

BMP380

Digital, barometric pressure sensor

GENERAL DESCRIPTION

Bosch Sensortec is the market leader in barometric pressure sensors with more than 1 billion shipped products. The BMP380 is a very small, low-power and low-noise 24 bit absolute barometric pressure sensor. BMP380 is specifically designed and ideally suited for a wide range of altitude tracking applications. The new BMP380 offers outstanding design flexibility, providing a single package solution that can be easily integrated into a multitude of existing and upcoming devices such as smartphones, GPS modules, wearables and drones.

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.

BMP380 TARGET APPLICATIONS

- ▶ Altitude stabilization in drones
- ▶ Improved calorie expenditure measurement accuracy in wearables and mobile devices
- ▶ Unprecedented precision for outdoor/indoor navigation and localization applications
- ▶ Enhanced GPS accuracy outdoors

SENSOR FEATURES

Typical applications for the BMP380 include altitude stabilization in drones, where altitude information is utilized to improve flight stability and landing accuracy. This simplifies drone steering, thereby making drones attractive for a broader range of users. 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 BMP380 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 issued in a power efficient manner without using software algorithms include: data ready interrupt, watermark interrupt (on byte level) or FIFO full interrupt.

BMP380 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

BMP380 TECHNICAL DATA

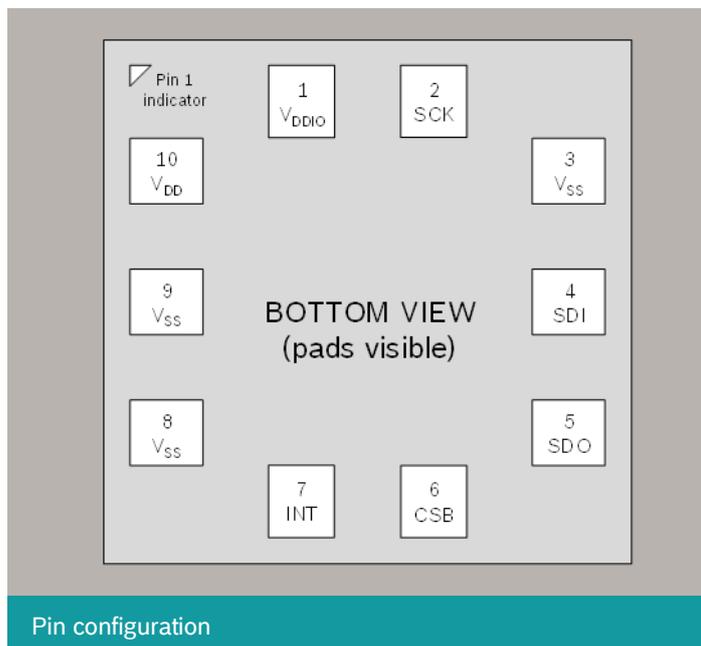
| | |
|---------------------------------------------------------------------------|---------------------------------------------------------------|
| Package dimensions | 10-pin LGA with metal lid 2.0 x 2.0 x 0.75 mm ³ |
| Operating range (full accuracy) | Pressure: 300...1250 hPa (0 - 65°C) |
| Supply voltage _{VDDIO} | 1.2 V ... 3.6 V |
| Supply voltage _{VDD} | 1.65 V ... 3.6 V |
| Interface | I ² C and SPI |
| Average typical current consumption (1 Hz data rate) | 2.0 μA @ 1 Hz |
| Absolute accuracy pressure (typ.) P=300 ...1100 hPa (T=0 ... 65 °C) | ±0.50 hPa |
| Relative accuracy pressure (typ.) p=900...1100 hPa (T=25...40°C) | ±0.06 hPa (equivalent to ±50 cm) |
| Noise in pressure Full bandwidth, highest resolution | 1.0 Pa |
| Temperature coefficient offset (25°...40°C @ 900 hPa) | 1.0 Pa/K (equivalent to ± 8.4 cm/K) |
| Long-term stability (12 months) | ±0.33 hPa |
| Solder drift | < ±0.5 hPa |
| Maximum sampling rate | 200 Hz |

TECHNICAL SPECIFICATIONS

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 mm² and 0.75 mm package height. Its small dimensions and its lower power consumption of 2.0 μ A @ 1Hz allow the implementation in battery driven devices.

The emerging applications of indoor navigation/localization and altitude stabilization in drones require a high relative accuracy and a low TCO at the same time. The BMP380 is perfectly suited for applications like floor level detection as well as improved calorie expenditure measurement accuracy in wearables and mobile devices since the sensor features excellent relative accuracy of ± 0.06 hPa which is equivalent to ± 50 cm difference in altitude, and an offset temperature coefficient (TCO) of only 1.0 Pa/K (equivalent to 8.4 Pa/K).

The BMP380 is the successor of the widely implemented BMP280 and achieves high performance in all applications requiring a precise barometric pressure measurement. Moreover, BMP380 features more application flexibility, new filter modes besides the shrinkage by 1/3 with respect to BMP280.



| Pin | Name | Description |
|-----|-------|--------------------------|
| 1 | VDDIO | 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 | VDD | Analog supply |

SENSOR OPERATION

The BMP380 features I²C and SPI (3-wire/4-wire) digital, serial interface. The sensor can be operated in three power modes to address the preferred application and optimize the power consumption: 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

BMP380 is equipped with a built-in IIR filter in order to minimize short-term disturbances in the output data caused by the slamming of a door or window. The filter coefficient ranges from 0 (off) to 128.

SYSTEM COMPATIBILITY

The BMP380 is designed for best possible fit into modern mobile consumer electronics devices. Besides the ultra-small footprint and very low power consumption, the BMP380 has very wide ranges for V_{DD} and V_{DDIO} supply voltages.

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