NAVMAN WIRELESS

Datasheet

Jupiter-F2
(Flash, EEPROM, ROM-only)

GPS Receiver Module

July 6, 2011

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1 Introduction

Building upon the SiRFstarIV™ architecture's high-performance and micro-power capabilities, the J-F2 devices incorporate innovations such as SiRFaware™, SiRFInstantFix™ and Active Jammer Removal. The J-F2 can navigate to -160dBm and track to -163dBm, providing higher coverage, accuracy and availability. This next generation Jupiter Module consumes only 23mW (1.8V) in 1-Hz TricklePower™ mode and can maintain hot-start conditions continuously in SiRFaware™ mode while drawing as little as 50-500uA. The J-F2 offers A-GPS support and operate with a 1.8V power supply. J-F2 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 and memory (Flash and EEPROM modules only).

1.1 SiRFaware™ Technology

SiRFaware™ maximizes performance of the J-F2 without requiring it to maintain full power. This is achieved by using the following advanced technology to maintain continuous location awareness while minimizing power consumption:

- Opportunistic ephemeris decode and advanced power management, which allow the GPS receiver to stay in hot start conditions nearly continuously while consuming very little power.
- Local ephemeris prediction for three days in advance using captured ephemerides, which boosts sensitivity and performance.
- Dynamic contextual awareness by monitoring temperature change and by interfacing with MEMS sensors to detect movement, which conserves power and also boosts performance.

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.

Adaptive Micro Power Manager – Advanced power management with integrated LDO regulation to maintain hot-start conditions with minimal energy. Always ON 1.8V supply must be used.

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.

High Performance Solution:

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

Adaptive Micro Power Controller:

- Only 50 to 500uA maintains hot start capability

Active Jammer Remover:

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

Advanced Navigation Features:

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

2.1 Product Compatibility

The J-F2 incorporates a new technology far advanced compared to the previous SiRFstarIII designs. It offers an upgrade path from existing Navman and competitive designs.

J-F2 incorporates the same footprint as the Jupiter3 (J3) with the same pad dimensions. Pinouts are adapted to make use of the SiRFstarIV advanced technology. Please check the Designer's Notes for more details.

Note that the J-F2 is not backwards compatible with the J3.

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-F2 receiver is shown in Figure 1.

