BMX055
Digital 9-axis sensor

Bosch Sensortec

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General description

The absolute orientation sensor BMX055 is a very small, 9-axis sensor, consisting of a triaxial 12bit acceleration sensor, a triaxial 16bit, ±2000°/s gyroscope and a triaxial geomagnetic sensor. The BMX055 allows accurate measurement of angular rate, acceleration and geomagnetic fields in 3 perpendicular axes within one device.

BMX055 target applications

- Navigation (in-door), dead-reckoning
- Augmented reality
- Human-machine interface and remote controls

Sensor features

With its ultra-small footprint of only 3 mm x 4.5 mm the BMX055 is unique in the class of low-noise 9-axis measurement units. On top, the BMX055 integrates a multitude of features that facilitate its use especially in the area of motion detection applications, such as device orientation measurement, gaming, HMI and menu browser control.

All three sensor components of the BMX055 can be operated and addressed independently from each other. All sensor parameters, like measurement ranges or low-pass filter settings and all settings of the respective interrupt engines can be easily programmed via the digital interfaces, i.e. I²C and SPI (3-wire/4-wire).

System compatibility

The BMX055 has been designed for best possible fit into modern mobile consumer electronics devices. Besides the ultra-small footprint and very low power consumption, the BMX055 has very wide ranges for V_{DD} and V_{DDIO} supply voltages.

The BMX055 also includes a FIFO buffer with 32 samples depth for each axis for the accelerometer and a FIFO buffer with 100 samples depth for each axis of the gyroscope. An integrated self-test feature facilitates overall system reliability.

BMX055	Technical details (prelim.)
Resolution	(A): 0.98 mg (G): 0.004 °/s (M): 0.3 µT
Measurement ranges (programmable)	(A): ±2g, ±4g, ±8g, ±16 g
	(G): ±125°/s, ±250°/s, ±500°/s, ±1000°/s, ±2000°/s
	(M): ±1300µT (x,y), ±2500µT (z)
Sensitivity w(calibrated)	(A): ±2g: 1024LSB/g ±4g: 512LSB/g ±8g: 256LSB/g ±16g: 128LSB/g
	(G): ±125°/s: 262.4 LSB/°/s ±250°/s: 131.2 LSB/°/s ±500°/s: 65.6 LSB/°/s ±1000°/s: 32.8 LSB/°/s ±2000°/s: 16.4 LSB/°/s
	(M): 1µT/µT
Zero-point offset	(A): ± 70mg (G): ± 1 °/s (M): ± 40 µT
Noise density (typ.)	(A): 150 µg/√Hz (G): 0.014 °/s/√Hz (M): 0.6µT
Supply voltage (V_{DD})	2.4 ... 3.6 V
I/0 supply voltage (V_{DDIO})	1.2 ... 3.6 V
Temperature range	-40 ... +85°C
Current consumption	
▶ Gyro @ full operation	5 mA
▶ Acc. @full operation	130 µA
▶ Acc. @ wake-up mode	< 10 µA
▶ Magnet sensor @ 10Hz ODR	0.54 mA
Package dimensions	3 x 4.5 x 0.95mm³ (LGA
Shock resistance	10,000 g x 200 µs

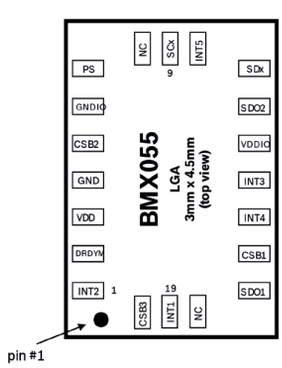
The BMX055 is fully supported by Bosch Sensortec's sensor fusion software FusionLib, which leverages the company's deep know-how of its proprietary MEMS sensor technologies. Together with the FusionLib software the sensor output can be combined to compensate each other and provide robust virtual sensor outputs such as quaternion, linear acceleration, rotation, gravity etc. Thus, developers can quickly and with little effort create advanced solutions with comprehensive 9-axis functionality.

The BMX055 comes in a standard 20 pin LGA package with MSL 1 classification. It is RoHS compliant and halogen-free.

BMX055 / BMI055 family concept

The dimensions of the BMX055's 3mm x 4.5mm LGA package are identical to those of Bosch Sensortec's BMI055 Inertial Measurement Unit. Whereas the BMI055 has only 16 pins the BMX055 features 20 pins, four pins more in order to cover the additional functionality that comes with the geomagnetic sensor. The common pins are located at the same positions on the package. With that in mind designers can start working with the BMI055 and later easily migrate to the BMX055.

Pin configuration (top view, pads not visible)



Pin	Name	Description
1	INT2	Interrupt output (A)
2	DRDYM	Data ready (M)
3	V_{DD}	Supply voltage
4	GND	Ground
5	CSB2	Chip select (G)
6	GND_{IO}	I/O ground
7	PS	Protocol select
8	NC	Not connected
9	SCx	SCK: SPI clock SCL: I^2C clock
10	INT5	Interrupt output (M)
11	SDx	Serial data input/ ouput
12	SDO2	SPI: Data out (G)
13	V_{DDIO}	I/O voltage
14	INT3	Interrupt input/ output (G)
15	INT4	Interrupt input/ ouput (G)
16	CSB1	Chip select (A)
17	SDO1	SPI: Data out (A), (M)
18	NC	Not connected
19	INT1	Interrupt output (A)
20	CSB3	Chip select (M)

(A) = Accelerometer
(G) = Gyroscope
(M) = Geomagnetic Sensor

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