Fastrax
www.fastraxgps.com

GPS/GNSS
Receiver products

11/2011

IT600
Multi GNSS

Fastrax
IT600

NEW!

UC430
Miniature antenna
module

Fastrax
UC430

NEW!

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 600-SERIES FOR MULTI GNSS					
IT600	Multi-GNSS receiver for GPS and Glonass positioning. Dead reckoning with MEMS sensors.	<33s	-146 dBm /-162 dBm	150-230 mW	16.2 x 18.8x 2.3
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

Product	Description	TTFF	Sensivity acq./navig.	Power consumption	Dimensions(mm)
FASTRAX 500-SERIES WITH INTEGRATED ANTENNA					
UP501	High-sensitivity GPS receiver module with integrated antenna	<33s	-148 dBm /-165 dBm	75mW@3.0V	22 x 22 x 8.0
FASTRAX 400-SERIES WITH INTEGRATED ANTENNA					
UC430	Smallest antenna module	<35s	-147 dBm /-163 dBm (tracking)	68mW@1.8V	9.6 x 14.0 x 1.95
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, RTCM104	Yes, with SDK	ST Microelectronics Teseo II	32		Multi-GNSS, PGPS, ST-AGPS, 10 Hz fix rate, sensor support for dead reckoning.
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	SiRFstarIIIGSC3f/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 (default) OSP (binary)	No	SiRFstar IV GSD4e	48		Integrated chip antenna, option for external antenna with switch
NMEA & SiRF	No	SiRFstar III GSC3e/LPx	20		Adaptive Trickle-Power™. Push-to-Fix™. Connector for optinonal external antenna.

Fastrax in a Nutshell

With over 12 years of expertise in positioning, Fastrax Ltd. manufactures OEM GNSS receiver modules and provides Software GNSS solutions that are amongst the most advanced anywhere.

"Fastrax – smart positioning" reflects who we are, what we stand for and the ambitions we have as a corporation. It defines the dynamics, the accuracy, the reliability, the dedication, the primary focus on our customers; the passion for innovation.

Fastrax GNSS modules

With the world's widest range of GNSS OEM modules for positioning use, Fastrax meets the most demanding market requirements concerning receiver size, power consumption, performance and programmability. The receivers are ideally suited for modern industrial, automotive and consumer applications.

Fastrax Software GNSS

– Fastrax' lowest-cost GPS/GNSS solution – is also helping extend location-based services to a wider array of consumer devices. Designed to carry out all GPS/GNSS calculations on a device's main processor using only a small part of the available resources, it offers record-breaking sensitivity, low power consumption, small size as well as outstanding flexibility and support for other GNSS solutions like Glonass, Galileo etc.

smart *positioning*

INDEX

Fastrax products and services – overview

Best available GNSS chipsets combined with Fastrax extensive hardware, RF design and software knowledge enable Fastrax to manufacture state of the art OEM GNSS 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 GNSS functionality in devices with less effort and cost than ever before.

GPS Receiver Module Series (p.6-14)

- Fastrax IT600
- Fastrax IT500
- Fastrax IT400
- Fastrax IT300
- Fastrax IT03

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

GPS Receiver Modules with Antenna (p.16-17)

- Fastrax UP501
- Fastrax UP300
- Fastrax UC430

GPS modules with integrated and optimized patch antennas.

Evaluation Kits (p.24-25)

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

Fastrax solutions

Fastrax solutions include, in addition to world-class OEM GNSS 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 GNSS 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** - find the best possible signal reception in your application, even when space is very limited.

▶ **Solving EMI issues** - identify, avoid or minimize the harmful impact of Electro Magnetic Interference.

▶ **System integration issues** – solve any difficulties in integrating GNSS functionality in customer's application.

▶ **GNSS testing** – test the application in early stages of development, in order to ensure best available functionality and quality.

▶ **GNSS Design Verification** –verify design files already prior to ordering proto types in order to save time and development cost.

Fastrax Technology Platforms

Fastrax IT600 series

Fastrax IT600-series is the first multi-GNSS receiver in Fastrax portfolio. In addition to GPS, the IT600-series receivers benefit from positioning satellites available in other GNSS constellations like Glonass, QZSS and in the future also Galileo and Compass/Beidou2. This multi-GNSS support gives better satellite availability and significantly better position accuracy than previously. The IT600-series is well suited for automotive industry, supporting different MEMS sensors (dead reckoning) for improved position accuracy when satellite signals are weak or even non-existing.

