Fastrax

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9/2010

GPS

Receivers & Tracking products

smart positioning

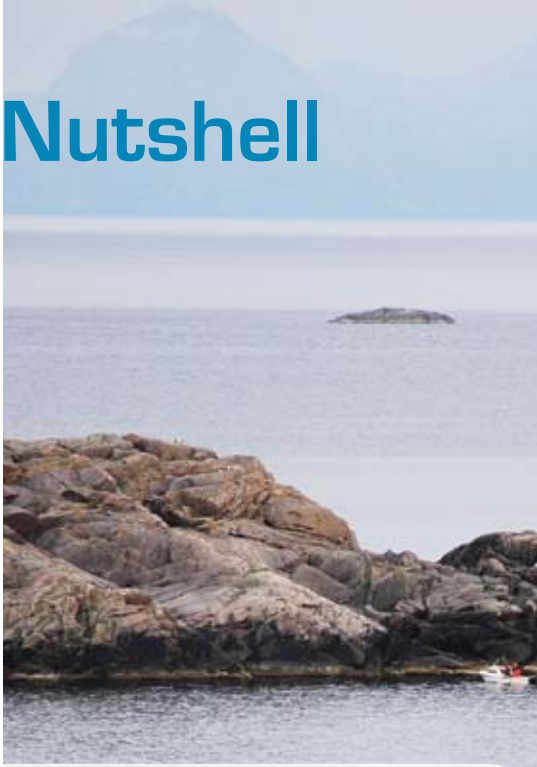
Choose from the widest range of GPS receiver solutions in the world!

FASTRAX PRODUCT MATRIX

Product	Description	TTFF	Sensivity acq./navig.	Power consumption	Dimensions(mm)
FASTRAX 500-SERIES FOR ULTIMATE SENSITIVITY					
IT500	Ultra-sensitive, pin-compatible with MP family GPS receivers	<33s	-148 dBm /-165 dBm	75mW@3.0V	16.2 x 18.8x 2.3
IT520	Ultra small, low-power and highly sensitive GPS module	<33s	-148 dBm /-165 dBm	75mW@3.0V	10.4 x 14.0 x 2.3
FASTRAX 400-SERIES FOR MINIATURE SIZE AND LOW POWER					
IT430	Smallest available complete GPS receiver with low power consumption and 1.8V single power supply	<35s	-147 dBm /-163 dBm (tracking)	56mW@1.8V or 68mW@1.8V	9.6 x 9.6 x 1.85
FASTRAX 300-SERIES FOR HIGH PERFORMANCE					
IT310	Small and highly sensitive GPS receiver module	<32s	-146 dBm /-159 dBm	75mW@3.0V	13.1 x 15.9x 2.3
IT300	Highly sensitive, pin-compatible with MP family GPS receivers	<32s	-146 dBm /-159 dBm	75mW@ 3.0V	16.2 x 18.8x 2.3
FASTRAX 03-SERIES FOR PROGRAMMABILITY AND LOW POWER					
IT03	Sensitive, low-power, programmable with iSuite SDK,DataLogger 140.000 pts	<36s	-142 dBm / -156 dBm	95mW@2.7V	22 x 23 x 2.9
FASTRAX 500-SERIES WITH INTEGRATED ANTENNA					
UP501	High-sensitivity GPS receiver module with integrated antenna	<33s	-148 dBm /-165 dBm	75mW@3.0V	22.0 x 22.0 x 8.0
FASTRAX 300-SERIES WITH INTEGRATED ANTENNA					
UP300	Sensitive, low-power GPS antenna module.	<32s	-146 dBm /-159 dBm	84mW@3.0V	19 x 27 x 7.2

	Protocols	Programmable	Chipset	Channels	Photo	Note
	NMEA	No	MTK3329	66+22		IT MP compatible, 10 Hz fix rate, extended power supply range , predicted 14 days A-GPS
	NMEA	No	MTK3329	66+22		Up to 10 Hz fix rate, predicted 14 days A-GPS
	NMEA (default) OSP (binary)	No	SiRFstar IV GSD4e	48		Client Generated Extended Ephemeris™ and SiRFAware™ for always hot start feature, advanced power saving modes
	NMEA & SiRF	Limited with Sirf SDK	SiRFstarIII GSC3f/LPx	20		Adaptive Trickle-Power™. Push-to-Fix™.
	NMEA & SiRF	Limited with Sirf SDK	SiRFstarIII GSC3e/LPx	20		Fastrax IT MP compatible Adaptive Trickle-Power™ Push-to-Fix™.
	NMEA & iTalk	Yes, iSuite SDK	uNav (uN8021 RF, uN8130 BB)	12		Programmable with iSuite3. For embedded applications, Custom protocols. On-board data logger.
	NMEA	No	MTK3329	66+22		Up to 10 Hz fix rate, predicted 14 days A-GPS
	NMEA & SiRF	No	SiRFstar III GSC3e/LPx	20		Adaptive Trickle-Power™. Push-to-Fix™. Connector for optional external antenna.

Fastrax in a Nutshell



Fastrax is a leading provider of high performing GPS modules, Software GPS solutions and Asset Tracking platforms for device designers and device manufacturers. The product portfolio consists of multiple GPS receiver modules and GPS antenna modules, novel pure Software GPS solutions for minimized cost and optimized GPS functionality in high-volume consumer devices, along with an easy-to-deploy Track & Trace asset tracking platform. Fastrax Extended Support Services provide expert advice and consulting in GPS application design, testing and production.

GPS / GNSS Receivers

The company has created a strong brand as a world leader in developing and manufacturing OEM GPS receiver modules that meet the most demanding market requirements concerning performance, receiver size, power consumption and programmability. With the broadest portfolio of GPS receivers, Fastrax ensures that any preference and requirement can be met. The receivers are ideally suited for both industrial location applications like various asset tracking platforms and high-volume, consumer products such as battery operated mobile phones, PDA's, PND's (Personal Navigation Devices) and recreational devices.

Software GPS

Lowest cost GPS receiver solution with ultimate performance

Fastrax Software GPS addresses the requirements for extremely low cost, yet high performance GPS and GNSS solution for consumer devices. Fastrax Software GPS is designed to perform all GPS/GNSS calculations on the main processor, using only a small portion of the available resources. This allows large savings in GPS/GNSS hardware cost in consumer electronics devices.

Fastrax iSuite SDK

Fastrax iSuite Development Environment is the only available embedded SDK for GPS receiver modules. It offers the programmer a lot of free resources in processing power, I/O's and memory size and full control of the GPS core. Thus cost and space can be reduced in many devices as no external microcontroller or memory is needed.

