BMP384

Robust barometric pressure sensor

GENERAL DESCRIPTION

Bosch Sensortec is the market leader in barometric pressure sensors with more than 1 billion shipped products. The BMP384 is a very small, low-power and low-noise 24-bit absolute barometric pressure sensor.

BMP384 has a gel-filled cavity that allows higher robustness against water, liquids and other chemicals if the applicable integration concept is used. The BMP384 is perfectly suitable for applications of water-level detection as well as differential barometric pressure measurement with ±9 Pa. This is equivalent to ±75 cm difference in altitude, and an offset temperature coefficient (TCO) of 1.0 Pa/K.
It is compatible for use with other Bosch Sensortec sensors, including the BMI088 for better performance, robustness and stability. The new BMP384 sensor with its small footprint offers outstanding design flexibility, providing a single package solution that is easy to integrate into other existing and upcoming devices for smart homes, industrial products and wearables.

The sensor is very accurate, 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 1.0 mm³ LGA package with metal lid.

BMP384 TARGET APPLICATIONS

- Water-level measurement in home appliances like washing machines
- Clog detection in white goods like dryers
- Measurement of relative pressure changes in humidifiers or smart inhaler
- Fitness applications in wearables with water resistant and robustness needs

SENSOR FEATURES

Due to its water and chemical resistance, the BMP384 is perfectly suitable for industrial applications or smart home appliances like air flow monitoring. Air flow monitoring is useful in different applications such as air conditioning or ventilation systems. This robustness is applicable for wearables as well.

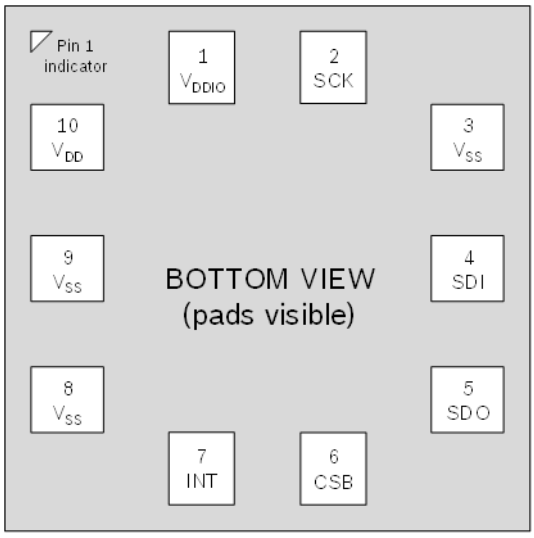
The new interrupt functionality provides simple access to data and storage. Examples of interrupts that can be used in a power efficient manner without using software algorithms include: data ready interrupt, watermark interrupt (on byte level) or First In – First Out (FIFO) full interrupt.

BMP384 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

BMP384 Technical data	
Package dimensions	2.0 x 2.0 x 1.0 mm³ metal lid LGA
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 (up to 3.4 MHz) and SPI (3 and 4 wire, up to 10 MHz)
Average typical current consumption (1 Hz data rate)	3.4 µA @ 1 Hz pressure and temperature, 2.0 µA in sleep mode
Absolute accuracy P=300 ...1100 hPa (T=0 ... 65 °C)	± 50 Pa
Relative accuracy Pressure (typ.) p=900...1100 hPa (T=25 ... 40 °C)	± 9 Pa, equiv. to ± 0.75 m
Noise in pressure lowest bandwidth, highest resolution	0.03 Pa
Temperature coefficient offset (25 ... 40 °C @ 900 hPa)	± 1 Pa/K
Long-term stability (12 months)	± 0.70 hPa
Solder drift	1.75 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 x 1.0 mm³ package height. Its small dimensions and its lower power consumption of 3.4 µA at 1 Hz allow the implementation in battery driven devices. The emerging applications in wearables, industrial areas and home appliances require a high relative accuracy and a low Total Cost of Ownership (TCO) at the same time.

The sensor features excellent relative accuracy and a wide temperature range between 25 and 40°C at 900 hPa. Thanks to these features, the BMP384 is perfectly suited for improved calorie consumption measurement accuracy in wearables as well.

SENSOR OPERATION

BMP384 features an I²C and SPI (3-wire/4-wire) digital, serial interface.

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

BMP384 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 127.

SYSTEM COMPATIBILITY

The BMP384 has been designed for the best possible fit into modern mobile consumer electronics devices. Besides the ultra-small footprint and very low power consumption, the BMP384 has very wide ranges for V_{DD} and V_{DDIO} supply voltages.

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Doc.-Number: BST-BMP384-FL000-00 / Version_1.0_102020