WÜRTH ELEKTRONIK

EVALUATION BOARD MANUAL

ABSOLUTE PRESSURE SENSOR

Evaluation board order code	Sensor order code
2511223013391	2511020213301

VERSION 2.1

FEBRUARY 22, 2021

Revision history

Manual version	Product version	Notes	Date
1.0	1.0	• Initial release of the manual	June 2019
2.0	2.0	• Release of the SPI interface • Added PCB layout and assembly diagram in section 3.2	October 2020
2.1	2.0	• Added Section 1.2 • Added Figure 2: Block Diagram • Restructured Section 2.1	February 2021

Abbreviations

Abbreviation	Description
I^2C	Inter integrated circuit
MEMS	Micro electro mechanical system
LSB	Least significant bit
SPI	Serial Peripharal interface

Contents

1 General description

1.1 Introduction

The evaluation board of the absolute pressure sensor provides an opportunity to verify the sensor performance and develop a prototype using an external processor e.g. Amber Pi design kit (Part No: 2609017281001) or an extention board e.g. Sensor Shield for Arduino (Part No. 2501000101291). It can be directly plugged to Amber Pi design kit using the mounted I²C and SPI interface pins. It can also be placed on a bread board using through hole pin header connections. The absolute pressure sensor (Part No: 2511020213301) is a 24-bit compact piezo-resistive digital pressure sensor with an I²C and SPI digital interface.

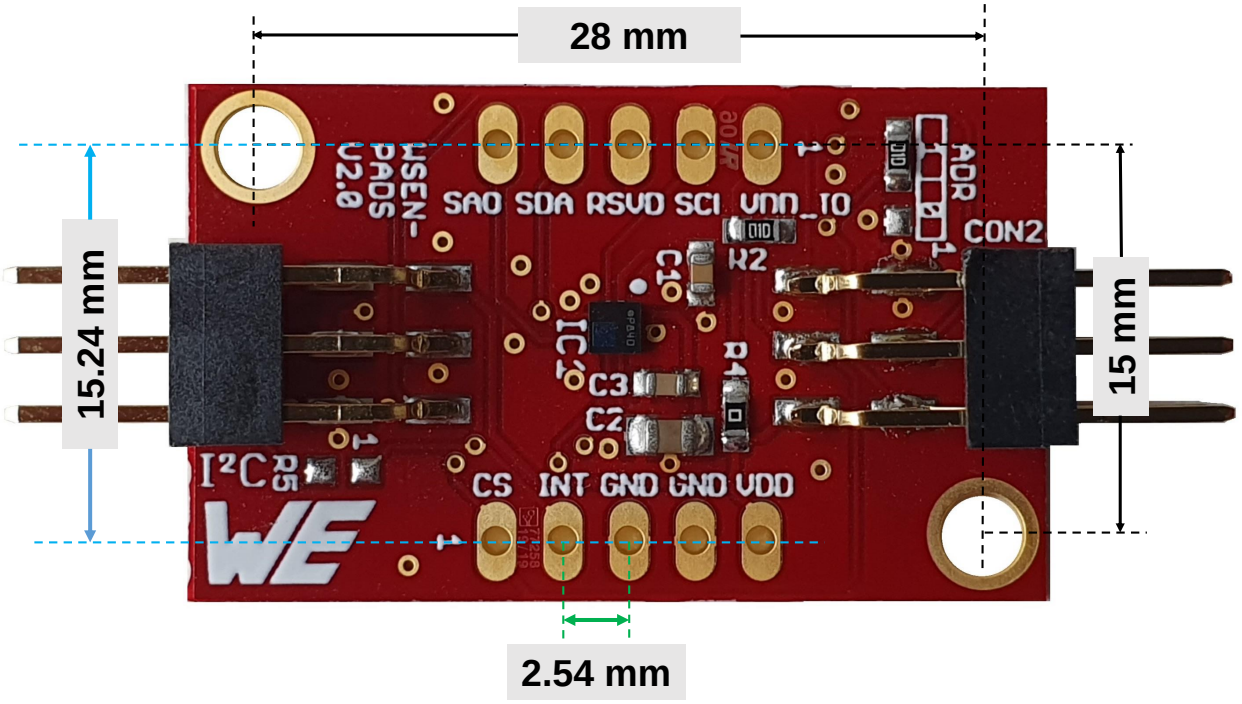


Figure 1: Evaluation board for the absolute pressure sensor

1.2 Pin header compatibility

6-pin right angle headers mounted on this evaluation board can be directly plugged in to the Sensor Shield for Arduino or Amber-Pi Design Kit. This serves a Plug-and-play solution to quickly take the evaluation board into operation.

