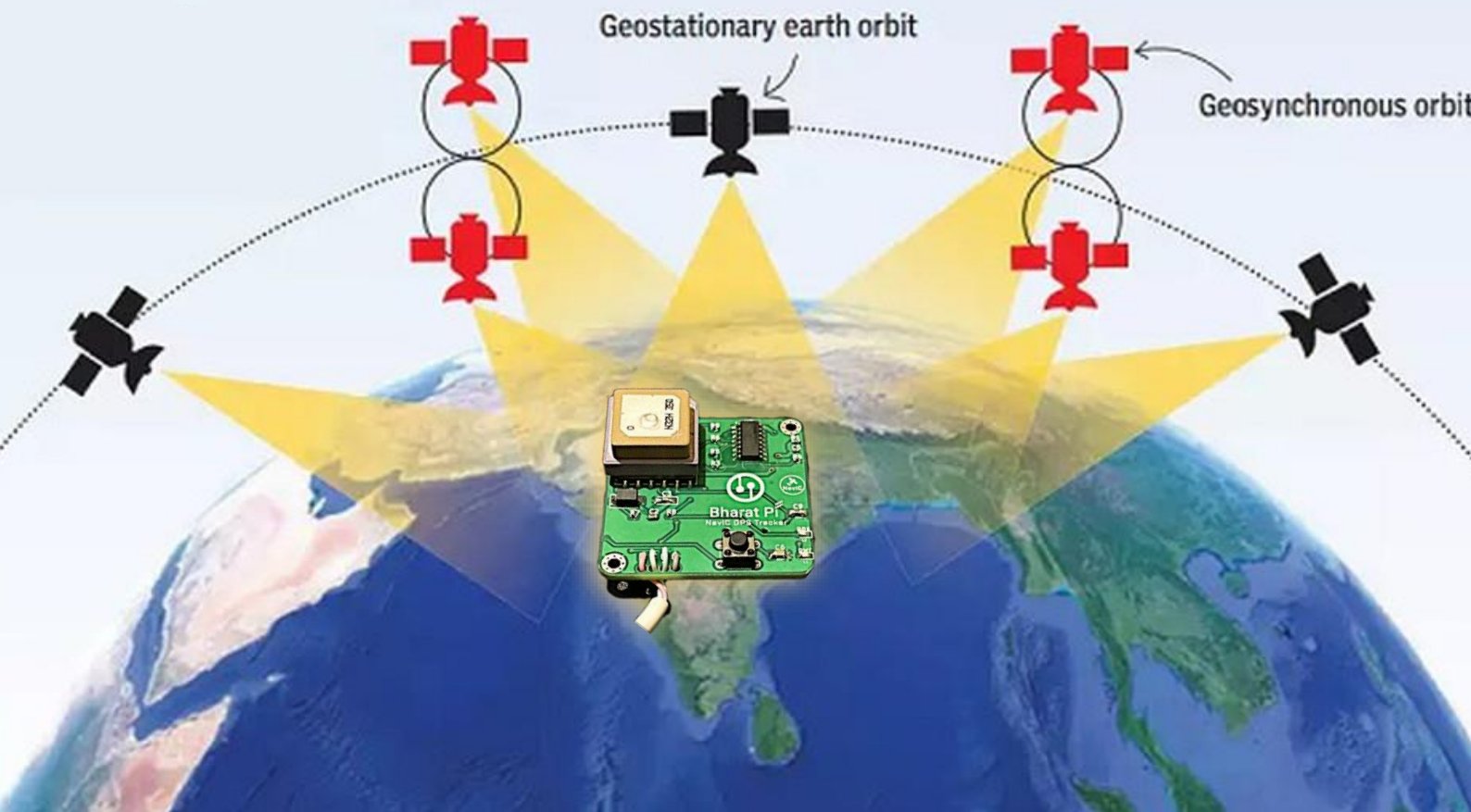


Bharat Pi – NavIC

NavIC GPS Tracker – USB Module



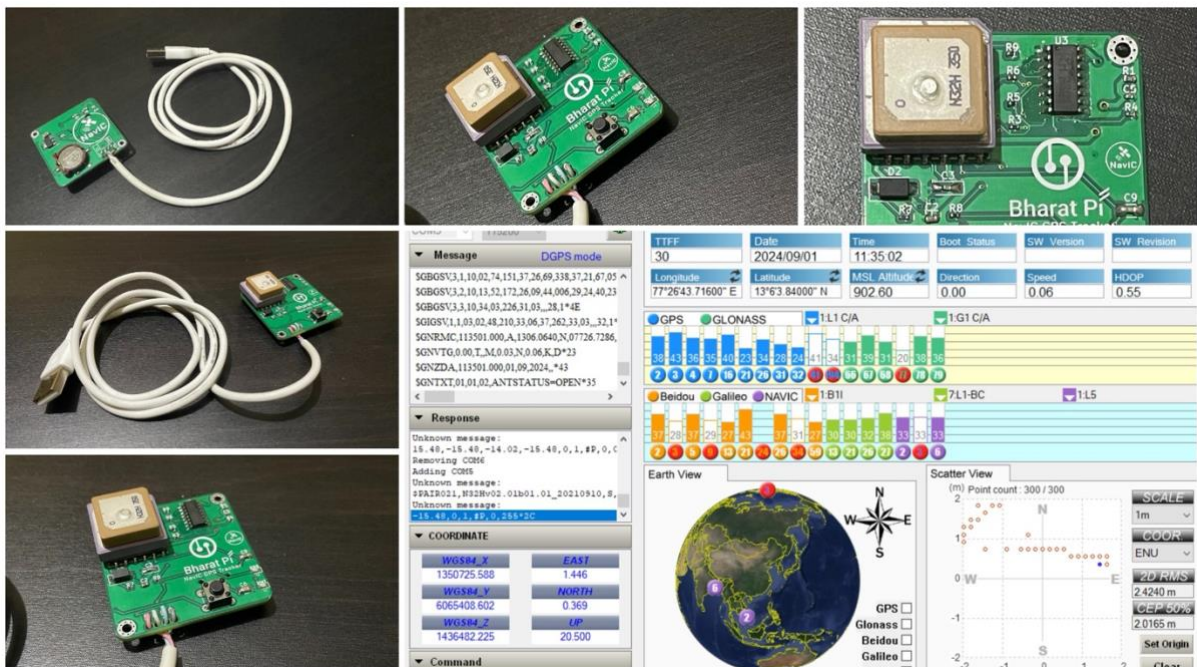
Introduction

The Indian Regional Navigation Satellite System (IRNSS), with an operational name of NavIC (acronym for Navigation with Indian Constellation; also, nāvīk 'sailor' or 'navigator' in Indian languages), is an autonomous regional satellite navigation system that provides accurate real-time positioning and timing services. It covers India and a region extending 1,500 km (930 mi) around it, with plans for further extension. The system currently consists of a constellation of eight satellites, with two additional satellites on ground as stand-by.

NavIC Module

Bharat Pi NavIC module is designed in a way to simplify development of live tracking/navigation devices and applications based on NavIC satellites. The module used is built for an India's AIS-140 market needs with 2m CEP accuracy.

The module is capable of using NavIC L5, GAGAN L1, and GPS L1 signal to provide 3D navigation in a single compact SMD module. It can track all in-view GPS, GAGAN and NavIC 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 dual-satellite 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 module contains single-chip Phoenix positioning engine inside, featuring high sensitivity and fast TTFF (Time to First Fix). It can acquire, track, and get position fix autonomously in difficult weak signal environment. Its high 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.



