BMI270 Door Lock
Application Note

Application Note – BMI270 Door Lock

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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   Introduction

The BMI270 is an ultra-low power IMU optimized for wearable and door lock applications. The IMU combines precise acceleration and angular rate measurement with intelligent on-chip motion-triggered interrupt features. The 6-axis sensor combines a 16-bit triaxial gyroscope and a 16-bit triaxial accelerometer in a compact 2.5 x 3.0 x 0.83 mm^3 LGA package.

The BMI270 is a member of Bosch Sensortec's BMI260 family of IMUs. The BMI270 features Bosch's automotive-proven gyroscope technology with an improved accelerometer. Significant improvements in the BMI270 include, but are not restricted to, the overall accelerometer performance, i.e. an extremely low zero-*g* offset and sensitivity error, low temperature drifts, robustness over PCB strain and a low noise density.

The BMI270 features the industry's first self-calibrating gyroscope using motionless CRT (Component Re-Trimming) functionality to compensate for MEMS typical soldering drifts, ensuring post-soldering sensitivity errors down to ± 0.4%.

The BMI270 includes intuitive gesture, context and activity recognition with an integrated plug-and-play step counter/detector, which is optimized for accurate step counting in wrist-worn devices. The IMU is also well suited for other types of wearable devices, such as hearables, smart clothes, smart shoes, smart glasses and ankle bands.

The BMI270 is available in application-specific versions: gesture and context & activity. The 'gesture' version includes flick in/out, arm up/down, and wrist tilt features. The 'context and activity' version has advanced features for recognizing context activity and activity change, for example standing, walking and log car parking by detecting the activity change. In case none of the features are needed but FIFO size is critical, there is a Max FIFO configuration.

The BMI270 Door Lock is newly designed version for door lock applications. It includes door state detection and any/no motion detection features.

1.1   Door Lock Features

This application note describes the door lock features of BMI270. It leverages raw gyroscope data to calculate the heading angle in real-time and determine whether the door is open or closed, providing reliable status monitoring for door lock applications. Two key features are designed specifically for the door angle calculation:

- Automatic axis remapping: Dynamically aligns the sensor's coordinate system with the door's rotation axis for consistent measurements regardless of mounting orientation.
- Dedicated gyroscope calibration mechanism: Compensates for gyroscope biases and environmental factors through a dedicated calibration routine, maintaining long-term measurement stability.

For complete details regarding BMI270 specifications (e.g., pin-out, power modes, self-test, temperature sensor, Sensor Time, and FIFO), digital interfaces (primary/secondary), landing pattern, HSMI, and sensor API, refer to the following:

https://www.bosch-sensortec.com/products/motion-sensors/imus/bmi270.html

https://www.bosch-sensortec.com/media/boschsensortec/downloads/datasheets/bst-bmi270-ds000.pdf

https://github.com/BoschSensortec/BMI270-Sensor-API

2 Quick Start Guide

The purpose of this section is to help developers get started with the BMI270 by giving some basic hands-on application examples.

2.1 Notes about using the BMI270

The communication between the application processor and BMI270 will occur either over the I2C or SPI interface.

Each register read operation includes dummy bytes:

- I2C: 0
- SPI: 1

For simplicity, the dummy bytes are not shown in the examples below.

The sensor is configured for advanced power save mode after POR or soft reset. For details on the interface operation in advanced power save mode, see the description of Register PWR_CONF.adv_power_save.

Before starting the application, the BMI270 has to be properly connected to the master (AP) and powered up.

For more information about the interfaces, see BMI270 Datasheet.

2.2 First application setup example procedures

After the correct power-up by setting the correct voltage to the appropriate external pins, the BMI270 automatically enters the Power On Reset (POR) sequence. To properly use the BMI270, certain steps from the host processor front are required. The following application examples explain the most typical operations in the form of flow diagrams.

Testing communication and initializing the BMI270

a. Reading chip id CHIP_ID (0x24) (checking correct communication). The interface is coming up configured for I2C, and the initial dummy read configures it to SPI.
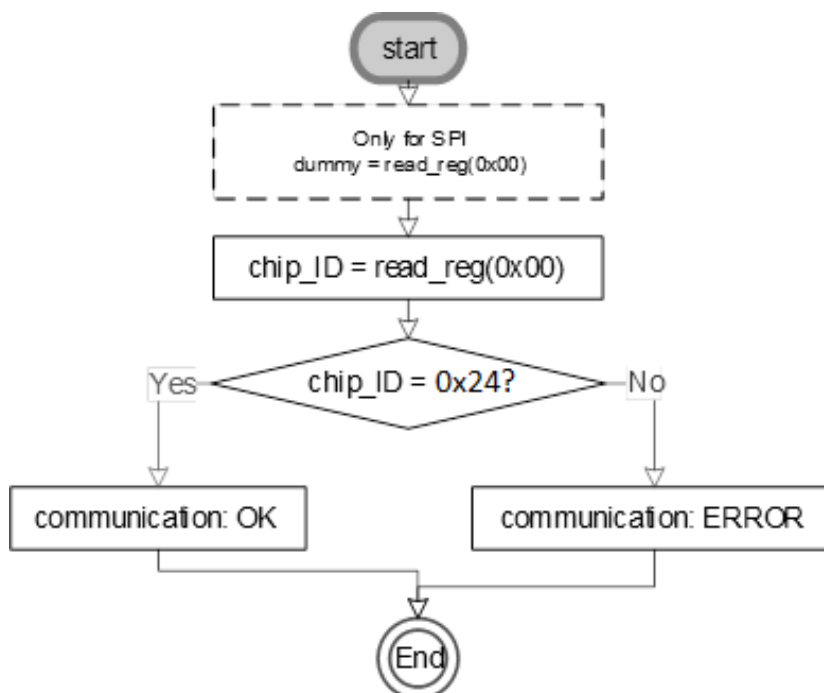
b.　Performing initialization sequence[1].

```
                          ┌─────────┐
                          │  start  │
                          └────┬────┘
                               │
                               │        disable PWR_
                               │        CONF.adv_power_save
                    ┌──────────▼──────────────┐
                    │ write_reg(addr=0x7C,val=0x00) │
                    └──────────┬──────────────┘
                               │        wait for 450us *
                          ┌────▼────────┐
                          │ sleep(450us) │
                          └────┬────────┘
                               │        prepare config load
                               │        INIT_CTRL=0x00
                    ┌──────────▼──────────────┐
                    │ write_reg(addr=0x59,val=0x00) │
                    └──────────┬──────────────┘
                               │        load config file and save
                               │        as array
                    ┌──────────▼──────────────┐
                    │ init_array[]=read_file(init_file) │
                    └──────────┬──────────────┘
                               │        burst write to
                               │        reg INIT_DATA
                               │        Start with byte 0
              ┌────────────────▼────────────────────┐
              │ burst_write_reg(addr=0x5E,val=init_array[]) │
              └────────────────┬────────────────────┘
                               │        complete config load
                               │        INIT_CTRL=0x01
                    ┌──────────▼──────────────┐
                    │ write_reg(addr=0x59,val=0x01) │
                    └──────────┬──────────────┘
                               │
                          ┌────▼────┐
                          │ ( End ) │
                          └─────────┘
```

*450us is the minimum duration (the recommended wait time is ≥ 450us).

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[1] The bmi270_config_file in https://github.com/BoschSensortec/BMI270-Sensor-API/blob/master/bmi270_dsd.c

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c. Checking the correct initialization status.
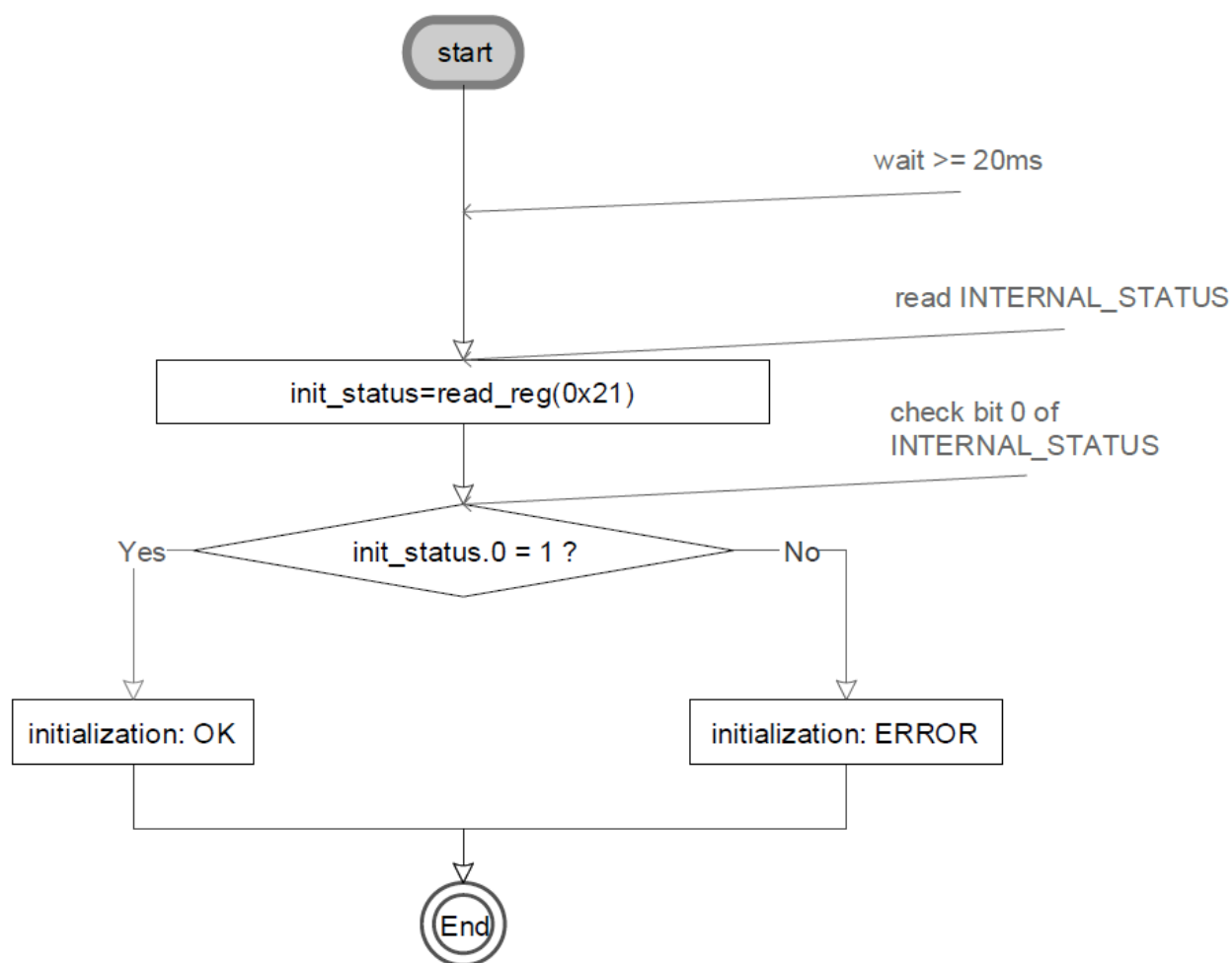
Note: For details on how to configure the BMI270 in Low-power mode/Normal mode/Performance mode, refer to the BMI270 Datasheet.

3   Functional description

3.1   System configurations

The BMI270 has 14 external I/F pins and supports SPI and I2C protocols on its primary interface to the host system. The BMI270 supports on its secondary interface (I2C master) an auxiliary sensor configuration (e.g., a magnetometer) configuration or an external OIS interface. Both configurations work independently of the configuration (SPI/I2C) of the primary interface. If the secondary I/F is configured as AUX I/F, the sensor data of the IMU and the AUX sensor are synchronized.
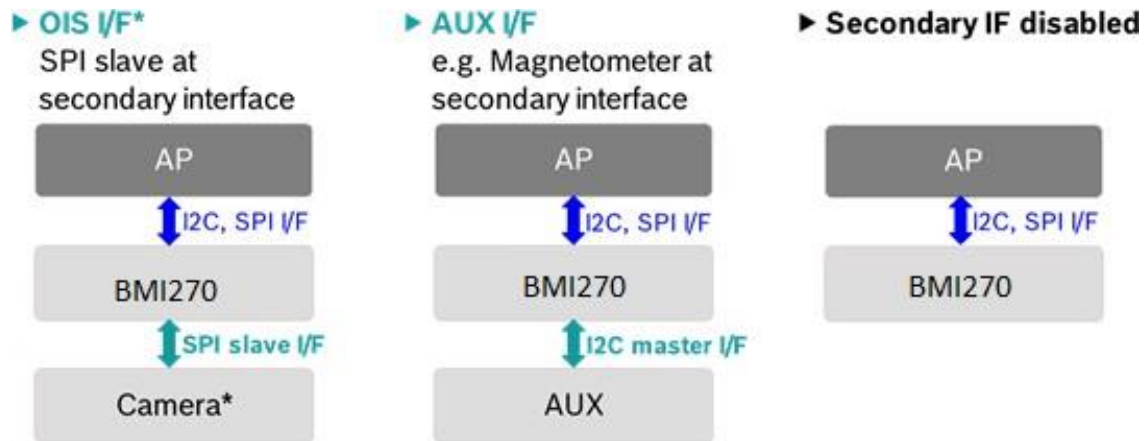
The BMI270 includes two sensors, an accelerometer, and a gyroscope. The accelerometer measures the direction and magnitude of the force applied to the sensor, reporting zero in a free fall scenario. The gyroscope measures the rotation rate, reporting zero at rest.

