BMG160
3-axis gyroscope sensor

Bosch Sensortec

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General description

The BMG160 is an ultra-small, digital 3-axis angular rate sensor with a measurement range up to 2000°/s and a digital resolution of 16 bit for consumer electronics applications.

The BMG160 allows low-noise measurement of angular rates in 3 perpendicular axes and is designed for use in mobile phones, handhelds, computer peripherals, man-machine interfaces, virtual reality features, remote and game controllers.

BMG160 target applications

- Gaming
- Navigation systems
- Motion and activity measurement
- Optical image stabilization

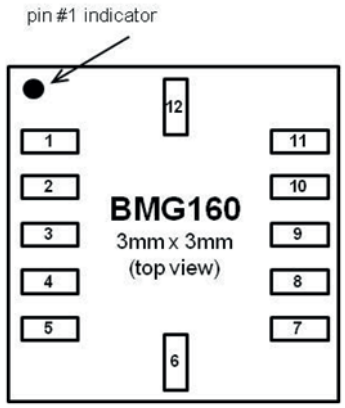
Key features

With its small footprint of only 3 mm x 3 mm the BMG160 is unique in the class of low-noise consumer electronics gyroscopes. The zero-rate offset and offset stability over temperature of the BMG160 are outstanding.

- 3-axis integrated, digital gyroscope
- 16 bit digital resolution
- 5 programmable angular rate measurement ranges
- Integrated interrupt engine and FIFO buffer
- Low power consumption <5 mA
- Short start-up time of 30 ms
- I²C and SPI interface (4-wire and 3-wire)
- Low-pass filters (programmable)
- Fast and slow offset controller
- Ultra small size: 3 mm x 3 mm x 0.95 mm outline dimensions
- MSL level 1 category 12-pin LGA package
- RoHS compliant, halogen-free

BMG160	Technical data
Digital resolution	16 bit
Measurement ranges (programmable)	±125 °/s, ±250 °/s, ±500 °/s, ±1000 °/s, ±2000 °/s
Sensitivity (calibrated)	±125°/s: 262.4 LSB/°/s ±250°/s: 131.2 LSB/°/s ±500°/s: 65.5 LSB/°/s ±1000°/s: 32.8 LSB/°/s ±2000°/s: 16.4 LSB/°/s
Zero-rate offset (typ.)	±1 °/s
Zero-rate offset over temperature	0.015 °/s/K
Noise density (typ.)	0.014 °/s/√Hz
Low-pass filter bandwidths (progr.)	230, 116, 64, 47, 32, 23, 12 Hz
Date rates (programmable)	2000, 1000, 400, 200, 100 Hz
Digital inputs/outputs	SPI, I²C, 2x digital interrupts
Supply voltage (V_{DD})	2.4 ... 3.6 V
I/0 supply voltage (V_{DDIO})	1.2 ... 3.6 V
Temperature range (operating)	-40 ... +85 °C
Current consumption	
▸ full operation	5.0 mA
▸ fast power-up	2.5 mA
FIFO data buffer	100 samples depth (each axis)
LGA package	3 mm x 3 mm x 0.95 mm
Shock resistance	10,000 g x 200 µs

Pin configuration (top view)



Pin no.	Name	Type	Description
1	NC	-	Not connected
2	V_{DD}	Power supply	Analog power supply
3	GNDA	Power supply	Analog ground
4	INT1	Input/output	Interrupt 1
5	CSB	Input	Chip select
6	PS	Input	Protocol Select
7	SCL/SCK	Input	Serial clock
8	SDO	Output	Serial data out
9	SDI/SDA	Input / output	Serial data in / out
10	V_{DDIO}	Power supply	Power supply digital interface
11	GND_{IO}	Power supply	I/O ground
12	INT2	Input/output	Interrupt 2

Featuring a full operation current consumption of only 5 mA the BMG160 is ideally suited for battery powered devices, like mobile phones, remote controllers and mobile gaming devices. In fast power-up mode the current consumption can be even further reduced to only 2.5 mA.

The BMG160 offers many configuration possibilites in order to give the designer full flexibility when integrating the sensor into the target application. Depending on the programmable settings the integrated interrupt engine of the BMG160 signals the occurrence of certain events via the sensors' interrupt pins. The corresponding registers of the BMG160 can easily be set and read-out via the digital sensor interfaces.

The BMG160 features I^2C and SPI (3-wire/4-wire) digital, serial interfaces. Sensor parameters, like measurement ranges or low-pass filter settings and also all interrupt engine settings can be easily programmed via the digital interfaces.

System compatibility

The BMG160 has been designed for best possible fit into modern mobile consumer electronics devices. Besides the ultra-small footprint and very low power consumption, the BMG160 has very wide ranges for V_{DD} and V_{DDIO} supply voltages.

Last but not least, the BMG160 also includes a FIFO buffer with 100 samples depth for each axis. An integrated self-test feature facilitates overall system reliability.

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