Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

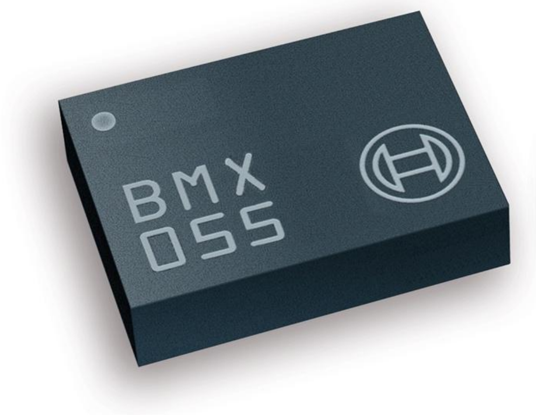
Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

Data sheet

BMX055
Small, versatile 9-axis sensor module

Bosch Sensortec

BOSCH
Invented for life



BMX055: Data sheet

Document revision	1.1
Document release date	November 7th, 2014
Document number	BST-BMX055-DS000-02
Technical reference code(s)	0 273 141 179
Notes	**Data and descriptions within this document are subject to change without notice.** Product photos and pictures are for illustration purposes only and may differ from the real product's appearance.

BMX055

Basic Description

Key features

• 3 sensors in one device	an advanced triaxial 16bit gyroscope, a versatile, leading edge triaxial 12bit accelerometer and a full performance geomagnetic sensor
• Small package	LGA package 20 pins footprint 3.0 x 4.5 mm², height 0.95mm
• Common voltage supplies	V_{DD} voltage range: 2.4V to 3.6V
• Digital interface	SPI (4-wire, 3-wire), I²C, 4 interrupt pins V_{DDIO} voltage range: 1.2V to 3.6V
• Smart operation and integration	All sensors can be operated individually 9-axis FusionLib software compatible
• Consumer electronics suite	MSL1, RoHS and RoHS2 compliant, halogen-free Operating temperature: -40°C ... +85°C

Accelerometer features

• Programmable functionality	Acceleration ranges ±2g/±4g/±8g/±16g Low-pass filter bandwidths 1kHz - <8Hz
• On-chip FIFO	Integrated FIFO with a depth of 32 frames
• On-chip interrupt controller	Motion-triggered interrupt-signal generation for - new data - any-motion (slope) detection - tap sensing (single tap / double tap) - orientation- & motion inactivity recognition - flat/low-g/high-g detection
• On-chip temperature sensor	factory trimmed, 8-bit, typical slope 0.5K/LSB.
• Ultra-low power IC	130µA current consumption, 1.3ms wake-up time, advanced features for system power management

Gyroscope features

• Programmable functionality	Ranges switchable from ±125°/s to ±2000°/s Low-pass filter bandwidths 230Hz - 12Hz Fast and slow offset controller (FOC and SOC)
• On-chip FIFO	Integrated FIFO with a depth of 100 frames
• On-chip interrupt controller	Motion-triggered interrupt-signal generation for - new data - any-motion (slope) detection - high rate
• Low power IC	< 5mA current consumption, 30ms start-up time wake-up time in fast power-up mode only 10ms

Magnetometer features

- Flexible functionality — Magnetic field range typical 1300µT (x-, y-axis); ±2500µT (z-axis)
  Magnetic field resolution of ~0.3µT
- On-chip interrupt controller — Interrupt-signal generation for
  - new data
  - magnetic low-/high-threshold detection
- Ultra-low power — Low current consumption (170µA @ 10Hz in low power preset), short wake-up time, advanced features for system power management

Typical applications

- Advanced gaming, HMI and augmented reality
- Advanced gesture recognition
- Indoor navigation
- Tilt measurement and compensation
- Free-fall detection and drop detection for warranty logging
- Display profile switching
- Advanced system power management for mobile applications
- Menu scrolling, tap / double tap sensing

General description

The BMX055 is an integrated 9-axis sensor for the detection of movements and rotations and magnetic heading. It comprises the full functionality of a triaxial, low-g acceleration sensor, a triaxial angular rate sensor and a triaxial geomagnetic sensor.

The BMX055 senses orientation, tilt, motion, acceleration, rotation, shock, vibration and heading in cell phones, handhelds, computer peripherals, man-machine interfaces, virtual reality features and game controllers.

Advanced evaluation circuitry (ASIC) converts the outputs of the micro-electromechanical and geomagnetic sensing structures (MEMS), developed, produced and tested in BOSCH facilities. The programmable on-chip interrupt engine enables motion-based applications without use of a microcontroller by providing contextual status of accelerometer, gyroscope and geomagnetic sensor. The integrated FIFO memories allow buffering the inertial sensor data.

