# Datasheet

# Jupiter-N3

## (Flash, EEPROM, ROM-only)

*GPS Receiver Module*

July 6, 2011

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# 1 Introduction

Building upon the SiRFstarIV™ architecture's high-performance, the J-N3 device incorporate innovations such as SiRFaware™, SiRFInstantFix™ and Active Jammer Removal. TheJ-N3 can navigate to -160dBm and track to -163dBm, providing higher coverage, accuracy and availability. This next generation Jupiter Module consumes only 13mA (3.3V) in 1-Hz TricklePower™ mode. The J-N3 offers A-GPS support and operate with a 3.3V power supply. J-N3 supports a full range of satellite-based augmentation systems, including WAAS, EGNOS, MSAS and GAGAN.
The GPS module combines the SiRFstarIV™ GSD4e™ GPS engine, TCXO, SAW filter, RTC, LDO, level conversion and memory (Flash and EEPROM devices only).

# 2 Technical Description

**High-speed Location Engine** – Twice the available DSP memory and search speed of SiRFstarIII architecture for enhanced sensitivity and navigation performance, greater coverage, reduced time to fix and improved positional accuracy.

**Battery Backup** is supported via a separate pin for applications that use a battery backup source when the GPS is shut down and the main supply is removed.

**Smart Sensor Interface** – Sensor support improves the location experience, enables greater context awareness, and opens the door to superior indoor positioning accuracy. This is achieved via the DR I2C port and a 3 axis accelerometer.

**Active Jammer Remover** – Advanced DSP technology actively identifies and removes jammers prior to correlation. This feature maximizes GPS performance and helps identify issues during the design phase. Up to 8 jammers can be identified and removed.

- Removes in-band jammers up to 80 dB-Hz
- Tracks up to 8 CW jammers

**High Performance Solution:**

- High sensitivity navigation engine (PVT) tracks as low as -163dBm
- 48 track verification channels
- SBAS (WAAS), EGNOS, MSAS, GAGAN

**Advanced Navigation Features:**

- Smart sensor I2C interface
- Interrupt input for context change detection

## 2.1 Product Compatibility

The J-N3 incorporates a new technology far advanced compared to the previous SiRFstarIII designs. It offers an upgrade path from existing Navman and competitive designs.

NMEA version 3.0 protocol is supported as well as the new SiRF ONE SOCKET binary PROTOCOL (OSP).

## 2.2 Receiver Architecture

The functional architecture of the J-N3 receiver is shown in Figure 1.

