

# BMC156

## eCompass (6-axis digital compass)

### GENERAL DESCRIPTION

Housed in an LGA package with a footprint of merely 2.2 x 2.2 mm<sup>2</sup> and 0.95 mm height, BMC156 is an extremely small low power and low noise 6-axis digital compass. Due to its pin-compatible pin-out it fits well on a 2 x 2 standard accelerometer landing pattern (BMA). 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 the 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, BMC156 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, BMC156 offers high PCB placement flexibility to the developer of handheld devices.

### BMC156 TARGET APPLICATIONS

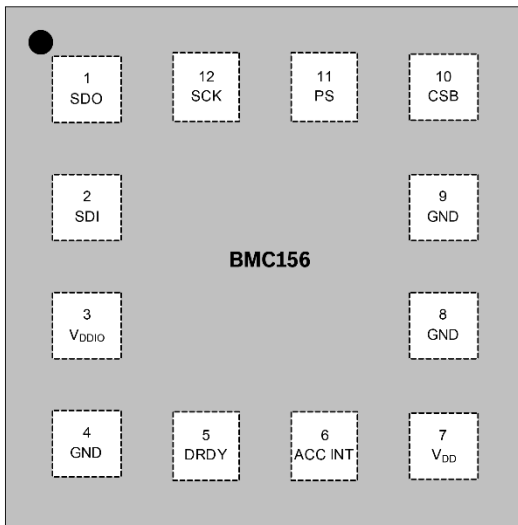
- ▶ Augmented reality applications and location-based services
- ▶ Indoor and outdoor navigation, e. g. map rotation or step counting
- ▶ Motion tracking
- ▶ Gesture recognition e. g. tap and double tap sensing, display profile switching
- ▶ Gaming
- ▶ Air mouse applications, pointing devices

### SENSOR FEATURES

The eCompass comprises a 3-axis geomagnetic sensor based on Bosch's proprietary FlipCore™ 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 the functions of a state-of-the-art standalone accelerometer and can be operated independently.

### TECHNICAL SPECIFICATIONS

BMC156 Technical data	
Digital interfaces	I <sup>2</sup> C, SPI (3/4 wire) interrupt pin
Current consumption	
– regular mode	540 µA @ 10 Hz
– low-power mode	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 mm <sup>3</sup>
<b>Geomagnetic sensor</b>	
Measurement range	± 1300 µT (x-,y-axis) ± 2500 µT (z-axis)
Resolution	0.3 µT
<b>Acceleration sensor</b>	
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 %
<b>Interrupt engine</b>	
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
<b>FIFO data buffer accelerometer</b>	32 sample depth for each axis



Pin configuration (top view)

## TECHNICAL SPECIFICATIONS

### Pin configuration

Pin No.	Name	Sensor	Description
1	SDO	Mag. + Acc.	SPI: Data out
2	SDI	Mag. + Acc.	SPI: Data in, I <sup>2</sup> C: Data
3	V <sub>DDIO</sub>	Mag. + Acc.	I/O voltage
4	GND	Mag.	Ground
5	DRDY	Mag.	Data ready
6	INT2	Acc.	Interrupt output #2
7	VDD	Mag. + Acc.	Supply voltage
8	GND	Mag.	Ground
9	GND	Mag. + Acc.	Ground
10	CSB	Mag. + Acc.	Chip Select
11	PS	Mag. + Acc.	Protocol select
12	SCK	Mag. + Acc.	Serial clock

Bosch Sensortec's BMC156 comes in a 2.2 x 2.2 x 0.95 mm<sup>3</sup> 12 pin LGA package. This is pin-compatible to current generation of Bosch Sensortec's 2 x 2 accelerometer. This simplifies feature up or feature down from/to BMA from/to BMC. BMC156 features I<sup>2</sup>C 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

### FEATURES OF BMC156

Backed by Bosch's huge technology and IP portfolio, Bosch Sensortec now introduces BMC156 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 combination with the high magnetic range of  $\pm 1300 \mu\text{T}$  (x-, y-axis) and  $\pm 2500 \mu\text{T}$  (z-axis) allow very flexible placement of the eCompass on the PCB.

The enhanced interrupt engine with respect to BMC156 features a set of hard-wired functions making it a more power efficient and easy to design-in product. The 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 BMC156, 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

#### Headquarters Bosch Sensortec GmbH

Gerhard-Kindler-Strasse 9  
72770 Reutlingen · Germany  
Telephone +49 7121 3535 900  
Fax +49 7121 3535 909

[www.bosch-sensortec.com](http://www.bosch-sensortec.com)