

BMP390L

High-performance longevity pressure sensor

GENERAL DESCRIPTION

BMP390L is a high-performance longevity digital barometric pressure sensor with extended availability up to 10 years¹. BMP390L is specifically designed for industrial markets including robots, home appliances and logistics, among others, that need long lifecycles.

**BMP390L is part of Bosch Sensortec's
longevity program**



BMP390L TARGET APPLICATIONS

- ▶ Industrial IoT (IIoT), e.g. localization and navigation
- ▶ Logistics, e.g. asset tracking
- ▶ White goods & home appliances, e.g. air flow detection
- ▶ Precision agriculture, e.g. water-level detection
- ▶ Robots (vacuum cleaners), e.g. clogging detection
- ▶ Drones, e.g. flight stabilization

SENSOR FEATURES

The sensor is more accurate than its predecessors, covering a wide measurement range from 300 hPa to 1250 hPa. This 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. The BMP390L is ideally suited for industrial applications which require very high performance and low power.

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.

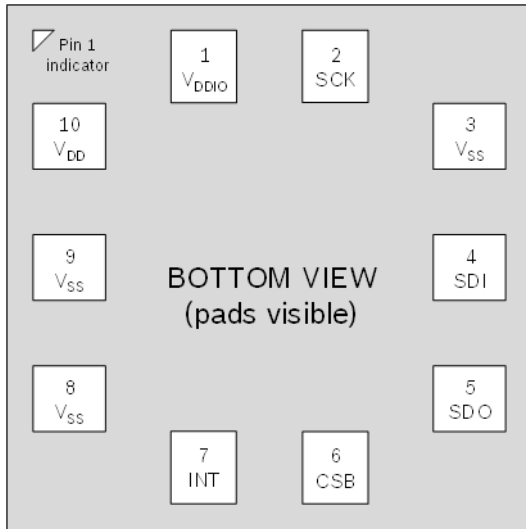
BMP390L also includes a FIFO functionality. This greatly improves ease of use while helping to reduce power consumption of the overall device system during full operation. The integrated 512 byte FIFO buffer supports low-power applications and prevents data loss in non-real-time systems.

TECHNICAL SPECIFICATIONS

BMP390L 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
Supply voltage V _{DDIO}	1.2 V ... 3.6 V
Supply voltage V _{DD}	1.65 V ... 3.6 V
Interface	I ² C and SPI
Average typical current consumption (1 Hz data rate)	3.2 μA at 1 Hz
Absolute accuracy P=300 ...1100 hPa (T=0 ... 65 °C)	±0.50 hPa
Relative accuracy Pressure (typ.) p=700...1100 hPa (T=25 ... 40 °C)	±0.03 hPa (equivalent to ±25 cm)
RMS Noise in pressure lowest bandwidth, highest resolution	0.02 Pa
Temperature coefficient offset (25 ... 40 °C @ 900 Pa)	± 0.6 Pa/K
Long-term stability (12 months)	±0.16 hPa
Solder drift	<±0.8 hPa
Maximum sampling rate	200 Hz

¹ Starting from product introduction; see disclaimer



Pin configuration

TECHNICAL SPECIFICATIONS

Pin	Name	Description
1	V _{DDIO}	Digital interface supply
2	SCK	Serial clock input
3	V _{SS}	Ground
4	SDI	Serial data input
5	SDO	Serial data output
6	CSB	Chip select
7	INT	INT output
8	V _{SS}	Ground
9	V _{SS}	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 3.2 μ A at 1 Hz allow the implementation in battery driven devices. The emerging industrial markets of robots (vacuum cleaners), drones, logistics, white goods and home appliances require an excellent relative and absolute accuracy and a low TCO at the same time, which is available for BMP390L.

The BMP390L is perfectly suitable for applications like water-level detection as well as indoor/outdoor localization in numerous devices since the sensor features excellent relative accuracy of ± 0.03 hPa which is equivalent to ± 25 cm difference in altitude. The sensor also offers a temperature coefficient offset

(TCO) of only 0.6 Pa/K. It is the successor of the widely implemented BMP388 and achieves much higher performance in all applications requiring a precise pressure measurement.

SENSOR OPERATION

The BMP390L features I²C and SPI (3-wire/4-wire) digital, serial interface. The sensor can be operated 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

BMP390L 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 BMP390L has been designed for best possible fit into consumer electronics and industrial devices. Besides the ultra-small footprint and very low power consumption, the BMP390L has very wide ranges for V_{DD} and V_{DDIO} supply voltages.

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