

GPS/GNSS Antenna Module



1. Product Information

1.1 Product Name: YIC51515GMS -37

1.2 Product Description:

YIC51515GMS -37 is a compact, high performance, and low power consumption GPS/GNSS Antenna Module.

It uses the chipset which can track up to 66 channels at a time and perform fast TTFF in weak signal environments.

YIC51515GMS -37 is suitable for the following applications:

- Automotive navigation
- Personal positioning
- Fleet management
- Mobile phone navigation
- Marine navigation

1.3 Product Features:

- High performance and low power consumption GPS Chipset
- Very high sensitivity
- Extremely fast TTFF (Time To First Fix) at low signal level
- Two serial ports
- Built-in LNA
- Compact size suitable for space-sensitive application
- Support NMEA 0183 and ublox binary protocol
- One size component, easy to mount on another PCB board

1.4 Product Specifications

GPS Performance

GPS Receiver		
Chip	MT3337(ROM)	
Frequency	L1 1575.42MHz, C/A code	
Channels	Support 66 channels	
Update rate	1Hz default, up to 10Hz	
Sensitivity	Tracking	-163dBm, 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	< 18,000 m	
Max. Velocity	< 515 m/s	
Protocol Support	NMEA 0183	9600 bps, 8 data bits, no parity, 1 stop bits (default)
		1Hz: GGA, GLL, GSA, GSV, RMC, VTG
Physical Characteristic		
Dimensions	15.5.m * 15.5 mm * 6.7mm	

1.5 DC Electrical characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VCC		2.8	3.3	4.3	V
Input Backup Battery Voltage	V_BCKP		2.0		3.6	V
Supply Current	Iss	VCC = 3.3V, w/o active antenna, Peak			150 ⁽¹⁾	mA
		Acquisition		30		mA
		Tracking		30 ⁽²⁾		mA
		Standby		280		uA
Backup Battery Current	Ibat	VCC = 0V		7		uA
High Level Input Voltage	VIH		2.0		3.6	V
Low Level Input Voltage	VIL		-0.3		0.8	V
High Level Input Current	IIH	no pull-up or down	-1		1	uA
Low Level Input Current	IIL	no pull-up or down	-1		1	uA
High Level Output Voltage	VOH		2.4		3.3	V
Low Level Output Voltage	VOL				0.4	V
High Level Output Current	IOH			2		mA
Low Level Output Current	IOL			2		mA

Note 1: This happens when downloading AGPS data to Module.

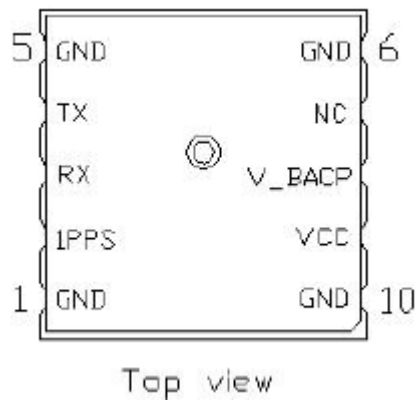
Note 2: Measured when position fix (1Hz) is available, input voltage is 3.3V and the function of self-generated ephemeris prediction is inactive.

