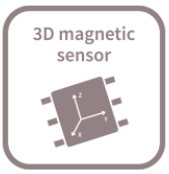
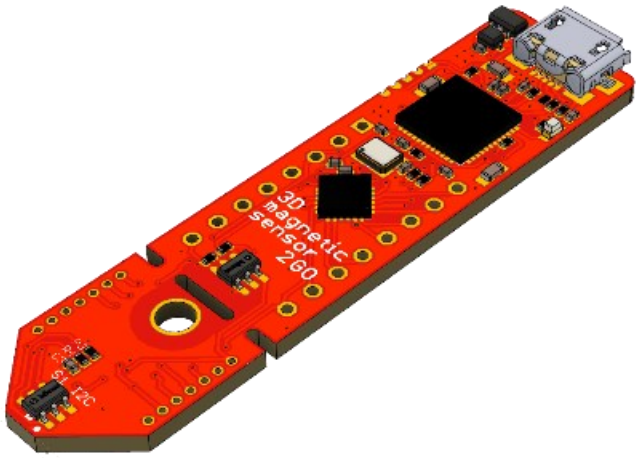
TLE493D-P3XX-MS2GO

3D 2go kit featuring TLE493D-P3B6 A0 (I2C) and TLE493D-P3I8 (SPI)

User Manual





About this document

Scope and purpose

This document provides an introduction to the 3D Magnetic Sensor 2 Go kit and should enable the reader to efficiently carry out own evaluations with the 3D magnetic sensor TLE493D-P3B6 and TLE493D-P3I8.

Intended audience

This document is aimed at everyone who wants to work with the 3D Magnetic Sensor 2 Go evaluation kit.

Table of contents

1 Introduction

Infineon's **3D Magnetic Sensor 2 Go** is a compact evaluation kit to familiarize the user with the 3D Hall sensors TLE493D P3B6 and TLE493D P3I8. In a short time, the board is set up and own 3D magnetic measurements can be executed. All required hardware is included, and the software can be downloaded for free from the Infineon web page. This user manual describes the different parts of the board, the software installation process and clarifies how the Graphical User Interface (GUI) can be used to do first evaluations. Further it is shown where to find example code and an Arduino library as an easy starting point for own developments.

1.1 Hardware overview

The 3D Magnetic Sensor 2 Go kit contains:

- The 3D evaluation board (EvalBoard) as shown in Figure 1, a ready-to-use printed circuit board (PCB) with the 3D Hall sensors. The EvalBoard is based on the XMC2Go-Kit. More technical documents and detailed description can be found at http://www.infineon.com/xmc2go
- A standalone 7x7x5 mm ferrite block magnet

To use the 3D Magnetic Sensor 2 Go kit the user has to acquire a USB cable with a micro USB connection-end for the EvalBoard side and a USB connection adequate for the PC side.

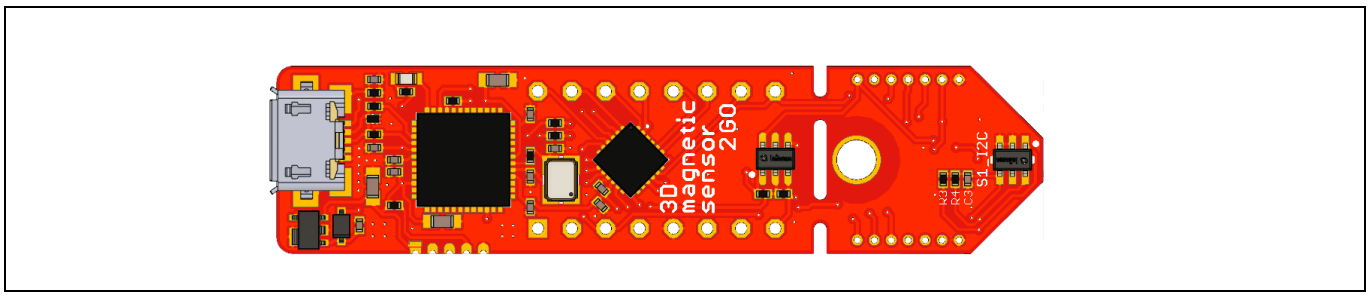


Figure 1 3D Magnetic Sensor 2 Go EvalBoard

1.2 Software

The required software to run the kit can be found at the Infineon web site. For further information refer to the chapter 3.

The software package contains:

- A Graphical User Interface (GUI) for sensor evaluation.
- Firmware to be flashed into the XMC microcontroller for the low-level communication with the sensor.
- USB driver J-Link from Segger which is necessary to establish the USB connection.

The USB protocols capabilities are defined by the Segger driver. Versions USB 2.0 and USB 3.0 are compatible. The GUI is used to enable a communication between the sensor and the PC. The user can configure the sensor to operate in different modes. In those modes the update rate of the magnetic field measured (X, Y and Z components) and current consumption vary.

1.3 Arduino compatible code

The 3D Hall evaluation board is based on the 2Go-XMC1100 board. This board is fully supported by the Arduino IDE. Thus, the 3D evaluation board is also compatible with Arduino. Instead of the firmware that is flashed by the GUI for fast evaluation, the user can also program the microcontroller directly.

