BHI160BP

Position Tracking Smart Sensor

GENERAL DESCRIPTION

The BHI160BP is an application specific upgrade of the BHI160 family and comes with a Pedestrian Dead Reckoning (PDR) Algorithm that allows Pedestrian Position Tracking at a fraction of the power consumption of GNSS only solutions.
The BHI160BP is a small, low-power smart sensor that combines an integrated three axis gyroscope, an integrated three axis accelerometer and a programmable microcontroller including an integrated specifically developed algorithm for PDR.

The BHI160BP can be integrated in devices that use any type of GNSS or any other absolute positioning system, enhancing the system in two aspects, both reducing the system power consumption and improving the robustness of the position tracking whenever the GNSS system suffers from bad signal quality. The BHI160BP allows to significantly reduce the power consumption, by interpolating the path between two position fixes, allowing to keep the GNSS receiver in sleep mode for a longer period of time (power duty cycling).

In addition to the Pedestrian Position Tracking functionality, the BHI160BP includes other algorithms like device 3D orientation, step-counting, double-tap wake up, wrist wear wake up, activity recognition, etc. Software included! Programmable! Extendable!

TECHNICAL SPECIFICATIONS

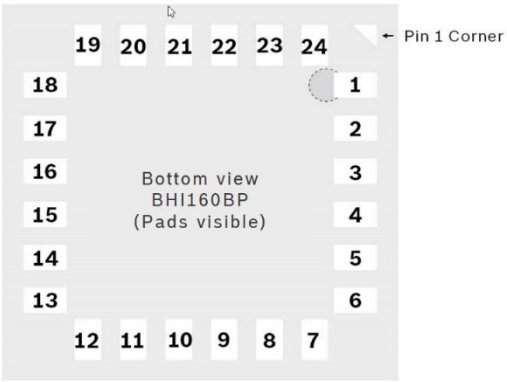
BHI160BP TARGET APPLICATIONS

- Pedestrian always-on position tracking
- Low-power always-on algorithms for wearables
- Enhanced position tracking robustness under challenging GNSS signal conditions
- Supports walking, jogging, and other activities
- Supports loose coupled synchronization with GNSS module over a generic interface

BHI160BP TARGET DEVICES

- Wearables such as smart watches, wrist- or neckbands
- Smart sports and smart fitness devices
- Smart hearable devices
- Mobile phones

BHI160BP technical data	
Package dimensions	3.0 x 3.0 x 0.95 mm³
Temperature range	-40 ... +85 °C
Supply voltage V_{DDIO}	1.2 ... 3.6 V
Supply voltage V_{DD}	1.71 ... 3.6 V
Typ. current consumption	
– Full 6DoF PDR[1]	1.3 mA
– Full 6DoF Fusion @100 Hz ODR[1]	1.2 mA
– Full 9DoF Fusion @100 Hz ODR[2]	1.3 mA
– Significant motion	128 µA
– Step detector	131 µA
– Suspend mode	11 µA
PDR Performance	
– Typical power saving[3]	50% - 80%
– Position accuracy[4]	10%
– Step counting error[5]	<5 %
Sensor Fusion Performance[5]	
– Static accuracy (Head., Pitch, Roll)	2, 2, 2, Degrees
– Dynamic accuracy (Head., Pitch, Roll)	7, 2, 2, Degrees
– Orientation stabilization time	0.2 seconds
Implemented Virtual Sensor Types with IMU only	PDR, Accelerometer, Gravity, Linear acceleration, Gyroscope, Gyroscope uncalibrated, Game rotation vector, Step counter, Step detector, Significant motion, Tilt detector, Pickup gesture, Wake up gesture, Glance gesture, Activity recognition



SENSOR FEATURES

The BHI160BP is specifically designed to enable always-on pedestrian position tracking at low power for battery-powered devices. It perfectly matches the requirements of wearables like smartwatches, smart bands, hearables and other small devices with demanding low power consumption requirements.
The sensors calculates the user's position based on previously known position (e.g. GNSS fix), extrapolating by means of an advance algorithm that makes use of the integrated inertial sensors.

The typical system power saving ranges from 50% to 80% depending on the application, user activity, device configuration and particular system characteristics.

The BHI160BP includes, in addition to PDR, other algorithms that allow low power always-on features for wearable devices like 2tap-wake-up, wrist worn wake-up, significant motion, etc.
The BHI160BP can be easily integrated in the end device architecture by making use of the generic driver "SensorAPI" and the Reference PDR-GNSS fusion library.

[1] Sensor typical power consumption.

[2] With attached Magnetometer

[3] 50% till 80% are the typical values of system power saving for standard user walking profile and system induding typically available GNSS module characteristics. Actual power saving usually vary depending on the application and GNSS module.

[4] Relative position estimation error for 75% of the population of various user profiles and movement profiles (walking, jogging, standing still, etc.) will have a typical error of 10% or better relative to the walked distance. This is the relative error of the BHI160BP PDR algorithm without GNSS assistance.

[5] Typical relative step counter error.

Pin

Pin	Name	Description
1	NC	Not connected
2	RESV1	Do not connect pin
3	GPIO1	Application specific I/O pin
4	RESV2	Do not connect pin
5	RESV3	Do not connect pin
6	NC	Not connected
7	ASCK	I^2C master serial clock, for connection of external sensors
8	V_{DDIO}	Digital I/O power supply
9	SA_GPIO7	Select I^2C address (I^2C slave address LSB) / application specific I/O pin
10	VREG	Regulator filter capacitor connection
11	GPIO2	Application specific I/O pin
12	INT	Host interrupt
13	VDD	Analog power supply voltage (1.71 ... 3.6 V)
14	NC	Not connected
15	NC	Not connected
16	NC	Not connected
17	NC	Not connected
18	GND	Analog power supply ground
19	NC	Not connected
20	GND_{IO}	Digital I/O power supply
21	ASDA	I^2C master serial data, for connection of external sensors
22	RESV4	Reserved
23	SCK	I^2C serial clock (Host interface)
24	SDA	I^2C serial data (Host interface)

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Doc.-Number: BST-BHI160BP-FL000-00/Version_1.0_112018