



# OpenIMU300ZI

## EZ-Family High-Performance IMU



The ACEINNA OpenIMU300ZI "EZ" is an easy-to-use high-performance 9-DOF open inertial platform. The OpenIMU300ZI features a precision 3-Axis Accelerometer, low-drift 3-Axis Rate Gyro, and 3-Axis Magnetometer. The low-power platform is powered by a 168MHz ARM M4 CPU with a Floating Point Unit. The OpenIMU300ZI runs the OpenIMU open-source stack that includes an optimized full-state Kalman Filter for Attitude and GPS-Aided Position-Velocity-Time (PVT) measurement. A free tool-chain based on VS Code supports PC, MAC, and Ubuntu.





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The ACEINNA OpenIMU300ZI is designed for use in embedded applications and operates from a 3.0 to 5.5 power supply. The cost-effective and light-weight cast aluminum housing provides rigidity and minimizes potential stress coupling from the PCBA to the sensor. Four mounting holes are provided to secure the OpenIMU300ZI to your PCBA with screws.

### Applications

- Autonomous Vehicles
- Unmanned Vehicles
- Self-Driving Taxis / Delivery Vehicles
- Agriculture Vehicles and Implements
- Forklifts
- Robotics Control / Feedback
- Antenna / Camera Gimballing and Stabilization



### Features

- Easy to Customize Open Source Algorithms
- Precision 3-axis MEMS Accelerometer
- Low-Drift 3-axis MEMS Angular Rate Sensor
- High Performance 3-axis AMR Magnetometer
- 168 MHz ARM M4 processor
- SPI and up to 3 UART interfaces
- Open Source Tool Chain
- Open Source Algorithms (VG / AHRS / INS)
- Built in 16-State Open Source Extended Kalman Filter
- Open Community & Support
- Wide Temp Range, -40C to +85C
- High Reliability, MTBF > 50k hours

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### Performance Specification

Ta = 25°C, VDC = 3.3 V, unless otherwise stated

Angular Rate	MIN	TYP <sup>2</sup>	MAX
Range (°/s)	-400		+400
Bias Instability (°/hr) <sup>1</sup>		6	
Bias Stability over Temp (°/s)		0.3	
Scale Factor Accuracy (%)		0.03	
Cross-Axis Error (%FSR)		0.02	
Angle Random Walk (°/√hr) <sup>1</sup>		0.3	
Configurable Bandwidth (Hz)	5		50
Acceleration	MIN	TYP <sup>2</sup>	MAX
Range (g)	-8		+8
Bias Instability (μg) <sup>1</sup>		10	
Bias Stability over Temp (mg)		3	
Scale Factor Accuracy over Temp (%FSR)		0.6	
Non-Linearity (%FSR)		0.06	
VRW (m/s/√hr) <sup>1</sup>		0.06	
Configurable Bandwidth (Hz)	2		50
Magnetic Field	MIN	TYP <sup>2</sup>	MAX
Range (mGauss)	-8000		+8000
Resolution (mGauss)		0.25	
Noise (mGauss/√Hz)		0.25	
Bandwidth (Hz)		5	

Note 1: Allan variance curve, constant temperature

Note 2: Typical values are 1-sigma values unless otherwise noted

### Electrical Specifications

Characteristic	Specification
Input voltage	3.0 – 5.5 V
Power Consumption	< 350 mW
Interface	SPI and UART
Max Output Data Rate - SPI	200 Hz
Max Output Data Rate - UART	200 Hz
Input Clock Sync	1pps, 1 kHz

### Physical Specifications

Characteristic	Specification
Size	24.15 x 37.7 x 9.5 mm
Weight	<17 gram
Connector	20-Pin (10x2) 1.0 mm pitch header
Mating Connector	SAMTEC CLM-110-02
Mounting holes	4 x 2.5 mm thru hole

### Environmental Specifications

Characteristic	Specification
Operating Temperature	-40 °C to 85 °C
Storage Temperature	-55 °C to 105 °C

### ESD Specification

Model	Class	MAX
Human Body	2	2000 V
Charged Device	II	500 V

### Qualification Summary (Not inclusive of all tests)

Item	Condition	Summary	
Hot Soak - Operating	Powered	96 Hours 85 °C per IEC 60068-2-2, method BE	
Cold Soak - Operating	Powered	96 Hours -40 °C per IEC 60068-2-1, method AD	
Temperature Cycle	Not Powered	415 cycles, -40 °C to 85 °C	
Temperature Cycle	Powered	141 cycles, , -40 °C to 85 °C	
Temperature Shock	Not Powered	50 Cycles; -40 °C to 85 °C, <60 s transition, 1 hour dwell	
Mechanical Shock	Powered	3 Shocks x 3 axis x 2 directions (18 total) 500 m/s <sup>2</sup> , ½ sine, 11 ms pulse	
Vibration Swept Sine	Powered	5 to 2000 Hz; 5 to 55 Hz Disp. = 0.01 in; 55 Hz to 2000 Hz, 1.5 g Peak	
Vibration Random	Powered	Frequency Breakpoint	Acceleration Spectral Density (g <sup>2</sup> /Hz)
		5	0.015
		100	0.04
		1000	0.04
		2000	0.02





