



EVALUATION BOARD MANUAL

3-AXIS ACCELERATION SENSOR

Evaluation board order code	Sensor order code
2533203301691	2533020201601

VERSION 2.0

FEBRUARY 23, 2021

Revision history

Manual version	Product version	Notes	Date
1.0	1.0	<ul style="list-style-type: none"> • Initial release of the manual 	July 2019
1.1	1.0	<ul style="list-style-type: none"> • Layout of schematic diagram updated 	April 2020
2.0	2.0	<ul style="list-style-type: none"> • SPI communication interface added • Chapter 1.2: Pin header compatibility added • Chapter 2: I²C and SPI chapter updated • Chapter 3.2: Layout added 	February 2021

Abbreviations

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

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1 General description

1.1 Introduction

The evaluation board of the acceleration 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 extension 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. The evaluation board can also be mounted on a bread board using through hole pin header connections. The acceleration sensor (Part No: 2533020201601) is a 14-bit digital ultra-low-power and high-performance three-axis linear accelerometer with an I²C and SPI digital interface.

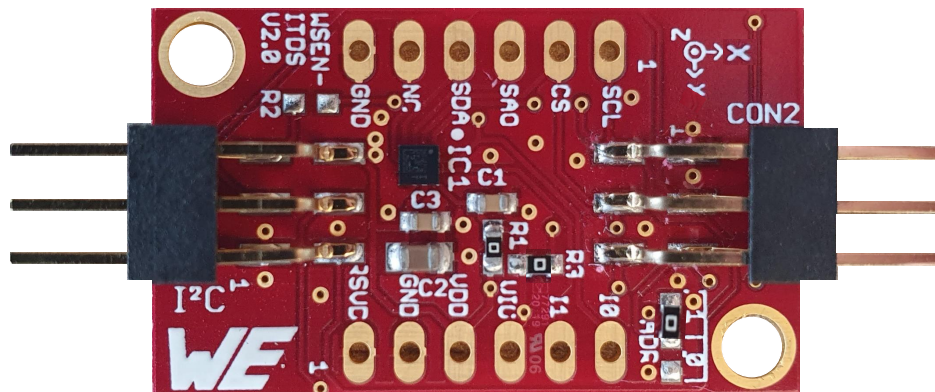


Figure 1: Evaluation board for the acceleration sensor

1.2 Pin header compatibility

6-pin right angle headers mounted on this evaluation board can be directly plugged into 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 extension board for Arduino UNO and DUE to connect the sensor evaluation boards. More information can be found on our website here.

2 Functional description

The acceleration sensor evaluation board supports the standard I²C and SPI communication interface. By default, I²C communication interface is enabled in the evaluation board.

- 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 *VDD_IO* 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 7-bit slave address of the acceleration sensor is 001100xb. LSB of the 7-bit slave address can be modified using the *SAO* pin.

