General Description

The GRM-3636F2W-AG is a receiving module that supports single frequency and GPS mode. It has built-in highly integrated GNSS receiver chip, supports single band and multi system cm4f (main frequency 428MHz, 22nm Technology) chip of Third-generation BeiDou Navigation Satellite System (BDS-3). Besides, it is capable of tracking all global civil navigation systems (GPS,QZSS and SBAS) in all bands.

GRM-3636F2W-AG module is based on the state of art GPS architecture, integrating single-band and single-system GNSS RF and baseband. This newly designed architecture makes this single chip achieve sub-meter level position accuracy without correction data from ground-based augmentation station and higher sensitivity, greater for improved jam resistance and multipath, provide a highly robust service in complicated environment.

GRM-3636F2W-AG module contains MediaTek AG3352Q positioning engine inside, featuring high sensitivity, low power consumption, and fast TTFF. The superior cold start sensitivity allows it to acquire, track, and get position fix autonomously in difficult weak signal environment. The receiver's superior tracking sensitivity allows continuous position coverage in nearly all outdoor application environments. The high performance signal parameter search engine is capable of testing 16 million time-frequency hypotheses per second, offering superior signal acquisition and TTFF speed.

Applications

- LBS (Location Based Service)
- PND (Portable Navigation Device)
- Vehicle navigation system
- Mobile phone

Figure:GRM-3636F2W-AG
Top View

Features

- Build on high performance, low-power MediaTek AG3352Q chip set
- Ultra high track sensitivity: -165dBm
- Concurrent reception of single-band and single-system satellite signals
- Supports all civil GNSS signals
- Supports GPS/QZSS signal
- Extremely fast TTFF at low signal level
- (Cold start ≤24s, Hot start ≤1s).
- Multipath detection and suppression
- Works with passive and active antenna
- Low power consumption: 26mA@3.3V
- NMEA-0183 compliant protocol or custom protocol
- Operating voltage: 3.0V--5.5V
- Operating temperature range:-40to85℃
- Patch Antenna Size:25x25x4mm
- Small form factor: 36.3x36.4x13.5mm
- Communication type: RS232
- Wire interface type: PS2 , L=150±5cm
- Waterproofing grade: IP67
- RoHS compliant (Lead-free)

1. Functional Description

1.1. Key Features

Table 1: Key Features

Parameter	Specification
GNSS engine	• GNSS engine has 47SVs channels and DSP accelerators
GNSS reception	• GPS/QZSS: L1 C/A, L1C, • SBAS: WAAS, EGNOS, MSAS, GAGAN
Update rate	• GNSS 10Hz Maximum
Position accuracy [1]	• GNSS <1m CEP • SBAS <1m CEP
Velocity & Time accuracy	• GNSS 0.01m/s CEP • SBAS 0.05 m/s • 1PPS 25 ns
Time to First Fix(TTFF) [1]	• Hot start 1 sec • Cold start 24 secs
Sensitivity [1]	• Cold start -148dBm • Hot start -155dBm • Reacquisition -158dBm • Tracking & navigation -165dBm
GNSS Operating limit	• Velocity 515m/s • Altitude 18,000m
Datum	• Default WGS-84, User definable
RS232 Port	• RS232 Port: RX and TX • Supports baud rate from 9600bps to 961200bps.9600bps by default • NMEA 0183 Protocol Ver. 4.00/4.10,Cynosure GNSS Receiver Protocol
Temperature Range	• Normal operation: -40°C ~ +75°C • Storage temperature: -45°C ~ +105°C • Humidity: 5% ~ 95%
Physical Characteristics	• Size: 36.3±0.5 ×36.4±0.5 ×13.5±1mm • Connecting line specifications: PS2 , L=150±5cm • Weight: Approx.48.4g

1.2 Power Supply

Regulated power for the GRM-3636F2W-AG 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 3.0V~5.5V, Recommended power supply voltage is 3.3V . maximum current is 26mA. Suitable decoupling must be provided by external decoupling circuitry.

1.3 RS232 Ports

The module supports two full duplex serial channels RS232. All serial connections are at 5.0V TTL logic levels, if need different voltage levels, use appropriate level shifters. The baud rate of both serial ports are fully programmable, the data format is however fixed: X, N, 8, 1, i.e. X baud rate, no parity, eight data bits and one stop bit, no other data formats are supported, LSB is sent first. The modules default baud rate is set up 115200bps, however, the user can change the default baud rate to any value from 9600 bps to 961200bps. RS232 is used e.g. for booting and NMEA interface.