# OpenIMU300ZI

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### Evaluation and Development Kit

- OpenIMU300ZI EVK
- ST-Link/v2 debugger for in-system development of application code
- Fixture and Interface Board
  - JTAG, USB and UART Interfaces

### Open Navigation Platform

Embedded navigation applications quickly developed on PC, MAC, and Ubuntu and deployed to run on OpenIMU hardware.

- Code / Compile / Debug / Simulate / Analyze

Aceinna Navigation Studio developer tools and GUI are found on our developer site: [developers.aceinna.com](http://developers.aceinna.com)

Full manual, API and Algorithm documentation are found at:

[openimu.readthedocs.io](http://openimu.readthedocs.io)

IDE and Compilation tools: download and Install Microsoft VS Code and add the free Aceinna Extension: [code.visualstudio.com](http://code.visualstudio.com)

### Development System Requirements

- PC or MAC
- USB Port (2.0)
- Internet Connection

### Ready to Use Open Source Algorithms

- Calibrated IMU, 3D Acceleration, 3D Rate, 3D Mag
- VG / AHRS, and Dynamic Roll, Pitch and Heading
- INS, Position, Velocity, Attitude and Heading

VG / AHRS Performance <sup>3</sup>	Typical
Pitch and Roll Dynamic Accuracy (Degree) <sup>4</sup>	0.5
Heading Accuracy (Degree) <sup>5</sup>	2
INS Performance <sup>3</sup>	
Position Accuracy (m) <sup>6</sup>	2
Pitch and Roll (Degree) <sup>6</sup>	0.2
Velocity Accuracy (m/s) <sup>6</sup>	0.05
Heading Accuracy (Degree) <sup>6</sup>	0.5

Note 3: Aceinna Open Source Reference Algorithm

Note 4: RMS Error as referenced to Novatel SPAN during 30 minute drive test.

Note 5: Tested in low distortion magnetic environment.

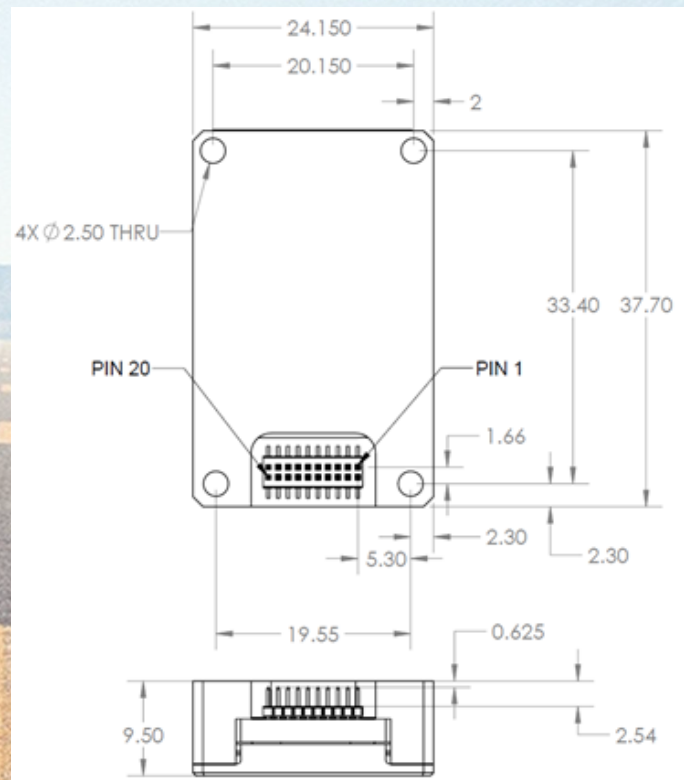
Note 6: RMS Error as referenced to Novatel SPAN during 30 minute drive test using GNSS input from UBLOX M8

### Ordering Information

Embedded High-Performance OpenIMU Platform	
OpenIMU300ZI	9 DOF IMU, FSR = 400dps / ±8 g / ±8 Gauss
OpenIMU300ZI EVK	Developer Kit with OpenIMU300ZI, JTAG, STLink/v2 Pod and Cable



### Dimensioned Drawing (mm)



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