Fastrax IT500 series

Fastrax IT500-series is very high performing module 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 modules provide extremely advanced power management and fast startup time combined with excellent performance, IT400-series is a ground-breaking solution for any portable application, especially with innovative smart antenna modules.

Fastrax IT300 series

 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. The protocols and commands are available as NMEA and/or Sirf binary.

Fastrax IT03 series

Fastrax IT03-series of GPS 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.

All Fastrax GNSS receivers are based on chipsets from leading suppliers in order to guarantee best possible features and functionalities at competitive prices for its customers.

smart *positioning*

Fastrax IT600

Double the amount of visible satellites!

Multi-GNSS!

Key Features:

▶ Multi-GNSS support (GPS/Galileo and Glonass)

▶ DR support (Odometer/Gyro or CAN DWP)

▶ Small form factor – 16.2 x 18.8 x 2.3mm
Low power consumption: 150-230mW

▶ Ultra High Sensitivity -162 dBm (Tracking)
Cold start sensitivity -146dBm

▶ Optional 10Hz update rate

▶ I2C for MEMS sensors and other I2C peripherals

▶ Three serial ports

▶ 1PPS output

▶ SPI and GPIO available for custom purposes

▶ ST-AGPS support

▶ Anti-Jamming detection and removal

▶ 1.8V core voltage and 3.3V I/O voltage

▶ JTAG for SDK and debugging

Multi-GNSS in one receiver - GPS, Glonass and QZSS

Fastrax IT600 is the first receiver that can use several GNSS systems simultaneously. It can be configured to use GPS, Glonass and QZSS, with an upgrade possibility for upcoming Galileo and Compass/Beidou2 systems. IT600 has 32 dedicated tracking channels that can be assigned to acquire and track any mix of GPS, Glonass and QZSS signals. This simultaneous, Multi-GNSS support is the biggest improvement for any device or application using satellite positioning during several years!

High navigation availability and accuracy

Any GPS user is familiar with the challenges of trying to get a position fix in difficult places with limited visibility to the sky and with a receiver struggling to decode data from some satellites that happens be to visible from a parking garage or among high rise buildings in a city center. This is normal for applications supporting one GNSS system as each, even slightly visible satellite, is crucial to make the required position calculations. With double amount of visible satellites the situation is completely different. In some cases the impossible is made possible, Fastrax IT600 has taken satellite positioning to a completely new level giving better position availability and position accuracy than what was possible before.

Sensor support for dead reckoning

Fastrax IT600 also offers advanced support for MEMS based dead reckoning in order to increase the position accuracy when limited or no satellites are visible. By supporting 3-axis digital gyro, odometer as well as DWP (Differential Wheel Pulse) from a vehicle's CAN bus the position accuracy and availability is secured as well as possible. Additional sensors, such as magnetometer and pressure sensor, can be integrated through the same interface.