The corresponding chip-sets are integrated into one single 20-pin LGA 3.0mm x 4.5mm x 0.95 mm housing. For optimum system integration the BMX055 is equipped with digital bi-directional SPI and I^2C interfaces. To provide maximum performance and reliability each device is tested and ready-to-use calibrated.

Package and interfaces of the BMX055 have been defined to match a multitude of hardware requirements. Since the sensor features a small footprint, a flat package and very low power consumption it is ideally suited for mobile-phone and tablet PC applications.

The BMX055 offers a variable V_{DDIO} voltage range from 1.2V to 3.6V and can be programmed to optimize functionality, performance and power consumption in customer specific applications.

Index of Contents

1 Specification

If not stated otherwise, the given values are over lifetime and full performance temperature and voltage ranges, minimum/maximum values are ±3σ.

1.1 Electrical specification

Table 1: Electrical parameter specification

OPERATING CONDITIONS						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**
Supply Voltage Internal Domains	V_{DD}		2.4	3.0	3.6	V
Supply Voltage I/O Domain	V_{DDIO}		1.2	2.4	3.6	V
Voltage Input Low Level	$V_{IL,a}$	SPI & I²C			$0.3V_{DDIO}$	-
Voltage Input High Level	$V_{IH,a}$	SPI & I²C	$0.7V_{DDIO}$			-
Voltage Output Low Level	$V_{OL,a}$	I_{OL} = 3mA, SPI & I²C			$0.23V_{DDIO}$	-
Voltage Output High Level	V_{OH}	I_{OH} = 3mA, SPI	$0.8V_{DDIO}$			-
Operating Temperature	T_A		-40		+85	°C

1.2 Electrical and physical characteristics, measurement performance

Table 2: Electrical characteristics accelerometer

OPERATING CONDITIONS ACCELEROMETER						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Units**
Acceleration Range	g_{FS2g}	Selectable via serial digital interface		±2		g
	g_{FS4g}			±4		g
	g_{FS8g}			±8		g
	g_{FS16g}			±16		g
Total Supply Current in Normal Mode	I_{DD}	see[1]		130		µA
Total Supply Current in Suspend Mode	I_{DDsum}	see[1]		2.1		µA
Total Supply Current in Deep Suspend Mode	I_{DDdsum}	see[1]		1.0		µA
Total Supply Current in Low-power Mode 1	I_{DDlp1}	see[1] sleep duration ≥ 25ms		6.5		µA
Total Supply Current in Low-power Mode 2	I_{DDlp2}	see[1] sleep duration ≥ 25ms		66		µA
Total Supply Current in Standby Mode	I_{DDsbm}	see[1]		62		µA
Wake-Up Time 1	$t_{w,up1}$	from Low-power Mode 1 or Suspend Mode or Deep Suspend Mode bw = 1kHz		1.3		ms
Wake-Up Time 2	$t_{w,up2}$	from Low-power Mode 2 or Stand-by Mode bw = 1kHz		1		ms
Start-Up Time	$t_{s,up}$	POR, bw = 1kHz				ms
Non-volatile memory (NVM) write-cycles	n_{NVM}				15	Cycles

[1] Conditions of current consumption if not specified otherwise: T_A=25°C, BW_Accel=1kHz, V_{DD} = V_{DDIO} = 2.4V, digital protocol on, no streaming data

Output Signal Accelerometer						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Units**
Sensitivity	S_{2g}	g_{FS2g}, T_A=25°C		1024		LSB/g
	S_{4g}	g_{FS4g}, T_A=25°C		512		LSB/g
	S_{8g}	g_{FS8g}, T_A=25°C		256		LSB/g
	S_{16g}	g_{FS16g}, T_A=25°C		128		LSB/g
Sensitivity Temperature Drift	TCS	g_{FS2g}, Nominal V_{DD} supplies		±0.03		%/K
Sensitivity Supply Volt. Drift	S_{VDD}	g_{FS2g}, T_A=25°C, $V_{DD\ min} \le V_{DD} \le V_{DD\ max}$		0.05		%/V
Zero-g Offset (x,y.z)	$Off_{x,z}$	g_{FS2g}, T_A=25°C, nominal V_{DD} supplies, over life-time		±80		mg
Zero-g Offset Temperature Drift	TCO	g_{FS2g}, Nominal V_{DD} supplies		±1		mg/K
Zero-g Offset Supply Volt. Drift	Off_{VDD}	g_{FS2g}, T_A=25°C, $V_{DD\ min} \le V_{DD} \le V_{DD\ max}$		0.5		mg/V
Bandwidth	bw_8	2nd order filter, bandwidth programmable		8		Hz
	bw_{16}			16		Hz
	bw_{31}			31		Hz
	bw_{63}			63		Hz
	bw_{125}			125		Hz
	bw_{250}			250		Hz
	bw_{500}			500		Hz
	bw_{1000}			1,000		Hz
Nonlinearity	NL	best fit straight line, g_{FS2g}	-1	±0.5	+1	%FS
Output Noise Density	n_{rms}	g_{FS2g}, T_A=25°C Nominal V_{DD} supplies Normal mode		150		µg/√Hz
Temperature Sensor Measurement Range	T_S		-40		85	°C
Temperature Sensor Slope	dT_S			0.5		K/LSB
Temperature Sensor Offset	OT_S			±2		K