Fastrax Track & Trace Platform

The new Fastrax Track&Trace Platform is designed for telematics device manufacturers and asset tracking service providers. Fastrax Track&Trace platform offers hardware and software for asset tracking applications allowing companies to focus on providing the tracking service and not using time and resources on device development. It is suited for both professional fleet management applications and a wide range of GPS-enabled consumer devices and services. Fastrax Track&Trace Platform provides an ideal basis for development of applications to track and trace for example cars, trucks, trailers, motor bikes, boats and rental equipment.

Fastrax is privately owned and founded in Finland in 1999.

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Fastrax products and services – overview

Best available GPS chipsets combined with Fastrax extensive hardware, RF design and software knowledge enable Fastrax to manufacture state of the art OEM GPS receivers for varying needs and requirements at very low cost. The receivers combined with Fastrax strong support and application design knowledge allow customer to integrated GPS functionality in devices with less effort and cost than ever before.

GPS Receiver Module Series

- Fastrax IT500
- Fastrax IT400
- Fastrax IT300
- Fastrax IT03

Highly sensitive, very small, low power consuming and cost-efficient GPS modules.

GPS Receiver Modules with Antenna

- Fastrax UP501
- Fastrax UP300

GPS modules with integrated and optimized patch antennas.

IT03 Software Development tool

Complete software development environment iSuite 3 SDK for developing embedded applications in GPS modules and for customizing GPS according to varying needs.

Evaluation Kits

Evaluation tools for all GPS receivers in the lab or on the field.

Fastrax solutions

Fastrax solutions include, in addition to world-class OEM GPS receiver modules, also the best-of-breed tools for product development and application integration, as well as for testing purposes.

Fastrax Engineering Services Team

Fastrax Engineering Services Team offers its outstanding expertise to help integrate Fastrax modules into specific designs and to optimize GPS performance in any application in order to ensure highest possible quality in the end products and to allow system developers to concentrate on their core tasks and competencies.

These services include, but are not limited to:

- ***Antenna design service*** - to find the best possible signal reception in your application, even when space is very limited.
- ***Solving EMI issues*** - to identify, avoid or minimize the harmful impact of Electro Magnetic Interference.
- ***System integration issues*** – to solve any difficulties in integrating a GPS functionality in customer's application.
- ***GPS testing*** – for testing the application in early stages of development, in order to ensure best available functionality and quality.
- ***GPS Design Verification*** – for verifying design files already prior to ordering proto types in order to save time and development cost.

Fastrax Technology Platforms

Fastrax GPS receivers are based on chipsets from a few selected suppliers in order to guarantee best possible features and functionalities at competitive prices for its customers.

Fastrax IT500 series

Fastrax IT500-series receivers are based on the MT3329 chip from Mediatek Inc. The IT500-series is very high performing with outstanding acquisition sensitivity and navigation sensitivity as well as 10 Hz update rate and low power consumption. In addition to extreme sensitivity the receivers offers excellent navigation results even in very demanding environments.

Fastrax IT400 series

Fastrax IT400-series is the latest series of GPS modules added to Fastrax extensive product range. The receivers are based on SiRFstar IV™, GSD4e chips from CSR/SiRF. With extremely advanced power management and fast startup time combined with excellent performance, IT400-series is a ground-breaking solution for any portable application.

Fastrax IT300 series

All receivers in the Fastrax IT300-series are based on the SiRFstarIII™ chipset, either GSC3e/LPx or GSC3f/LPx. The protocols and commands are available as NMEA and/or Sirf binary. The complete Fastrax 300-series has very high performance and low power consumption which is proven to be a successful combination all over the world.

Fastrax IT03 series

Fastrax IT03-series of GPS receivers are based on the RF chip uN8021 and the base band chips uN8130 from Atheros Communications. The receivers offer minimal power consumption with on-board data logger, power saving interval mode and versatile programmability with a lot of free I/O's and processing resources. It provides accurate and configurable timing (1PPS), access to raw data such as code and carrier phase measurements and is thus suitable for varying expert needs.

Fastrax IT520 and IT500

Simply the most sensitive GPS receiver modules

The most sensitive GPS receivers for ultimate performance

Fastrax IT520 and IT500 GPS receiver modules offer the best performance and sensitivity among any GPS modules. Both modules have same features and specifications, like 14 days predicted A-GPS, up to 10Hz update rate, amazing signal acquisition and record breaking navigation sensitivity. The only difference is size. IT520 is the smallest module in the Fastrax IT500 series of GPS receivers with a footprint of only 10.4 x 14.0 x 2.3mm while the IT500 has Fastrax Multiplatform footprint, which means that that the same hardware design can be used for Fastrax IT300 modules as well.

Sensitivity

Sensitivity = "Minimum received signal strength that a receiver can work with"

Fastrax IT520 and IT500 are built with the market-leading GPS chip from Mediatek, MT3329. With cold start sensitivity of -148dBm it is possible to acquire satellite signals and start navigating in places where competing modules do not get even the first fix. Once the receivers have a fix, the ultimate navigation sensitivity of -165 dBm ensures the satellite signals will be received even in most dense and difficult urban areas.

Very high sensitivity also compensates the possible negative effect of host system EMI, enabling post-installations in several additional applications.

Assisted GPS (A-GPS) with two weeks ephemeris information makes the startup time to acquire a position even faster.

Ultra sensitive!

IT520 Actual size

Key Features:

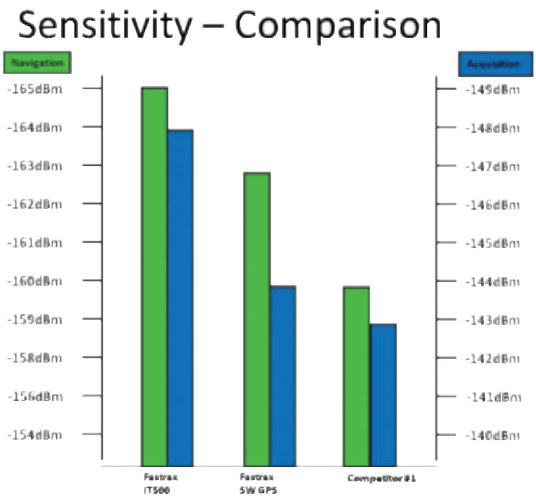
- IT500, compatible with Fastrax IT Multiplatform footprint
- IT520, size only 10.4 x 14.0 x 2.3mm
- Low power consumption:
  75mW@3.0V
- Ultimate sensitivity:
  -148 dBm (acquisition)
  -165 dBm (navigation)
- 10 Hz fix update rate
- A-GPS (14 days predicted ephemeris)
- Optional USB 2.0 connection (IT520U)
- Mediatek MTK3329
- Jammer detection and removal

Flexible and low power

Fastrax IT500 series receiver modules have internal high-efficiency switch mode regulators which enable a wide power range (+3.0…+4.2V) and power supply directly from Lithium Ion or Lithium Polymer batteries, without adding the cost of expensive external regulators. At +3.0 volt the power consumption is as low as 75mW in full operation, 3mW in stand-by mode and only 15uW in back-up mode.

