INERTIALSENSE
autonomous navigation solutions

Overview

The **GPX-1™** is a multi-frequency and multi-constellation GNSS receiver module that combines GPS/QZSS (L1, L5), Galileo (E1, E5), GLONASS (L1), BeiDou (B1, B2), NavIC (L5), and SBAS (L1) to provide improved performance for global positioning navigation solutions. The use of multiple frequencies greatly reduces multi-path effects in urban environments and improves the location accuracy.

The **GPX-1-RTK™** has onboard Real-Time Kinematic (RTK), enabling centimeter level position accuracy with an RTCM3 correction input stream.

The **GPX-1-Dual™** has two GNSS receivers (two antenna channels) for RTK positioning and dual GNSS heading/compassing, eliminating the need for magnetometer heading.

The GPX-1 comes in a 20.7 x 12.5 mm LGA surface mount module and includes a powerful baseband processor, embedded Flash memory, and integrated LNA. The ultrasensitive RF front-end and multi-frequency and multi constellation capability support navigation in challenging outdoor scenarios.

Combining the GPX-1 and **IMX-5™** tactical grade IMU/INS creates GNSS aided inertial navigation sensor fusion with roll, pitch, heading, velocity, and position up to 250Hz.

The **RUG4-IMX5-GPX1™** combines the GPX-1 and IMX-5 tactical grade IMU/INS in a rugged aluminum enclosure and RS232, RS485, and CAN bus. Inertial navigation sensor fusion is enabled for roll, pitch, heading, velocity, and position.

The **Inertial Sense SDK** is an open-source software development kit for quick integration to configure and communicate with Inertial Sense products. The SDK includes data logger, math libraries, and interface for Linux, Windows, and embedded platforms.

GPX-1
Size: 20.7 x 12.5 x 2.9 mm
Weight: 1.7 g
GNSS: Multi-Band L1/L5

RUG4-IMX5-GPX1
Size: 30.5 x 25.4 x 10.5 mm
Weight: 14 g
GNSS-INS: Multi-Band L1/L5

Features

- **Multi-band (L1/L5) GNSS receiver**
- **Multi-constellation (GPS, GLONASS, QZSS, BeiDou, Galileo)**
- **Dual GNSS receivers (two antennas)**
- **Onboard RTK Positioning and Compassing**
- **Low power consumption GNSS positioning**
- **Combine w/ IMX-5 for GNSS aided INS @ 250Hz**
- **0.4° RMS heading accuracy @ 1m baseline**
- Ultra-sensitive -165 dBm (tracking) RF front-end
- Supports ephemeris file injection (A-GNSS)
- Satellite Based Augmentation System (SBAS)
- Up to 25 Hz output data rate
- -40°C to 85°C Operating Temperature
- Binary and NMEA Protocol
- PPS Output for Time Synchronization
- SDK, Example Software, and Data Logging

Applications

- Drone Navigation
- Unmanned Vehicle Payloads
- Ground and Aerial Survey
- Automotive Navigation
- Stabilized Platforms
- Antenna and Camera Pointing
- First Responder and Trackers
- Health, Fitness, and Sport Monitors
- Robotics, Ground Vehicles, Maritime

INERTIALSENSE
autonomous navigation solutions

Specifications

Features

Heading Accuracy	0.4° RMS using 1m antenna baseline
Receiver type	62 physical acquisition/tracking channels
Constellations (Frequency bands)	GPS (L1C/A L5) GLONASS (L1OF) Galileo (E1B/C, E5a) BeiDou (B1I, B1C, B2a) QZSS (L1C/A, L1S, L1C/B, L5) NavIC (L5) SBAS (L1): WAAS, EGNOS, MSAS, GAGAN
Navigation update rate	Up to 25 Hz
Position accuracy	1.0 m CEP RTK: 0.02 m CEP
Convergence time	1 s RTK: < 10 s
Acquisition	Cold start 24 s Hot start 1 s
Sensitivity	Cold start -149 dBm Hot start -158 dBm Reacquisition -163 dBm Tracking & nav. -167 dBm
Internal LNA gain	69 dB
1 PPS Output	10 ns resolution < 100 ns accuracy
Oscillator	TCXO
RTC crystal	Built-in
Anti-jamming	7-ch notch filter for each L1 and L5 band
Memory	Flash
Moving base	For dual GNSS compassing (heading)
Supported antennas	Active

Interfaces

Serial (GPX-1)	UART x3, SPI, I2C, CAN, USB
Serial (RUG-4)	UART x2, SPI, RS232, RS485, CAN, USB
Max Baud Rate:	
SPI	10 Mbps
UART, RS422, RS485	3 Mbps
RS232	500 Kbps
I/O Level (UART, SPI, PPS)	1.8V to 3.3V

Package

Package	42-pin LGA (Land Grid Array)	SMT module
Size	20.7 x 12.5 x 2.9 mm	
Weight	1.7 g	

Function

Function	GPX-1™	+RTK	+Dual	+IMX-5™
Position and Velocity	●	●	●	●
RTK Centimeter Level Position		●	●	●
Dual GNSS Compassing (Heading)			●	●
Roll, Pitch, Velocity, Position (INS)				●

Environmental

	MAX	
Operating Temperature	-40 to 85 °C	
Storage Temperature	-40 to 85 °C	
ESD rating	± 2 kV	Human body model
Solder Reflow Temperature Max	245 °C	
Solder Reflow Temperature Limit	217 °C liquidus: 40 – 60 s	
Magnetic field immunity	25 mT (operation), 55 mT (storage)	

Electrical

	Min	Typ	Max	Units
Power Draw @ 5Hz		160*	200*	mW
Power Draw @ 25Hz		190*	240*	mW
Supply Voltage (Vcc)	3.0	3.3	3.6	V
I/O Pin MAX Voltage Range	-0.5		3.6	V
Total Output Current, All Pins			100	mA
Logic levels for 3.3V I/O (VAUX = 3.3V)				
Input low-level			0.99	V
Input high-level	2.31	3.3		V
Output high-level		3.3		V
Logic levels for 1.8V I/O (VAUX = 1.8V)				
Input low-level			0.4	V
Input high-level	1.3	1.8		V
Output high-level		1.8		V
RF Power In (GNSS1_RF, GNSS2_RF)			0	dBm

* TBD following pre-production testing.

Related Products: RUG-4 & IG-2 Electrical

	Min	Typ	Max	Units
Supply Voltage (VIN)	4.5		20	V
RUG4-IMX5-GPX1 + Antenna				
Current Draw @ 5V, 250Hz*		185		mA
Power Consumption @250Hz*		927		mW
Power Consumption @100Hz*				mW
Power Consumption – Dual		1470		mW

*Navigation filter update rate.

Related Products: RUG-4 Package

Size	30.5 x 25.4 x 10.5 mm	
IP Rating	40	No liquid protection
Mounting Tab	30.836 mm	Hole Spacing
Weight	14.0 g	
Connectors	Main: Harwin# G125-MV11205L1P, GPS 1/2: MMCX	

Related Products: IG-2 Package

Package	36-pin LGA (Land Grid Array)	SMT module
Size	46.6 x 24.5 x 5.9 mm	
Weight	8.5 g	

Development Kits available on our website.

IG-2
SMT Module (GPX1 + IMX5)
Size: 46.6 x 24.5 x 5.9 mm
Weight: 8.5 g
GNSS-INS: Multi-Band L1/L5