

Adafruit Absolute Orientation Sensor (BNO055) – 9-Axis IMU Fusion Breakout Board

Unlock the full potential of motion sensing and orientation tracking with the **Adafruit Absolute Orientation Sensor (BNO055)** – a powerful 9-axis IMU that delivers precise, real-time 3D orientation data without the need for complex algorithm development. Engineered by Bosch and integrated into a user-friendly Adafruit breakout board, the BNO055 combines **accelerometer, gyroscope, and magnetometer** data through an advanced onboard **sensor fusion processor**, providing stable and reliable orientation information in just minutes.

Whether you're developing robotics, motion-controlled devices, wearable tech, or navigation systems, this sensor offers **plug-and-play precision** and **professional-grade stability**—making it one of the most popular IMUs for engineers, students, and developers alike.

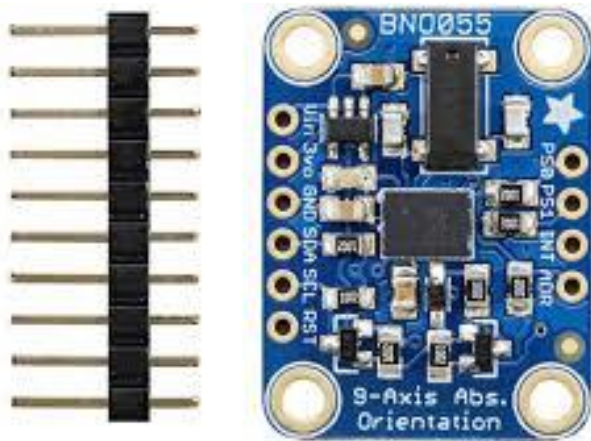
All-in-One 9-DOF Sensor with Onboard Fusion

At the core of the module lies the **Bosch BNO055**, a fully integrated **9 Degrees of Freedom (9-DOF)** sensor that merges three essential sensors:

- **3-axis accelerometer** – Measures linear acceleration.

- **3-axis gyroscope** – Detects angular velocity.
- **3-axis magnetometer** – Senses magnetic field strength for heading information.

What makes the BNO055 truly unique is its **built-in 32-bit Cortex-M0 microcontroller** that performs all **sensor fusion computations internally**. Unlike conventional IMUs that require complex code and calibration to derive usable orientation data, the BNO055 outputs ready-to-use, fully processed orientation data—saving you time and reducing development complexity.



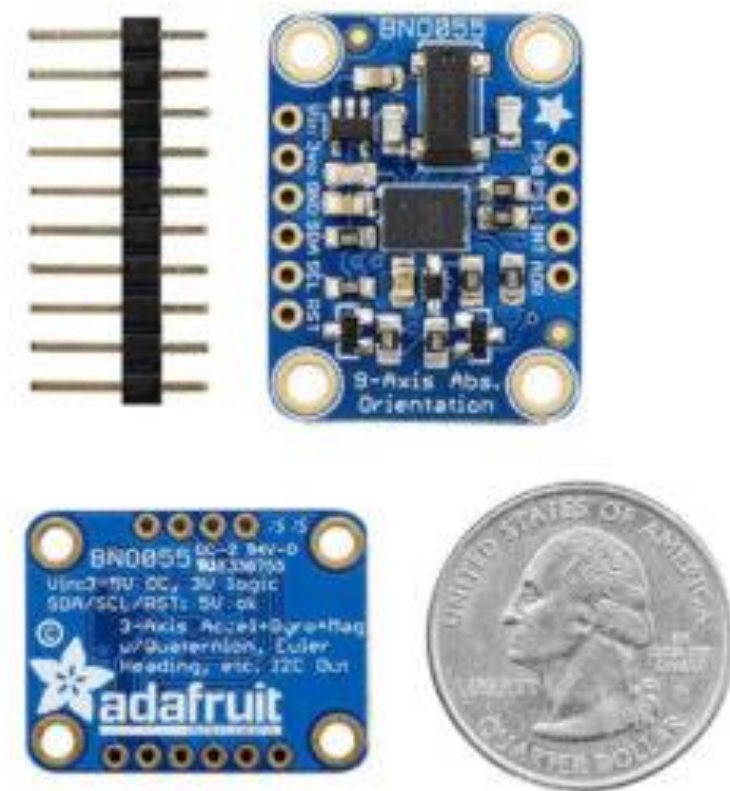
Real-Time Orientation Data with Multiple Outputs

The **Adafruit BNO055** outputs a variety of data types at high precision and frequency, making it suitable for both static and dynamic applications.