Sensor Shield for Arduino is a stackable extention board for Arduino UNO and DUE to connect the sensor evaluation boards. More information can be found on our website *here*.

2 Functional description

This absolute pressure sensor evaluation board supports the standard I²C and 4-wire SPI communication interface.

- A positive supply voltage is applied to the sensor through *VDD* pin and I/O supply voltage for digital interface through *VDD_IO* pin. The *VDD* and *VIO* pins on the board are connected together using 0Ω resistor R1.
- The I²C communication is enabled by connecting *CS* pin to *VDD_IO*. The *CS* pin is connected to *VDD_IO* using 100kΩ resistor R3. The I²C address of the sensor can be configured using the *SAO* pin.
- The 7-bit slave address of the absolute pressure sensor is 101110xb. LSB of the 7-bit slave address can be modified using the *SAO* pin.

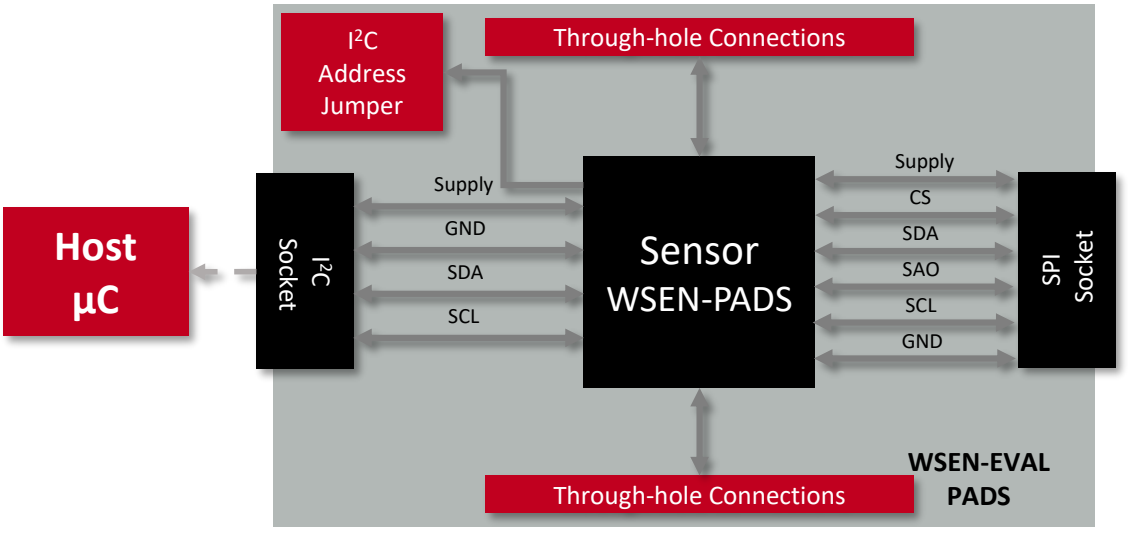


Figure 2: Block diagram of Evaluation board for the absolute pressure sensor

By default the 7-bit slave address of the absolute pressure sensor on the evaluation board is 1011101b (0x5D). i.e. *SAO* pin of the sensor is connected to *VDD_IO* using 100kΩ resistor ADR.

Please refer to the data sheet and the user manual of the absolute pressure sensor (Part No: 2511020213301) for more information about the electrical properties and sensor functionality.

The 7-bit slave address of the absolute pressure sensor can be changed to 1011100b (0x5C) by removing 100kΩ resistor ADR from '1' part and mounting it on the '0' part of the evaluation board. i.e. *SAO* pin is connected to *GND* using 100kΩ resistor ADR.