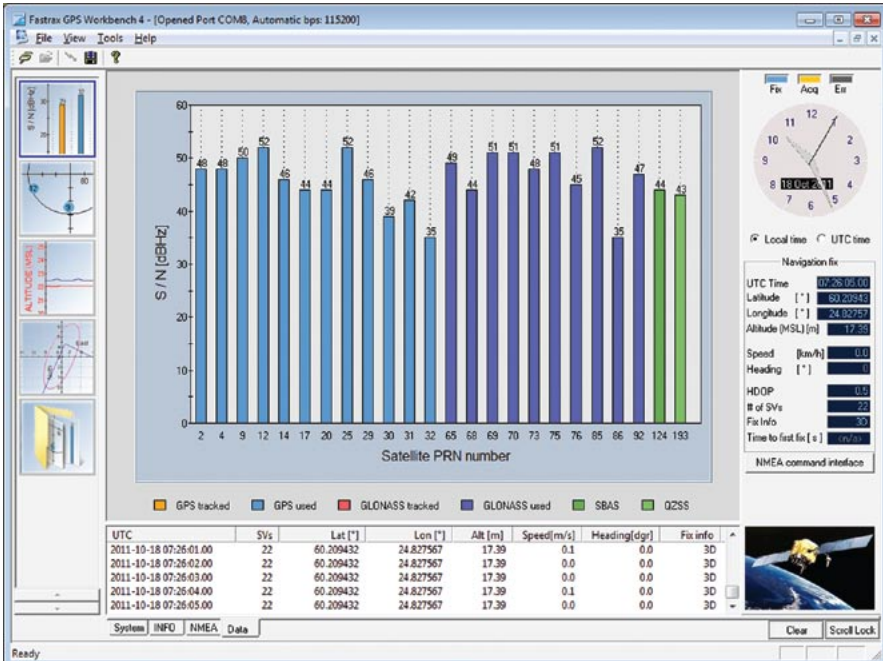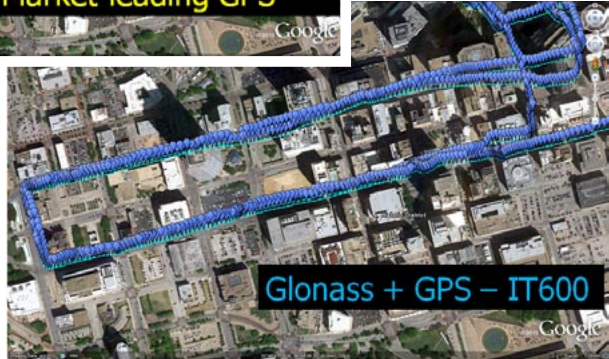### Benefit from free CPU resources

Approximately 50% of the ARM CPU inside the IT600 is available for customer use. This can lead to significant cost saving as smaller or even no additional CPU is required.

*Competitor GPS
(4-6 satellites all the time)*

*IT600 GPS+GLONASS
(8-12 satellites all the time)*

Fastrax IT520 and IT500

Simply the most sensitive GPS receiver modules

Ultra sensitive!

IT520 Actual size

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, and on top of all: an 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"

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.

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)

▶ 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 17.

Sensitivity – Comparison
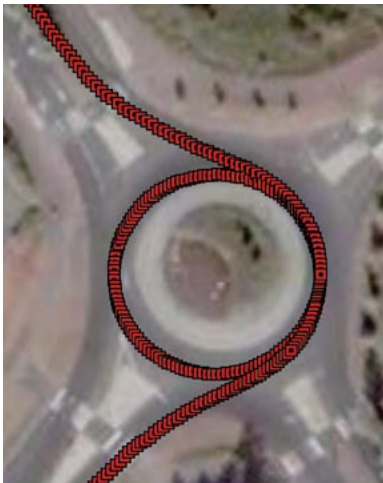
Perfect trace with IT500 and 10Hz update rate in roundabout
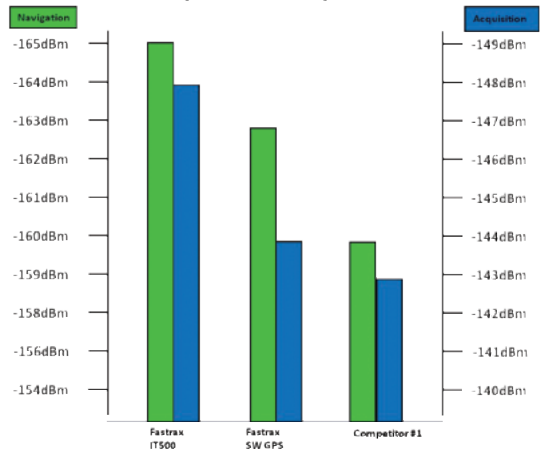
Acquisition and navigation sensitivity comparison of IT500, Fastrax SW GPS and Fastrax main module competitor.

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

Ultra small!

Actual size

Next generation of GPS

Fastrax IT430 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 the SiRFAware technology it consumes only 125uA in average (with ROM 2.0 onwards). 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.