Example code for this purpose is available on the following github page: https://github.com/Infineon/xensiv-magnetic-sensors-sw-examples/tree/main/3D-Sensors/Arduino/Raw_readout

1.4 Hardware extensions

Additionally, to the provided standalone magnet there are several dedicated extensions available that can be mounted to the 3D Magnetic Sensor 2 Go kit. The ever-growing selection of the available add ons can be found on the website:

https://www.infineon.com/cms/en/product/sensor/magnetic-sensors/magnetic-position-sensors/3d-magnetics/?tab=~%27boards_designs#!designsupport

2 EvalBoard description

The evaluation board (EvalBoard) is a ready-to-use printed circuit board (PCB) which contains:

- The 3D magnetic sensor TLE493D P3B6 and TLE493D P3I8. For the availability of 3D Magnetic Sensor 2 Go kits with different sensor variants check the Infineon web page: https://www.infineon.com/cms/en/product/sensor/magnetic-sensors/magnetic-position-sensors/3d-magnetics/?tab=~%27all#!products
- XMC1100 microcontroller based on ARM Cortex™ -M0 at 48 MHz frequency connected to the 3D sensor.
- XMC4200 microcontroller based on ARM Cortex™ -M4 at 144 MHz frequency used for debugging and USB communication.
- Micro USB connector for power supply and communication with the Graphical User Interface (GUI).
- LED for indication of power supply and debugging.
- Voltage regulator, reverse current protection diode and ESD protection diode.
- Pin headers to access data lines (e.g. via oscilloscope, external microcontroller).
- Break away option to use as individual shield.

The different components and its location are shown in Figure 2. The 3D magnetic sensor can be separated from the rest of the EvalBoard by cutting the break line.

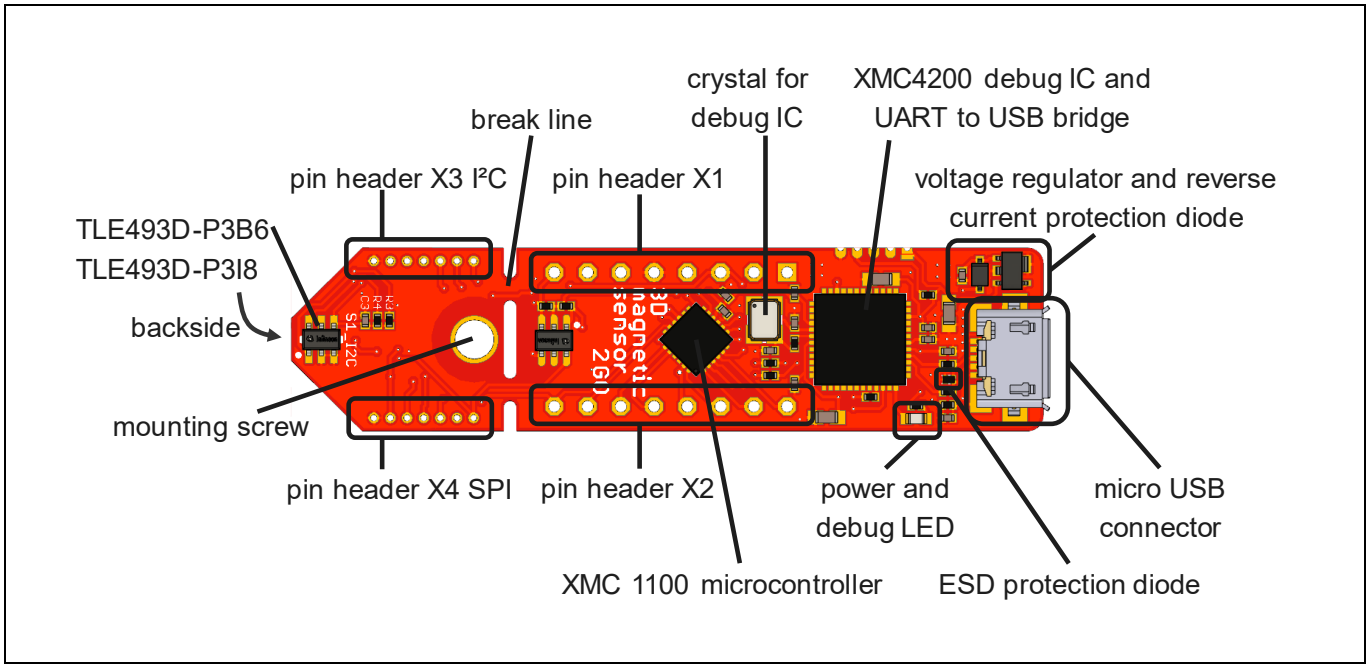


Figure 2 Main components of the EvalBoard

The mechanical hardware dimensions can be found in Figure 3.

