BOSCH

BMA422
Intelligent, triaxial acceleration sensor

GENERAL DESCRIPTION

The BMA422 is an ultra-small, triaxial, low-g acceleration sensor with digital interfaces, aiming for low-power consumer electronics applications. Featuring 12 bit digital resolution and embedded intelligence, the BMA422 allows low-noise measurement of accelerations in 3 perpendicular axes and thus senses significant motion, tilt and enables plug 'n' play step counting in smart phones Furthermore the device is optimized to fulfill Android low power accelerometer requirements.

BMA422 TARGET APPLICATIONS

▶ Step-counting

▶ Significant motion

▶ Tilt detection

▶ Low power user interaction

▶ Gesture recognition

▶ Advanced power management for mobile devices

▶ Shock and free-fall detection

▶ Tilt compensation for electronic compass

SENSOR FEATURES

With its embedded intelligence BMA422 is unique in the class of consumer grade accelerometers for smart phones, wearable devices and toys and gadgets. The embedded intelligence enables low current step-counting at 25 µA. On top, the BMA422 integrates a multitude of other features (e.g. tilt, significant motion etc.) that facilitate its use especially in the area of Android based smart phones, to fulfill the newest Android M accelerometer requirements. Featuring a high performance measurement mode with low pass filters and a current consumption of only 150 µA the BMA422 is robust to vibrations and aliasing. In low-power mode operation the current consumption can be even further reduced by more than one order of magnitude. This fulfills the current consumption requirements for always-on applications. The BMA422 is highly configurable in order to give the designer full flexibility when integrating the sensor into the system.
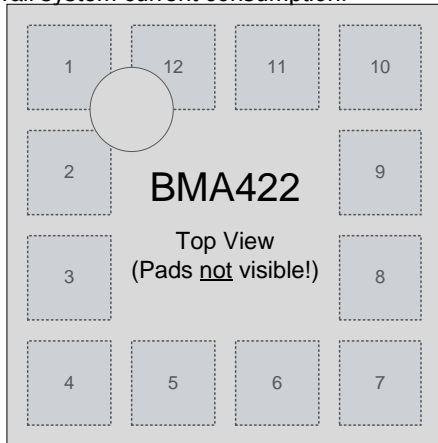
TECHNICAL SPECIFICATIONS

BMA422 Technical data	
Digital resolution	12 bit
Resolution (in ±2g range)	0.98 mg
Measurement ranges (programmable)	±2 g; ±4 g; ±8 g; ±16 g
Sensitivity (calibrated)	±2 g: 1024 LSB/g ±4 g: 512LSB/g ±8 g: 256 LSB/g ±16 g: 128 LSB/g
Zero-g offset (typ., over life-time)	±80 mg
Noise density (typ.)	220 µg/√Hz
Output data rate (programmable)	1600 Hz ... 8 Hz
Digital inputs/outputs	SPI & I^2C, 2x digital interrupt pins
Supply voltage (V_{DD})	1.62 ... 3.6 V
I/0 supply voltage (V_{DDIO})	1.2 ... 3.6 V
Temperature range	-40 ... +85 °C
Current consumption – full operation – low-power mode	 150 µA 13 µA (@ 50 Hz data rate)
FIFO data buffer	1 kB
LGA package	2 x 2 x 0.95 mm^3
Shock resistance	10,000 g x 200 µs

SENSOR OPERATION

The BMA422 supports two modes of operation:

1) Standard data polling mode: Acceleration data is directly read-out via the sensor's digital interface and computed by a system μController, application processor or a baseband processor. An integrated FIFO with 1 kB of size can be used optionally to reduce overall system current consumption.

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Pin configuration (top view)

TECHNICAL SPECIFICATIONS

Pin		
Pin	Name	Description
1	SDO	SPI – Serial Data Out; I^2C - address select
2	SDx	Serial data I/O
3	V_{DDIO}	Power supply
4	ASDA	Serial data I/O – Secondary Interface
5	INT1	Interrupt pin
6	INT2	Interrupt pin
7	V_{DD}	Voltage supply
8	GND_{IO}	Ground
9	GND	Ground
10	CSB	SPI – Chip select
11	ASCL	Digital clock (in) – Secondary Interface
12	SCx	Digital clock (in)

2) Plug 'n' play intelligence operation: Acceleration data is computed already within the BMA422.

The embedded intelligence of the sensor can trigger an interrupt at certain selectable events which can be mapped to the selectable interrupt pins. In addition to the electrical interrupt, the status of the events and the counted steps are stored in the register map and can be read out easily.

Embedded Intelligence:

▶ Step detector / Step counting

▶ Significant motion

▶ Tilt detection

▶ Wake-up, Glance, Pick-up

Feature parameters can be configured by the designer and thus perfectly support the adoption to the required use case and system design.

SYSTEM COMPATIBILITY

The BMA422 has been designed for best possible fit into modern mobile consumer electronics devices. Beside the ultra-small footprint and lowest power consumption, the BMA422 has very wide ranges for VDD and VDDIO supply voltages. The BMA422 features I^2C and SPI (3-wire/4-wire) digital, serial interfaces. The availability of a separate I²C interface enables the connection of an external magnetometer (BMM150 recommended) and the synchronization of the acceleration and the magnetometer data in the FIFO of the BMA422. This reduces the complexity of sensor data fusion and improves its precision as well. BMA422 is designed for plug 'n' play functionality and ease-of-use in various system designs.

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