BOSCH

BMI263
Smart, MIPI I3C^{SM} I/F Inertial Measurement Unit (IMU)

GENERAL DESCRIPTION

BMI263 is a high-performance, low-power IMU featuring the new MIPI I3C^{SM} serial interface. The IMU combines precise acceleration and angular rate measurement data with intelligent on-chip motion-triggered interrupt features. 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.

BMI263 TARGET APPLICATIONS

▶ MIPI I3C^{SM} ecosystems (e.g. Mobiles/IoT)
▶ Advanced gesture / activity and context recognition
▶ Augmented / virtual reality (AR/VR)
▶ Optical and electronic image stabilization (OIS/EIS)
▶ Simultaneous localization and mapping (SLAM)
▶ Indoor navigation / pedestrian dead reckoning (PDR)

BMI263 TARGET DEVICES

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

SENSOR FEATURES

BMI263 is Bosch Sensortec's first IMU that is compliant with the latest I3C standard as defined by MIPI Alliance. BMI263 features MIPI I3C^{SM} serial interface with two signal lines (Data SDA & Clock SDC), improving upon features, performance and power use of I2C while maintaining backwards compatibility. MIPI I3C^{SM} serial interface reduces wiring complexity, pin count and signal paths, offering high-speed data transfer at very low power levels compared to the traditional I2C or SPI interfaces.
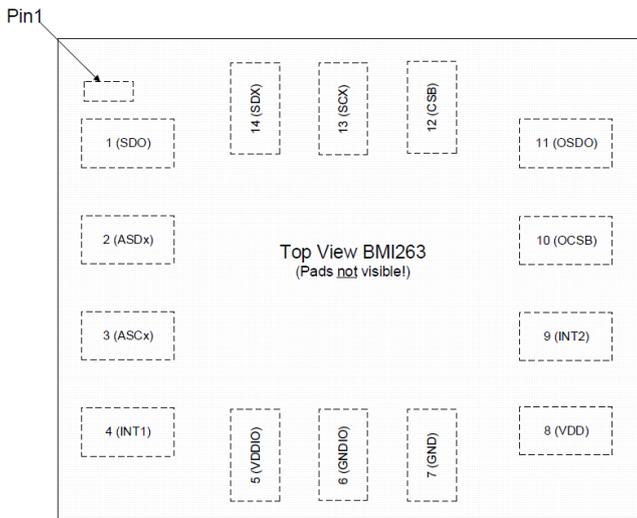
BMI263 is compliant to MIPI's synchronous and asynchronous time stamping definition, improving the accuracy of applications that use signals from various sensors. It can also batch and transmit data quickly to minimize energy consumption of the host processor. Significant improvements in BMI263 include extremely low zero-*g* offset and sensitivity error, low temperature drifts, robustness over PCB strain and low noise density. On top, BMI263 features 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%.

TECHNICAL SPECIFICATIONS (TYP)

BMI263 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	1x MIPI I3C^{SM} 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	~700 µA at full ODR (aliasing-free)
Package size	2.5 x 3.0 x 0.8 mm³ 14 pin LGA

Pin configuration

Pin1

Top View BMI263
(Pads not visible!)

1 (SDO)	14 (SDX) 13 (SCX) 12 (CSB)	11 (OSDO)
2 (ASDx)		10 (OCSB)
3 (ASCx)		9 (INT2)
4 (INT1)	5 (VDDIO) 6 (GNDIO) 7 (GND)	8 (VDD)

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	VDDIO, Digital I/O supply voltage (1.2 ... 3.6V)
6	GNDIO, 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^{2}C serial clock (SCK/SCL)
14	SDx, Serial data I/O

BMI263 is pin-to-pin compatible with BMI160 and BMI260.

SYSTEM COMPATIBILITY

Beside the standard primary interface (I2C/ MIPI I3C^{SM} and SPI configurable), where sensor acts as a slave to the application processor (AP), BMI263 supports a freely configurable secondary interface that could be used as either auxiliary interface (I2C master) or OIS interface (SPI slave). If the secondary interface is configured as an auxiliary interface, an external sensor such as a magnetometer could be connected to BMI263 in order to build a 9-DoF solution. In this configuration, BMI263 would act as a master to the external sensor, reading the sensor data automatically and providing it synchronised to the AP. Alternatively, the secondary interface may be used as an OIS interface to connect to an external OIS control unit. The OIS control unit acts as a master and BMI263 then acts as a slave, providing also access to specific CTRL and CONFIG registers.

BMI263 has a wide range for V$_{DD}$ and V$_{DDIO}$ supply voltages. The performance and current consumption are stable over the entire supply range. By enabling high output data rates with low current consumption, system designers can avoid an unpleasant aliasing effect – an effect that causes different signals to become indistinguishable when sampled at lower ODRs.

BMI263'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) e.g. panorama photo panning/action video tagging.

BMI263 provides an intelligent power management system enabling motion-triggered always-on features to run inside the ultra-low power domain of the IMU. It features an improved embedded step counter/step detector and supports a subset of Android™ smartphone optimized interrupts including: SENSOR_STRING_TYPE_SIG_MO / _STEP_DETECTOR / _STEP_COUNT / _TILT / _DEVICE_ORIENTATION / _STATIONARY_DETECT / _MOTION_DETECT