1.6 Temperature characteristics

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

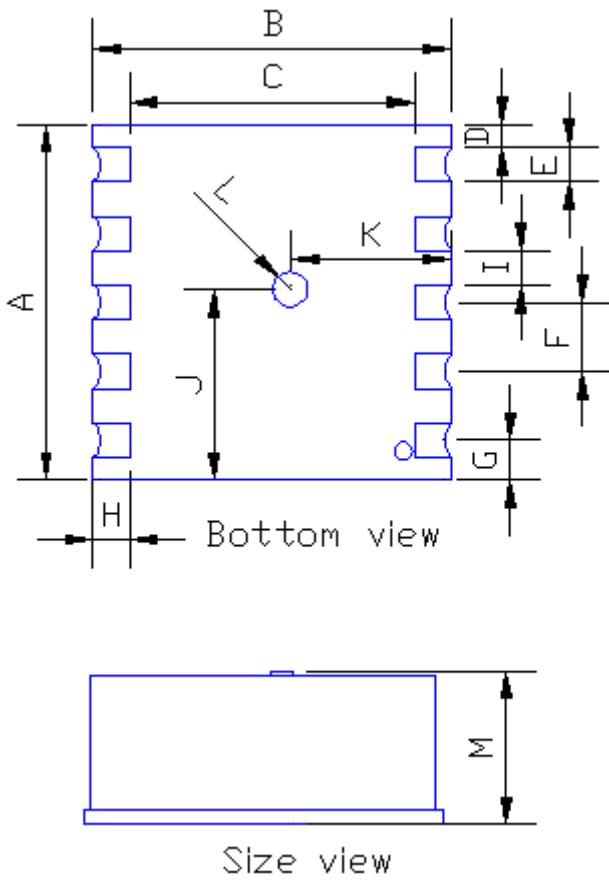
2. Technical Information

2.1 Module Pin Assignment



Pin No.	Pin name	Type	Description	Remark
1	GND	P	Ground	
2	1PPS	O	Pulse per second (default 100ms pulse/sec when 3D fix is available)	
3	RX	I	Serial data input	
4	TX	O	Serial data output	
5	GND	P	Ground	
6	GND	P	Ground	
7	NC		No connection	
8	V_BCKP	P	Backup battery supply voltage (2.0V~3.6V)	
9	VCC	P	DC Supply voltage (2.8V~4.3V)	
10	GND	P	Ground	

2.2 Dimensions



Parameter	Specification
A	15.5+0.3mm/-0.1mm
B	15.5±0.1mm
C	12.4±0.1mm
D	1±0.1mm
E	1.5±0.1mm
F	3±0.1mm
G	1.75±0.1mm
H	1.6±0.1mm
I	1.5±0.1mm
J	8.3±0.1mm
K	7.0±0.1mm
L	φ 1.5±0.1mm
M	6.7±0.2mm
Weight	28g

3. Application guideline

Layout Rules

Do not routing the other signal or power trace under the engine board .

Design Notes

VBAT

Plug-in RTC Battery Input.

TXD

This is the main transmits channel for outputting navigation and measurement data to user's navigation software or user written software.

RXD

This is the main channel for receiving software commands from u-blox software or from your proprietary software.

VCC

Module Power Supply, Module Power Supply.

GND

Ground pin for the baseband circuit.

4. Software Interface

NMEA output message

Table 4.1 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

GGA--- Global Positioning System Fixed Data

Table 4.2 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

Table4. 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 4.3
Satellites Used	17		Range 0 to 33
HDOP	0.71		Horizontal Dilution of Precision
MSL Altitude	116.7	meters	
Units	M	meters	
Geoid Separation	15.3	meters	
Units	M	meters	
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

Table4.3 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

Table4.4 contains the values for the following example:

\$GNGLL,2503.7148,N,12138.7451,E,060406.000,A,D*46

Table4.4 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

GSA---GNSS DOP and Active Satellites

Table 4.5 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

Table4. 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 4.6
Mode 2	3		See Table 4.7
ID of satellite used	22		Sv on Channel 1
ID of satellite used	21		Sv on Channel 2
....		
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

Table4.6 Mode 1

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

Table 4.7 Mode 2

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

GSV---GNSS Satellites in View

Table 4.8 contains the values for the following example:

\$GPGSV,6,1,21,18,78,169,36,209,72,273,36,22,63,309,38,207,63,328,38*7B

\$GPGSV,6,2,21,203,58,205,39,25,56,138,39,201,55,141,34,206,50,168,*45

\$GPGSV,6,3,21,210,49,282,34,12,48,076,39,204,39,118,,14,38,322,37*77

\$GPGSV,6,4,21,193,37,180,34,202,36,246,29,24,23,041,34,31,21,244,*71

\$GPGSV,6,5,21,21,17,198,33,205,16,258,28,15,12,092,33,208,09,169,30*7B

\$GPGSV,6,6,21,51,,,*7E

Table 4.8 GSV Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Total number of messages ¹	6		Range 1 to 6
Message number ¹	1		Range 1 to 6
Satellites in view	21		
Satellite ID	18		Channel 1 (Range 01 to 237), GPS Satellites ID : 01~32, SBAS Satellites ID : 33~64, QZSS Satellites ID:193~196, &BEIDOU Satellites ID : 201~214
Elevation	78	degrees	Channel 1 (Range 00 to 90)
Azimuth	169	degrees	Channel 1 (Range 000 to 359)
SNR (C/No)	36	dB-Hz	Channel 1 (Range 00 to 99, null when not tracking)
Satellite ID	207		Channel 4 (Range 01 to 237) , GPS Satellites ID : 01~32, SBAS Satellites ID : 33~64, QZSS Satellites ID:193~196, &BEIDOU Satellites ID : 201~214
Elevation	63	degrees	Channel 4 (Range 00 to 90)
Azimuth	328	degrees	Channel 4 (Range 000 to 359)
SNR (C/No)	38	dB-Hz	Channel 4 (Range 00 to 99, null when not tracking)
Checksum	*7B		
<CR> <LF>			End of message termination

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

RMC---Recommended Minimum Specific GNSS Data

Table 4.9 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 4.9 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

VTG---Course Over Ground and Ground Speed

Table 4.10 contains the values for the following example:

\$GPVTG,0.00,T,,M,0.01,N,0.02,K,D*3B

Table 4.10 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