General Description

The GP-1513P-SN is a complete GPS engine module that features super sensitivity, ultra low power and small form factor. The GPS signal is applied to the antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol.

Its –165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS was not possible before. The small form factor and low power consumption make the module easy to integrate into portable device like PNDs, mobile phones, cameras and vehicle navigation systems.

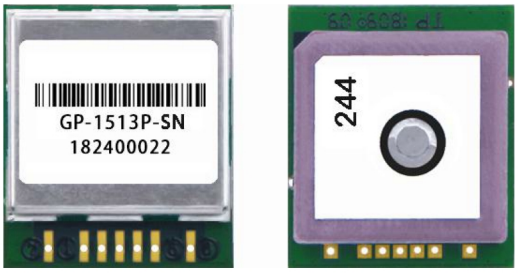

Figure1: GP-1513P-SN Top View

Applications

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

Features

- Build on high performance, low-power SONY CXD5603GF chip set
- Ultra high Track sensitivity: -165dBm
- Extremely fast TTFF at low signal level
- Built in high gain LNA
- Low power consumption: Max 10mA@3.3V
- NMEA-0183 compliant protocol or custom protocol
- Operating voltage: 2.8V to 5.5V
- Operating temperature range:-40 to 85℃
- Patch Antenna Size: 12x12x4mm
- Module Size: 15.25x13.1x6.75mm
- Communication type: UART/TTL
- RoHS compliant (Lead-free)

1 Description

1.1. Key Features

Parameter	Specification
Power Supply	• Supply voltage: 2.8V~5.5V Typical: 3.3V
Power Consumption	• Acquisition: 10mA @VCC=VBAT=3.3V • Tracking: 7mA @VCC=VBAT=3.3V • Idel mode: 3mA @VCC=VBAT=3.3V • Backup: 0mA @VBAT=3.3V
Receiver Type	• Code 66 search channels, GPS&QZSS L1 1575.42MHz C/A • 22 simultan ous tracking channels
Sensitivity	• Tracking: -165dBm • Re-acquisition: -156dBm • Acquisition: -148dBm
TTFF (Autonomous)	• Cold start: 35s typ @-130dBm • Warm start : 30s typ @-130dBm • Hot start : 1s typ @-130dBm
Horizontal Position Accuracy (Autonomous)	• <2.5m CEP @-130 dBm
Update Rate	• 1Hz
Accuracy of 1PPS Signal	• Typical accuracy: ±10ns, Time pulse width: 100ms
Acceleration Accuracy	• Without aid: 0.1m/s²
Dynamic Performance	• Maximum altitude: 18,000m • Maximum velocity: 515m/s • Acceleration: 4G
UART Port	• UART Port: TXD and RXD • Supports baud rate from 4800bps to 115200bps, 9600bps by default • UART port is used for NMEA output, SONY proprietary commands input
Temperature Range	• Normal operation: -40°C ~ +85°C • Storage temperature: -45°C ~ +125°C
Physical Characteristics	• Size: 15.25±0.50 ×13.1±0.50 ×6.75±0.50mm • Weight: Approx. 3.8g

1.2 Power Supply

Regulated power for the GP-1513P-SN 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 2.8V~5.5V, Recommended power supply voltage is 3.3V . maximum current is 10 mA. Suitable decoupling must be provided by external decoupling circuitry.

1.3 UART Ports

The module supports two full duplex serial channels UART. All serial connections are at 3V CMOS 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 9600bps, however, the user can change the default baud rate to any value from 4800 bps to 115kbps. UART port can be used for firmware upgrade, NMEA output and SONY proprietary commands input.

2 Application

The module is equipped with a 7-pin pad that connects to your application platform. The GP-1513P-SN module It consists of a SONY CXD5603GF 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.

2.1. Pin Assignment

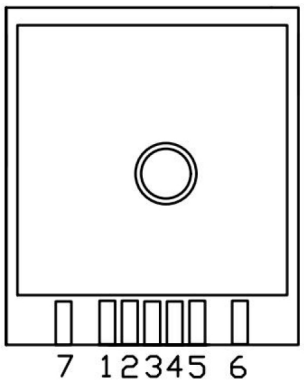

Figure 2: Pin Assignment

CON Pin Description

Pin No.	Pin name	I/O	Description	Remark
1	NC			
2	TXD	O	UART Serial Data output	
3	RXD	I	UART Serial Data Input	
4	VCC	I	Module Power Supply	Voltage range: 2.8V~5.5V
5	GND	G	Ground	
6	PPS	O	One pulse per second	
7	GPIO1	I/O	General purpose I/O	

2.2 Mechanical Dimensions

This chapter describes the mechanical dimensions of the GP-1513P-SN module. Size unit（mm）