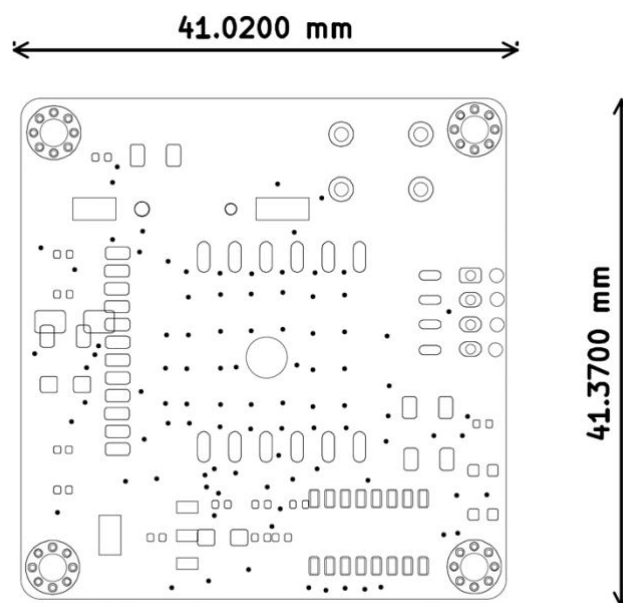
Key Features

- 1 GNSS receiver, supports QZSS, EPO™, EASY™
- 2 153 tracking/153 acquisition-channel
- 3 12 multi-tone active interference cancellers and jamming elimination
- 4 Indoor and outdoor multi-path detection and compensation
- 5 Maximum NMEA update rate up to 10Hz (w/o adding), 5Hz (with adding)
- 6 Pulse-per-second (PPS) GNSS time reference
 - 1 Adjustable duty cycle
 - 2 typical accuracy: ± 10 ns
- 7 Interface
 - UART
- 8 Operating temperature: $-40 \sim +85^{\circ}\text{C}$
- 9 Accuracy 2.5m CEP@-130dBm, RoHS compliant.

The module provides complete signal processing from antenna input to host port in either NMEA messages. The module requires 3.2V~5.0V power supply. The host port is configurable to UART.

Board Dimensions

The board measures 41mm x 41.3mm with a thickness of 1.6mm. The overall height dimension of the board is shown as below.



Technical Specifications

Receiver Type	40 tracking/96 acquisition-channel GNSS receiver
Accuracy	Position – 2.5m CEP Velocity – 0.1m/sec Time – 10nsec
Startup Time	~1sec hot start < 32sec cold start ~30s warm starts
Sensitivity	Tracking : -166 dBm Reacquisition : -160 dBm Autonomous acquisition : -148 dBm
Accuracy	Horizontal Position : ~2.5m Velocity Accuracy: ~0.1m/s Acceleration Accuracy: ~0.1m/s Timing Accuracy: ~10ns
Dynamics	Maximum altitude: 18000m Maximum velocity: 514m/s Maximum Acceleration: 4G
Serial Interface	3.3V LVTTTL level UART, selectable 4800 ~ 115200 baud rate
Protocol	NMEA:8 bits, no parity, 1 stop bit,115200bps
Input Voltage	3.3V DC +/-10%
Current Consumption	21.0mA acquisition, 18.9mA tracking 62uA Rtc mode(sleep), 67uA Backup current
Dimension	39.4mm W x 41.0mm L x 2.9mm H
Operating Temperature	-40°C ~ +85°C
Storage Temperature	-45°C ~ +90°C
Humidity	5% ~ 45%
GNSS signal level	-130dBm
Host port	UART
Supply voltage VCC	+3.2V~5.0V
Supply voltage ripple VCC	54 mV(RMS) max @ f = 0~3MHz 15 mV(RMS) max @ f > 3MHz
I/O output sink/source capability	+/-3mA max
I/O input leakage	+/-10uA max

Parameters		Value
Supply voltage VCC		+3.2V~5.0V
Supply voltage ripple VCC		54 mV(RMS) max @ f = 0~3MHz 15 mV(RMS) max @ f > 3 MHz
Storage temperature		-45°C~+90°C
Operating temperature		-40°C~+85°C (note 1)
I/O signal levels	V _{IL}	-0.3V~0.8V
	V _{IH}	2.0V~3.6V
	V _{OL}	-0.3V~0.4V
	V _{OH}	2.4V~3.1V
I/O output sink/source capability		+/- 3mA max
I/O input leakage		+/- 10uA max
Host port		UART
Serial port protocol (UART)		NMEA:8 bits, no parity, 1 stop bit, 115200 bps
TIMEMARK output (1PPS)		1 pulse per second, synchronized at rising edge, pulse length 100ms

Note: Operation in the temperature range -40°C~-30°C is allowed but Time-to-First-Fix performance and tracking sensitivity may be degraded.