Fastrax 500-series modules with integrated antenna
Fastrax UP501 - more on page 14.

Perfect trace with IT500 and 10Hz update rate in roundabout



Acquisition and navigation sensitivity comparison of IT500, Fastrax SW GPS and Fastrax main module competitor.

NMEA Manual for IT500-series of receivers can be requested from support@fastraxgps.com while brochure and technical interface description are found from:

http://www.fastraxgps.com/products/gpsmodules/500series

Fastrax IT430

Smallest available complete GPS module with low power consumption

Next generation GPS now

Fastrax IT430, based on new generation SiRFstar IV architecture and SiRFaware technology, offers a range of new benefits that speed the inclusion of location-aware features in battery operated consumer devices. The complete Fastrax IT430 GPS module is packed into a tiny casing for easy fitting into various handheld or other battery powered devices. Fastrax IT430 features a miniature form factor of only 9.6 x 9.6 x 1.85 mm, which makes it one of the smallest complete GPS modules available on the market. With the included TCXO, RTC and SAW filter, the amount of required external components is reduced to a minimum.

Battery life is critical

Fastrax IT430 is especially well suitable for battery operated devices using 1.8 V internal power regulation. The low-power GPS module consumes only 56 mW at 1.8 V in full operation mode. With SiRFAware it consumes only 500uA in average. The small size and low power consumption combined with ultra-high sensitivity, allows easy utilization in a variety of applications, including the smallest battery-operated consumer devices.

With its new innovative standby mode, Fastrax IT430 activates itself autonomously from time to time in order to maintain awareness of its location at all times. As a result, updated location information is available almost immediately when activated, without compromising battery life.

Ultra small!

Actual size

Key Features:

- Miniature size: 9.6 x 9.6 x 1.85 mm
- Ultra high sensitivity:
  -147dBm (cold start)
  -163dBm (tracking)
- Low Power Consumption:
  56mW@1.8V
- 500uA average power consumtion with SiRF Aware
- 48 channels
- Host port configurable to UART, SPI or I2C
- Advanced power modes
- Jammer detection and removal, up to 8 CW EMI sources
- SiRFstarIV, GSD4e GPS chip

Fastrax 300-Series GPS Receiver Modules

Fastrax IT310

Key Features:

- Very low power consumption: 75mW @ 3.0V
- Small form factor: 13.1 x 15.9 x 2.3 mm
- Ultra High Sensitivity: -146dBm (cold start) -159 dBm (tracking)
- Extremely Fast TTFF

Actual size

Fastrax IT300

Key Features:

- Compatible with IT Multiplatform footprint
- Ultra-High Sensitivity with SiRFstarIII -146dBm (cold start) -159 dBm (Tracking)
- Very low power consumption: 75mW @ 3.0V
- Size 16.2 x 18.8 x 2.3 mm
- Extremely Fast TTFF

Actual size

Why IT310?

The advantage of Fastrax IT310 is the small size combined with very low power consumption. IT310 is based on the proven and tested GSC3fLPx GPS chip from CSR/SiRF, enabling the low power consumption during acquisition and navigation: 75mW

Why IT300?

The main benefit of Fastrax IT300 is the IT Multiplatform compatible footprint. This allows customers to select two different modules (IT300 and IT500), with two different functionalities in one form factor. This translates to flexibility and cost-saving in any design.

Fastrax 300-Series receivers with integrated antenna

Fastrax UP300

(More on page 15)

Fastrax IT03

Programmable, High Sensitive and Low Power GPS Receiver Module

Performance for savings

The Fastrax IT03 features a 16Mbit Flash memory, which allows remote firmware updates, permanent operation parameter changes via NMEA or iTalk 3 and data logging as a standard feature. Fastrax IT03 supports versatile programmability with iSuite 3 SDK, which results to reduced application costs when no external processor is required as the Fastrax IT03 is used as a host controller. See more of iSuite SDK on page 22.

Module for advanced use

Ultra-low, user configurable power management makes Fastrax IT03 one of the lowest power consuming, complete GPS receiver modules on the market. Furthermore, the expert features like accurate and configurable timing, different coordinate systems, availability of raw measurement data and many other advantages make this module the most intelligent GPS receiver on the market. See expert features on next page.

World of applications

Offering industry-leading benefits in performance, size, power consumption, programmability and total cost of product, the Fastrax IT03 receivers are ideally suited for both industrial tracking and navigation systems and battery operated consumer products like sports accessories, handheld computers, asset tracking devices, vehicle navigation devices and mobile phones.

Key Features:

- Programmable with iSuite™ SDK
- Very accurate time 20ns RMS (configurable pulse)
- Low power consumption – only 95 mW @ 2.7V
- Small form factor: 22 x 23 x 2.9 mm
- High sensitivity: -156 dBm (navigation)
- Built-in data logger
- Atheros chipset
- Extensive interface ports

Actual size

IT03-SERIES EXPERT FEATURES

- **Very accurate timing, 20ns accuracy**
  Configurable cable delay
  Changeable polarity of time pulse
  Configurable length of time pulse
- **Enables different coordinate systems**
  For example MGRS
- **On-board data logger**
  Enables easy logging of position, speed, velocity
- **Access to Raw measurement data**
  Carrier phase
  Code phase
  Pseudorange
- **Extensive configurability**
- **Programmability**
  Functions as host CPU
  Management of radio modems, displays, LED's, buttons, I/O's
  Custom protocols

Fastrax UP501

The most sensitive antenna module

Can the best be improved?

Fastrax UP501 is the successor of extremely popular UP500, with further improved sensitivity and power consumption, thanks to the latest generation Mediatek MT3329 chip. Extremely sensitive UP501 can have a fix even indoors when necessary, due to its extremely high cold start sensitivity of -148 dBm. Performance and ease of use make UP501 a reliable and simple GPS solution for any device.

Solid and simple

Fastrax UP501 is specially designed to make application design easy. It eliminates the need for antenna selection and tuning, speeding up the time-to-market for the device. The integrated patch antenna of 18 x 18mm provides very good performance, and it is already tuned for a plastic enclosure. In order to support stable mounting, there are built-in PCB-mounting flanges on the shield for firm soldering, to survive even tougher environments.

Ultimate performance

Fastrax UP501 enables extremely high navigation performance due to the navigation sensitivity of -165dBm. This sensitivity can also be utilized on 10 Hz update rate, making UP501 ideal also for motor sports applications. When a very fast fix is needed, Assisted-GPS with 14-days predicted assistance can be used to further speed up the fix time, without having to connect the server for download every time.

Very high sensitivity and internal jammer detection compensates the possible negative effect to host system EMI, enabling post-installations in multiple applications.

