GPS/GNSS Receiver Module

1. Product Information

1.1 Product Name: YIC92217EB

1.2 Product Description:

YIC92217EB is a compact, high performance, and low power consumption GNSS engine board.

It uses the chipset which can track up to 56 channels at a time and perform fast TTFF in weak signal environments.
YIC92217EB is suitable for the following applications:

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

Product Features:

- High performance and low power consumption GNSS 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
- One size component, easy to mount on another PCB board
- Support NMEA 0183 and ublox binary protocol

1.3 Product Specifications

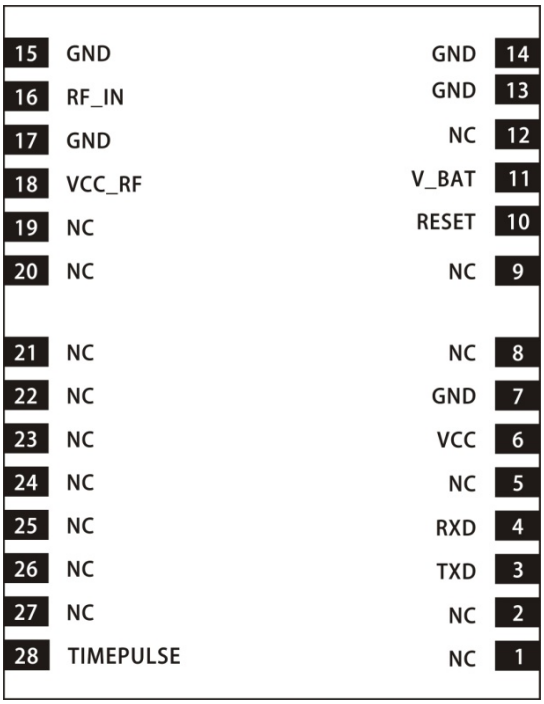
GPS Performance

GPS Receiver	
Frequency	L1 frequency band
Code	C/A Code
Protocol	NMEA 0183 v4.1 GALILEO L1 open service (with upgrade) Default:GGA,GSA,GSV,RMC Support:VTG,GLL,TXT ublox binary and NMEA Command
Available Baud Rate	9,600 bps
Channels	56
Sensitivity	Tracking:-161dBm Reacquisition:-160dBm ColdStart:-147dBm
Cold Start	29 seconds, average
Warm Start	28 seconds, average
Hot Start	1 second, average
Accuracy	HorizontalPosition:Autonomous<2.5maverage, SBAS < 2.0m average Velocity: 0.1 m/s Timepulse signal: RMS 30 ns
Maximum Altitude	50,000 meter
Maximum Velocity	515 m/s(1000 knots)
Dynamics	≦ 4G
Update Rate	4 Hz
A-GPS	AssistNow on-line and off-line
Interface	
I/O Pins	1 serial ports
Physical Characteristic	
Type	28 pin stamp holes
Dimensions	22.0mm * 17.0 mm * 2.4mm ±0.2mm

DC Characteristics	
Power Supply	3.3VDC ± 5%
Backup Voltage	1.8~3.6VDC
Power Consumption	Max Performance: Acquisition:49mA Tracking: 42mA Eco Mode: Acquisition:48mA Tracking:38mA Power Save Mode: 16mA
Environmental Range	
Humidity Range	5% to 95% non-condensing
Operation Temperature	-40℃ to 85℃
Storage Temperature	-40℃ to 85℃