3.2   Block diagram
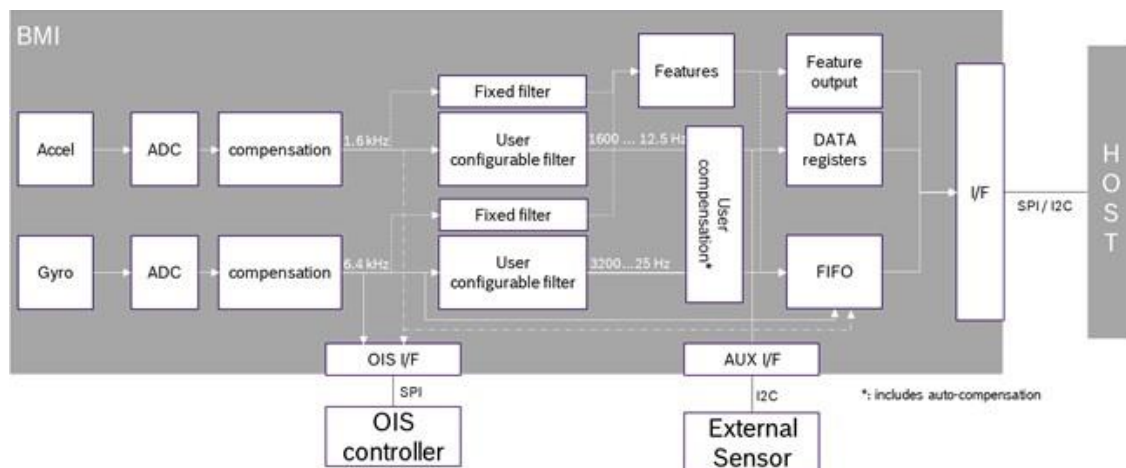
For details regarding Supply Voltage and Power Management, see BMI270 Datasheet.

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3.3 Power-On-Reset (POR) and device initialization

During POR, the voltages VDD/VDDIO are ramped up to their respective target values. After reaching the target supply voltages, all registers are accessible after a delay of 450 µs.

After every POR or soft reset, the IMU remains in suspend mode. To get ready for operation, the BMI270 must be initialized through the following procedure:

1) Interface selection (SPI only): Read an arbitrary register of the sensor, discard the read response
2) Disable advanced power save mode: PWR_CONF.adv_power_save =0b0
3) Wait for 450 µs (or 12 LSB of SENSORTIME_0)
4) Write INIT_CTRL.init_ctrl = 0x00 – to prepare config load
5) Upload the configuration file
    a. Burst write 8 KB of initialization data to Register INIT_DATA (start with byte 0 of initialization data) [2]. This requires ca. 6.6 ms at 10 MHz SPI I/F frequency. The configuration file is available on GitHub (https://github.com/BoschSensortec/BMI270-Sensor-API/blob/master/bmi270_dsd.c)
    b. Optional: Burst read the configuration file from Register INIT_DATA and check the correctness by comparing it to the data written to the register in the previous step.
6) Write INIT_CTRL.init_ctrl = 0x01– to complete the config load.
    Note: This operation **must not** be performed more than once after POR or soft reset.
7) Wait until Register INTERNAL_STATUS.message contains the value 0b0001. This will happen after at most 20 ms.

After the initialization sequence is completed, the power mode of the sensor is automatically set to "Configuration mode" . Now, it is possible to switch to other power modes.

For details regarding power modes and sensor data, see BMI270 Datasheet.

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[2] If the maximum burst write length of the host is less than 8 kB the initialization data can be written in smaller chunks. Between two write operations the Registers INIT_ADDR_0 and INIT_ADDR_1 need to be incremented by the length of the first chunk write operation in bytes/2.

3.4　FIFO

BMI270 supports the following FIFO operating modes:

- Streaming mode: overwrites oldest data on FIFO full condition
- FIFO mode: discards newest data on FIFO full condition

The FIFO size is 2 KB and supports the following interrupts:

- FIFO full interrupt
- FIFO watermark interrupt

FIFO is enabled for accelerometer data with FIFO_CONFIG_1.fifo_acc_en=0b1, for gyroscope data with FIFO_CONFIG_1.fifo_gyr_en=0b1, and auxiliary interface (e.g., magnetometer) data with FIFO_CONFIG_1.fifo_aux_en=0b1 (0b0=disabled).

The FIFO may be used in all power modes of the BMI270.

For further details on FIFO, refer to section 4.7 of the BMI270 Datasheet.

3.5   General interrupt pin configuration

3.5.1   Electrical interrupt pin behavior

Both interrupt pins, PIN1 and PIN2, can be configured to show the desired electrical behavior. Interrupt pins can be enabled in INT1_IO_CTRL.output_en and INT2_IO_CTRL.output_en. The characteristic of the output driver of the interrupt pins may be configured with bits INT1_IO_CTRL.od and INT2_IO_CTRL.od. By setting these bits to 0b1, the output driver shows the open-drive characteristic by setting the configuration bits to 0b0, the output driver shows the push-pull characteristic.
The electrical behavior of the Interrupt pins, whenever an interrupt is triggered, can be configured as either "active-high" or "active-low" via INT1_IO_CTRL.lvl or INT2_IO_CTRL.lvl.

Both interrupt pins can be configured as input pins via INT1_IO_CTRL.input_en and INT2_IO_CTRL.input_en. This is necessary when FIFO tag feature is used (see Section FIFO synchronization with external interrupts" in BMI270 datasheet). If both are enabled, the input (e.g. marking FIFO) is driven by the interrupt output.

The BMI270 supports edge and level-triggered interrupt inputs, and this can be configured through FIFO_CONFIG_1.fifo_tag_int1_en and FIFO_CONFIG_1.fifo_tag_int2_en.

The BMI270 supports non-latched and latched interrupt modes for data ready, FIFO watermark, FIFO full, error, and the advanced feature interrupts. The mode is selected by INT_LATCH.int_latch. Non-latched interrupts are designed for systems using edge-triggered interrupts, and latched interrupts are designed for systems using level-triggered interrupts.

In latched mode, an asserted interrupt status in INT_STATUS_0 (advanced feature interrupts) or INT_STATUS_1 (data ready, FIFO, and error interrupts) and the selected pin are reset if the corresponding status register is read. If the interrupt activation condition still holds when the interrupt is reset, the interrupt status and pin are asserted again. If more than one interrupt pin is used in latched mode, all interrupts in INT_STATUS_0 should be mapped to one interrupt pin, and all interrupts in INT_STATUS_1 should be mapped to the other interrupt pin. If just one interrupt pin is used, all interrupts may be mapped to this interrupt pin.

In the non-latched mode, the selected pin is reset as soon as the activation condition is no longer valid. The interrupt status bits are active until read by the host.

3.5.2   Interrupt pin mapping

The data ready, FIFO watermark, FIFO full, error, and the advanced feature interrupts are mapped to the external INT1 or INT2 pins by setting the corresponding bits in the Registers INT_MAP_DATA, INT1_MAP_FEAT and INT2_MAP_FEAT. The corresponding bits must be reset to unmap these interrupts.

Once an interrupt triggers the output pin, the host can derive the source of the interrupt of the corresponding status bit in the Register: INT_STATUS_0 and INT_STATUS_1.

3.6   Advanced features

3.6.1   Global configuration

The configuration of the interrupt feature engine is described in the Registers FEATURES. These registers are partitioned into several pages. The page valid for the next read or write to the Registers FEATURES is selected by the Register FEAT_PAGE.page. Writes to a FEATURES register must be 16-bit word-oriented, i.e., writes should start at an even address (2m), and the last byte written should be at an odd address (2n+1), where 0x30<=2m<=2n<0x3F. If the write start address is less than 0x30, the write may start at any address (see example 4 below). If the end address is greater than 0x3F, it may stop at any address (see example 5 below).

- For register writes that stop at an even SPI address (2n), the data at the odd SPI address (2n+1) are undefined (see Example 2, 3 below)
- For writes that start at an odd SPI address (2m+1), the data at the even address (2m) are undefined. (see Example 3 below)

Ex. 1) Write 4 bytes starting at address 0x30

0x30	Valid Data
0x31	Valid Data
0x32	Valid Data
0x33	Valid Data

Ex. 2) Write 3 bytes starting at address 0x30

0x30	Valid Data
0x31	Valid Data
0x32	Valid Data
0x33	Undefined

Ex. 3) Write 2 bytes starting at address 0x31

0x30	Undefined
0x31	Valid Data
0x32	Valid Data
0x33	Undefined

Ex. 4) Write 9 bytes starting at address 0x29

0x29	Valid Data
0x2A	Valid Data
...	...
0x2E	Valid Data
0x2F	Valid Data
0x30	Valid Data
0x31	Valid Data

Ex. 5) Write 5 bytes starting at address 0x3E

0x3E	Valid Data
0x3F	Valid Data
0x40	Valid Data
0x41	Valid Data
0x42	Valid Data
...	...

Make sure the sensor is initialized properly before the feature configuration is performed (see description in section 3.3.)

Some features generate interrupts. INT1_MAP_FEAT and INT2_MAP_FEAT configure these features. INT_STATUS_0 reports the interrupt source.

Minimum Bandwidth Settings

If the filter performance of the accelerometer is configured to high performance (ACC_CONF.acc_filter_perf is 0b1), the features operate at the highest performance independent of the ODR and the bandwidth set by the host.
If the filter performance of the accelerometer is configured to low power (ACC_CONF.acc_filter_perf is 0b0), the feature performance depends on the ODR and the averaging factor(ACC_CONF.acc_bwp) set by the host. The ODR must be set to a minimum of 50 Hz.

If the sensor configuration does not meet the minimum requirements, the corresponding flag in the Register INTERNAL_STATUS is set if one of the advanced features is enabled. In this case, the features are still evaluated, and the same number of samples are evaluated but sampled at the lower rate.

Error Interrupts

The BMI270 supports an error interrupt, which triggers if the sensor cannot be recovered without a soft reset or a POR. This error interrupt is enabled through INT_MAP_DATA. The interrupt status is available in INT_STATUS_1.err_int. After restarting a sensor, reinitialization must be done.

Axis remapping for interrupt features

If the coordinate system of the end device differs from the sensor coordinate system, the sensor axis must be remapped to use the orientation-dependent features (e.g., any/no motion interrupt) properly.

The axis remapping register allows the host to freely map individual axes to the coordinate system of the used platform. Individual axes can be mapped to any other defined axis. The sign value of the axis can also be configured. For example, the x axis can be mapped to the −x axis, +y axis, - y axis, +z axis, or −z axis. Similarly, other axes also have their combinations.

Invalid remappings are signaled through the register INTERNAL_STATUS.axes_remap_error if an advanced feature is enabled.

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

Configuration settings:
1.   GEN_SET_1.map_x_axis − describes which axis shall be mapped to the x-axis.
2.   GEN_SET_1.map_x_axis_sign − describes whether the mapped axis shall be inverted or not to be inverted.
3.   GEN_SET_1.map_y_axis − describes which axis shall be mapped to the y-axis.
4.   GEN_SET_1.map_y_axis_sign − describes whether the mapped axis shall be inverted or not to be inverted.
5.   GEN_SET_1.map_z_axis − describes which axis shall be mapped to the z-axis.
6.   GEN_SET_1.map_z_axis_sign − describes whether the mapped axis shall be inverted or not to be inverted.

3.6.2   Door state detection

The door state detection (DSD) utilizes 200 Hz gyroscope data to monitor door status (open/closed) and calculate the door's heading angle. The power consumption is 0.69mA in normal mode with both accelerometer and gyroscope enabled.

