BOSCH

BMP388
Digital, barometric pressure sensor

GENERAL DESCRIPTION

Bosch Sensortec is the market leader in barometric pressure sensors with more than 1 billion shipped products. The BMP388 is a very small, low-power and low-noise 24 bit absolute barometric pressure sensor.

BMP388 enables accurate altitude tracking and is specifically suited for drone applications. The best-in-class TCO of the BMP388 between 0-65°C for accurate altitude measurement over a wide temperature range greatly enhances the drone flying experience by making accurate steering easier. It is compatible for use with other Bosch sensors, including the new BMI088 for better performance, robustness and stability. The new BMP388 sensor offers outstanding design flexibility, providing a single package solution that is easy to integrate into other existing and upcoming devices such as smart homes, industrial products and wearables.

The sensor is more accurate than its predecessors, covering a wide measurement range from 300 hPa to 1250 hPa.
This new barometric pressure sensor exhibits an attractive price-performance ratio coupled with low power consumption.
It is available in a compact 10-pin 2.0 x 2.0 x 0.75 mm³ LGA package with metal lid.

BMP388 TARGET APPLICATIONS

▶ Altitude stabilization in drones

▶ Improve calorie expenditure measurement accuracy in wearables for sports and health management

▶ Unprecedented precision to outdoor/indoor navigation and localization applications, e.g. in Smart Homes

▶ Enhancing GPS accuracy outdoors

SENSOR FEATURES

Due to the built-in hardware synchronization of the pressure sensor data and its ability to synchronize data from external devices such as acceleration sensors, the BMP388 is ideally suited for fitness and navigation applications which require highly accurate, low power and low latency sensor data fusion. The new interrupt functionality provides simple access to data and storage. Examples of interrupts that can be used in a power efficient manner without using software algorithms include: Data
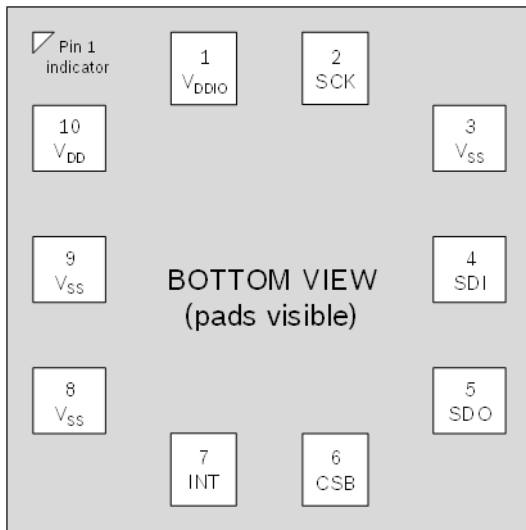
ready interrupt, watermark interrupt (on byte level) or FIFO full interrupt.

BMP388 also includes a new FIFO functionality. This greatly improves ease of use while helping to reduce power consumption of the overall device system during full operation. The integrated 512-byte FIFO buffer supports low power applications and prevents data loss in non-real-time systems.

TECHNICAL SPECIFICATIONS

BMP388 Technical data	
Package dimensions	10-pin LGA with metal lid 2.0 x 2.0 x 0.75 mm³
Operating range (full accuracy)	Pressure: 300 ... 1250 hPa
Supply voltage V_{DDIO} Supply voltage V_{DD}	1.2 V ... 3.6 V 1.65 V ... 3.6 V
Interface	I²C and SPI
Average typical current consumption (1 Hz data rate)	2.7 µA @ 1 Hz
Absolute accuracy P=900 ...1100 hPa (T=25 ... 40 °C)	±0.40 hPa
Relative accuracy Pressure (typ.) p=900...1100 hPa (T=25 ... 40 °C)	±0.08 hPa
Noise in pressure lowest bandwidth, highest resolution	0.03 Pa
Temperature coefficient offset (-20 ... 65 °C @ 700 hPa to 1100 hPa)	±0.75 Pa/K
Long-term stability (12 months)	±0.33 hPa
Solder drift	<±1.0 hPa
Maximum sampling rate	200 Hz

Pin configuration

Pin			
Pin	Name		Description
1	V_{DDIO}		Digital interface supply
2	SCK		Serial clock input
3	VSS		Ground
4	SDI		Serial data input
5	SDO		Serial data output
6	CSB		Chip select
7	INT		INT output
8	VSS		Ground
9	VSS		Ground
10	V_{DD}		Analog supply

The sensor module is housed in an extremely compact 10-pin metal-lid LGA package with a footprint of only 2.0 x 2.0 and 0.75 package height. Its small dimensions and its lower power consumption of 2.74 μA @ 1 Hz allow the implementation in battery driven devices. The growing applications of indoor navigation/localization as well as altitude stabilization in drones require a high relative accuracy and a low TCO at the same time.

The sensor features excellent relative accuracy of ±0.08 hPa which is equivalent to ±66 cm difference in altitude, and an offset temperature coefficient (TCO) of only 0.75 Pa/K for a wide temperature range between -20 and 65°C at 700 to 1100 hPa. Thanks to these features, the BMP388 is perfectly suited for applications like drones as well as improved calorie expenditure measurement accuracy in wearables.

SENSOR OPERATION

The BMP388 features I²C and SPI (3-wire/4-wire) digital, serial interface.

The sensor operates in three power modes: The sleep mode, the normal mode and the forced mode. In sleep mode, no measurements are performed. Normal mode comprises an automated perpetual cycling between an active measurement period and an inactive standby period. In forced mode, a single measurement is performed. When the measurement is finished, the sensor returns to sleep mode.

A set of oversampling settings is available ranging from ultra-low power to highest resolution setting in order to adapt the sensor to the target application. The settings are predefined combinations of pressure measurement oversampling and temperature measurement oversampling. Pressure and temperature measurement oversampling can be selected independently from 0 to 32 times oversampling:

▶ Temperature measurement
▶ Ultra-low power
▶ Low power
▶ Standard resolution
▶ High resolution
▶ Ultra-high resolution
▶ Highest resolution

BMP388 is equipped with a built-in IIR filter in order to minimize short-term disturbances in the output data caused by for example the slamming of a door or window. The filter coefficient ranges from 0 (off) to 128.

SYSTEM COMPATIBILITY

The BMP388 has been designed for best possible fit into modern mobile consumer electronics devices. Besides the ultra-small footprint and very low power consumption, the BMP388 has very wide ranges for V_{DD} and V_{DDIO} supply voltages.