BMA456 – AN Feature Set
Application Note

Application Note – BMA456 AN Feature Set

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Notes	Data and descriptions in this document are subject to change without notice. Product photos and pictures are for illustration purposes only and may differ from the real product appearance. The technical details and legal disclaimer of the respective product data sheet apply.

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1. Feature set

The application note describes the feature set for the firmware version BMA456-AN which supports the following features: Any-motion and No-motion.
For complete details regarding BMA456 specifications (e.g. pin-out, power modes, interrupt pin configuration, temperature sensor, sensor Time, FIFO), digital interfaces (primary/secondary), landing pattern, HSMI and firmware image refer the following link:
https://www.bosch-sensortec.com/products/motion-sensors/accelerometers/bma456.html
https://github.com/BoschSensortec

1.1. Interrupt Features

Global Configuration

The configuration of the interrupt feature set is described in the register FEATURES_IN.
In order to reconfigure the features, the user must perform a burst read of the whole content from the register FEATURES_IN, followed by a modification of the content, and finally a burst write of the modified content to the register FEATURES_IN. The content of the successive bytes read or written in burst mode correspond to the each bytes described in FEATURES_IN.

Ensure that the sensor is initialized before the feature configuration is performed (see datasheet chapter 4.2 Device Initialization)

The output of the interrupt features can be read from the status registers listed below.

Feature	Output Status
Any motion	INT_STATUS_0.any_motion_out
No motion	INT_STATUS_0.no_motion_out
Error interrupt	INT_STATUS_0. error_int_out

Table 1: Interrupt status register overview

The error interrupt signals indicate that the sensor has been stopped after a fatal error. In this condition the device re-initialization must be done for proper functioning of the sensor.

The BMA456 supports features processing in both power modes: high performance and low power. In addition BMA456 supports automated power modes and also conditional power mode switching. The features have as input data the acceleration samples, which between 50Hz and 200Hz in low power mode.

Minimum Bandwidth Settings
If performance mode is enabled (ACC_CONF.acc_perf_mode is 0b1, device is in continuous mode), then the features are functioning properly, regardless to the ODR and the Bandwidth that the Host would set.
If Performance Mode is disabled (ACC_CONF.acc_perf_mode is 0b0) (device is in non-continuous mode), then the minimum ODR setting must comply with the following restrictions:

- The ODR must be set to minimum 50 Hz for the most features

If the minimum requirements are not met, then the corresponding error flag from the register INTERNAL_STATUS is set.

Axes remapping for interrupt features

If the sensor orientation, when integrated into the customer devices, is different from described in chapter 'sensing axis orientation', the sensor axis/axes must be remapped to use the integrated features properly.
Axes remapping register allows the host to freely map individual axis to the coordinate system of the used platform. Individual axis can be mapped to any other defined axis. The sign value of the axis can also be configured. For example x axis can be mapped to –x axis, +y axis, - y axis, +z axis or –z axis. Similarly other axes can also be configured depending on the customer use case.

Note:
The axis remapping does apply only to the data fetched into the features. The DATA_0 to DATA_13 registers are not affected and should be accordingly remapped on the driver level if needed.

Configuration settings:

1. FEATURES_IN.axes_remapping.map_x_axis - describes which axis shall be mapped to x axis.
2. FEATURES_IN.axes_remapping.map_x_axis_sign – describes whether the mapped axis shall be inverted or not to be inverted.
3. FEATURES_IN.axes_remapping.map_y_axis – describes which axis shall be mapped to y axis.
4. FEATURES_IN.axes_remapping.map_y_axis_sign – describes whether the mapped axis shall be inverted or not to be inverted.
5. FEATURES_IN.axes_remapping.map_z_axis –describes which axis shall be mapped to z axis.
6. FEATURES_IN.axes_remapping.map_z_axis_sign – describes whether the mapped axis shall be inverted or not to be inverted.

2. Features Description

2.1. Any Motion detection

Any-motion detection uses the slope between current input and reference acceleration samples to detect the motion status of the device. Feature can be enabled by setting at least one of the following: FEATURES_IN.ANYMO_2.x_en, FEATURES_IN.ANYMO_2.y_en, FEATURES_IN.ANYMO_2.z_en, respectively for each axis.

Any-motion provides an interrupt when the absolute value of the slope exceeds the configurable FEATURES_IN.ANYMO_1.threshold for consecutive FEATURES_IN.ANYMO_2.duration samples for at-least one of the enabled sensing axis.

Reference acceleration sample is updated only when an any-motion interrupt is triggered. The interrupt status is reset as soon as the slope falls below the set FEATURES_IN.ANYMO_1.threshold value. The signals and timings relevant to the any-motion interrupt functionality are depicted in the figure below:

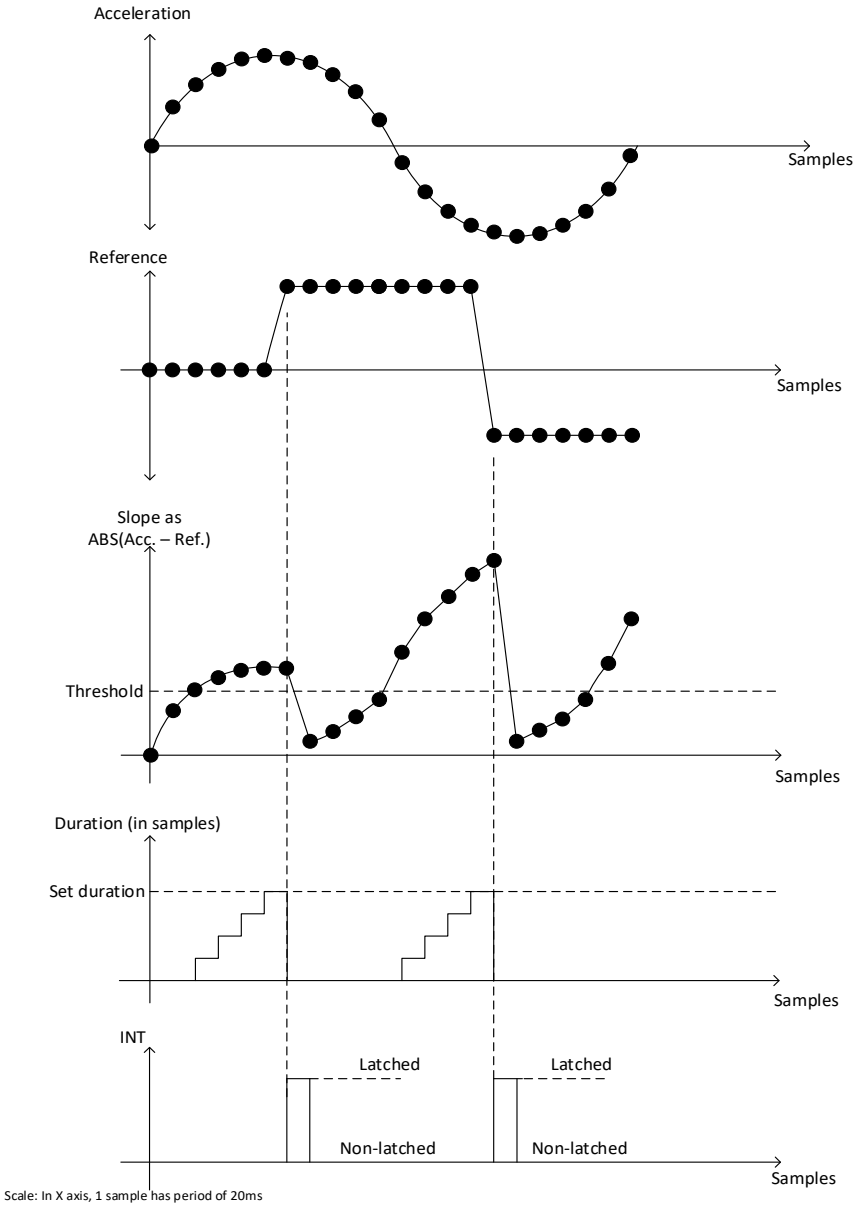

Figure 1: Signal and timing diagram for any-motion interrupt detection

Configuration settings:

1. FEATURES_IN.ANYMO_1.threshold – the slope threshold.
2. FEATURES_IN.ANYMO_2.duration – the number of consecutive data points for which the threshold condition must be respected, for interrupt assertion.
3. FEATURES_IN.ANYMO_2.x_en – indicates if this feature is enabled for x axis
4. FEATURES_IN.ANYMO_2.y_en – indicates if this feature is enabled for y axis
5. FEATURES_IN.ANYMO_2.z_en –indicates if this feature is enabled for z axis

2.2. No Motion Detection

No-motion detection uses the slope between two consecutive acceleration signal samples to detect static state of the device. Feature can be enabled by setting at least one of the following flags: FEATURES_IN.NOMO_2.x_en, FEATURES_IN.NOMO_2.y_en and FEATURES_IN.NOMO_2.z_en, respectively for each axis.

No-motion interrupt is triggered when the slope on all enabled sensing axis remains smaller than the configurable FEATURES_IN.NOMO_1.threshold for the duration configured by FEATURES_IN.NOMO_2.duration. No-motion interrupt is cleared as soon as the acceleration slope exceeds the set threshold. The signals and timings relevant to the no-motion interrupt functionality are depicted in the figure below.

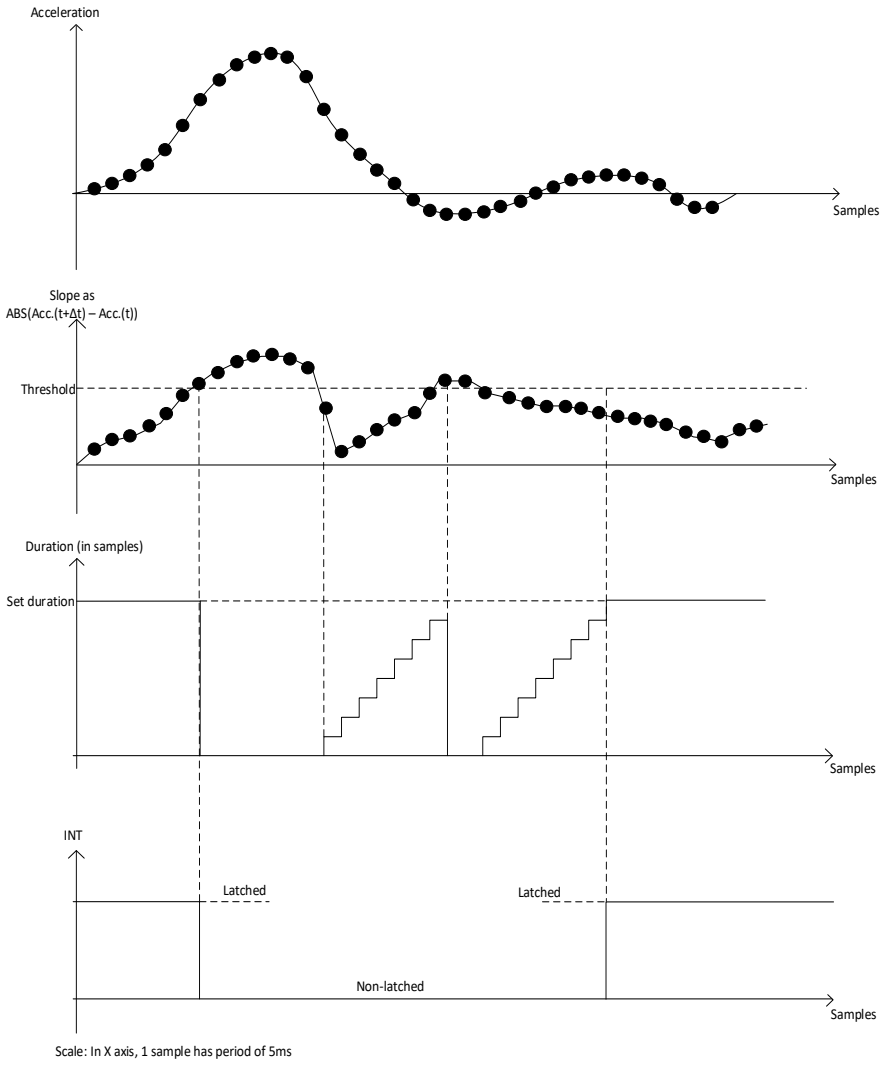

Figure 2: Signal and timing diagram for no-motion interrupt detection

Register FEATURES_IN.NOMO_2.duration defines the number of consecutive data points for which the slope of enabled axis must be smaller than the threshold for an interrupt to be asserted.
Configuration settings:

1. FEATURES_IN.NOMO_1.threshold – the slope threshold.
2. FEATURES_IN.NOMO_2.duration – the number of consecutive data points for which the threshold condition must be respected, for interrupt assertion.
3. FEATURES_IN.NOMO_2.x_en – indicates if this feature is enabled for x axis
4. FEATURES_IN.NOMO_2.y_en – indicates if this feature is enabled for y axis
5. FEATURES_IN.NOMO_2.z_en –indicates if this feature is enabled for z axis

Note: The firmware image with any motion and no motion feature set mentioned in this application note is available for download under the following link - https://github.com/BoschSensortec