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

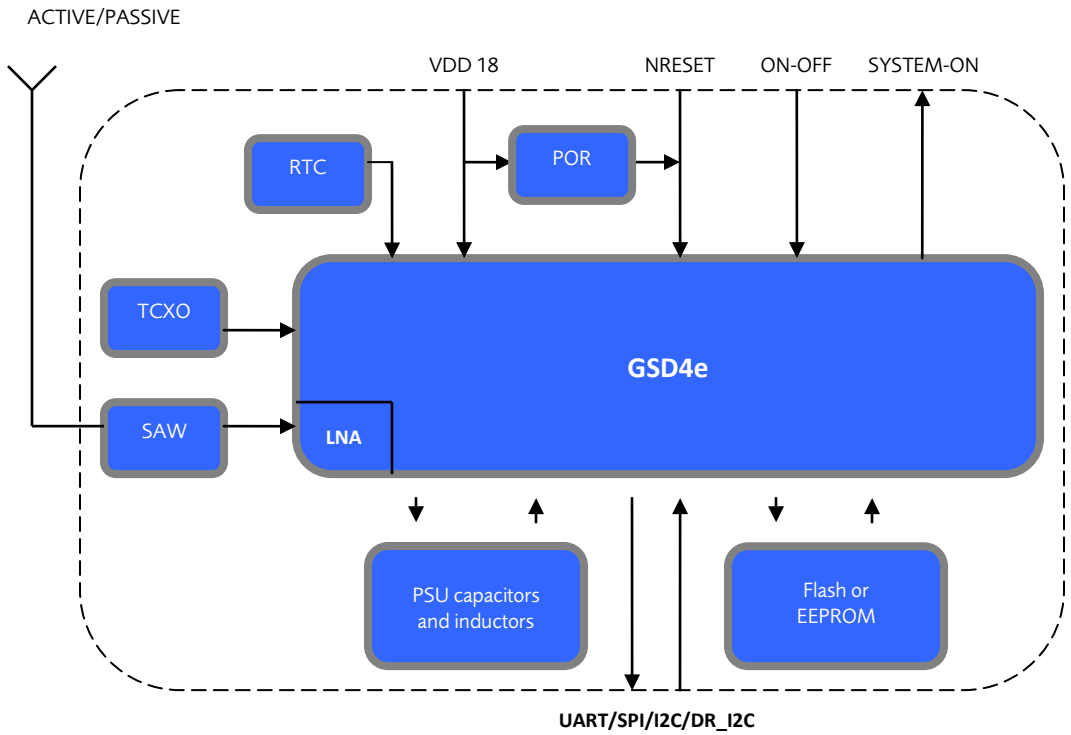


Figure 1 – J-F2 Architecture

2.3 Major Components

All power supply components are on board including capacitors and additional Power-On-Reset (POR) for the 1.8V supply.

A 1.8V always ON supply with noise and ripple characteristics mentioned in section 5.1 is critical for reliable operation. This can be a 1.8V supply that is backed up by a very low current 1.8V LDO that will supply the 14uA typical when the GPS has been shut down into Hibernate mode. Refer to the Designer's Notes for additional details. If the 1.8V supply is inadvertently cut off the GPS 1.8V POR will shut it down into Hibernate with loss of data. It is important that the GPS has sufficient bulk capacitance to enable the GPS to shut down gracefully into Hibernate mode. In addition this would only be possible if a 1.8V battery backed supply is also provided to retain the GPS in Hibernate mode ready to accept an ON pulse once the main 1.8V supply is available again.

2.3.1 ON-OFF

This control 1.8V to 3.6V input signal is used to turn ON and turn OFF the GPS receiver. Main 1.8V power must be already available and stable.

There is a minimum time period before the receiver will accept an ON pulse once the 1.8V power has been first applied, 3 seconds typical. It is suggested the SYSTEM-ON line is monitored as it will indicate when the GPS can accept an ON pulse after the first 1.8V power application. If a 1.8V battery back-up system is used and the GPS has already been powered up, shut down should be done via the ON-OFF line. The SYSTEM-ON line will not indicate a READY state if the main 1.8V supply is re-applied. The battery back-up supply has kept the system ready and valid and an ON pulse can be applied as soon the main 1.8V supply is stable. Note, clean application of this 1.8V supply is required.

2.3.2 SYSTEM-ON

This is an active high (1.8V) indication that the system is ready to receive an ON pulse or that the system is ON and running. A short duration active high pulse occurs on this line if the main 1.8V supply has been connected (if no 1.8V battery back-up is used) and is valid. Note, that noisy or unstable application of the 1.8V power will cause the 1.8V POR monitor to shut the GPS down and lose data.

Band pass 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. The filter has a bandwidth of 2 MHz.

2.3.3 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.

2.3.4 VDD 18

This is the primary, always-ON supply voltage for the module. A very low noise 1.8V always-ON source must be used.

2.3.5 NRESET

This is the user Reset input, however it is recommended not be used. The module has two internal POR devices. One POR for the 1.2V core and a POR for the 1.8V supply. No user POR is required.

2.3.6 Host Port

The J-F2 has a single HOST port. The user can select between UART, I2C and SPI ports through the use of external pull-up and pull-downs resistors. See the Designer's Notes for more details.

The UART port is the default serial communications port.

2.3.7 MEMS Sensor Interface

The DR 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.

2.3.8 TCXO

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

2.3.9 Memory

Two versions of the J-F2 are available with internal memory, Flash or EEPROM.

The Flash version includes a 16MB Flash storage device for operational software and satellite data.

The EEPROM version includes a 512KB EEPROM storage device for patch code and satellite data.

The ROM-only 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-F2 receiver has advanced miniature packaging and a LGA footprint and is smaller than the Jupiter 32 and similar in size to the Jupiter3 (J3). It is a surface mount device packaged on a printed circuit board, with a metallic RF enclosure on one side. There are 32 surface mount connection pads with a base metal of copper and an Electroless Nickel Immersion Gold (ENIG) finish.

