



INERTIAL SENSE

autonomous navigation solutions

IMX-5 (IMU, AHRS, GNSS-INS)

Tactical Grade Inertial Systems

+RTK +Dual GNSS

Overview

The **IMX-5™** is a 10-DOF sensor module consisting of a tactical grade Inertial Measurement Unit (IMU), magnetometer, and barometer. Output includes angular rate, linear acceleration, magnetic vector, and barometric pressure and altitude. IMU calibration consists of bias, scale factor, cross-axis alignment, and temperature compensation. The IMX-5 includes Attitude Heading Reference System (**AHRS**) sensor fusion to estimate roll, pitch, and heading. Adding GNSS input to the IMX-5 enables onboard Inertial Navigation System (**INS**) sensor fusion for roll, pitch, heading, velocity, and position.

The **RUG-3-IMX-5™** series adds a rugged aluminum enclosure and RS232, RS485, and CAN bus to the IMX-5.

The **RUG-3-IMX-5-RTK™** includes a multi-frequency GNSS receiver with RTK precision position enabling INS sensor fusion for roll, pitch, heading, velocity, and position.

The **RUG-3-IMX-5-Dual™** includes two multi-frequency GNSS receivers with RTK precision position and dual GNSS heading/compass.

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.



RUG-3-IMX-5

Size: 30.5 x 25.4 x 9.9 mm

Weight: 10.5 g



IMX-5

Size: 15.6 x 12.5 x 2.9 mm

Weight: 0.8 g

INS: External GNSS Input



RUG-3-IMX-5-RTK/Dual

Size: 30.5 x 25.4 x 14.8 mm

Weight: 14 g

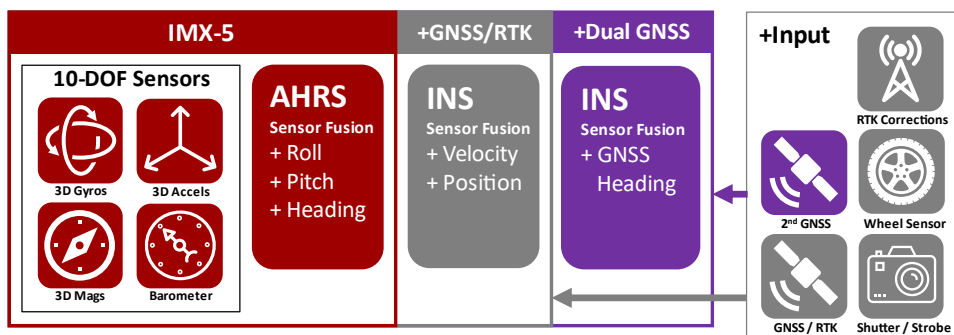
GNSS: Multi-Band L1/L2/E5

Features

- **Tactical Grade IMU**
 - Gyro: 1.5 °/hr Bias Instability, 0.16 °/vhr ARW
 - Accel: 19 µg Bias Instability, 0.02 m/s/vhr VRW
- **0.04° Dynamic Roll/Pitch**
- **0.13° Dynamic Heading**
- **Surface Mount Reflowable (PCB Module)**
- Up to 1KHz IMU Output Data Rate
- External GNSS Support (Multi-Band)
- Attitude (Roll, Pitch, Yaw, Quaternions), Velocity, and Position UTC Time Synchronized
- Triple Redundant IMUs Calibrated for Bias, Scale Factor, Cross-axis Alignment, and G-sensitivity
- -40°C to 85°C Sensor Temperature Calibration
- Binary and NMEA ASCII Protocol
- Barometric Pressure and Humidity
- Strobe In/Out Data Sync (Camera Shutter Event)
- Fast Integration with SDK and Example Software
- Data Logging (SDK and Application Software)
- RUG-3-IMX-5: RS232, RS485, CAN bus

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 and Ground Vehicles
- Maritime





Specifications

Performance (AHRS, INS, RUG-3)	Typ
INS Dynamic Roll/Pitch** (RMS)	0.04°
Static Roll/Pitch (RMS)	0.1°
INS Dynamic Heading** (RMS)	0.13°
Static Heading w/Dual Compass* (RMS)	0.4°
Static Heading w/magnetometer (RMS)	0.5°

*1 m baseline distance between GNSS antennas.