3. Register Description

3.1. Register Map

read/write	read only	write only	reserved

Corresponding to BMA456-490_image.tbin version 1.0, register map version 1.0

Register Address	Register Name	Default Value	7	6	5	4	3	2	1	0
0x7E	CMD	0x00	cmd							
0x7D	PWR_CTRL	0x00	reserved					acc_en	reserved	aux_en
0x7C	PWR_CONF	0x03	reserved						fifo_self_wakeup	adv_power_save
0x7B	-	-	reserved							
...	-	-	reserved							
0x74	-	-	reserved							
0x73	OFFSET_2	0x00	off_acc_z							
0x72	OFFSET_1	0x00	off_acc_y							
0x71	OFFSET_0	0x00	off_acc_x							
0x70	NV_CONF	0x00	reserved				acc_off_en	i2c_wdt_en	i2c_wdt_sel	spi_en
0x6F	-	-	reserved							
0x6E	-	-	reserved							
0x6D	ACC_SELF_TEST	0x00	reserved				acc_self_test_amp	acc_self_test_sign	reserved	acc_self_test_en
0x6C	-	-	reserved							
0x6B	IF_CONF	0x00	reserved			if_mode	reserved			spi3
0x6A	NVM_CONF	0x00	reserved						nvm_prog_en	reserved
0x69	-	-	reserved							
...	-	-	reserved							
0x60	-	-	reserved							
0x5F	INTERNAL_ERROR	0x00	reserved					int_err_2	int_err_1	reserved
0x5E	FEATURES_IN	0x00	features_in							
0x5D	-	-	reserved							
...	-	-	reserved							
0x5A	-	-	reserved							

0x59	INIT_CTRL	0x90	init_ctrl							
0x58	INT_MAP_DATA	0x00	reserved	int2_drdy	int2_fwm	int2_ffull	reserved	int1_drdy	int1_fwm	int1_ffull
0x57	INT2_MAP	0x00	error_int_out	no_motion_out	any_motion_out	reserved				
0x56	INT1_MAP	0x00	error_int_out	no_motion_out	any_motion_out	reserved				
0x55	INT_LATCH	0x00	reserved							int_latch
0x54	INT2_IO_CTRL	0x00	reserved			input_en	output_en	od	lvl	edge_ctrl
0x53	INT1_IO_CTRL	0x00	reserved			input_en	output_en	od	lvl	edge_ctrl
0x52	-	-	reserved							
...	-	-	reserved							
0x50	-	-	reserved							
0x4F	AUX_WR_DATA	0x02	write_data							
0x4E	AUX_WR_ADDR	0x4C	write_addr							
0x4D	AUX_RD_ADDR	0x42	read_addr							
0x4C	AUX_IF_CONF	0x83	aux_manual_en	reserved					aux_rd_burst	
0x4B	AUX_DEV_ID	0x20	i2c_device_addr							reserved
0x4A	-	-	reserved							
0x49	FIFO_CONFIG_1	0x10	reserved	fifo_acc_en	fifo_aux_en	fifo_header_en	fifo_tag_int1_en	fifo_tag_int2_en	reserved	
0x48	FIFO_CONFIG_0	0x02	reserved						fifo_time_en	fifo_stop_on_full
0x47	FIFO_WTM_1	0x02	reserved			fifo_water_mark_12_8				
0x46	FIFO_WTM_0	0x00	fifo_water_mark_7_0							
0x45	FIFO_DOWNS	0x80	acc_fifo_filt_data	acc_fifo_downs		reserved				
0x44	AUX_CONF	0x46	aux_offset			aux_odr				
0x43	-	-	reserved							
0x42	-	-	reserved							
0x41	ACC_RANGE	0x01	reserved						acc_range	

0x40	ACC_CONF	0xA8	acc_perf_mode	acc_bwp			acc_odr	
0x3F	-	-	reserved					
...	-	-	reserved					
0x2B	-	-	reserved					
0x2A	INTERNAL_STATUS	0x00	odr_high_error	odr_50Hz_error	axes_remap_error	alp_state	message	
0x29	-	-	reserved					
...	-	-	reserved					
0x27	-	-	reserved					
0x26	FIFO_DATA	0x00	fifo_data					
0x25	FIFO_LENGTH_1	0x00	reserved		fifo_byte_counter_13_8			
0x24	FIFO_LENGTH_0	0x00	fifo_byte_counter_7_0					
0x23	-	-	reserved					
0x22	TEMPERATURE	0x00	temperature					
0x21	-	-	reserved					
0x20	-	-	reserved					
0x1F	-	-	reserved					
0x1E	-	-	reserved					
0x1D	INT_STATUS_1	0x00	acc_drdy_int	reserved	aux_drdy_int	reserved	fwm_int	ffull_int
0x1C	INT_STATUS_0	0x00	error_int_out	no_motion_out	any_motion_out	reserved		
0x1B	EVENT	0x01	reserved					por_detected
0x1A	SENSORTIME_2	0x00	sensor_time_23_16					
0x19	SENSORTIME_1	0x00	sensor_time_15_8					
0x18	SENSORTIME_0	0x00	sensor_time_7_0					
0x17	DATA_13	0x00	acc_z_15_8					
0x16	DATA_12	0x00	acc_z_7_0					
0x15	DATA_11	0x00	acc_y_15_8					

0x14	DATA_10	0x00	acc_y_7_0							
0x13	DATA_9	0x00	acc_x_15_8							
0x12	DATA_8	0x00	acc_x_7_0							
0x11	DATA_7	0x00	aux_r_15_8							
0x10	DATA_6	0x00	aux_r_7_0							
0x0F	DATA_5	0x00	aux_z_15_8							
0x0E	DATA_4	0x00	aux_z_7_0							
0x0D	DATA_3	0x00	aux_y_15_8							
0x0C	DATA_2	0x00	aux_y_7_0							
0x0B	DATA_1	0x00	aux_x_15_8							
0x0A	DATA_0	0x00	aux_x_7_0							
0x09	-	-	reserved							
...	-	-	reserved							
0x04	-	-	reserved							
0x03	STATUS	0x10	drdy_acc	reserved	drdy_aux	cmd_rdy	reserved	aux_man_op	reserved	
0x02	ERR_REG	0x00	aux_err	fifo_err	reserved	error_code			cmd_err	fatal_err
0x01	-	-	reserved							
0x00	CHIP_ID	0x16	chip_id							

FEATURES_IN

Register Address	**Register Name**	**Default Value**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x5E:0x0B	general_settings.axes_remapping[1]	0x00	reserved							map_z_axis_sign
0x5E:0x0A	general_settings.axes_remapping[0]	0x88	map_z_axis		map_y_axis_sign	map_y_axis		map_x_axis_sign	map_x_axis	
0x5E:0x09	general_settings.Reserved[1]	0x00	Reserved							
0x5E:0x08	general_settings.Reserved[0]	0x00	Reserved							
0x5E:0x07	no_motion.NOMO_2[1]	0x00	z_en	y_en	x_en	duration				
0x5E:0x06	no_motion.NOMO_2[0]	0x05	duration							

0x5E: 0x05	no_motion.NOMO_1[1]	0x00	reserved			threshold
0x5E: 0x04	no_motion.NOMO_1[0]	0xAA	threshold			
0x5E: 0x03	any_motion.ANYMO_2[1]	0x00	z_en	y_en	x_en	duration
0x5E: 0x02	any_motion.ANYMO_2[0]	0x05	duration			
0x5E: 0x01	any_motion.ANYMO_1[1]	0x00	reserved			threshold
0x5E: 0x00	any_motion.ANYMO_1[0]	0xAA	threshold			

3.1.1 Register (0x00) CHIP_ID

DESCRIPTION: Chip identification code
RESET: 0x16
DEFINITION (Go to register map):

Name	**Register (0x00) CHIP_ID**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	1
Content	chip_id			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	1	1	0
Content	chip_id			

chip_id: Chip identification code for BMA456.

