Triaxial acceleration sensor
SMB380

Bosch Sensortec

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General description

The SMB380 is a triaxial low-g acceleration sensor with digital output for consumer market applications. It allows measurements of accelerations in 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 base of the micromachining technology has proven its capability in more than 100 million Bosch accelerometers and gyroscopes so far. The modular ASIC design provides a flexibility to react quickly to customer needs for additional sensor functionality in the future.

The SMB380 package and interface have been defined to match a multitude of hardware requirements. The sensor comes with ultra-low-power capabilities, a small footprint (3 mm x 3 mm) and a flat package (0.9 mm height). Thus, it is attractive for mobile applications. Furthermore, the sensor has a flexible on-chip logic which can be programmed to evaluate motion profiles autonomously.

The SMB380 senses tilt, motion and shock vibration in cell phones, handhelds, computer peripherals, man-machine interfaces, virtual reality features and game controllers.

Applications based on acceleration sensing

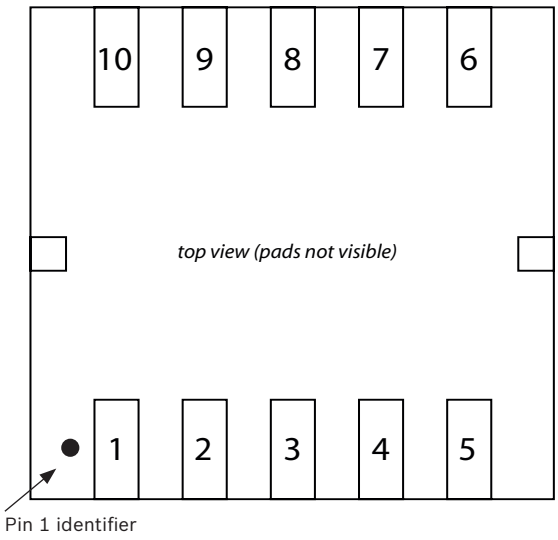
- Advanced system power management for mobile applications
- HDD protection
- Drop protection for warranty logging
- Menu scrolling, tap-tap function
- Pedometer
- Display profile switching
- Shock detection
- Gaming

Key features SMB380
Switchable g-range and bandwidth
Low-power ASIC
SPI (3-wire / 4-wire) / I²C interface
Programmable interrupt feature for mobile wake-up or free-fall detection
Ultra-low-power self-wake-up mode
Full selftest capability
Absolute temperature output
QFN package (footprint 3 mm x 3 mm, height 0.9 mm)
RoHS compliance

Technical data

Triaxial acceleration sensor – SMB380	
Sensitivity axes	x / y / z
Measurement range	±2 g, ±4 g, ±8 g (switchable via SPI / I²C)
Sensitivity (calibrated)	2 g: 256 LSB / g; 4 g: 128 LSB/g; 8 g: 64 LSB/g
Resolution	10 bit => 4 mg (±2 g)
Nonlinearity	±0.5 % FS
Axis Mixing	1 %
0g-Offset (calibrated)	±40 mg
Offset temperature drift	2 mg / K
Noise	0.5 mg / √Hz
Bandwidth	25 Hz – 1500 Hz (switchable via SPI / I²C)
Digital input/ output	SPI / I²C, Interrupt pin
Supply voltage V_{DD} / V_{DDIO}	2.4 – 3.6 V / 1.8 – 3.6 V
Current consumption	200 µA
Idle current	1 µA
Wake-up time	1 ms
Temperature range	-40°C ... -85°C

Triaxial acceleration sensor – SMB380:
Pin configuration I²C Interface



Pin No.	Name	Function
1	DNC	Do not connect
2	V_{DD}	Power supply
3	GND	Ground
4	INT	Interrupt
5	V_{DDIO}	Connect to digital interface power supply
6	SCK	Clock
7	GND	Ground
8	SDA	Serial data in/out
9	V_{DDIO}	Digital interface power supply
10	DNC	Do not connect

Note: Pin configuration for SPI uses pin5 = CSB (chip select)
pin7 = SDO, pin8 = SDI

Sensor operation

The function and performance of SMB380 can be tailored to customer specific applications by means of parameter and control settings.

The SMB380 provides a digital 10 bit output signal in SPI / I²C format. Via serial interface command the full measurement range can be chosen to ±2 g, ±4 g or ±8 g. A second-order filter with a pole-frequency of 1500 Hz is included to provide preconditioning of the measured acceleration signal. The maximum data conversion rate is 3 KHz.

Additional digital filtering is possible to improve S / N ratio (down to 25 Hz bandwidth). Typical noise level and quantization lead to a resolution of 4 mg or an accuracy of 0.3° in an inclination sensing application, respectively. The current consumption is typically 200 µA.
In addition there are several features implemented to support the host system in reducing power consumption.

Parallel to normal operation, where acceleration values are provided to the output registers, the SMB380 is capable to perform internal computations of the results. The customer is enabled to define specific criteria, e.g. high-g or low-g thresholds but also criteria for the recognition of smooth motion profiles. The sensor can inform the host system about the fulfillment of one of these criteria via an interrupt pin. This feature can be used for many purposes, e.g. to wake-up the host system from a global sleep mode, to signalise a shock situation or to indicate free fall.

The sensor also features full self-test capability. It is activated via serial interface command which results in a physical deflection of the seismic mass in the sensing element due to an electrostatic force. Thus, it provides full testing of the complete signal evaluation path including the micromachined sensor structure and the evaluation ASIC.

The sensor is available in a standard SMD QFN package with a footprint of 3 mm x 3 mm and a height of 0.9 mm.

Bosch is the world market leader for acceleration sensors in automotive applications. The SMB380 offers this high experience and reliability for consumer applications. Bosch Sensortec is a 100% subsidiary of Bosch. It focuses on application and marketing of micromechanical components for the non-automotive markets.

Please contact us for further details. We are happy to provide you more information.

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