Datasheet – GNSS Receiver BOB with IRNSS – PTNAVBOB-SK02ZV1Series

1 Features

- L1 / L5 signal reception supporting NavIC, GAGAN/ GPS satellites. Uses SkyTraQ module PX1125S-01
- Less than 33 second cold start TTFF.
- ~1 second hot start.
- ~2.5m CEP accuracy.
- Optional on-board "Patch antenna" or "External dual band GNSS antenna" for L1 and L5 bands. SMA (Jack), U.FL(Plug) interface for external antenna, if required.
- Works from external 5V±5%, ≤120mA DC input.
- Provision for RTC Battery (MS621FE-FL11E-not populated)
- Sensitivity

<-145dBm	for Cold-start
<-154dBm	for Hot-start
<-155dBm	for Re-acquisition
<-160dBm	for Tracking

2 Description

ParryTech "GNSS Receiver BOB with IRNSS", is a satellite navigation receiver break out board, capable of supporting band L5-NavIC and L1-GAGAN/GPS signals to provide 3D navigation. SkyTraQ chipset/module combined with best board level RF design and matched &tested antenna, offers superior cold start sensitivity that allows to acquire, track, and get position fix autonomously even in difficult and weak signal environments.

3 Advantages

- Less immune to surrounding materials due to proper ground plane and RF layout design.
- Optionally orderable external antenna with SMA connector which is tested for best overall system performance.
- Custom form factor board design and antenna matching for final product for mid and high volume can be offered as additional paid services.

4 Product ordering guide

Based on application requirements, User can order the various GNSS receivers with below requirement configurations.

- For different type of satellite constellations such as GPS /GAGAN NavIC.
- Internal (on-board patch)/external antenna.
- SMA (Jack) and U.FL (Plug) interface for external antenna.
- Single band/ Dual band (L1/L5 band).

Detailed ordering information can be found in **Product ordering guide**.

Purchase Notes:

- Separate BOB part number for deployment in any satellite bands can be supported. Reach out to us through our support email ID (estore-enquiry@parrytech.net) for any such requirement.

5 Applications

- Autonomous Vehicle guidance
- Photogrammetry
- UAVs
- Precision agriculture
- Robotics
- Automatic container movement

6 Simplified Block Diagram

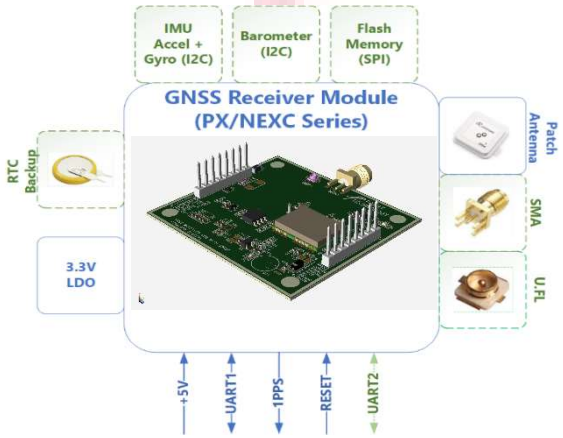

Figure 1: Block Diagram

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7 Specifications

RF Specifications		
Satellite constellations supported	L5 NavIC, L1 GPS/GAGAN	
Sensitivity	<-145/ -144dBm	GPS/ NavIC Cold start
	<-154/ -153dBm	GPS/ NavIC Hot start
	<-155/ -154dBm	GPS/ NavIC Re-acquisition
	<-160/ -156dBm	GPS/ NavIC Tracking
Accuracy	Position	2.5m CEP
	Time	12nsec
	Velocity	0.1m/sec
Start-up Time	~1sec hot start and ≤30sec cold start	
Update Rate	1 / 2 / 4 / 5 / 8 / 10 Hz, default 1Hz	
Dynamics	4G (39.2m/sec^2) acceleration	
Multi-path Mitigation	Multi-path detection and suppression	
A-GPS	7-day server-based AGPS, Self-aided ephemeris estimation	
Power Supply specifications		
Input voltage	5V±5%	
Input current	≤120mA	
Power Consumption	≤0.6W	
Digital Specifications		
Communication	UART communication; 3.3V LVTTL	
Speed	4800bps (Minimum) and 115200bps (Maximum)	
Software Specifications		
Protocol	NMEA-0183 V3.01, SkyTraq binary, 115200 baud, 8, N, 1	
Datum	Default WGS-84, User definable	
Dimension Specifications		
Dimension	(50 x 55 x 17.3) ±1mm	
Interface Specifications		
RF Interface	For external antenna: SMA (Jack) & U. FL(Plug)	
DC & Digital Interface	1x8 Header (Plug) – 2Nos	
Environmental Specifications		
Operating Temperature	-40°C to +85°C	
Storage Temperature	-55°C to +100°C	
Relative Humidity	5% to 95%	
Operational Limits	Altitude <18,000m or velocity < 515m/s, not exceeding both	