2.5 Mechanical Specification

The physical dimension of the J-F2 is as follows:

- length: 11.0 mm ± 0.1 mm
- width: 11.0 mm ± 0.1 mm
- thickness: 2.25 mm max
- weight: 1 g max

Refer to Figure 2 for the J-F2 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.

Note that GPIO and UART/SPI/I2C/DR_I2C are 1.8V signals.

2.8 Environmental

The environmental operating conditions of the J-F2 is 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-F2 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-F2 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. 11 = 2011, 12 = 2012)
- 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

2.11 Active Antenna Gain Requirements

LNA Gain Setting	LNA Gain (dB)	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. Requires always ON 1.8V main supply.

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. Requires always ON 1.8V main supply.

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, modules with EEPROM do not support SGEE.

Note: The ROM-only module does 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 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 paragraphs describe the six power management modes supported by the J-F2.

Note that power consumption will be lower if AGPS is used.

3.4.1 Hibernate State

This is the lowest power consumption state (14uA typical) and allows a Hot Start within 2-4 hours of last shut down. The GPS receiver must have had a valid fix with sufficient visible satellites before having been shut down via the ON-OFF line or serial command.

Note: If AGPS is used there will be no time limit as long as the AGPS data is still valid.

3.4.2 Advanced Power Management (APM)

This is a sophisticated power management scheme that uses several user-specified criteria such as specified navigation solution accuracy and position reporting interval. It also allows for prioritization of the various criteria. In this mode the J-F2 uses the minimum average power that is needed to meet the specified criteria. APM is designed for use in AGPS wireless applications.

3.4.3 Micro Power Mode

Micro Power mode is a very low power maintenance mode implementing SiRFaware™ technology. In this mode the J-F2 remains predominantly in the Hibernate state, but exits this state only as needed to maintain location awareness and valid ephemeris data. Thus high sensitivity hot start conditions are always present when the ON-OFF signal is used to wake up the J-F2 and obtain a navigation update.

3.4.4 Adaptive Trickle Power (ATP)

Trickle Power mode is a duty-cycled power management mode that reduces average current consumption by the J-F2 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-F2 in and out of full power mode as needed in order to maintain GPS performance.

3.4.5 Push to Fix Mode (PTF)

Push to Fix mode is designed for applications that do not require frequent navigation updates. In this mode the J-F2 remains in the hibernate state most of the time, but wakes up periodically to perform a hot start acquisition (up to once every two hours) and provide a quality navigation solution. The J-F2 also wakes up when requested by a signal on the ON-OFF line.

3.5 Differential Aiding

3.5.1 Satellite Based Augmentation Systems (SBAS)

The J-F2 is capable of receiving WAAS and EGNOS, MSAS, 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 Flash designs only. Not available in standard code release.

Table 2 – J-F2 Performance Data

3.7 Dynamic Constraints

The J-F2 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 VDD 18

Main 1.8V always ON power input.

Noise and ripple requirements are:

- Supply voltage: Nominal 1.8V, +50mV, -50mV.
- 0-3MHz range, less than 50mV peak to peak noise.
- >3MHz range, less than 15mV peak to peak noise.

Note: protected by POR, which will force the GPS receiver into Hibernate mode, if triggered. It will require an ON pulse to wake it up again.

Sufficient low ESR capacitance is required and the 1.8V supply must have low source impedance to prevent the 1.8V rail POR to trigger when the module is started up via the ON-OFF line. This causes inrush current that can cause the 1.8V supply to drop.

Refer to the Designer's Notes for more details.

4.1.2 External Antenna Voltage

The J-F2 requires an external antenna Bias-T to provide the voltage to the antenna. This is detailed in the Designer's Notes.

4.1.3 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.

4.1.4 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.

4.1.5 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.

4.1.6 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.

4.1.7 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.

4.1.8 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 modules can support patch updates if Host memory is available.

4.1.9 Reset Input

This active low input to NRESET. No user POR is required. It is recommended to not use or connect to this pin, except as indicated by NAVMAN.

