BOSCH

BMI085
High-performance Inertial Measurement Unit (IMU)

GENERAL DESCRIPTION

BMI085 is a high-performance IMU specifically designed for Augmented/Virtual Reality (AR/VR) applications. 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^3 (16-pin) LGA package and features low latency and high temperature stability.

BMI085 TARGET APPLICATIONS

▶ AR/VR

▶ High-end gaming/Handheld devices

▶ Indoor navigation/Dead reckoning

▶ Body/Human motion tracking

▶ HMI

▶ Precise device orientation and tilt measurement

▶ Platform stabilization (e.g. image, video, DSLR)

SENSOR FEATURES

The closed-loop gyroscope of BMI085 has an unmatched bias instability of less than 2°/h and low temperature coefficient of offset (TCO) below 15 mdps/K. The low-noise (120 µg/√Hz) and low-TCO (0.2 mg/K) accelerometer makes BMI085 a perfect choice for orientation tracking applications.
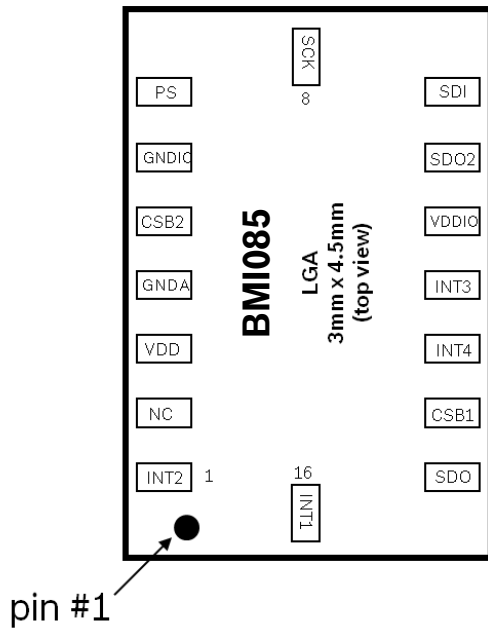
BMI085 provides accurate and reliable 6-DoF motion tracking data even under demanding conditions, including environments where those conditions change, such as thermal effects like heating, typically encountered due to power dissipation in AR/VR head-mounted displays (HMDs).

For AR/VR applications, BMI085 offers synchronized inertial data with a latency below 3 ms. This low latency allows to reduce the overall system (motion-to-photon) latency. In constantly changing conditions—for instance in HMDs under different CPU loads, worn, unworn—the excellent offset stability over temperature fluctuations of BMI085 is the basis for a truly immersive user experience. Due to low TCOs, low zero-*g* offset and excellent linearity, BMI085 also reduces the calibration effort at end-of-line testing of final devices.

TECHNICAL SPECIFICATIONS

BMI085 Technical data (Typical)	
Digital resolution	Accelerometer (A): 16-bit Gyroscope (G): 16-bit
Resolution	(A): 0.1 m*g* (G): 0.004 °/s
Measurement range and sensitivity (calibrated)	(A) ±2 *g*: 16384 LSB/*g* ±4 *g*: 8192 LSB/*g* ±8 *g*: 4096 LSB/*g* ±16 *g*: 2048 LSB/*g* (G) ±125 °/s: 262.144 LSB/°/s ±250 °/s: 131.072 LSB/°/s ±500 °/s: 65.536 LSB/°/s ±1000 °/s: 32.768 LSB/°/s ±2000 °/s: 16.384 LSB/°/s
Zero offset (typ. Over life-time)	(A): ± 20 m*g* (G): ± 1 °/s
TCO	(A): ± 0.2 mg/K (G): ± 0.015 °/s/K
Noise density (typ.)	(A): 120 µg/√Hz (G): 0.014 °/s/√Hz
Bandwidths (progr.)	5 Hz … 684 Hz
Selectable output data rates	12.5 Hz … 2 kHz
Digital inputs/outputs	SPI, I^{2}C 4 x digital interrupts
Supply voltage (V$_{DD}$)	2.4 … 3.6 V
I/0 supply voltage (V$_{DDIO}$)	1.2 … 3.6 V
Temperature range	-40 … +85 °C
Current consumption (full operation)	5.15 mA
LGA package	3 x 4.5 x 0.95mm³

Pin configuration

pin #1

Pin description

Pin No.	Name
1	INT2 (Accelerometer)
2	NC
3	V_{DD}
4	GNDA
5	CSB2 (Gyroscope)
6	GND_{IO}
7	PS
8	SCx
9	SDx
10	SDO2 (Gyroscope)
11	V_{DDIO}
12	INT3 (Gyroscope)
13	INT4 (Gyroscope)
14	CSB1 (Accelerometer)
15	SDO1 (Accelerometer)
16	INT1 (Accelerometer)

BMI085 is pin-to-pin compatible with the BMI055

DATA SYNCHRONISATION

BMI085 is a system-in-package IMU that offers accurate acceleration and angular rate measurements. To achieve data synchronization on BMI085, the data ready interrupt signal from the gyroscope of the BMI085 needs to be connected to one of the interrupt pins of the BMI085 accelerometer, which can be configured as input pins. The internal signal processing unit of the accelerometer uses the data ready signal from the gyroscope to synchronize the data of the accelerometer, taking into consideration the group delay of the sensors. The accelerometer part then notifies the host of available data. With this technique, it is possible to achieve synchronized data and provide inertial data at an ODR of 2 kHz.

SYSTEM COMPATIBILITY

BMI085 has been designed for best possible fit into modern embedded CE devices. The sensor has very wide ranges for V_{DD} and V_{DDIO} supply voltages. The performance and current consumption are stable over the entire voltage supply range. BMI085 provides two digital serial interfaces: I^2C and SPI.