

# Navika-Exd – Fleet Management Platform with integrated GPS



## Features

- ◆ ARM7 processing core at 90MHz
- ◆ Integrated, high performance GPS engine
  - 16 parallel GPS channels for Acquisition and Tracking
  - Capable of indoor positioning
  - Extremely fast fix times
- ◆ 2Mbits of internal SRAM for applications
- ◆ Rich set of peripheral support
  - USB 2.0 Full-speed
  - CAN 2.0 Controller
  - SPI with upto 7 slaves
  - Serial Port with I2S support
  - Two Wire Interface (I2C)
  - Sixteen GPIO
  - Three Timers
- ◆ Multiple boot modes
- ◆ 1" x 1.5" form-factor
- ◆ Single 3.3V input supply



Figure 1. Navika-Exd

## Product Description

The Navika-Exd is a 1"x1.5" module catering to applications that demand high performance from a GPS module at an extremely small form-factor.

The Navika-Exd makes use of Accord's AST-GPSRF RF front end and AST-230 SoC.

The AST-GPSRF is a miniature GPS RF Front end designed for GPS C/A and Galileo OS band receivers. The RF chip has an in-built low noise amplifier (LNA), single down conversion stage, automatic gain controlled amplifier (AGC), on-chip IF band pass filter and a 2-bit analog-to-digital converter (ADC).

In addition, the chip has in-built protection/detection circuitry for accidental short/open of the GPS antenna.

The AST-230 is a revolutionary digital integrated circuit that combines a high performance GPS Correlator, ARM7 core and a host of rich peripherals. This System On Chip (SoC) delivers unmatched performance in conjunction with the AST-GPSRF.

The GPS Correlator executes 16 channels of acquisition and tracking on GPS signals. With a large number of internal Correlator blocks, the AST-230 is able to detect the weakest of signals in very short time frames, thereby delivering positioning data in the blink of an eye.

The ARM7 core runs at 90 MHz and interfaces with several industry standard peripherals on AHB/APB bus. With an on-chip 2Mbit SRAM, running applications on the AST-230 is a cinch. Further, about 30 MIPS are available on the ARM7 to run user applications

The AST-230 provides plenty of peripherals ranging from USB 2.0 OTG with Full Speed, CAN 2.0 controller, SPORT, SPI, TWI, Timers, Timing block, GPIO and Battery backed counter/RTC.



## Navika-Exd Module Details

The Navika-Exd brings out some of the essential peripherals for host interface such as SPI port, TWI port, two UART ports, USB port and GPIO's.

The Navika-Exd is targeted for applications that require positioning and/or timing outputs. In addition to the user co-ordinates, Navika-Exd is capable of delivering unmatched timing accuracy. Typical applications where Navika-Exd could be integrated are –

- ◆ Vehicle tracking
- ◆ Security
- ◆ Geo-tagging
- ◆ Wireless base-stations

The Navika-Exd is a 1"x1.5" sized GPS system on board. It requires a single 3.3V supply and a 1.2V battery feed that would enable the user to fully exploit all its features.

The module has been designed keeping all components on one side of the PCB and provides SMD pads at the bottom for electrical and mechanical connectivity.

The connection details and the mechanical information are provided below.

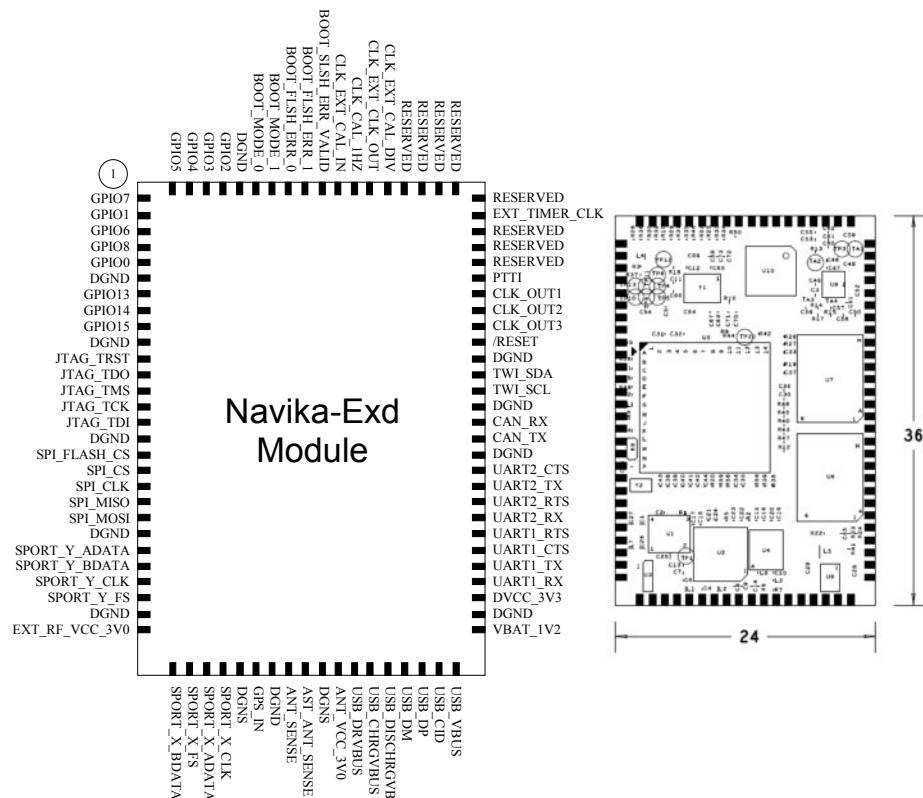


Figure 2: Navika-Exd Pinouts and Mechanical Details



## Navika-Exd – Connection Diagram

In order to build a complete GPS receiver using the module, all it takes are a few connections. The diagram below depicts the interconnections to be done in order to use the Navika-Exd.