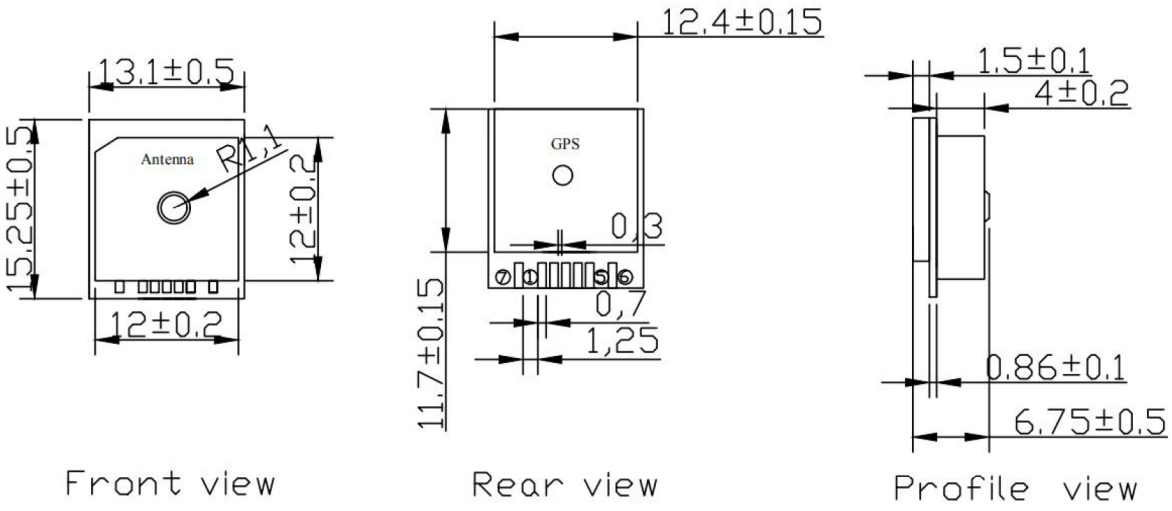

Figure 3: Specification size chart

3 NMEA 0183 Protocol

This section describes the specifications of NMEA sentences. GP-1513P-SN outputs NMEA0183 compliant sentences,IMES sentences and proprietary sentences whose talker ID is “$PS”.

3.1 NMEA 0183 compliant sentences

GP-1513P-SN outputs below sentences of NMEA0183 (ver 4.00) compliant sentences.

3.1.1 GGA : Global Positioning System Fix Data

Format:$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>

Fields:

Field	Format	Description
Header	$	
Talker ID	--	GP
Sentence ID	GGA	
UTC of position	hhmmss.ss	hh [hour] mm [min] ss.ss [sec]
Latitude	llll.ll	dd [degree] mm.mmmm [min]
Latitude – N/S	a	N : North latitude, S : South latitude
Longitude	yyyyy.yy	ddd [degree] mm.mmmm [min]
Longitude – E/W	a	E : East longitude, W : West longitude
Quality indicator	x	0：Fix not available 1：Fix valid 2：Fix valid, Differential GPS 6 : Dead reckoning
Number of satellites in use	xx	
HDOP	x.x	
Altitude (mean-sea-level), meters	x.x,M	[m]
Geoidal separation, meters	x.x,M	[m]
Age of DGPS data	x.x	NULL
Differential reference station ID	xxxx	NULL
Checksum	*hh	
Termination	<CR><LF	

3.1.2 GLL : Geographic Position – Latitude / Longitude

Format : $--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,A,a*hh<CR><LF>

Fields:

Field	Format	Description
Header	$	
Talker ID	--	GP : Using only GPS for positioning GL : Using only GLONASS for positioning QZ : Using only QZS for positioning GN : Using combined satellite systems fo positioning
Sentence ID	GLL	
Latitude	llll.ll	dd [degree] mm.mmmm [min]
Latitude – N/S	a	N : North latitude, S : South latitude
Longitude	yyyyy.yy	ddd [degree] mm.mmmm [min]
Longitude – E/W	a	E : East longitude, W : West longitude
UTC of position	hhmmss.ss	hh [hour] mm [min] ss.ss [sec]
Status	A	A : Data valid, V : Data not valid
Mode Indicator	a	Positioning system Mode Indicator : A : Autonomous mode D : Differential mode E : Dead reckoning mode N : Data not valid
Checksum	*hh	
Termination	<CR><LF>	

3.1.3 GNS: GNSS Fix Data

Format:$--GNS,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>

Fields:

Field	Format	Description
Header	$	
Talker ID	--	GP : Using only GPS for positioning GL : Using only GLONASS for positioning QZ : Using only QZS for positioning GN : Using combined satellite systems for positioning
Sentence ID	GNS	
UTC of position	hhmmss.ss	hh [hour] mm [min] ss.ss [sec]
Latitude	llll.ll	dd [degree] mm.mmmm [min]
Latitude – N/S	a	N : North latitude, S : South latitude

Longitude	yyyyy.yy	ddd [degree] mm.mmmm [min]
Longitude – E/W	a	E : East longitude, W : West longitude
Mode indicator	c--c	Positioning system Mode Indicator (1st character : GPS, 2nd character : GLONASS) A : Autonomous mode D : Differential mode E : Dead reckoning mode N : Data not valid
Number of satellites in use	xx	
HDOP	x.x	
Altitude (mean-sea-level)	x.x,M	[m]
Geoidal separation, meters	x.x,M	[m]
Age of DGPS data	x.x	
Differential reference station ID	xxxx	NULL
Checksum	*hh	
Termination	<CR><LF>	

3.1.4 GSA: GNSS DOP and Active Satellites

When the combined satellite systems are used for positioning, the sentences from each satellite system are output one by one (Talker ID of each sentences are “GN”). The information of QZS is also output on the line of GPS (SVIDs are over 193).