The key features include:
- Automatic axis remapping and gyroscope calibration
- Precise door angle measurement
- Real-time door state detection (open/closed)

Automatic axis remapping and gyroscope calibration
The system requires specific initialization movements to perform automatic axis remapping and gyroscope calibration. Follow these steps precisely:

1. **Sensor placement:**
   - Mount the sensor horizontally on the door, ensuring one sensor axis (X/Y/Z) is parallel to the door's rotation axis.
2. **Initialization:**
   - With the door closed, enable the Door Lock feature (DSD_ SET_1. dsd_enable) with both accelerometer and gyroscope active.
   - Keep the door still for at least 1 second to initialize the system.
   - *Note:* Any door movement during initialization will cause calibration failure.
3. **Axis remapping:**
   - Open the door >20° at normal speed (>1dps).
   - Complete within 30 seconds after enabling.
   - Upon successful remapping:
     - DSD_SET_1.remap_flag is set to 0x1.
     - DSD_SET_1.z_axis indicates the sensor axis mapped to the rotation axis of the door.
     - DSD_SET_1.z_sign shows the axis polarity.
   - *Timeout Condition:* If remapping isn't completed within 30 seconds, DSD_SET_1.remap_flag is set to 0x2, and a soft reset or repowering is required.
4. **Gyroscope calibration:**
   - Close the door within 5 minutes after remapping.
   - Maintain stillness for 5 seconds to complete calibration.
   - The initial calibration threshold is configured via DSD_SET_2.init_calib_thr (resolution: 0.1dps), which represents the RMS tolerance of the signal when the gyroscope is stationary.
   - Upon successful calibration:
     - DSD_OUT.calib_flag is set
     - Gyroscope bias values are stored in DSD_SET_3-8 registers (resolution: 61µdps).
   - *Best Practice:* If the door remains open post-remapping, ensure stillness before closing for optimal calibration.

Persistent configuration management
When the device is powered off, the remapping and calibration information will be lost. Users can store the remapped axis and gyro bias information on the host side before powering off the device. After the next power-on, users can directly load the information. Once the feature is enabled, the remapping flag and calibration flag will be set immediately without any operation.

Remapping information is stored in the following registers:
- DSD_ SET_1.z_axis
- DSD_ SET_1.z_sign

Set register DSD_SET_1.remap_flag to 0x1 to activate remapping.

Note: Must load remapping configurations before enabling the feature.

Calibration information is stored in the following registers:
- DSD_SET_3-8

Set register DSD_SET_1.gyro_calib_apply to activate the gyro bias compensation. Note that the register field is automatically cleared after application.

The user can also choose to only load remapping information and then keep the door closed and still for gyroscope calibration after the feature is enabled, in case the gyroscope bias changes over time during shutdown.

Door state detector
After the initial calibration is completed, the user can check the door heading angle value in HEADING_LOW_BYTE and HEADING_HIGH_BYTE, which is updated at 200 Hz. The door angle value is also provided in register HEADING_OUT. The heading output range is [-180°, 180°] and the resolution is 0.01˚. For example, the value = 235 means that the actual heading value is 2.35˚.

The threshold to determine whether the door is closed is configured in the register DSD_SET_9.door_closed_thr. The default value is 200, with a resolution of 0.01˚. For example, the value = 210 means that the door closing threshold is 2.1˚.

The open and closed state of the door is determined by the heading angle. By default:

- heading < 2° (with 0.3s stillness): door closed
- heading ≥ 2.35°: door open
- 2° ≤ heading < 2.35°: maintains previous state

When the door state switches, an event (open and close) is reported in the register DSD_OUT.door_event_out and also in register DOOR_EVENT_OUT.

Heading reset mechanism
The algorithm supports both automatic and manual heading reset when the door is closed. The mechanism of automatic reset depends on the heading and still time. By default:

- -2° ≤ heading < 2° (with 10s stillness)
- heading < -2° (with 3s stillness)

Manual reset is configured through register DSD_SET_2. reset_heading. Note that the register field is automatically cleared after application.

Configuration settings
1. DSD_SET_1. dsd_enable - DSD feature enable/disable
2. DSD_SET_1.remap_flag - Axis remap status. 0: undone, 1: done, 2: timeout
3. DSD_SET_1.z_sign - Map the desired axis sign to the z-axis. 0: invert, 1: not_invert
4. DSD_SET_1.z_axis - Map the desired axis to the z-axis. 0: x_axis, 1: y_axis, 2: z_axis
5. DSD_SET_1.gyro_calib_apply - Apply gyro calibration bias.
6. DSD_SET_2.init_calib_thr - Initial calibration threshold. The default value is 20 (resolution: 0.1dps).
7. DSD_SET_2. reset_enable_flag - Manual reset enable
8. DSD_SET_3.bias_x_low_word - Value of the lower word of bias_x
9. DSD_SET_4.bias_x_high_word - Value of the higher word of bias_x
10. DSD_SET_5.bias_y_low_word - Value of the lower word of bias_y
11. DSD_SET_6.bias_y_high_word - Value of the higher word of bias_y
12. DSD_SET_7.bias_z_low_word - Value of the lower word of bias_z
13. DSD_SET_8.bias_z_high_word - Value of the higher word of bias_z
14. DSD_SET_9.door_closed_thr - The maximum angle when the door is closed.

Output

1. DSD_OUT.door_event_out - Door event output
   o None=0: No door event occurs.
   o Close=1: When the previous state is open and the current state is closed, a close event is triggered.
   o Open=2: When the previous state is closed and the current state is open, an open event is triggered.
2. DSD_OUT.calib_flag - Gyro calibration status. When the initial gyro calibration is done, this bit will be set.
3. HEADING_LOW_BYTE - Output of the heading low bytes.
4. HEADING_HIGH_BYTE - Output of the heading high bytes.
5. DOOR_EVENT_OUT - Door event output is the same as DSD_OUT.door_event_out.
6. HEADING_OUT - Complete heading output. HEADING_LOW_BYTE stores its low byte, and HEADING_HIGH_BYTE stores its high byte.
7. INT_STATUS_0.dsd_out – Set to 1 when the door lock interrupt is generated by the sensor.

3.6.3   Any-motion detection

The any-motion detection uses the slope between two acceleration signals to detect changes in motion. The interrupt is configured by setting the enable flag ANYMO_2.enable along with at least one of the following flags: ANYMO_1.select_x, ANYMO_1.select_y, and ANYMO_1.select_z respectively for each axis.

It generates an interrupt when the absolute value of the slope (the difference between two accelerations) exceeds the preset ANYMO_2.threshold for a certain number of consecutive data points ANYMO_1.duration.

The slope (difference) is computed between the current acceleration sample and the reference sample. The reference sample is updated while any motion is detected; basically, this means the reference is the last state when the sensor detects any motion.

The interrupt generated will be reset as soon as the slope value falls below the threshold.

Configuration settings
1. ANYMO_2.enable – enable the feature.
2. ANYMO_1.duration – the number of consecutive data points for which the threshold condition must be respected, for interrupt assertion.
3. ANYMO_2.threshold – the slope threshold.
4. ANYMO_1.select_x – select the feature for the x-axis.
5. ANYMO_1.select_y – select the feature for the y-axis.
6. ANYMO_1.select_z – select the feature for the z-axis.

Output
INT_STATUS_0.any_motion_out – Set to 1 when an any-motion interrupt is generated by the sensor.

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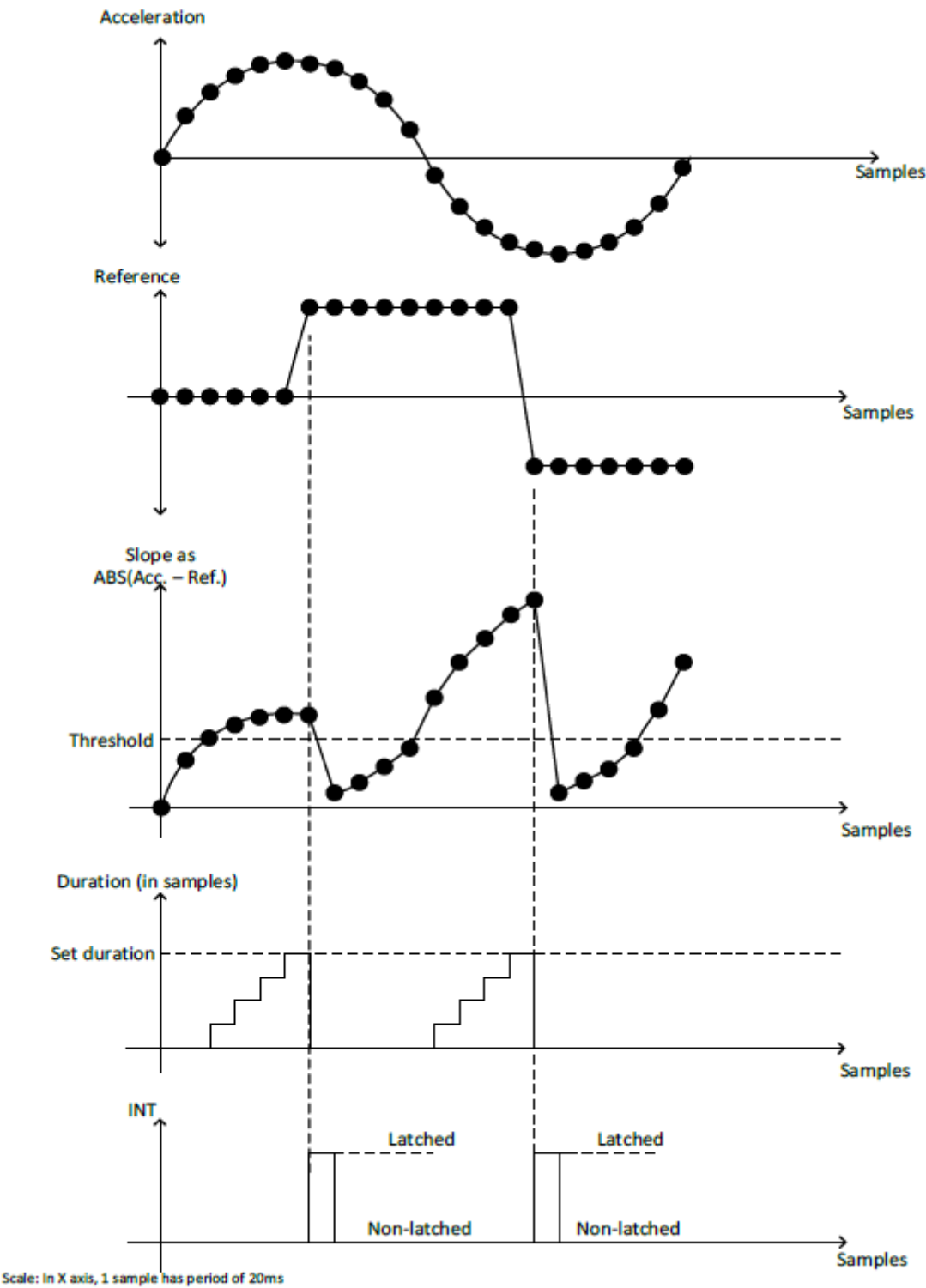
Figure 1: Any-motion detection

3.6.4   No-motion detection

The interrupt is configured by setting the enable flag NOMO_2.enable along with at least one of the following flags: NOMO_1.select_x, NOMO_1.select_y, and NOMO_1.select_z respectively for each axis.

No-motion Detection interrupt is generated when the slope on all selected axes remains smaller than a programmable NOMO_2.threshold for a programmable time. The signals and timings relevant to the no-motion interrupt functionality are depicted in the figure below.

Register NOMO_1.duration defines the number of consecutive slope data points of the selected axis that must exceed the threshold for an interrupt to be asserted.

Configuration settings
1. NOMO_2.enable − enable the feature
2. NOMO_1.duration − the number of consecutive data points for which the threshold condition must be respected, for interrupt assertion.
3. NOMO_2.threshold − the slope threshold
4. NOMO_1.select_x − select the feature for the x-axis.
5. NOMO_1.select_y − select the feature for the y-axis.
6. NOMO_1.select_z − select the feature for the z-axis.