Mechanical Characteristics Accelerometer						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Units**
Cross Axis Sensitivity	S	relative contribution between any two of the three axes		1		%
Alignment Error	E_A	relative to package outline		±0.5		deg

Table 3: Electrical characteristics gyroscope

Operating Conditions Gyroscope						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**
Range	R_{FS125}	Selectable via serial digital interface		125		°/s
	R_{FS250}			250		°/s
	R_{FS500}			500		°/s
	R_{FS1000}			1,000		°/s
	R_{FS2000}			2,000		°/s
Supply Current in Normal Mode	I_{DD}	see[2]		5		mA
Supply Current in Fast Power-up Mode	I_{DDfpm}	see[2]		2.5		mA
Supply Current in Suspend Mode	I_{DDsum}	see[2], digital and analog (only IF active)		25		µA
Supply Current in Deep Suspend Mode	I_{DDdsum}	see[2]		<5		µA
Start-up time	t_{su}	to ±1°/s of final value; from power-off		30		ms
Wake-up time	t_{wusm}	From suspend- and deep suspend-modes		30		ms
Wake-up time	t_{wufpm}	From fast power-up mode		10		ms
Non-volatile memory (NVM) write-cycles	n_{NVM}				15	cycles

[2] Conditions of current consumption if not specified otherwise: T_A=25°C, BW_Gyro=1kHz, V_{DD}=2.4V, V_{DDIO}=1.8V, digital protocol on, no streaming data

Output Signal Gyroscope						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**
Sensitivity		Ta=25°C, R_{FS2000}		16.4		LSB/°/s
		Ta=25°C, R_{FS1000}		32.8		LSB/°/s
		Ta=25°C, R_{FS500}		65.6		LSB/°/s
		Ta=25°C, R_{FS250}		131.2		LSB/°/s
		Ta=25°C, R_{FS125}		262.4		LSB/°/s
Sensitivity tolerance		Ta=25°C, R_{FS2000}		±1		%
Sensitivity Change over Temperature	TCS	Nominal V_{DD} supplies -40°C ≤ T_A ≤ +85°C R_{FS2000}		±0.03		%/K
Sensitivity Supply Volt. Drift	S_{VDD}	T_A=25°C, $V_{DD\_min} \le V_{DD} \le V_{DD\_max}$		<0.4		%/V
Nonlinearity	NL	best fit straight line R_{FS1000}, R_{FS2000}		±0.05		%FS
g- Sensitivity		Sensitivity to acceleration stimuli in all three axis (frequency <20kHz)			0.1	°/s/g
Zero-rate Offset	Off Ω_x Ω_y and Ω_z	Nominal V_{DD} supplies T_A=25°C, slow and fast offset cancellation off		±1		°/s
Zero-Ω Offset Change over Temperature	TCO	Nominal V_{DD} supplies -40°C ≤ T_A ≤ +85°C R_{FS2000}		±0.015		°/s per K
Zero-Ω Offset Supply Volt. Drift	$Off\Omega_{VDD}$	T_A=25°C, $V_{DD\_min} \le V_{DD} \le V_{DD\_max}$		<0.1		°/s /V
Output Noise	n_{rms}	rms, BW=47Hz (@ 0.014°/s/√Hz)		0.1		°/s

Bandwidth BW	f_{-3dB}			unfiltered 230 116 64 47 32 23 12		Hz
Data rate (set of x,y,z rate)				2000 1000 400 200 100		Hz
Data rate tolerance (set of x,y,z rate)				±0.3		%
Cross Axis Sensitivity		Sensitivity to stimuli in non-sense-direction		±1		%

