



Navika-131
High Performance GPS-SBAS Antenna
Module

Datasheet

Document History

SI No.	Version	Changed By	Changed On	Change Description
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Introduction

Navika-131 is a passive antenna based GPS-SBAS module. Providing a total of 32 acquisition and tracking channels, Navika-131 provides the highest performance even under challenging environments. The module can be easily integrated into the application platform through an interface connector.

This document provides detailed information on Navika-131 and is organized into the following chapters –

Chapter 1	Product Description	Describes – <ul style="list-style-type: none"> • Product description • Block diagram • Features
Chapter 2	Hardware Details	Describes – <ul style="list-style-type: none"> • Mechanical details • Pinouts • Recommended and application circuits
Chapter 3	Specifications	Describes – <ul style="list-style-type: none"> • Performance specification • Electrical specification • Environmental specification • Qualification and certification
Chapter 4	Assembly Instructions	Describes – <ul style="list-style-type: none"> • Packaging • Shipment • Storage • Handling • Soldering • Testing
Chapter 5	Ordering Information	Describes – <ul style="list-style-type: none"> • Ordering

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Scope

The scope of this document is to present the salient features of Navika-131 GPS-SBAS application platform. It in no way implies that the information shared is recommended for the end application. The schematic and BOM is shared for the basis of providing information about the hardware circuitry. It in no way recommends the use of identical circuit and / or components in the customer application hardware.

Audience

The audience for this document is hardware and application engineers who would be interested in using Navika-131 in their end applications.

Support

Support for Navika-131 is available through the following ways –

- Email questions to
 - Gnss_faq@navikaelectronics.com
- Phone questions to
 - +91-80-25350105 extn 233
- Fax questions to
 - +91-80-25352723
- Snail mail questions to
 - Navika Electronics
 - 37, Krishna Reddy Colony,

Domlur Layout
Bangalore – 560071
INDIA

Related Documents

In addition, a system integrator would need to refer to additional resources to gain complete information about Navika-131 hardware and software features.

These are listed below –

Resource	Description	Availability
Navika GNSS Message Details	The message details contains the list of input and output messages supported by the GPS firmware when running on Navika-131	www.navika-electronics.com

Chapter 1: Product Description

Overview

Navika-131 is a passive antenna based GPS-SBAS module. It is a self-contained module which can be easily integrated onto application hardware through a simple interface connector.

Navika-131 integrates a GPS module and a passive patch antenna on a space saving PCB of size 35mm x 35mm x 8.3mm. The interface connector allows powering the device. It also allows access to the UART port of the module. For applications that require a precise time output, 1PPS pulse is also brought to the connector.

Navika-131 is a high performance module with key performance figures such as 2-3s Hot start TTFF, -162dBm Tracking Sensitivity, Position accuracy of 2.5m and all-in-view positioning. Navika-131 is ideally suited for applications that demand superior performance from the GPS sensor.

Navika-131 can be considered for a variety of applications ranging from vehicle and asset tracking, radio sonde, time synchronization, buoys, navigation etc.