**Note:** The LNA is included in the GPS chip for passive antenna operation.

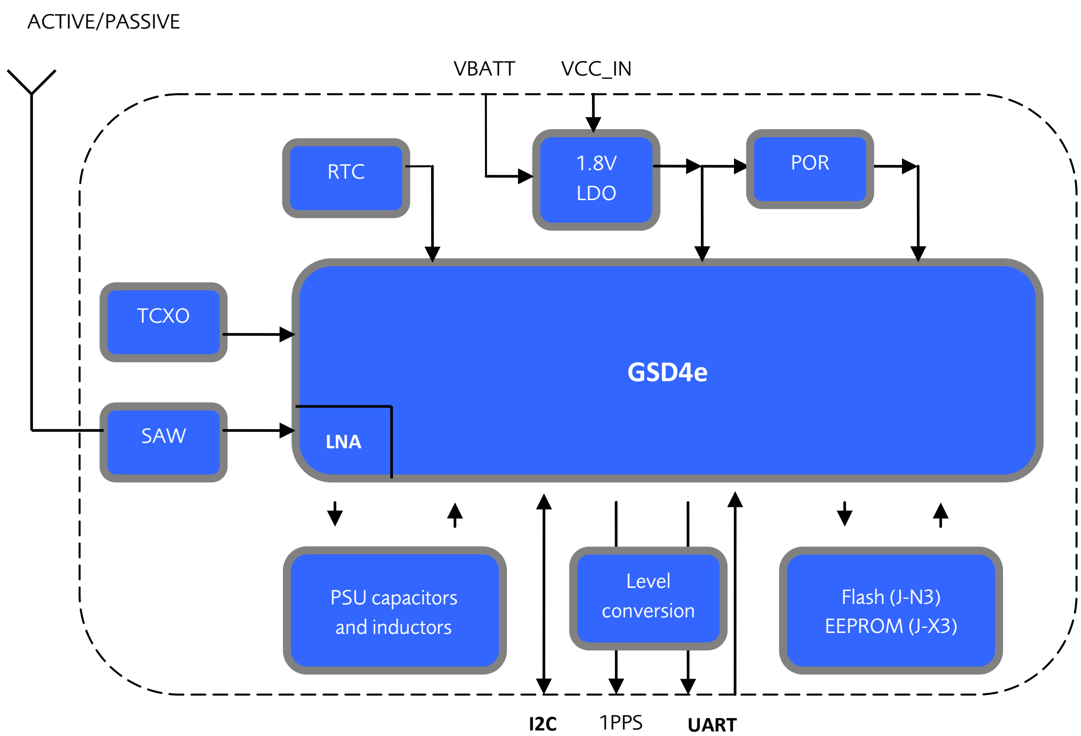


**Figure 1 – J-N3 Architecture**

**Note:** LNA is included in the GPS chip for passive antenna operation.

## 2.3 Major Components

All power supply components are on board including capacitors.

### 2.3.1 GSD4e Chip

This single chip GPS device includes an integrated Baseband and RF sections. The LNA amplifies the GPS signal and provides enough gain for the receiver to use a passive antenna. A very low noise design is utilized to provide maximum sensitivity. This LNA is internal to the GPS baseband and can be switched between low and high gain mode.

### 2.3.2 RF_IN

GPS RF signal input. This requires an external BIAS-T and antenna voltage supply for active antenna.

### 2.3.3 VCC_IN

This is the primary 2.85V to 3.6V supply voltage for the module. A voltage of 2.85V to 3.3V is recommended.

### 2.3.4 VBATT

The Battery Backup supply voltage is 2.2V to 3.3V. A typical low current supply for ensuring the RTC/BBRAM is kept running to ensure HOT/WARM starts. Higher battery backup supply voltages are catered for up to 3.6V.

### 2.3.5 Host Port

The J-N3 has a single serial communications port -- UART. See the Designer's Notes for more details.

### 2.3.6 MEMS Sensor Interface

The I2C port is used for MEMS sensor interface. Reference the Designer's Notes for more details on how to connect to an accelerometer and/or magnetic sensor to this port.

### 2.3.7 SAW Filter (1.575 GHz)

This filters the GPS signal and removes unwanted signals caused by external influences that would corrupt the operation of the receiver. The filtered signal is fed to the RF input of GSD4e chipset for further processing.

### 2.3.8 TCXO

This highly stable 16.369 MHz oscillator controls the down conversion process for the RF block.

### 2.3.9 RTC

The Real Time Clock allows Hot/Warm starts and low power modes.

### 2.3.10 Memory

The J-N3 Flash design includes a 16MB Flash storage device for operational software and satellite data.

The J-N3 EEPROM design includes a 512KB EEPROM storage device for patch code and satellite data.

The J-N3 ROM-only design does not include on-module memory. External Host memory may be used to store patch code and satellite data.

## 2.4 Physical Characteristics

The J-N3 receiver has advanced miniature packaging with a base metal of copper and an Electroless Nickel Immersion Gold (ENIG) finish.

It has 24 interface pads. These are castellated edge contacts.

## 2.5 Mechanical Specification

The physical dimensions of the J-N3 are as follows:

- length: 16.0 mm ± 0.1 mm
- width: 12.2 mm ± 0.1 mm
- thickness: 2.4 mm ± 0.2 mm
- weight: 1 g max

Refer to Figure 2 for the J-N3 mechanical layout drawing.

## 2.6 External Antenna Connection

The RF connection for the external antenna has a characteristic impedance of 50 ohms.

## 2.7 Input/Output and Power Connections

The I/O (Input / Output) and power connections use surface mount pads.

## 2.8 Environmental

The environmental operating conditions of the J-N3 are as follows:

- temperature: –40°C to +85°C (measured on the shield)
- humidity: up to 95% non-condensing or a wet bulb temperature of +35°C
- shock (non-operating): 18 G peak, 5 ms

## 2.9 Compliances

The J-N3 complies with the following:

- Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- Manufactured in an ISO 9000: 2000 accredited facility
- Manufactured to TS 16949 requirement (upon request)

## 2.10 Marking/Serialization

The J-N3 supports a 2D barcode indicating the unit serial number below. The Navman 13-character serial number convention is:

- characters 1 and 2: year of manufacture (e.g. 10 = 2010, 11 = 2011)
- characters 3 and 4: week of manufacture (01 to 52, starting first week in January)
- character 5: manufacturer code
- characters 6 and 7: product and type
- character 8: product revision
- characters 9-13: sequential serial number