Output
INT_STATUS_0.no_motion_out − Set to 1 when a no-motion interrupt is generated by the sensor.
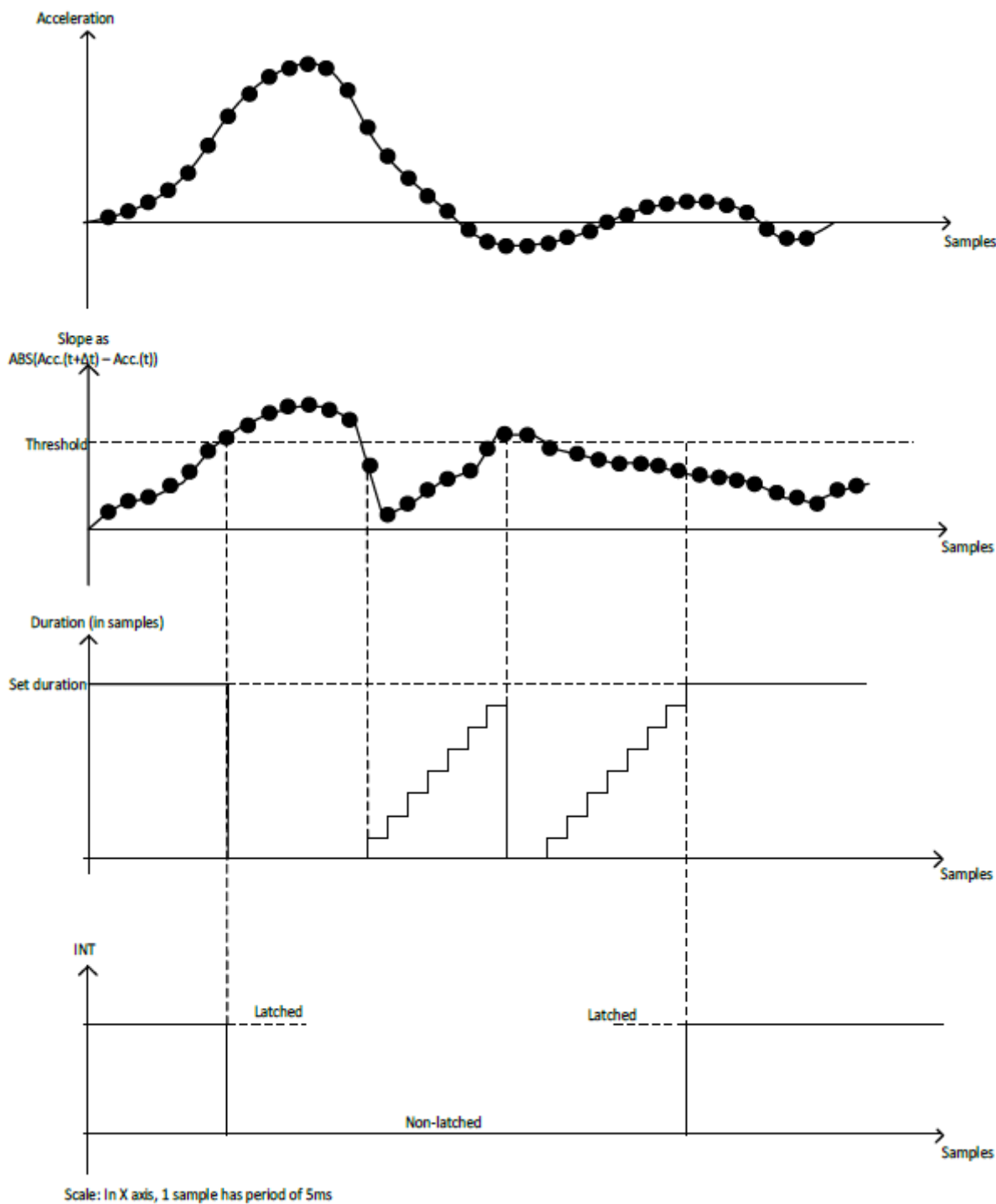
Figure 2: No-motion detection

3.7   Gyroscope Sensitivity Error Compensation

The sensor supports sensitivity (gain) compensation (e.g. to compensate for a soldering drift). This can be done either manually by rotating the device and comparing against a known reference or motionless using CRT (Component ReTrim). For manual sensitivity error compensation, refer to Section 4.14 of BMI270 Datasheet.

Component ReTrimming Feature CRT (Fast, motionless SENS Error Compensation)

For motionless SENS error compensation (CRT) the following flow needs to be executed:

1. Issue a soft reset (see Section 4.17 of BMI270 Datasheet) or a power-on reset (POR) (see Section 3.4)
2. Initialize device (see Section 3.4)
3. Disable APS PWR_CONF.adv_power_save=0b0 and wait for 450us
4. Enable accelerometer PWR_CTRL.acc_en=0b1
5. Ensure that the device is at rest during CRT execution
6. Set GYR_CRT_CONF.crt_running=0b1
7. Set G_TRIG_1.select=1
8. Set G_TRIG_1.block=0
9. Send *g_trigger* command using the register CMD
10. CRT is complete, after the device sets GYR_CRT_CONF.crt_running=0b0
11. GYR_GAIN_STATUS.g_trig_status reports a successful CRT run or execution errors
12. Optionally, the new gyroscope gain values can be programmed to NVM. See Section 4.15 of BMI270 Datasheet for details about NVM programming.
13. The new gain values are applied automatically at the next start of the gyroscope.

If the device detects motion during the CRT flow, the operation is aborted and the gain remains unchanged. If CRT is abort, Register GYR_GAIN_STATUS.g_trig_status will be set to 0x03.

CRT may run in the full operating temperature range. We recommend to run CRT at the operating temperature of the sensor. The sensitivity error is typically minimal at the temperature CRT was performed at.

We recommend performing CRT according the description above for one-time CRT calibration. Both one-time and repeated CRT is supported by the device.

4 Register description

4.1 General remarks

This section contains register definitions. REG[x]<y> denotes bit y in byte x in register REG. Val(Name) is the value contained in the register interpreted as a non-negative binary number. When writing to reserved bits, '0' should be written if not stated differently.

For most of the registers, the auto address increment applies, with the exception of the registers below, which trap the address:

- FIFO_DATA
- INIT_DATA

Register read from a burst read must remain consistent. In order to ensure this, when a read starts in one register of a group, the registers in this group are shadowed:

- STATUS, DATA_x, SENSORTIME_x, TEMPERATURE_x, FIFO_LENGTH_x

The registers listed below are clear-on-read:
- ERR_REG
- STATUS.drdy_acc (cleared when DATA_9.acc_x_15_8 is read)
- STATUS.drdy_gyr (cleared when DATA_15.gyr_x_15_8 is read)
- STATUS.drdy_aux (cleared when DATA_1.aux_x_15_8 is read)
- EVENT
- INT_STATUS_0
- INT_STATUS_1

The register clearance happens, when bit 0 of the corresponding register is read.

4.2   Register map

read/write	read only	write only	reserved

<div align="right">**Corresponding to bmi270_dsd_image.tbin version 4.3, register map version 4.2**</div>

Register Address	Register Name	Default Value	7	6	5	4	3	2	1	0
0x7E	CMD	0x00	cmd							
0x7D	PWR_CTRL	0x00	reserved				temp_en	acc_en	gyr_en	aux_en
0x7C	PWR_CONF	0x03	reserved					fup_en	fifo_self_wake_up	adv_power_save
0x7B	-	-	reserved							
...	-	-	reserved							
0x78	-	-	reserved							
0x77	OFFSET_6	0x00	gyr_gain_en	gyr_off_en	gyr_usr_off_z_9_8		gyr_usr_off_y_9_8		gyr_usr_off_x_9_8	
0x76	OFFSET_5	0x00	gyr_usr_off_z_7_0							
0x75	OFFSET_4	0x00	gyr_usr_off_y_7_0							
0x74	OFFSET_3	0x00	gyr_usr_off_x_7_0							
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	GYR_SELF_TEST_AXES	0x00	reserved				gyr_axis_z_ok	gyr_axis_y_ok	gyr_axis_x_ok	gyr_st_axes_done
0x6D	ACC_SELF_TEST	0x00	reserved				acc_self_test_amp	acc_self_test_sign	reserved	acc_self_test_en
0x6C	DRV	0xAA	io_pad_i2c_b2	io_pad_drv2			io_pad_i2c_b1	io_pad_drv1		
0x6B	IF_CONF	0x00	reserved		aux_en	ois_en	reserved		spi3_ois	spi3
0x6A	NVM_CONF	0x00	reserved						nvm_prog_en	reserved
0x69	GYR_CRT_CONF	0x00	reserved				rdy_for_dl	crt_running	reserved	
0x68	AUX_IF_TRIM	0x01	reserved						asda_pupsel	
0x67	-	-	reserved							
...	-	-	reserved							
0x60	-	-	reserved							

Addr	Name	Reset	Bit fields (7→0)
0x5F	INTERNAL_ERROR	0x00	reserved | feat_eng_disabled | reserved | int_err_2 | int_err_1 | reserved
0x5E	INIT_DATA	0x00	data
0x5D	-	-	reserved
0x5C	INIT_ADDR_1	0x00	base_11_4
0x5B	INIT_ADDR_0	0x00	reserved | base_0_3
0x5A	-	-	reserved
0x59	INIT_CTRL	0x00	init_ctrl
0x58	INT_MAP_DATA	0x00	err_int2 | drdy_int2 | fwm_int2 | ffull_int2 | err_int1 | drdy_int1 | fwm_int1 | ffull_int1
0x57	INT2_MAP_FEAT	0x00	reserved | any_motion_out | no_motion_out | reserved | dsd_out | reserved
0x56	INT1_MAP_FEAT	0x00	reserved | any_motion_out | no_motion_out | reserved | dsd_out | reserved
0x55	INT_LATCH	0x00	reserved | int_latch
0x54	INT2_IO_CTRL	0x00	reserved | input_en | output_en | od | lvl | reserved
0x53	INT1_IO_CTRL	0x00	reserved | input_en | output_en | od | lvl | reserved
0x52	ERR_REG_MSK	0x00	aux_err | fifo_err | reserved | internal_err | fatal_err
0x51	-	-	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 | aux_fcu_write_en | reserved | man_rd_burst | aux_rd_burst
0x4B	AUX_DEV_ID	0x20	i2c_device_addr | reserved
0x4A	SATURATION	0x00	reserved | gyr_z | gyr_y | gyr_x | acc_z | acc_y | acc_x
0x49	FIFO_CONFIG_1	0x10	fifo_gyr_en | fifo_acc_en | fifo_aux_en | fifo_header_en | fifo_tag_int2_en | fifo_tag_int1_en
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

Addr	Register	Value	Bit fields							
0x45	FIFO_DOWNS	0x88	acc_fifo_filt_data	acc_fifo_downs			gyr_fifo_filt_data	gyr_fifo_downs		
0x44	AUX_CONF	0x46	aux_offset				aux_odr			
0x43	GYR_RANGE	0x00	reserved				ois_range	gyr_range		
0x42	GYR_CONF	0xA9	gyr_filter_perf	gyr_noise_perf	gyr_bwp		gyr_odr			
0x41	ACC_RANGE	0x02	reserved					acc_range		
0x40	ACC_CONF	0xA8	acc_filter_perf	acc_bwp			acc_odr			
0x3F	FEATURES[15]	0x00	features_in_out							
...	...	-								
0x30	FEATURES[0]	0x00								
0x2F	FEAT_PAGE	0x00	reserved				page			
0x2E	-	-	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	TEMPERATURE_1	0x80	tmp_data_15_8							
0x22	TEMPERATURE_0	0x00	tmp_data_7_0							
0x21	INTERNAL_STATUS	0x00	Reserved	odr_50hz_error	axes_remap_error	Reserved	message			
0x20	HEADING_HIGH_BYTE	0x00	heading_high_byte							
0x1F	HEADING_LOW_BYTE	0x00	heading_low_byte							
0x1E	DSD_OUT	0x00	reserved				calib_flag	door_event_out		
0x1D	INT_STATUS_1	0x00	acc_drdy_int	gyr_drdy_int	aux_drdy_int	reserved		err_int	fwm_int	ffull_int
0x1C	INT_STATUS_0	0x00	reserved	any_motion_out	no_motion_out	reserved	dsd_out	reserved		

0x1B	EVENT	0x01	reserved		error_code		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_19	0x00	gyr_z_15_8					
0x16	DATA_18	0x00	gyr_z_7_0					
0x15	DATA_17	0x00	gyr_y_15_8					
0x14	DATA_16	0x00	gyr_y_7_0					
0x13	DATA_15	0x00	gyr_x_15_8					
0x12	DATA_14	0x00	gyr_x_7_0					
0x11	DATA_13	0x00	acc_z_15_8					
0x10	DATA_12	0x00	acc_z_7_0					
0x0F	DATA_11	0x00	acc_y_15_8					
0x0E	DATA_10	0x00	acc_y_7_0					
0x0D	DATA_9	0x00	acc_x_15_8					
0x0C	DATA_8	0x00	acc_x_7_0					
0x0B	DATA_7	0x00	aux_r_15_8					
0x0A	DATA_6	0x00	aux_r_7_0					
0x09	DATA_5	0x00	aux_z_15_8					
0x08	DATA_4	0x00	aux_z_7_0					
0x07	DATA_3	0x00	aux_y_15_8					
0x06	DATA_2	0x00	aux_y_7_0					
0x05	DATA_1	0x00	aux_x_15_8					
0x04	DATA_0	0x00	aux_x_7_0					
0x03	STATUS	0x10	drdy_acc	drdy_gyr	drdy_aux	cmd_rdy	reserved	aux_busy	reserved
0x02	ERR_REG	0x00	aux_err	fifo_err	reserved	internal_err	fatal_err
0x01	-	-	reserved					
0x00	CHIP_ID	0x24	chip_id					

FEATURES Pages

Register Address	Register Name	Page 0	Page 1	Page 2	Page 3
0x30	FEATURES[0,1]	Reserved	Reserved	DSD_SET_1	DSD_SET_9
0x32	FEATURES[2,3]	Reserved	G_TRIG_1	DSD_SET_2	DSD_SET_10
0x34	FEATURES[4,5]	Reserved	GEN_SET_1	DSD_SET_3	NOMO_1
0x36	FEATURES[6,7]	DOOR_EVENT_OUT	GYR_GAIN_UPD_1	DSD_SET_4	NOMO_2
0x38	FEATURES[8,9]	HEADING_OUT	GYR_GAIN_UPD_2	DSD_SET_5	ANYMO_1
0x3A	FEATURES[10,11]	GYR_GAIN_STATUS	GYR_GAIN_UPD_3	DSD_SET_6	ANYMO_2
0x3C	FEATURES[12,13]	GYR_CAS	Reserved	DSD_SET_7	Reserved
0x3E	FEATURES[14,15]	Reserved	Reserved	DSD_SET_8	Reserved