Operating Mode

Mode	VCC	V_BCKP	Internal LDO	Main Clock	RTC Clock
Full on	on	on	on	on	on
Standby	on	on	off	off	on
Backup	off	on	off	off	on

Power supply and clock state according to operation mode

Full on Mode

The module will enter full on mode after first power up with factory configuration settings. Power consumption will vary depending on the amount of satellite acquisitions and number of satellites in track.

Standby Mode

Standby mode means a low quiescent power state, non-volatile RTC, and backup RAM block is powered on. Other internal blocks like digital baseband and RF are internally powered off. The power supply input VCC shall be kept active all the time, even during standby mode.

Entering standby mode is sent using PMTK command "\$PMTK161,0*28" through the communication interface by host side. Waking up from standby mode is sent any byte through the communication interface by host side.

Backup Mode

Power source (such as battery or cap) connected to V_BCKP pin will help the chipset in keeping its internal RTC running when the VCC power source is turned off. The voltage should be kept between 1.6~4.3V, Typical 3.0V.

The V_BCKP power should be kept active all the time, the module will perform a quick start every time it is power-on.

Entering into standby mode is sent PMTK command "\$PMTK225,4*2F" and keep FORCE_ON low. The only way to wake up the module is pulling the FORCE_ON high.

Absolute Maximum Ratings

Parameter	Min	Max	Unit
VCC		5.0	V
Input Power at GNSS_ANT		-12	dBm
V_BCKP		4.3	V
I/O pin voltage		3.6	V
Storage temperature	-40	+85	°C
Operating Temperature	-40	+85	°C

Absolute maximum ratings

UART Interface

The interface for serial communication of N32Hseries is UART. The UART is as NMEA output and PMTK command input. The receiver (RX) and transmitter (TX) side of every

port contains a 16-byte FIFO. UART can provide the developers signal or message outputs. The default baud rate is 115200bps.

RESET Input

The RESET pin (active low) is used to reset the system, normally external control of RESET is not necessary. The signal can be left floating, if not used.

When RESET signal is used, it will force volatile RAM data loss. Note that Non-Volatile backup RAM content is not cleared and thus fast TTF is possible. The input has internal pull up.

1PPS Output

The 1PPS pin outputs one pulse-per-second (1PPS) pulse signal for precise timing purposes. The 1PPS signal can be provided through designated output pin for many external applications. This pulse is not only limited to be active every second but also allowed to set the required duration frequency, and active high/low by programming user-defined settings.

GNSS Antenna

N32H series has integrated a internal GNSS antenna, which is a passive patch antenna. Patch antenna size is 18.4*18.4*4mm.

Recommended Operating Conditions

Parameter	Symbol	Min	Type	Max	Unit
Operating temperature range		-40	+25	+85	°C
Main supply voltage	VCC	3.2	3.3	5.0	V
Backup battery voltage	V_BCKP	1.6	3	4.3	V

Parameter	Symbol	Min	Type	Max	Unit
Low level output voltage Test conditions $I_{OL} = 2\text{mA}$ and 4.0mA	V_{OL}	-0.3		0.40	V
High level output voltage Test conditions $I_{OL} = 2\text{mA}$ and 4.0mA	V_{OH}	2.4	2.8	3.1	V
Low level input voltage	V_{IL}	-0.3		0.8	V
High level input voltage	V_{IH}	2.0		3.6	V
Input Pull-up resistance	R_{PU}	40		190	$K\Omega$
Input Pull-down resistance	R_{PD}	40		190	$K\Omega$
Input capacitance	C_{IN}		5		pF
Load capacitance	C_{load}			8	pF
Tri-state leakage current	I_{OZ}	-10		10	μA

Series operating conditions