## 2.11 Active Antenna Gain Requirements

| LNA Gain Setting | LNA Gain (dB) | GPS Noise Figure (dB) | Recommended External Gain Range (dB) |
|---|---|---|---|
| Low | 6.0 – 10.0 | 8.5 – 9.5 | 16-30 |
| High (default) | 16.0 – 20.0 | 4.0 | 8-18 |

**Table 1 – Active Antenna Gain Requirements**

**Notes:**

1. Recommended external gain range is total any external gain, such as antenna or external LNA and any passive loss due to cables, connectors, filters, matching network, etc.
2. In the High Gain setting an external LNA is not recommended.
3. In the Low Gain setting, the noise figure of the external LNA or active antenna must be chosen to ensure that the total cascaded noise figure is sufficiently low to meet overall system design requirements.

# 3 Performance Characteristics

## 3.1 TTFF (Time to First Fix)

TTFF is the actual time required by a GPS receiver to achieve a valid position solution. This specification will vary with the operating state of the receiver, the length of time since the last position fix, the location of the last fix, and the specific receiver design.

### 3.1.1 Hot Start

A hot start results from a software reset after a period of continuous navigation, or a return from a short idle period (i.e. a few minutes) that was preceded by a period of continuous navigation. In this state, all of the critical data (position, velocity, time, and satellite ephemeris) is valid to the specified accuracy and available in memory.

### 3.1.2 Warm Start

A warm start typically results from user-supplied position and time initialization data or continuous RTC operation with an accurate last known position available in memory. In this state, position and time data are present and valid but ephemeris data validity has expired.

### 3.1.3 Cold Start

A cold start acquisition results when either position or time data is unknown. Almanac information is used to identify previously healthy satellites.

Please refer to section 3.6 for performance data.

## 3.2 AGPS

GPS aiding comes in several forms. For the purposes of this document, we will focus on extended ephemeris data as a form of assisted GPS data.

InstantFix (SGEE and CGEE) is a method of GPS aiding that effectively reduces the TTFF by making every start a Hot or Warm start, through the use of ephemeris predictions.

CGEE captures ephemeris data from satellites locally and predicts ephemeris up to 3 days.

SGEE does not require local ephemeris collection from satellites; it receives the extended ephemeris data from a server.

The module supports AGPS as standard. NAVMAN provides a server for customers to download the SGEE file. Contact NAVMAN for support regarding this service.

**Note:** Due to memory size constraints, the EEPROM devices do not support SGEE.

**Note:** The ROM-only devices do not support CGEE or SGEE.  External Host memory can be used to enable both these features.  See Designer's Notes for more details on how to interface with external Host memory.

## 3.3 Time Mark Pulse (1PPS)

A 1PPS time mark pulse is provided as an output with a width of 200ms. This signal has not been verified or characterized for all operational conditions.

**Note:** The GPS receiver will only provide 1PPS when a 3D fix has been obtained using 5 SVs. When the fix degrades below a 3D solution, the 1PPS will be blanked. Once the fix quality improves back to a 3D fix the 1PPS will again be output.

## 3.4 Power Management

The following paragraph describes the power management mode supported by the J-N3.

### 3.4.1 Adaptive Trickle Power (ATP)

Trickle Power mode is a duty-cycled power management mode that reduces average current consumption by the J-N3 while retaining a high quality of GPS accuracy and dynamic motion response. The duty cycle and navigation update rate are specified by the user to best fit in the operating environment.  This mode adapts to weak or blocked satellite signals by transitioning the J-N3 in and out of full power mode as needed in order to maintain GPS performance.

## 3.5 Differential Aiding

### 3.5.1 Satellite Based Augmentation Systems (SBAS)

The J-N3 is capable of receiving WAAS, EGNOS, MSAS, and GAGAN differential corrections which are regional implementations of SBAS. SBAS improves horizontal position accuracy by correcting GPS signal errors caused by ionospheric disturbances, timing and satellite orbit errors.