Actual size

Key Features:

- Ultra high sensitivity:
  -148 dBm (Cold start acquisition)
  -165 dBm (Navigation)
- Low Power consumption:
  75 mW @ 3.0V
- Up to 10 Hz fix rate
- Tiny form factor: 22 x 22 x 8mm
- Embedded, pre-tuned 18 x 18 mm patch antenna
- Mediatek MT3329, 66 channel receiver
- Predicted A-GPS for 14 days WAAS/EGNOS support
- Optional internal back-up battery (UP501B)
- Optional RS232 level serial port (UP501R)
- Jammer detection and removal

On-board high efficiency switch mode regulator and extensive supply range allow direct power supply from Li-Ion or Li-Polymer batteries.

Different variants

Fastrax UP501 comes in few different variants: UP501B with an on-board backup battery, as well as UP501R with RS232 level serial port and back-up battery.

Fastrax GPS Modules with Integrated Patch Antennas

Fastrax UP300

GPS Antenna Module

- Embedded GPS patch antenna
- Connector and switch for optional external antenna
- Low power consumption: 84 mW @ 3.3V
- Ultra High Sensitivity with SiRFstarIII GSC3e/LPx single chip receiver
- External system connector

Key features:

- Size 19 x 27 x 7.2mm
- Sensitivity
  -146 dBm (acquisition)
  -159 dBm (tracking)

Actual size

Cable + connector available for Fastrax UP300 – see accessories on page 28.

Fastrax Antenna Modules Comparison

	Fastrax UP300	Fastrax UP501
TTFF		
Cold start	32 s	33 s
Hot start	1 s	1 s
Sensitivity (dBm)		
Acquisition	-146	-148
Navigation	-159	-165
Power consumption		
Navigating	85mW	75 mW
Back-up state	45 uW	<15 uW
Channels	20	66 + 22
Size (mm)	19 x 27 x 7.2	22 x 22 x 8
Ground plane	Integrated	Integrated
External antenna connector	Yes	No
Automated antenna int/ext switch	Yes	No
Interface Connector	8-pin JST SM08B-SURS-TF	1x6pin grid, 2.54 mm pitch
Back-up supply	Yes	Yes (optional internal battery)
Chipset	SiRFstar III (GSC3e/LPx)	Mediatek MT3329
HW options	N/A	UP501 UP501B (internal back-up battery) UP501R (RS232+internal back-up battery)
Mounting	Integrated into customer mechanics	Using pin headers + wings on shield
Pro's and con's	+ Perfect solution for applications requiring both internal and external GPS antenna	+ Suitable for any application requiring extremely good sensitivity
	+ Enables GPS "post-installation" without big changes in design	+ Best antenna module when indoor navigation is required
	+ System cable enables flexible choise for positioning the module	+ Easy to mount due to "wings" on the shield and standard 6-pin header
	- Because of connectors and cables, UP300 is more costly than standard receivers	+ Low cost, simple module with three different hardware options
	- Very sensitive for EMI, shielding should be done properly	

Fastrax Multiplatform Receivers

GPS receivers for several applications

Fastrax MP (Multiplatform) receivers are pin compatible with each other offering common form factor and main functionality. The receivers offer very high sensitivity, low power consumption and excellent navigation performance even in most demanding environments.

Fastrax IT MP (Multiplatform) modules

- Fastrax IT500
- Fastrax IT300

All the MP modules work with NMEA protocol, while binary protocols are not compatible.

In order to verify seamless change between modules it is important that any Fastrax IT MP design is made according to the Fastrax IT MP Application Note. The Fastrax IT MP Application Note can be downloaded from www.fastraxgps.com.

Benefits:

- Common footprint
- Only one hardware design
- Optimal receiver for each application
- Fast Time To Market with Low Development Cost (Development, testing and documentation costs can be shared among several designs)
- 2 UARTS, 1PPS
- High sensitivity
- Low power consumption

Fastrax IT MP

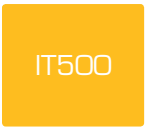
Key Features:

- Two Pin Compatible receivers
- Footprint: 16.2 x 18.8 x 2.3mm

Actual size

How to choose the right
GPS receiver module

Fastrax IT500 series



CHOOSE IT500 SERIES FOR:

- Highest possible sensitivity
- Low power consumption
- 10Hz fix rate
- A-GPS support
- USB 2.0 support (IT520U)
- Multiplatform footprint (IT500)

Fastrax IT400 series

CHOOSE IT400 SERIES FOR:

- Smallest size (IT430)
- Lowest power consumption
- 1.8V power supply
- High sensitivity
- Always hot start
- Advanced power saving modes
- Embedded extended ephemeris
- SiRFstar IV
- 8 CW jammer remover
- SiRFAware for 500 µA avg. power consumption

Fastrax IT300 series

CHOOSE IT300 SERIES FOR:

- Low power consumption
- High sensitivity
- Advanced power saving features
- Multiplatform footprint (IT300)

Fastrax IT03 series

CHOOSE IT03 SERIES FOR:

- Embedded applications
- Expert requirements
- 1PPS accuracy and pulse configurability
- Different coordinate systems, custom protocols etc
- Data logging

How to choose the right
GPS antenna module

Fastrax IT500 series

UP501

CHOOSE UP500 SERIES FOR:

- Highest sensitivity
- Lowest cost
- 10 Hz update rate
- A-GPS
- Back-up battery (UP500B)
- RS232 (UP500R)
- Stable mounting possibilities

Fastrax IT300 series

UP300

CHOOSE UP300 SERIES FOR:

- Switch for optional external antenna
- System connector and cable
- Advanced power saving features

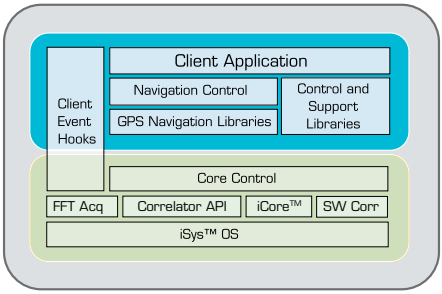
Fastrax Software GPS

What is Fastrax Software GPS?

A traditional GPS receiver consists of an antenna, an RF front-end and a baseband IC. The baseband IC consists of an application processor, some memory, and dedicated hardware for communication (UART, SPI) and signal processing (correlators, acquisition engine).

In addition to the traditional GPS receiver described above, there are also solutions on the market that reduce the size and price of the receiver hardware by moving parts of the software onto the host CPU. In such approaches, typically only the acquisition and tracking tasks are running on the GPS baseband IC, and the navigation algorithms are run on the host CPU. These approaches are usually referred to as measurement front end receivers.

Contrary to a traditional GPS receiver or a measurement front end, Fastrax Software GPS performs all GPS functionalities in software on an already existing CPU without the need of any GPS specific IC. This includes signal correlation, - acquisition and – tracking as well as pseudorange calculations, navigation and final PVT output.



