



Jupiter 32 xLP

Extra Low Power
Miniature 20-channel
GPS receiver module

Data Sheet



Related documents

- Jupiter 32 xLP Product brief
LA000268
- Jupiter 32 Integrator's manual
LA000605
- Jupiter Development kit guide
LA000645
- Low power operating modes
application note LA000513
- Navman NMEA reference manual
MN000315
- SiRF Binary protocol reference
manual, MN000314



Contents

| | |
|---|-----------|
| Related documents | 1 |
| 1.0 Introduction | 4 |
| 2.0 Technical description | 4 |
| 2.1 Product applications | 4 |
| 2.1.1 Compatibility | 5 |
| 2.2 Receiver architecture | 5 |
| 2.3 Major components of the Jupiter 32 xLP..... | 5 |
| 2.4 Physical characteristics | 6 |
| 2.5 Mechanical specification | 6 |
| 2.6 External antenna surface mount pads | 6 |
| 2.7 I/O and power connections..... | 6 |
| 2.9 Compliances | 6 |
| 2.10 Marking/Serialization | 7 |
| 3.0 Performance characteristics | 7 |
| 3.1 TTFF (Time To First Fix)..... | 7 |
| 3.1.1 Hot start | 7 |
| 3.1.2 Warm start..... | 7 |
| 3.1.3 Cold start | 7 |
| 3.2 Acquisition times | 7 |
| 3.3 Timing 1 PPS output..... | 8 |
| 3.4 Power management | 8 |
| 3.4.1 Adaptive TricklePower | 8 |
| 3.4.2 Push-To-Fix mode..... | 8 |
| 3.5 Differential aiding | 8 |
| 3.5.1 Differential GPS (DGPS)..... | 8 |
| 3.5.2 Satellite Based Augmentation Systems (SBAS) | 8 |
| 3.6 Core processor performance | 8 |
| 3.7 Sensitivity | 9 |
| 3.8 Dynamic constraints..... | 9 |
| 3.9 Position and velocity accuracy..... | 9 |
| 4.0 Multi-mode aiding | 9 |
| 5.0 Electrical requirements | 10 |
| 5.1 Power supply | 10 |
| 5.1.1 Primary power..... | 10 |
| 5.1.2 Battery backup (SRAM/RTC backup)..... | 10 |
| 5.1.3 VCC_RF power supply | 10 |
| 5.1.4 External antenna voltage..... | 10 |
| 5.1.5 RF (Radio Frequency) input..... | 10 |
| 5.1.6 Antenna gain..... | 11 |
| 5.1.7 Burnout protection | 11 |
| 5.1.8 Jamming performance..... | 11 |
| 5.1.9 Flash upgradability | 11 |
| 5.1.10 Reset input | 11 |

| | |
|--|-----------|
| 5.2 Data input output specifications | 11 |
| 5.2.1 Voltage levels | 12 |
| 5.2.2 I/O surface mount pads | 12 |
| 6.0 Software interface | 14 |
| 6.1 NMEA output messages..... | 14 |
| 6.2 SiRF Binary | 14 |
| 6.3 Software functions and capabilities..... | 14 |
| 7.0 Jupiter 32 xLP mechanical drawing | 15 |
| 8.0 Jupiter 32 xLP evaluation kit..... | 16 |
| 9.0 Product handling | 16 |
| 9.1 Product packaging and delivery | 16 |
| 9.2 Moisture sensitivity..... | 16 |
| 9.3 ESD sensitivity | 16 |
| 9.4 Safety | 16 |
| 9.5 Disposal..... | 16 |
| 10.0 Ordering information | 17 |
| 11.0 Glossary and acronyms..... | 17 |

Figures

| | |
|---|----|
| Figure 2-1: Jupiter 32 xLP architecture..... | 5 |
| Figure 7-1: Jupiter 32 xLP mechanical layout..... | 15 |

Tables

| | |
|---|----|
| Table 3-1: Acquisition times at -125 dBm and -140 dBm | 7 |
| Table 3-2: Sensitivity | 9 |
| Table 3-3: Position and velocity accuracy | 9 |
| Table 5-1: Operating power for the Jupiter 32 xLP..... | 10 |
| Table 5-2: Typical jamming performance | 11 |
| Table 5-3: Interface voltage levels | 12 |
| Table 5-4: Jupiter 32 xLP Module pad functions | 13 |
| Table 6-1: Default NMEA messages | 14 |
| Table 6-2: Jupiter 32 xLP software capability | 14 |
| Table 10-1: Jupiter 32 xLP ordering information..... | 17 |

1.0 Introduction

Navman's Jupiter 32 xLP extra low power receiver module has been designed to address markets where performance, size, power and flexibility are very important. A miniature successor to the ultra sensitive Jupiter 30, the Jupiter 32 xLP is Navman's smallest, lowest power consumption, autonomous, fully featured GPS receiver yet.