## 3.6 Performance Data

| Parameter | Description | Performance | | | |
|---|---|---|---|---|---|
| | | Min | Typical | Max | Units |
| Horizontal Position Accuracy | Autonomous | - | <2.5 | - | m |
| Velocity Accuracy | Speed | - | <0.01 | - | m/s |
| | Heading | - | <0.01 | - | $^{0}$ |
| Time to First Fix | Hot Start: Autonomous | - | <1 | - | s |
| | Warm Start: Autonomous | - | <35 | - | s |
| | Cold Start: Autonomous | - | <35 | - | s |
| | MS Based: GSM coarse time | - | <4.7 | - | s |
| | MS Assisted: GSM coarse time | - | <4.7 | - | s |
| Sensitivity | Autonomous acquisition | - | -147 | - | dBm |
| | GSM/UMTS[1] coarse time aided | - | -160 | - | dBm |
| | CDMA[1] precise time aided | - | -160 | - | dBm |
| | Tracking | - | -163 | - | dBm |
| | Navigation | - | -160 | - | dBm |

1. Supported on J-N3 Flash designs only. Not available in standard code release.

**Table 2 – J-N3 Performance Data**

## 3.7 Dynamic Constraints

The J-N3 receiver will lose track if any of the following limits are exceeded:

- ITAR limits: velocity greater than 514 m/s AND altitude above 18,288 m
- altitude: 24,000 m (max) or -500 m (min)
- velocity: 600 m/s (max)
- acceleration: 4 G (max)
- vehicle jerk: 5 m/s$^3$ (max)

# 4 Electrical Requirements

## 4.1 Power Supply

### 4.1.1 VCC_IN

Main 2.85V-3.6V power input. Reference the Designer's Notes for additional details.

Supply voltage: 2.85V to 3.6V +/- 30mV noise/ripple.

### 4.1.2 VBATT

Battery backup power input. 2.2V to 3.3V recommend. Maximum 3.6V supported, minimum of 2.2V. Required for HOT/WARM starts and retention of GPS data.

## 4.2 External Antenna Voltage

The J-N3 requires an external antenna Bias-T to provide the voltage to the antenna. This is detailed in the Designer's Notes.

## 4.3 RF (Radio Frequency) Input

RF input is 1575.42 MHz (L1 Band) at a level between –135 dBm and –165 dBm into 50 Ohm impedance.

## 4.4 Antenna Gain

The receiver will operate with a passive antenna with Isotropic gain down to a minimum of -6dBi. Active antennas are supported. The internal LNA must be switched to low gain mode if an active antenna is used.

An active antenna of 20dB minimum (exiting the cable) will offer the best performance. 30dB exiting the antenna cable is maximum useable active antenna gain. Refer to section 2.11 for more details. Contact NAVMAN for in depth passive antenna design support.

## 4.5 Burnout Protection

The receiver accepts without risk of damage a signal of +10 dBm from 0 to 2 GHz carrier frequency, except in band 1560 to 1590 MHz where the maximum level is –10 dBm.

## 4.6 Jamming Performance

Eight separate in band jammers can be detected and digitally removed in the GPS DSP. This is over and above the excellent SAW filter response that exists before the GPS LNA input.

**Note:** The spectral purity of oscillators and RF transmitters in the host system will determine if harmonics are formed that are equal to the frequencies above.

Compact wireless product design requires close monitoring of jamming issues.

## 4.7 Flash Upgradability (Flash only)

The firmware programmed in the Flash memory may be upgraded via the serial port TX/RX pads. The user can control this by driving the Serial BOOT select line high at startup, then downloading the code from a PC with suitable software (SiRFFlash). In normal operation this pad should be left floating for minimal current drain. It is recommended that in the user's application, the BOOT select pad is connected to a test pad for use in future software upgrades. Refer to the Designer's Notes for additional information.

## 4.8 Patch Updates (EEPROM only)

Modules with EEPROM can be patched from the Host using simple One Socket Protocol (OSP) Patch Protocol serial messages. Patches are stored inside the I2C Serial EEPROM and are automatically applied by internal firmware whenever the baseband CPU is started.

**Note:** ROM-only devices can support patch updates, if Host memory is available.

## 4.9 Data Input/Output Specifications

All communications between the J-N3 receiver and external devices are through the I/O surface mount pads. These provide the contacts for power, ground, serial I/O and control. Power requirements are discussed in the following sections.

### 4.9.1 Voltages and Currents

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Power Supply Voltage [1,3] | VCC_IN | 2.85 | 2.9 to 3.3 | 3.6 | V |
| Operating Temperature [2] | $T_{OPR}$ | -40 | | 85 | $^0$C |
| Navigating Current Consumption:<br>Low Gain Mode<br>High Gain Mode | | | <br>28<br>29 | | <br>mA<br>mA |
| 1Hz Trickle Power Current | | | 10 | | mA |
| Battery Backup Supply | VBATT | 2.2 | 3 | 3.6 | V |
| Battery Backup Current (abrupt removal of VCC_IN) | | | 600 | | uA |
| Battery Backup Current with commanded shutdown | | | 45 | | uA |

**Table 3 – Power Requirements**

**Notes:**

1. Power must be always applied.
2. Operating temperature is ambient.
3. Ripple characteristics must be ensured for best GPS performance and reliable operation.