Benefits with Fastrax Software GPS

- ***Cost & Flexibility***

Cost is significantly reduced as required silicon area is minimized in comparison to any other available GPS solution.

Flexibility is unique with Fastrax Software GPS. By using latest available radios with Fastrax Software GPS makes things really interesting. The receiver supports GPS today but can be configured to receiver other GNSS signals in the future as well. A multiband GNSS receiver can thus be implemented with a fraction of the cost of existing conventional multiband receivers.

- ***Low power consumption***

Another truly unique feature with Fastrax Software GPS is that the power consumption is typically 30mJ/fix, which is equivalent of more than 60.000 fixes from a single coin cell battery. This is achievable as Fastrax Software GPS receiver needs only to be on as long as the GNSS signal is received. In urban canyons 100ms is typically enough for good performance and in areas with good visibility it can be even shorter.

- ***Record Breaking Sensitivity***

Fastrax Software GPS enables also integration times far longer than conventional receivers and thus record breaking acquisition sensitivities can be achieved. The software architecture is also very flexible in terms of number of channels and number of correlator fingers used, which can be adjusted and optimized according to application specific requirements. With Fastrax Software GPS it is additionally straightforward to implement multipath mitigation and to detect and eliminate interference of CW (continuous wave) type of signals.

Software GPS applications

Since Fastrax Software GPS receiver is very flexible and fundamentally different from a conventional receiver, some new and exciting applications can be implemented. A traditional receiver needs to be on continuously during normal operation albeit some receivers have implemented power saving schemes where the radio is turned on and off. However, fundamentally a traditional receiver needs continuous operation for real-time code correlation. This means that a traditional receiver must be on for 8s for a warm start and 40s for a cold start, depending on the availability of ephemeris before a fix can be calculated. In terms of power consumption it means anything between 600mJ to 3000mJ to get one fix.

Fastrax Software GPS on the other hand can easily be used for a Push-to-Fix (P2F) type of solution where the GNSS signal is recorded with a time stamp and stored for post processing. The radio can be turned off immediately after the signal is captured. A cold start with a traditional low power receiver consumes thus 100 times more power than a Cold start using a software P2F solution.

A P2F type of solution can be used in many applications where real-time navigation is not required. Some typical examples are low power data loggers and digital cameras.

Key Features:

- Lowest cost GPS solution
- Lowest possible energy/fix required.
- Easy to optimize and adjust to available resources and signal availability
- Support for GPS, Software upgradeable to new GNSS systems
- Non real time requirement for signal processing

Available evaluation platform

At the moment Fastrax Software GPS can be demonstrated by using Fastrax IT910 USB stick containing an RF chip, CPU and a 1Gbit NAND Flash memory for data storage. It includes also a rechargeable Li-Ion battery and a RTCC for maintaining clock and calendar. The IT910 USB stick can be configured for autonomous logging at desired logging rates with an easy to use GUI or it can be operated manually by simply pushing a button. The actual positions are finally calculated automatically by the PC software once the USB stick is connected to the PC or server.

iSuite™ 3 SDK

Software Development Kit for Embedded GPS Applications in IT03-Series of receivers

iSuite 3 SDK is a complete software development environment for application specific customization and programming of Fastrax IT03-Series GPS receivers.

The main advantages are flexibility and full control of the application as well as miniature size, fast time to market, very low power consumption and low cost of ownership as no additional microcontroller is needed in the end applications. Suitable target segments are applications with special requirements like custom protocols and coordinate systems or access to pseudoranges and carrier phase data. Other suitable applications are asset tracking, person tracking and recreation applications where miniature size, lowest possible power consumption and excellent sensitivity are key requirements.

Typical iSuite™ 3 SDK Applications

iSuite 3 SDK is used in a variety of different applications. The applications are often small size, high volumes consumer application like speed camera devices, Bluetooth positioning devices, sports devices or anti-theft asset tracking devices. In such applications the internal microcontroller is used to manage GSM/GPRS modems, Bluetooth modules, LED's, displays, buttons, microphones, POI storage etc. The iSuite 3 SDK is also often used for more special requirements such as geo-fencing, integrating proprietary communication protocols, changing coordinate systems, accessing carrier phase data and pseudoranges or 100Hz post processed position updates.

Develop your own application

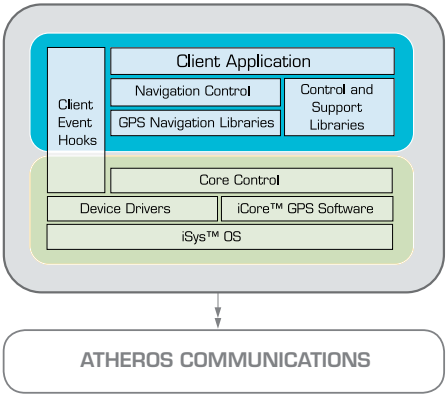
iSuite 3 SDK is used to develop customer specific applications that are executed on the Fastrax IT03-series of GPS receivers. The customer application software can process both raw and calculated position data generated by the iSuite 3 GPS Navigation software. The application software can also communicate with other devices with standard and customer specific communication protocols. The Fastrax IT03 receivers can also be used to do other programmed tasks triggered either internally or externally. These applications can utilize the on chip memory, flash memory file system for data and software code storage in addition to access the various I/O lines on the Fastrax IT03-series of GPS receiver. The receivers provide enough memory and bandwidth for even complex user tasks.

iSuite™ 3 SDK is now more powerful than ever

iSuite 3 SDK is the only true embedded, real time GPS Software Development Environment! Spare CPU processing capacity and extensive I/O's of Fastrax IT03 and Fastrax IT03-02 OEM GPS receivers can be used for custom purposes.

	IT03/16	IT03-02
CPU available for user application	41% of total CPU cycles free	
Code executed from RAM [1]	4.8 Dhrystone MIPS	
Code executed from Flash [1]	0.8 Dhrystone MIPS	
Free RAM memory	37.4 kBytes + 10.7 kBytes (Divided into X and Y memory spaces)	
Free program code and constant data memory on Flash [2]	1082 kBytes	1082 kBytes

Note 1): 100% of the CPU can be allocated to user application by temporarily suspending the GPS functionality. Note 2): These are minimum values. Available program code space can be increased by leaving out unused system features while compiling user application. System resources are based on currently available iSuite firmware version. Available resources are subject to change without prior notice.



iSys Real Time Operating System

iSys Real Time Operating System offers true multi-tasking and a 100% control of the application while iTalk protocol offers effective synchronized message queues. Thus programming challenges of multitasking and data sharing environment are already solved by the operating system.