2.1 Evaluation board in operation

2.1.1 I²C connection (CON1)

The pinning of connector CON1 provides I²C communication interface fits directly to the sensor shield for Arduino as well as Amber-Pi as mentioned in section 1.2.

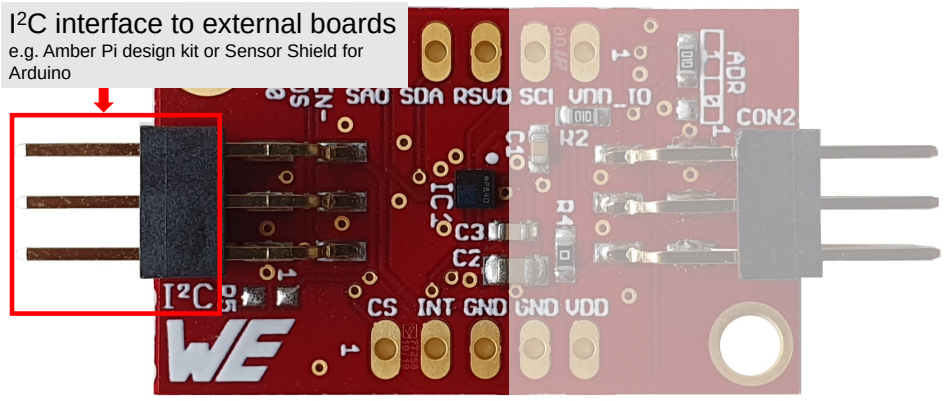
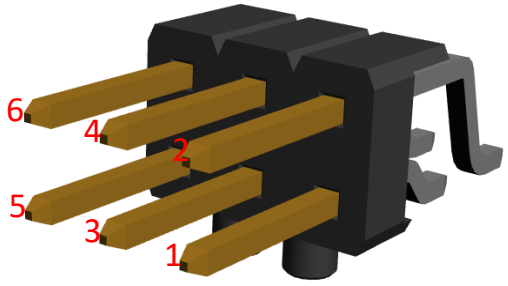


Figure 3: I²C Pin header connection to the external boards



Pin	I²C pins
1	*GND*
2	*SCL*
3	*SDA*
4	*GND*
5	*INT*
6	*VDD*

Table 1: Pin header to the external boards

When the evaluation board is connected to Amber Pi design kit using I²C interface pins, INT interrupt pin function will not be available.

2.1.2 SPI connection (CON2)

The pinning of connector CON2 provides SPI communication interface fits directly to the sensor shield for Arduino as well as Amber-Pi as mentioned in section 1.2.

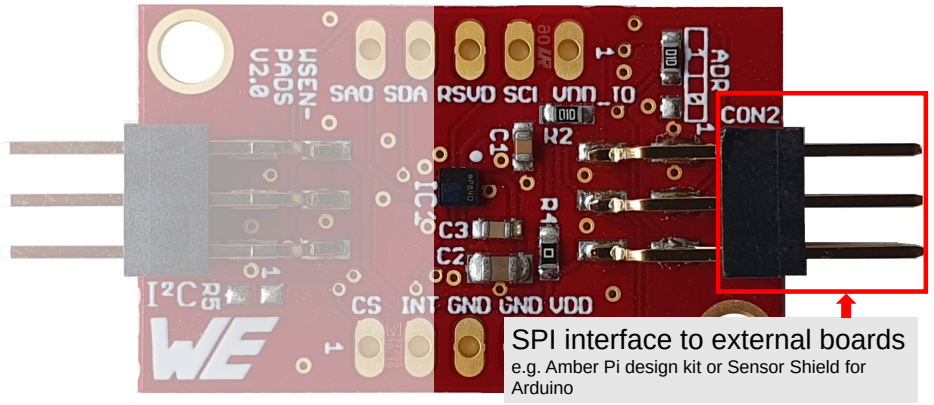
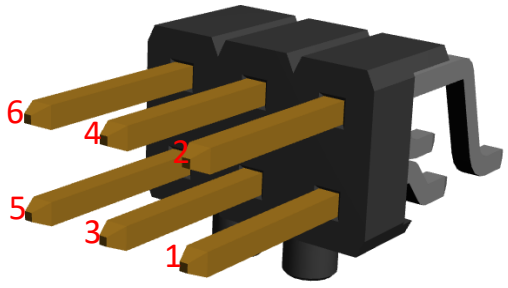


