-level below ellipsoid
		Units of geoidal separation, meters
	M	Age of differential GNSS data, time in seconds since Last SC104,
	x	type 1 or 9 update, null field when DGPS is not used
		Differential reference station ID, 0000-1023
		Checksum
	xxxx	
	hh	
Example	$GPGGA,175722.000,0045.94406,N,00028.67819,E,1,10,1.19,35.8,M,18.2,M,,*50	

GSA – GNSS DOP and Active Satellites

ID	GSA
Description	GNSS receiver operating mode, satellites used in the navigation solution reported by the GGA, and DOP values.
Format (In V3.01)	$GNGSA,a,m,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x.x,x.x,x.x*hh<CR><LF>
Format (In V4.00)	$GPGSA,a,m,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x.x,x.x,x.x*hh<CR><LF> $BDGSA,a,m,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x.x,x.x,x.x*hh<CR><LF>
Format (In V4.10)	$GNGSA,a,m,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x.x,x.x,x.x,h*hh<CR><LF>
Content (Shown in sequence)	a Selection mode M=Manual, forced to operate in 2D or 3D, A=Automatic, 3D/2D m Mode (1 = no fix, 2 = 2D fix, 3 = 3D fix) Note: 2D fix hint that the receiver position error meets the 2D level. Maybe under this condition the used satellite number is little more than 4. x ID of 1st satellite used for fix x ID of 2nd satellite used for fix x ID of 3rd satellite used for fix x ID of 4th satellite used for fix x ID of 5th satellite used for fix x ID of 6th satellite used for fix x ID of 7th satellite used for fix x ID of 8th satellite used for fix x ID of 9th satellite used for fix x ID of 10th satellite used for fix x ID of 11th satellite used for fix x ID of 12th satellite used for fix x PDOP x.x HDOP x.x VDOP x.x systemId Note: NMEA v4.10 and above only h Checksum hh
Example	$GNGSA,A,3,02,206,208,06,05,203,209,09,202,12,204,25,1.04,0.78,0.69*17

NMEA version 3.01	Note: SVID_BEIDOUGEO1 =201～SVID_BEIDOUGEO5 = 205 SVID_BEIDOU6 = 206～SVID_BEIDOU37 = 237 QZSS = 193
Example NMEA version 4.00	$GPGSA,A,3,02,06,05,09,12,25,17,29,23,,,,1.04,0.78,0.70*0F $BDGSA,A,3,06,08,03,09,02,04,05,,,,,,1.04,0.78,0.70*19 Note: SVID_BEIDOUGEO1 =01～SVID_BEIDOUGEO5 = 5 SVID_BEIDOU6 = 06～SVID_BEIDOU37 = 32 QZSS = 193
Example NMEA version 4.10	$GNGSA,A,3,05,193,02,13,29,20,15,06,30,07,,,1.06,0.74,0.76,1*35 $GNGSA,A,3,206,209,208,203,214,201,202,204,,,,,1.06,0.74,0.76,4*07 Note: SVID_BEIDOUGEO1 =201～SVID_BEIDOUGEO5 = 205 SVID_BEIDOU6 = 206～SVID_BEIDOU37 = 237 QZSS = 193

GSV – GNSS Satellites in View

ID	GSV
Description	Number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value.
Format (In V3.01)	$GNGSV,x,x,x,x,x,x,x,...*hh<CR><LF>
Format support (In 4.00)	$GPGSV,x,x,x,x,x,x,x,...*hh<CR><LF> $BDGSV,x,x,x,x,x,x,x,...*hh<CR><LF>
Format (In 4.10)	$GPGSV,x,x,x,x,x,x,x,...h*hh<CR><LF> $BDGSV,x,x,x,x,x,x,x,...h*hh<CR><LF>
Content (Shown in sequence)	x Total number of GSV messages to be transmitted in this group Origin number of this GSV message within current group x Total number of satellites in view (leading zeros sent) x Satellite PRN number (leading zeros sent) x Elevation in degrees (00-90) (leading zeros sent) x Azimuth in degrees to true north (000-359) (leading zeros sent) x SNR in dB (00-99) (leading zeros sent) More satellite info quadruples like 4-7n) x Signal Id Note: NMEA v4.10 and above only ... Checksum h hh
Example NMEA version 3.01	$GNGSV,5,1,19,206,76,265,46,5,75,319,50,2,68,92,48,209,50,243,44*54 Note: SVID_BEIDOUGEO1 =201～SVID_BEIDOUGEO5 = 205 SVID_BEIDOU6 = 206～SVID_BEIDOU37 = 237 QZSS = 193
Example NMEA version 4.00	$GPGSV,3,1,12,5,75,332,49,2,66,98,47,13,40,176,46,29,36,307,45*4F $BDGSV,2,1,07,6,77,271,44,9,50,245,43,8,48,168,41,3,42,190,41*60 Note: SVID_BEIDOUGEO1 =01～SVID_BEIDOUGEO5 = 05 SVID_BEIDOU6 = 06～SVID_BEIDOU37 = 32