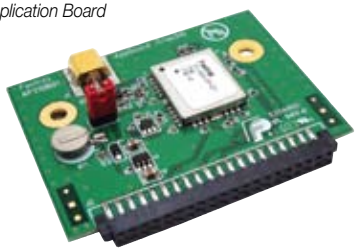
Toolkits for controlling your device

iSuite 3 SDK Toolkits for controlling your device can be used to enhance the capabilities further. Optional toolkits are available for controlling wireless modems, simple keyboards, LCD displays and other external sensors and peripheral devices. Toolkits are delivered with complete source code and function either as such or as reference implementations.

Hardware Platforms for application development with iSuite™ 3 SDK

Evaluation Kit with appropriate IT03-Series application board. The hardware enables easier debugging and testing of receiver software and access to all interface signals as well as seamless platform to platform transition of the application code and thus your valuable investment in software development is protected.

IT Application Board



iSuite™ 3 SDK Includes:

- iSuite 3 Software development environment
- New iSuite Builder IDE
- iSysTM Portable Real Time Operating System
- GPS core software, navigation libraries with control and support API's
- System libraries and device drivers with source code
- Protocol libraries with source code including iTalk 3 and NMEA.
- Full on-line documentation
- Support for Windows based development, debugging and testing using Microsoft® Visual Studio® .NET 2003•

Documentation and Training

- 2 days optional training and hands-on programming sessions are available.
- Full On-line documentation with search facilities makes using the SDK easy.

For more information, please visit iSuite SDK Developers site: http://support.fastraxgps.com/

Fastrax Mini Evaluation Kit

Easy evaluation of Fastrax receivers

The Fastrax Mini Evaluation Kit is equipped with a 40 pin socket for Fastrax IT(nn) and UP501 Application Boards and a JST system connector for Fastrax UP300 antenna modules. Easy module evaluation of the different GPS receivers can be done by simply changing the application boards or by connecting the UP300 and cable to the system connector.

The Fastrax Mini Evaluation kit is furthermore equipped with two (mini-B) USB connectors, a reset switch and a programming switch for firmware upgrades. PPS signal is available from a pin header and the general I/O lines can be probed from a 40-pin socket connector if needed. The GPS antenna signal is obtained by connecting an active antenna to the MCX rf connector of the Application Board. The Fastrax UP300 and UP501 receivers do not need an external antenna as they are already equipped with an internal patch antenna.

Fastrax provides one USB cable in the sales package. The USB needs drivers to be installed on the PC. This driver is included in the sales package on a CD and it can also be downloaded from Fastrax support pages.

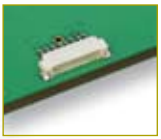
- For all Fastrax IT GPS receiver modules
- For Fastrax UP300 and UP501 OEM GPS antenna modules

Evaluation software

Suitable PC software are Fastrax GPS WorkBench or SirfDemo for Sirf binary. The SirfDemo can be requested from support@fastraxgps.com while the Fastrax GPS WorkBench can be downloaded from:

http://www.fastraxgps.com/support/

Mini-B USB connector



JST system connector for Fastrax UP300

Fastrax Application Boards

Fastrax IT(nn) Application Boards

Fastrax has developed Application Boards for all Fastrax IT(nn) modules and for the UP501 GPS antenna module in order to make evaluation easier. The Application Boards are connected to the Fastrax Evaluation kit or the Fastrax Mini Evaluation kit with the on-board 40 pin system connector. The application boards are also equipped with a MCX antenna connector for the external active antenna.

Each Application Board is also a reference design for its appropriate Fastrax IT(nn) module and therefore each BoM and design layouts are described in detail in the Technical Interface Description of each module.

- For Fastrax Evaluation kit
- For Fastrax Mini Evaluation kit

Fastrax Track & Trace Platform

The Fastrax Track&Trace platform offers hardware and technology for asset tracking applications allowing companies to focus on providing the tracking service and not spending time and resources on device development. The uTrace03e can be used either as a stand-alone tracking device in a plastic enclosure with battery or connected to a motherboard as a part of more complex application. The software is customizable and Fastrax Track&Trace Server can be used for evaluation and development purposes.

Benefits

An easily customizable tracking device enables fast time to market without need for extensive engineering work.

The integrated GPS and GSM antennas provide high quality global coverage for GPS and GSM.

Ability to easily and extensively modify the tracking device software allows application specific know-how to be implemented in the tracking device itself.

Applications

The uTrace03e module can be used as a component connected to a motherboard as a part of more complex system or as a stand-alone tracking unit in an enclosure with customizable membrane. Due to its cost-effective, integrated design uTrace03e is ideal even for applications where long battery life is required.

Track&Trace Hardware Solutions

uTrace03e Circuit Board

- Circuit board dimensions: 55 x 90 x 10 mm
- Low power sleep mode: 22 uA @ 3.8VDC
- Integrated GPS and quad band GSM including antennas
- Shock sensor
- 3D accelerometer
- Li-ion battery management
- On-board connectors:
  - USB, audio, IO, external GPS antenna
  - 80-pin extension connector

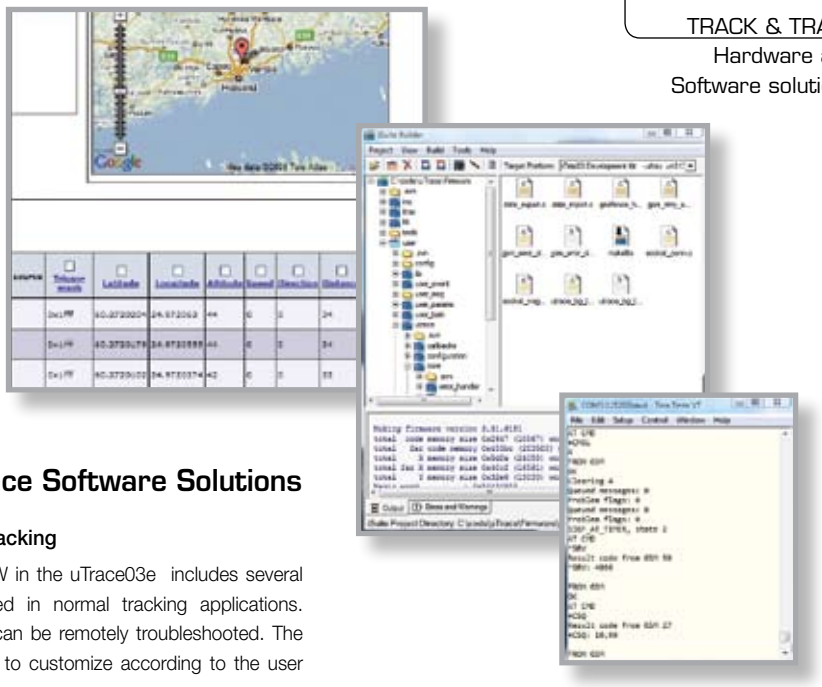
uTrace03e Enclosed Unit

Key features

- Enclosure dimensions: 62 x 100 x 25 mm
- 1050 mAh li-ion battery in enclosed unit
- The uTrace03e module inside.
- Customizable membrane user interface with three LED's and three buttons.

