BMI261

Smart Inertial Measurement Unit (IMU) for Android™ OS

GENERAL DESCRIPTION

BMI261 is an ultra-low power IMU especially designed for the Android™ ecosystem and is therefore fully HiFi compliant. The IMU combines precise acceleration and angular rate measurement with intelligent on-chip motion-triggered interrupts. The 6-axis sensor features a 16-bit triaxial gyroscope and accelerometer in a compact 2.5 x 3.0 x 0.8 mm³ LGA package.

BMI261 TARGET APPLICATIONS

- Advanced gesture / activity and context recognition
- Optical and electronic image stabilization (OIS/EIS)
- Simultaneous localization and mapping (SLAM)
- Location based services
- Augmented / virtual reality (AR/VR)
- Indoor navigation / pedestrian dead reckoning (PDR)

BMI261 TARGET DEVICES

- Smartphones, cameras, tablets and smart pens
- Game controllers, remote controls and pointing devices
- Smart TV, smart earphones and hearables

SENSOR FEATURES

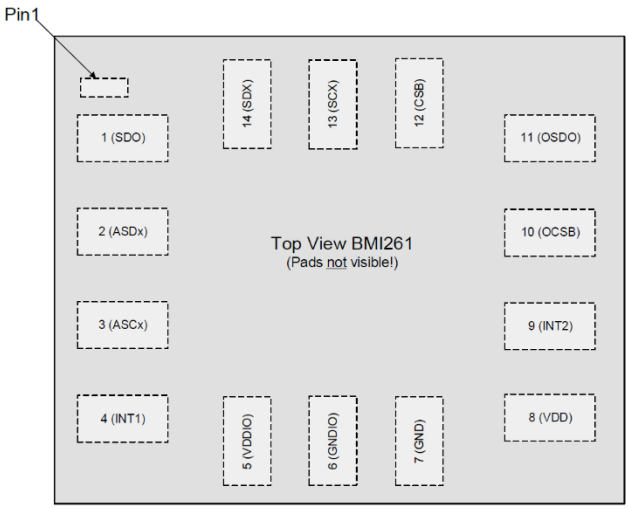
BMI261 is a part of the BMI260 family and is optimized for always-on smartphone gesture and activity recognition. BMI261 is fully compliant to Android operating systems. BMI261 provides highly accurate step counting, motion detection and is pin-to-pin compatible with the BMI160. BMI261 features Bosch's automotive-proven gyroscope technology. Significant improvements in BMI261 include extremely low zero-*g* offset and sensitivity error, low temperature drifts, robustness over PCB strain and a low noise density.

On top, BMI261 features the industry's first self-calibrating gyroscope using motionless CRT (Component Re-Trimming) functionality to compensate MEMS typical soldering drifts, ensuring post-soldering sensitivity errors down to ± 0.4%. Other key features of BMI261 include Hardware and TimeSync functions besides the embedded Android™ OS specific SENSOR_STRING_TYPE's. BMI261 also supports a low-latency secondary interface with accelerometer and gyroscope data output, freely configurable for SPI or I2C interface operation and measurement range.

TECHNICAL SPECIFICATIONS (TYP)

BMI261 data	Accelerometer (A) Gyroscope (G)
Digital resolution	(A): 16-bit or 0.06 mg/LSB (G): 16-bit or 0.004 dps/LSB
Programmable measurement range & Sensitivity	(A): ±2 g: 16384 LSB/g to (A): ±16 g: 2048 LSB/g (G): ±125 dps: 262.1 LSB/dps to (G): ±2000 dps: 16.4 LSB/dps
Zero-g/Zero-rate offset	(A): ±20 mg (G): ±0.5 dps
Sensitivity error	(A): ± 0.4% (G): ± 0.4% (with CRT)
Temperature range	-40 ... +85 °C
Temperature behaviour (TCO; TCS)	(A): ±0.25 mg/K; ±0.004 %/K (G): ±0.02 dps/K; ±0.02 %/K
Noise density	(A): 160 µg/√Hz (G): 0.008 dps/√Hz
Offset vs PCB strain	(A): ±0.01 mg/µε (G): ±1.5 mdps/µε
Filter BW (programmable)	(A): 5 Hz ... 684 Hz (G): 11 Hz ... 751 Hz
Output Data Rate (ODR)	(A): 12.5 Hz ... 1.6 kHz (G): 25 Hz ... 6.4 kHz
Digital inputs/outputs	2x SPI; 2x I2C; AUX I/F; OIS I/F 2x digital interrupts
Supply voltage	1.7 ... 3.6 V_{DD} 1.2 ... 3.6 V_{DDIO}
Current consumption	685 µA at full ODR (aliasing-free)
Package size	2.5 x 3.0 x 0.8 mm³ 14 pin LGA

Pin configuration



Pin-out top view

Pin description

Pin No.	Name
1	SDO, Serial data output in SPI 4W
2	ASDx, Aux interface / OIS interface
3	ASCx, Aux interface / OIS interface
4	INT1, Interrupt Pin 1
5	VDD_{IO}, Digital I/O supply voltage (1.2 ... 3.6V)
6	GND_{IO}, Ground for I/O
7	GND, Ground for digital & analog
8	VDD, Power supply analog & digital (1.71 ... 3.6V)
9	INT2, Interrupt Pin 2
10	OCSB, OIS interface
11	OSDO, OIS interface
12	CSB, Chip select for SPI mode
13	SCx, SPI/I^2C serial clock (SCK/SCL)
14	SDx, Serial data I/O

BMI261 is pin-to-pin compatible with BMI160 and BMI260.

SYSTEM COMPATIBILITY

BMI261 is designed for best fit into modern Android™ smartphones and provides a primary digital interface (I^2C and SPI) and a freely configurable secondary digital interface (I^2C and SPI). Dual SPI configuration enables BMI261 to serve two SPI-based modules supporting stereo or 3D camera operation.

BMI261 has a wide range for V_{DD} and V_{DDIO} supply voltages. The performance and current consumption are stable over the entire supply range. Typical current draw for BMI261's accelerometer and gyroscope at full ODR of 6.4 kHz is under 700 µA. By enabling high output data rates with low current consumption, smartphone manufacturers can avoid an unpleasant aliasing effect – an effect that causes different signals to become indistinguishable when sampled at lower ODRs.

BMI261's low latency, minimal group delays and high-precision time stamps on µs level substantially improve photo/video quality in the context of optical and electronic image stabilisation (OIS/EIS). Using BMI261 on the mainboard in dual interface operation mode enables congruent HMI and OIS functions, such as stabilized panorama photo panning and action video tagging.

BMI261 provides an intelligent power management system enabling motion-triggered always-on features to run inside the ultra-low power domain of the IMU. The host application processor wakes up only on dedicated occasions, enabling a maximized idle period for the main processor.

BMI261 features an improved embedded step counter and step detector, an improved secondary interface for AUX or OIS operation and manual or automatic in-use offset compensation. BMI261 supports Android™ smartphone optimized interrupts including:

- virtual & batch sensors for dynamic batching
- tilt / glance / pick up / wake up gesture
- significant motion, motion detect and stationary detect
- tap / double tap detection (as primary wakeup gesture)
- wrist tilt, raise to wake (as alternative wakeup gesture)

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