µIMU-5, µAHRS-5, µINS-5

Calibrated Inertial Systems
+RTK +Dual GNSS

INERTIALSENSE
autonomous navigation solutions

Rugged-1
Size: 25.4 x 25.4 x 11.2 mm
Weight: 10.5 g

PCB Module
Size: 15.6 x 12.5 x 2.9 mm
Weight: 0.8 g

Rugged-2
Size: 25.4 x 25.4 x 20.0 mm
Weight: 14 g
GNSS: Multi-Band L1/L2/E5

Overview

The **µIMU**™ is a 6-DOF sensor module consisting of a triple redundant Inertial Measurement Unit (IMU). Data output includes angular rate and linear acceleration. IMU calibration includes bias, scale factor, cross-axis alignment, g-sensitivity, and temperature compensation.

The **µAHRS**™ is a 10-DOF Attitude Heading Reference System (AHRS) sensor module with IMU, magnetometer, barometer, and sensor fusion to estimate roll, pitch, and heading.

The **µINS**™ is a 10-DOF Inertial Navigation System (INS) sensor module with sensor fusion combining data from an external GNSS receiver and onboard sensors to estimate roll, pitch, heading, velocity, and position.

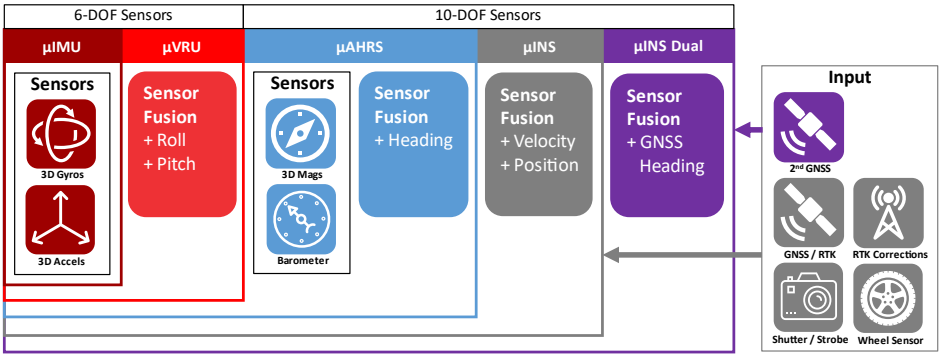
The **µINS Dual**™ is a 10-DOF Inertial Navigation System (INS) sensor module with sensor fusion combining data from two external GNSS receivers and onboard sensors. Dual GNSS heading can be determined in environments that are challenging for a magnetometer.

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: 1.5 °/hr Bias Instability, 0.17 °/√hr ARW**
- **Accel: 20 µg Bias Instability, 0.04 m/s/√hr VRW**
- **0.05° Roll/Pitch, 0.08° 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)



Specifications

Performance (µAHRS, µINS, Rugged-2)	Typ
Dynamic Roll/Pitch** (RMS)	0.03°
Static Heading w/magnetometer (RMS)	2.0°
Static Heading w/Dual Compass* (RMS)	0.4°
µINS Dynamic Heading** (RMS)	0.1°

*1 m baseline distance between GNSS antennas.
**Using external GNSS with motion.

Performance (µINS, Rugged-2)	L1 GNSS, ublox M8	Rugged-2, ZED-F9P
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 *	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

*Used external GNSS receiver.

Absolute Maximum Ratings	MAX	
Acceleration	10,000 g	
Storage Temperature (µINS)	-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	< 1.5 °/hr	< 20 µg		
Random Walk	0.17 °/√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°	
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™	µAHRS™	µINS™
Gyro & Accelerometer (IMU)	•	•	•
Magnetometer & Barometer		•	•
Roll, Pitch, Heading		•	•
Heading		•	•
Inertial Velocity & Position (using external GNSS)			•

Electrical (µINS, µAHRS, µIMU)	Min	Typ	Max	Units
Power Draw				
µIMU @ 1KHz		95	105	mW
µINS, µAHRS @ 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 (Rugged-2)	Min	Typ	Max	Units
Supply Voltage (VIN)	4.0		20	V
µINS with Rugged-2 + 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 (µINS, µAHRS, µIMU)		
µINS		**Units**
Size	15.6 x 12.5 x 2.9	mm
Weight	0.8	grams

Mechanical (Rugged-2)		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
Rugged Interface (IS-RUG-1.x)	USB, UART x3, RS232, RS485, CAN
Max Baud Rate:	
SPI	10 Mbps
UART, RS422, RS485	3 Mbps
RS232	500 Kbps
Strobe Input / Output Pins	4 / 1

Development Kits available on our website.