OPUS EMBEDDED LTD.
*Embedded Piece of Art*

Meet *OPUS-Inertial* Series!

Tiniest SMD IMU / AHRS

OPUS-Inertial family is a small form-factor surface mount device (SMD) with industrial IMU / AHRS functionality. While P20 option is ~10 x 10 mm, P28 option is ~12 x 12 mm.

Having industry standard interfaces, small dimensions and flexible voltage input range, they provide easy integration to various systems.

P20 and P28 form factor options have similar infrastructure with different focuses leading a perfect trade-off with power consumption and performance which enhances the flexibility on users' end.

Rich interface capability, low power consumption and cost-efficient structure make OPUS-Inertial devices a perfect match for unmanned or battery powered devices.
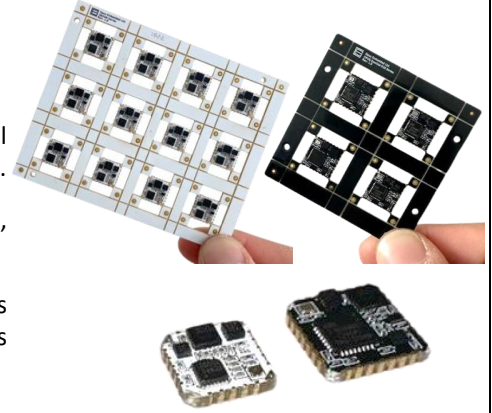
KEY FEATURES

- Precise **Calibrated Inertial Measurements**
- Precise 3D Attitude **(Roll / Pitch / Heading)**
- Up to 1kHz of **measurement** output **(ODR)**
- Up to 1kHz of **computed 3D attitude** output **(ODR)**
- Smart hardware with **tiny dimensions**
- Industry standard **interface capability** (SPI/I2C/UART)
- **Ultra low power** design
- Easy **firmware interface** for device control
- Development Kit's Available !
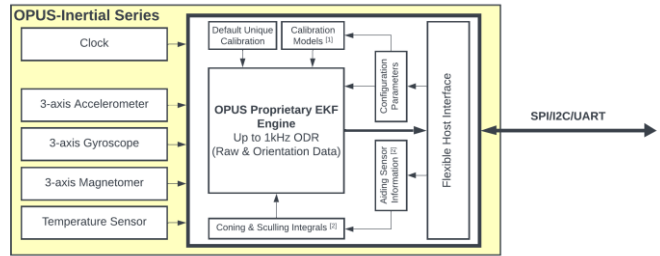
FUNCTIONAL FEATURES

OPUS-Inertial-R series have the easiest Firmware Interface for device access and control. Some features can be configured with single line commands. Please request our firmware interface, EN_FI_OPUS-Inertial-R document from technical@opusembedded.com for further information. [1]

- Calibrated IMU Outputs
- Precise 3D Attitude Information
- Adaptive Filtering
- World Magnetic Model (in P28 option)
- Magnetic North / True North Options (in P28 option)
- From 1Hz to 1kHz ODR Selection
- Coning & Sculling Integrals (Δθ, ΔV Vectors)
- Manual Magnetic Calibration
- Sensor On & Off
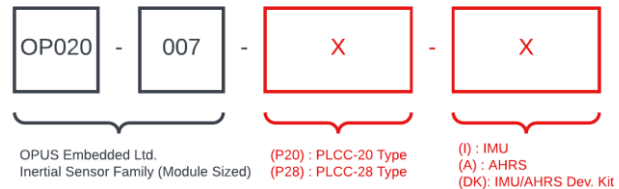- External Sensor Support (in P28 option)

APPLICATIONS

- Indoor / Outdoor Navigation Systems
- Robotics
- Mini / Micro Drones
- UAV's / UGV's
- Wearable Technologies
- Battery Powered Systems

BLOCK DIAGRAM

ORDER INFORMATION

OPUS Embedded Ltd.
Inertial Sensor Family (Module Sized)

(P20) : PLCC-20 Type
(P28) : PLCC-28 Type

(I) : IMU
(A) : AHRS
(DK): IMU/AHRS Dev. Kit

| Order Option	Product Detail
OP020-007-P20-I	PLCC-20 size SMD IMU.
OP020-007-P20-A	PLCC-20 size SMD AHRS.
OP020-007-P20-DK	PLCC-20 size SMD IMU/AHRS Development Kit.
OP020-007-P28-I	PLCC-28 size SMD IMU.
OP020-007-P28-A	PLCC-28 size SMD AHRS.
OP020-007-P28-DK	PLCC-28 size SMD IMU/AHRS Development Kit.

