Changing the I2C-Address and activating new data interrupt
Application note for products of the SLF3x-family

Summary

This application note describes how to change the factory-set I2C-address of a SLF3x sensor. This helps if several sensors are used on the same I2C bus. To change the address, a command (containing the new address as argument) needs to be sent to the bus, right afterwards, the IRQn pin of the sensor has to be set to high state for at least 100 us. After a confirmation the sensor can be called with the new address.

Furthermore, the command to change the I2C address also enables the new-data-interrupt functionality, which indicates whether new measurement results are available.

1 Introduction

Sensirion flow sensors of the SLF3x-family have all the same I2C address, which is set during the factory-calibration. In order to read out several flow sensors connected to the same bus, individual I2C-addresses shall be assigned.
This application note describes the necessary procedure.

2 Remarks

- The I2C address will be reset to the default value specified in the data sheet upon a hard- or soft-reset. Hence, the procedure will have to be repeated to assign individual I2C addresses.
- It takes roughly 2 ms to change the I2C address for one device.
- An arbitrary number of devices can be configured with this procedure and an arbitrary I2C address can be used for each device.
- The procedure has to be executed upon a hard- or soft-reset of the sample, other commands must not be issued prior to the I2C address configuration command.

3 Procedure to change I2C address

Prerequisites

- All sensors are connected to the same I2C bus
- The IRQn pin can be directly controlled by a micro controller. The connecting pin needs to be configurable either as an input or as an output.
- A soft or hard reset is done prior to the address-changing procedure (see datasheet for more details)

Pad	Description	Comments
1	**IRQn**	**Connect this pin separately for each device to the micro controller**
2	SDA (data)	Serial data, bidirectional
3	VDD	Supply voltage
4	GND	Ground
5	SCL (clock)	Serial clock, bidirectional
6	n.c.	Nonfunctional, connect to GND or leave floating
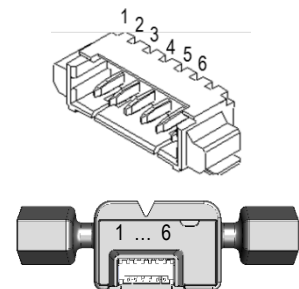
Explanation of the procedure

Using the default I2C address in the data sheet a specific command to change the I2C address has to be issued. All sensors will respond to this command and internally a monitoring process is started, which will check the state of pin 1 during the subsequent 1.5 ms. Please note, that the pin 1 shall be generally referred to as the new data interrupt (IRQn), which will become more comprehensible below. Hence, this pad is configurable as an output of the flow-sensor. However, upon issuing the command to change the I2C address the pad will be set to input mode, and the master is able to configure the pin on his side as output. The customer has then the possibility to set the pin 1 to high (for the course of at least 100 us during the 1.5 ms time window) in order to apply the requested I2C address for the specific device. If a sensor detects a high state of the IRQn pad during the 1.5 ms, the I2C address will be applied as requested in the command argument. If no high phase occurs during the time window, nothing happens and the I2C address will not be changed. After the 1.5 ms have elapsed, the sensor will configure the pad to output mode, therefore, by this time the master needs to have reconfigured the pad to input mode. It may be advisable to use a pull-down resistance on the IRQn pin in order to prevent accidental high states caused by disturbances while the pin is configured to input mode by the slave.
The sensor where the I2C address has been changed will confirm the successful execution of the procedure by setting the IRQn pin to high for 200 us. Upon this confirmation the slave will respond on the requested I2C address.
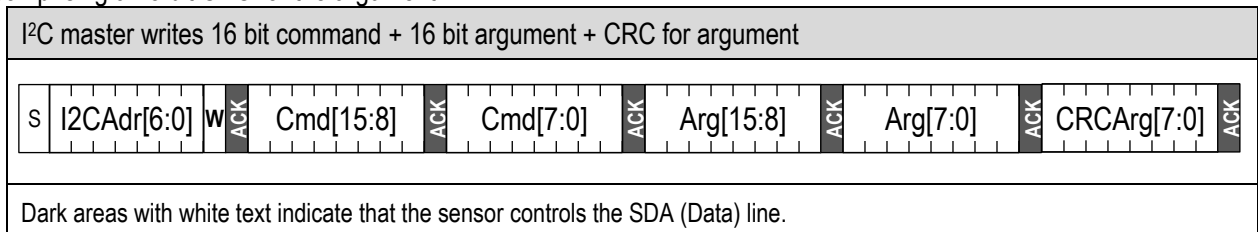
IRQn Functionality

After issuing the command (incl. command argument) to change the I2C address, the new data interrupt functionality will be enabled on pin 1 (therefore referred to as IRQn pin). The IRQn pin indicates whether new measurement results are available. The signal is active low, meaning that when the signal is high there is no new measurement data available. The IRQn will automatically clear to high when a flow measurement value is read out.

The IRQn pin will be set to low after confirming the I2C address change procedure with a 200 us long high pulse and remain low, until a measurement command is sent.

When the IRQn signal is not used, the pin should stay unconnected and must not be tied to GND or VDD.

Command Description

The address is changed by sending a dedicated command, followed by an argument with the new I2C address comprising an 8 bit CRC for the argument.