The module contains a POR that monitors the 1.8V supply. This POR has strict criteria to ensure system software reliability. If this signal is triggered by low voltage on the 1.8V supply the J-F2 will drop into Hibernate mode and the patch RAM and CGEE will be cleared. The J-F2 will require an ON pulse once the supply has stabilized to wake up the GPS receiver and return to a full power state (CGEE must be reloaded). If the supply voltage drops low enough for a long enough period of time the RAM/BBRAM will be cleared and the GPS will carry out a Cold start once woken up.

Note: If the voltage drops low enough to affect the RAM/BBRAM/PATCH RAM and the 1.8V POR has triggered, all power must be removed from the module for a minimum of 10 seconds to ensure the memory is cleared of all corrupted data. It is strongly recommend a 1.8V back up supply is used to ensure this does not happen. The 1.8V back up supply (14uA typical) will take over once the GPS has been shut down into Hibernate mode via the 1.8V rail POR as the main 1.8V supply inadvertently drops. Enough isolation is required on the main 1.8V supply to prevent current draining back through the main 1.8V supply and cause memory corruption. Review the Designer's Note for more details.

It is important that the always ON 1.8V is primary design consideration and must be maintained as much as possible.

Review the Designer's Note for in depth information on the 1.8V supply requirements.

4.2 Data Input/Output Specifications

All communications between the J-F2 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.

4.2.1 Voltages and Currents

Parameter	Symbol	Min	Typ	Max	Unit
Power Supply Voltage [1,3]	VDD	1.75	1.8	1.90	V
Operating Temperature [2]	T_{OPR}	-40		85	^{0}C
Navigating Current Consumption [4]					
Low Gain Mode			34		mA
High Gain Mode			38		mA
1Hz Trickle Power Current [4]			13		mA
Hibernate Current			<14		uA

Table 3 – Power Requirements

Notes:

1. Power must be always applied. The GPS will control its own power consumption depending on the required power configuration. The ON-OFF pin must be used to power the GPS OFF and ON.
2. Operating temperature is ambient.
3. Ripple characteristics must be ensured for best GPS performance and reliable operation. The 1.8V POR has strict requirements and will shut the GPS down if these minimum specifications are not maintained.
4. This is in LDO mode. Default power mode on power application and start up.

Note: Allowable ripple on the 1.8V supply is <50mV (0-3MHz) and <16mV above 3MHz. This is WITH the GPS and all systems running.

Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Power Supply Voltage	VDD	2.2	V
Input Pin Voltage	VIO_IN	3.6	V
Output Pin Voltage	VIO_OUT	3.6	V
Storage Temperature	T_{stg}	-50 to 150	^{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.

Parameter	Symbol	Min	Typ	Max	Units
Low level output voltage Test conditions I_{ol}=2mA and 4.0mA	V_{ol}	-	-	0.40	V
High level output voltage Test conditions I_{ol}=2mA and 4.0mA	V_{oh}	0.75xVDD	-	-	V
Low level input voltage	V_{il}	-0.4	-	0.45	V
High level input voltage	V_{ih}	0.7xVDD	-	3.6	V
Internal pull-up resistor equivalent	R_{pu}	50	86	157	kΩ
Internal pull-down resistor equivalent	R_{pd}	51	91	180	kΩ
Input leakage at V_I=1.8V or 0V	L_i	-10	-	10	uA
Tristate output leakage at V_0=1.8V or 0V	L_{oz}	-10	-	10	uA
Input capacitance	C_{in}	-	5	-	pF
Output capacitance	C_{load}	-	-	-	pF