Figure 4: SPI Pin header connection to the external boards



Pin	SPI pins
1	*GND*
2	*SCL*
3	*SDA (MOSI)*
4	*CS*
5	*SAO (MISO)*
6	*VDD*

Table 2: Pin header to the external boards

CS pin is controlled by the host controller (master) when the SPI interface is used.

2.1.3 Resistor functionality

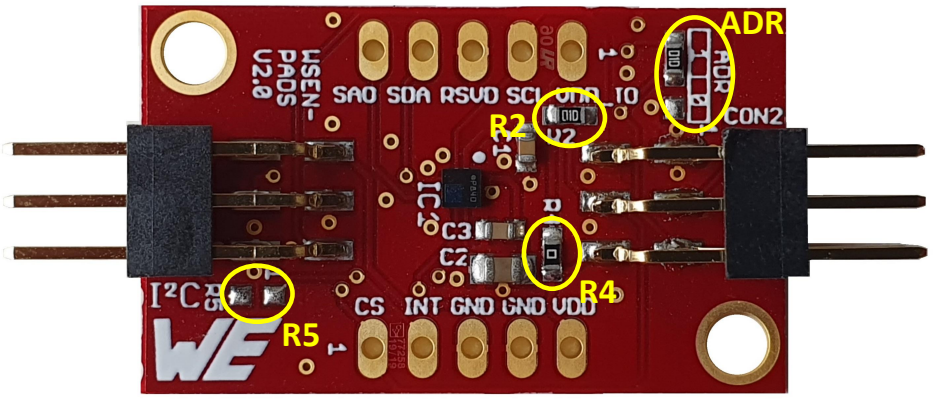


Figure 5: Resistor functionality

Resistor	Description
R2	I^2C enabled. *CS* is connected to *VDD_IO*
R4	VDD and VDD_IO pins are connected together
R5	Open. It should be connected if the interrupt function on INT pin is necessary
ADR	Position-1; I^2C address of the sensor is 1011101b. *SAO* is connected to the *VDD_IO*

Table 3: Functionality of the resistors on the evaluation board

2.1.4 Through hole connection

Through hole pin header connection gives direct access to each sensor pin. To use I^2C via these through hole connection, SDA, SCL and INT pins must be connected to VDD_IO via pull-up resistors. SAO pin connection to either VDD or GND is also necessary in order to define an I^2C slave address.

