

# BMA120

## Digital, triaxial acceleration sensor

Bosch Sensortec



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### General description

The BMA120 is a triaxial, low-g acceleration sensor with digital interfaces, aiming for low-power consumer market applications.

The BMA120 allows measurement of accelerations in 3 perpendicular axes. An evaluation circuitry converts the output of a three-channel micromechanical acceleration sensing structure that works according to the differential capacitance principle.

The BMA120 senses tilt, motion, shock and vibration in cell phones, handhelds, computer peripherals, man-machine interfaces, virtual reality features and game controllers.

### BMA120 target applications

- ▶ Display profile switching (e.g. portrait/landscape)
- ▶ Tap/Double-tap function
- ▶ Menu scrolling
- ▶ Gaming
- ▶ Advanced power management for mobile devices
- ▶ Drop protection for warranty logging
- ▶ Shock detection
- ▶ Pedometer/step counting

### Sensor operation

The BMA120 represents a new generation of digital acceleration sensors. The BMA120 integrates a multitude of features that facilitates its use especially in the area of motion detection applications, such as device orientation detection, gaming, HMI and menu browser control.

#### Key features BMA120

- ▶ User programmable g-range and bandwidth
- ▶ Low-power consumption
- ▶ SPI (3-wire/4-wire) and I<sup>2</sup>C interface
- ▶ User programmable interrupt engine
- ▶ Ultra-low-power self-wake-up mode
- ▶ Very small package
- ▶ RoHS compliant, halogen-free

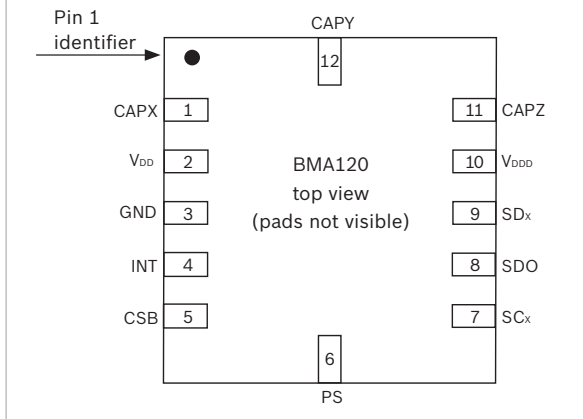
The BMA 120 is highly configurable in order to give the designer full flexibility when integrating the sensor into his system. All features can be set by software via the digital interface.

As already introduced with the successful BMA150 and SMB380 acceleration sensors, also for the BMA120 g-ranges and bandwidths can be user programmed via the serial digital interface. Here the user can choose between an I<sup>2</sup>C and an SPI (3-wire/4-wire) interface modes.

One of the key elements of the BMA120 is the intelligent interrupt engine that gives the hard- and software designer full control. Various motion detection scenarios can be identified by the BMA120 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 from the BMA120.

Technical data	BMA120
Sensitivity axes	x/y/z
Measurement range	±2g, ±4g, ±8g, ±16g (switchable via SPI/I <sup>2</sup> C)
Sensitivity (calibrated)	2g: 16LSB/g 4g: 8LSB/g 8g: 4LSB/g 16g: 2LSB/g
Resolution	6bit ⇒ 62.5mg (±2g range)
Nonlinearity	±2% FS
Zero-g offset	±100mg (typ.)
Bandwidth	50Hz, 75Hz, 150Hz, 250Hz, 600Hz, 1kHz (switchable via SPI/I <sup>2</sup> C)
Digital input/output	SPI & I <sup>2</sup> C, interrupt pin
Supply voltage (V <sub>DD</sub> / V <sub>DDIO</sub> )	1.8V (±10%)
Temperature range	-20°C ... +70°C
LGA package	3 mm x 3 mm x 0.9mm

## Pin configuration (top view)



Pin No.	Name	Function
1	CAPX	Do not connect! (recommended)
2	V <sub>DD</sub>	Power supply analog
3	GND	Shared ground
4	INT	Interrupt output
5	CSB	SPI chip-select
6	PS	Protocol select pin
7	SCL SCK	I <sup>2</sup> C(SCL)/SPC(SCK) serial clock
8	SDO	SPI serial data output
9	SDA, SDI, SDO	I <sup>2</sup> C/SPI serial data in/out
10	V <sub>DDD</sub>	Power supply digital
11	CAPZ	Do not connect! (recommended)
12	CAPY	Do not connect! (recommended)

Following motion detection scenarios are supported by the interrupt engine:

- ▶ Any-motion (slope) detection
- ▶ Tap sensing
- ▶ Orientation change recognition
- ▶ Low-g / high-g detection
- ▶ Data-ready
- ▶ Self-wake-up

The interrupts can be configured by the user and thus perfectly support the integration of the BMA120 into the user's system environment.

Another important feature of the BMA120 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 uses cases the power consumption drastically shrinks to just a fraction of what would be required in full performance mode.

The power modes the BMA120 supports are:

Mode	Wake-up time	Current consumption @ 1.8V V <sub>DD</sub>
Power-off	only 1 ms	0 μA
Suspend	≤ 400 μs	1 μA (typ.)
Low-power (sleep)	≤ 400 μs	2 μA (typ.)
Full performance	–	430 μA

The BMA120 also features self-test capability, allowing for testing of the complete signal evaluation path including the micromachined sensor structure and the evaluation ASIC.

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