The Jupiter 32 xLP offers the ultimate in high sensitivity GPS performance, capable of both autonomous and aided modes of operation. The module has advanced miniature packaging and a Land Grid Array (LGA) footprint with unique integration features for high volume, low cost and low power applications where tighter integration is required.

Incorporating the highest specification components available, the Jupiter 32 xLP can track down to -159 dBm and offers unparalleled accuracy and extremely fast fixes even under attenuated conditions such as in built-up urban areas, dense foliage, indoors or while subject to challenging temperature profiles. The module provides a miniature 20-channel receiver that continuously tracks all satellites in view and provides accurate positioning data.

Featuring active or passive antenna support, Write-to-Flash configuration, power saving modes, SiRFInstantFix support and full multi-mode aiding capability, the Jupiter 32 xLP is highly suited for all battery powered applications or high-end track and trace applications.

2.0 Technical description

Navman has enhanced the architecture of the SiRF GSC3f chipset by adding carefully selected key components including TCXO and LNA. This ensures frequency stability, improved sensitivity at low level signals down to -159 dBm, lower power consumption and a faster TTFF (Time To First Fix). The GSC3f chip integrates baseband, RF sections and Flash memory, thereby reducing power consumption and size. Integrated 4 Megabit flash memory gives the user the ability to store configurations permanently.

By providing separate on-board regulators, the Jupiter 32 xLP allows operation over a wide input voltage range, down to 3.0VDC. This gives OEMs the ability to design with a single voltage supply that consumes less power.

The 20-channel architecture with more than 200 000+ effective correlators provides rapid TTFF under all start-up conditions. Acquisition is guaranteed under all conditions due to higher sensitivity and the ability to use multi-mode aiding.

Protocols supported are selected NMEA (National Marine Electronics Association) data messages and SiRF Binary.

2.1 Product applications

The Jupiter 32 xLP is designed specifically for applications where rapid TTFF and operation under low signal levels along with a small form factor are primary requirements. The module offers high performance and maximum flexibility in a wide range of OEM configurations.

The high sensitivity of the module makes it ideal for:

- navigation systems – where athermic glass, or an unsuitably positioned antenna inside the vehicle will reduce visibility and signal strength
- vehicle and people tracking devices – where satellites are obstructed by partially covered car parks and walkways, tracking even continues indoors
- marine buoys – where multipath and unstable sea conditions make satellite visibility irregular
- asset tracking – where construction machinery is located in covered yards and areas of dense foliage
- people tracking - home detention and house arrest applications, emergency location services