Accessories

- External 12V to mini-USB power converter for fixed installations.
- Internal 12V power adaptor with optional 350mAh backup battery.



Track&Trace Software Solutions

Software for tracking

The standard SW in the uTrace03e includes several functions required in normal tracking applications. It is stable and can be remotely troubleshooted. The software is easy to customize according to the user application.

Smart event based reporting logic can be used to drive down communication cost and excess amounts of data to the server:

- Start / stop of movement
- Traveled distance
- Heading change
- Geofence or route adherence breach using the advanced geofencing library
- Detection of G-forces

The event settings can be changed over the air and using the optional SW development tools new events can be created.

Advanced features

The uTrace03e SW provides advanced geofencing possibilities: geofences can be circular around a single point, polygons built from multiple points or multiple points connected to form a route to provide route adherence. The system can be updated over-the-air and also troubleshooting can be done remotely. The troubleshooting commands are usable through SMS and TCP/HTTP, and with a single command the uTrace software will download a new firmware image and verify the image integrity.

Advanced logging system

Different events can be logged into an internal event log and later uploaded to an FTP server or extracted with a USB connection. The log is able to store over 20000 events. Depending on the amount of logged events, the storage space can hold events for several weeks. The oldest events are automatically erased when the storage space runs out. Configuring the length of the log and adding new events can be done by simple modifications to the source code.

Flexible communication

The most cost effective protocol: SMS, UDP, TCP, can be easily selected depending on the application type. FTP and HTTP protocols are available for data communication with a server.

Customisable local user interface

The membrane appearance is easily customizable and the behaviour of the buttons and LED's can be modified for the particular application.

Coming up in 2011…

Assisted GPS (A-GPS) and Cell ID location.

Accessories

In order to make design, sourcing and manufacturing easier Fastrax offers some accessories that can be used together with the GPS receiver modules. The accessories are sold only together with modules.

Fastrax UP300 system cable and mother board connector

The 10cm system cable including system connectors on both ends is designed to be used with the Fastrax UP300 GPS antenna receivers. Fastrax offers also the mother board system connector separately in order to make sourcing even easier. Detailed information about the system cable and the mother board connector can be downloaded from www.fastraxgps.com or by contacting any Fastrax distributors, sales persons or by e-mailing support@fastraxgps.com

Fastrax IT03-02 AMP 4-353512-0 mating connector

The AMP mating connector is used for the system connector on the Fastrax IT03-02 GPS receiver.

Fastrax Order Codes

Fastrax order codes define GPS receivers, evaluation tools and accessories as well as hardware and software versions.

General naming convention

Fastrax GPS receivers are named: xxxxxx-sssr-yyy-bbbb:

Where xxxxxx	=	Module name (e.g. IT430, IT520, IT300, IT0316, UP501)
sss	=	Firmware version (e.g. 325, 350 (Sirf), 331, 341 (iTalk))
r	=	Build variant
yyy	=	Firmware specific custom code (e.g. STD = standard)
bbbb	=	Material code

Example codes:

IT0316-331E-STD-3278IT03S = Fastrax IT03, firmware 3.31.E (6151) - standard conf., BoM 3278.

IT300-324S-STD-1892 = Fastrax IT300, firmware 3.5.0 (Sirf), standard conf., BoM 2861.

Fastrax order codes

GPS Modules

Fastrax 500-series:	IT520-130S-ITX-XXXX
	IT500-130S-ITX-XXXX
Fastrax 400-series:	IT430-401S-SGT-XXXX
Fastrax 300-series:	IT300-350S-STD-XXXX
	IT310-350S-CAR-XXXX
Fastrax 03-series:	IT0316-331E-STD-XXXX
	IT3216-331E-STD-XXXX

GPS Modules with integrated Antennas

Fastrax 500-Series:	UP501-130S-ITX-XXXX
	UP501B-130S-ITX-XXXX
	UP501R-130S-ITX- XXXX
Fastrax 300-Series:	UP300-350S-CAR-XXXX

Evaluation Tools

Fastrax Mini Evaluation kit: MVK

Application Boards = AP + module code:
APU + antenna module code
AP430, AP430U
AP300, AP310
AP03/16
AP520, AP500, APU501, APU501B, APU501R

All Evaluation kits and Application Boards are supplied with the latest available firmware versions by default unless otherwise requested.

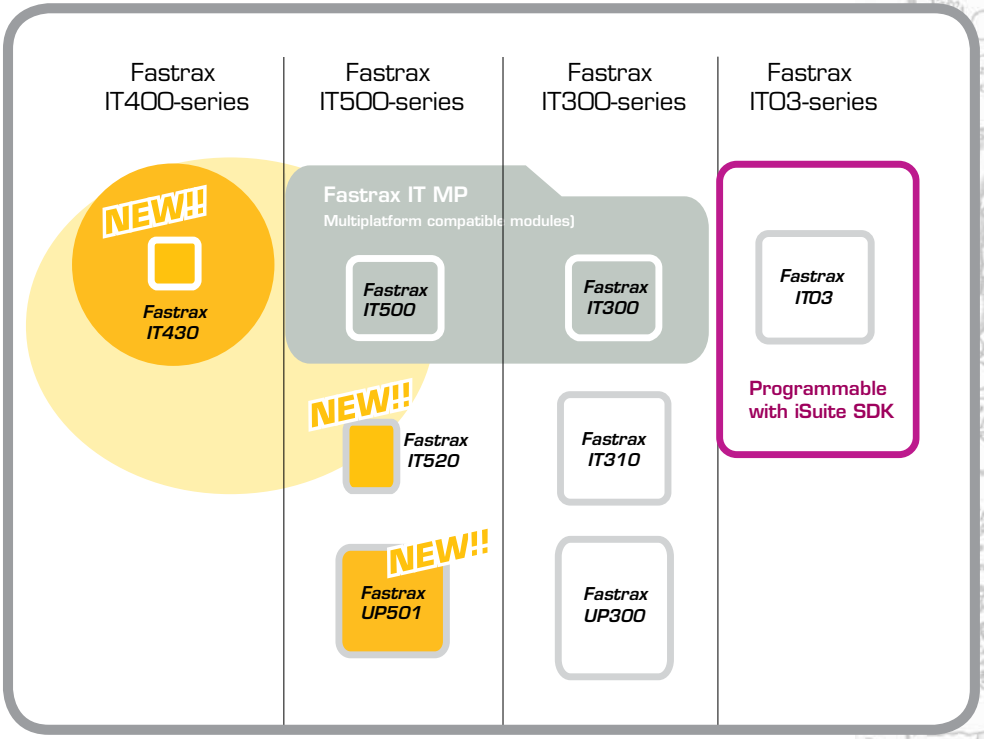
Accessories

Cable for UP300:	CBL-JST-2351
Connector for UP300 cable:	CON-JST-1852
Mounting Clip for UP102:	CLIP-UP102
AMP system connector for IT0302:	AMP 4-5353512-0