**With GNSS input and periodic motion >0.8 m/s² acceleration and >2 m/s velocity.

Performance (INS, RUG-3)	RUG-3	+RTK
Horizontal Position (w/ SBAS)	1.5 m CEP	1 cm + 1 PPM CEP
Velocity (GPS and INS)	0.03 m/s	
Angular Resolution	0.05°	
Operation Limits		
Velocity (external GNSS)	500 m/s	
Altitude (external GNSS)	50 Km	
Altitude (Barometric)	10 Km	
GNSS cold start time to fix	24 s	-

Performance	Typ
Startup Time	0.8 s
INS/AHRS Timestamp Accuracy (RMS)	1 us
Max Output Data Rate (IMU / INS*)	1 KHz / 62 KHz
IMU signal latency	4 ms

*INS output data rate will increase to 100Hz in a future firmware update.

Absolute Maximum Ratings	MAX
Acceleration	10,000 g
Operating Temperature	-40 to 105 °C
Magnetometer & Barometer	-40 to 85 °C
Storage Temperature	-40 to 125 °C
Overpressure	600 kPa
ESD rating	± 2 kV
Solder Reflow Temperature Max	245 °C
Solder Reflow Temperature Limit	217 °C liquidus: 40 – 60 s

Sensors	IMU - Gyros	IMU - Accels	Mags	Pressure
Operating Range	±4000 °/sec	±16 g	±2500 μT	30–125 kPa
In-Run Bias Stability	< 1.5 °/hr	< 19 μg		
Random Walk	0.16 °/Vhr	0.02 m/s/Vhr		
Non-linearity	0.02 % FSR	0.02 % FSR		
Noise Density	5 mdps/VHz	60 μg/VHz		Pa/VHz
Bias Error over -40C to 85C	0.3 °/s RMS	3.7 mg RMS		
Max Output Rate	1 KHz	1 KHz	100 Hz	50 Hz
Bandwidth	250 Hz	218 Hz	50 Hz	5 Hz
Alignment Error	0.03°	0.03°	0.05°	
Resonant Freq.	2.6/2.17 KHz	20 KHz		
Sampling Rate	8 KHz	4 KHz	300 Hz	200 Hz
Resolution	*0.0076 °/sec	*122 μg	0.3 μT	0.03 Pa
				(2 cm)

*1KHz resolution after oversampling

Function	IMX™	+RTK	+Dual
Gyro & Accelerometer (IMU)	•	•	•
Magnetometer & Barometer	•	•	•
Roll, Pitch, Heading (AHRS)	•	•	•
Heading, Velocity, Position (INS)		•	•
GNSS Heading			•



Development
Kits available on
our website.

Electrical (IMX-5)	Min	Typ	Max	Units
Power Draw				
μIMU @ 1KHz		95	105	mW
w/ AHRS, INS @ 250Hz		100	110	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			120	mA
I/O Pin Input low-level	0.99			V
I/O Pin Input high-level	2.31	3.3	3.6	V
I/O Pin Output high-level		3.3		V
STROBE input frequency			1	KHz
Rising Slope of VIN*	2.4			V/ms

*The supply rising slope must be higher than minimum rating for proper function.

Electrical (RUG-3)	Min	Typ	Max	Units
Supply Voltage (VIN)	4.0		20	V
RUG-3-IMX-5-RTK + 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.

Mechanical (IMX-5)	Units
Size	15.6 x 12.5 x 2.9
Weight	0.8
	grams

Mechanical (RUG-3)	Units	Conditions
Size	30.5 x 25.4 x 9.9	RUG-3
	30.5 x 25.4 x 14.8	RUG-3-RTK/Dual
IP Rating	40	No liquid protection
Mounting Tab	30.836	
Hole Spacing		
Weight	14.0	grams
Connectors	Main: Harwin# G125-MV11205L1P, GPS 1/2: MMCX	

Communications & I/O	
IMX-5 Interface	USB, UART x3, SPI
RUG-3 Interface	USB, UART x2, RS232, RS485, CAN, SPI
Max Baud Rate:	
SPI	10 Mbps
UART, RS422, RS485	3 Mbps
RS232	500 Kbps
Strobe Inputs / Outputs	4 / 1