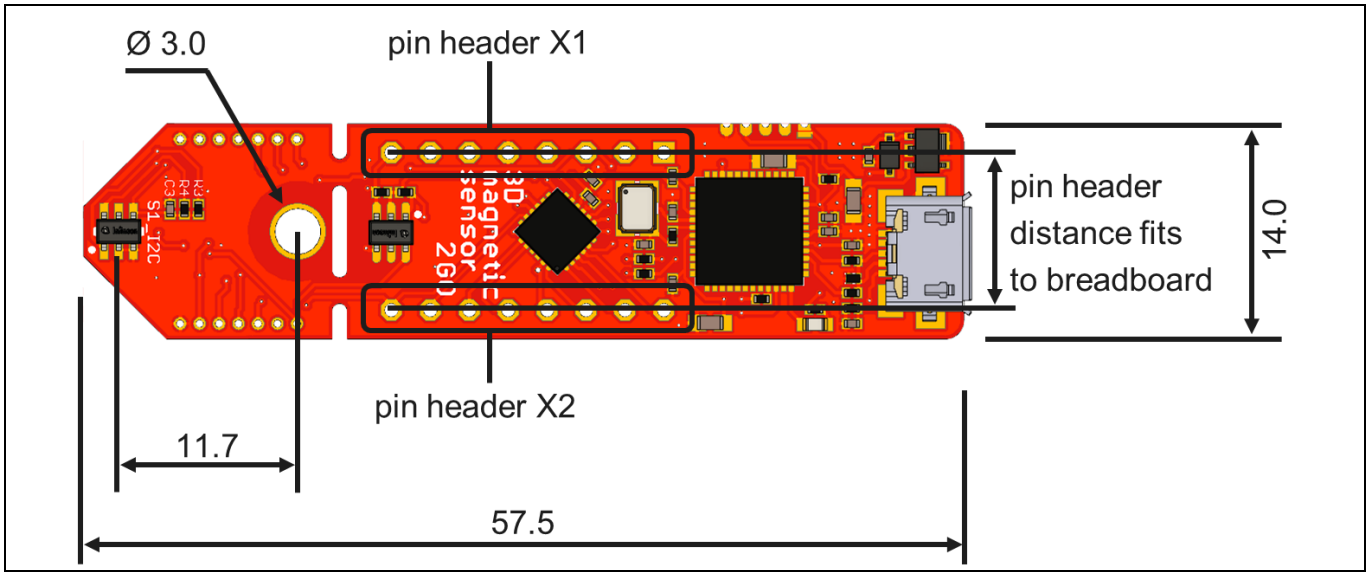


Figure 3 Mechanical dimensions of the EvalBoard

2.1 Optional external power supply

The 3D Magnetic Sensor 2 Go EvalBoard is supplied via the USB cable. It is also possible to provide an external power supply. If this is the case, a few considerations must be considered as described below.

The 3D Magnetic Sensor 2 Go EvalBoard must be supplied either by external 5 Volt DC power supply connected to the micro-USB plug or by 3.3. Volt over the X1 & X2 header. In case of USB powerd supply, the voltage regulator shifts the voltage level to 3.3 V for the microcontrollers and the 3D magnetic sensor. The Power & Debug LED indicates the presence of the generated 3.3 V supply voltage.

Out of the box with the pre-programmed application and the on-board debugger in operation the EvalBoard typically draws about 75 mA. This current can be delivered via the USB plug of a PC, which is specified to deliver up to 500 mA. An on-board reverse current protection diode will ensure safe operation and protects the USB port of the Laptop/PC in case power is provided through the pin header X1.

It is not recommended to apply an additional power supply to the VDD pin of X1 (3.3 V) when the board is powered via USB, because the 3.3 V supply could drive against the on-board power supply. The VDD pin can be used to power an external circuit. But care must be taken not to draw more current than 150 mA, which is the maximum current the on-board voltage regulator can deliver. After power-up the Debug LED starts blinking. In case there is connection to a PC with correctly installed drivers, the Debug LED will turn from blinking to constant illumination.

2.2 Pin header connector

The pin headers X1 and X2 can be used to extend the evaluation board or to perform measurements on the XMC1100. The order of pins available at X1 and X2 corresponds to the pinning schema of the XMC1100 microcontroller in the TSSOP-16 pin package. The pinning table is also printed onto the bottom side of the PCB (depending on the version). The pin headers X3 (I^2C) and X4 (SPI) can be used to access directly the 3D magnetic sensor pins.

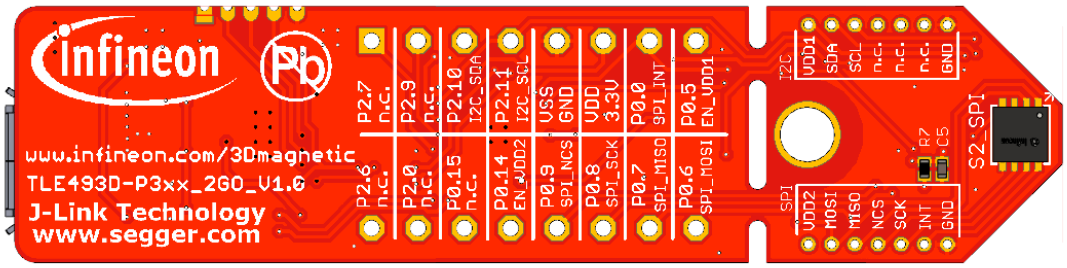


Figure 4 EvalBoard pin header connectors

The 3D Hall sensor pins can be accessed via the pin headers as shown in Table 1.

Table 1 Pin header description for the TLE493D-P3B6 3D magnetic sensor X3

Header X3	TLE493D-P3B6 pin number	Pin name on board	XMC1100 port pin	Sensor pin description
1	4	VDD1	P0.5	Supply pin via transistor
2	6	SDA	P2.10	Interface data pin, open drain
3	1	SCL	P2.11	Interface clock and \INT pin, open drain
7	3	GND	GND	Ground pin

Table 2 Pin header description for the TLE493D-P3I8 3D magnetic sensor X4

Header X4	TLE493D-P3I8 pin number	Pin name on board	XMC1100 port pin	Sensor pin description
1	4	VDD2	P0.14	Supply pin via transistor
2	1	MOSI	P0.7	SPI master out slave in
3	2	MISO	P0.6	SPI master in slave out
4	6	NCS	P0.9	SPI chip select not input
5	7	SCK	P0.8	SPI serial clock input
6	8	INT	P0.0	Interrupt pin
7	5	GND	GND	Ground pin

2.3 EvalBoard schematics

The schematics of the different blocks from the EvalBoard of the3D Magnetic Sensor 2 Go kit are provided in this chapter. They can be used to design customized PCBs. The user (integrator) is responsible for the correct functioning on system level as well as for the validation and testing.