Key Features:

▶ Miniature size: 9.6 x 9.6 x 1.85 mm
▶ Ultra high sensitivity:
   -147dBm (cold start)
   -163dBm (tracking)
▶ Low Power Consumption: 56 / 68mW@1.8V
▶ 125uA average power consumption with SiRF Aware (ROM2.0 onwards)
▶ 48 channels
▶ Host port configurable to UART, SPI or I2C
▶ Advanced power modes
▶ Jammer detection and removal, up to 8 CW EMI sources
▶ Client Generated Extended Ephemeris
▶ Up to 5 Hz update rate

Fastrax IT400-series modules with integrated antenna
Fastrax UC430 - more on page 16.

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 module has a low power consumption during acquisition and navigation, only 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 16)

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.

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

smart *positioning*

Fastrax GPS Modules with
Integrated Antennas

Fastrax UC430

The smallest GPS antenna module in the world!

Actual size

OEM GPS Receiver for many Applications

Miniature size with embedded GPS antenna and optional external GPS antenna connectivity allows the UC430 to suit wide range of applications ranging from handheld computers to asset tracking devices.

Small in size and power, big in features Fastrax UC430 is similar to IT430 in features and performance, including market-leading power consumption combined with excellent performance. The main difference is in the embedded antenna. The chip antenna is using the application PCB as a part of the antenna, the whole GPS solution taking only a small area of the PCB: **UC430 is only 9.6 x 14.0 x 1.95 mm.**

Key features like IT430 with following differencies:

▶ Extremely tiny form factor
  9.6 x 14.0 x 1.95 mm

▶ Low power consumption:
  68 mW @ 1.8 V

Cutting component costs

The chip antenna of UC430 performs well against larger patch antennas and circular radiation pattern increases flexibility for device installation. When external antenna is required, UC430 works efficiently as a back-up antenna if the external antenna is damaged or removed. With small design, limited amount of required external components and SMT design both space and manufacturing cost are reduced to a minimum.

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 GSC3f/LPx single chip receiver
• External system connector

Actual size

Key features:
▶ Size 19 x 27 x 7.2mm
▶ Sensitivity
  -146 dBm (acquisition)
  -159 dBm (tracking)

Cable + connector available for Fastrax UP300 – see accessories on page 30.

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. 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
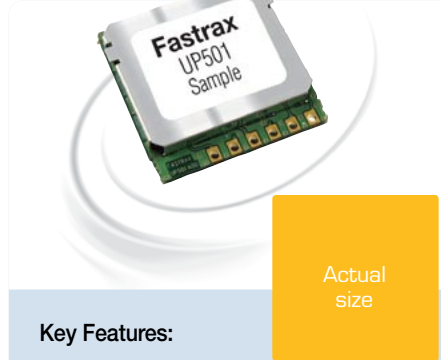
Key Features:

▶ 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

▶ Predicted A-GPS for 14 days

▶ WAAS/EGNOS support

▶ Optional internal back-up battery (UP501B)

▶ Optional dual SAW filter (UP501D)

▶ 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 UP501D with dual SAW filter for increasing resistance against possible radio interference.

Fastrax Antenna Modules Comparison

	Fastrax UC430	Fastrax UP501
TTFF		
Cold start	35 s	33 s
Hot start	1 s	1 s
Sensitivity (dBm)		
Acquisition	-147	-148
Navigation	-163	-165
Power consumption		
Navigating	68 mW	75 mW
Back-up state	36 uW	<15 uW
Channels	48	66 + 22
Size (mm)	9.6 x 14.0 x 1.95	22 x 22 x 8
Ground plane	Minimum 45 x 20 mm	Integrated
External antenna connector	Optional externally	No
Automated antenna int/ext switch	Optional externally	No
Interface Connector	31 SMD pads	1x6pin grid, 2.54 mm pitch
Back-up supply	Hibarnate mode	Yes (optional internal battery)
Chipset	SiRFstar IV (GSD4e)	Mediatek MT3329
HW options	N/A	UP501 UP501B (internal back-up battery) UP501D (Dual SAW filter)
Mounting	SMD component	Using pin headers + wings on shield
Advantages	+ Optimal solution for mobile devices where small and slim design required	+ Suitable for any application requiring extremely good sensitivity
	+ Very flexible installation due to circular radiation pattern.	+ Best antenna module when indoor navigation is required
	+ Low total cost, SMD component, no manual labor	+ Easy to mount due to "wings" on the shield and standard 6-pin header+ Low cost, simple module with three different hardware options
		+ Low cost, simple module with three different hardware options