8 Detailed overview

The "GNSS Receiver BOB with IRNSS" is a satellite navigation receiver, capable of supporting L5 NavIC, L1 GAGAN/GPS signal to provide 3D navigation. The Size of the board is kept 50mm x 55mm to achieve good patch antenna performance. The main device of this BOB is **SkyTraQ** based receiver, which has 56 tracking channels and could track all in-view satellites. It is fully autonomous such that once power is applied, the receiver automatically searches, acquires, and tracks satellite signals. When enough satellites are tracked with valid measurements, the receiver produces 3D position and velocity outputs. NavIC + GPS/GAGAN capability enables using greater number of satellite signal than GPS-only receivers. The increased satellite number offers superior performance in challenging urban canyon and multipath environments. **The PX1125S-01** module contains single-chip Phoenix positioning engine inside, featuring high sensitivity, low power consumption, and fast TTFF (Time to First Fix). 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.

The GNSS Receiver BOB can be ordered with passive ceramic patch antenna, which is on-board antenna, is low-cost and provides good sensitivity. Usually, the ceramic patch antenna is mounted on opposite side of the PCB to reduce possibility of picking up digital noise. To improve signal reception performance and overall antenna gain, larger ground plane under the patch antenna has been given. For optimal NavIC+GAGAN/GPS operation, frequency bandwidth of the patch antenna covers 1174MHz to 1179MHz and 1573MHz to 1578MHz respectively when mounted on the PCB.

Product can be ordered with various options of on-board patch antenna, U. FL or SMA interface for external antenna. Refer **Product ordering guide** as per requirement.

9 Advantages of GNSS receiver BOB

- Proper ground plane and RF layout design.
- Suitable external antennas for best overall system performance.
- One BOB suitable for multiple requirements (GPS, NavIC).

10 Absolute Maximum Ratings

Parameter	Min	Max	Unit
Supply Voltage (Vin)		5.5	Volt
Backup Battery Voltage (V_BCKP)		3.6	Volt
Input V_{CC} to SkyTraQ receiver IC (V_{cc} 3.3V)		V_{cc}+0.5	Volt
Input Power at RF_IN		+5	dBm
Storage Temperature	-55	100	°C

Table 1: Absolute Maximum Ratings

Note: Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the module. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect module reliability.

11 Recommended Operating Conditions

Parameter	Min	Typ.	Max	Unit
Supply Voltage (Vin)	4.75	5.0	5.25	V
Acquisition Current (excluding active antenna current)		120		mA
Tracking Current (excluding active antenna current)		110		mA
Battery backup Voltage (V_BCKP)		3.3		V
Backup battery current (When V_{CC} available)			1	mA
Backup battery current (V_{CC} voltage off)			45	µA
I/O Output LOW Voltage			0.4	V
I/O Output HIGH Voltage	2.4			V
I/O Input LOW Voltage			0.8	V
I/O Input HIGH Voltage	2			V
I/O Input LOW Current	-10		10	uA
I/O Input HIGH Current	-10		10	uA
RF Input Impedance (RFIN)		50		ohms

Table 2: Operating conditions

12 GNSS Receiver BOB connector/ Interface Details

The J4 and J5 connectors along with pin number indication are shown by arrow in Figure **2**

