INERTIALSENSE
autonomous navigation solutions

GPX-1

Multi-Band (L1/L5) Dual GNSS Receiver +RTK +Compassing

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

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Specifications

Features - Performance		
Heading accuracy	0.4° RMS using 1m antenna baseline *	
Position accuracy	1.0 m CEP	RTK: 0.02 m CEP **
Vertical Operational Limit	100,000 m	
Receiver type	62 physical acquisition/tracking channels	
Constellations (Frequency bands)	GPS (L1C/A L5) Galileo (E1B/C, E5a) QZSS (L1C/A, L1S, L1C/B, L5) SBAS (L1): WAAS, EGNOS, MSAS, GAGAN	GLONASS (L1OF) BeiDou (B1I, B1C, B2a) NavIC (L5)
Navigation update rate	Up to 25 Hz	
Convergence time	1 s	RTK: < 10 s
Acquisition	Cold start Hot start	24 s 1 s
Sensitivity	Cold start Hot start Reacquisition Tracking & nav.	-149 dBm -158 dBm -163 dBm -167 dBm
Max Velocity	600 m/s	
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	

* GNSS-Compassing, ** RTK-Positioning

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

Part Numbers

IS-GPX-0010-U3G2-IND	Dual GNSS (no compassing or RTK positioning)
IS-GPX-0010-U3G2-C1-IND	GNSS-Compassing
IS-GPX-0010-U3G2-R1-IND	RTK-positioning (available mid 2024)
IS-IG-2050-U3G2-C1R1-DVK	Development Kit for IG2-IMX5-GPX1

Development kits available on our website.

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	

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