BMA180
Digital, triaxial acceleration sensor

Bosch Sensortec

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General description

The BMA180 is an ultra high performance digital triaxial acceleration sensor, aiming for low power consumer market applications.

The BMA180 allows high accurate measurement of accelerations in 3 perpendicular axes and thus senses tilt, motion, shock and vibration in cell phones, handhelds, computer peripherals, man-machine interfaces, virtual reality features and game controllers.

The BMA180 is highly configurable in order to give the designer full flexibility when integrating the sensor into his system. All features can be set by software via the digital interface. Here the user can choose between an I²C and an SPI (4-wire) interface mode.

BMA180 target applications

▶ Navigation (INS / Dead Reckoning)
▶ High accurate tilt detection
  (e.g. tilt compensated compass)
▶ Pointing and menu scrolling
▶ Display profile switching (portrait / landscape)
▶ Gaming
▶ Drop detection for warranty logging
▶ Shock detection
▶ Step-counting

Sensor operation

The BMA180 represents a new generation of digital acceleration sensors with a unique performance and feature set within 3 mm x 3 mm x 0.9 mm standard LGA package.

Technical data		BMA180
Sensitivity axes		x / y / z
Measurement range (switchable via SPI / I²C)		±1g, ±1.5g, ±2g, ±3g, ±4g, ±8g, ±16g
Sensitivity (calibrated)		1g: 8192LSB/g
		1.5g: 5460LSB/g
		2g: 4096LSB/g
		3g: 2730LSB/g
		4g: 2048LSB/g
		8g: 1024LSB/g
		16g: 512LSB/g
Resolution		14bit ⇨ 0.244mg (±2g range) (switchable 12 bit option)
Nonlinearity		±0.15% FS (±2g range)
Zero-g offset (ex-factory)		±15mg
Zero-g offset (after offset fine tuning)		±5mg
Zero-g offset temperature drift		±0.5mg/K
Noise density		150µg/√Hz
Bandwidth (switchable via SPI/I²C)	low pass	10Hz ... 1200Hz
	high pass	1Hz
	band pass	0.2 ... 300Hz
Digital input / output		SPI & I²C, interrupt pin
Supply voltages	V_{DD}	1.62 ... 3.6V
	V_{DDIO}	1.20 ... 3.6V
Current consumption		650µA
Temperature range		-40°C ... +85°C

Key features BMA180

▶ All parameters and features user programmable
▶ 7 user programmable g-ranges and 10 selectable bandwidth settings
▶ Low-power consumption
▶ Ultra-low-power self-wake-up mode
▶ User programmable interrupt engine
▶ 0g offset regulation and in-field offset re-calibration with ultra-high accuracy
▶ SPI (4-wire) / I²C interface
▶ RoHS compliant, halogen-free

One of the key elements of the BMA180 is the intelligent interrupt engine that gives the hard- and software designer full control. Various motion detection scenarios can be identified by the BMA180 and signaled to the system via a simple interrupt pin. By using the digital serial interface, the exact details of the motion event that triggered the interrupt can be read-out.

Following motion detection use case scenarios are supported by the interrupt engine:
▶ Any-motion (slope) detection
▶ Tap sensing
▶ Low-g / high-g detection
▶ Data-ready with sample skipping option
▶ Self-wake-up

The interrupts can be conveniently configured by the user and thus perfectly support the integration of the BMA180 into the user's system environment.

Another important feature of the BMA180 acceleration sensor is the power management module. This module allows for optimizing the sensor's power consumption in-line with the specific user requirements. Thus, it is not necessary to operate the sensor at full power for all application scenarios all the time. For some use cases the power consumption drastically shrinks to just a fraction of what would be required in full performance mode. Moreover this feature of the BMA180 allows for an intelligent system power management and thus significant reduction of the whole system's power consumption. In particular, this helps increasing battery life-time of any kind of mobile device.

BMA180 Pin configuration (top view)
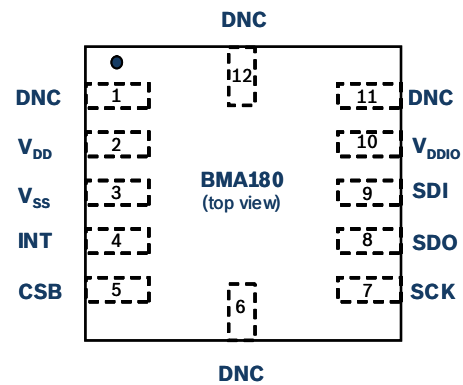
Pin No.	Name	Function
1	DNC	Do not connect
2	VDD	Analog supply voltage
3	VSS	Ground
4	INT	Interrupt output
5	CSB	SPI chip select
6	DNC	Do not connect
7	SCK	Serial clock
8	SDO	Serial data output
9	SDI	Serial data in/out
10	VDDIO	Digital interface power supply
11	DNC	Do not connect
12	DNC	Do not connect

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