[1] Some of listed features are hardware ready and are going to be implemented with the following firmware updates via OPUSDeviceManager Software. Please contact our technical team for further information.

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TECHNICAL SPECIFICATIONS

IMU Sensor Specifications

Specification	Accelerometer	Gyroscope	Magnetometer
Range	±2 g, ±4 g, ±16 g	±250 °/s, ±500 °/s ±2000 °/s	±2 G, ±4 G, ±8 G ±16 G
Non-Linearity	0.5 %FS	0.1 %FS	0.25 %
Bias Stability	**TBD**	**TBD**	--
Scale Factor Stability	**TBD**	**TBD**	**TBD**
Noise Density	130 µg/√Hz	0.005 °/s/√Hz	1.5 mG RMS
Alignment Error	0.08°	0.08°	0.08°
Bandwidth	350 Hz	250 Hz	--
Sampling Rate	1000 Hz	2000 Hz	100 Hz
IMU Output Rate	1 Hz to 1000 Hz		
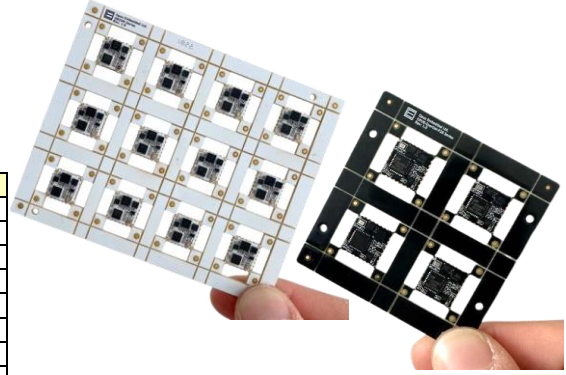
Data Outputs

	Data Output	P20 -I	P20 -A	P28 -I	P28 -A
Filtered IMU [2]	Acceleration	•	•	•	•
	Angular Rate	•	•	•	•
	Magnetic Field	•	•	•	•
	Ambient Temperature	•	•	•	•
	Δθ, ΔV Vectors	•	•	•	•
	Compensated Acceleration & Angular Rate	•	•	•	•
	Manual Magnetic Calibration	•	•	•	•
	Runtime Automatic Magnetic Calibration			•	•
	External IMU Sensor Input Support			•	•
EKF Outputs [2]	Euler Angle (Roll & Pitch & Yaw)		•		•
	Quaternions		•		•
	Orientation Matrix		•		•
	Filtered Output Uncertainties		•		•
	True & Magnetic North Information				•
General [2]	OPUS Proprietary Firmware Interface	•	•	•	•
	NMEA0183	•	•	•	•
	Main I2C, SPI and UART	•	•	•	•
	Auxiliary Port			•	•

AHRS Performance

Specification	Value
Pitch / Roll (Static)	0.5°
Pitch / Roll (Dynamic)	0.8°
Heading (Static)	1°
Heading (Dynamic)	2°

DEVELOPMENT KITS

Both versions have development kits available for customers. The kits have all the options available on-board which allow users to evaluate and develop with the tiniest detail of the products.

OPUS-Inertial-P20-DK:
• USB Mini-B connection option
• Power source selection
• VDDA / VDDIO selection
• UART / SPI / I2C header interface
• 40 x 40 mm !

OPUS-Inertial-P28-DK:
• USB Type-C connection option
• Power source selection
• VDDA / VDDIO selection
• UART / SPI / I2C header interface
• Interface selection (PSEL)
• 45 x 45 mm !

Integration & Operating Conditions

Specification	Condition
Input Voltage	VDDA: 1.8V or 3.3V VDDIO: 1.8V or 3.3V (VDDIO must be ≤ VDDA)
Power Consumption	P20: 50 mW typ. P28: 80 mW typ.
Operating Temperature	**TBD**
Temperature Compensation	**TBD**
Interfaces	✓ UART, I2C, SPI
Output Data Rate (ODR)	Up to 1kHz (for both Measurement and Attitude)
Protocol	✓ OPUS Proprietary Firmware Interface
SDK Support	✓ ROS2 Drivers [3] ✓ C/C++ API's for Embedded Development [3]
Dimensions	P20: ~10 x 10 mm P28: ~12 x 12 mm
Mounting	SMD or PLCC Sockets
CAD Data	Altium Designer Library
Reference Schematic Design	Available

[2] Some of listed outputs are hardware ready and are going to be implemented with the following firmware updates via **OPUSDeviceManager** software. Please contact our technical team for further information.

[3] NMEA0183, NMEA2000 and C/C++ API's are under development and will be released in shortly. User's can always contact our technical team or visit our Website in order to get recent updates.