Block Diagram

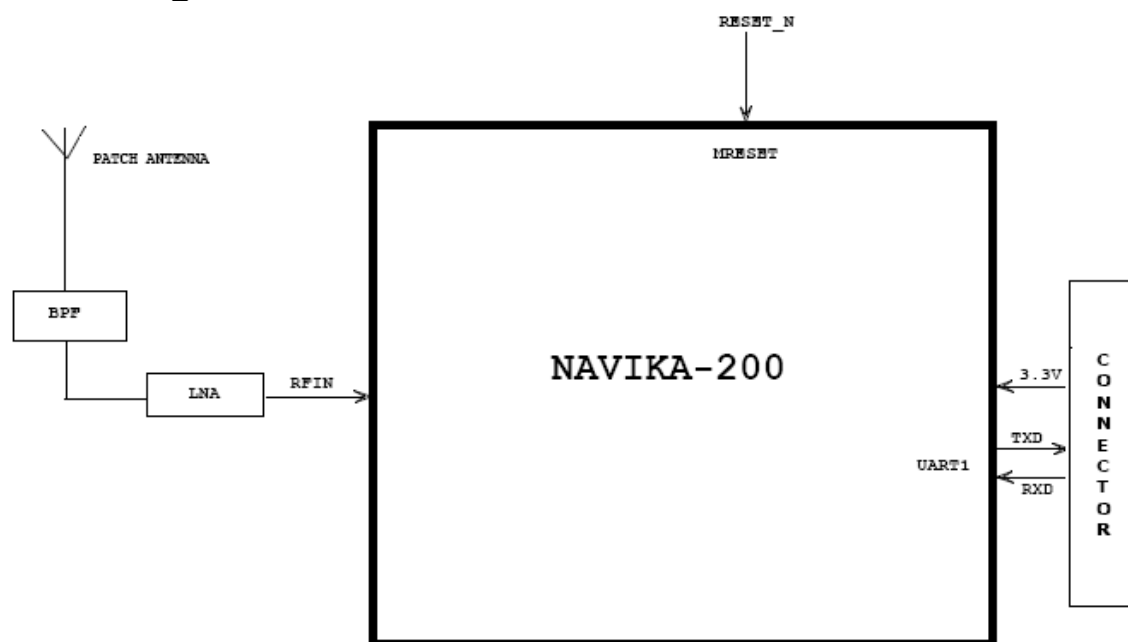


Figure 1: Block Diagram of Navika-131

Chapter 2: Hardware Details

This chapter describes the mechanical details, pin outs and recommended circuits to use Navika-131 module and its hardware interfaces.

Navika-131 Image



Figure 2: Navika-131 top and bottom image

Mechanical Details

Navika-131 is a 35mm x 35mm x 8.3mm GPS-SBAS module. The mechanical details are shown in the figure below.