3.1.2 Register (0x02) ERR_REG

DESCRIPTION: Reports sensor error conditions
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x02) ERR_REG**			
Bit	7	6	5	4
Read/Write	R	R	n/a	R
Reset Value	0	0	0	0

Content	aux_err	fifo_err	reserved	error_code
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	error_code		cmd_err	fatal_err

fatal_err: Fatal Error, chip is not in operational state (Boot-, power-system). This flag will be reset only by power-on-reset or softreset.
cmd_err: Command execution failed.
error_code: Error codes for persistent errors

error_code		
0x00	no_error	no error is reported
0x01	acc_err	error in Register ACC_CONF

fifo_err: Error in FIFO detected: Input data was discarded in stream mode. This flag will be reset when read.
aux_err: Error in I2C-Master detected. This flag will be reset when read.

3.1.3 Register (0x03) STATUS

DESCRIPTION: Sensor status flags
RESET: 0x10
DEFINITION (Go to register map):

Name	**Register (0x03) STATUS**			
Bit	7	6	5	4
Read/Write	R	n/a	R	R
Reset Value	0	0	0	1
Content	drdy_acc	reserved	drdy_aux	cmd_rdy
Bit	3	2	1	0
Read/Write	n/a	R	n/a	n/a
Reset Value	0	0	0	0
Content	reserved	aux_man_op	reserved	

aux_man_op: ‘1’(‘0’) indicate a (no) manual auxiliary interface operation is ongoing.
cmd_rdy: CMD decoder status. `0´ -> Command in progress `1´ -> Command decoder is ready to accept a new command
drdy_aux: Data ready for auxiliary sensor. It gets reset when one auxiliary DATA register is read out
drdy_acc: Data ready for accelerometer. It gets reset when one accelerometer DATA register is read out

3.1.4 Register (0x0A) DATA_0

DESCRIPTION: AUX_X(LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x0A) DATA_0**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_x_7_0			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_x_7_0			

3.1.5 Register (0x0B) DATA_1

DESCRIPTION: AUX_X(MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x0B) DATA_1**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_x_15_8			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_x_15_8			

3.1.6 Register (0x0C) DATA_2

DESCRIPTION: AUX_Y(LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x0C) DATA_2**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_y_7_0			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_y_7_0			

3.1.7 Register (0x0D) DATA_3

DESCRIPTION: AUX_Y(MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x0D) DATA_3**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_y_15_8			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_y_15_8			

3.1.8 Register (0x0E) DATA_4

DESCRIPTION: AUX_Z(LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x0E) DATA_4**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_z_7_0			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_z_7_0			

3.1.9 Register (0x0F) DATA_5

DESCRIPTION: AUX_Z(MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x0F) DATA_5**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_z_15_8			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_z_15_8			

3.1.10 Register (0x10) DATA_6

DESCRIPTION: AUX_R(LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x10) DATA_6**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_r_7_0			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_r_7_0			

3.1.11 Register (0x11) DATA_7

DESCRIPTION: AUX_R(MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x11) DATA_7**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_r_15_8			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	aux_r_15_8			

3.1.12 Register (0x12) DATA_8

DESCRIPTION: ACC_X(LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x12) DATA_8**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_x_7_0			
Bit	3	2	1	0

Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_x_7_0			

3.1.13 Register (0x13) DATA_9

DESCRIPTION: ACC_X(MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x13) DATA_9**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_x_15_8			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_x_15_8			

3.1.14 Register (0x14) DATA_10

DESCRIPTION: ACC_Y(LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x14) DATA_10**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_y_7_0			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_y_7_0			

3.1.15 Register (0x15) DATA_11

DESCRIPTION: ACC_Y(MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x15) DATA_11**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_y_15_8			

Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_y_15_8			

3.1.16 Register (0x16) DATA_12

DESCRIPTION: ACC_Z(LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x16) DATA_12**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_z_7_0			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_z_7_0			

3.1.17 Register (0x17) DATA_13

DESCRIPTION: ACC_Z(MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x17) DATA_13**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_z_15_8			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	acc_z_15_8			

3.1.18 Register (0x18) SENSORTIME_0

DESCRIPTION: Sensor time <7:0>
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x18) SENSORTIME_0**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	sensor_time_7_0			

Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	sensor_time_7_0			

sensor_time_7_0: Sensor time <7:0> in units of 39.0625 us.

3.1.19 Register (0x19) SENSORTIME_1

DESCRIPTION: Sensor time <15:8>
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x19) SENSORTIME_1**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	sensor_time_15_8			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	sensor_time_15_8			

sensor_time_15_8: Sensor time <15:8> in units of 10 ms.

3.1.20 Register (0x1A) SENSORTIME_2

DESCRIPTION: Sensor time <23:16>
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x1A) SENSORTIME_2**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	sensor_time_23_16			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	sensor_time_23_16			

sensor_time_23_16: Sensor time <23:16> in units of 2.56 s.

3.1.21 Register (0x1B) EVENT

DESCRIPTION: Sensor status flags
RESET: 0x01
DEFINITION (Go to register map):

Name	**Register (0x1B) EVENT**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a

Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	n/a	n/a	R
Reset Value	0	0	0	1
Content	reserved			por_detected

por_detected: '1' after device power up or softreset. Clear-on-read

3.1.22 Register (0x1C) INT_STATUS_0

DESCRIPTION: Interrupt/Feature status. This register will be cleared on read.
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x1C) INT_STATUS_0**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	error_int_out	no_motion_out	any_motion_out	reserved
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	reserved			

any_motion_out: Any-motion detection output
no_motion_out: No-motion detection output
error_int_out: Error interrupt output

3.1.23 Register (0x1D) INT_STATUS_1

DESCRIPTION: Interrupt Status. This register will be cleared on read.
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x1D) INT_STATUS_1**			
Bit	7	6	5	4
Read/Write	R	n/a	R	n/a
Reset Value	0	0	0	0
Content	acc_drdy_int	reserved	aux_drdy_int	reserved
Bit	3	2	1	0
Read/Write	n/a	n/a	R	R
Reset Value	0	0	0	0
Content	reserved		fwm_int	ffull_int

ffull_int: FIFO Full Interrupt
fwm_int: FIFO Watermark Interrupt
aux_drdy_int: Auxiliary sensor data ready interrupt
acc_drdy_int: Accelerometer data ready interrupt

3.1.24 Register (0x22) TEMPERATURE

DESCRIPTION: Contains the temperature value of the sensor
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x22) TEMPERATURE**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	temperature			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	temperature			

temperature: Temperature value in two's complement representation in units of 1 Kelvin: 0x00 corresponds to 23 degree Celsius.