FEATURES Pages

Register Address	Register Name	Page 4	Page 5	Page 6	Page 7
0x30	FEATURES[0,1]	Reserved	Reserved	Reserved	Reserved
0x32	FEATURES[2,3]	Reserved	Reserved	Reserved	Reserved
0x34	FEATURES[4,5]	Reserved	Reserved	Reserved	Reserved
0x36	FEATURES[6,7]	Reserved	Reserved	Reserved	Reserved
0x38	FEATURES[8,9]	Reserved	Reserved	Reserved	Reserved
0x3A	FEATURES[10,11]	Reserved	Reserved	Reserved	Reserved
0x3C	FEATURES[12,13]	Reserved	Reserved	Reserved	Reserved
0x3E	FEATURES[14,15]	Reserved	Reserved	Reserved	Reserved

4.2.1　Register (0x00) CHIP_ID

DESCRIPTION: Chip identification code
RESET: 0x24
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x00		CHIP_ID		0x24	
	7...0	chip_id	Chip identification code	0x24	R

4.2.2　Register (0x02) ERR_REG

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

Address	Bit	Name	Description	Reset	Access
0x02		ERR_REG		0x00	
	0	fatal_err	Fatal Error, chip is not in operational state (Boot-, power-system). This flag will be reset only by power-on reset or soft reset.	0x0	R
	4...1	internal_err	Internal error. Please contact your Bosch Sensortec regional support team.	0x0	R
	6	fifo_err	Error when a frame is read in streaming mode (so skipping is not possible) and fifo is overfilled (with virtual and/or regular frames). This flag will be reset when read.	0x0	R
	7	aux_err	Error in I2C-Master detected. This flag will be reset when read.	0x0	R

4.2.3　Register (0x03) STATUS

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

Address	Bit	Name	Description	Reset	Access
0x03		STATUS		0x10	
	2	aux_busy	'1' ('0') indicates that an (no) Auxiliary sensor interface operation is ongoing, triggered via AUX_RD_ADDR, AUX_WR_ADDR or from FCU.	0x0	R

	4	cmd_rdy	CMD decoder status. '0' -> Command in progress '1' -> Command decoder is ready to accept a new command.	0x1	R
	5	drdy_aux	Data ready for Auxiliary sensor. It gets reset when one Auxiliary sensor DATA register is read out.	0x0	R
	6	drdy_gyr	Data ready for gyroscope. It gets reset when one Gyroscope DATA register is read out.	0x0	R
	7	drdy_acc	Data ready for accelerometer. It gets reset when one Accelerometer DATA register is read out.	0x0	R

4.2.4   Register (0x04) DATA_0

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

Address	Bit	Name	Description	Reset	Access
0x04		DATA_0		0x00	
	7...0	aux_x_7_0	Copy of register Val(AUX_IF[1]) in Auxiliary sensor register map.	0x0	R

4.2.5   Register (0x05) DATA_1

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

Address	Bit	Name	Description	Reset	Access
0x05		DATA_1		0x00	
	7...0	aux_x_15_8	Copy of register Val(AUX_IF[1])+1 in Auxiliary sensor register map	0x0	R

4.2.6   Register (0x06) DATA_2

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

Address	Bit	Name	Description	Reset	Access
0x06		DATA_2		0x00	
	7...0	aux_y_7_0	Copy of register Val(AUX_IF[1])+2 in Auxiliary sensor register map	0x0	R

4.2.7   Register (0x07) DATA_3

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

Address	Bit	Name	Description	Reset	Access
0x07		DATA_3		0x00	
	7...0	aux_y_15_8	Copy of register Val(AUX_IF[1])+3 in Auxiliary sensor register map	0x0	R

4.2.8   Register (0x08) DATA_4

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

Address	Bit	Name	Description	Reset	Access
0x08		DATA_4		0x00	
	7...0	aux_z_7_0	Copy of register Val(AUX_IF[1])+4 in Auxiliary sensor register map	0x0	R

4.2.9   Register (0x09) DATA_5

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

Address	Bit	Name	Description	Reset	Access
0x09		DATA_5		0x00	
	7...0	aux_z_15_8	Copy of register Val(AUX_IF[1])+5 in Auxiliary sensor register map	0x0	R

4.2.10 Register (0x0A) DATA_6

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

Address	Bit	Name	Description	Reset	Access
0x0A		DATA_6		0x00	
	7...0	aux_r_7_0	Copy of register Val(AUX_IF[1])+6 in Auxiliary sensor register map	0x0	R

4.2.11 Register (0x0B) DATA_7

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

Address	Bit	Name	Description	Reset	Access
0x0B		DATA_7		0x00	
	7...0	aux_r_15_8	Copy of register Val(AUX_IF[1])+7 in Auxiliary sensor register map	0x0	R

4.2.12 Register (0x0C) DATA_8

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

Address	Bit	Name	Description	Reset	Access
0x0C		DATA_8		0x00	
	7...0	acc_x_7_0		0x0	R

4.2.13 Register (0x0D) DATA_9

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

Address	Bit	Name	Description	Reset	Access
0x0D		DATA_9		0x00	
	7...0	acc_x_15_8		0x0	R

4.2.14 Register (0x0E) DATA_10

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

Address	Bit	Name	Description	Reset	Access
0x0E		DATA_10		0x00	
	7...0	acc_y_7_0		0x0	R

4.2.15 Register (0x0F) DATA_11

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

Address	Bit	Name	Description	Reset	Access
0x0F		DATA_11		0x00	
	7...0	acc_y_15_8		0x0	R

4.2.16 Register (0x10) DATA_12

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

Address	Bit	Name	Description	Reset	Access
0x10		DATA_12		0x00	
	7...0	acc_z_7_0		0x0	R

4.2.17 Register (0x11) DATA_13

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

Address	Bit	Name	Description	Reset	Access
0x11		DATA_13		0x00	
	7...0	acc_z_15_8		0x0	R

4.2.18 Register (0x12) DATA_14

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

Address	Bit	Name	Description	Reset	Access
0x12		DATA_14		0x00	
	7...0	gyr_x_7_0		0x0	R

4.2.19 Register (0x13) DATA_15

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

Address	Bit	Name	Description	Reset	Access
0x13		DATA_15		0x00	
	7...0	gyr_x_15_8		0x0	R

4.2.20 Register (0x14) DATA_16

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

Address	Bit	Name	Description	Reset	Access
0x14		DATA_16		0x00	
	7...0	gyr_y_7_0		0x0	R

4.2.21 Register (0x15) DATA_17

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

Address	Bit	Name	Description	Reset	Access
0x15		DATA_17		0x00	
	7...0	gyr_y_15_8		0x0	R

4.2.22 Register (0x16) DATA_18

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

Address	Bit	Name	Description	Reset	Access
0x16		DATA_18		0x00	
	7...0	gyr_z_7_0		0x0	R

4.2.23 Register (0x17) DATA_19

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

Address	Bit	Name	Description	Reset	Access
0x17		DATA_19		0x00	
	7...0	gyr_z_15_8		0x0	R

4.2.24 Register (0x18) SENSORTIME_0

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

Address	Bit	Name	Description	Reset	Access
0x18		SENSORTIME_0		0x00	
	7...0	sensor_time_7_0	Sensor time <7:0>	0x0	R

4.2.25 Register (0x19) SENSORTIME_1

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

Address	Bit	Name	Description	Reset	Access
0x19		SENSORTIME_1		0x00	
	7...0	sensor_time_15_8	Sensor time <15:8>.	0x0	R

4.2.26 Register (0x1A) SENSORTIME_2

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

Address	Bit	Name	Description	Reset	Access
0x1A		SENSORTIME_2		0x00	
	7...0	sensor_time_23_16	Sensor time <23:16> The sensor time is a 24-bit counter available in suspend, low power, and normal mode. The value of the SENSORTIME register is shadowed when it is read in a burst read with the data register at the beginning of the operation and the shadowed value is returned. When the fifo is read the register is shadowed, whenever a new frame is read. The resolution of the sensor_time is 39.0625 us and it is synchronous to ODR. The register wraps if it reaches 0xFFFFFF.	0x0	R

4.2.27 Register (0x1B) EVENT

DESCRIPTION: Sensor event flags. It will be cleared on read when bit 0 is sent out over the bus.
RESET: 0x01

DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x1B		EVENT		0x01	
	0	por_detected	'1' after device power up or soft-reset, '0' after status read.	0x1	R
	4...2	error_code	Error codes for persistent errors Value Name Description 0x00 no_error no error is reported 0x01 acc_err error in Register ACC_CONF 0x02 gyr_err error in Register GYR_CONF 0x03 acc_and_gyr_err error in Registers ACC_GYR & GYR_CONF	0x0	R

4.2.28 Register (0x1C) INT_STATUS_0

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

Address	Bit	Name	Description	Reset	Access
0x1C		INT_STATUS_0		0x00	
	3	dsd_out	Door state detection output	0x0	R
	5	no_motion_out	No motion detection output	0x0	R
	6	any_motion_out	Any motion detection output	0x0	R

4.2.29 Register (0x1D) INT_STATUS_1

DESCRIPTION: Interrupt Status 1. It will be cleared on read when bit 0 is sent out over the bus.
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x1D		INT_STATUS_1		0x00	
	0	ffull_int	FIFO Full Interrupt	0x0	R
	1	fwm_int	FIFO Watermark Interrupt	0x0	R
	2	err_int	ERROR Interrupt	0x0	R
	5	aux_drdy_int	Auxiliary Data Ready Interrupt	0x0	R
	6	gyr_drdy_int	Gyroscope Data Ready Interrupt	0x0	R
	7	acc_drdy_int	Accelerometer Data Ready Interrupt	0x0	R

4.2.30 Register (0x1E) DSD_OUT

DESCRIPTION: Outputs of the door state detector
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x1E		DSD_OUT		0x00	
	1...0	door_event_out	Door event output Value Name Description 0x00 none Nothing 0x01 close Close the door	0x0	R

			0x02 open Open the door		
2	calib_flag		Gyro calibration status **Value** **Name** **Description** 0x00 Undone Undone 0x01 Done Done	0x0	R

4.2.31 Register (0x1F) HEADING_LOW_BYTE

DESCRIPTION: Heading output low byte

RESET: 0x00

DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x1F		HEADING_LOW_BYTE		0x00	
	7...0	heading_low_byte	Heading output low byte. The range is [-180°, 180°] and resolution is 0.01˚	0x0	R

4.2.32 Register (0x20) HEADING_HIGH_BYTE

DESCRIPTION: Heading output high byte

RESET: 0x00

DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x20		HEADING_HIGH_BYTE		0x00	
	7...0	heading_high_byte	Heading output high byte. The range is [-180°, 180°] and resolution is 0.01˚	0x0	R

4.2.33 Register (0x21) INTERNAL_STATUS

DESCRIPTION: Error bits and message indicating internal status

RESET: 0x00

DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x21		INTERNAL_STATUS		0x00	
	3...0	message	Internal Status Message **Value** **Name** **Description** 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 0x05 nvm_error Internal error while accessing NVM 0x06 start_up_error Internal error while accessing NVM and Initialization error 0x07 compat_error Compatibility error	0x0	R
	4	Reserved	Reserved	0x0	R
	5	axes_remap_error	Incorrect axes remapping. X, Y, and Z axes must be mapped to exclusively separate axes i.e. they cannot be mapped to the same axes.	0x0	R

	6	odr_50hz_error	The minimum bandwidth conditions are not respected for the features which require 50 Hz data.	0x0	R
	7	Reserved	Reserved	0x0	R

4.2.34 Register (0x22) TEMPERATURE_0

DESCRIPTION: Temperature LSB: The temperature is disabled when all sensors are in suspend mode. The output word of the 16-bit temperature sensor is valid if the gyroscope is in normal mode, i.e., gyr_pmu_status=1. The resolution is $1/2^9$ K/LSB. The absolute accuracy of the temperature is in the order of:

  0x7FFF -> $87 - 1/2^9$ °C
  0x0000 -> 23°C
  0x8001 -> $-41 + 1/2^9$ °C
  0x8000 -> invalid

If the gyroscope is in normal mode (see register PMU_STATUS), the temperature is updated every 10 ms (+-12%); if the gyroscope is in standby mode or fast power-up mode, the temperature is updated every 1.28 s aligned with bit 15 of the register SENSORTIME.
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x22		TEMPERATURE_0		0x00	
	7...0	tmp_data_7_0	Temperature value.	0x0	R

