Bosch Sensortec

BOSCH

BMC150
eCompass (6-axis digital compass)

GENERAL DESCRIPTION

Housed in an LGA package with a footprint of merely 2.2 x 2.2 mm² and 0.95 mm height, BMC150 is an extremely small low power and low noise 6-axis digital compass. It measures the earth's geomagnetic field as well as dynamic and static acceleration in all three dimensions and outputs tilt compensated heading and orientation information. The integrated accelerometer provides all functionalities of Bosch Sensortec's leading-edge 12 bit digital accelerometer, including a 32 frame FIFO buffer storing acceleration data. Due to its small package size and its advanced power management, BMC150 is ideally suited for virtual reality and navigation applications or motion tracking in handhelds like mobile phones, tablet PCs, notebooks, portable media players, man-machine interfaces and game controllers. With an increased magnetic measurement range, BMC150 offers high PCB placement flexibility to the developer of handheld devices.
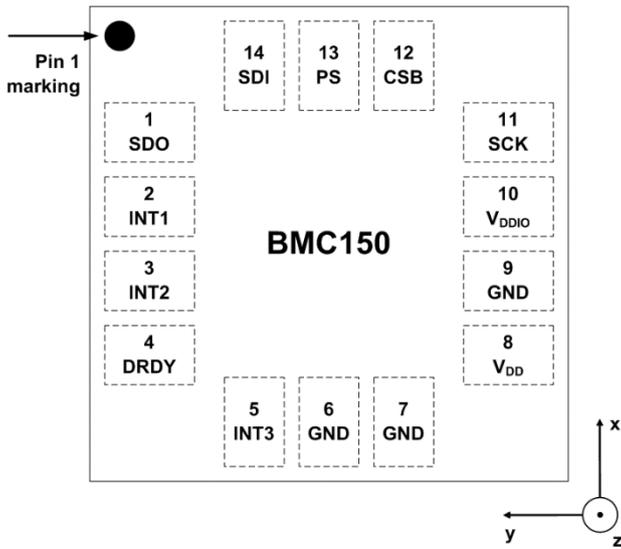
BMC150 TARGET APPLICATIONS

▶ Augmented reality applications and location-based services
▶ Indoor and outdoor navigation, e. g. map rotation or step counting
▶ Motion tracking
▶ Gesture recognition e. g. tap and double tap sensing, display profile switching
▶ Gaming
▶ Air mouse applications, pointing devices

SENSOR FEATURES

The eCompass comprises a 3-axis geomagnetic sensor based on Bosch's proprietary FlipCoreTM technology and a 3-axis 12 bit accelerometer. The accelerometer provides the device orientation for tilt compensated heading output. At the same time, it features all functions of a state-of-the art standalone accelerometer and can be operated independently.

TECHNICAL SPECIFICATIONS

BMC150 Technical data	
Digital interfaces	I²C, SPI (3/4 wire) 4 interrupt pins
Current consumption – regular mode – low-power mode	540 µA @ 10 Hz 190 µA @ 10 Hz
Supply voltage	1.62 ... 3.6 V
Supply voltage I/O	1.20 ... 3.6 V
Operating temperature	-40 ... +85 °C
LGA package	2.2 x 2.2 x 0.95 mm³
Geomagnetic sensor	
Measurement range	± 1300 µT (x-,y-axis) ± 2500 µT (z-axis)
Resolution	0.3 µT
Acceleration sensor	
Stand-alone operation	supported
Resolution	12 bit
Programmable g-range	±2 g; ±4 g; ±8 g; ±16 g
Zero-g offset (typ.)	±80 mg
Sensitivity tolerance	±4 %
Interrupt engine	
Accelerometer interrupts	Orientation/flat detection, any motion, tap/double tap, sensing, low-/high-g threshold, slow motion/no motion detection, data ready
Magnetometer interrupts	magnetic data ready, magnetic threshold detection
FIFO data buffer accelerometer	32 sample depth for each axis

Pin configuration (top view)

Bosch Sensortec's BMC150 comes in a 2.2 x 2.2 x 0.95 mm³ 14 pin LGA package. With respect to its predecessor the BMC050, the footprint of BMC150 could be reduced by almost 50 %.

BMC150 features I²C and SPI (3-wire/4-wire) digital, serial interfaces and a powerful interrupt engine. Parameters like g-ranges or low-pass filter settings as well as all interrupt settings can easily be programmed via the digital interfaces.

NEW FEATURES OF BMC150

Backed by Bosch's huge technology and IP portfolio, Bosch Sensortec now introduces BMC150 in the premium eCompass segment. Since most permanent magnets on the target PCB such as speaker magnets or camera modules are magnetized perpendicular to the PCB plane a high magnetic measurement is needed in z-direction. Its stunning package dimensions in com-bination with the high magnetic range of ±1300 µT (x-, y-axis) and ±2500 µT (z- axis) allow very flexible placement of the eCompass on the PCB.

The enhanced interrupt engine with respect to BMC150 features a set of new hard-wired functions making it a more power efficient and easy to design-in product. The new FIFO memory allows storing 32 samples of each axis and offers use-case specific FIFO operation modes for the accelerometer.

ECOMPASS SOFTWARE

Bosch Sensortec licenses proprietary leading-edge software package supporting BMC150, which has been tailored to ideally complement with the Bosch MEMS hardware. It features in-use calibration and self-monitoring and includes automatic magnetic offset cancellation and accelerometer tilt-compensation in order to provide a magnetic robust heading. For more details please contact your Bosch Sensortec representative.

▶ Fast in-use offset calibration

▶ Hard- and soft-iron calibration

▶ Magnetic heading

▶ 3D device orientation

▶ Signal quality information

▶ M4G – gyroscope emulation

TECHNICAL SPECIFICATIONS

Pin configuration

Pin No.	Name	Sensor	Description
1	SDO	Mag. + Acc.	SPI: Data out
2	INT1	Acc.	Interrupt output 1
3	INT2	Acc.	Interrupt output 2
4	DRDY	Mag.	Data ready
5	INT3	Mag.	Interrupt output 3
6	GND	Mag. + Acc.	Ground
7	GND	Mag. + Acc.	Ground
8	VDD	Mag. + Acc.	Supply voltage
9	GND	Mag. + Acc.	Ground
10	V_{DDIO}	Mag. + Acc.	I/O voltage
11	SCK	Mag. + Acc.	Serial clock
12	CSB	Acc.	Chip select
13	PS	Mag.	Protocol select
14	SDI	Mag. + Acc.	SPI: Data in, I²C: Data