GPS RECEIVER MODULES				
Module	IT500	IT520	IT430	IT300
General	L1 frequency, C/A code (SPS)			
Channels	22 track + 66 acq.	22 track + 66 acq.	48	20
Update rate	up to 10 Hz	up to 10 Hz	1 Hz	1 Hz
Accuracy				
Position	2.7 m (CEP 95)	2.7 m (CEP 95)	2.5 m (CEP 50)	2.7 m (CEP 95)
Velocity	0.1m/s	0.1m/s	0.01 m/s	0.1m/s
Time	50ns RMS	50ns RMS	1µs	1µs
Time-to-first-fix (TTFF), typically				
Cold start	33s	33s	35s	32s
Warm start	33s	33s	35s	32s
Hot start	1s	1s	1s	1s
Sensitivity				
Acquisition (cold start)	-148 dBm	-148 dBm	-147 dBm	-146 dBm
Re-acquisition	-160 dBm	-160 dBm	-160 dBm	-157 dBm
Navigating	-165 dBm	-165 dBm	-160 dBm	-159 dBm
Power drain				
Navigating	75mW typ.	75mW typ.	56/68mW	75mW typ.
Backup state	15uW	15uW	36uW	18uW typ.
Operating voltage				
Main supply	+3.0V...4.2V	+3.0V...4.2V	+1.8V	+3.0V..3.3V
Backup supply	+2.0V...4.2V	+2.0V...4.2V	–	+1.5V..3.3V
Protocol	NMEA 0183	NMEA 0183	NMEA 0183, OSP binary	NMEA, Sirf binary
Baud rate	9600 (configurable)	9600 (configurable)	4800 (configurable)	4800/9600 (configurable)
Chipset	Mediatek MTK3329	Mediatek MTK3329	SiRFstar IV (GSD4e)	SiRFstar III (GSC3e/LPx)
Dimensions	16.2 x 18.8 x 2.3 mm	10.4 x 14.0 x 2.3 mm	9.6 x 9.6 x 1.85 mm	16.2 x 18.8 x 2.3 mm
Weight	1.5 g	0.7 g	TBD	1.4 g
Operating temperature	-40C...+85C	-40C...+85C (1)	-40C...+85C (1)	-40C...+85C (1)
Storage temperature	-40C...+85C	-40C...+85C	-40C...+85C	-40C...+85C
HW options		IT520U (USB 2.0)	Signature (default) or Basic firmware options	
Memory size	4 MBit	4 MBit		8 MBit
Antenna	External, passive or active	External, passive or active	External, passive or active	External, passive or active
Antenna input	LGA pad, 50 ohm	LGA pad, 50 ohm	LGA pad, 50 ohm	LGA pad, 50 ohm
Antenna bias	Same as VDD	Same as VDD	Antenna bias supply input	Same as VDD
I/O ports	30 contact LGA Two asyncronous serial ports 1PPS output Antenna detector status pins	24 contact LGA Two asyncronous serial ports 1PPS output Antenna detector status pins	28 contact LGA one host port: UART, SPI or I2C On/OFF control input 1PPS output antenna bias supply input dedicated I2C port for external sensors	30 contact LGA Two asynchronous serial ports 1PPS output 8xGPIO (one interrupt capable)
	(1) Operates down to -40degC, all specifications are not guaranteed below -30degC			

			GPS ANTENNA MODULES	
	IT310	IT03	UP501	UP300
	20	12	22 track + 66 acq.	20
	1 Hz	up to 3 Hz	up to 10 Hz	1 Hz
	2.7 m (CEP 95)	2.7 m (CEP 95)	2.7 m (CEP 95)	2.7 m (CEP 95)
	0.1m/s	0.1m/s	0.1m/s	0.1m/s
	1µs	20ns RMS	50ns RMS	1µs
	32s	35s	33s	32s
	32s	34s	33s	32s
	1s	4s	1s	1s
	-146 dBm	-142 dBm	-148 dBm	-146 dBm
	-157 dBm	-149 dBm	-160 dBm	-157 dBm
	-159 dBm	-156 dBm	-165 dBm	-159 dBm
	75mW typ.	95mW typ.	75mW typ.	84mW typ.
	18uW typ.	20uW (sleep mode)	15uW	18 uW typ.
	+3.0V..3.6V	+2.7V..3.3V	+3.0V...4.2V	+3.0V..3.6V
	+1.5V..3.6V	-	+2.0V...4.2V	+1.5V..3.6V
	NMEA, Sirf binary	NMEA, iTalk	NMEA 0183	NMEA, Sirf binary
	4800/9600 (configurable)	4800 (configurable)	9600 (configurable)	9600 (configurable)
	SiRFstar III (GSC3f/LPx)	uN2110 + uN8021	Mediatek MTK3329	SiRFstar III (GSC3f/LPx)
	13.1 x 15.9 x 2.3 mm	21.6 x 23.3 x 2.6 mm	22.0 x22.0 x 8.0 mm	19.0 x 27.0 x 7.2 mm
	0.9 g	2.7 g	9.0 g	9.1 g
	-40C...+85C (1)	-40C...+85C	-40C...+85C (1)	-40C...+85C (1)
	-40C...+85C	-40C...+85C	-40C...+85C	-40C...+85C
		IT0302 (replacement for IT02)	UP501. UP501B (internal backup battery) UP501R (RS232 level serial port + battery)	
	4 MBit	16MBit	4 MBit	4 MBit
	External, passive or active	External, passive or active	Integrated patch 18.4 x 18.4 mm	Integrated patch 18.4 x 18.4 mm, connector & switch for external ant.
	LGA pad, 50 ohm	LGA pad, 50 ohm	-	Hirose U.FL-R, 50 ohm
	Same as main supply VCC	Same as VDDRF	-	Same as VDD
	36 contact LGA Two asynchronous serial ports 1PPS output 2 x GPIOExternal clock input Timesync input Wakeup interrupt input	37 contact LGA Two asynchronous serial ports 22-pin GPIO (Shared functionality) 2 x SPI-interface Dual pulse measurement inputs 1PPS output 2 x Pulse measurement timers 2 x Capture timers 2 x Clock inputs MMC (Master) connection	6 contact pin soldering Two asynchronous serial ports Main & Back-up supply 1PPS output	8-pin cable connector One asynchronous serial port Main & Back-up supply 1PPS output RESET input UPDATE input (re-programming)

Fastrax GPS Receiver Modules



Fastrax

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www.fastraxgps.com