Table 5 – DC Electrical Characteristics

Note: VDD=1.8V

4.2.2 Pinout Description

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

Pad Number	Pad Function	Type	Description
1	GND	PWR	GROUND
2	NC	-	No connection
3	NC	-	No connection
4	NC	-	No connection
5	SYSTEM-ON	O	Indication that GPS is running (Active high)
6	NC	-	No connection
7	GND	PWR	GROUND
8	RF IN	I	GPS RF Input
9	GND	PWR	GROUND
10	TX	O	UART/SPI/I2C (1.8V)
11	RX	I	UART/SPI/I2C (3.6V tolerant)
12	NRESET	I	GPS Reset (Active low)
13	ON-OFF	I	Input signal turns GPS ON or OFF (Active high pulse)
14	NC	-	No connection
15	GPIO4	I/O	General Purpose Input/Output
16	NC	-	No connection
17	BOOT	I	Boot pin for firmware update (Active high)
18	GPIO2	I/O	General Purpose Input/Output
19	GPIO3	I/O	General Purpose Input/Output
20	NC	-	No connection
21	GND	PWR	GROUND
22	NC	-	No connection
23	GPIO6	I/O	General Purpose Input/Output
24	GPIO7	I/O	General Purpose Input/Output
25	VDD 18	PWR	Redundant supply (1.8V). Connect to Pin 32.
26	GPIO8	I/O	General Purpose Input/Output
27	NC	-	No connection
28	TM	O	1PPS time mark pulse
29	GPIO1	I/O	General Purpose Input/Output (DR I2C CLK)

30	GPIO0	I/O	General Purpose Input/Output (DR I2C IO)
31	GND	PWR	GROUND
32	VDD 18	PWR	Main supply voltage, 1.8V (ALWAYS ON)

Table 6 – LGA Pad Functions

Note: GPIO/UART/SPI/I2C/DR_I2C voltages and levels are based on 1.8V.

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:

UART: 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:

- MID 7
- MID 64 SUB ID 2 – One message for each satellite being tracked.
- MID41
- MID4
- MID3
- MID138
- MID2
- MID9