I2C master writes 16 bit command + 16 bit argument + CRC for argument
S | I2CAdr[6:0] | W | ACK | Cmd[15:8] | ACK | Cmd[7:0] | ACK | Arg[15:8] | ACK | Arg[7:0] | ACK | CRCArg[7:0] | ACK
Dark areas with white text indicate that the sensor controls the SDA (Data) line.

The following table describes the content of the write sequence depicted above.

Name	Description
Command	To change I2C address Command code: 0x3661
Argument	16-bit argument for new I2C address: 0x0000 to 0x007F: range for new I2C address (restrictions according to I2C-specification may apply) For example 0x000F for address 15
CRC for Argument	8 bit CRC. See datasheet for more details

During the 1.5 ms that the sensor is subsequently checking the state of the pin 1, other measurement commands must not be sent to the sensor (the sensor does not acknowledge [NACK] such commands). This waiting time of 1.5 ms must also be observed even if the I2C address shall not be changed (i.e. pin 1 will not be pulled to high), but only the new data interrupt shall be enabled.

Typical Implementation Diagram

In the following scope plot, a typical implementation diagram of the address-change sequence and the new data interrupt functionality is shown.
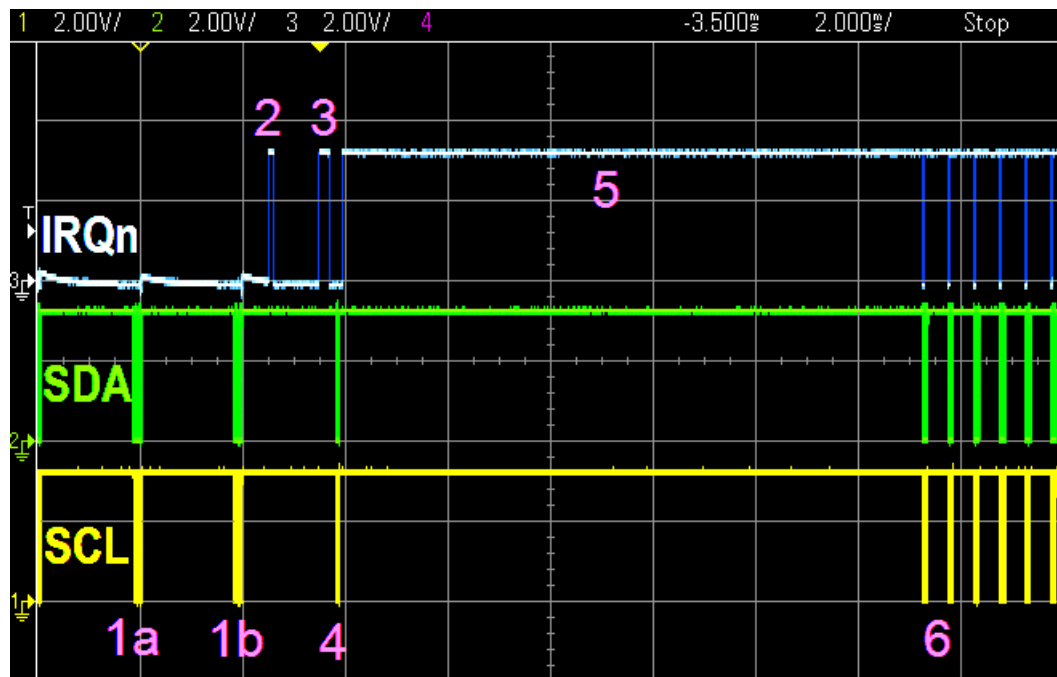
Description of sequence steps

1a,1b The command to change the I2C address may be issued multiple times according to the number of SLF3x on the bus. The desired I2C address is transmitted in the command argument. After receiving the command, the IRQn pin is set to input, and the master (microcontroller) can set the pad-mode to output.

2. Applying a high state to the IRQn pin of the SLF3x to change I2C address for at least 100 us is the selection criterion on which SF3x to change the I2C address.

3. After 1.5 ms the slave (SLF3x) will change the pin-mode to output, therefore, by this time the pad-mode of the master (microcontroller) needs to be reset to input. The sensor where the I2C address has been changed confirms the successful execution of the procedure by setting the IRQn pin high for 200 us. Upon this confirmation the slave will respond on the requested I2C address. The IRQn pin has been enabled (in fact already with the first command to change the I2C address) and remains low, until a measurement command is sent.

4. A start measurement command is issued, which configures the IRQn to its default active low behavior.

5. No flow measurement values can be read during the first 12 ms (see data sheet), therefore the IRQn pin state is high.

6. After about 12 ms the IRQn pin adopts its active low alert state to indicate that flow data can be read from the sensor. The master is synchronized to the IRQn pin and reads the data as soon as the measurement data is available indicated by the IRQn.

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Revision History of the Application Note "I2C-Address-Change" – for INTERNAL USE only

Revision	Date	Changes Chapter	Description	Author
0.1	Nov 2021	all	First preliminary version	PARE
0.2	24.11.	all	Changes of Harry Figi implemented. Discussed together with Stefan Arnold	PARE, HFI