Table 4: Electrical characteristics magnetometer

OPERATING CONDITIONS MAGNETOMETER						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Units**
Magnetic field range[3]	Brg,xy	TA=25°C	±1200	±1300		µT
	Brg,z		±2000	±2500		µT
Magnetometer heading accuracy[4]	$Ac_{heading}$	30µT horizontal geomagnetic field component, TA=25°C			±2.5	deg
System heading accuracy[5]	$As_{heading}$	30µT horizontal geomagnetic field component, TA=25°C			±3.0	deg
Supply Current in Active Mode (average)[6]	IDD,lp,m	Low power preset Nominal VDD supplies TA=25°C, ODR=10Hz		170		µA
	IDD,rg,m	Regular preset Nominal VDD supplies TA=25°C, ODR=10Hz		0.5		mA
	IDD,eh,m	Enhanced regular preset Nominal VDD supplies TA=25°C, ODR=10Hz		0.8		mA
	IDD,ha,m	High accuracy preset Nominal VDD supplies TA=25°C, ODR=20Hz		4.9		mA
Supply Current in Suspend Mode	IDDsm,m	Nominal VDD/VDDIO supplies, TA=25°C		1		µA
Peak supply current in Active Mode	IDDpk,m	In measurement phase Nominal VDD supplies TA=25°C		18		mA
Peak logic supply current in active mode	IDDIOpk, m	Only during measurement phase Nominal VDDIO supplies TA=25°C		210		µA
POR time	tw_up,m	from OFF to Suspend; time starts when VDD>1.5V and VDDIO>1.1V			1.0	ms
Start-Up Time	ts_up,m	from Suspend to sleep			3.0	ms

[3] Full linear measurement range considering sensor offsets.
[4] The heading accuracy depends on hardware and software. For detailed information of the software performance please contact Bosch Sensortec.
[5] Heading accuracy of the tilt-compensated 9-axis system, assuming calibration with Bosch Sensortec FusionLib software. Average value over various device orientations (typical device usage).
[6] For details on magnetometer current consumption calculation refer to chapter 9.2.4

Magnetometer Output Signal						
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**
Device Resolution	$D_{res,m}$	T_A=25°C		0.3		µT
Gain error[7]	$G_{err,m}$	After API compensation T_A=25°C Nominal V_{DD} supplies		±5		%
Sensitivity Temperature Drift	TCS_m	After API compensation -40°C ≤ T_A ≤ +85°C Nominal V_{DD} supplies		±0.01		%/K
Zero-B offset	OFF_m	T_A=25°C		±40		µT
Zero-B offset[8]	$OFF_{m,cal}$	After software calibration with Bosch Sensortec eCompass software -40°C ≤ T_A ≤ +85°C		±2		µT
ODR (data output rate), normal mode	odr_{lp}	Low power preset		10		Hz
	odr_{rg}	Regular preset		10		Hz
	odr_{eh}	Enhanced regular preset		10		Hz
	odr_{ha}	High accuracy preset		20		Hz
ODR (data output rate), forced mode	odr_{lp}	Low power preset	0		>300	Hz
	odr_{rg}	Regular preset	0		100	Hz
	odr_{eh}	Enhanced regular preset	0		60	Hz
	odr_{ha}	High accuracy preset	0		20	Hz
Full-scale Nonlinearity	$NL_{m, FS}$	best fit straight line			1	%FS
Output Noise	$n_{rms,lp,m,xy}$	Low power preset x, y-axis, T_A=25°C Nominal V_{DD} supplies		1.0		µT
	$n_{rms,lp,m,z}$	Low power preset z-axis, T_A=25°C Nominal V_{DD} supplies		1.4		µT
	$n_{rms,rg,m}$	Regular preset T_A=25°C Nominal V_{DD} supplies		0.6		µT
	$n_{rms,eh,m}$	Enhanced regular preset T_A=25°C Nominal V_{DD} supplies		0.5		µT

[7] Definition: *gain error = ((measured field after API compensation) / (applied field))* – 1
[8] Magnetic zero-B offset assuming calibration with Bosch Sensortec eCompass software. Typical value after applying calibration movements containing various device orientations (typical device usage).

