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

Tactical Grade Inertial Systems
+RTK +Dual GNSS

INERTIALSENSE
autonomous navigation solutions

RUG-IMX-5
Size: 25.4 x 25.4 x 11.2 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-IMX-5-RTK/Dual
Size: 25.4 x 25.4 x 20.0 mm
Weight: 14 g
GNSS: Multi-Band L1/L2/E5

Overview

The **IMX-5**™ is a 10-DOF sensor module consisting of a triple redundant Inertial Measurement Unit (IMU), magnetometer, and barometer. Data output includes angular rate and linear acceleration. IMU calibration consists of bias, scale factor, cross-axis alignment, g-sensitivity, 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 the onboard Inertial Navigation System (**INS**) sensor fusion to estimate roll, pitch, heading, velocity, and position.

The **RUG-INS-5-RTK**™ combines a multi-frequency GNSS receiver with the IMX-5 enabling the Inertial Navigation System (INS) sensor fusion to estimate roll, pitch, heading, velocity, and position.

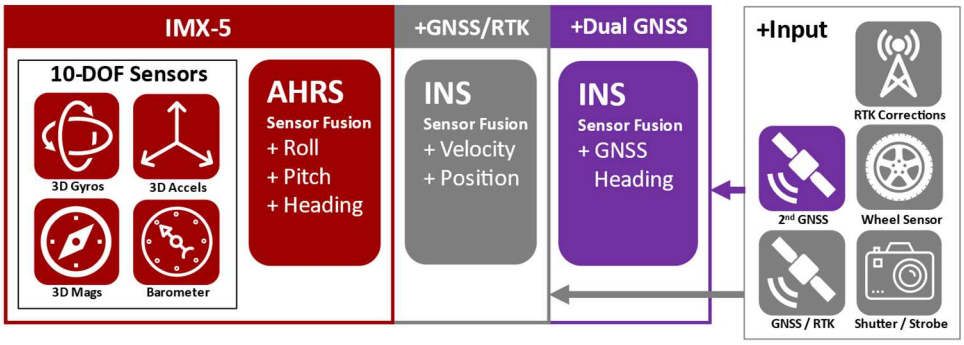
The **RUG-INS-5-Dual**™ combines two multi-frequency GNSS receivers and the IMX-5 onboard sensor fusion. Dual GNSS heading can be determined in environments that are challenging for a magnetometer.

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

Features

- **Tactical Grade IMU**
- **Gyro: 2.0 °/hr Bias Instability, 0.2 °/√hr ARW**
- **Accel: 20 µg Bias Instability, 0.04 m/s/√hr VRW**
- **0.03° Roll/Pitch, 0.1° Dynamic Heading**
- **Surface Mount Reflowable (PCB Module)**
- Up to 1KHz IMU and INS 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)



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Specifications

Performance (AHRS, INS, RUG)	Typ
Dynamic Roll/Pitch** (RMS)	0.03°
Static Heading w/magnetometer (RMS)	2.0°
Static Heading w/Dual Compass* (RMS)	0.4°
INS Dynamic Heading** (RMS)	0.1°

*1 m baseline distance between GNSS antennas.
**With GNSS input and periodic motion >0.8 m/s^2 acceleration and >2 m/s velocity.

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

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

Absolute Maximum Ratings	MAX	
Acceleration	10,000 g	
Storage Temperature	-45 to 85 °C	Barometer limitation
Overpressure	600 kPa	
ESD rating	± 2 kV	Human body model
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	< 2.0 °/hr	< 20 µg		
Random Walk	0.2 °/√hr	0.04 m/s/√hr		
Non-linearity	0.02 % FSR	0.02 % FSR		
Noise Density	5 mdps/√Hz	60 µg/√Hz		Pa/√Hz
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	µIMU™	+RTK	+Dual
Gyro & Accelerometer (IMU)	•	•	•
Magnetometer & Barometer	•	•	•
Roll, Pitch, Heading (AHRS)	•	•	•
Heading, Velocity, Position (INS)		•	•
GNSS Heading			•

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)	Min	Typ	Max	Units
Supply Voltage (VIN)	4.0		20	V
RUG-INS-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	mm
Weight	0.8	grams

Mechanical (RUG)		Units	Conditions
Size	25.4 x 25.4 x 20.0 35.9 x 25.4 x 20.0	mm	W/o mounting tabs W/ mounting tabs
IP Rating	40		No liquid protection
Mounting Tab Hole Spacing	30.836	mm	
Weight	14.0	grams	
Connectors	Main: Harwin# G125-MV11205L1P, GPS 1/2: MMCX		

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

Development Kits available on our website.