**Absolute Maximum Ratings**

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| Power Supply Voltage | VCC_IN | 3.6 | V |
| Input Pin Voltage | VIO_IN | 3.6 | V |
| Output Pin Voltage | VIO_OUT | 3.6 | V |
| Storage Temperature | $T_{stg}$ | -40°C to +85°C | $^{0}$C |

**Table 4 – Digital Core and I/O Voltage (Volatile)**

**Warning** – Stressing the device beyond the "Absolute Maximum Ratings" may cause permanent damage. These are stress ratings only. Operation beyond the "Operating Conditions" is not recommended and extended exposure beyond the "Operating Conditions" may affect device reliability.

### 4.9.2 DC Electrical Characteristics (Update to Table Format – include I/O levels)

#### *4.9.2.1 TX and 1PPS*

TXA and 1PPS outputs at TRISTATE until Active VCC is reached. Active VCC min is 1V.

These outputs TRISTATE if VCC reaches Ground. Maximum stress voltage on these pins is 4.5V and there is OVT protection.

VOL = 0.3V-0.4V MAX.

VOH = 0.75 x VCC typical MIN. 3.6V MAX pull up.

Typical MAX current = + 12mA, -12mA.

Normal current = +100uA to + 6mA (VOL). -100uA to -6mA (VOH)

VCC = 2.85V to 3.3V typical.3.6V MAX.

#### *4.9.2.2 RX*

VIL = 0.45V MAX.

VIH = 1.26V MIN. MAX 3.6V pull up.

Internal pull up resistance 90k ohm nominal to internal 1.8V. MAX 3.6V pull up.

INPUT/TRISTATE leakage = -10uA, +10uA.

#### *4.9.2.3 I2C_CLK and I2C_DATA*

I2C_CLK and I2C_DATA outputs are in a high-impedance state until Active VCC is reached.

VOL = 0.55V MAX.

VOH = 2.4V MIN.

#### *4.9.2.4 BOOT (Flash only)*

For normal operation, leave this pin floating. To place the J-N3 into BOOT mode, tie this pin to 1.8 volts DC. This pin is not 3.3 volt tolerant. See the Designer's Notes for more information.

### 4.9.3 Pinout Description

Details of the LGA pad functions are shown in Table 6.

| Pad Number | Pad Function | Type | Description |
|---|---|---|---|
| 1 | NC | - | No connection |
| 2 | NC | - | No connection |
| 3 | 1PPS | O | Timemark Pulse, 200ms Active High |
| 4 | EXTINT | I | Reserved (fix this signal – MEMS Accel IRQ) |
| 5 | NC | - | No connection |
| 6 | NC | - | No connection |
| 7 | BOOT | I | Low for run, high for reprogram (Flash only) |
| 8 | NC | - | No connection |
| 9 | VCC_IN | PWR | VCC |
| 10 | GND | PWR | Ground |
| 11 | RF_IN | I | GPS RF Input, 50 Ohm |
| 12 | GND | PWR | Ground |
| 13 | GND | PWR | Ground |
| 14 | NC | - | No connection |
| 15 | NC | - | No connection |
| 16 | NC | - | No connection |
| 17 | NC | - | No connection |
| 18 | SDA2 | I/O | Sensor I2C Data Port |
| 19 | SCL2 | I/O | Sensor I2C Clock Port |
| 20 | TX | O | UART TX Output |
| 21 | RX | I | UART RX Input |
| 22 | VBATT | PWR | Battery Backup Voltage |
| 23 | VCC_IN | PWR | Main Supply Voltage |
| 24 | GND | PWR | Ground |

**Table 5 – LGA Pad Functions**

# 5 Software Interface

The host serial I/O port of the receiver's serial data interface supports full duplex communication between the receiver and the user.

The default serial configuration is as follows: NMEA, 4800 bps, 8 data bits, no parity, 1 stop bit

**Note:** Contact your local sales representative for details on module configurations with default NMEA 9600 bps.

## 5.1 NMEA Output Messages

NMEA v3.0 is the default protocol. The following messages are output by default:

- RMC = 1 second update
- GGA = 1 second update
- GSA = 1 second update
- GSV = 5 second update

Reference the NMEA protocol manual for additional message details.