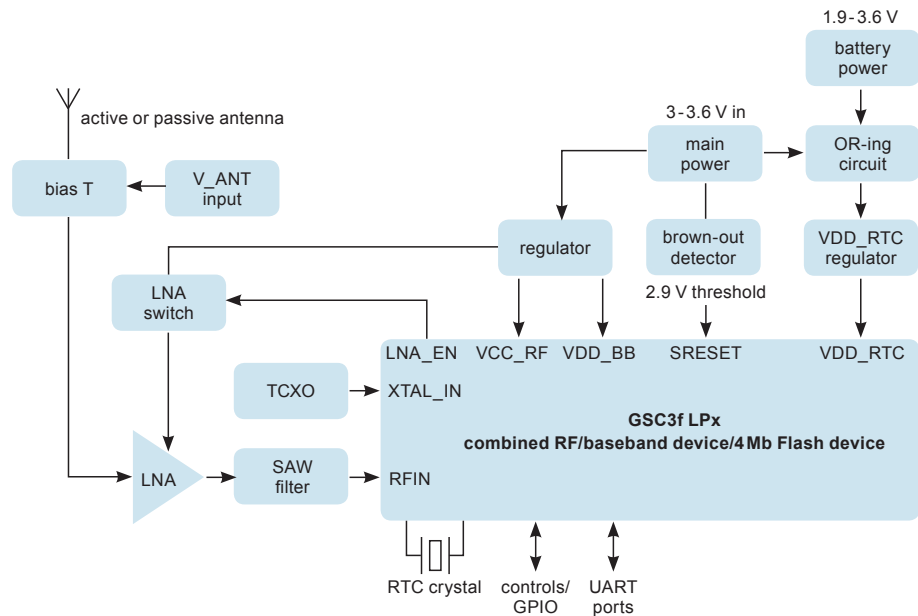


Figure 2-1: Jupiter 32 xLP architecture

2.1.1 Compatibility

The Jupiter 32 xLP is 100% backward compatible to Jupiter 32 and identical in function and electrical compatibility to the Jupiter 30 but has advanced miniature packaging, with a smaller form factor (17.0x15.0 mm). It features the ability to save user configurations to flash memory and uses the latest SiRFInstantFix technology for improved performance.

2.2 Receiver architecture

The functional architecture of the Jupiter 32 xLP receiver is shown in Figure 2-1.

2.3 Major components of the Jupiter 32 xLP

Bandpass 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 GSC3f chipset for further processing. The filter has a bandwidth of 2MHz.

Battery power: The back-up battery supply feeds the VDD_RTC regulator through the OR-ing circuit, and provides the power to the battery-backed SRAM and the RTC section of the GSC3f.

Bias T: This provides the voltage to an external active antenna.

Brown out detector: The precision voltage detector chip senses the input voltage and resets the module in case of any drop in the voltage. This detector chip also serves the function of power-on-reset.

GSC3f chip: This single chip GPS device includes an integrated Baseband, RF section and integrated Flash which stores software, long term and user configuration data.

LNA (Low Noise Amplifier): This amplifies the GPS signal and provides enough gain for the receiver to use a passive antenna. A very low noise design is utilised to provide maximum sensitivity.

LNA switch: The LNA switch controls the LNA during low power modes.

Main power: The primary supply voltage range is 3.0 to 3.6V.

OR-ing circuit: This circuit distributes the RTC/SRAM voltage from either the main voltage supply or the back-up voltage input in order for the RTC/SRAM elements to work in low power and continuous modes. However a back-up voltage must be connected if the device is to be shut down and required to perform Hot and Warm starts.

Regulator: This dual low-noise regulator provides two outputs of 2.85V power to the RF section and the digital IO section of the GSC3f chip.

RTC (Real Time Clock) crystal: The 32 kHz crystal operates in conjunction with the RTC inside the baseband block, and provides an accurate clock function when main power has been removed, if the battery backup is connected.

TCXO (Temperature Compensated Crystal Oscillator): This highly stable 16.369 MHz oscillator controls the down conversion process for the RFIC block.

VDD_RTC regulator: This supplies a regulated voltage for the RTC/SRAM cell within the GSC3f chip.

2.4 Physical characteristics

The Jupiter 32 xLP receiver has advanced miniature packaging and a LGA footprint and is smaller than the Jupiter 30. It is a surface mount device packaged on a miniature printed circuit board, with a metallic RF enclosure on one side. There are 34 surface mount connection pads with a base metal of copper and an Electroless Nickel Immersion Gold (ENIG) finish.

2.5 Mechanical specification

The physical dimensions of the Jupiter 32 xLP are as follows:

| | |
|------------|------------------|
| length: | 17.0 mm ± 0.1 mm |
| width: | 15.0 mm ± 0.1 mm |
| thickness: | 2.7 mm max |
| weight: | 2.0 g max |

Refer to Figure 7-1 for the Jupiter 32 xLP mechanical layout drawing.

2.6 External antenna surface mount pads

The RF surface mount pad for the external antenna has a characteristic impedance of 50 ohms.

2.7 I/O and power connections

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

2.8 Environmental

The environmental operating conditions of the Jupiter 32 xLP are as follows:

| | |
|------------------------|---|
| temperature: | -40°C to +85°C |
| humidity: | up to 95% non-condensing or a wet bulb temperature of +35°C |
| altitude: | -304 m to 18 000 m |
| vibration: | random vibration IEC 68-2-64 |
| max. vehicle dynamics: | 500 m/s |
| shock (non-operating): | 18 G peak, 5 ms |

2.9 Compliances

The Jupiter 32 xLP complies with the following:

- Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- CISPR22 and FCC: Part 15, Class B for radiated emissions
- Manufactured in an ISO 9000:2000 accredited facility
- Manufactured to TS 16949 requirement

2.10 Marking/Serialisation

The Jupiter 32 xLP 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. 06=2006, 07=2007)
- characters 3 and 4:** week of manufacture (1 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

3.0 Performance characteristics

3.1 TTFF (Time To First Fix)

TTFF is the actual time required by a GPS receiver to achieve a 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.