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

Actual size

Key Features:

• Two Pin Compatible receivers

• Footprint: 16.2 x 18.8 x 2.3mm

How to choose the right
GNSS receiver module

Fastrax IT600 series

IT600

CHOOSE IT600 SERIES FOR:

- ▶ Multi-GNSS system
- ▶ High availability of position
- ▶ Highest accuracy
- ▶ Glonass, GPS and Galileo support
- ▶ Dead reckoning support
- ▶ 10Hz update rate
- ▶ Embedded programming with SDK

Fastrax IT500 series

IT520

IT500

CHOOSE IT500 SERIES FOR:

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

How to choose the right
GPS antenna module

Fastrax IT500 series

UP501

CHOOSE UP501 FOR:

- ▶ Highest sensitivity
- ▶ Lowest cost
- ▶ 10 Hz update rate
- ▶ A-GPS
- ▶ Back-up battery (UP501B)

Fastrax IT300 series

UP300

CHOOSE UP300 FOR:

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

Fastrax IT400 series

IT 430

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
▶ 8 CW jammer remover
▶ SiRFAware for 125 µA avg. power consumption

Fastrax IT300 series

IT310   IT300

CHOOSE IT300 SERIES FOR:

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

Fastrax IT03 series

IT03

CHOOSE IT03 SERIES FOR:

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

HOW TO CHOOSE

Fastrax IT400 series

UC430

CHOOSE UC430 FOR:

▶ Smallest size antenna module
▶ Possibility to use with external antenna
▶ Lowest power consumption
▶ Flexibility with orientation
▶ Slim design requirements
▶ Advanced power modes
▶ Autonomous AGPS (CGEE)

smart *positioning*

Fastrax Software GNSS

What is Fastrax Software GNSS?

Fastrax Software GNSS performs all GNSS function-alities in software on an already existing CPU of the device, without the need of any GNSS specific IC. This includes signal correlation, - acquisition and – tracking as well as pseudorange calculations, navigation and final output.

Fastrax Software GNSS is a highly flexible receiver using an RF Front-end as the only GNSS specific component. With a suitable RF front-end any existing and future GNSS system can be utilized for navigation. This kind of receiver architecture is also the most cost-efficient compared to any other GNSS receiver implementa-tion. A software receiver can also be used to imple-ment receiver architectures that are not possible with a traditional hardware based solution and therefore e.g. extreme sensitivity or lowest possible power consump-tion can be achieved. Close R&D cooperation with the customer during early stage of the project ensures that choice of RF Front-End and CPU as well as Software GNSS design is optimized for the customers' particular application and needs.

Key Features:

▶ Lowest cost GNSS solution

▶ Huge cost saving through software upgrades instead of HW re-designs

▶ Lowest possible energy/fix required.

▶ Easy to optimize and adjust to available resources and signal availability

▶ Flexibility for customizations

▶ Support for GNSS, Software upgradeable to new GNSS systems

▶ Non real time requirement for signal processing

Benefits with Fastrax Software GNSS

COST & FLEXIBILITY – Cost is significantly reduced as required silicon area is minimized in comparison to any other available GNSS solution.

Flexibility is unique with Fastrax Software GNSS. By using latest available radios with Fastrax Software GNSS things become really interesting. The receiver supports GPS today but can be configured to receive 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 GNSS 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 GNSS 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 Soft-ware GNSS 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 GNSS it is additionally straightforward to implement multipath miti-gation and to detect and eliminate interference of CW (continuous wave) type of signals.

SW GNSS benefits per target market

▶ Cellular (Handset) market:

- New requirements for performance as well as additional GNSS systems are often limited by hardware. With Software GNSS, the flexibility of the solution will solve this issue.
- Low BOM cost is a standard requirement; the best option to minimize component cost is to utilize already existing hardware capabilities. This can be achieved by true SW GNSS integration.
- Size of required additional components is minimal

▶ Tablets and portable computers:
- Low component cost. When properly planned, the existing CPU power is sufficient for continuous navigation utilizing SW GNSS.
- Size of the GNSS solution is critical, it's always beneficial to get rid of extra HW or components.
- Multi-GNSS support will become de facto standard. Software is the optimal way to achieve this.
- Narrowband EMI is a challenge in almost every platform, with SW GNSS the interference can easily be removed. Fastrax design support can also help in suppressing wideband EMI.