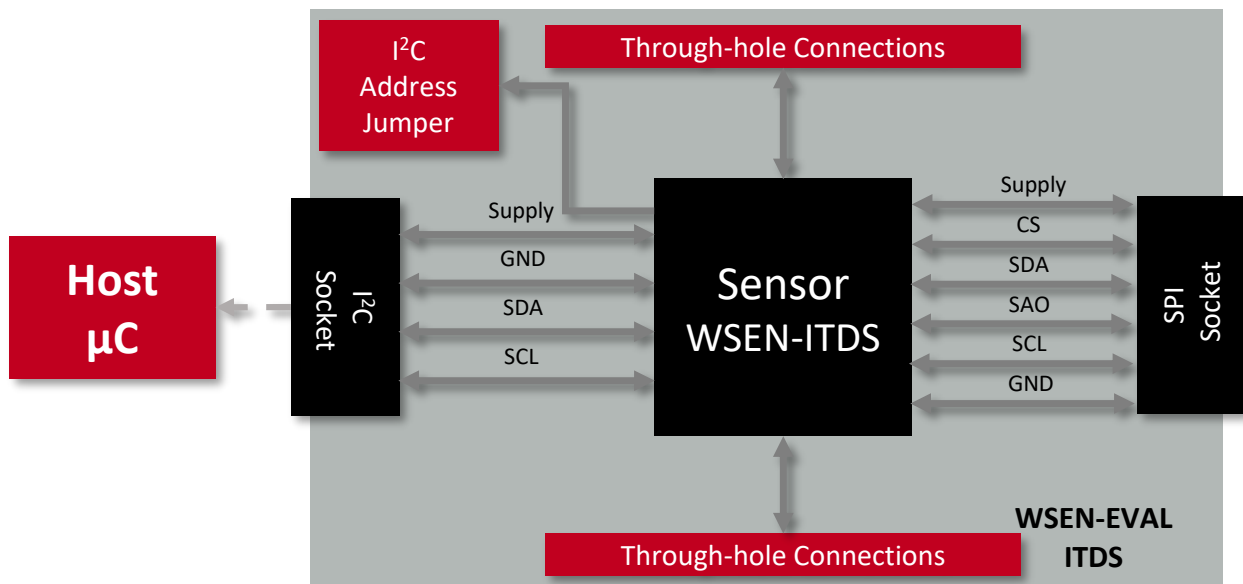


Figure 2: Block diagram



By default the 7-bit slave address of the acceleration sensor on the evaluation board is 0011001b (0x19). i.e. *SAO* pin of the sensor is connected to *VDD_IO* using 100k Ω resistor ADR.



The 7-bit slave address of the acceleration sensor can be changed to 0011000b (0x18) by removing 100k Ω 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 100k Ω resistor ADR.



Please refer to the data sheet and user manual of the acceleration sensor (Part No: 2533020201601) for more information about the electrical properties.

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 and Amber-Pi as mentioned in section 1.2.

I²C Interface to external boards
e.g. Amber Pi design kit or
Sensor shield for Arduino

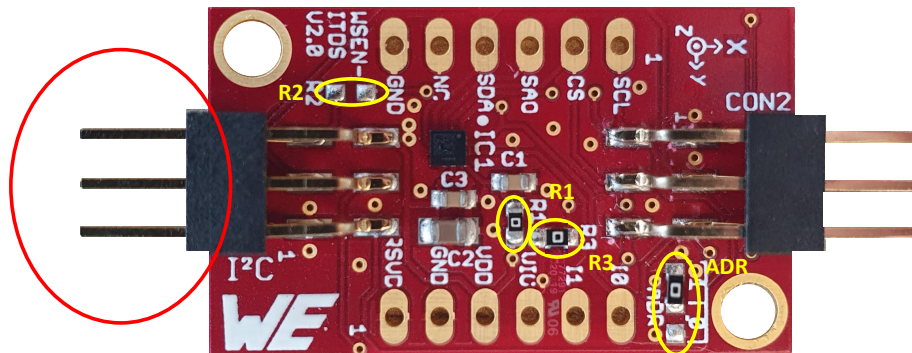
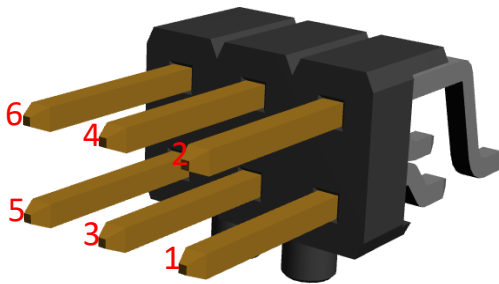


Figure 3: I²C Pin header connection to the external boards



Pin No	I ² C Pins (CON1)
1	<i>GND</i>
2	<i>SCL</i>
3	<i>SDA</i>
4	<i>GND</i>
5	<i>NC</i>
6	<i>VDD</i>

Table 1: I²C Pin header to external boards



Connecting the sensor evaluation board to Amber Pi design kit using I²C or SPI interface pins will disable INT_0 and INT_1 interrupt pin functions

2.1.2 SPI connection (CON2)

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

SPI Interface to external boards
e.g. Amber Pi design kit or
Sensor shield for Arduino

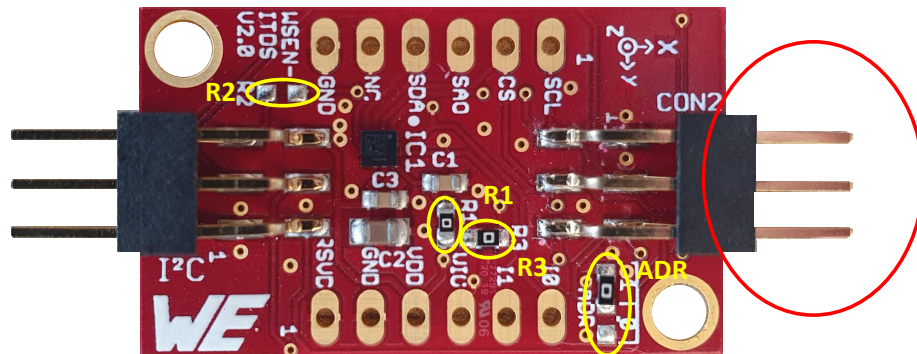
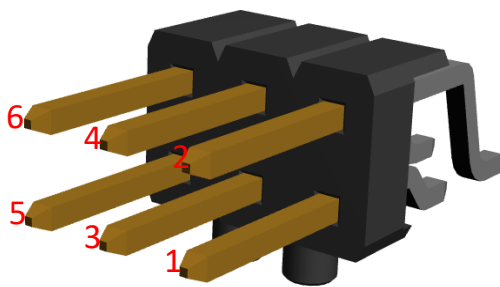