Aiding is a method of effectively reducing the TTFF by making every start Hot or Warm.

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 SRAM. Battery backup of the SRAM and RTC during loss of power is required to achieve a hot start.

3.1.2 Warm start

A warm start typically results from user-supplied position and time initialisation 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.

3.2 Acquisition times

Acquisition time is also affected by strength of the signal received, as per the tables below. Table 3-1 shows the corresponding TTFF times for each of the acquisition modes.

| Mode | @ -125 dBm | |
|------------------------------------|------------|------|
| | Typ | 90% |
| hot start TTFF | 500 ms | <1 s |
| warm start TTFF | 31 s | 36 s |
| cold start TTFF | 33 s | 38 s |
| re-acquisition (<10 s obstruction) | 1 s | |

Table 3-1: Acquisition times at -125 dBm

3.3 Timing 1 PPS output

The 1 PPS output of the Jupiter 32 xLP receiver is $< 1 \mu\text{s}$, typical $\pm 300 \text{ ns}$ ref UTC. Refer to Table 6-2 for the default status on the Jupiter 32 xLP.

3.4 Power management

The Jupiter 32 xLP offers two kinds of power saving mode: Adaptive TricklePower and Push-To-Fix (refer to Table 6-2 for the default status on the Jupiter 32 xLP). These modes can be set using NMEA or SiRF Binary messages.

3.4.1 Adaptive TricklePower

The Jupiter 32 xLP can use the Adaptive TricklePower (ATP) feature, which reduces power consumption by intelligently switching between full power in tough GPS environments and low power in strong GPS signal areas.

When signal levels drop, the receiver returns to full power so that message output rates remain constant. This results in variable power savings but much more reliable performance for a fixed output rate. Applications using ATP should give performance very similar to full power, but with significant power savings in strong signal conditions.

ATP is best suited for applications that require solutions at a fixed rate as well as low power consumption and still maintain the ability to track weak signals.

With ATP at a 1 second update, a power saving of 50% can easily be achieved with minimal degradation in navigation performance.

3.4.2 Push-To-Fix mode

Push-To-Fix mode always forces the GPS software to revert to a continuous sleep mode after a navigation position fix. It will stay in sleep mode until woken by activation of the WAKEUP input (pad F4), and compute a fresh position.

If the ephemeris data become invalid, the RTC has the ability to self activate and refresh the data, thus keeping the restart TTFF very short.

This mode yields the lowest power consumption of the module, and is ideal where a battery powered application requires very few position fixes.

For further information refer to the Low Power Operating Modes application note (LA000513), Navman NMEA reference manual (MN000315) and the SiRF Binary Protocol reference manual.

3.5 Differential aiding

3.5.1 Differential GPS (DGPS)

DGPS is not available on the Jupiter 32 xLP.

3.5.2 Satellite Based Augmentation Systems (SBAS)

The Jupiter 32 xLP is capable of receiving WAAS and EGNOS 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. Refer to Table 6-2 for the default status on the Jupiter 32 xLP.

3.6 Core processor performance

The standard Jupiter 32 xLP with GSW3 software runs at a CPU clock speed of 49MHz. An SDK (Software Development Kit) is available from SiRF to customise the Jupiter 32 xLP firmware.

3.7 Sensitivity

Sensitivity of the Jupiter 32 xLP is measured assuming a system noise value of 3 dB. The sensitivity values are as follows:

| Parameter | Signal strength | C/N ₀ |
|--------------------------|-----------------|------------------|
| acquisition – cold start | –144 dBm | 26 dBHz |
| acquisition – hot start | –155 dBm | 15 dBHz |
| navigation | –157 dBm | 13 dBHz |
| tracking | –159 dBm | 10 dBHz |

Table 3-2: Sensitivity

3.8 Dynamic constraints

The Jupiter 32 xLP receiver is programmed to deliberately lose track if any of the following limits is exceeded:

- velocity: 500 m/s max
- acceleration: 4 G (39.2 m/s²) max
- vehicle jerk: 5 m/s³ max
- altitude: 18000 m max (referenced to MSL)

3.9 Position and velocity accuracy

The position and velocity accuracy of the Jupiter 32 are shown in Table 3-3, assuming full accuracy C/A code. These values are the same in normal operation and when Adaptive TricklePower is active.