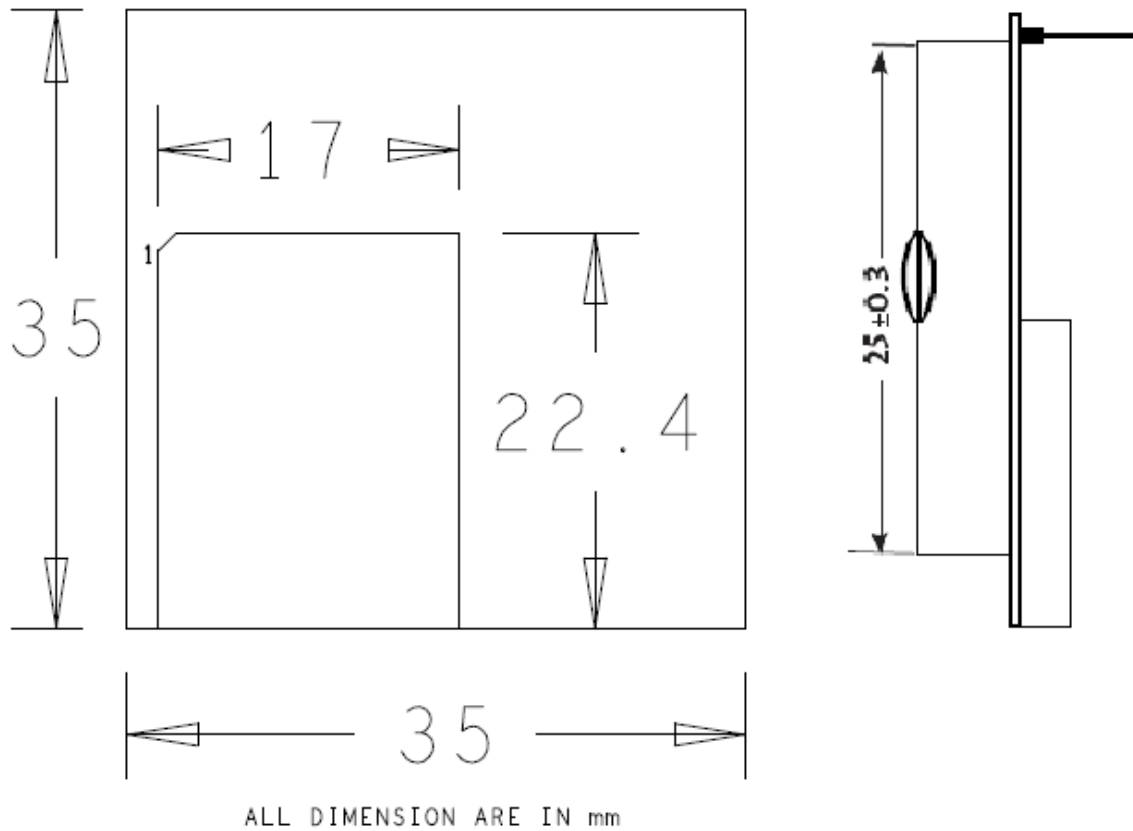


Figure 3: Navika-131 Package outline and dimensions

Interface Connector Details

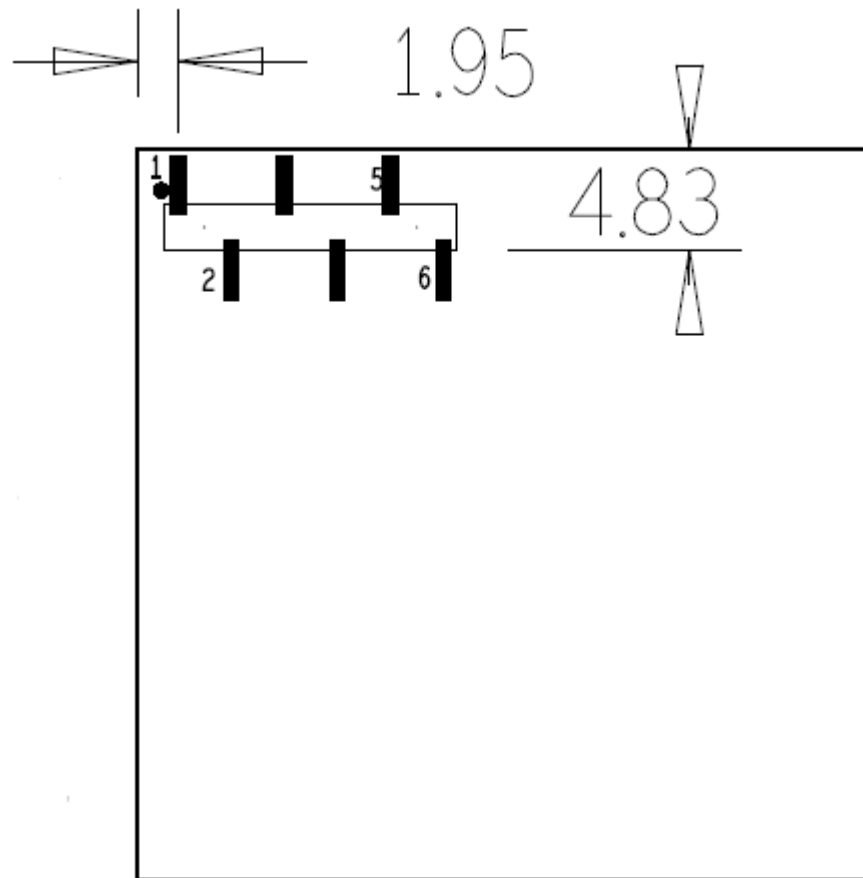


Figure 4: Navika-131 Pin outs

The table below provides the pin definition and the description / specification of each pin.

Pin Number	Pin Name	Input / Output	Description	Pull up /Pull down / Comments
1	GND		Ground	
2	1PPS		Precise one second pulse	
3	DVCC_3V3		Power supply input for the entire module	See Power Supply section for more details
4	UART_RXD	I	UART Receive	Pull up
5	UART_TXD	O	UART Transmit	
6	VBat_3V0		Battery backed supply for hot start performance	

Table 1: Navika-131 pin details and recommended terminations

Key Hardware Blocks

This section describes the key hardware blocks and interfaces of Navika-131. The block diagram shown in Figure 1 earlier is a good starting point to understand Navika-131 hardware architecture. As seen, the core building blocks of Navika-131 are the GPS section, Antenna section, Battery section and Interface section.

GPS Section

Navika-131 uses a high performance GPS-SBAS module from Navika Electronics. This is a 17mm x 22.4 x 3.3mm module with 32 channels for acquisition and tracking.

The key specifications of the GPS-SBAS module are tabulated below.