▶ Timing and synchronization:
- Accuracy of timing is critical with most systems. SW GNSS with 1PPS accuracy of 15 ns will make the SW GNSS an unbeatable solution for any synchronization system.
- Utilizing existing hardware, SW GNSS can be used for example in femtocell systems. There is no need to add a special GNSS receiver module with costly VCOCXO and other components, instead a low-cost VCTCXO can be used, saving remarkably on the cost.

▶ Digital cameras:
- The most critical requirements for picture positioning in camera are TTFF as well as power consumption.
- Using Tag & Locate with SW GNSS post-processing capability, the signals (noise) can be recorded at the moment of pressing the shoot-button, minimizing the power consumption as well as the typical time for TTFF. The recorded Tag can be stored simply on the memory card like the photo. Photos are then uploaded to a computer where the position can be calculated, using the Fastrax SW GNSS.
- Price of SW GNSS in camera application is minimal compared to a built-in GNSS receiver.

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), UC430 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 GNSS antenna signal is obtained by connecting an active antenna to the MCX rf connector of the Application Board. The Fastrax UP300, UC430 and UP501 receivers do not need an external antenna as they are already equipped with an internal patch or chip antenna.

Fastrax provides an active antenna and one USB cable in the sales package. The USB needs drivers to be installed on the PC. This driver can be downloaded from Fastrax support pages.

▶ For all Fastrax IT GPS receiver modules

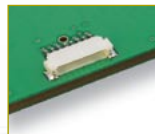▶ For Fastrax UP300 and UP501 OEM GPS antenna modules

Evaluation software

Suitable PC software are Fastrax GPS WorkBench or SirfLive for Sirf binary. The SirfLive 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 UC430 and UP501 GPS antenna modules 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 Data Sheet of each module.

▶ For Fastrax Evaluation kit

▶ For Fastrax Mini Evaluation kit

smart *positioning*

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
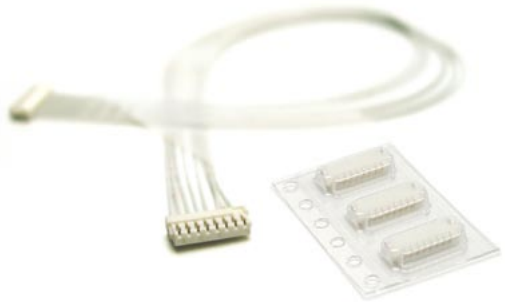
Fastrax IT03-02 AMP 4-5353512-0 mating connector

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 GNSS 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.

IT300-350S-STD-2861 = Fastrax IT300, firmware 3.5.0 (Sirf), standard conf., BoM 2861.

Fastrax product list

GNSS Modules

Fastrax 600-series:	IT600
Fastrax 500-series:	IT520
	IT500
Fastrax 400-series:	IT430
Fastrax 300-series:	IT300
	IT310
Fastrax 03-series:	IT0316
	IT3216

GPS Modules with integrated Antennas

Fastrax 500-Series:	UP501
	UP501B
	UP501D
Fastrax 400-series:	UC430
Fastrax 300-Series:	UP300