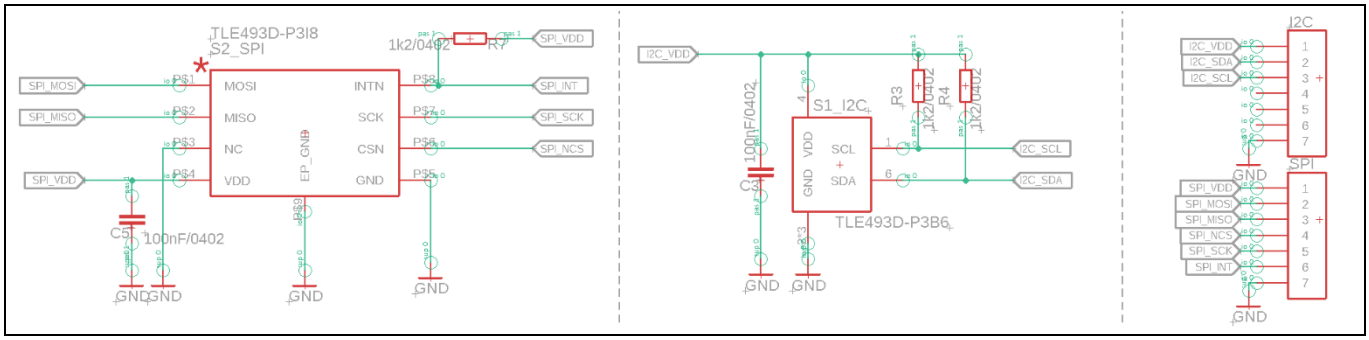


Figure 5 EvalBoard schematic: 3D magnetic sensors; left: SPI; center: I²C; right: header

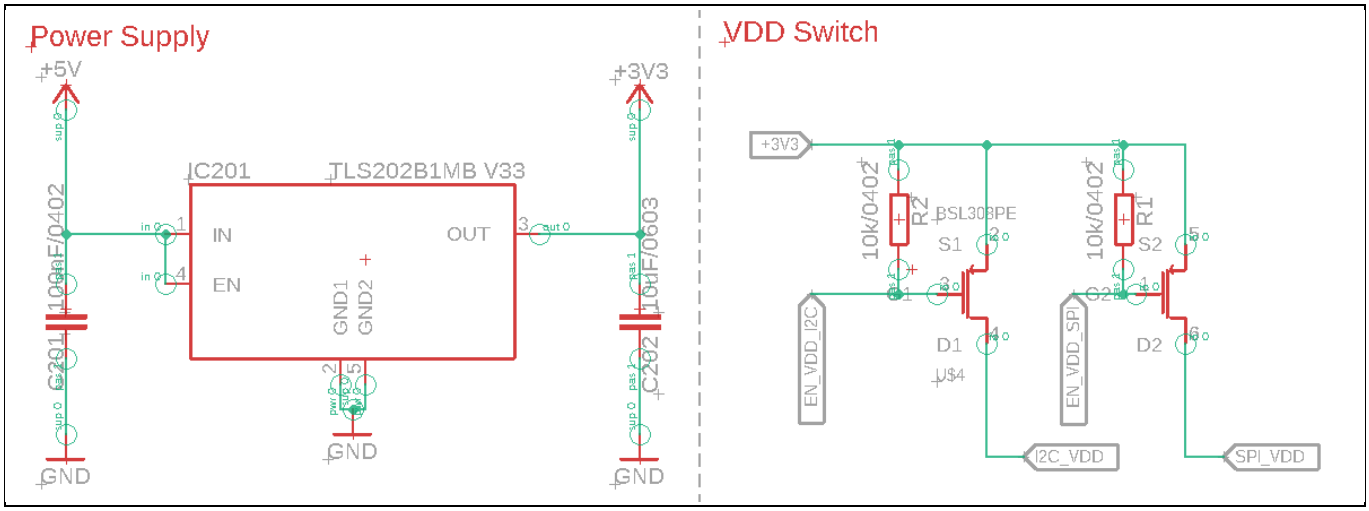


Figure 6 EvalBoard schematic: the voltage regulator (for the power supply) and the switches enabling the power supply to the sensors