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

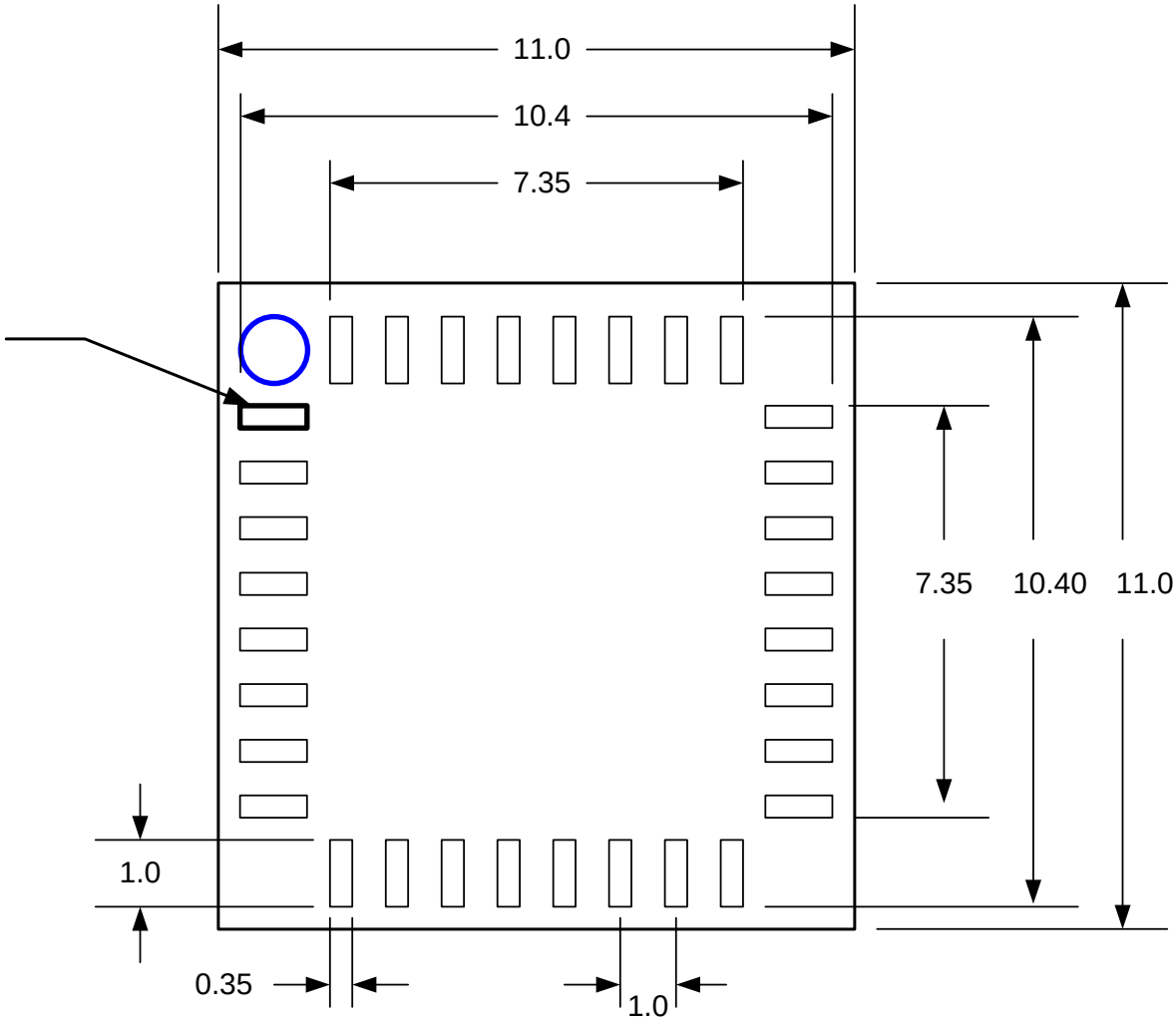
5.3 Software Functions and Capabilities

Table 7 shows the software features available to the J-F2.

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
Push to Fix Mode	Provides an on-demand position fix mode designed to further improves battery life compared to ATP.	A
Micro Power Management	Advanced power management with integrated switched-mode regulation to maintain hot start conditions with minimal energy.	A
Advanced Power Management	Allows many system triggers to be set to ensure the lowest power consumption is achieved with the required number of fixes and quality of fixes.	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 and wake-up. 3-axis magnetometer support for compass heading.	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 and 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 7 – Software Features

6 Mechanical Drawing



All dimensions are in mm.

Figure 2 – Mechanical Layout

Bottom pad pinouts as viewed from the top through to the bottom.