| Parameter | Value |
|--|-----------|
| horizontal CEP* | 2.5 m |
| horizontal (2dRMS) | 5.5 m |
| vertical VEP* | 2.0 m |
| velocity (speed)** | < 0.01m/s |
| velocity (heading)** | < 0.01° |
| <i>* position error 50% and under normal open sky conditions</i> <i>** In 3D Kalman filtered mode in steady state open sky conditions</i> | |

Table 3-3: Position and velocity accuracy

4.0 Multi-mode aiding

Multi-mode aiding technology makes navigation information available to GPS devices when enough Satellite Vehicles (SVs) are not visible due to obstruction. In autonomous operation mode, the GPS receiver requires a signal level of 28 dBHz or higher in four or more SVs to download ephemerides. This requires an uninterrupted full 30 seconds of data reception from each SV. If the data isn't received in full, the ephemeris data collection has to start again at the next cycle.

The type of multi-mode aiding currently supported by the Jupiter 32 xLP is Ephemeris Push. This feature supports live ephemeris data to be downloaded from application servers that allows hot start performance at all times including in weak conditions and moving start ups. The ephemeris would typically be valid for 4 hours until the live ephemeris is downloaded or new ephemeris data is provided.

To use with this Ephemeris Push, the live ephemeris data is collected at application servers and then transmitted to the GPS receiver through a network connection. An application note about Ephemeris Push is in preparation and will be available at a later date.

5.0 Electrical requirements

5.1 Power supply

5.1.1 Primary power

The Jupiter 32 xLP GPS receiver is designed to operate from a single supply voltage, meeting the requirements shown in Table 5-1.

| Parameter | Value | |
|--|---------------------------------|---------------|
| input voltage | 3.0 to 3.6VDC | |
| average sustained power (after 1st solution) | @ 3V: <82mW | @ 3.3V: <95mW |
| power (typ) using ATP* | 56 mW at 3.3V | |
| battery backup voltage** | 1.9 to 3.6VDC | |
| battery backup current | 5 to 6 μ A (typ) | |
| ripple | not to exceed 50mV peak to peak | |
| *Using Adaptive TricklePower with a 1s update | | |
| **Battery backup voltage must not fall below 1.4V | | |

Table 5-1: Operating power for the Jupiter 32 xLP

5.1.2 Battery backup (SRAM/RTC backup)

During 'powered down' conditions, the SRAM and RTC (Real Time Clock) may be kept operating by supplying power from the VBATT as shown in Table 5-1.

5.1.3 VCC_RF power supply

The VCC_RF (pad F3) provides a regulated 2.85V power source. The specifications for this supply are as follows:

voltage: 2.85V \pm 2%

current max: 50 mA

5.1.4 External antenna voltage

DC power is supplied to the external antenna through the antenna power input pad (VANT). The receiver does not use this supply. The DC supply to the RF connection does not current limit in the event of a short circuit. Reference designs for antenna current limit are available in the Jupiter 32 xLP Integrator's manual (LA000605).

The external antenna characteristics are as follows:

voltage (typ): 3V

voltage max: 12V

current max: 50 mA

WARNING!

The GPS receiver will experience permanent damage if the antenna or its cable develops a short circuit and the external antenna current is not limited.

5.1.5 RF (Radio Frequency) input

RF input is 1575.42 MHz (L1 Band) at a level between -135 dBm and -159 dBm into a 50 Ohm impedance. This input may have a DC voltage impressed upon it to supply power to an active antenna. The maximum input return loss is -9 dB.

5.1.6 Antenna gain

The receiver will operate with a passive antenna with unity gain. However, GPS performance will be optimum when an active antenna is used. The gain of this antenna at the input of the module should ideally be 16 dB.

Recommendations for antenna use and testing are available in the Jupiter 32 Integrator's manual (LA000605).

5.1.7 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.

5.1.8 Jamming performance

The typical jamming performance of the receiver based upon a 3 dB degradation in C/N_0 performance is shown in Table 5-2. This is with reference to the external antenna.

| Frequency MHz | Jamming signal power dBm |
|---------------|--------------------------|
| 200 | 3 |
| 400 | 4 |
| 800 | -9 |
| 1400 | -2 |
| 1425.42 | -2 |
| 1530 | -11 |
| 1555 | -44 |
| 1575.42 | -97 |
| 1625.42 | -4 |
| 1725.42 | -2 |

Table 5-2: Typical jamming performance

5.1.9 Flash upgradability

The firmware programmed in the Flash memory may be upgraded via the serial port RXA pad D5. The user can control this by driving the Serial BOOT SELECT pad C4 high at startup, then downloading the code from a PC with suitable software (e.g. 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.