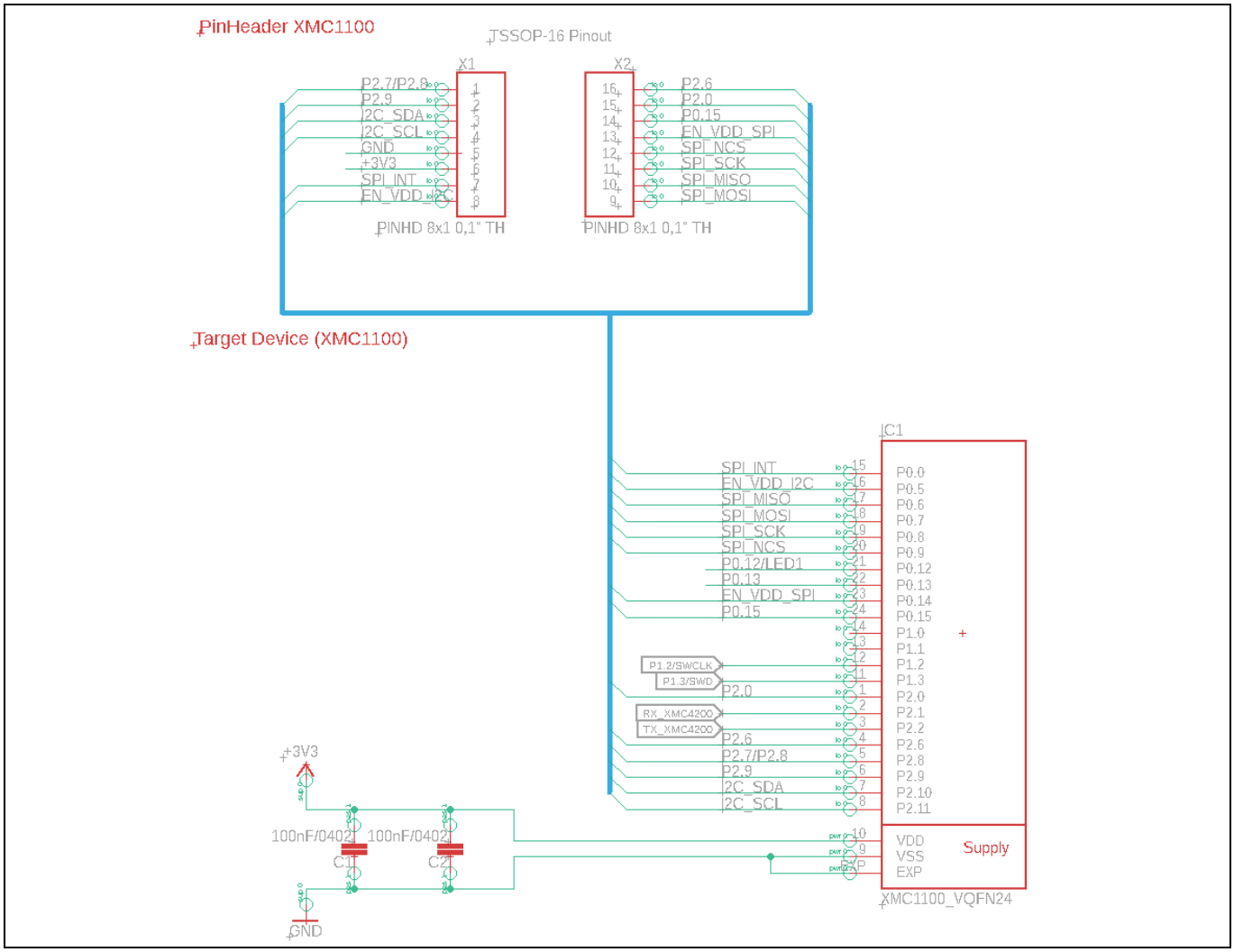


Figure 7 EvalBoard schematic: the XMC1100 microcontroller and pin headers

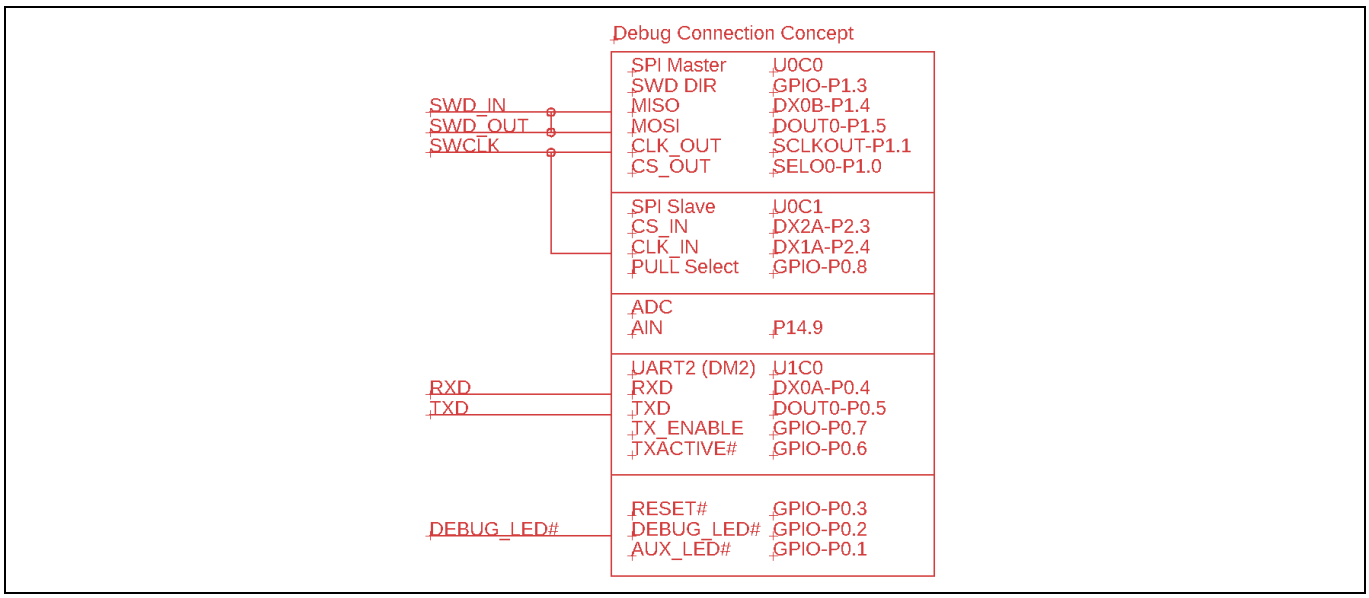


Figure 8 Sketch of the debug connection

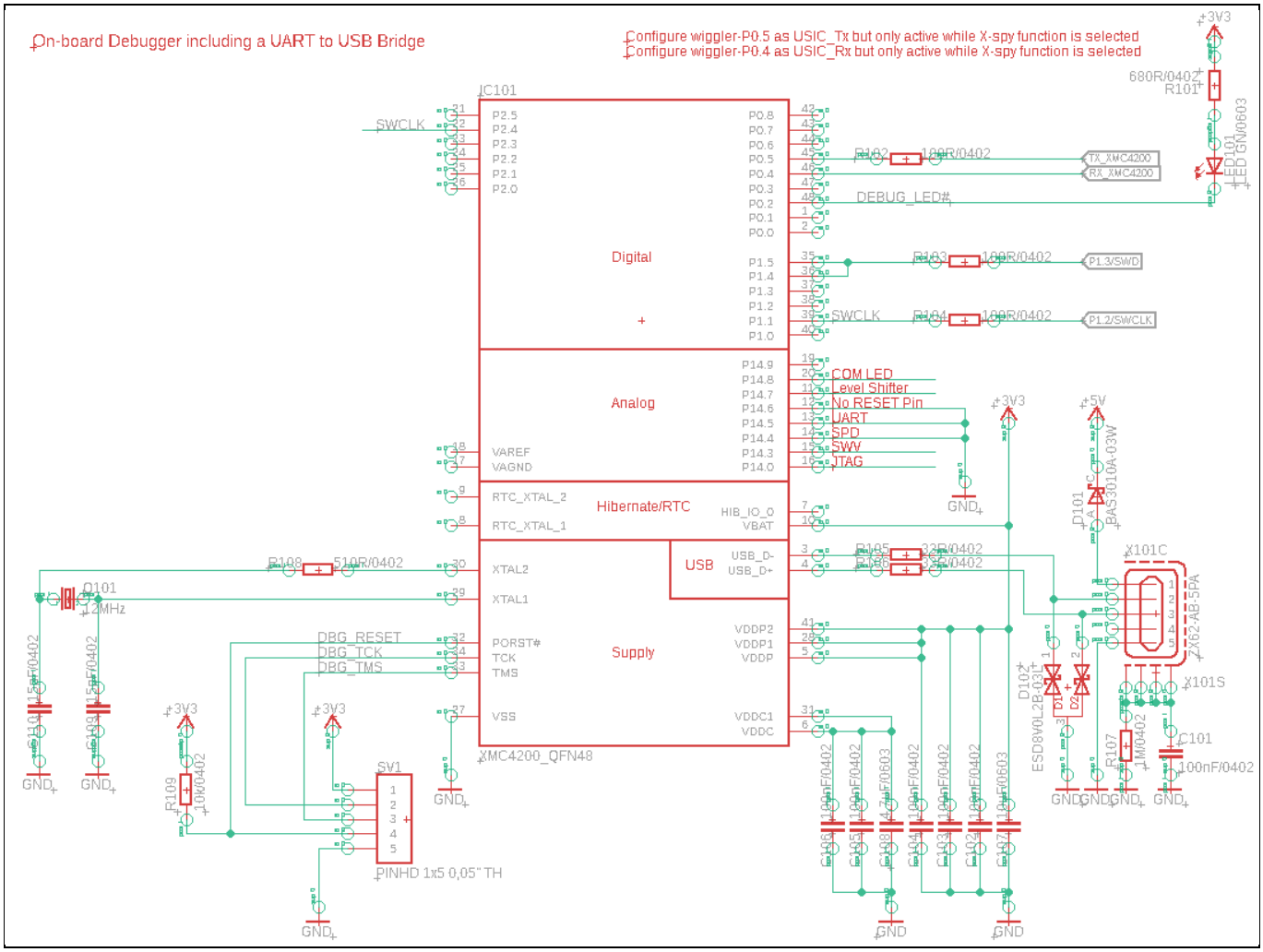


Figure 9 EvalBoard schematic: the XMC4200 microcontroller and micro-USB connector

3 Software installation

The software installation for the "3D Magnetic Sensor 2 Go" is designed to be as simple and automated as possible. An installation programme guides you through all the necessary steps. This is available under the following link:

https://softwaretools.infineon.com/tools/com.ifx.tb.tool.tlx493d

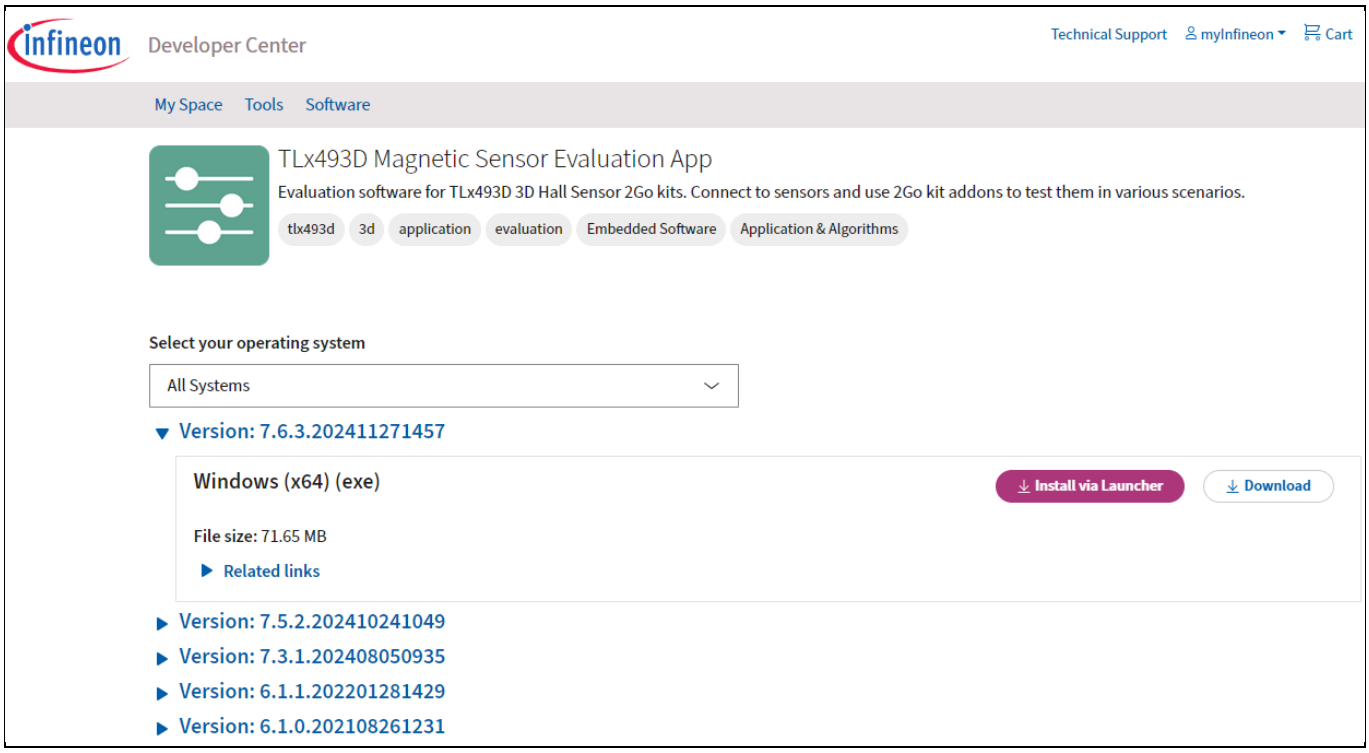


Figure 10 https://softwaretools.infineon.com/tools/com.ifx.tb.tool.tlx493d

Download the installation file and execute this file. You will be guided through the complete installation process. This process includes:

- Installing the graphical user interface (GUI)
- Including the installation of SEGGER J-Link
- Including Microsoft .NET installation
- And finally restarting your computer

4 3D magnetic sensor evaluation

This chapter describes how the GUI can be used to make first evaluations with Infineon's 3D magnetic sensors.

4.1 Getting started

Once the software is installed, the following steps are necessary to do the first magnetic measurements.

Steps

1. Connect the EvalBoard to the PC via the USB cable. The USB cable has to be able to provide also the data communication. A chargin only cable will result in a fast blinking debug LED on the board. Use the micro USB port for the EvalBoard and USB port for the PC. The power LED on the EvalBoard will switch on, indicating the EvalBoard is supplied with enough power.
2. Open the 3D 2Go GUI. Chose the COM port of the connected sensor PCB as shown in Figure 11 to establish the connection with the 3D Magnetic Sensor 2 Go kit. The first time you connect the board, a firmware will be downloaded to the XMC1100 which takes short time. This is indicated by the blinking power LED on the EvalBoard.