## 5.2 SiRF OSP Output Messages

SiRF One Socket Protocol (OSP) is supported. This is an extension of the existing SiRF Binary protocol.

The following messages are output once per second:

- MID2
- MID4
- MID9
- MID41

Reference the SiRF One Socket Protocol manual for additional message details.

## 5.3 Software Functions and Capabilities

Table 7 shows the software features available to the J-N3.

| Feature | Description | Availability |
|---|---|---|
| SBAS | Improve position accuracy by using freely available satellite based correction services called SBAS (Satellite Based Augmentation System) | A |
| Adaptive Trickle Power | Improves battery life by using enhanced power management and intelligently switching between low and full power depending on the current GPS signal level. Refer to the Low Power Operating Modes application note. | A |
| Almanac to Flash | Improves cold start times by storing the most recent almanac to flash memory. | Yes (Flash only) |
| Low Signal Acquisition | Acquires satellites and continues tracking in extremely low signal environments. | Yes |
| Low Signal Navigation | Continues navigating in extremely low signal environments. | Yes |
| Time Mark Pulse (1PPS) | A timing pulse generated every second the receiver is in a valid navigation state (5 SVs required for initial pulse start-up). | Yes |
| MEMS | 3-axis accelerometer support for static detection. 3-axis magnetometer support for compass heading pass-thru data. | A |
| Antenna Supervisor | Active antenna short circuit and open circuit detection/control, software supported. | V4.1.2 |
| SGEE | AGPS using predicted ephemeris data from a server. Supporting Host required. | Yes (Flash only) |
| CGEE | AGPS using prediction of ephemeris from live (downloaded from satellites), ephemeris stored in memory. | Yes (Flash/EEPROM only) |
| Adaptive Jammer Detection | System scan for up to 8 CW jammers for removal by the GPS | Yes |
| Yes = always enabled A = available, but not enabled by default | | |