5.1.10 Reset input

This active low input to N_RESET (pad E5) allows the user to restart the software from an external signal. In normal operation this pad should be left floating or activated by an open drain driver. Active pull-up is not recommended.

5.2 Data input output specifications

All communications between the Jupiter 32 xLP 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 Section 5.1.

5.2.1 Voltage levels

The I/O connector voltage levels measured at PWRIN=3V are shown in Table 5-3.

| Signal | Parameter | Value |
|--|---------------------------------|--------------|
| TXD & RXD GPIOs | V_{IH} (min) | 1.995V |
| | V_{IH} (max) | 3.15V |
| | V_{IL} (min) | 0.3V |
| | V_{IL} (max) | 0.855V |
| | V_{OH} (min) at I_{OH} 2mA | 2.137V |
| | V_{OH} (max) | 2.85V |
| | V_{OL} (min) | 0V |
| | V_{OL} (max) at I_{OL} -2mA | 0.7125V |
| Reset input* | max capacitance C_{max} | 100pF |
| | input current max | -600 μ A |
| | pulse time min | 250ms |
| *Reset input should not be driven high by external circuits. It is recommended that this input is driven low by an open drain interface. | | |

Table 5-3: Interface voltage levels

5.2.2 I/O surface mount pads

Details of the LGA pad functions are shown in Table 5-4. With the round hole on the label side of the chip facing up and to the left, the pads are designated A-F in columns down and 1-7 in rows across. Pad 1A starts at the hole. See Figure 7-1.

| Pad No | Pad Names | Type | Description |
|--------|------------------|------|--|
| A1 | RF_IN | I | RF Input 50 ohm |
| A2 | GND | P | RF signal ground return |
| A3 | GND | P | ground |
| A4 | VANT | P | active antenna power input |
| A5 | GPIO15 | I/O | reserved |
| A6 | GPIO14 | I/O | reserved |
| A7 | RF_ON | O | output to indicate whether the RF section is enabled (active high) |
| B1 | GND | P | RF signal ground return |
| B3 | VDD_BB | P | baseband power supply input for external regulator build option - DO NOT CONNECT |
| B4 | GPIO4 | I/O | reserved |
| B5 | GPIO13 | I/O | reserved |
| B6 | VDD_RTC | P | RTC power supply input for external regulator build option - DO NOT CONNECT |
| B7 | GPIO1 | I/O | reserved |
| C1 | GND | P | ground |
| C2 | TCXO_IN | I | TCXO input for external TCXO build option - DO NOT CONNECT |
| C4 | BOOT | I | active high to download flash firmware |
| C5 | LNA_EN | O | external antenna enable, active high |
| D2 | FACTORY USE ONLY | | reserved |
| D4 | N_GPS_FIX | O | active low when 2D or 3D fix data available |
| D5 | RXA | I | CMOS level asynchronous input for UART A |
| D7 | TXA | O | CMOS level asynchronous output for UART A |
| E1 | GND | P | ground |
| E2 | GND | P | ground |
| E4 | GPIO2 | | reserved |
| E5 | N_RESET | I | master reset, active low |
| E6 | RXB | I | CMOS level asynchronous input for UART B |
| E7 | 1PPS | O | 1 pulse per second output 1µs wide |
| F1 | PWRIN | P | 3.0 - 3.6V main power supply input |
| F2 | VBATT | P | 1.9 - 3.6V backup battery input |
| F3 | VCC_RF | P | RF power supply output for external regulator option - DO NOT CONNECT |
| F4 | WAKEUP | I | Push-to-Fix wake-up, active high |
| F5 | N_WAKEUP | O | low output indicates baseband is powered up - DO NOT CONNECT |
| F6 | TXB | O | CMOS level asynchronous output for UART B |
| F7 | ECLK | I | external clock input, not used |

Table 5-4: Jupiter 32 Module pad functions

6.0 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 modes are as follows:

- Port A: NMEA, 9600 bps, 8 data bits, no parity, 1 stop bit
- Port B: SiRF Binary, 38400 bps, 8 data bits, no parity, 1 stop bit