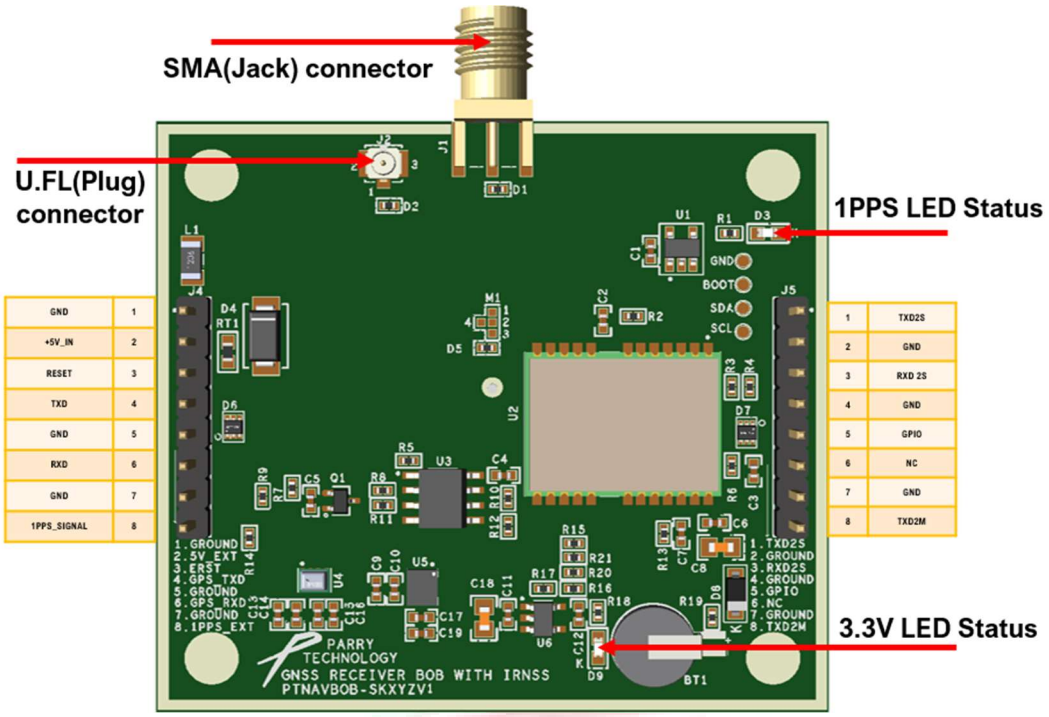

Figure 2: Pin1 indication for J4 and J5 interface

Pin	Name	Type	Voltage level	Description
1, 5, 7	GND	-	-	Ground
2	+5V_IN	Power supply Input	5V +/-0.25V	+5V DC input to the BOB
3	RESET	Digital Input	3.3V	External reset signal input to GNSS receiver BOB, Active high, 3.3V LVTTL.
4	TXD	Digital output	3.3V	UART serial data output from GNSS Receiver BOB, 3.3V LVTTL.
6	RXD	Digital Input	3.3V	UART serial data input to GNSS Receiver BOB, 3.3V LVTTL.
8	1PPS_SIGNAL	Digital Output	3.3V	Buffered One-pulse-per-second (1PPS) time mark output, 3.3V LVTTL.

Table 3: Connector J4 details

Pin	Name	Type	Voltage level	Description
1	TXD2S	Digital output	3.3V	Reserved
2, 4, 7	GND	-	-	Ground
3	RXD2S	Digital input	3.3V	Reserved
5	GPIO	Digital input/ output	3.3V	Reserved
6	NC	-		No Connect
8	TXD2M	Digital output	3.3V	Reserved

Table 4: Connector J5 details

13 Product ordering guide

Part Number: PTNAVBOB-SKXYZV1			
Variant	**Abbreviation**	**Module Part #**	**Description**
XY	00	S1216F8-GI3*	GNSS Simple Precision Receiver BOB for L1 GAGAN/GPS/GLONASS, L5 NavIC tracking, Venus 8 positioning engine
	01 07	PX1120S* PT100-0S *	GNSS Simple Precision Receiver BOB for L1 GPS/BeiDou/Galileo/GLONASS tracking, Phoenix positioning engine.
	02 08	**PX1125S-01** PT100-0D *	**GNSS Simple Precision Receiver BOB for L1 GPS/GAGAN, L5 NavIC tracking, Phoenix positioning engine.**
	03 09	PX1120D * PT100-2R *	GNSS Dead Reckoning Receiver BOB for L1 GPS/BeiDou/Galileo/GLONASS tracking, integrated Accel, Gyro, Barometric sensors, Phoenix positioning engine.
	04 10	PX1125D-01 * PT100-5S*	GNSS Dead Reckoning Receiver BOB for L1 GPS/GAGAN, L5 NavIC tracking, external Accel, Gyro, Barometric sensors, Phoenix positioning engine.
	05 11	PX1122C * PT100-5D *	GNSS Carrier Phase Measurement Receiver BOB for L1/L2C GPS/QZSS, L1/L2 GLONASS, B1I/B2I BeiDou, GalileoE1/E5b tracking, Phoenix positioning engine
	06 12	PX1122R * PT100-2C *	GNSS RTK Receiver BOB for L1/L2C GPS/QZSS, L1/L2 GLONASS, B1I/B2I BeiDou, GalileoE1/E5b tracking, Phoenix positioning engine
Z	0	Patch Antenna	Patch Antenna on BOB
	1	U.FL*	U.FL interface in BOB for external passive antenna
	2	SMA	SMA interface in BOB for external passive antenna

Table *5: Product ordering guide table*

Part numbers available for sale:

PTNAVBOB-SK022V1 – BOB with SMA connector for external antenna [External antenna to be purchased separate]

PTNAVBOB-SK020V1 – BOB with onboard dual band patch antenna

Note: * Request for availability through e-mail estore-enquiry@parrytech.net

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