3.1.25 Register (0x24) FIFO_LENGTH_0

DESCRIPTION: FIFO byte count register (LSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x24) FIFO_LENGTH_0**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	fifo_byte_counter_7_0			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	fifo_byte_counter_7_0			

fifo_byte_counter_7_0: Current fill level of FIFO buffer.

3.1.26 Register (0x25) FIFO_LENGTH_1

DESCRIPTION: FIFO byte count register (MSB)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x25) FIFO_LENGTH_1**			
Bit	7	6	5	4
Read/Write	n/a	n/a	R	R
Reset Value	0	0	0	0
Content	reserved		fifo_byte_counter_13_8	
Bit	3	2	1	0

Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	fifo_byte_counter_13_8			

fifo_byte_counter_13_8: FIFO byte counter bits 13..8

3.1.27 Register (0x26) FIFO_DATA

DESCRIPTION: FIFO data output register
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x26) FIFO_DATA**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	fifo_data			
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	fifo_data			

fifo_data: FIFO read data, for burst read.

3.1.28 Register (0x2A) INTERNAL_STATUS

DESCRIPTION: Error bits and message indicating internal status
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x2A) INTERNAL_STATUS**			
Bit	7	6	5	4
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	odr_high_error	odr_50Hz_error	axes_remap_error	alp_state
Bit	3	2	1	0
Read/Write	R	R	R	R
Reset Value	0	0	0	0
Content	message			

message: Internal Status Message

message		
0x00	not_init	ASIC is not initialized
0x01	init_ok	ASIC initialized
0x02	init_err	Initialization error
0x03	drv_err	Invalid driver
0x04	sns_stop	Sensor stopped

alp_state: Indicates the current state of auto low power mode

alp_state		
0x00	auto_wake	Wake state, where all enabled features shall be processed
0x01	auto_sleep	Sleep state, where any motion and no motion shall be processed

axes_remap_error: Incorrect axes remapping. X,Y,Z axes must be mapped to exclusively separate axes i.e. they cannot be mapped to same axes.

odr_50Hz_error: The minimum bandwidth conditions are not respected for the features which require 50Hz data

odr_high_error: The minimum bandwidth conditions are not respected for the features which require 200Hz data

3.1.29 Register (0x40) ACC_CONF

DESCRIPTION: Sets the output data rate, the bandwidth, and the performance mode of the acceleration sensor

RESET: 0xA8

DEFINITION (Go to register map):

Name	**Register (0x40) ACC_CONF**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	1	0	1	0
Content	acc_perf_mode	acc_bwp		
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	1	0	0	0
Content	acc_odr			

acc_odr: ODR in Hz. The output data rate is independent of the power mode setting for the sensor, but not all settings are supported in all power modes.

acc_odr		
0x00	reserved	Reserved
0x01	odr_0p78	25/32
0x02	odr_1p5	25/16
0x03	odr_3p1	25/8
0x04	odr_6p25	25/4
0x05	odr_12p5	25/2
0x06	odr_25	25
0x07	odr_50	50
0x08	odr_100	100
0x09	odr_200	200
0x0a	odr_400	400
0x0b	odr_800	800
0x0c	odr_1k6	1600
0x0d	odr_3k2	Reserved
0x0e	odr_6k4	Reserved

0x0f	odr_12k8	Reserved

acc_bwp: Bandwidth parameter, determines filter configuration (acc_perf_mode=1) and averaging for undersampling mode (acc_perf_mode=0)

acc_bwp		
0x00	osr4_avg1	acc_perf_mode = 1 -> OSR4 mode; acc_perf_mode = 0 -> no averaging
0x01	osr2_avg2	acc_perf_mode = 1 -> OSR2 mode; acc_perf_mode = 0 -> average 2 samples
0x02	norm_avg4	acc_perf_mode = 1 -> normal mode; acc_perf_mode = 0 -> average 4 samples
0x03	cic_avg8	acc_perf_mode = 1 -> Reserved; acc_perf_mode = 0 -> average 8 samples
0x04	res_avg16	acc_perf_mode = 1 -> Reserved; acc_perf_mode = 0 -> average 16 samples
0x05	res_avg32	acc_perf_mode = 1 -> Reserved; acc_perf_mode = 0 -> average 32 samples
0x06	res_avg64	acc_perf_mode = 1 -> Reserved; acc_perf_mode = 0 -> average 64 samples
0x07	res_avg128	acc_perf_mode = 1 -> Reserved; acc_perf_mode = 0 -> average 128 samples

acc_perf_mode: Select accelerometer filter performance mode:

acc_perf_mode		
0x00	cic_avg	averaging mode.
0x01	cont	continuous filter function.

3.1.30 Register (0x41) ACC_RANGE

DESCRIPTION: Selection of the Accelerometer g-range
RESET: 0x01
DEFINITION (Go to register map):

Name	**Register (0x41) ACC_RANGE**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	n/a	RW	RW
Reset Value	0	0	0	1
Content	reserved		acc_range	

acc_range: Accelerometer g-range

acc_range		
0x00	range_2g	+/-2g
0x01	range_4g	+/-4g
0x02	range_8g	+/-8g
0x03	range_16g	+/-16g

3.1.31 Register (0x44) AUX_CONF

DESCRIPTION: Sets the output data rate of the Auxiliary interface
RESET: 0x46
DEFINITION (Go to register map):

Name	**Register (0x44) AUX_CONF**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	1	0	0
Content	aux_offset			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	1	1	0
Content	aux_odr			

aux_odr: Select the poll rate for the sensor attached to the Auxiliary interface.

aux_odr		
0x00	reserved	Reserved
0x01	odr_0p78	25/32
0x02	odr_1p5	25/16
0x03	odr_3p1	25/8
0x04	odr_6p25	25/4
0x05	odr_12p5	25/2
0x06	odr_25	25
0x07	odr_50	50
0x08	odr_100	100
0x09	odr_200	200
0x0a	odr_400	400
0x0b	odr_800	800
0x0c	odr_1k6	Reserved
0x0d	odr_3k2	Reserved
0x0e	odr_6k4	Reserved
0x0f	odr_12k8	Reserved

aux_offset: trigger-readout offset in units of 2.5 ms. If set to zero, the offset is maximum, i.e. after readout a trigger is issued immediately.