	$n_{rms,ha,m}$	High accuracy preset T_A=25°C Nominal V_{DD} supplies		0.3		µT
Power Supply Rejection Rate	$PSRR_m$	T_A=25°C Nominal V_{DD} supplies		±0.5		µT/V

2 Absolute maximum ratings

Table 5: Absolute maximum ratings

Parameter	Condition	Min	Max	Units
Voltage at Supply Pin	V_{DD} Pin	-0.3	4.25	V
	V_{DDIO} Pin	-0.3	4.25	V
Voltage at any Logic Pin	Non-Supply Pin	-0.3	V_{DDIO}+0.3	V
Passive Storage Temp. Range	≤ 65% rel. H.	-50	+150	°C
None-volatile memory (NVM) Data Retention	T = 85°C, after 15 cycles	10		y
Mechanical Shock	Duration ≤ 200µs		10,000	g
	Duration ≤ 1.0ms		2,000	g
	Free fall onto hard surfaces		1.8	m
ESD	HBM, at any Pin		2	kV
	CDM		500	V
	MM		200	V

Note: Stress above these limits may cause damage to the device. Exceeding the specified electrical limits may affect the device reliability or cause malfunction.

3 Block diagram

Figure 1 shows the basic building blocks of the BMX055:

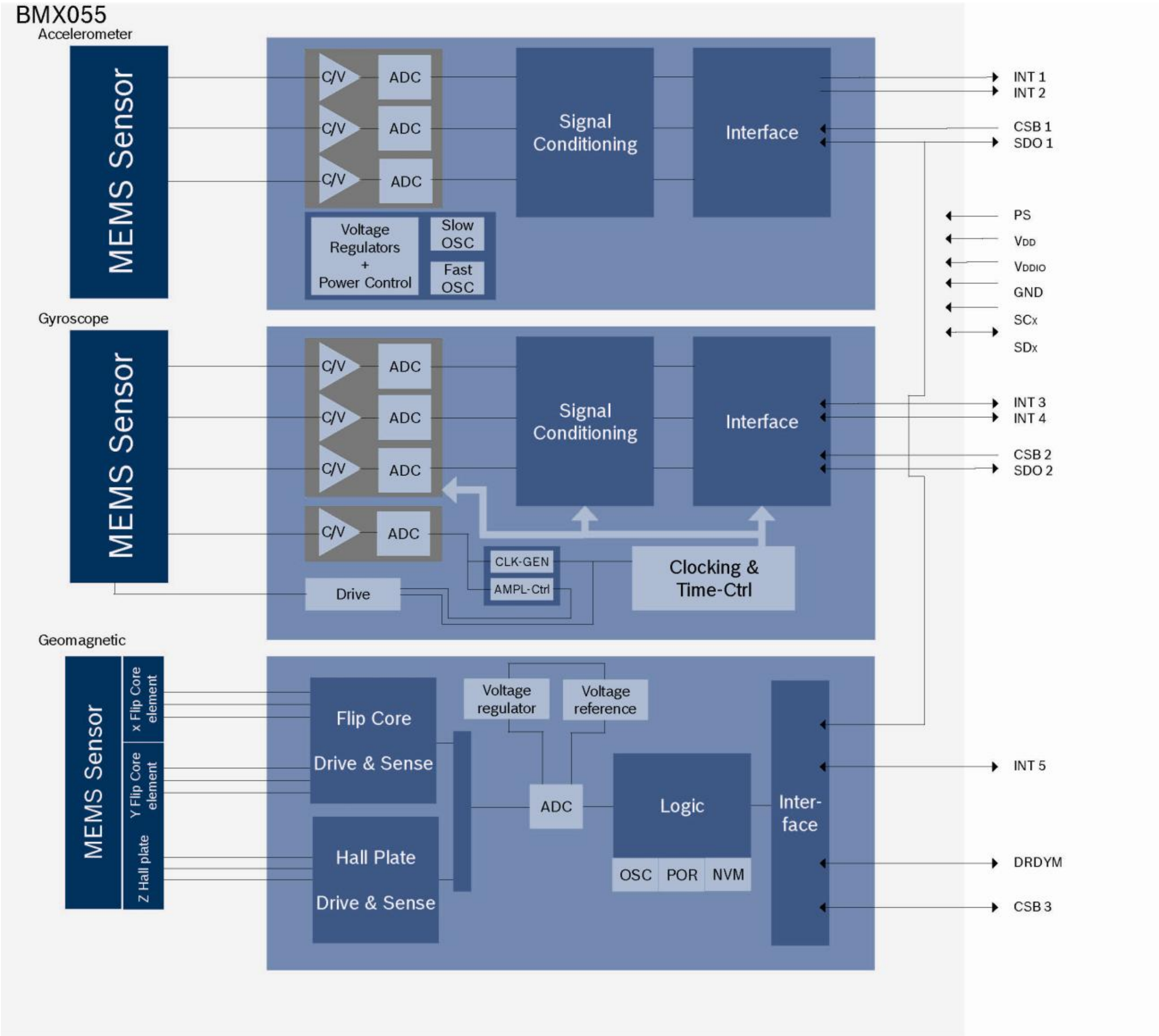


Figure 1: Block diagram of the BMX055

4 Basic power management

The BMX055 has two distinct power supply pins:
- V_{DD} is the main power supply for the internal blocks
- V_{DDIO} is a separate power supply pin mainly used for the supply of the interface