1. Connect a 50Ω trace between the RF\_IN pad and the antenna connector
2. Connect a 20Ω, 1W resistor between the ANT\_SENSE and ANT\_VCC\_3V pads. This is required to sense a short circuit on the antenna power line as well as to protect the power-ground short circuit
3. An active low power ON reset of at least 25ms should be provided on the /RESET pad
4. The host communication can be tapped at the UART1\_RXD and UART1\_TXD lines
5. Since the AST-230 supports multiple boot modes, it is necessary to set the boot mode to boot from NOR flash. This can be done by properly terminating the BOOT\_MODE\_0 and BOOT\_MODE\_1 lines
6. Mains power of 3.3V +/- 5% should be applied at DVCC\_3V3 pad. The maximum current draw of the board would be about 50mA (excluding antenna current). It is recommended to mount a decoupling capacitor of 1uF close to the DVCC\_3V3 pad
7. A backup battery of 1.2V should be applied at VBAT\_1V2 pad. The recharge circuitry (in case of a rechargeable battery) should be provisioned on the motherboard

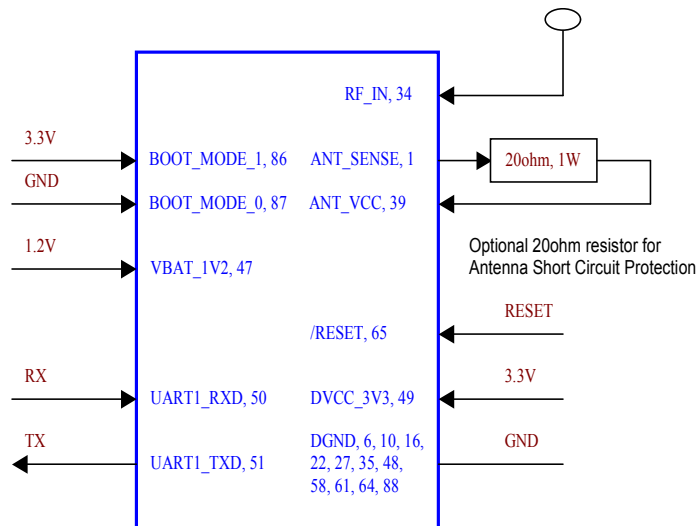


Figure 3. Circuit Interconnection using Navika-Exd module

# Specifications of Navika-Exd Module

## Processor

Processor core	ARM7-TDMI
Instruction speed	90MHz
Host bus clock speed	45MHz (max)
Peripheral clock speed	22.5MHz (max)

## GPS System Specifications

Channels	16 Acquisition, 16 Tracking
Acquisition Sensitivity	-155dBm (Hot start, 1SV @ -144dBm) -160dBm (Reacquisition)
Tracking Sensitivity	-160dBm
Hot Start TTFF (with valid ephemeris, almanac, position and time estimate)	1 sec (typical) switch OFF/ON cycle less than 1 hour
Warm Start TTFF (with almanac, position and time estimate)	35 sec (typical)
Cold Start TTFF (without almanac, time, or position)	40 sec (typical)
Position Accuracy	10 m (90% without S/A)
Velocity Accuracy	0.1 m/sec (90% without S/A)
1PPS Accuracy	+/- 12ns (2 $\sigma$ without errors)

## Memory

Internal Memory	2Mbits SRAM
Battery Backed	32Kbits SRAM
Expansion	External SRAM / Serial Flash

## SPI

Configuration	CS, CLK, MOSI, MISO
Clock	22.5MHz
Slave selects	Upto 7

## TWI

Configuration	SDA, SCLK
Data transfer	400Kbits / sec

## UART

Configuration	TX, RX (2 sets)
Baud Rate	Up to 1Mbps
Message Formats	5, 6, 8 data bits, even / odd parity

## USB

Configuration	Full-Speed DM, DP, VBUS
Functionality	Device
Endpoints	Control endpoint: 1 RX endpoints: 7 TX endpoints: 7

## GPIO

Configuration	Upto 16 GPIO (multiplexed with SPI Slave selects)
Features	Independently programmable as input or output Capable of detecting external edge / level sensitive interrupts

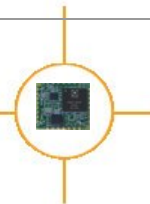
## Others

Antenna Sense	AST-400 can sense an open circuit on the active antenna line by monitoring the drop across an external resistor. The value of the resistor needs to be designed in accordance with the antenna current.
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## Electrical

Supply Current	50mA @ 3.3V
Battery Current	8 $\mu$ A @ 1.2V

Table 1. Specifications of Navika-Exd



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