Parameter	Specification
General	
Channels	32 16 Acquisition, 16 Tracking
Signals supported	GPS L1 C/A SBAS (WAAS, EGNOS, GAGAN, MSAS)
Sensitivity (as referenced to the output of a GPS simulator)	
Acquisition Sensitivity (with active antenna with noise temperature of 100K)	-158 dBm (Hot start, 1SV @ -143 dBm) -148 dBm (Cold start) -160 dBm (Reacquisition)
Tracking Sensitivity (with active antenna with noise temperature of 100K)	-162 dBm
TTF	
Hot Start TTF (with valid ephemeris, almanac, position and time estimate)	2-3 sec (typical) switch OFF/ON cycle less than 1 hour
Warm Start TTF (with almanac, position and time estimate)	30 sec (typical)
Cold Start TTF (without almanac, time, or position)	35 sec (typical)
Accuracy	
Position Accuracy (Open sky, C/N0 of 40dB-Hz or higher, HDOP < 2, VDOP < 3)	2.5 m (CEP, without SBAS) 2.0 m (CEP, with SBAS)
Velocity Accuracy	Speed: 0.1 m/sec (RMS) Heading: 0.5 degrees

1PPS Accuracy (Open sky, C/N0 of 40dB-Hz or higher, HDOP < 2, VDOP < 3)	25ns (RMS)
Dynamics	
Dynamics	Velocity: 515 m/s Acceleration: 4g Jerk: 7 m/s ³
Altitude	Altitude support up to 50km
GPS Data output	
Position Update Rate	1Hz

Table 2: Specifications of the Navika-131 module

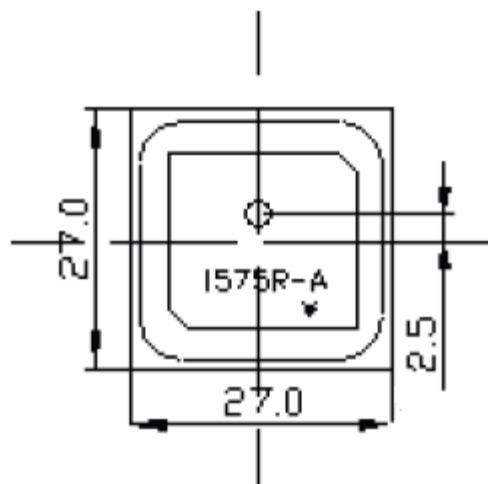
Antenna Section

Navika-131 uses a passive patch antenna of size 25mm x 25mm x 4mm.

The key specifications of the antenna are tabulated below.

Parameter	Specification
Receiving Frequency Range	1575.42MHz +/- 1.023MHz
Center Frequency @ -10dB bandwidth	1573.0 +/- 2MHz
-10dB Bandwidth	8MHz
Gain (Zenith @ 90°)	4.5dBic
VSWR at Center Frequency	2.3
Polarization	RHCP

Table 3: Antenna specifications



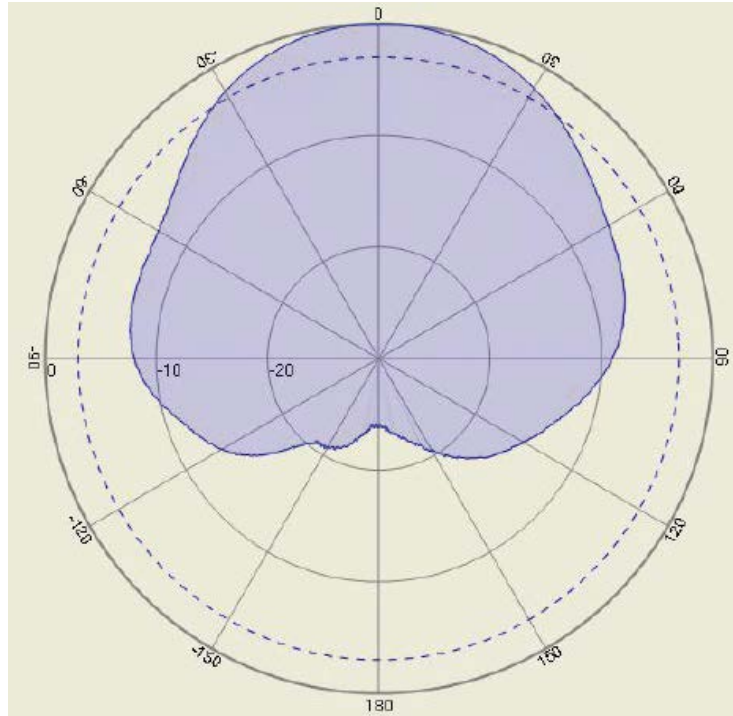


Figure 5: Antenna dimension and radiation pattern

Battery Section

Navika-131 supports a backup battery with which the module can provide Hot and Warm start performance. There is no need to provide this voltage from external source.

