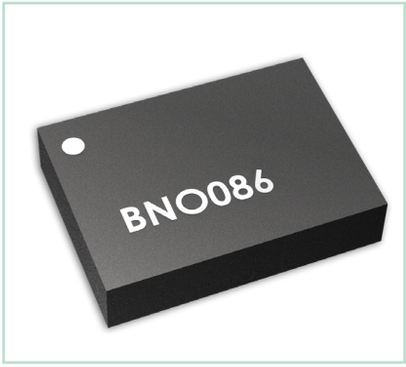
Product Note

BNO085/BNO086

9-AXIS SYSTEM IN PACKAGE (SIP) IMU

Consisting of the BNO085 and BNO086, our BNO08X family of SiPs (System-in-Package) is perfect for robotics, AR/VR, HIDs (Human Interface Devices, such as remote controls) and other motion-sensing applications. Leveraging our advanced sensor fusion software and a Bosch Sensortec sensor, this powerful platform is highly flexible, and we'll work with your technology teams so you can easily configure it to bring out the best in your product.

The BNO086 delivers high performance, shortens development times and simplifies BOMs by combining a 9-axis sensor (AGM) with sensor fusion capabilities in a single package. By addressing popular sensor anomalies with proprietary algorithms that are continually perfected through rigorous testing, our motion sensors deliver more accurate dynamic heading than the competition. We've built a deep and flexible sensor platform so you can pick what works best for you – stay focused on innovating in other product areas while speeding time to market. Leave the sensor fusion to the experts.

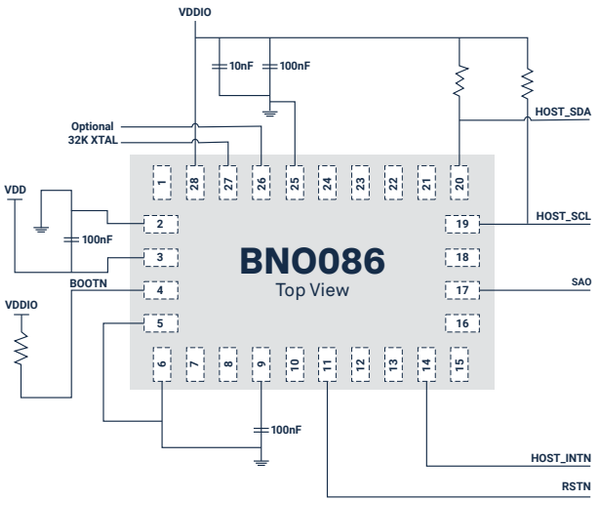


FEATURE HIGHLIGHTS

- **MotionEngine™ 9-Axis and 6-Axis Sensor Fusion** – Provides raw, calibrated sensor orientation data for more accurate heading and orientation
- **Intelligent Power Management** – Manages sensor states to conserve power without sacrificing quality of motion data
- **Calibration** – Supports both dynamic and factory-based calibration to deliver the highest performance. The BNO086 includes Ceva's Interactive Calibration, bringing even greater accuracy to robotics applications
- **Compatibility** – BNO086 is backwards compatible with BNO085 and both are pin-for-pin replacements for Bosch Sensortec's BNO055 and BMF055
- **Always-on Capabilities** – Includes software to enable low power, step counter and gesture recognition
- **Control via I2C, SPI or UART Interfaces** – Freedom to optimize overall circuit design requirements
- **Secondary I2C interface** – Allows attachment of additional environmental sensors
- **OS Independent** – Driver example code is available for ease of integration
- **Software Library Support** – Includes support for external MotionElements software libraries for advanced applications such as 6DOF VR controllers and attitude monitoring (e.g., antennas)

PHYSICAL ATTRIBUTES

SOFTWARE	motion engine	Hillcrest Labs' proprietary sensor fusion software	
SENSORS	Accel	Gyro	Mag
PROCESSOR	mcu	ARM Cortex-M0+	
INTERFACES	I2C	SPI	UART



BNO085/BNO086

9-AXIS SYSTEM IN PACKAGE (SIP) IMU

AR/VR

The BNO08X line delivers more accurate orientation information with low latency - even during rapid motion - eliminating motion sickness and other negative user experiences. Low power consumption, predictive motion, high output rate of 1 kHz, and compact size (5.2 x 3.8 x 1.1 mm³) all make the BNO08X line ideal for VR/AR devices such as HMD (head mounted displays), glasses and controllers, where both power and space are at a premium. Our MotionElements software combines camera data with the sensor data from the BNO085 or BNO086 to deliver a more cost-effective 6DOF controller experience.

Features & Benefits

- **1 kHz Sample Rate** – Enables flawless, smooth head- tracking with low latency and support for time-warping for immersive experiences
- **Predictive Head Tracking and AR/VR Stabilization** – Adjust angular position gradually over time to avoid "jumps" and compensate for system latency
- **Enhanced Controller Tracking** – Utilizes camera data to significantly improve VR controller performance
- **Tare** – Allows for arbitrary mounting of any BNO08X SiP in the end product
- **Context and Activity Tracking** – Step-based activity features for head-mounted devices, including stationary, running, walking and step count

ROBOTICS

The BNO08X family is optimized for service robots that employ Simultaneous Localization and Mapping (SLAM) or other "intelligent" navigation solutions, such as robotic vacuum cleaners. Our combination of proprietary sensor fusion software and multi-axis sensors delivers superior heading performance, even when the robot runs over uneven surfaces, such as a floor transition from one material to another. Interactive Calibration (BNO086 only) uses the robot's knowledge of its own motion state to provide even greater levels of performance right out of the box. Whether your robot cleaner relies mainly on an IMU for navigation or leverages an IMU to complement a LIDAR, VSLAM system or optical sensor (optical flow), our product will help you meet your requirements.

Features & Benefits

- **Accurate Heading Angle** – Less than 0.16°/min (10°/hr) typical error rate when using Interactive Calibration
- **Tilt Independent Heading** – Allows for proper heading output when surface is uneven
- **Bump Detection** – Calibrated accelerometer output provides data to support a bump detection algorithm without having to use a separate sensor
- **Inclination Detection** – Provides full 3DOF robot orientation, allowing detection of surface and device issues

About Ceva

At Ceva, we are passionate about bringing new levels of innovation to the smart edge. Our wireless communications, sensing and Edge AI technologies are at the heart of some of today's most advanced smart edge products. From Bluetooth connectivity, Wi-Fi, UWB and 5G platform IP for ubiquitous, robust communications, to scalable Edge AI NPU IPs, sensor fusion processors and embedded application software that make devices smarter, we have the broadest portfolio of IP to connect, sense and infer data more reliably and efficiently. We deliver differentiated solutions that combine outstanding performance at ultra-low power within a very small silicon footprint. Our goal is simple - to deliver the silicon and software IP to enable a smarter, safer, and more interconnected world. This philosophy is in practice today, with Ceva powering more than 17 billion of the world's most innovative smart edge products from AI-infused smartwatches, IoT devices and wearables to autonomous vehicles and 5G mobile networks.

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