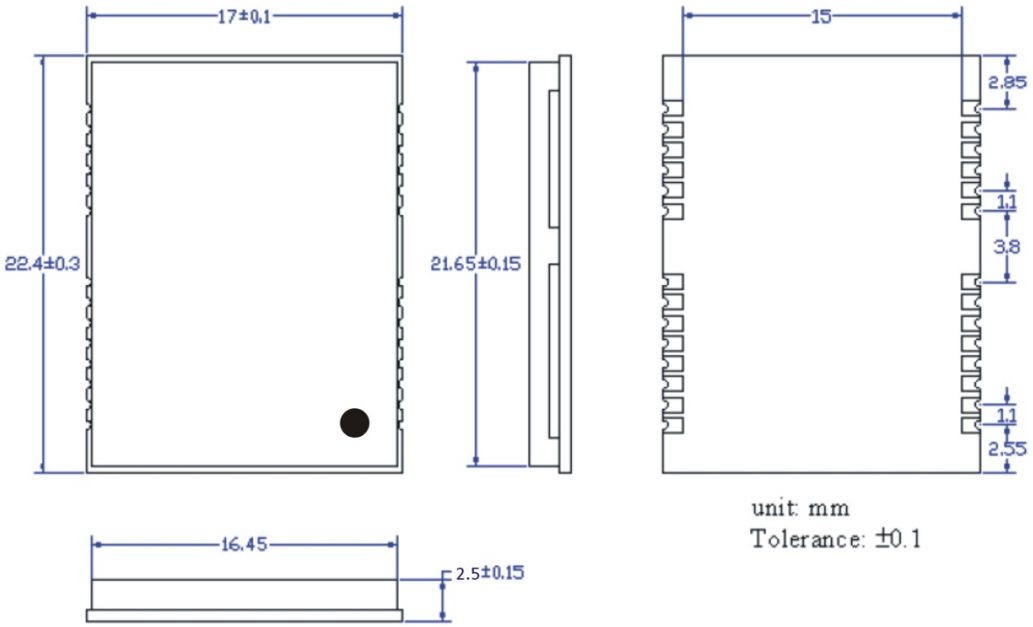
2. Technical Information

2.1 Module Pin Assignment



Pin No.	Pin Name	Description
1	NC	Not connected
2	NC	Not connected
3	TXD	UART_TX data transmit；1.8V or 3.3V Output
4	RXD	UART_RX data receiver；1.8V or 3.3 Input
5	NC	Not connected
6	VCC	3.3V power input;2.5V~3.5V Tolerant
7	GND	Ground
8	NC	Not connected
9	NC	Not connected
10	RESET	System Reset，and Low level is Enabled；Connected with Host GPIO or not be connected
11	V_BAT	3.3V power input;2.5V~3.5V Tolerant
12	NC	Not connected
13	GND	Ground
14	GND	Ground
15	GND	Ground
16	RF_IN	GNSS signal inputed in
17	GND	Ground
18	VCC_RF	Output Voltage RF
19	NC	Not connected
20	NC	Not connected
21	NC	Not connected
22	NC	Not connected
23	NC	Not connected
24	NC	Not connected
25	NC	Not connected
26	NC	Not connected
27	NC	Not connected
28	TIMEPULSE	One pulse per second.

2.2 Dimensions



3. Application guideline

Layout Rules

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

*** RF:**

This pin receives signal of GNSS analog via external active antenna .It has to be a controlled impedance trace at 50ohm.

Do not place the RF traces close to the other signal path and not routing it on the top layer. Keep the RF traces as short as possible.

*** Antenna:**

Keep the active antenna on the top of your system and confirm the antenna radiation pattern、axial ratio，power gain，noise figure，VSWR are correct when you Setup the antenna in your case.

Design Notes

VCC

This is the main power supply to the engine board. (3.3Vdc ± 5%)

GND

Ground pin for the baseband circuit.

RXD

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

TXD

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

Output TTL level, 0V ~ 2.85V

RF_IN

This pin receives signal of GNSS analog via external active antenna . It has to be a controlled impedance trace at 50ohm. Do not have RF traces closed the other signal path and routing it on the top layer.

Keep the RF traces as short as possible.

V_BAT

This is the battery backup power input for the SRAM and RTC when main power is removed. Typical, the current draw is 15uA. Without the external backup battery, the module/engine board will always execute a cold star after turning on. To achieve the faster start-up offered by a hot or warm start, a battery backup must be connected. The battery voltage should be between 1.8v and 3.6v.

Timepulse

1 pulse per second synchronized at rising edge pulse length 100ms.

4. NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a $ and with carriage return/line feed. GNSS specific messages all start with $GPxxx where xxx is a three-letter identifier of the message data that follows. NMEA messages have a checksum, which allows detection of corrupted data transfers.

YIC92217EB modules support the following NMEA-0183 messages: GGA, GLL,GSA, GSV, RMC and VTG.

Table 1: NMEA-0183 Output Messages

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 2 contains the values of the following example:

$GPGGA, 161229.487,3723.24751,N, 12158.34160,W, 1,07,1.0,9.0,M.0000*18

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.24571		ddmm.mmmmm
N/S indicator	N		N=north or S=south
Longitude	12158.34160		ddmm.mmmmm
E/W Indicator	W		E=east orW=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSLAltitude	9.0	meters	
Units	M	meters	
Geoids Separation		meters	
Units	M	meters	
Age of Diff.Corr.		second	Null fields when DGPS is not Used
Diff.Ref.Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message termination

Table 2-1: 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	GPS PPS Mode, fix valid

GLL-Geographic Position – Latitude/Longitude

Table 3 contains the values of the following example:

$GPGLL , 3723.24755, N,12158.34161,W,161229.487, A*2C.

Table 3: GLL Data Format

Name	Example	Units	Description
Message ID	$GPGLL		GLL protocol header
Latitude	3723.24755		Ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		ddmm.mmmmm
E/W Indicator	W		E=east orW=west
UTC Position	161229.487		Hhmmss.sss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR> <LF>			End of message temination

GSA-GNSS DOP and Active Satellites

Table 4 contains the values of the following example:

$GPGSA , A, 3, 07, 02, 26,27, 09, 04,15, , , , , , 1.8,1.0,1.5*33.

Table 4: GSA Data Format

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1
Satellite Used	02		Sv on Channel 2
…	…		…
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

Table 4-1: Mode 1

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

Table 4-2: Mode 2

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

GSV-GNSS Satellites in View

Table 5 contains the values of the following example:

$GPGSV , 2, 1, 07, 07, 79,048, 42, 02, 51,062, 43, 26, 36,256, 42, 27, 27, 138,42*71

$GPGSV, 2, 2, 07, 09, 23,313, 42, 04, 19, 159, 41, 15,12,041, 42*41.

Table 5: GGA Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Number of Message	2		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	79	degrees	Channel 1(Maximum 90)
Azinmuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
…			…
Satellite ID	27		Channel 4(Range 1 to 32)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<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 6 contains the values of the following example:

$GPRMC, 161229.487, A, 3723.24751, N, 12158.34161,W, 0.13,309.62, 120598,, *10

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTS Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.24751		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		Ddmm.mmmmm
E/W Indicator	W		E=east orW=west
Speed Over Ground	0.13	Knots	
Course Over	309.62	Degrees	True
Ground			
Date	120598		Dummy
Magnetic variation		Degrees	E=east or W=west
Checksum	*10		
<CR> <LF>			End of message termination

VTG-Course Over Ground and Ground Speed

Table 7 contains the values of the following example:

$GPVTG, 309.62, T, M, 0.13, N, 0.2, K*6E

Table 7: VTG Data Format

Name	Example	Units	Description
Message ID	$GPVTG		VTG protocol header
Course	309.62	Degrees	Measured heading
Reference	T		True
Course		Degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	Knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	K		Kilometer per hour
Date	*6E		
<CR> <LF>			End of message termination