There are no limitations on the voltage levels of both pins relative to each other, as long as each of them lies within its operating range. Furthermore, the device can be completely switched off (V_{DD} = 0V) while keeping the V_{DDIO} supply on (V_{DDIO} > 0V) or vice versa.

When the V_{DDIO} supply is switched off, all interface pins (CSB, SDI, SCK, PS) must be kept close to GND_{IO} potential.

The device contains a power-on reset (POR) generator. It resets the logic part and the register values after powering-on V_{DD} and V_{DDIO}. Please note, that all application specific settings which are not equal to the default settings (refer to 6.2 register map accelerometer, to 8.2 register map gyroscope and to 10.2 register map magnetometer), must be re-set to its designated values after POR.

In case the I²C interface shall be used, a direct electrical connection between V_{DDIO} supply and the PS pin is needed in order to ensure reliable protocol selection. For SPI interface mode the PS pin must be directly connected to GND_{IO}.

5 Functional description accelerometer

Note: Default values for registers can be found in Chapter 6.

5.1 Acceleration data

The accelerometer has six different power modes. Besides normal mode, which represents the fully operational state of the device, there are five energy saving modes: deep-suspend mode, suspend mode, standby mode, low-power mode 1 and low-power mode 2.

The possible transitions between the power modes are illustrated in Figure 2:

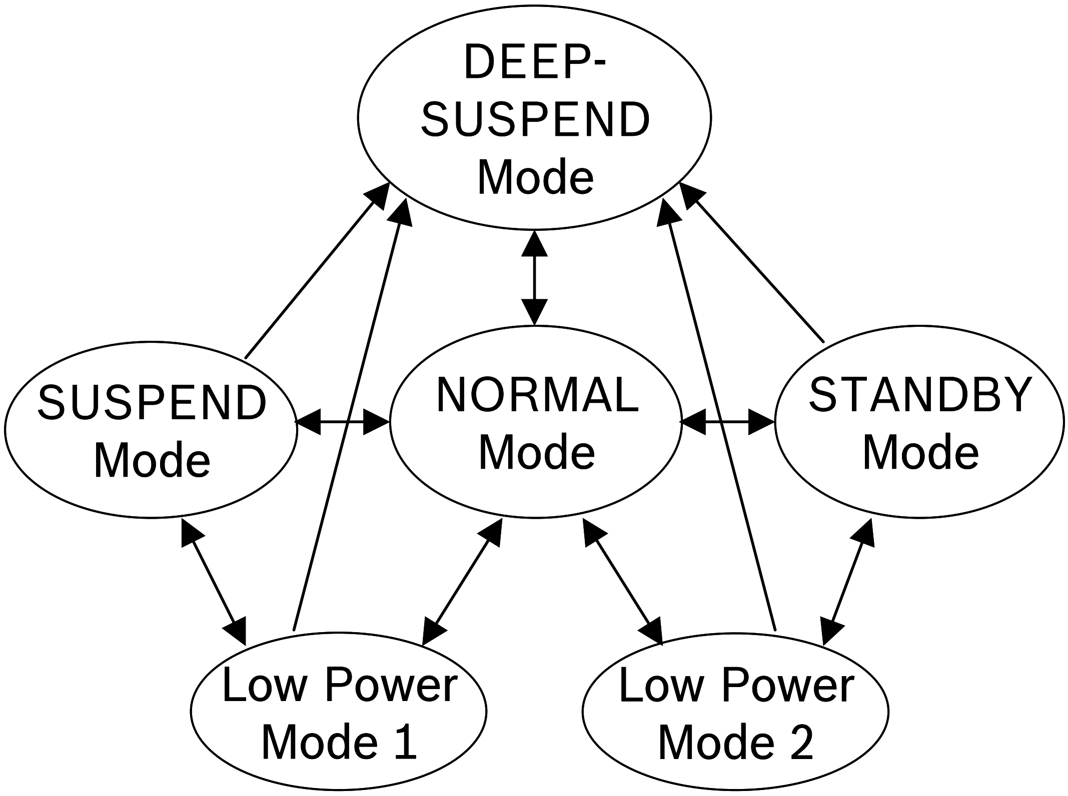


Figure 2: Power mode transition diagram

After power-up accelerometer is in normal mode so that all parts of the device are held powered-up and data acquisition is performed continuously.