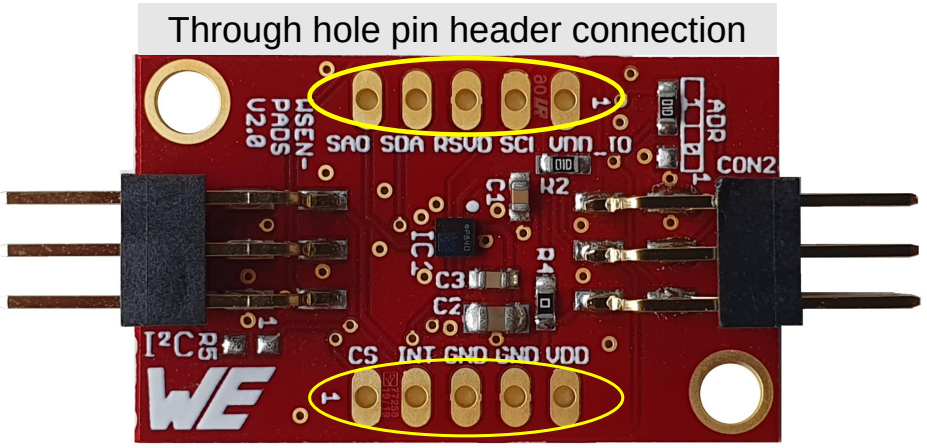


Figure 6: Through hole connection

Pin No.	Name	Function	I/O	Comments
1	*VDD_IO*	Positive supply voltage for I/O pins	Supply	
2	*SCL*	I²C/SPI serial clock	Input	Internal pull-up disconnected by default
3	*RSVD*	Reserved	Input	Connect to ground
4	*SDA*	I²C serial data; SPI serial data input	Input/ Output	Internal pull-up disconnected by default
5	*SAO*	I²C device address selection; SPI serial data output	Input/Output	High: device address LSB is 1 Low: device address LSB is 0
6	*CS*	I²C enable/disable; SPI chip select pin	Input	High: I²C enable
7	*INT*	Interrupt	Input/Output	Do not connect if not used
8	*GND*	Negative supply voltage	Supply	
9	*GND*	Negative supply voltage	Supply	
10	*VDD*	Positive supply voltage	Supply	

Table 4: Pin description

Check if necessary for your configuration that R2, R4 and ADR resistors have to be removed before connecting the evaluation board to a processor.