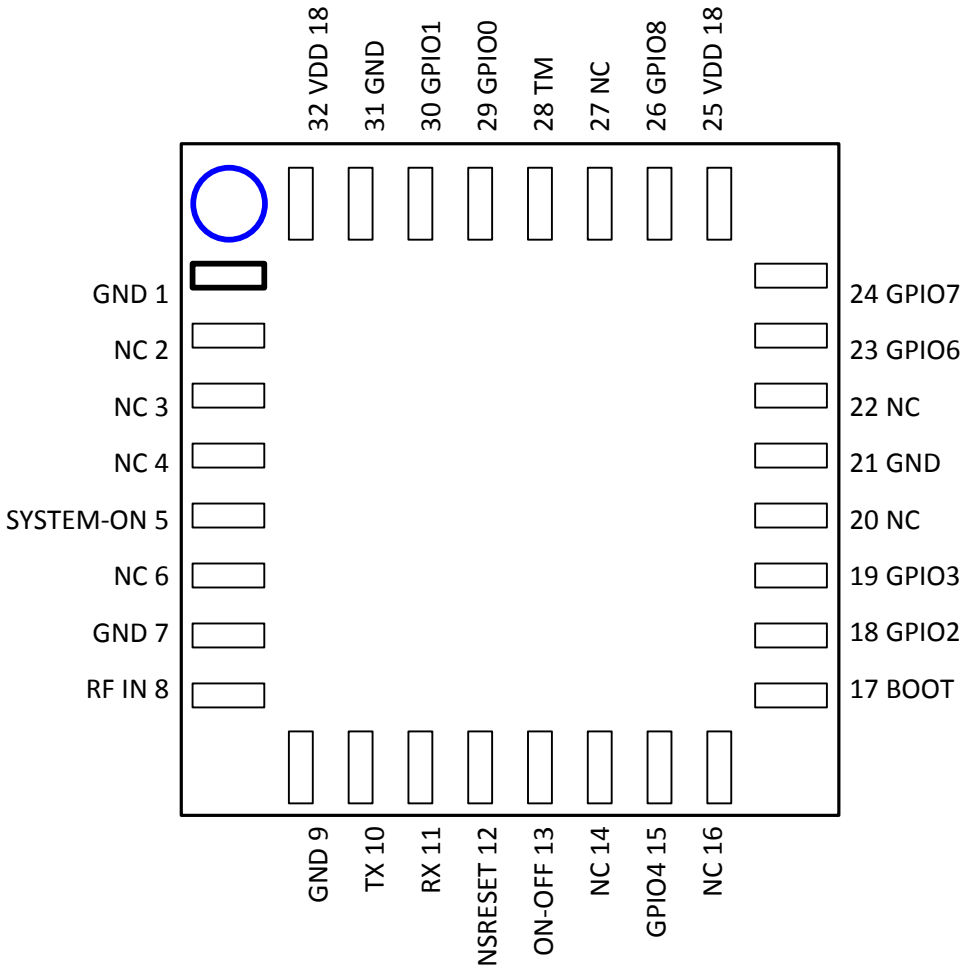


Figure 3 – Pinout (Top View)

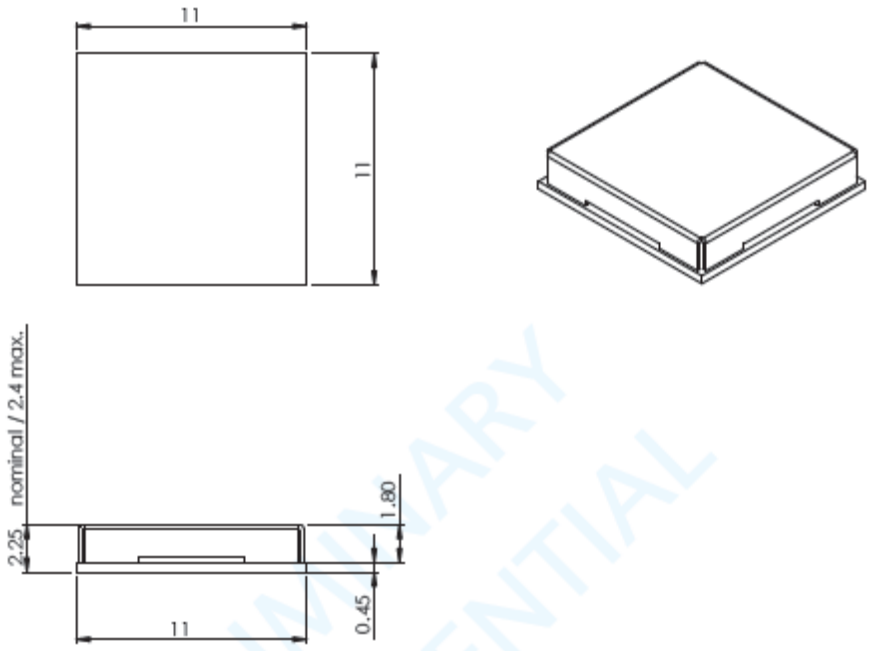


Figure 4 – 3D Model

7 Evaluation Kit

The J-F2 Evaluation Kit is available to assist in the evaluation and integration of the J-F2 module in custom applications. The Development Kit contains all of the necessary hardware and software to carry out a thorough evaluation of the J-F2 module.

8 Product Handling

8.1 Product Packaging and Delivery

J-F2 modue is 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 a 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-F2 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 9.2 and 9.3).

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-F2 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-F2.B0xx.xY J-F2 Flash Module (TR = tray)
- J-F2.B0xx.xR J-F2 Flash Module (TP = tape and reel)
- J-F2.B0xx.xE J-F2 Flash Module Evaluation Kit
- J-F2.C5xx.xY J-F2 512K EEPROM Module (TR = tray)
- J-F2.C5xx.xR J-F2 512K EEPROM Module (TP = tape and reel)
- J-F2.C5xx.xE J-F2 512K EEPROM Evaluation Kit
- J-F2.C0xx.xY J-F2 ROM-only Module (TR = tray)
- J-F2.C0xx.xR J-F2 ROM-only Module (TP = tape and reel)
- J-F2.C0xx.xE J-F2 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
6/3/11	-	Initial Release
6/6/11	A	Clarify ITAR limits
6/28/11	B	Correct pin 1 name (GND), updated Table 2, update ordering information Remove reference to J-R2 and J-H2.
7/6/11	C	Swapped pinout definition for pins 29 and 30 in Table 6.