Evaluation Tools

Fastrax Mini Evaluation kit: MVK

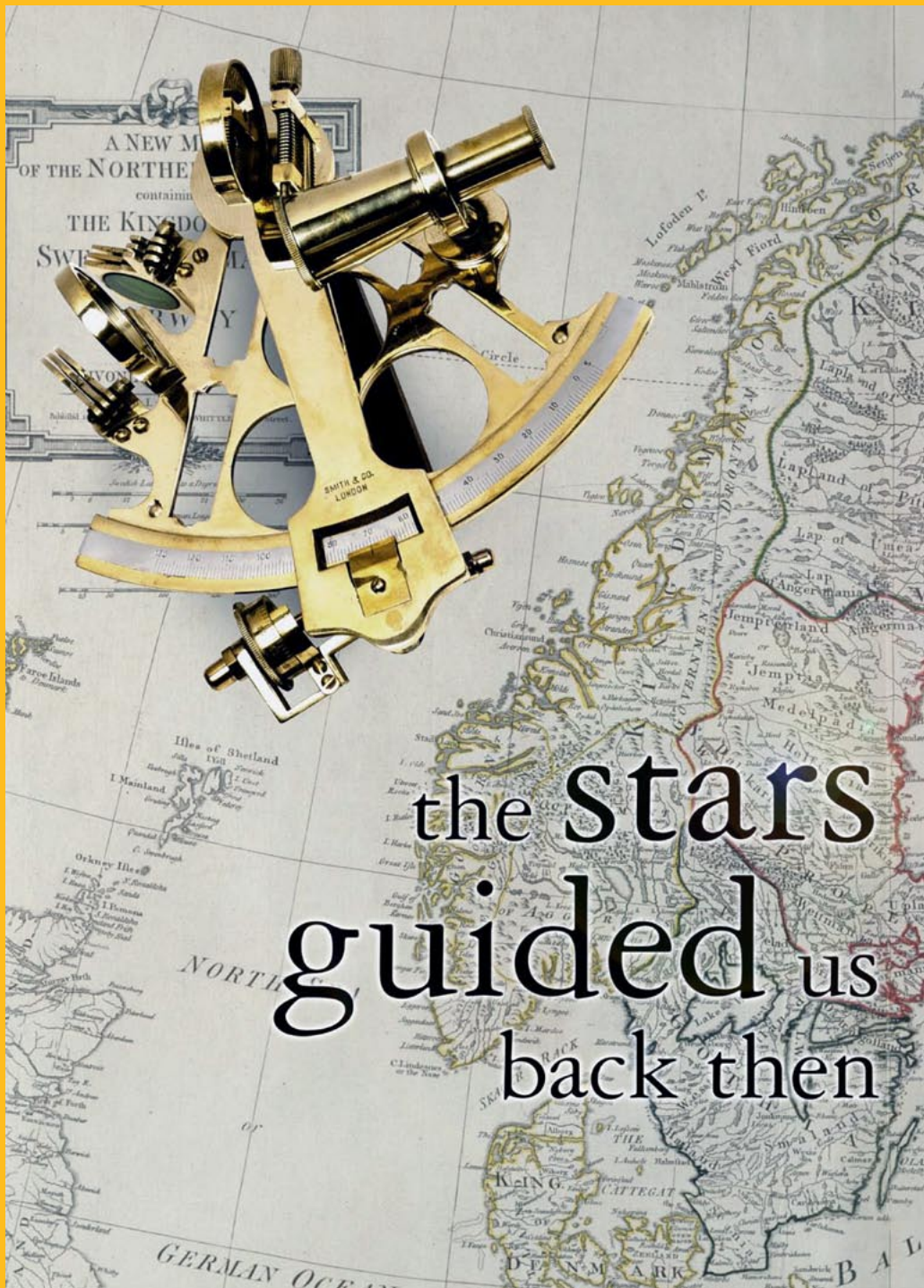Application Boards:
    AP + module code:
    APU + patch antenna module code
    AC + chip antenna module code

    AP430, AC430
    AP300, AP310
    AP03/16,
    AP520, AP500, APU501, APU501B, APU501D
    AP600, (DB600 - IT600 development board, equipped with connectors)

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
AMP system connector for IT0302:	AMP 4-5353512-0