4.2.35 Register (0x23) TEMPERATURE_1

DESCRIPTION: Contains the MSBs of temperature sensor value
RESET: 0x80
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x23		TEMPERATURE_1		0x80	
	7...0	tmp_data_15_8	Temperature LSBs.	0x80	R

4.2.36 Register (0x24) FIFO_LENGTH_0

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

Address	Bit	Name	Description	Reset	Access
0x24		FIFO_LENGTH_0		0x00	
	7...0	fifo_byte_counter_7_0	Current fill level of FIFO buffer This includes the skip frame for a full fifo. An empty FIFO corresponds to 0x000. The byte counter may be reset by reading out all frames from the FIFO buffer or when the FIFO is reset through the register CMD. The byte counter is updated each time a complete frame was read or written.	0x0	R

4.2.37 Register (0x25) FIFO_LENGTH_1

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

Address	Bit	Name	Description	Reset	Access
0x25		FIFO_LENGTH_1		0x00	
	5...0	fifo_byte_counter_13_8	FIFO byte counter bits 13..8	0x0	R

4.2.38 Register (0x26) FIFO_DATA

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

Address	Bit	Name	Description	Reset	Access
0x26		FIFO_DATA		0x00	
	7...0	fifo_data	FIFO read data for burst read (8 bits). Data format depends on the setting of register FIFO_CONFIG. The FIFO data are organized in frames. The new data flag is preserved. Read burst access must be used, the address will not increment when the read burst reads at the address of FIFO_DATA. When a frame is only partially read out, it is retransmitted, including the header at the next readout.	0x0	R

4.2.39 Register (0x2F) FEAT_PAGE

DESCRIPTION: Page number for feature configuration and output registers
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x2F		FEAT_PAGE		0x00	
	2...0	page	Map 16 feature registers to one of the 8 feature pages	0x0	RW

4.2.40 Register (0x30) FEATURES[16]

DESCRIPTION: Input registers for feature configuration. Output registers for feature results.
RESET: 0x00
DEFINITION (Go to register map):

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Address	Bit	Name	Description	Reset	Access
Reserved					
0x30		Reserved	Reserved	0x0000	
	15...0	Reserved	Reserved	0x0	RW
0x32		Reserved	Reserved	0x0000	
	15...0	Reserved	Reserved	0x0	RW
0x34		Reserved	Reserved	0x0000	
	15...0	Reserved	Reserved	0x0	RW
door_event_output					
0x36		DOOR_EVENT_OUT	Door event output	0x0000	
	1...0	door_event_out	Door event output	0x0	R

			Value	Name	Description		
			0x00	none	Nothing		
			0x01	close	Close the door		
			0x02	open	Open the door		
heading_output							
0x38		HEADING_OUT	Heading output			0x0000	
	15...0	heading_out	Heading output. The range is [-180°, 180°] and resolution is 0.01°			0x0	R
gyr_gain_status							
0x3A		GYR_GAIN_STATUS	Describes the saturation status for the gyroscope gain update and G_TRIGGER command status			0x0000	
	0	sat_x	This bit will be 1 if the updated gain results to a saturated value based on the ratio provided for x-axis; otherwise, it will be 0.			0x0	R
	1	sat_y	This bit will be 1 if the updated gain results to a saturated value based on the ratio provided for y-axis; otherwise, it will be 0.			0x0	R
	2	sat_z	This bit will be 1 if the updated gain results to a saturated value based on the ratio provided for z axis; otherwise, it will be 0.			0x0	R
	5...3	g_trig_status	Status of gyroscope trigger G_TRIGGER command. These bits are updated at the end of feature execution.			0x0	R
			Value	Name	Description		
			0x00	no_err	Command is valid. Selected feature has been executed andoutput offeature has been updated.		
			0x01	precon_err	Command is aborted. Pre-condition to start the feature was not completed.		
			0x02	dl_err	Command is aborted. Unsuccessful download of 2kB configuration stream.		
			0x03	abort_err	Command is aborted either by host via the block bit or due to motion detection.		
gyr_postproc							
0x3C		GYR_CAS	Register for gyroscope data post processing			0x0000	
	6...0	factor_zx	Factor to further optimize the gyroscope performance			0x0	R
Reserved							
0x3E		Reserved	Reserved			0x0000	
	8	Reserved	Reserved			0x0	R
	9	Reserved	Reserved			0x0	R
	10	Reserved	Reserved			0x0	R
	11	Reserved	Reserved			0x0	R
	12	Reserved	Reserved			0x0	R
	13	Reserved	Reserved			0x0	R
	14	Reserved	Reserved			0x0	R
	15	Reserved	Reserved			0x0	R

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Address	Bit	Name	Description	Reset	Access
general_settings					
0x30		Reserved	Reserved	0x0000	
	15...0	Reserved	Reserved	0x0	R
0x32		G_TRIG_1	Configuration for features triggered by G_TRIGGER command.	0x0000	
	7...0	max_burst_len	Maximum burst-write length in 16-bit words to download 2 kB configuration stream of G_TRIGGER feature. Range is 0 to 255. E.g. value = 20 means that maximum burst-write length is set to 20 words or 40 bytes.	0x0	RW
	8	select	Select feature that should be executed **Value** **Name** **Description** 0x00 gyr_bist Gyroscope built-in self-test will be executed 0x01 crt CRT will be executed	0x0	RW
	9	block	Block feature with next G_TRIGGER command **Value** **Name** **Description** 0x00 unblock Do not block further G_TRIGGER commands 0x01 block With the next G_TRIGGER command, the ongoing selected feature will be aborted, OR if a feature is not ongoing, then the G_TRIGGER command will be ignored	0x0	RW
0x34		GEN_SET_1	Describes configuration of general features	0x0088	
	1...0	map_x_axis	Map the x-axis to the 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 Reserved	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 invert 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 0x01 y_axis Map to y-axis 0x02 z_axis Map to z-axis 0x03 reserved Reserved	0x1	RW
	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 invert 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	0x2	RW

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Address	Bit	Name	Description	Reset	Access
			0x02 z_axis Map to z-axis 0x03 reserved Reserved		
	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 invert Set this bit to invert the z-axis	0x0	RW
	9	Reserved	Reserved	0x0	RW
	10	nvm_prog_prep	Prepares the system for NVM programming	0x0	RW
gyr_gain_update					
0x36		GYR_GAIN_UPD_1	ωrx/ωmx for which the gain needs to be updated.	0x0000	
	10...0	ratio_x	Gain update value for x-axis. Fixed point representation is Q(1,10) with range from 1±0.25. For example, value of 0.75 shall be represented in 11bits as 0x300 and 1.25 shall be represented in 11bits as 0x500	0x0	RW
0x38		GYR_GAIN_UPD_2	ωry/ωmy for which the gain needs to be updated.	0x0000	
	10...0	ratio_y	Gain update value for y-axis. Fixed point representation is Q(1,10) with range from 1±0.25. For example, value of 0.75 shall be represented in 11bits as 0x300 and 1.25 shall be represented in 11bits as 0x500	0x0	RW
0x3A		GYR_GAIN_UPD_3	ωrz/ωmz for which the gain needs to be updated.	0x0000	
	10...0	ratio_z	Gain update value for z-axis. Fixed point representation is Q(1,10) with range from 1±0.25. For example, value of 0.75 shall be represented in 11bits as 0x300 and 1.25 shall be represented in 11bits as 0x500	0x0	RW
	11	enable	Enable the gyroscope gain update by writing a value of 1 to it. Once the gain update is completed, the device will clear the bit.	0x0	RW
Reserved					
0x3C		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3E		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW

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Address	Bit	Name	Description	Reset	Access
door_state_detector_1					
0x30		DSD_SET_1	Setting 1	0x0008	
	0	dsd_enable	DSD feature enable/disable	0x0	RW
	4...1	Reserved	Reserved	0x4	R
	6...5	remap_flag	Axis remap status **Value** **Name** **Description** 0x00 undone Axis remap is not done 0x01 done Axis remap is set in the register 0x02 timeout timeout	0x0	RW
	7	z_sign	Map the desired axis sign to the z-axis **Value** **Name** **Description** 0x00 invert Invert the axis sign 0x01 not_invert Do not invert the axis sign	0x0	RW
	9...8	z_axis	Map the desired axis to the z axis. **Value** **Name** **Description** 0x00 x_axis Map x-axis to z-axis 0x01 y_axis Map y-axis to z-axis 0x02 z_axis Map z-axis to z-axis	0x0	RW

Address	Bit	Name	Description	Reset	Access
	10	gyro_calib_apply	Apply gyro calibration bias	0x0	RW
0x32		DSD_SET_2	Setting 2	0x0014	
	7...0	init_calib_thr	Initial calibration threshold, default value is 20, resolution: 0.1 dps	0x14	RW
	8	reset_heading	Reset heading value manually	0x0	RW
0x34		DSD_SET_3	Setting 3	0x0000	
	15...0	bias_x_low_word	Value of lower word of bias_x	0x0	RW
0x36		DSD_SET_4	Setting 4	0x0000	
	15...0	bias_x_high_word	Value of higher word of bias_x	0x0	RW
0x38		DSD_SET_5	Setting 5	0x0000	
	15...0	bias_y_low_word	Value of lower word of bias_y	0x0	RW
0x3A		DSD_SET_6	Setting 6	0x0000	
	15...0	bias_y_high_word	Value of higher word of bias_y	0x0	RW
0x3C		DSD_SET_7	Setting 7	0x0000	
	15...0	bias_z_low_word	Value of lower word of bias_z	0x0	RW
0x3E		DSD_SET_8	Setting 8	0x0000	
	15...0	bias_z_high_word	Value of higher word of bias_z	0x0	RW

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Address	Bit	Name	Description	Reset	Access
door_state_detector_2					
0x30		DSD_SET_9	Setting 9	0x00C8	
	9...0	door_closed_thr	Maximum angle when door is closed. Default value is 200, resolution: 0.01 deg	0xC8	RW
	15...10	Reserved	Reserved	0x0	R
0x32		DSD_SET_10	Setting 10	0x2814	
	9...0	Reserved	Reserved	0x14	RW
	15...10	Reserved	Reserved	0xA	RW
no_motion					
0x34		NOMO_1	No-motion detection general configuration flags - part 1	0xE005	
	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 163 sec. Default value is 5=100ms.	0x5	RW
	13	select_x	Selects the feature on a per-axis basis	0x1	RW
	14	select_y	Selects the feature on a per-axis basis	0x1	RW
	15	select_z	Selects the feature on a per-axis basis	0x1	RW
0x36		NOMO_2	No-motion detection general configuration flags - part 2	0x3090	
	10...0	threshold	Slope threshold value for no-motion detection. Range is 0 to 1g. Default value is 0x90 = 70mg.	0x90	RW
	14...11	Reserved	Reserved	0x6	R
	15	enable	Enables the feature	0x0	RW
any_motion					
0x38		ANYMO_1	Any-motion detection general configuration flags - part 1	0xE005	
	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	select_x	Selects the feature on a per-axis basis	0x1	RW
	14	select_y	Selects the feature on a per-axis basis	0x1	RW

Address	Bit	Name	Description	Reset	Access
	15	select_z	Selects the feature on a per-axis basis	0x1	RW
0x3A		ANYMO_2	Any-motion detection general configuration flags - part 2	0x38AA	
	10...0	threshold	Slope threshold value for any-motion detection. Range is 0 to 1g. Default value is 0xAA = 83mg.	0xAA	RW
	14...11	Reserved	Reserved	0x7	R
	15	enable	Enables the feature	0x0	RW
Reserved					
0x3C		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3E		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW

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Address	Bit	Name	Description	Reset	Access
Reserved					
0x30		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x32		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x34		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x36		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x38		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3A		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3C		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3E		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW

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Address	Bit	Name	Description	Reset	Access
Reserved					
0x30		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x32		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x34		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x36		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x38		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3A		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3C		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3E		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW

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Address	Bit	Name	Description	Reset	Access
Reserved					
0x30		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x32		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x34		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x36		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x38		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3A		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3C		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3E		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW

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Address	Bit	Name	Description	Reset	Access
Reserved					
0x30		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x32		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x34		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x36		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x38		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3A		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3C		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW
0x3E		Reserved	Reserved	0x0000	
	15...0	reserved	Reserved	0x0	RW

4.2.41 Register (0x40) ACC_CONF

DESCRIPTION: Sets the output data rate, the bandwidth, and the read mode of the acceleration sensor
RESET: 0xA8
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x40		ACC_CONF		0xA8	

Bits	Name	Description	Reset	Access
3...0	acc_odr	ODR in Hz. The output data rate is independent of the power mode setting for the sensor.	0x8	RW

Value	Name	Description
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

Bits	Name	Description	Reset	Access
6...4	acc_bwp	Bandwidth parameter determines filter configuration (acc_filt_perf=1) and averaging for undersampling mode (acc_filt_perf=0)	0x2	RW

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

Bits	Name	Description	Reset	Access
7	acc_filter_perf	Selects accelerometer filter performance mode:	0x1	RW

Value	Name	Description
0x00	ulp	power optimized
0x01	hp	performance opt.