In **deep-suspend** mode the device reaches the lowest possible power consumption. Only the interface section is kept alive. No data acquisition is performed and the content of the configuration registers is lost. Deep suspend mode is entered (left) by writing '1' ('0') to the *(ACC 0x11) deep_suspend* bit while *(ACC 0x11)* suspend bit is set to '0'. The I^2C watchdog timer remains functional. The *(ACC 0x11) deep_ suspend* bit, the *(ACC 0x34) spi3* bit, *(ACC 0x34) i2c_wdt_en* bit and the *(ACC 0x34) i2c_wdt_sel* bit are functional in deep-suspend mode. Equally the interrupt level and driver configuration registers *(ACC 0x20) int1_lvl*, *(ACC 0x20) int1_od*, *(ACC 0x20) int2_lvl*, and *(ACC 0x20) int2_od* are accessible. Still it is possible to enter normal mode by performing *a* softreset as described in chapter 5.7. Please note, that all application specific settings which are not equal to the default settings (refer to 6.2 register map accelerometer), must be re-set to its designated values after leaving deep-suspend mode.

In **suspend mode** the whole analog part is powered down. No data acquisition is performed. While in suspend mode the latest acceleration data and the content of all configuration registers are kept. Writing to and reading from registers is supported except from the (0x3E) fifo_config_1, (0x30) fifo_config_0 and (0x3F) fifo_data register. It is possible to enter normal mode by performing a softreset as described in chapter 5.7.

Suspend mode is entered (left) by writing ´1´ (´0´) to the *(ACC 0x11) suspend* bit after bit *(ACC 0x12) lowpower_mode* has been set to ‘0’. Although write access to registers is supported at the full interface clock speed (SCL or SCK), a waiting period must be inserted between two consecutive write cycles (please refer also to section 9.2.1).

In **standby mode** the analog part is powered down, while the digital part remains largely operational. No data acquisition is performed. Reading and writing registers is supported without any restrictions. The latest acceleration data and the content of all configuration registers are kept. Standby mode is entered (left) by writing ´1´ (´0´) to the *(ACC 0x11) suspend* bit after bit *(ACC 0x12) lowpower_mode* has been set to ‘1’. It is also possible to enter normal mode by performing a softreset as described in chapter 5.7.

In **low-power mode 1**, the device is periodically switching between a sleep phase and a wake-up phase. The wake-up phase essentially corresponds to operation in normal mode with complete power-up of the circuitry. The sleep phase essentially corresponds to operation in suspend mode. Low-power mode is entered (left) by writing ´1´ (´0´) to the *(ACC 0x11) lowpower_en* bit with bit *(ACC 0x12) lowpower_mode* set to ‘0’. Read access to registers is possible except from the *(0x3F) fifo_data* register. However, unless the register access is synchronised with the wake-up phase, the restrictions of the suspend mode apply.

Low-power mode 2 is very similar to low-power mode 1, but register access is possible at any time without restrictions. It consumes more power than low-power mode 1. In low-power mode 2 the device is periodically switching between a sleep phase and a wake-up phase. The wake-up phase essentially corresponds to operation in normal mode with complete power-up of the circuitry. The sleep phase essentially corresponds to operation in standby mode. Low-power mode is entered (left) by writing ´1´ (´0´) to the *(ACC 0x11) lowpower_en* bit with bit *(ACC 0x12) lowpower_mode* set to ‘1’.

The timing behaviour of the low-power modes 1 and 2 depends on the setting of the *(ACC 0x12) sleeptimer_en* bit. When *(ACC 0x12) sleeptimer_en* is set to ‘0’, the event-driven time-base mode (EDT) is selected. In EDT the duration of the wake-up phase depends on the number of samples required by the enabled interrupt engines. If an interrupt is detected, the device stays in the wake-up phase as long as the interrupt condition endures (non-latched interrupt), or until the latch time expires (temporary interrupt), or until the interrupt is reset (latched interrupt). If no interrupt is detected, the device enters the sleep phase immediately after the required number of acceleration samples have been taken and an active interface access cycle has ended. The EDT mode is recommended for power-critical applications which do not use the FIFO. Also, EDT mode is compatible with legacy BST sensors. Figure 3 shows the timing diagram for low-power modes 1 and 2 when EDT is selected.