**Table 6 – Software Features**

## 6 Mechanical Drawing

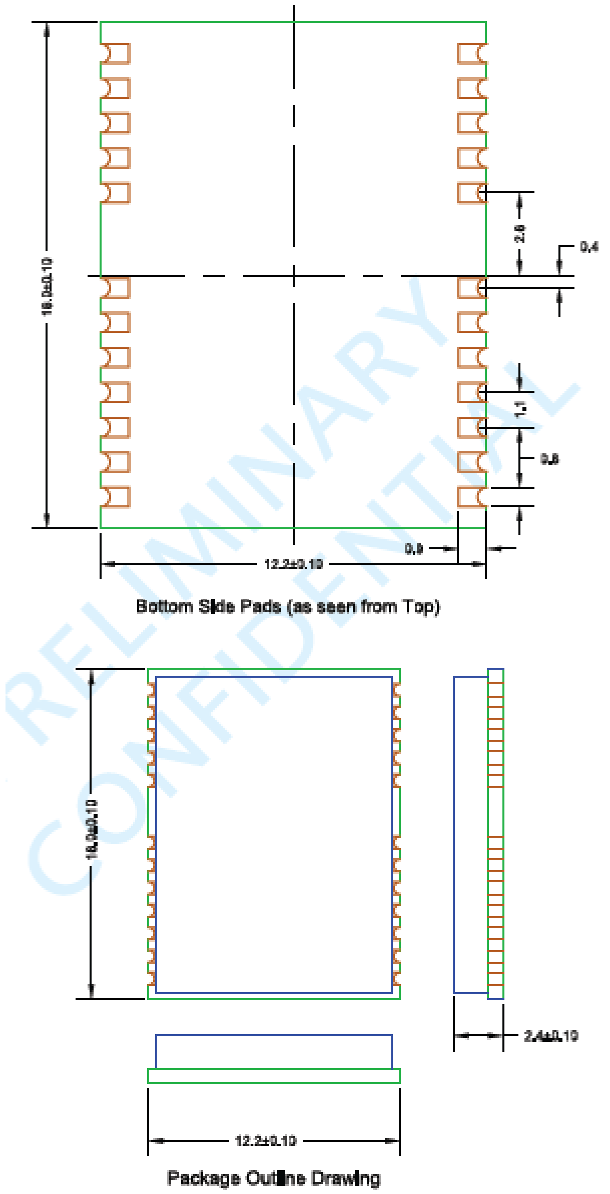


**Figure 2 – Mechanical Layout**

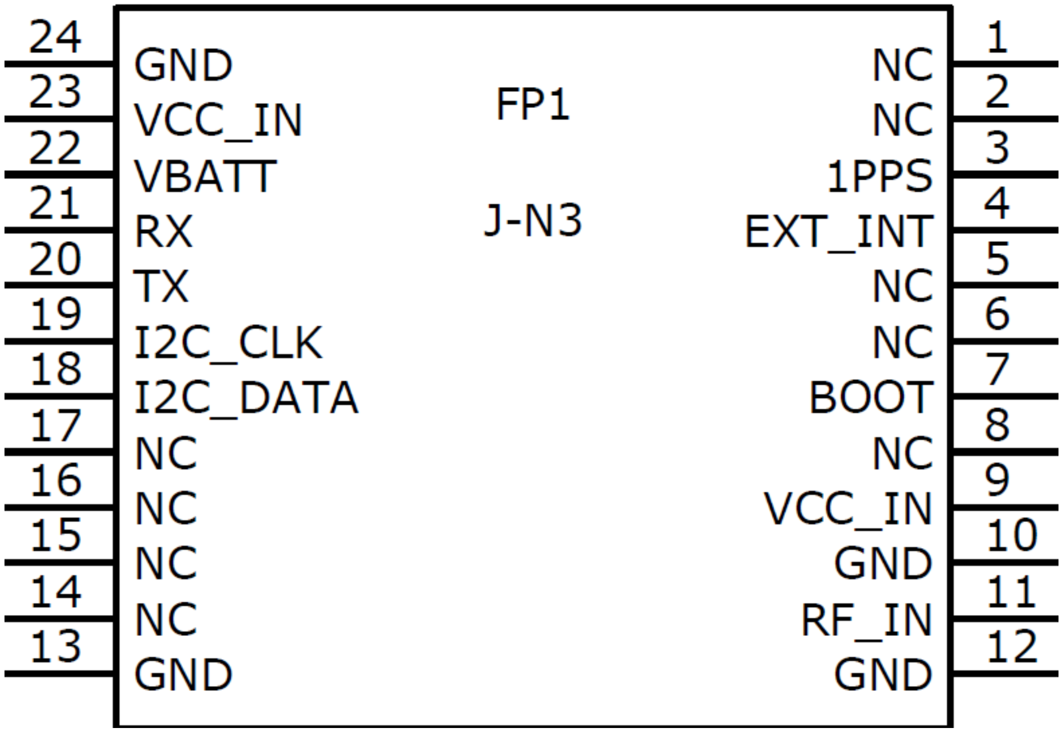


**Figure 3 – Pinout (Top View)**

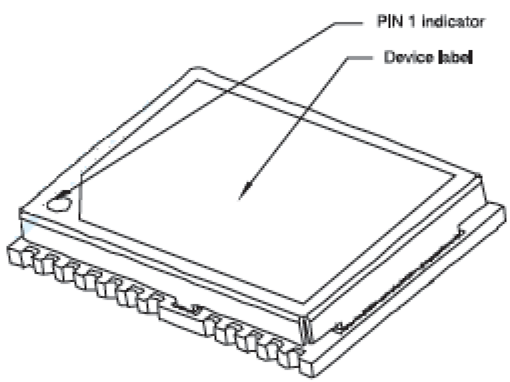


**Figure 4 – 3D Model**

# 7 Evaluation Kit

The J-N3 Development Kit is available to assist in the evaluation and integration of the J-N3 module in custom applications. The Development Kit contains all of the necessary hardware and software to carry out a thorough evaluation of the J-N3 module.

# 8 Product Handling

## 8.1 Product Packaging and Delivery

J-N3 modules are shipped in Tape and Reel form. The reeled modules are shipped in 24mm reels with 1000 units per reel. Each reel is 'dry' packaged and vacuum sealed in an Moisture Barrier Bag (MBB) with two silica gel packs and placed in a carton.

The minimum order quantity for shipping is 1000 units. Refer to the Designer's Notes for additional details.

All packaging is ESD protective lined. The J-N3 GPS receiver is a Moisture Sensitive Device (MSD) level 3. Please follow the MSD and ESD handling instructions on the labels of the MBB and exterior carton (refer to sections 8.2 and 8.3).

## 8.2 Moisture Sensitivity

Precautionary measures are required in handling, storing and using such devices to avoid damage from moisture absorption. If localized heating is required to rework or repair the device, precautionary methods are required to avoid exposure to solder reflow temperatures that can result in performance degradation.

Further information can be obtained from the IPC/JEDEC standard J-STD-033: Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices.