4.2.42 Register (0x41) ACC_RANGE

DESCRIPTION: Selection of the Accelerometer g-range
RESET: 0x02

DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x41		ACC_RANGE		0x02	
	1...0	acc_range	Accelerometer g-range **Value** **Name** **Description** 0x00 range_2g +/-2g 0x01 range_4g +/-4g 0x02 range_8g +/-8g 0x03 range_16g +/-16g	0x2	RW

4.2.43 Register (0x42) GYR_CONF

DESCRIPTION: Sets the output data rate and the bandwidth of the gyroscope in the sensor
RESET: 0xA9
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x42		GYR_CONF		0xA9	
	3...0	gyr_odr	ODR in Hz **Value** **Name** **Description** 0x00 reserved Reserved 0x01 odr_0p78 Reserved 0x02 odr_1p5 Reserved 0x03 odr_3p1 Reserved 0x04 odr_6p25 Reserved 0x05 odr_12p5 Reserved 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 3200 0x0e odr_6k4 Reserved 0x0f odr_12k8 Reserved	0x9	RW
	5...4	gyr_bwp	The Gyroscope bandwidth coefficient defines the 3 dB cutoff frequency of the low pass filter for the sensor data. **Value** **Name** **Description** 0x00 osr4 OSR4 mode 0x01 osr2 OSR2 mode 0x02 norm normal mode 0x03 res reserved	0x2	RW
	6	gyr_noise_perf	Selects noise performance: **Value** **Name** **Description** 0x00 ulp power optimized 0x01 hp performance opt.	0x0	RW
	7	gyr_filter_perf	Selects gyroscope filter performance mode: **Value** **Name** **Description** 0x00 ulp power optimized 0x01 hp performance opt.	0x1	RW

4.2.44 Register (0x43) GYR_RANGE

DESCRIPTION: Defines the Gyroscope angular rate measurement range
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x43		GYR_RANGE		0x00	
	2...0	gyr_range	Full scale, Resolution: applies to filtered FIFO data and DATA registers. **Value** **Name** **Description** 0x00 range_2000 +/-2000dps, 16.4 LSB/dps 0x01 range_1000 +/-1000dps, 32.8 LSB/dps 0x02 range_500 +/-500dps, 65.6 LSB/dps 0x03 range_250 +/-250dps, 131.2 LSB/dps 0x04 range_125 +/-125dps, 262.4 LSB/dps	0x0	RW
	3	ois_range	Full scale, Resolution: applies to pre-filtered FIFO data and OIS data. **Value** **Name** **Description** 0x00 range_250 +/-250dps, 131.2 LSB/dps 0x01 range_2000 +/-2000dps, 16.4 LSB/dps	0x0	RW

4.2.45 Register (0x44) AUX_CONF

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

Address	Bit	Name	Description	Reset	Access
0x44		AUX_CONF		0x46	
	3...0	aux_odr	Defines the poll rate for the magnetometer attached to the Auxiliary sensor interface. This is independent of the power mode setting for the sensor. The output data rate in Hz. In addition to setting the poll rate, it is required to configure the Auxiliary sensor properly using the AUX_IF_CONF register. **Value** **Name** **Description** 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	0x6	RW

	7...4	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.	0x4	RW

4.2.46 Register (0x45) FIFO_DOWNS

DESCRIPTION: Configure Gyroscope and Accelerometer downsampling rates for FIFO
RESET: 0x88
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x45		FIFO_DOWNS		0x88	
	2...0	gyr_fifo_downs	Downsampling for gyroscope (2**downs_gyro)	0x0	RW
	3	gyr_fifo_filt_data	Selects filtered or unfiltered Gyroscope data for FIFO. **Value Name Description** 0x00 unfiltered Unfiltered data 0x01 filtered Filtered data	0x1	RW
	6...4	acc_fifo_downs	Downsampling for accelerometer (2**downs_accel)	0x0	RW
	7	acc_fifo_filt_data	Selects filtered or unfiltered Accelerometer data for FIFO. **Value Name Description** 0x00 unfiltered Unfiltered data 0x01 filtered Filtered data	0x1	RW

4.2.47 Register (0x46) FIFO_WTM_0

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

Address	Bit	Name	Description	Reset	Access
0x46		FIFO_WTM_0		0x00	
	7...0	fifo_water_mark_7_0	Triggers an interrupt when FIFO contains fifo_water_mark_7_0+fifo_water_mark_12_8*256 bytes.	0x0	RW

4.2.48 Register (0x47) FIFO_WTM_1

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

Address	Bit	Name	Description	Reset	Access
0x47		FIFO_WTM_1		0x02	
	4...0	fifo_water_mark_12_8	Triggers an interrupt when FIFO contains fifo_water_mark_7_0+fifo_water_mark_12_8*256 bytes.	0x2	RW

4.2.49 Register (0x48) FIFO_CONFIG_0

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

Address	Bit	Name	Description	Reset	Access

0x48		FIFO_CONFIG_0		0x02	
	0	fifo_stop_on_full	Stops writing samples into FIFO when FIFO is full.	0x0	RW
			Value **Name** **Description**		
			0x00 disable do not stop writing to FIFO when full		
			0x01 enable Stop writing into FIFO when full.		
	1	fifo_time_en	Returns sensortime frame after the last valid data frame.	0x1	RW
			Value **Name** **Description**		
			0x00 disable do not return sensortime frame		
			0x01 enable return sensortime frame		

4.2.50 Register (0x49) FIFO_CONFIG_1

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

Address	Bit	Name	Description	Reset	Access
0x49		FIFO_CONFIG_1		0x10	
	1...0	fifo_tag_int1_en	FIFO interrupt 1 tag enable	0x0	RW
			Value **Name** **Description**		
			0x00 int_edge enable tag on rising edge of int pin		
			0x01 int_level enable tag on level value of int pin		
			0x02 acc_sat enable tag on saturation of accelerometer data		
			0x03 gyr_sat enable tag on saturation of gyroscope data		
	3...2	fifo_tag_int2_en	FIFO interrupt 2 tag enable	0x0	RW
			Value **Name** **Description**		
			0x00 int_edge enable tag on rising edge of int pin		
			0x01 int_level enable tag on level value of int pin		
			0x02 acc_sat enable tag on saturation of accelerometer data		
			0x03 gyr_sat enable tag on saturation of gyroscope data		
	4	fifo_header_en	FIFO frame header enable	0x1	RW
			Value **Name** **Description**		
			0x00 disable no header is stored (the output data rates of all enabled sensors need to be identical)		
			0x01 enable header is stored		
	5	fifo_aux_en	Store Auxiliary sensor data in FIFO (all 3 axes)	0x0	RW
			Value **Name** **Description**		
			0x00 disable no Auxiliary sensor data is stored		
			0x01 enable Auxiliary sensor data is stored		
	6	fifo_acc_en	Store Accelerometer data in FIFO (all 3 axes)	0x0	RW
			Value **Name** **Description**		
			0x00 disable no Accelerometer data is stored		
			0x01 enable Accelerometer data is stored		
	7	fifo_gyr_en	Store Gyroscope data in FIFO (all 3 axes)	0x0	RW
			Value **Name** **Description**		
			0x00 disable no Gyroscope data is stored		
			0x01 enable Gyroscope data is stored		

4.2.51 Register (0x4A) SATURATION

DESCRIPTION: Contains the information if one of the raw data samples used to generate current filtered data sample has been saturated (reached 0x8001 or 0x7FFF). The register is updated synchronous to the corresponding data registers in DATA_0..19.
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x4A		SATURATION		0x00	
	0	acc_x	ACC X-axis raw data saturation flag.	0x0	R
	1	acc_y	ACC Y-axis raw data saturation flag.	0x0	R
	2	acc_z	ACC Z-axis raw data saturation flag.	0x0	R
	3	gyr_x	GYR X-axis raw data saturation flag.	0x0	R
	4	gyr_y	GYR Y-axis raw data saturation flag.	0x0	R
	5	gyr_z	GYR Z-axis raw data saturation flag.	0x0	R

4.2.52 Register (0x4B) AUX_DEV_ID

DESCRIPTION: Auxiliary interface device_id
RESET: 0x20
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x4B		AUX_DEV_ID		0x20	
	7...1	i2c_device_addr	I2C device address of Auxiliary sensor	0x10	RW

4.2.53 Register (0x4C) AUX_IF_CONF

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

Address	Bit	Name	Description	Reset	Access
0x4C		AUX_IF_CONF		0x83	
	1...0	aux_rd_burst	Burst data length (1, 2, 6, and 8 bytes) **Value** **Name** **Description** 0x00 BL1 Burst length 1 0x01 BL2 Burst length 2 0x02 BL6 Burst length 6 0x03 BL8 Burst length 8	0x3	RW
	3...2	man_rd_burst	Manual burst data length (1, 2, 6, and 8 bytes) **Value** **Name** **Description** 0x00 BL1 Burst length 1 0x01 BL2 Burst length 2 0x02 BL6 Burst length 6 0x03 BL8 Burst length 8	0x0	RW
	6	aux_fcu_write_en	Enables FCU write command on AUX IF for auxiliary sensors that need a trigger.	0x0	RW
	7	aux_manual_en	Switches auxiliary interface between automatic and manual mode. In manual mode all read and write operations on the auxiliary interface must be triggered manually; in automatic	0x1	RW

		mode (aux_manual_en = "0") FCU triggers read and write operations periodically (as programmed by the user).		

4.2.54 Register (0x4D) AUX_RD_ADDR

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

Address	Bit	Name	Description	Reset	Access
0x4D		AUX_RD_ADDR		0x42	
	7...0	read_addr	Address to read. In manual mode it triggers the read operation.	0x42	RW

4.2.55 Register (0x4E) AUX_WR_ADDR

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

Address	Bit	Name	Description	Reset	Access
0x4E		AUX_WR_ADDR		0x4C	
	7...0	write_addr	Address to write. In manual mode it triggers the write operation.	0x4C	RW

4.2.56 Register (0x4F) AUX_WR_DATA

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

Address	Bit	Name	Description	Reset	Access
0x4F		AUX_WR_DATA		0x02	
	7...0	write_data	Data to write	0x2	RW

4.2.57 Register (0x52) ERR_REG_MSK

DESCRIPTION: Defines which error flag will trigger the error interrupt once enabled
'1' - use to generate the error interrupt
'0' - do not use to generate error interrupt
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x52		ERR_REG_MSK		0x00	
	0	fatal_err	Use fatal error to generate the error interrupt.	0x0	RW
	4...1	internal_err	Use internal error to generate the error interrupt	0x0	RW
	6	fifo_err	Use FIFO error to generate the error interrupt.	0x0	RW
	7	aux_err	Use aux interface error to generate the error interrupt.	0x0	RW

4.2.58 Register (0x53) INT1_IO_CTRL

DESCRIPTION: Configure the electrical behavior of the interrupt pin INT1
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x53		INT1_IO_CTRL		0x00	
	1	lvl	Configure output level of INT1 pin **Value Name Description** 0x00 active_low active low 0x01 active_high active high	0x0	RW
	2	od	Configure output behaviour of INT1 pin **Value Name Description** 0x00 push_pull push-pull 0x01 open_drain open drain	0x0	RW
	3	output_en	Output enable for INT1 pin **Value Name Description** 0x00 off Output disabled 0x01 on Output enabled	0x0	RW
	4	input_en	Input enable for INT1 pin **Value Name Description** 0x00 off Input disabled 0x01 on Input enabled	0x0	RW

4.2.59 Register (0x54) INT2_IO_CTRL

DESCRIPTION: Configure the electrical behavior of the interrupt pin INT2
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x54		INT2_IO_CTRL		0x00	
	1	lvl	Configure level of INT2 pin **Value Name Description** 0x00 active_low active low 0x01 active_high active high	0x0	RW
	2	od	Configure output behaviour of INT2 pin **Value Name Description** 0x00 push_pull push-pull 0x01 open_drain open drain	0x0	RW
	3	output_en	Output enable for INT2 pin **Value Name Description** 0x00 off Output disabled 0x01 on Output enabled	0x0	RW
	4	input_en	Input enable for INT2 pin **Value Name Description** 0x00 off Input disabled 0x01 on Input enabled	0x0	RW

4.2.60 Register (0x55) INT_LATCH

DESCRIPTION: Configure interrupt latch modes

RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x55		INT_LATCH		0x00	
	0	int_latch	Latched/non-latched interrupt modes	0x0	RW
			Value Name Description		
			0x00 none non latched		
			0x01 permanent permanent latched		

4.2.61 Register (0x56) INT1_MAP_FEAT

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

Address	Bit	Name	Description	Reset	Access
0x56		INT1_MAP_FEAT		0x00	
	3	dsd_out	Door state detection output	0x0	RW
	5	no_motion_out	No motion detection output	0x0	RW
	6	any_motion_out	Any motion detection output	0x0	RW