3 Evaluation board

3.1 Schematic diagram

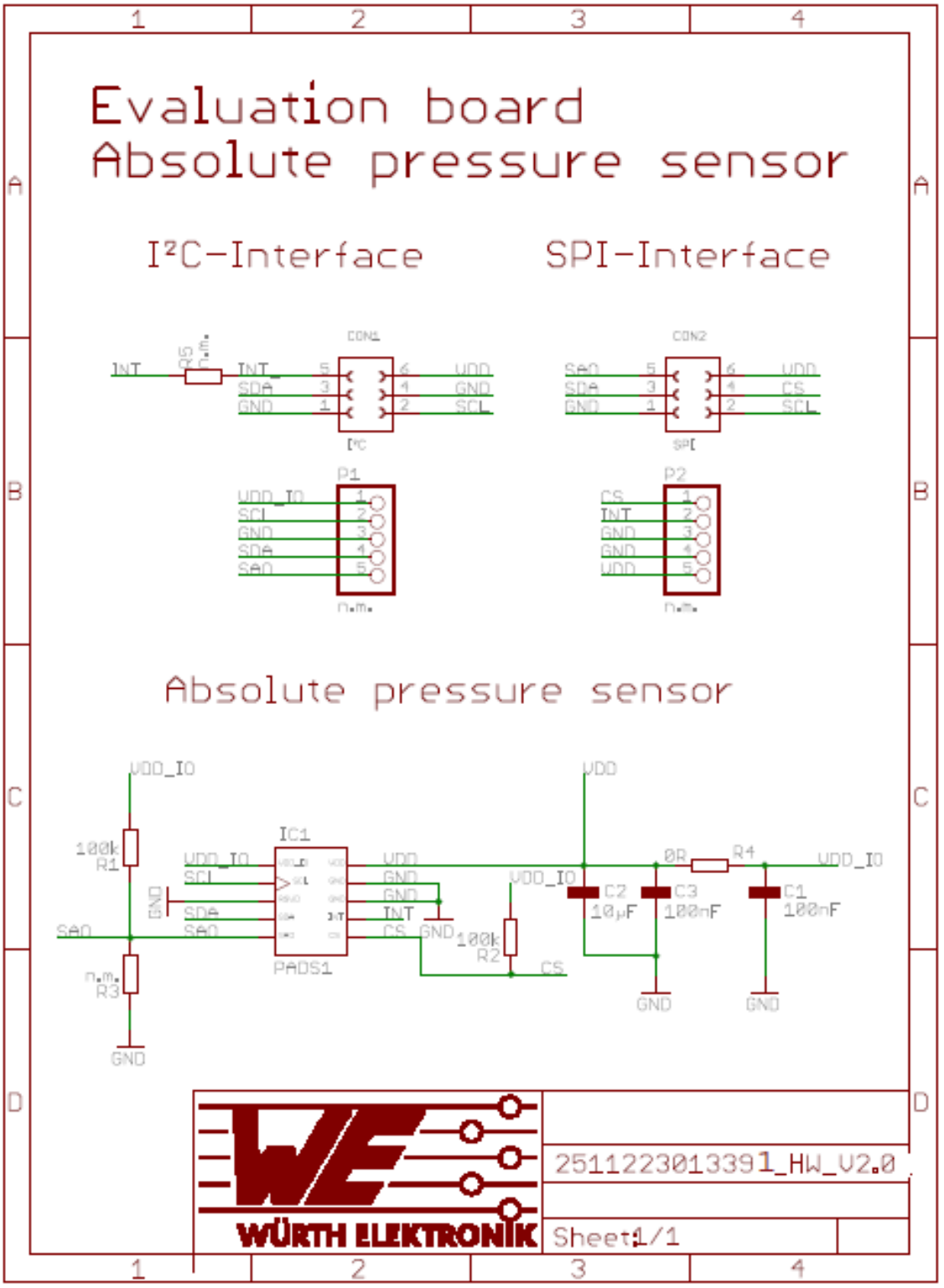


Figure 7: Schematic diagram

3.2 Layout

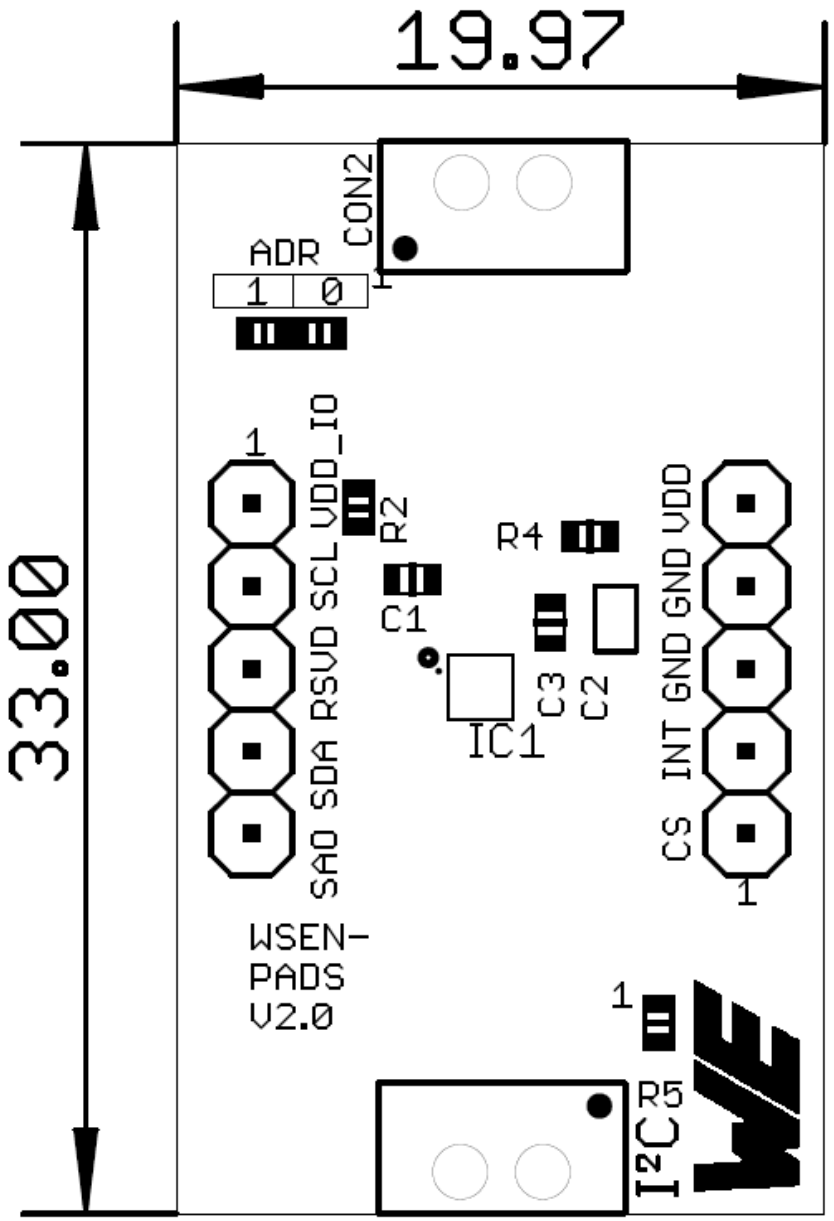