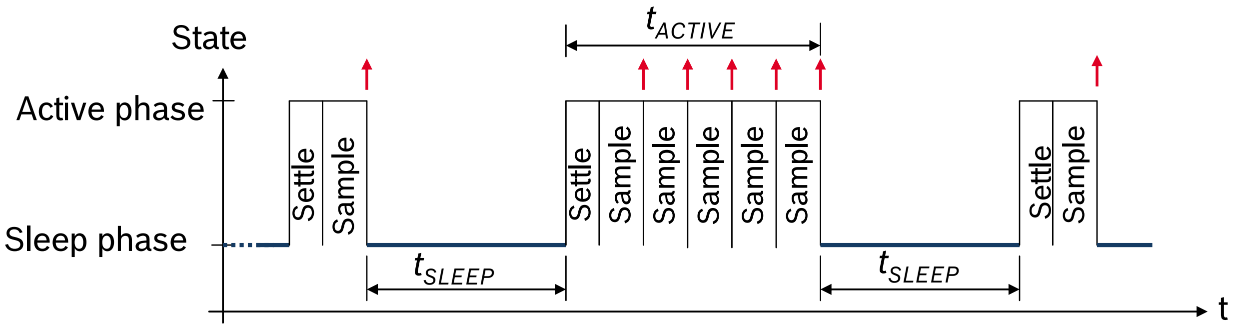


Figure 3: Timing Diagram for low-power mode 1/2, EDT

When *(ACC 0x12) sleeptimer_en* is set to ‘1’, the equidistant-sampling mode (EST) is selected. The use of the EST mode is recommended when the FIFO is used since it ensures that equidistant samples are sampled into the FIFO regardless of whether the active phase is extended by active interrupt engines or interface activity. In EST mode the sleep time t_{SLEEP} is defined as shown in Figure 4. The FIFO sampling time t_{SAMPLE} is the sum of the sleep time t_{SLEEP} and the sensor data sampling time t_{SSMP}. Since interrupt engines can extend the active phase to exceed the sleep time t_{SLEEP}, equidistant sampling is only guaranteed if the bandwidth has been chosen such that $1/(2 * bw) = n * t_{SLEEP}$ where n is an integer. If this condition is infringed, equidistant sampling is not possible. Once the sleep time has elapsed the device will store the next available sample in the FIFO. This set-up condition is not recommended as it may result in timing jitter.

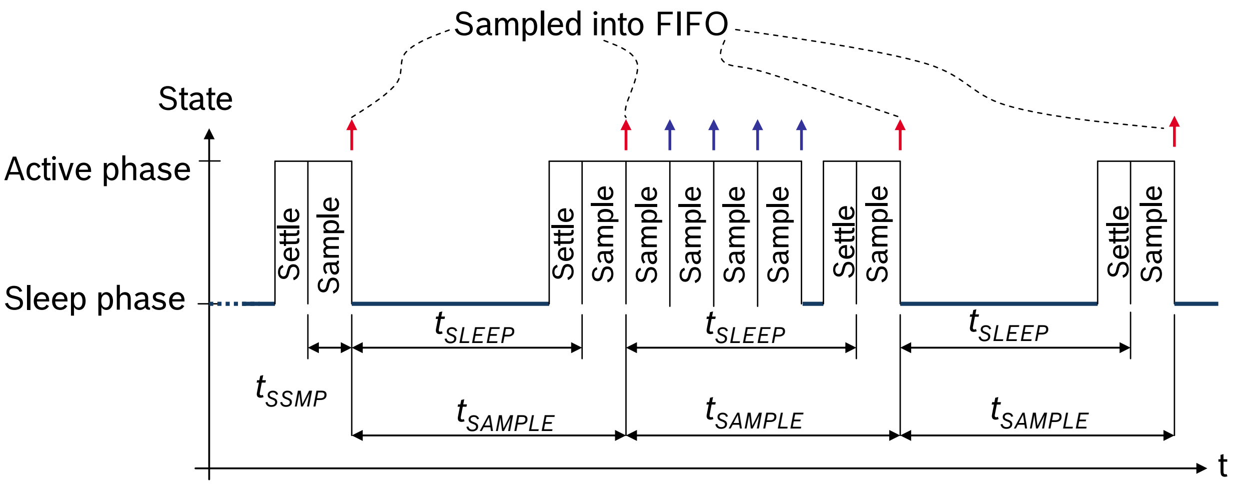


Figure 4: Timing Diagram for low-power mode 1/2, EST