6.1 NMEA output messages

NMEA is a standard protocol used by GPS receivers to transmit data. Output NMEA (0183 v2.2) messages for the Jupiter 32 xLP are listed in Table 6-1. A complete description of each NMEA message is contained in the Navman NMEA reference manual (Part Number MN000315).

| Message ID and description | Refresh rate |
|---|--------------|
| GGA – global positioning system fix data | 1 s |
| GSA – DOP and active satellites | 1 s |
| GSV – satellites in view | 1 s |
| RMC – recommended minimum specific GPS data | 1 s |
| VTG – track made good and ground speed | 1 s |
| GLL – latitude, longitude, UTC of position fix and status | 1 s |
| ZDA – PPS timing message | 1 s |

Table 6-1: Default NMEA messages

6.2 SiRF Binary

SiRF Binary is the proprietary interface protocol of SiRF. It allows the Jupiter 32 a greater level of configurability and a more standardised message set than NMEA. A complete description of each binary message is contained in the SiRF Binary Protocol reference manual.

6.3 Software functions and capabilities

Table 6-2 shows the software features available to the Jupiter 32 xLP.

| Feature | Description | Availability |
|---|---|--------------|
| SBAS capability | Improves position accuracy by using freely available satellite-based correction services called SBAS (Satellite Based Augmentation System) | A |
| Adaptive TricklePower | 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 |
| Push-to-Fix | Provides an on-demand position fix mode designed to further improve battery life. Refer to the Low Power Operating Modes application note. | A |
| Ephemeris Push | allows hot start performance at all times including in weak conditions and moving start ups | yes |
| Almanac to Flash | Improves cold start times by storing the most recent almanac to flash memory. | yes |
| 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 |
| 1 PPS | A timing signal generated every second on the second. | yes |
| Write Configurations to Flash | Saves and restores user configurations and preferences to Flash memory. Refer to Saving and retrieving configuration data to Flash application note. | yes |
| Pre-defined Profiles | Allows easy selection of predefined user/application profiles. Refer to Jupiter 32 Integrator's Guide. | yes |
| yes = always enabled A = available, but not enabled by default | | |