Format:$--GSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x*hh<CR><LF>

Fields:

Field	Format	Description
Header	$	
Talker ID	--	GP : Using only GPS for positioning GL : Using only GLONASS for positioning QZ : Using only QZS for positioning GN : Using combined satellite systems for positioning
Sentence ID	GSA	
2D / 3D Mode	a	A : Automatically switch 2D / 3D
Mode	x	1 : Fix not available, 2 : 2D, 3 : 3D
Used satellite #1	xx	
. . .		
Used satellite #12	xx	

PDOP	x.x	
HDOP	x.x	
VDOP	x.x	
Checksum	*hh	
Termination	<CR><LF>	

3.1.5 GSV: GNSS Satellites In View

Format : $--GSV,x,x,xx,xx,xx,xxx,xx,.....,xx,xx,xxx,xx,h*hh<CR><LF>

Fields:

Field	Format	Description
Header	$	
Talker ID	--	GP : GPS satellites in view GL : GLONASS satellites in view QZ : QZS satellites in view
Sentence ID	GSV	
Total number of sentences	x	
Sentence number	x	
Total number of satellites in view	xx	
SV1	Satellite ID	xx
Elevation	xx	[degree]
Azimuth	xxx	[degree]
SNR (C/N)	xx	[dB-Hz] (NULL at no acquisition)
SV2	Satellite ID	xx
Elevation	xx	[degree]
Azimuth	xxx	[degree]
SNR (C/N)	xx	[dB-Hz] (NULL at no acquisition)
SV3	Satellite ID	xx
Elevation	xx	[degree]
Azimuth	xxx	[degree]
SNR (C/N)	xx	[dB-Hz] (NULL at no acquisition)
SV4	Satellite ID	xx
Elevation	xx	[degree]
Azimuth	xxx	[degree]
SNR (C/N)	xx	[dB-Hz] (NULL at no acquisition)
Checksum	*hh	
Termination	<CR><LF>	

3.1.6 RMC: Recommended Minimum Specific GNSS Data

Format : $--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,xxxxxx,x.x,a,a,a*hh<CR><LF>

Fields:

Field	Format	Description
Header	$	
Talker ID	--	GP : Using only GPS for positioning GL : Using only GLONASS for positioning QZ : Using only QZS for positioning GN : Using combined satellite systems for positioning
Sentence ID	RMC	
UTC of position fix	hhmmss.ss	hh [hour] mm [min] ss.ss [sec]
Status	A	A : Data valid, V : Data not valid
Latitude	llll.ll	dd [degree] mm.mmmm [min]
Latitude – N/S	a	N : North latitude, S : South latitude
Longitude	yyyyy.yy	ddd [degree] mm.mmmm [min]
Longitude – E/W	a	E : East longitude, W : West longitude
Speed over ground	x.x	[knot]
Course over ground	x.x	[degree]
Date	xxxxxx	dd [day] mm [month] yy [year]
Magnetic variation	x.x	[degree]
Magnetic variation – E/W	a	E : East, W : West
Mode Indicator	a	A : Autonomous mode D : Differential mode E : Dead reckoning mode N : Data not valid
Checksum	*hh	
Termination	<CR><LF>	

3.1.7 VTG: Course Over Ground & Ground Speed

Format : $--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>

Fields:

Field	Format	Description
Header	$	
Talker ID	--	GP : Using only GPS for positioning GL : Using only GLONASS for positioning QZ : Using only QZS for positioning GN : Using combined satellite systems for positioning

Sentence ID	VTG	
Course over ground - True	x.x,T	[degrees]
Course over ground - Magnetic	x.x,M	NULL
Speed over ground	x.x,N	[knot]
Speed over ground	x.x,K	[km/h]
Mode Indicator	a	A : Autonomous mode D : Differential mode E : Dead reckoning mode N : Data not valid
Checksum	*hh	
Termination	<CR><LF>	

3.1.8 ZDA: Time & Date

Format : $--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>

Fields :

Field	Format	Description
Header	$	
Talker ID	--	GP : Using only GPS for positioning GL : Using only GLONASS for positioning QZ : Using only QZS for positioning GN : Using combined satellite systems for positioning
Sentence ID	ZDA	
UTC	hhmmss.ss	hh [hour] mm [min] ss.ss [sec]
Day	xx	
Month	xx	
Year	xxxx	
Local zone hours	xx	NULL
Local zone minutes	xx	NULL
Checksum	*hh	
Termination	<CR><LF	