



# BNO070

In partnership with Bosch Sensortec

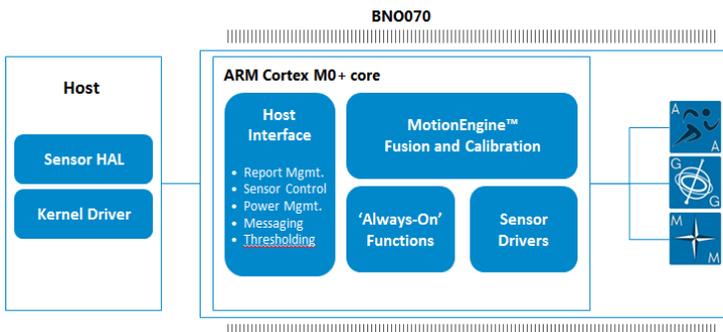
High Accuracy 9-axis System in Package for mobile, wearable, robotics, and IoT devices



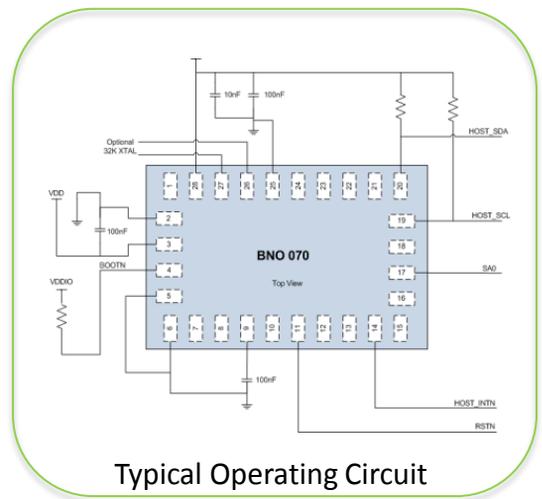
Co-developed by Bosch and Hillcrest Labs, the BNO070 is a single chip solution that features a high-performance accelerometer, magnetometer, and gyroscope with a low-power 32-bit ARM Cortex M0+ MCU in a small package.

Hillcrest's software pre-integrated on the BNO070 provides an intelligent sensor hub software stack which makes low power, context aware sensing possible in mobile, wearable, and Internet of Things ("IoT") devices. The turn-key solution includes the highest quality sensor fusion, step counter and gesture recognition features, optimized sensor drivers, and the hub/host interface.

- ✓ **MotionEngine™ Mobile 9-Axis Sensor Fusion**  
Hillcrest's flagship software solution is the foundation of the BNO070 and provides unparalleled power and motion performance.
- ✓ **'Always-on' Capabilities** - Includes software to enable step counter and gesture recognition at low power.
- ✓ **Application Based Fusion** - Sensor fusion output can be tuned for best performance of the specific application.
- ✓ **Intelligent Power Management** - Manages sensor states to conserve power without sacrificing quality of motion data.
- ✓ **Includes secondary I<sup>2</sup>C interface** - allows attachment of environmental, vital signs and other sensors
- ✓ **Android Compatible** – Provides support for sensors defined in Android 5.x and 6.0.
- ✓ **Low power 9-axis fusion** - < 25 mW, @100Hz
- ✓ **Standby power** – 100 μW
- ✓ **Single Chip** – 28 pin LGA: 5.2 x 3.8 x 1.1 mm<sup>3</sup>



BNO070 Block Diagram



Typical Operating Circuit

# BNO070

The BNO070 offers all the functions of a sensor hub, providing calibrated sensor data and value added composite sensors and classifiers. The sensor hub provided is compatible with Android but it can be used with any operating system.

The pre-integrated solution eases system integration, provides faster time-to-market, and reduces customer development costs while adding advanced sensor-based functionality.

## CONFIGURATION OPTIONS

The BNO070 can be used in many applications, including: AR glasses, VR head mounted displays, body worn motion trackers, robotic vacuum cleaners, drones and any device that requires high performance inertial motion tracking.

Optimization for particular applications is possible:



### Autonomous Robots

The BNO070 is optimized for robotic cleaners that employ Simultaneous Localization And Mapping (SLAM) based navigation. The BNO070 provides an accurate heading output, calibrated angular velocity and acceleration. The inclusion of 3-axis sensors allows the heading output to remain precise even on uneven flooring. In addition, the BNO070 can provide collision (bump) detection and also an estimate of tilt (inclination).



### AR/VR HMD

The BNO070 provides a head tracking solution for head mounted displays (HMD). The low power consumption and compact size – 5.2 x 3.8 x 1.1 mm<sup>3</sup> – make the solution ideal for wearable devices, where both power and space are limited. In an HMD the BNO070 can provide low latency, high sample rate and smooth orientation updates, allowing for superior head tracking performance.

## KEY BNO070 FEATURES

Feature	Description
Single-chip solution	Lower total cost, more design flexibility, and simplified integration
Size	5.2 x 3.8 x 1.1 mm <sup>3</sup>
Supply voltage $V_{DD}$ Supply voltage $V_{DDIO}$	2.4V-3.6V 1.7V-3.6V
Typical power consumption (9-axis fusion)	10mA @100Hz
Communication Interfaces	I <sup>2</sup> C, SPI, UART
Heading performance	Typical < 1% heading error
Accurate Heading Angle	For robotic cleaners, will track any motion, even across tilt changes (e.g. docking station or uneven ground)
Collision (Bump) and Tilt Detection in RVCs	Without the need of additional sensors
Calibrated sensor data	Rotation vector, angular velocity and accelerometer sensor data available at different rates (up to 400Hz)

## ABOUT HILLCREST LABS

Hillcrest Labs is the leading global supplier of software and hardware for motion-enabled products. Our Freespace® technology transforms human movement into high quality, application-ready motion information. With a decade of development and many unique patented features, products come to life with Freespace® motion. Find out more at [www.hillcrestlabs.com](http://www.hillcrestlabs.com), or contact us at [sales@hillcrestlabs.com](mailto:sales@hillcrestlabs.com).