the stars
guided us
back then

GPS RECEIVER MODULES				
Module	IT600	IT500	IT520	IT430
General	L1 frequency (GPS, Glonass Galileo)	L1 frequency, C/A code (SPS)		
Channels	32	22 track + 66 acq.	22 track + 66 acq.	48
Update rate	up to 10 Hz	up to 10 Hz	up to 10 Hz	1 Hz
Accuracy				
Position	2.7 m (CEP 95)	2.7 m (CEP 95)	2.7 m (CEP 95)	2.5 m (CEP 50)
Velocity	< 0.1m/s	0.1m/s	0.1m/s	0.01m/s
Time	15ns RMS	50ns RMS	50ns RMS	1us (typ.)
Time-to-first-fix (TTFF), typically				
Cold start	33s	33s	33s	35s
Warm start	33s	33s	33s	35s
Hot start	1s	1s	1s	1s
Sensitivity				
Acquisition (cold start)	-146 dBm	-148 dBm	-148 dBm	-147 dBm
Re-acquisition	-150 dBm	-160 dBm	-160 dBm	-162 dBm
Navigating	-162 dBm (tracking)	-165 dBm	-165 dBm	-163 dBm (tracking)
Power drain				
Navigating	150-230 mW typ.	75mW typ.	75mW typ.	56/68mW
Backup state	50uW	15uW	15uW	36uW (hibernate)
Operating voltage				
Main supply	+1.8V	+3.0V...4.2V	+3.0V...4.2V	+1.8V
Backup supply	+1.62V...3.6V	+2.0V...4.2V	+2.0V...4.2V	–
Protocol	NMEA 0183	NMEA 0183	NMEA 0183	NMEA 0183, OSP binary
Baud rate	115200 (configurable)	9600 (configurable)	9600 (configurable)	4800 (configurable)
Chipset	ST Teseo II	Mediatek MTK3329	Mediatek MTK3329	SiRFstar IV (GSD4e)
Dimensions	16.2 x 18.8 x 2.3 mm	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
Weight	3.0 g	1.5 g	0.7 g	0.4 g
Operating temperature	-40C...+85C (1)	-40C...+85C	-40C...+85C	-40C...+85C (1)
Storage temperature	-40C...+85C	-40C...+85C	-40C...+85C	-40C...+85C
HW options				
Memory size	16MBit	4 MBit	4 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 I/O supply VDD3V3	Same as VDD	Same as VDD	Antenna bias supply input
I/O ports	36 contact castellated vias Three asynchronous serial ports 1PPS output I2C or CAN1 CAN0 JTAG ADC input for Analog Gyro from car Odometer input from car RSTn, STANDBYn, WAKEUP inputs SPI Interface	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

(1) Operates down to -40degC, all specifications are not guaranteed below -30degC

GPS ANTENNA MODULES			
IT03	**UP501**	**UP300**	**UC430**
12	22 track + 66 acq.	20	48
up to 3 Hz	up to 10 Hz	1 Hz	1 Hz
2.7 m (CEP 95)	2.7 m (CEP 95)	2.7 m (CEP 95)	2.5 m (CEP 50)
0.1m/s	0.1m/s	0.1m/s	0.01m/s
20ns RMS	50ns RMS	1us	1us (typ.)
35s	33s	32s	35s
34s	33s	32s	35s
4s	1s	1s	1s
-142 dBm	-148 dBm	-146 dBm	-147 dBm
-149 dBm	-160 dBm	-157 dBm	-162 dBm
-156 dBm	-165 dBm	-159 dBm	-163 dBm (tracking)
95mW typ.	75mW typ.	84mW typ.	68mW
20uW (sleep mode)	15uW	18 uW typ.	36uW (hibernate)
+2.7V..3.3V	+3.0V...4.2V	+3.0V..3.6V	+1.8V
-	+2.0V...4.2V	+1.5V..3.6V	–
NMEA, iTalk	NMEA 0183	NMEA, Sirf binary	NMEA 0183, OSP binary
4800 (configurable)	9600 (configurable)	9600 (configurable)	4800 (configurable)
uN2110 + uN8021	Mediatek MTK3329	SiRFstar III (GSC3f/LPx)	SiRFstar IV (GSD4e)
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	9.6 x 14.0 x 1.95 mm
2.7 g	9.0 g	9.1 g	0.5 g
-40C...+85C	-40C...+85C	-40C...+85C (1)	-40C...+85C (1)
-40C...+85C	-40C...+85C	-40C...+85C	-40C...+85C
ITO302 (replacement for ITO2)	UP501B (internal backup battery) UP501D (Dual SAW filter)		
16MBit	4 MBit	4 MBit	
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.	Embedded chip antenna (ground plane required)
LGA pad, 50 ohm	-	Hirose U.FL-R, 50 ohm	LGA pad, 50 ohm
Same as VDDRF	-	Same as VDD	
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)	31 contact LGA One host port: UART, SPI or I2C On_OFF control input 1PPS output Antenna output, RF input Dedicated I2C port for external sensors

smart *positioning*

smart
positioning

Fastrax

Itsehallintokuja 6, 02600 ESPOO, FINLAND

ww.fastraxgps.com