2. Application

The GRM-3636F2W-AG Gmouse is equipped with a 6-Pin connector that connects to your application platform. It consists of a MediaTek AG3352Q single chip GPS IC which includes the RF part and Baseband part, a patch antenna, a LNA, a SAW filter, a TCXO, a crystal oscillator,a IC-RS3220. Also comes with a 0.22F crystal capacitor ,can backup satellite ephemeris about 2 hour.
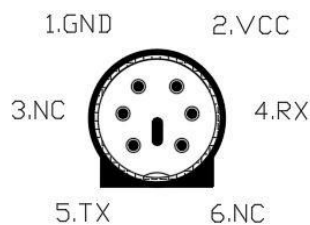
2.1. Pin Assignment

Figure 2: Pin Assignment

CON Pin Description

Pin No.	Pin name	I/O	Description	Remark
1	GND	G	Ground	
2	VCC	I	Module Power Supply	Voltage range: 3.0V~5.5V
3	NC			
4	RX	O	RS232 Serial Data intput	
5	TX	I	RS232 Serial Data output	
6	NC			

2.2 Mechanical Dimensions

This chapter describes the mechanical dimensions of the GRM-3636F2W-AG module. Size unit（mm）

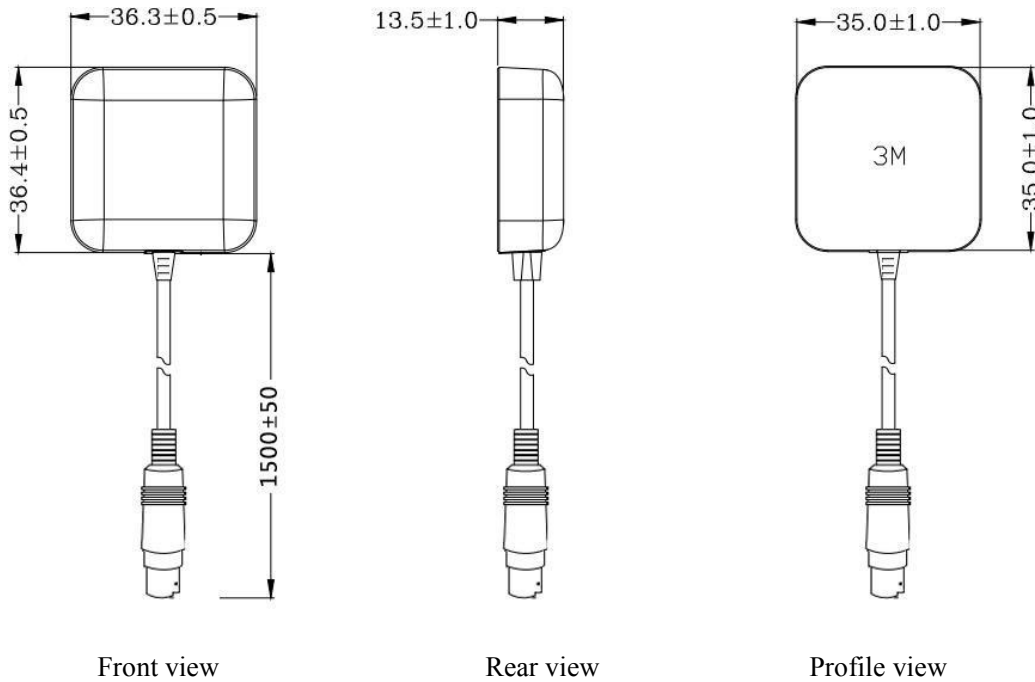| Front view | Rear view | Profile view |

Figure 3:GGM-4538-UB8FPS2150 Specification size chart

3. NMEA 0183 Protocol

The output protocol supports NMEA-0183 standard. The implemented messages include GGA, GLL, GSA, GSV, VTG, RMC, and ZDA messages. The NMEA message output has the following sentence structure:

$AACCC，c-c*hh

The detail of the sentence structure is explained in Table 1.

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 Gotop GRM-3636F2W-AG Initialization location mode for GPS mode,

    Output data：$GPRMC,$GPVTG,$GPGGA,$GPGLL,$GPGSA,$GPGSV.

11.1 GGA – Global Positioning System Fix Data

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

$GPGGA,hhmmss.sss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh

For example:

$GPGGA,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 pf 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	

11.2 GLL – Latitude/Longitude

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

$GPGLL,ddmm.mmmm,a,dddmm.mmmm,a,hhmmss.sss,A,a*hh

For example:

$GPGLL,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	

1.3 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:

$GPGSA,A,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x,x*hh

For example:

$GPGSA,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;
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
8	Checksum	18	

11.4 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
$GPGSV , 4,2 , 13 , 20,47 , 118 , 42,15 , 39,046 , 44,41 , 39,242 , 41,12 , 28,129 , 42 , 1*68

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;

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	

11.5   RMC – Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data provided by a GNSS navigation receiver.
Structure:

$GPRMC,hhmmss.sss,A,dddmm.mmmm,a,dddmm.mmmm,a,x.x,x.x,ddmmyy,,,a*hh

For example:

$GPRMC,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	

11.6   VTG – Course Over Ground and Ground Speed

The actual course and speed relative to the ground.
Structure: GPVTG,x.x,T,,M,x.x,N,x.x,K,a*hh
For example:

$GPVTG,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	

11.7 ZDA – TIME AND DATE

UTC, day, month, year and local time zone
Structure:

$GPZDA,hhmmss.sss,xx,xx,xxxx,xx,xx*hh<CR><LF>

For example:

$GPZDA,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

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