	QZSS = 193
Example NMEA version 4.10	$GPGSV,4,1,14,6,67,28,47,2,53,299,45,17,39,135,45,12,35,283,43,1*5C $BDGSV,3,3,09,205,16,249,30,4*75 Note: SVID_BEIDOUGEO1 =201～SVID_BEIDOUGEO5 = 205 SVID_BEIDOU6 = 206～SVID_BEIDOU37 = 237 QZSS = 193

RMC – Recommended Minimum Specific GNSS Data

ID	RMC	
Description	Time, date, position, course and speed data provided by a GNSS navigation receiver.	
Format	$GPRMC,hhmmss.fff,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a,a*hh<CR><LF>	
Content (Shown in sequence)	hhmmss.fff	Hour Minute Second. fraction (UTC)
	A	Status, V=Navigation receiver warning A=Valid
	llll.llll	Latitude
	a	N or S
	yyyyy.yyyyy	Longitude
	a	E or W
	x.x	Speed over ground, knot
	x.x	Degrees to true north
	ddmmyy	Date
	x.x	Magnetic variation
	a	Degrees E/W
	a	Mode Indicator: V = Invalid, A= Autonomous and D =Differential
		Nav Status Note: NMEA v4.10 and above only
	a	Checksum
	hh	
Example NMEA version 3.01/4.00	$GNRMC,075939.000,A,2225.56166,N,11412.68199,E,0.000,64.79,020589,0.0,E,A*1D	
Example NMEA version 4.10	$GNRMC,084910.000,A,4006.20817,N,11628.09527,E,0.000,36.14,151015,0.0,E,A,S*6A	

VTG – Course Over Ground and Ground Speed

ID	VTG (support NMEA version 3.01/4.00/4.10)
Description	The actual course and speed relative to the ground
Format	$GPVTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>
Content (Shown in sequence)	x.x Track Degrees T True x.x Magnetic Degrees M Magnetic x.x Speed Knots N Knots x.x Speed Kilometers Per Hour K Kilometers Per Hour A Mode Indicator: V = Invalid, A= Autonomous and D =Differential Checksum hh
Example	$GNVTG,0.00,T,0.00,M,0.000,N,0.000,K,A*3D

ZDA – Time & Date

ID	ZDA (support NMEA version 4.10/3.01/4.00)
Description	Time & Date - UTC, day, month, year and local time zone
Format	$GNZDA,hhmmss.fff,dd,mm,yyyy,xx,yy*hh<CR><LF>
Content (Shown in sequence)	hhmmss.fff Hour Minute Second. fraction (UTC) dd Day mm Month yyyyy Year xx Local zone hours -13..13 yy Local zone minutes 0..59 hh Checksum
Example	$GNZDA,072319.000,14,10,2015,-7,45*5F

GLL - Geographic Position - Latitude/Longitude

ID	GLL(support NMEA version 4.10/3.01/4.00)	
Description	Latitude and Longitude of vessel position, time of position fix and status.	
Format support	$GPGLL,llll.lllll,a,yyyyy.yyyyy,a,hhmmss.fff,A,a*hh<CR><LF>	
Content (Shown in sequence)	llll.lllll a yyyyy.yyyyy a hhmmss.fff A a hh	Latitude N or S (North or South) Longitude E or W (East or West) Hour Minute Second. fraction (UTC) Status A - Data Valid, V - Data Invalid Mode Indicator: V = Invalid, A= Autonomous and D =Differential Checksum
Example	$GNGLL,2225.56149,N,11412.68190,E,074822.001,A,A*44	

4. Appendix B Coordinate System and Output Settings

- **B.1 Coordinate System**

  World standard coordinate system WGS84 is builds in.

- **B.2 Output Settings**

  Coordinate System: WGS84.

  Baud rate: 9600

  Output message: GGA, GSA, GSV, RMC

Warning:
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However. there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
--Reorient or relocate the receiving antenna.
-- Increase the separation between the equipment and receiver
--Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
--Consult the dealer or an experienced radio/TV technician for help