Figure 8: Assembly diagram

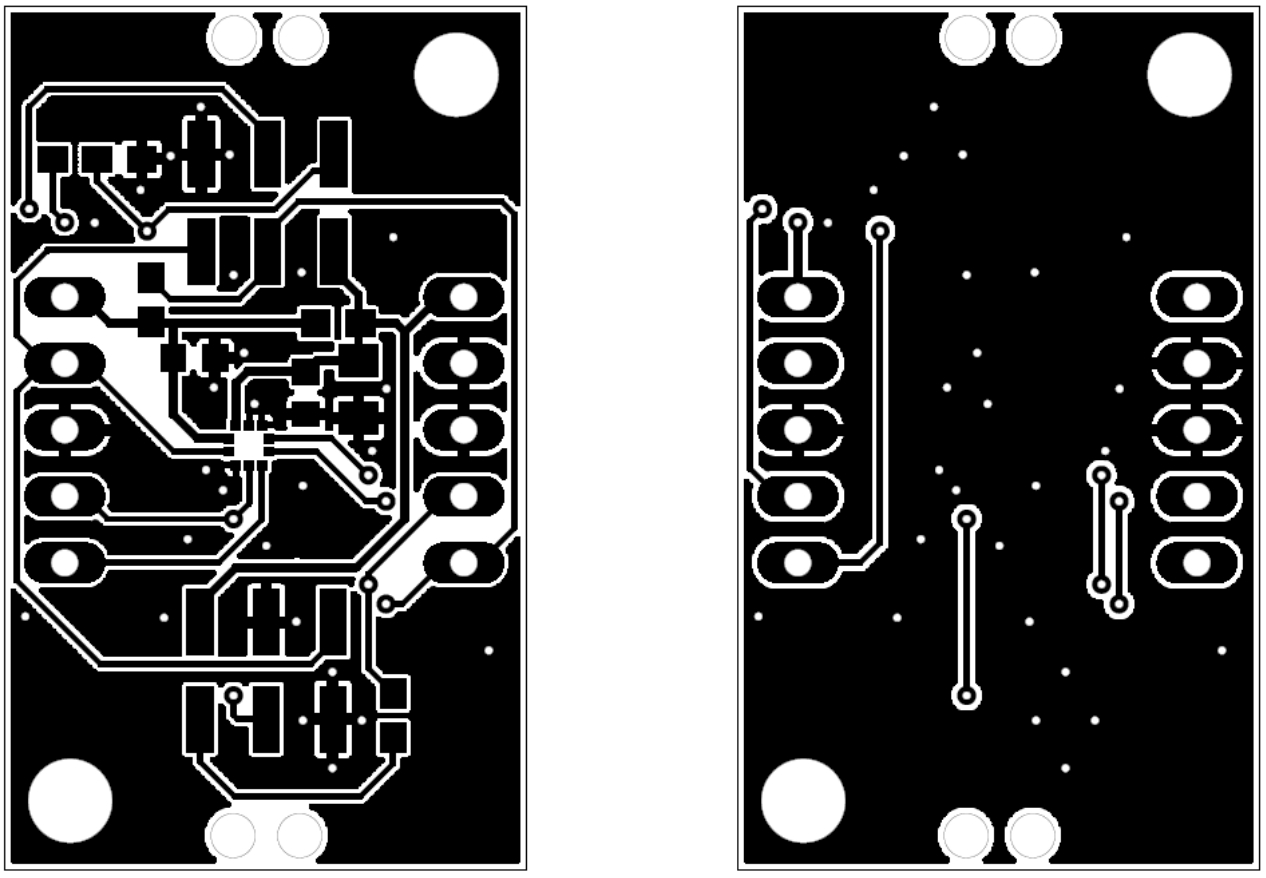


Figure 9: Top (left) and bottom (right) layers

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