Table 6-2: Jupiter 32 xLP software capability

7.0 Jupiter 32 xLP mechanical drawing

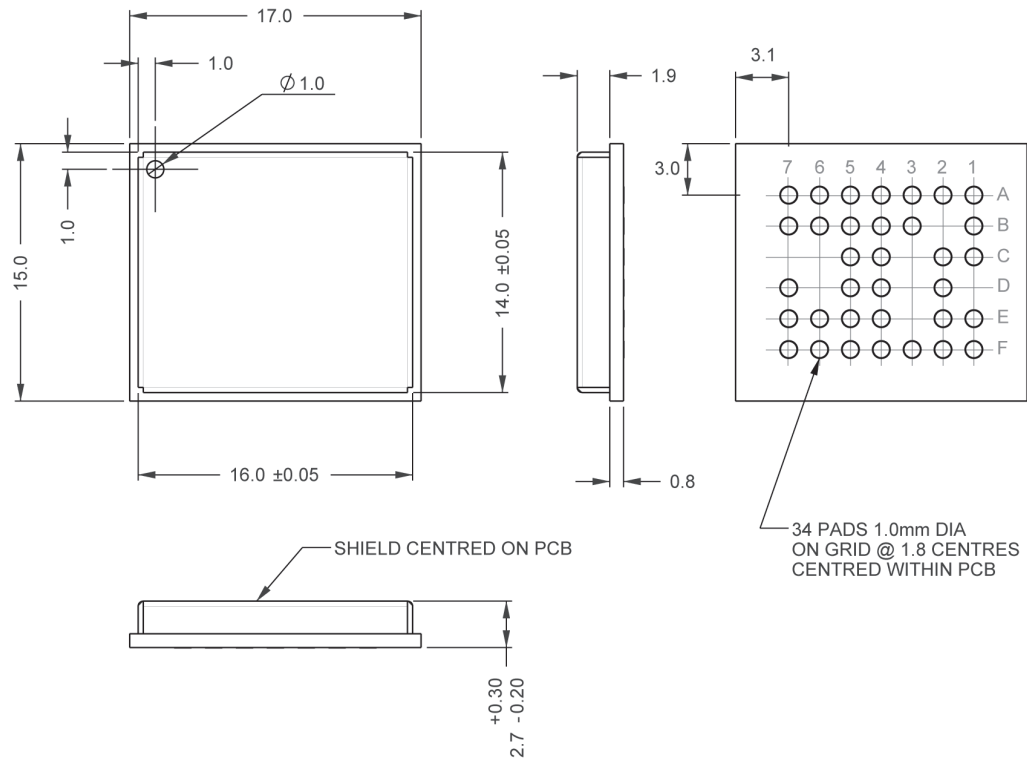


Figure 7-1: Jupiter 32 xLP mechanical layout

8.0 Jupiter 32 xLP evaluation kit

The Jupiter 32 xLP Development Kit (Part number AA003253-G) is available to assist in the evaluation and integration of the Jupiter 32 xLP module in custom applications. The Development Kit contains all of the necessary hardware and software to carry out a thorough evaluation of the Jupiter 32 xLP module.

9.0 Product handling

9.1 Product packaging and delivery

Jupiter 32 xLP modules are shipped in Tape and Reel form. The reeled modules are shipped with 250 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 250 units. Refer to the Jupiter 32 Integrator's manual for details on this.

All packaging is ESD protective lined. The Jupiter 32 xLP GPS receiver is an 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 9.2 and 9.3).

9.2 Moisture sensitivity

Precautionary measures are required in handling, storing and using such devices to avoid damage from moisture absorption. If localised 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*.

9.3 ESD sensitivity

The Jupiter 32 xLP GPS receiver contains class 1 devices and is Electro-Static Discharge Sensitive (ESDS). Navman recommends the two basic principles of protecting ESDS 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 IEC Technical Report *IEC61340-5-1 & 2: Protection of electronic devices from electrostatic phenomena*.

9.4 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.

9.5 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.



10.0 Ordering information

The part numbers of the Jupiter 32 xLP variants are shown in Table 10-1.

| Part Number | Description |
|-------------|---------------------------------|
| AA003255-G | Jupiter 32 xLP (standard) |
| AA003256-G | Jupiter 32 xLP on adapter board |
| AA003257-G | Jupiter 32 xLP evaluation kit |

Table 10-1: Jupiter 32 xLP ordering information

11.0 Glossary and acronyms

2dRMS: twice-distance Root Mean Square

A horizontal measure of accuracy representing the radius of a circle within which the true value lies at least 95% of the time.

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.

C/A code: Course Acquisition code

A spread spectrum direct sequence code that is used primarily by commercial GPS receivers to determine the range to the transmitting GPS satellite.

DGPS: Differential GPS

A technique to improve GPS accuracy that uses pseudo-range errors recorded at a known location to improve the measurements made by other GPS receivers within the same general geographic area.

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.

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.

GPS: Global Positioning System

A space-based radio positioning system that provides accurate position, velocity, and time data.

LGA: Land Grid Array

A physical interface for microprocessors. 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.

NMEA: National Marine Electronics Association**OEM: Original Equipment Manufacturer****Re-acquisition**

The time taken for a position to be obtained after all satellites have been made invisible to the receiver.

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.

SiRFInstantFix

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.

SiRFLoc

Allows a GPS receiver in a wireless device to intelligently switch between several different modes, ranging from a stand alone mode through various aided modes to determine a position based on the application and signal strength environment. This technology optimizes the use of airtime and flexibility depending on the situation.

SRAM: Static Random Access Memory**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.

Push-To-Fix and TricklePower are registered trademarks of SiRF Technologies.

© 2008 Navman Wireless OEM. All Rights Reserved.

Information in this document is provided in connection with Navman Wireless OEM ('Navman') products. These materials are provided by Navman as a service to its customers and may be used for informational purposes only. Navman assumes no responsibility for errors or omissions in these materials. Navman may make changes to specifications and product descriptions at any time, without notice. Navman makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Navman's Terms and Conditions of Sale for such products, Navman assumes no liability whatsoever.

THESE MATERIALS ARE PROVIDED 'AS IS' WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, RELATING TO SALE AND/OR USE OF NAVMAN PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. NAVMAN FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. NAVMAN SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

Navman products are not intended for use in medical, lifesaving or life sustaining applications. Navman customers using or selling Navman products for use in such applications do so at their own risk and agree to fully indemnify Navman for any damages resulting from such improper use or sale. Product names or services listed in this publication are for identification purposes only, and may be trademarks of third parties. Third-party brands and names are the property of their respective owners. Additional information, posted at www.navmanwireless.com/oem, is incorporated by reference.