## 8.3 ESD Sensitivity

The J-N3 GPS receiver contains class 1 devices and is Electro-Static Discharge Sensitive (ESDS). Navman recommends the two basic principles of protecting ESD devices from damage:

Only handle sensitive components in an ESD Protected Area (EPA) under protected and controlled conditions

Protect sensitive devices outside the EPA using ESD protective packaging. All personnel handling ESDS devices have the responsibility to be aware of the ESD threat to the reliability of electronic products.

Further information can be obtained from the JESD625-A requirements for Handling Electrostatic Discharge Sensitive (ESDS) Devices.

## 8.4 Safety

Improper handling and use of the Jupiter GPS receiver can cause permanent damage to the receiver. There is also the possible risk of personal injury from mechanical trauma or choking hazard.

## 8.5 Disposal

We recommend that this product should not be treated as household waste. For more detailed information about recycling this product, please contact your local waste management authority or the reseller from whom you purchased the product.

# 9 Ordering Information

- J-N3.B0xx.xY J-N3 Flash Module (TR = tray)
- J-N3.B0xx.xR J-N3 Flash Module (TP = tape and reel)
- J-N3.B0xx.xE J-N3 Flash Module Evaluation Kit
- J-N3.C5xx.xY J-N3 512K EEPROM Module (TR = tray)
- J-N3.C5xx.xR J-N3 512K EEPROM Module (TP = tape and reel)
- J-N3.C5xx.xE J-N3 512K EEPROM Evaluation Kit
- J-N3.C0xx.xY J-N3 ROM-only Module (TR = tray)
- J-N3.C0xx.xR J-N3 ROM-only Module (TP = tape and reel)
- J-N3.C0xx.xE J-N3 ROM-only Evaluation Kit

**NOTE:** x denotes unique identifiers.

Contact your local sales representative for more details.

# 10 Glossary and Acronyms

AGPS: Assisted GPS. AGPS uses additional resources to locate the satellites faster and better in poor signal conditions.

Almanac: A set of orbital parameters that allows calculation of approximate GPS satellite positions and velocities. The almanac is used by a GPS receiver to determine satellite visibility and as an aid during acquisition of GPS satellite signals. The almanac is a subset of satellite ephemeris data and is updated weekly by GPS Control.

CGEE: Client Generated Extended Ephemeris data. AGPS using prediction of ephemeris from live (downloaded from satellites), ephemeris stored in memory.

EGNOS: European Geostationary Navigation Overlay Service
The system of geostationary satellites and ground stations developed in Europe to improve the position and time calculation performed by the GPS receiver.

Ephemeris plural ephemerides: A set of satellite orbital parameters that is used by a GPS receiver to calculate precise GPS satellite positions and velocities. The ephemeris is used to determine the navigation solution and is updated frequently to maintain the accuracy of GPS receivers.

ESD: Electro-Static Discharge
large momentary unwanted currents that cause damage to electronic equipment.

GDOP: Geometric Dilution of Precision.
A factor used to describe the effect of the satellite geometry on the position and time accuracy of the GPS receiver solution. The lower the value of the GDOP parameter, the less the error in the position solution. Related indicators include PDOP, HDOP, TDOP and VDOP.

GPS: Global Positioning System.
A space-based radio positioning system that provides accurate position, velocity, and time data.

InstantFix: Eliminates the initial delay of obtaining GPS satellite location data from the satellites themselves by using algorithms to predict seven days of satellite location data.

LGA: Land Grid Array.
There are no pins on the chip; in place of the pins are pads of bare gold-plated copper that touch pins on the motherboard.

MSD: Moisture sensitive device.

NMEA: National Marine Electronics Association

POR: Power on Reset.

SBAS: Satellite Based Augmentation System
Any system that uses a network of geostationary satellites and ground stations to improve the performance of a Global Navigation Satellite System (GNSS). Current examples are EGNOS and WAAS.

SGEE: Server Generated Extended Ephemeris data. AGPS using predicted ephemeris data from a server. Supporting Host required.

WAAS: Wide Area Augmentation System
The system of satellites and ground stations developed by the FAA (Federal Aviation Administration) that provides GPS signal corrections. WAAS satellite coverage is currently only available in North America.

# 11 Revision History

| Date | Revision | Changes |
|---|---|---|
| 4/25/11 | - | Initial Release |
| 6/8/11 | A | Updates for split rail design |
| 6/10/11 | B | Add Battery Backup current, minor edits, update Table 6 to remove low power modes |
| 7/6/11 | C | Remove reference to J-X3 and J-H3, updated ordering information. |