4.2.62 Register (0x57) INT2_MAP_FEAT

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

Address	Bit	Name	Description	Reset	Access
0x57		INT2_MAP_FEAT		0x00	
	3	dsd_out	Door state detection output	0x0	RW
	5	no_motion_out	No motion detection output	0x0	RW
	6	any_motion_out	Any motion detection output	0x0	RW

4.2.63 Register (0x58) INT_MAP_DATA

DESCRIPTION: Data Interrupt mapping for both INT pins
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x58		INT_MAP_DATA		0x00	
	0	ffull_int1	FIFO Full interrupt mapped to INT1	0x0	RW
	1	fwm_int1	FIFO Watermark interrupt mapped to INT1	0x0	RW
	2	drdy_int1	Data Ready interrupt mapped to INT1	0x0	RW
	3	err_int1	Error interrupt mapped to INT1	0x0	RW
	4	ffull_int2	FIFO Full interrupt mapped to INT2	0x0	RW
	5	fwm_int2	FIFO Watermark interrupt mapped to INT2	0x0	RW
	6	drdy_int2	Data Ready interrupt mapped to INT2	0x0	RW
	7	err_int2	Error interrupt mapped to INT2	0x0	RW

4.2.64 Register (0x59) INIT_CTRL

DESCRIPTION: Start initialization
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x59		INIT_CTRL		0x00	
	7...0	init_ctrl	Start initialization	0x0	RW

4.2.65 Register (0x5B) INIT_ADDR_0

DESCRIPTION: Base address of the initialization data. Increment by burst write length in bytes/2 after each burst write operation. Ignore if your host supports loading the initialization data in a single 8kB burst write operation.
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x5B		INIT_ADDR_0		0x00	
	3...0	base_0_3	Bits 0 to 3 of the base address for initialization data.	0x0	RW

4.2.66 Register (0x5C) INIT_ADDR_1

DESCRIPTION: Base address of the initialization data. Increment by burst write length in bytes/2 after each burst write operation. Ignore if your host supports loading the initialization data in a single 8kB burst write operation.
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x5C		INIT_ADDR_1		0x00	
	7...0	base_11_4	Bits 4 to 11 of the base address for initialization data.	0x0	RW

4.2.67 Register (0x5E) INIT_DATA

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

Address	Bit	Name	Description	Reset	Access
0x5E		INIT_DATA		0x00	
	7...0	data	Register for initialization data	0x0	RW

4.2.68 Register (0x5F) INTERNAL_ERROR

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

Address	Bit	Name	Description	Reset	Access
0x5F		INTERNAL_ERROR		0x00	
	1	int_err_1	Internal error flag - long processing time, processing halted	0x0	R
	2	int_err_2	Internal error flag - fatal error, processing halted	0x0	R

	4	feat_eng_disabled	Feature engine has been disabled by host during sensor operation	0x0	R

4.2.69 Register (0x68) AUX_IF_TRIM

DESCRIPTION: Auxiliary interface trim register (NVM backed)
RESET: 0x01
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x68		AUX_IF_TRIM		0x01	
	1...0	asda_pupsel	Pull-up configuration for ASDA **Value Name Description** 0x00 pup_res_off Pullup off 0x01 pup_res_40k Pullup 40k 0x02 pup_res_10k Pullup 10k 0x03 pup_res_2k Pullup 2k	0x1	RW

4.2.70 Register (0x69) GYR_CRT_CONF

DESCRIPTION: Component Re-trimming for Gyroscope
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x69		GYR_CRT_CONF		0x00	
	2	crt_running	Indicates that CRT is currently running. If CRT is completed, check CRT_STATUS register for the completion status **Value Name Description** 0x00 disabled disabled 0x01 enabled enabled	0x0	RW
	3	rdy_for_dl	Pacemaker bit for downloading the CRT data **Value Name Description** 0x00 ongoing ongoing or not started 0x01 complete complete	0x0	R

4.2.71 Register (0x6A) NVM_CONF

DESCRIPTION: NVM Configuration
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x6A		NVM_CONF		0x00	
	1	nvm_prog_en	Enable NVM programming. **Value Name Description** 0x00 disable disable 0x01 enable enable	0x0	RW

4.2.72 Register (0x6B) IF_CONF

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

Address	Bit	Name	Description	Reset	Access
0x6B		IF_CONF		0x00	
	0	spi3	Configures SPI Interface Mode for primary interface **Value Name Description** 0x00 spi4 SPI 4-wire mode 0x01 spi3 SPI 3-wire mode	0x0	RW
	1	spi3_ois	Configures SPI Interface Mode for OIS interface (if enabled) **Value Name Description** 0x00 spi4 SPI 4-wire mode 0x01 spi3 SPI 3-wire mode	0x0	RW
	4	ois_en	Interface configuration - OIS enable bit. It has lower priority than aux_en.	0x0	RW
	5	aux_en	Interface configuration - AUX enable bit. It has higher priority than ois_en.	0x0	RW

4.2.73 Register (0x6C) DRV

DESCRIPTION: Drive strength control register (NVM backed)
RESET: 0xAA
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x6C		DRV		0xAA	
	2...0	io_pad_drv1	Output pad drive strength setting for the SDO and SDx pins: 0b111 is approx. 10x stronger driver than 0b000..	0x2	RW
	3	io_pad_i2c_b1	Output pad drive strength setting to disable the additional increase in pull down strength of the SDx pin in I2C mode (in case of strong external pull-up resistor)..	0x1	RW
	6...4	io_pad_drv2	Output pad drive strength setting the OSDO, ASCx, and ASDx pins: 0b111 is approx. 10x stronger driver than 0b000.	0x2	RW
	7	io_pad_i2c_b2	Output pad drive strength setting to disable the additional increase in pull down strength of the ASCx and ASDx pins in i2c mode (in case of strong external pull-up resistor).	0x1	RW

4.2.74 Register (0x6D) ACC_SELF_TEST

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

Address	Bit	Name	Description	Reset	Access
0x6D		ACC_SELF_TEST		0x00	
	0	acc_self_test_en	Enables accelerometer self-test **Value Name Description** 0x00 disabled disabled 0x01 enabled enabled	0x0	RW
	2	acc_self_test_sign	Selects sign of self-test excitation as **Value Name Description**	0x0	RW

Address	Bit	Name	Description				Reset	Access
			0x00 negative negative					
			0x01 positive positive					
	3	acc_self_test_amp	Selects amplitude of the self-test deflection:				0x0	RW
			Value	**Name**	**Description**			
			0x00	low	low			
			0x01	high	high			

4.2.75 Register (0x6E) GYR_SELF_TEST_AXES

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

Address	Bit	Name	Description	Reset	Access
0x6E		GYR_SELF_TEST_AXES		0x00	
	0	gyr_st_axes_done	STATUS: functional test of detection channels finished.	0x0	R
	1	gyr_axis_x_ok	Status of gyro X-axis self-test	0x0	R
	2	gyr_axis_y_ok	Status of gyro Y-axis self-test	0x0	R
	3	gyr_axis_z_ok	Status of gyro Z-axis self-test	0x0	R

4.2.76 Register (0x70) NV_CONF

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

Address	Bit	Name	Description				Reset	Access
0x70		NV_CONF					0x00	
	0	spi_en	Disables the I2C and enables SPI for the primary interface when it is in autoconfig mode.				0x0	RW
			Value	**Name**	**Description**			
			0x00	disabled	I2C enabled			
			0x01	enabled	I2C disabled			
	1	i2c_wdt_sel	Selects timer period for I2C Watchdog				0x0	RW
			Value	**Name**	**Description**			
			0x00	short	I2C watchdog timeout after 1.25 ms			
			0x01	long	I2C watchdog timeout after 40 ms			
	2	i2c_wdt_en	I2C Watchdog at the SDA pin in I2C interface mode				0x0	RW
			Value	**Name**	**Description**			
			0x00	Disable	Disable I2C watchdog			
			0x01	Enable	Enable I2C watchdog			
	3	acc_off_en	Adds the offset defined in the off_acc_[xyz] OFFSET register to filtered and unfiltered Accelerometer data				0x0	RW
			Value	**Name**	**Description**			
			0x00	disabled	Disabled			
			0x01	enabled	Enabled			

4.2.77 Register (0x71) OFFSET_0

DESCRIPTION: Offset compensation for Accelerometer X-axis (NVM backed)
RESET: 0x00

DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x71		OFFSET_0		0x00	
	7...0	off_acc_x	Accelerometer offset compensation (X-axis).	0x0	RW

4.2.78 Register (0x72) OFFSET_1

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

Address	Bit	Name	Description	Reset	Access
0x72		OFFSET_1		0x00	
	7...0	off_acc_y	Accelerometer offset compensation (Y-axis).	0x0	RW

4.2.79 Register (0x73) OFFSET_2

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

Address	Bit	Name	Description	Reset	Access
0x73		OFFSET_2		0x00	
	7...0	off_acc_z	Accelerometer offset compensation (Z-axis).	0x0	RW

4.2.80 Register (0x74) OFFSET_3

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

Address	Bit	Name	Description	Reset	Access
0x74		OFFSET_3		0x00	
	7...0	gyr_usr_off_x_7_0	Gyroscope offset compensation (X-axis).	0x0	RW

4.2.81 Register (0x75) OFFSET_4

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

Address	Bit	Name	Description	Reset	Access
0x75		OFFSET_4		0x00	
	7...0	gyr_usr_off_y_7_0	Gyroscope offset compensation (Y-axis).	0x0	RW

4.2.82 Register (0x76) OFFSET_5

DESCRIPTION: Offset compensation for Gyroscope Z-axis (NVM backed)
RESET: 0x00

DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x76		OFFSET_5		0x00	
	7...0	gyr_usr_off_z_7_0	Gyroscope offset compensation (Z-axis).	0x0	RW

4.2.83 Register (0x77) OFFSET_6

DESCRIPTION: Offset compensation (MSBs gyroscope, enables) (NVM backed)
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x77		OFFSET_6		0x00	
	1...0	gyr_usr_off_x_9_8	Gyroscope offset compensation (X-axis).	0x0	RW
	3...2	gyr_usr_off_y_9_8	Gyroscope offset compensation (Y-axis).	0x0	RW
	5...4	gyr_usr_off_z_9_8	Gyroscope offset compensation (Z-axis).	0x0	RW
	6	gyr_off_en	Adds the offset defined in the gyr_usr_off_[xyz] OFFSET register to filtered and unfiltered Gyroscope data. Value Name Description 0x00 disabled Disabled 0x01 enabled Enabled	0x0	RW
	7	gyr_gain_en	Compensates the gain as described in section "Sensitivity Error Compensation". Value Name Description 0x00 disabled Disabled 0x01 enabled Enabled	0x0	RW

4.2.84 Register (0x7C) PWR_CONF

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

Address	Bit	Name	Description	Reset	Access
0x7C		PWR_CONF		0x03	
	0	adv_power_save	Advanced power save disabled. Value Name Description 0x00 aps_off Advanced power save disabled. 0x01 aps_on Advanced power mode enabled.	0x1	RW
	1	fifo_self_wake_up	FIFO read disabled in low power mode Value Name Description 0x00 fsw_off FIFO read disabled in low power mode 0x01 fsw_on FIFO read enabled in low power mode after FIFO interrupt is fired	0x1	RW
	2	fup_en	Fast power up enable Value Name Description 0x00 fup_off Fast power up disabled 0x01 fup_on Fast power up enabled	0x0	RW

4.2.85 Register (0x7D) PWR_CTRL

DESCRIPTION: Power mode control register
RESET: 0x00
DEFINITION (Go to register map):

Address	Bit	Name	Description	Reset	Access
0x7D		PWR_CTRL		0x00	
	0	aux_en		0x0	RW
			Value **Name** **Description** 0x00 aux_off Disables the Auxiliary sensor. 0x01 aux_on Enables the Auxiliary sensor.		
	1	gyr_en		0x0	RW
			Value **Name** **Description** 0x00 gyr_off Disables the Gyroscope. 0x01 gyr_on Enables the Gyroscope.		
	2	acc_en		0x0	RW
			Value **Name** **Description** 0x00 acc_off Disables the Accelerometer. 0x01 acc_on Enables the Accelerometer.		
	3	temp_en		0x0	RW
			Value **Name** **Description** 0x00 temp_off Disables the Temperature sensor. 0x01 temp_on Enables the Temperature sensor.		

4.2.86 Register (0x7E) CMD

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

Address	Bit	Name	Description	Reset	Access
0x7E		CMD		0x00	
	7...0	cmd	Available commands (Note: The register will always return 0x00 as the read result): **Value** **Name** **Description** 0x02 g_trigger Trigger special gyro operations. 0x03 usr_gain Applies new gyro gain value. 0xa0 nvm_prog Writes the NVM backed registers into NVM. 0xb0 fifo_flush Clears FIFO content. 0xb6 softreset Triggers a reset, all user configuration settings are overwritten with their default state.	0x0	W

5   Document history and modification

Rev. No	Chapter	Description of modification/changes	Date
1.0	-	Initial release	May 2025