The specifications of the battery are provided in the Power Supply section.

Power Supply

Navika-131 operates on two power domains as listed and described below.

Signal / Power name	Connection Detail
DVCC_3V3	3.3V +/- 5%, 100mA This is the mains supply to the Navika-131 module which is supplied through the interface connector of the module. Have decoupling capacitors as close as possible to the module. Typical values could be 1uF, 0.01uF, 10pF.
VBAT_3V0	3.0V, 20uA This is the supply to the battery backed domain of

	Navika-131 module which is on-board. Have decoupling capacitors as close as possible to the module. Typical values could be 0.01uF, 10pF.
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Table 4: Power supply specifications

Chapter 3: Specifications

This chapter lists the specifications of Navika-131 module. The electrical and environmental specifications are listed in this chapter.

Electrical Specifications

Absolute Maximum Ratings

- Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the module. This is a stress rating only; functional operation of the module at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect module reliability.

Parameter	Rating
DVCC_3V3 (Mains Power Supply)	3.6 V
Input pins	3.6 V
Current	100 mA
Load capacitance	20pF
Storage temperature	-40 C to +85 C
Operating temperature	-30 C to +85 C

Table 5: Absolute maximum ratings of Navika-131

Operating Conditions

- The operating conditions are stated for an ambient temperature of 25 C

Parameter	Condition	Min	Typ	Max	Unit
DVCC_3V3		3.135	3.3	3.465	V
V _{IH}	All peripheral pins	1.6		2.8	V
V _{IL}	All peripheral pins	-0.3		0.7	V
V _{OH}	All peripheral pins	1.7	1.8		V
V _{OL}	All peripheral pins		0.2	0.7	V
I _{OH} @ V _{OH} = 1.7V	All peripheral pins	7.5	12.3	18.2	mA
I _{OH} @ V _{OL} = 0.7V	All peripheral pins	5.8	9.3	12.9	mA
I _{VCC} @ 3.3 V			67	85	mA
Input capacitance			10		pF
Output Capacitance			20		pF

Table 6: Operating conditions of Navika-131

Environmental Specifications

Parameter	Condition	Min	Typ	Max	Unit
Operating Temperature		-30	25	+85	°C
Storage Temperature		-40	25	+85	°C

Table 7: Environmental Specifications of Navika-131

Chapter 4: Assembly Instructions

Packaging and Shipment

Navika-131 are packed in hermetically sealed reels to enable machine assembly and shipped in Tape and Reel format.

Storage

As Navika-131 modules are moisture sensitive, appropriate precaution during assembly should be taken.

Handling

Navika-131 module contains components that are ESD sensitive and require special care when handling. Below are a few precautions that will have to be exercised to ensure ESD protection.

- Use ESD-safe equipment for mounting where applicable
- Use ESD-safe soldering station when soldering interface cables to the module (when not supplied with connector)

Soldering

In cases where the module is supplied without the interface connector (upon specific customer instruction), it is recommended to follow the below manual soldering procedure to solder interface cable on the pads.

Use AWG29 Wire for soldering onto the pads. The pad dimensions are 2.8mm x 0.7mm. Strip the wire and tin if required. Place the end of the wire on the pad on the Navika-131 module. The length of the stripped end of the wire should be at least 2 times the width of the pad. Apply a small amount of liquid flux to the overlap joint. Lap solder the wire to the pad and make sure that the wire is properly aligned. Clean the area. If required, the wire can be bonded to the PCB surface using adhesive, epoxy or tape dots. If epoxy is applied, it is important to cure the epoxy. Also examine the material used for bonding keeping in mind the operating temperature requirements.

Testing

GPS

To validate the performance of the Navika-131 module, it is recommended to test the module under open sky conditions.

The UART output from the Navika-131 can be connected to a user interface software (PC application) and the C/N0 of the GPS satellite(s) can be observed. The module outputs NMEA 0183 sentences of which the GSV string carries the C/N0 of the GPS satellites.

Typically, under open sky conditions, the C/N0 of the satellite(s) should vary from about 35dB-Hz to 45dB-Hz.

Chapter 5: Ordering Information

NAVIKA-131 can be ordered against the information mentioned below –

Ordering part number	Description
NAVIKA-131	GPS-SBAS passive antenna module