3.1.32 Register (0x45) FIFO_DOWNS

DESCRIPTION: Configure Accelerometer downsampling rates for FIFO
RESET: 0x80
DEFINITION (Go to register map):

Name	**Register (0x45) FIFO_DOWNS**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW

Reset Value	1	0	0	0
Content	acc_fifo_filt_data	acc_fifo_downs		
Bit	3	2	1	0
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			

acc_fifo_downs: Downsampling for accelerometer data (2**acc_fifo_downs)
acc_fifo_filt_data: selects filtered or unfiltered Accelerometer data for fifo

acc_fifo_filt_data		
0x00	unfiltered	Unfiltered data
0x01	filtered	Filtered data

3.1.33 Register (0x46) FIFO_WTM_0

DESCRIPTION: FIFO Watermark level LSB
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x46) FIFO_WTM_0**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	fifo_water_mark_7_0			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	fifo_water_mark_7_0			

3.1.34 Register (0x47) FIFO_WTM_1

DESCRIPTION: FIFO Watermark level MSB
RESET: 0x02
DEFINITION (Go to register map):

Name	**Register (0x47) FIFO_WTM_1**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	RW
Reset Value	0	0	0	0
Content	reserved			fifo_water_mark_12_8
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	1	0
Content	fifo_water_mark_12_8			

3.1.35 Register (0x48) FIFO_CONFIG_0

DESCRIPTION: FIFO frame content configuration
RESET: 0x02
DEFINITION (Go to register map):

Name	**Register (0x48) FIFO_CONFIG_0**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	n/a	RW	RW
Reset Value	0	0	1	0
Content	reserved		fifo_time_en	fifo_stop_on_full

fifo_stop_on_full: Stop writing samples into FIFO when FIFO is full.

fifo_stop_on_full		
0x00	disable	do not stop writing to FIFO when full
0x01	enable	Stop writing into FIFO when full.

fifo_time_en: Return sensortime frame after the last valid data frame.

fifo_time_en		
0x00	disable	do not return sensortime frame
0x01	enable	return sensortime frame

3.1.36 Register (0x49) FIFO_CONFIG_1

DESCRIPTION: FIFO frame content configuration
RESET: 0x10
DEFINITION (Go to register map):

Name	**Register (0x49) FIFO_CONFIG_1**			
Bit	7	6	5	4
Read/Write	n/a	RW	RW	RW
Reset Value	0	0	0	1
Content	reserved	fifo_acc_en	fifo_aux_en	fifo_header_en
Bit	3	2	1	0
Read/Write	RW	RW	n/a	n/a
Reset Value	0	0	0	0
Content	fifo_tag_int1_en	fifo_tag_int2_en	reserved	

fifo_tag_int2_en: FIFO interrupt 2 tag enable

fifo_tag_int2_en		
0x00	disable	disable tag
0x01	enable	enable tag

fifo_tag_int1_en: FIFO interrupt 1 tag enable

fifo_tag_int1_en		
0x00	disable	disable tag
0x01	enable	enable tag

fifo_header_en: FIFO frame header enable

fifo_header_en		
0x00	disable	no header is stored (output data rate of all enabled sensors need to be identical)
0x01	enable	header is stored

fifo_aux_en: Store Auxiliary data in FIFO (all 3 axes)

fifo_aux_en		
0x00	disable	no Auxiliary data is stored
0x01	enable	Auxiliary data is stored

fifo_acc_en: Store Accelerometer data in FIFO (all 3 axes)

fifo_acc_en		
0x00	disable	no Accelerometer data is stored
0x01	enable	Accelerometer data is stored

3.1.37 Register (0x4B) AUX_DEV_ID

DESCRIPTION: Auxiliary interface slave device id
RESET: 0x20
DEFINITION (Go to register map):

Name	**Register (0x4B) AUX_DEV_ID**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	1	0
Content	i2c_device_addr			
Bit	3	2	1	0
Read/Write	RW	RW	RW	n/a
Reset Value	0	0	0	0
Content	i2c_device_addr			reserved

i2c_device_addr: I2C device address of Auxiliary slave

3.1.38 Register (0x4C) AUX_IF_CONF

DESCRIPTION: Auxiliary interface configuration
RESET: 0x83
DEFINITION (Go to register map):

Name	**Register (0x4C) AUX_IF_CONF**			
Bit	7	6	5	4
Read/Write	RW	n/a	n/a	n/a
Reset Value	1	0	0	0
Content	aux_manual_en	reserved		
Bit	3	2	1	0
Read/Write	n/a	n/a	RW	RW
Reset Value	0	0	1	1
Content	reserved		aux_rd_burst	

aux_rd_burst: Burst data length (1,2,6,8 byte)

aux_rd_burst		
0x00	BL1	Burst length 1
0x01	BL2	Burst length 2
0x02	BL6	Burst length 6
0x03	BL8	Burst length 8

aux_manual_en: Enable auxiliary interface manual mode.

aux_manual_en		
0x00	disable	Data mode
0x01	enable	Setup mode

3.1.39 Register (0x4D) AUX_RD_ADDR

DESCRIPTION: Auxiliary interface read register address
RESET: 0x42
DEFINITION (Go to register map):

Name	**Register (0x4D) AUX_RD_ADDR**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	1	0	0
Content	read_addr			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	1	0
Content	read_addr			

read_addr: Address to read

3.1.40 Register (0x4E) AUX_WR_ADDR

DESCRIPTION: Auxiliary interface write register address
RESET: 0x4C
DEFINITION (Go to register map):

Name	**Register (0x4E) AUX_WR_ADDR**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	1	0	0
Content	write_addr			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	1	1	0	0
Content	write_addr			

write_addr: Address to write

3.1.41 Register (0x4F) AUX_WR_DATA

DESCRIPTION: Auxiliary interface write data
RESET: 0x02
DEFINITION (Go to register map):

Name	**Register (0x4F) AUX_WR_DATA**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	write_data			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW

Reset Value	0	0	1	0
Content	write_data			

write_data: Data to write

3.1.42 Register (0x53) INT1_IO_CTRL

DESCRIPTION: Configure the electrical behaviour of the interrupt pins
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x53) INT1_IO_CTRL**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	RW
Reset Value	0	0	0	0
Content	reserved			input_en
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	output_en	od	lvl	edge_ctrl

edge_ctrl: Configure trigger condition of INT1 pin (input)

edge_ctrl		
0x00	level_tr	Level
0x01	edge_tr	Edge

lvl: Configure output level of INT1 pin

lvl		
0x00	active_low	active low
0x01	active_high	active high

od: Configure output behaviour of INT1 pin to open drain.