Sensor Output Data:

- **Euler Angles (100Hz):** 3D orientation across a full 360° sphere.
- **Quaternions (100Hz):** High-accuracy orientation output ideal for 3D graphics and motion control.
- **Angular Velocity (100Hz):** Real-time rotation rate in radians per second.
- **Acceleration (100Hz):** Measures both gravity and motion.
- **Magnetic Field (20Hz):** Magnetic field strength in microteslas (μT).
- **Linear Acceleration (100Hz):** Pure motion data with gravity removed.
- **Gravity Vector (100Hz):** Gravity-only acceleration data for tilt compensation.
- **Temperature (1Hz):** Ambient temperature in degrees Celsius.

These outputs make the BNO055 ideal for **precise motion tracking**, **gesture recognition**, and **orientation control** across a wide range of projects.



Plug-and-Play Integration via I²C

One of the standout features of the Adafruit BNO055 is its **ease of integration**. Connecting it to your microcontroller or single-board computer is simple using the **I²C interface**. Within minutes, you can start receiving **real-time orientation data** without worrying about complex calibration or algorithm tuning.

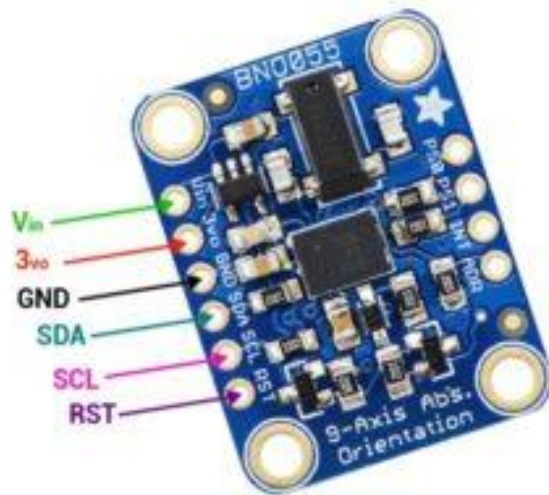
It's fully compatible with platforms like **Arduino**, **Raspberry Pi**, **ESP32**, and **BeagleBone**, and Adafruit provides **ready-to-use open-source libraries and examples**—allowing you to get your project up and running effortlessly.

Precision Engineering for Reliable Performance

The **Adafruit BNO055 breakout board** is compact yet durable, featuring:

- **Onboard voltage regulator and logic-level shifting**, allowing operation with both 3.3V and 5V systems.
- **Mounting holes** for secure installation in embedded systems or robotics projects.
- **Breakout headers** for easy breadboard or custom PCB connection.

The sensor's integrated fusion firmware ensures **stable, drift-compensated output**, eliminating the need for external filters or complex sensor alignment procedures.



Ideal for a Wide Range of Applications

The Adafruit BNO055 9-DOF sensor is designed for versatility and can be used in dozens of real-world applications, including:

- **Robotics and Drones:** Real-time position and attitude control for stable movement.
- **Wearable Technology:** Gesture detection, posture tracking, and motion monitoring.
- **Navigation Systems:** Accurate orientation for GPS-assisted navigation or mapping.
- **Gaming and VR/AR:** Motion capture and head-tracking for immersive experiences.
- **Automation and Industrial Control:** Detect motion, tilt, or vibration with high precision.
- **STEM Education and Research:** Perfect for teaching motion sensing, IMUs, and orientation algorithms.

Key Features

- Fully integrated **9-DOF IMU sensor** with onboard fusion algorithm.

- **Plug-and-play via I²C** for easy connection with Arduino, Raspberry Pi, and similar boards.
- **Bosch BNO055 chip** with built-in fusion processor – no external code needed.
- Outputs orientation data as **Euler angles, quaternions, velocity, acceleration, magnetic field, and gravity vector**.
- **High update rate** (up to 100Hz) for smooth, responsive motion data.
- **Compact breakout design** with voltage regulation and logic level shifting.
- Supported by **Adafruit's open-source libraries** and detailed documentation.

Package Includes

- **1× Adafruit BNO055 9-DOF IMU Fusion Breakout Board**

Why Choose the Adafruit BNO055 Absolute Orientation Sensor

If your project needs **accurate motion tracking without the hassle of writing complex fusion algorithms**, the **BNO055** is your best choice. With its onboard fusion engine, robust performance, and easy integration, it delivers professional-grade results in a simple, compact form. Supported by Adafruit's extensive documentation and community, it's a perfect fit for **makers, engineers, and educators** looking to add precise orientation sensing to their projects.