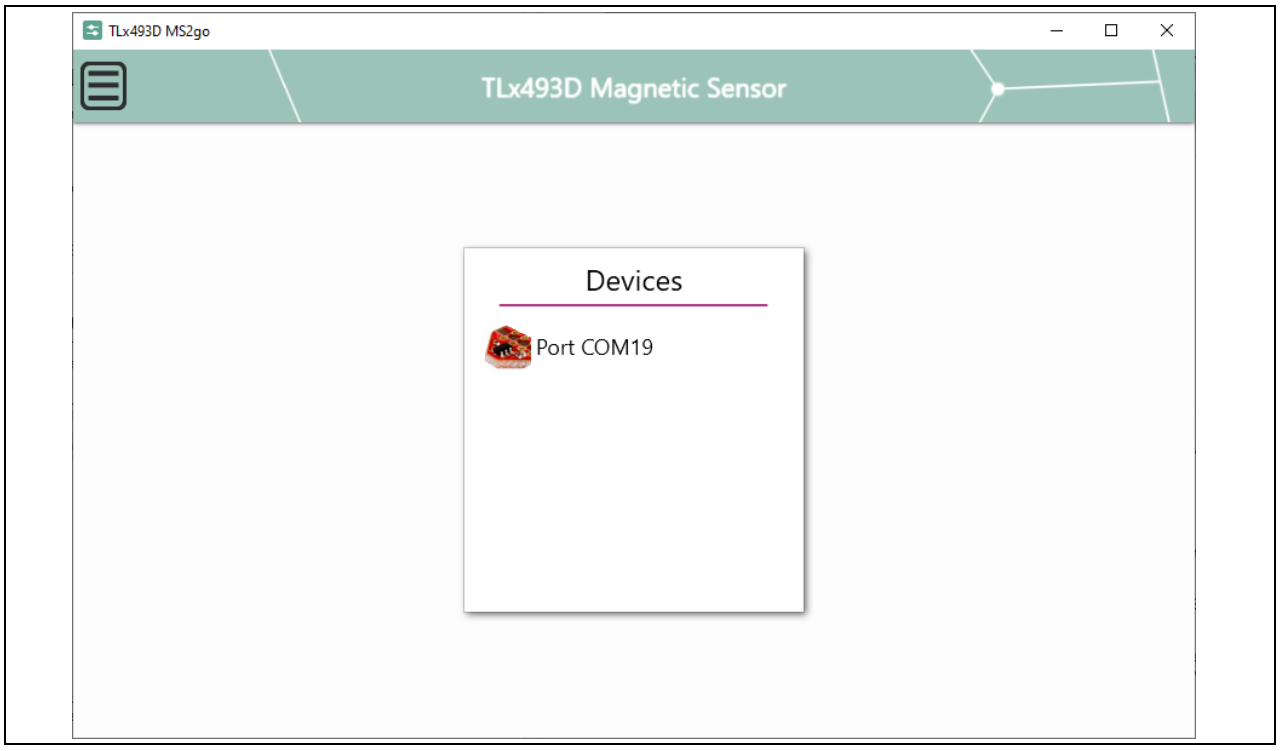


Figure 11 Establish the connection to the EvalBoard

3. The GUI automatically detects the sensor type on the 3D Magnetic Sensor 2 Go kit. Different configuration modes can be selected. For details refer to TLE493D P3B6 and TLE493D P3I8 data sheet and user manual. After you have selected the mode, click on **Start** to begin with the measurements.

4.2 Graph View - Charts

The graph view displays the magnetic field measurements in X, Y and Z direction. Also, the temperature measurement can be enabled. Figure 12 shows the charts view window. In the center there are three histograms which plot the magnetic field for each measured sample. On the right the current value is displayed, including

the temperature if enabled. There is a logging option at the bottom, with which you can save data and analyse the recordings afterwards. On the left side, a lot of different settings can be adjusted, depending on the connected board / activated sensor, like the active sensor.

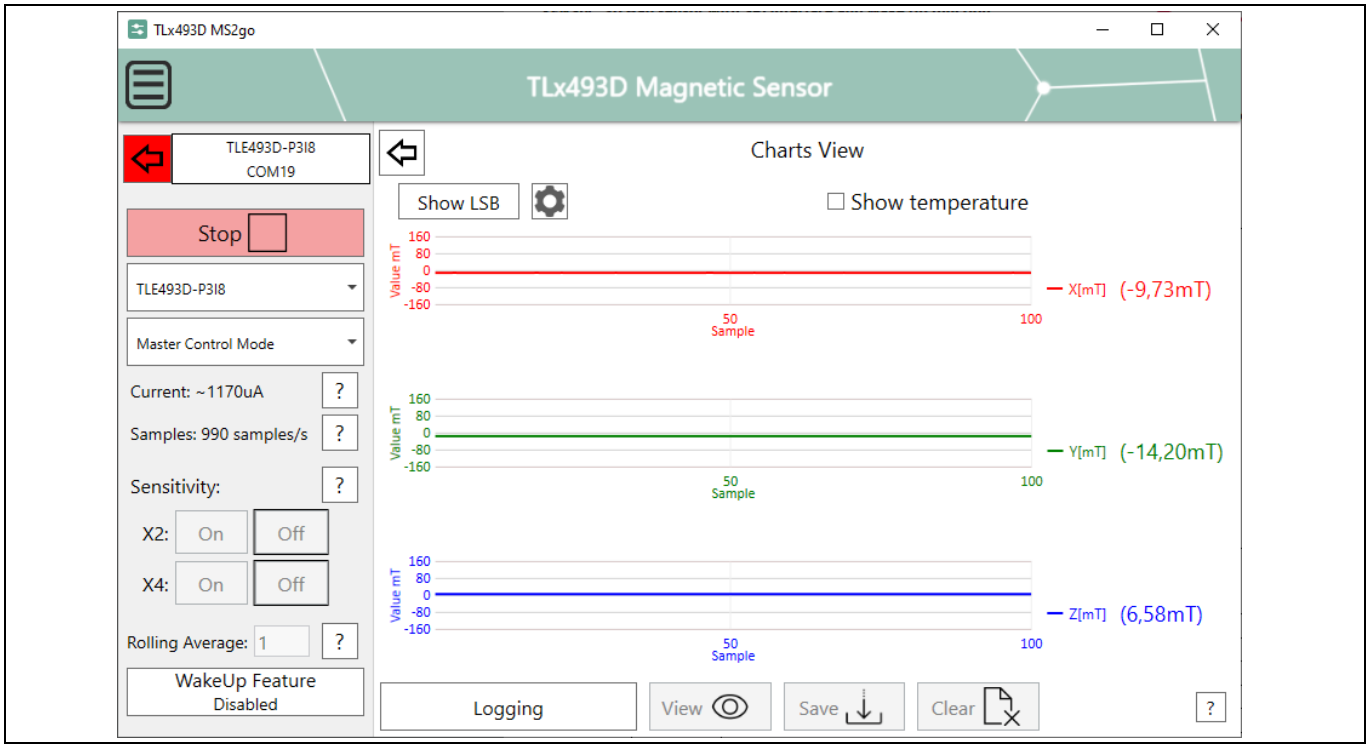


Figure 12 Graph view

4.3 Views for add ons

Apart from the charts view there are also dedicated views for the available add ons. A list of the available add ons can be found on our website. The usermanual for the different views can be found in the user manuals of the individual add ons.

5 XMC for Arduino - Example code for developers

Finally, the 3D Magnetic Sensor 2 Go kit can be used in combination with the Arduino IDE. A library is provided to enable a fast evaluation in the individual application. More details and the download can be found at the link below:

https://github.com/Infineon/xensiv-magnetic-sensors-sw-examples/tree/main/3D-Sensors/Arduino/Raw_readout

Revision history

Document revision	Date	Description of changes
1.0	2024-12-04	Initial version

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