od		
0x00	push_pull	push-pull
0x01	open_drain	open drain

output_en: Output enable for INT1 pin

output_en		
0x00	off	Output disabled
0x01	on	Output enabled

input_en: Input enable for INT1 pin

input_en		
0x00	off	Input disabled
0x01	on	Input enabled

3.1.43 Register (0x54) INT2_IO_CTRL

DESCRIPTION: Configure the electrical behaviour of the interrupt pins
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x54) INT2_IO_CTRL**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	RW
Reset Value	0	0	0	0
Content	reserved			input_en
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	output_en	od	lvl	edge_ctrl

edge_ctrl: Configure trigger condition of INT2 pin (input)

edge_ctrl		
0x00	level_tr	Level
0x01	edge_tr	Edge

lvl: Configure level of INT2 pin

lvl		
0x00	active_low	active low
0x01	active_high	active high

od: Configure output behaviour of INT2 pin to open drain.

od		
0x00	push_pull	push-pull
0x01	open_drain	open drain

output_en: Output enable for INT2 pin

output_en		
0x00	off	Output disabled
0x01	on	Output enabled

input_en: Input enable for INT2 pin

input_en		
0x00	off	Input disabled
0x01	on	Input enabled

3.1.44 Register (0x55) INT_LATCH

DESCRIPTION: Configure interrupt modes
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x55) INT_LATCH**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	n/a	n/a	RW
Reset Value	0	0	0	0
Content	reserved			int_latch

int_latch: Latched/non-latched/ modes

int_latch		
0x00	none	non latched
0x01	permanent	latched

3.1.45 Register (0x56) INT1_MAP

DESCRIPTION: Interrupt/Feature mapping on INT1
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x56) INT1_MAP**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	error_int_out	no_motion_out	any_motion_out	reserved
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	reserved			

any_motion_out: Any-motion detection output
no_motion_out: No-motion detection output
error_int_out: Error interrupt output

3.1.46 Register (0x57) INT2_MAP

DESCRIPTION: Interrupt/Feature mapping on INT2
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x57) INT2_MAP**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	error_int_out	no_motion_out	any_motion_out	reserved
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	reserved			

any_motion_out: Any-motion detection output
no_motion_out: No-motion detection output
error_int_out: Error interrupt output

3.1.47 Register (0x58) INT_MAP_DATA

DESCRIPTION: Interrupt mapping hardware interrupts
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x58) INT_MAP_DATA**			
Bit	7	6	5	4
Read/Write	n/a	RW	RW	RW
Reset Value	0	0	0	0
Content	reserved	int2_drdy	int2_fwm	int2_ffull
Bit	3	2	1	0
Read/Write	n/a	RW	RW	RW
Reset Value	0	0	0	0
Content	reserved	int1_drdy	int1_fwm	int1_ffull

int1_ffull: FIFO Full interrupt mapped to INT1
int1_fwm: FIFO Watermark interrupt mapped to INT1
int1_drdy: Data Ready interrupt mapped to INT1
int2_ffull: FIFO Full interrupt mapped to INT2
int2_fwm: FIFO Watermark interrupt mapped to INT2
int2_drdy: Data Ready interrupt mapped to INT2

3.1.48 Register (0x59) INIT_CTRL

DESCRIPTION: Start initialization
RESET: 0x90
DEFINITION (Go to register map):

Name	**Register (0x59) INIT_CTRL**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	1	0	0	1
Content	init_ctrl			

Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	init_ctrl			

init_ctrl: Start initialization

3.1.49 Register (0x5E) FEATURES_IN

DESCRIPTION: Feature configuration read/write port
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x5E) FEATURES_IN**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	features_in			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	features_in			

features_in: Feature configuration read/write data

Address	**Bit**	**Name**	**Description**	**Reset**	**Access**
any_motion					
0x5E: 0x00		ANYMO_1	Any-motion detection general configuration flags - part 1	0x00AA	
	10...0	threshold	Slope threshold value for any-motion detection. Range is 0 to 1g. Default value is 0xAA = 83mg.	0xAA	RW
0x5E: 0x02		ANYMO_2	Any-motion detection general configuration flags - part 2	0x0005	
	12...0	duration	Defines the number of consecutive data points for which the threshold condition must be respected for interrupt assertion. It is expressed in 50 Hz samples (20 ms). Range is 0 to 163sec. Default value is 5=100ms.	0x5	RW
	13	x_en	Enables the feature on a per-axis basis	0x0	RW
	14	y_en	Enables the feature on a per-axis basis	0x0	RW
	15	z_en	Enables the feature on a per-axis basis	0x0	RW
no_motion					

0x5E: 0x04		NOMO_1	No-motion detection general configuration flags - part 1	0x00AA	
	10...0	threshold	Slope threshold value for no-motion detection. Range is 0 to 1g. Default value is 0xAA = 83mg.	0xAA	RW
0x5E: 0x06		NOMO_2	No-motion detection general configuration flags - part 2	0x0005	
	12...0	duration	Defines the number of consecutive data points for which the threshold condition must be respected for interrupt assertion. It is expressed in 50 Hz samples (20 ms). Range is 0 to 163sec. Default value is 5=100ms.	0x5	RW
	13	x_en	Enables the feature on a per-axis basis	0x0	RW
	14	y_en	Enables the feature on a per-axis basis	0x0	RW
	15	z_en	Enables the feature on a per-axis basis	0x0	RW
general_settings					
0x5E: 0x08		Reserved	Reserved	0x0000	
	15...0	Reserved	Reserved	0x0	R
0x5E: 0x0A		axes_remapping	Describes axes remapping	0x0088	
	1...0	map_x_axis	Map the x axis to desired axis **Value** **Name** **Description** 0x00 x axis Map to x-axis 0x01 y axis Map to y-axis 0x02 z axis Map to z-axis 0x03 reserved Map to x-axis	0x0	RW
	2	map_x_axis_sign	Map the x axis sign to the desired one **Value** **Name** **Description** 0x00 not_invert Clear this bit to not invert the x axis 0x01 inverted Set this bit to invert the x axis	0x0	RW
	4...3	map_y_axis	Map the y axis to desired axis **Value** **Name** **Description** 0x00 x axis Map to x-axis	0x1	RW

