

# BMI090L

## High-performance longevity Inertial Measurement Unit

### GENERAL DESCRIPTION

BMI090L is a high-performance longevity Inertial Measurement Unit (IMU) with extended availability up to 10 years<sup>1</sup>. BMI090L is specifically designed to cater the long lifecycles of industrial applications, such as robots and white goods.

BMI090L is part of Bosch Sensortec's  
longevity program



### BMI090L TARGET APPLICATIONS

- ▶ White goods and appliances (washing machines, power tools)
- ▶ Robots (vacuum cleaners) and drones
- ▶ Precision agriculture
- ▶ IIoT
- ▶ Logistics and asset tracking

### SENSOR FEATURES

The 6-axis IMU combines a 16-bit triaxial gyroscope and a 16-bit triaxial accelerometer in a miniature 3 x 4.5 x 0.95 mm<sup>3</sup> (16-pin) LGA package. BMI090L features a closed-loop gyro and a robust accelerometer with a built-in mechanical filter to suppress high-frequency vibrations, thus enabling precise orientation and motion tracking in harsh and demanding industrial environments.

BMI090L offers wide acceleration measurement range (from  $\pm 3$  g to  $\pm 24$  g), vibration robustness as well as high temperature stability. The automotive-proven gyroscope of the BMI090L has an unmatched bias instability of less than 2 °/h (consumer electronics industry-best) and a low temperature coefficient of offset (TCO) below 15 mdps/K. The accelerometer features a low TCO of 0.2 mg/K and low spectral noise of less than 200  $\mu\text{g}/\sqrt{\text{Hz}}$ .

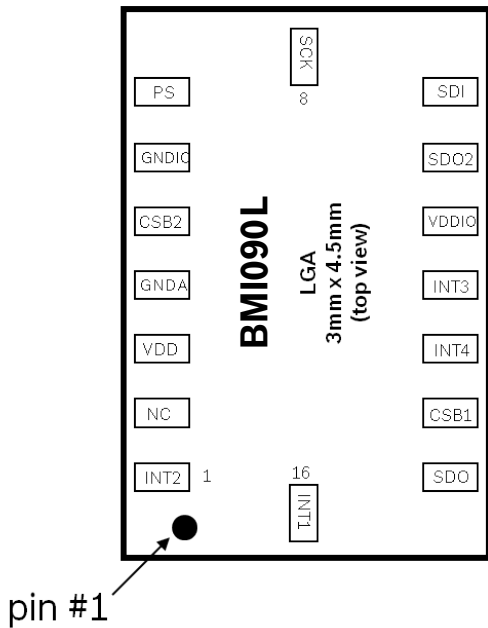
BMI090L provides accurate and reliable inertial sensor data even under demanding conditions, including environments where those conditions change, such as thermal effects like heating, mechanical impacts and stresses such as high shocks, vibrations and PCB bending.

### TECHNICAL SPECIFICATIONS

BMI090L Technical data	
<b>Digital resolution</b>	Accelerometer (A): 16-bit Gyroscope (G): 16-bit
<b>Resolution</b>	(A): 0.09 mg (G): 0.004 °/s
<b>Measurement range and sensitivity (calibrated)</b>	(A) $\pm 3$ g: 10920 LSB/g $\pm 6$ g: 5460 LSB/g $\pm 12$ g: 2730 LSB/g $\pm 24$ g: 1365 LSB/g (G) $\pm 125$ °/s: 262.1 LSB/°/s $\pm 250$ °/s: 131.1 LSB/°/s $\pm 500$ °/s: 65.5 LSB/°/s $\pm 1000$ °/s: 32.8 LSB/°/s $\pm 2000$ °/s: 16.4 LSB/°/s
<b>Zero offset (typ. over lifetime)</b>	(A): $\pm 20$ mg (G): $\pm 1$ °/s
<b>TCO</b>	(A): $\pm 0.2$ mg/K (G): $\pm 0.015$ °/s/K
<b>Noise density (typ.)</b>	(A): 190 $\mu\text{g}/\sqrt{\text{Hz}}$ (G): 0.014 °/s/ $\sqrt{\text{Hz}}$
<b>Bandwidths (progr.)</b>	5 Hz ... 523 Hz
<b>Selectable output data rates</b>	12.5 Hz ... 2 kHz
<b>Digital inputs/outputs</b>	SPI, I <sup>2</sup> C 4 x digital interrupts
<b>Supply voltage (V<sub>DD</sub>)</b>	2.4 ... 3.6 V
<b>I/O supply voltage (V<sub>DDIO</sub>)</b>	1.2 ... 3.6 V
<b>Temperature range</b>	-40 ... +85 °C
<b>Current consumption (full operation, A+G)</b>	5.15 mA
<b>LGA package</b>	3 x 4.5 x 0.95 mm <sup>3</sup>

<sup>1</sup> Starting from product introduction; see longevity disclaimer in data sheet

**Pin configuration**



**Pin description**

Pin no.	Name
1	INT2 (Accelerometer)
2	NC
3	V <sub>DD</sub>
4	GNDA
5	CSB2 (Gyroscope)
6	GND <sub>IO</sub>
7	PS
8	SCx
9	SDx
10	SDO2 (Gyroscope)
11	V <sub>DDIO</sub>
12	INT3 (Gyroscope)
13	INT4 (Gyroscope)
14	CSB1 (Accelerometer)
15	SDO1 (Accelerometer)
16	INT1 (Accelerometer)

Note: BMI090L is pin-to-pin compatible with BMI088 and BMI085.

**SYSTEM COMPATIBILITY**

The BMI090L is designed for best possible fit into modern embedded consumer electronics devices. The sensor has very wide ranges for V<sub>DD</sub> and V<sub>DDIO</sub> supply voltages. The performance and the current consumption are stable over the whole voltage supply range. BMI090L provides two digital serial interfaces: I<sup>2</sup>C and SPI.

The high robustness of the sensor gives the user more freedom in placing the sensor on a PCB and can help to reduce the design effort and costs on system level, for example by omitting additional damping structures or freeing up space when considering heat sources or thermal distributions across the PCB. Depending on the application needs, the sensor may also allow to reduce calibration effort at end-of-line tests.

BMI090L features a 1 kB FIFO and provides synchronized data (accelerometer data at an ODR of 2 kHz). BMI090L supports the following industry-relevant features:

- a. Any motion/no motion
- b. Orientation
- c. High g/low g

Together with the barometric pressure sensor BMP388 and the magnetometer BMM150, the BMI090L is part of a comprehensive 7-DoF/10-DoF solution from Bosch Sensortec, allowing for additional features like precise altitude measurement and accurate heading calculation.

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