			0x01 y axis Map to y-axis 0x02 z axis Map to z-axis 0x03 reserved Map to y-axis		
	5	map_y_axis_sign	Map the y axis sign to the desired one **Value Name Description** 0x00 not_invert Clear this bit to not invert the y axis 0x01 inverted Set this bit to invert the y axis	0x0	RW
	7...6	map_z_axis	Map the z axis to desired axis **Value Name Description** 0x00 x axis Map to x-axis 0x01 y axis Map to y-axis 0x02 z axis Map to z-axis 0x03 reserved Map to z-axis	0x2	RW
	8	map_z_axis_sign	Map the z axis sign to the desired one **Value Name Description** 0x00 not_invert Clear this bit to not invert the z axis 0x01 inverted Set this bit to invert the z axis	0x0	RW

3.1.50 Register (0x5F) INTERNAL_ERROR

DESCRIPTION: Internal error flags. Value of all reserved bits should be ignored.
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x5F) INTERNAL_ERROR**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	R	R	n/a
Reset Value	0	0	0	0

Content	reserved	int_err_2	int_err_1	reserved

int_err_1: Internal error flag - long processing time, processing halted
int_err_2: Internal error flag - fatal error, processing halted

3.1.51 Register (0x6A) NVM_CONF

DESCRIPTION: NVM controller mode (Prog/Erase or Read only)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x6A) NVM_CONF**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	n/a	RW	n/a
Reset Value	0	0	0	0
Content	reserved		nvm_prog_en	reserved

nvm_prog_en: Enable NVM programming

nvm_prog_en		
0x00	disable	disable
0x01	enable	enable

3.1.52 Register (0x6B) IF_CONF

DESCRIPTION: Serial interface settings
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x6B) IF_CONF**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	RW
Reset Value	0	0	0	0
Content	reserved			if_mode
Bit	3	2	1	0
Read/Write	n/a	n/a	n/a	RW
Reset Value	0	0	0	0
Content	reserved			spi3

spi3: Configure SPI Interface Mode for primary interface

spi3		
0x00	spi4	SPI 4-wire mode
0x01	spi3	SPI 3-wire mode

if_mode: Auxiliary interface configuration

if_mode		
0x00	p_auto_s_off	Auxiliary interface:off
0x01	p_auto_s_mag	Auxilary interface:Magnetometer

3.1.53 Register (0x6D) ACC_SELF_TEST

DESCRIPTION: Settings for the sensor self-test configuration and trigger
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x6D) ACC_SELF_TEST**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	RW	RW	n/a	RW
Reset Value	0	0	0	0
Content	acc_self_test_amp	acc_self_test_sign	reserved	acc_self_test_en

acc_self_test_en: Enable accelerometer self-test

acc_self_test_en		
0x00	disabled	disabled
0x01	enabled	enabled

acc_self_test_sign: select sign of self-test excitation as

acc_self_test_sign		
0x00	negative	negative
0x01	positive	positive

acc_self_test_amp: select amplitude of the selftest deflection:

acc_self_test_amp		
0x00	low	low
0x01	high	high

3.1.54 Register (0x70) NV_CONF

DESCRIPTION: NVM backed configuration bits.
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x70) NV_CONF**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a

Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	acc_off_en	i2c_wdt_en	i2c_wdt_sel	spi_en

spi_en: disable the I2C and enable SPI for the primary interface, when it is in autoconfig mode

spi_en		
0x00	disabled	I2C enabled
0x01	enabled	I2C disabled

i2c_wdt_sel: Select timer period for I2C Watchdog

i2c_wdt_sel		
0x00	wdt_short	I2C watchdog timeout after 1.25 ms
0x01	wdt_long	I2C watchdog timeout after 40 ms

i2c_wdt_en: I2C Watchdog at the SDA pin in I2C interface mode

i2c_wdt_en		
0x00	Disable	Disable I2C watchdog
0x01	Enable	Enable I2C watchdog

acc_off_en: Add the offset defined in the off_acc_[xyz] OFFSET register to filtered and unfiltered Accelerometer data

acc_off_en		
0x00	disabled	Disabled
0x01	enabled	Enabled

3.1.55 Register (0x71) OFFSET_0

DESCRIPTION: Offset compensation for Accelerometer X-axis (NVM backed)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x71) OFFSET_0**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	off_acc_x			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	off_acc_x			

off_acc_x: Accelerometer offset compensation (X-axis).

3.1.56 Register (0x72) OFFSET_1

DESCRIPTION: Offset compensation for Accelerometer Y-axis (NVM backed)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x72) OFFSET_1**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	off_acc_y			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	off_acc_y			

off_acc_y: Accelerometer offset compensation (Y-axis).

3.1.57 Register (0x73) OFFSET_2

DESCRIPTION: Offset compensation for Accelerometer Z-axis (NVM backed)
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x73) OFFSET_2**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	off_acc_z			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	off_acc_z			

off_acc_z: Accelerometer offset compensation (Z-axis).

3.1.58 Register (0x7C) PWR_CONF

DESCRIPTION: Power mode configuration register
RESET: 0x03
DEFINITION (Go to register map):

Name	**Register (0x7C) PWR_CONF**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	n/a	RW	RW
Reset Value	0	0	1	1
Content	reserved		fifo_self_wakeup	adv_power_save

adv_power_save		
0x00	aps_off	advanced power save disabled (fast clk always enabled).
0x01	aps_on	advanced power mode enabled (slow clk is active when no measurement is ongoing.)

fifo_self_wakeup		
0x00	fsw_off	FIFO read disabled in advanced power saving mode.
0x01	fsw_on	FIFO read enabled after interrupt in advanced power saving mode.

3.1.59 Register (0x7D) PWR_CTRL

DESCRIPTION: Sensor enable register
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x7D) PWR_CTRL**			
Bit	7	6	5	4
Read/Write	n/a	n/a	n/a	n/a
Reset Value	0	0	0	0
Content	reserved			
Bit	3	2	1	0
Read/Write	n/a	RW	n/a	RW
Reset Value	0	0	0	0
Content	reserved	acc_en	reserved	aux_en

aux_en		
0x00	mag_off	Disables the auxiliary sensor.
0x01	mag_on	Enables the auxiliary sensor.

acc_en		
0x00	acc_off	Disables the Accelerometer.
0x01	acc_on	Enables the Accelerometer.

3.1.60 Register (0x7E) CMD

DESCRIPTION: Command Register
RESET: 0x00
DEFINITION (Go to register map):

Name	**Register (0x7E) CMD**			
Bit	7	6	5	4
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	cmd			
Bit	3	2	1	0
Read/Write	RW	RW	RW	RW
Reset Value	0	0	0	0
Content	cmd			

cmd: Available commands (Note: Register will always read as 0x00):

cmd		
0xa0	nvm_prog	Writes the NVM backed registers into NVM
0xb0	fifo_flush	Clears all data in the FIFO, does not change FIFO_CONFIG and FIFO_DOWNS registers
0xb6	softreset	Triggers a reset, all user configuration settings are overwritten with their default state

4. Document history and modification

Rev. No	Chapter	Description of modification/changes	Date
0.1		Document creation	April 2022

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