Figure 4: SPI Pin header connection to the external boards



Pin No	SPI Pins (CON2)
1	<i>GND</i>
2	<i>SCL</i>
3	<i>SDA (MOSI)</i>
4	<i>CS</i>
5	<i>SAO (MISO)</i>
6	<i>VDD</i>

Table 2: SPI Pin header to external boards



SPI communication is enabled by removing the R3 and ADR resistors.



Connecting the sensor evaluation board to Amber Pi design kit using I²C or SPI interface pins will disable INT_0 and INT_1 interrupt pin functions

2.1.3 Resistor functionality

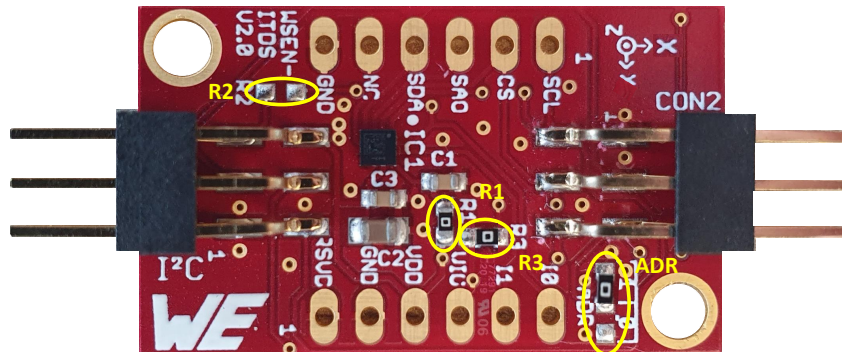


Figure 5: Resistor functionality

Resistor	Description
R1	VDD and VDD_IO pins are connected together
R2	Open. When mounted, the INT_0 interrupt pin is available on I ² C pin 5
R3	I ² C enabled by default. CS is connected to VDD_IO. To enable SPI communication, remove the mounted R3 and ADR resistors
ADR	I ² C address of the sensor is 0011001b. 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 I²C via these through hole connection, SDA and SCL pins must be connected to VDD_IO via pull-up resistors. Please refer to Table 4 for the pin description of the evaluation board.

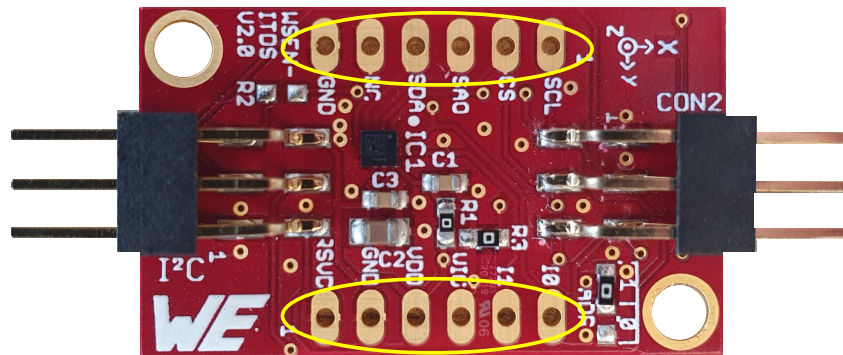


Figure 6: Through hole connection

Pin No.	Evaluation board pins	Description	Input/Output
1	<i>SCL</i>	I ² C/SPI serial clock	Input
2	<i>CS</i>	I ² C enable/disable, SPI chip select	Input
3	<i>SAO</i>	I ² C device address selection, SPI serial data output	Input/output
4	<i>SDA</i>	I ² C serial data, SPI serial data input	Input/Output
5	<i>NC</i>	No connection	-
6	<i>GND</i>	Negative supply voltage	Supply
7	<i>RSVD</i>	Reserved, connect to GND	Input
8	<i>GND</i>	Negative supply voltage	Supply
9	<i>VDD</i>	Positive supply voltage	Supply
10	<i>VIO</i>	Positive supply voltage for I/O pins	Supply
11	<i>I1</i>	Interrupt pin 1	Input/Output
12	<i>I0</i>	Interrupt pin 0	Output

Table 4: Pin description



Check if necessary for your configuration, the resistors R1, R3 and ADR have to be removed before connecting the evaluation board to a processor.

3 Evaluation board

3.1 Schematic diagram

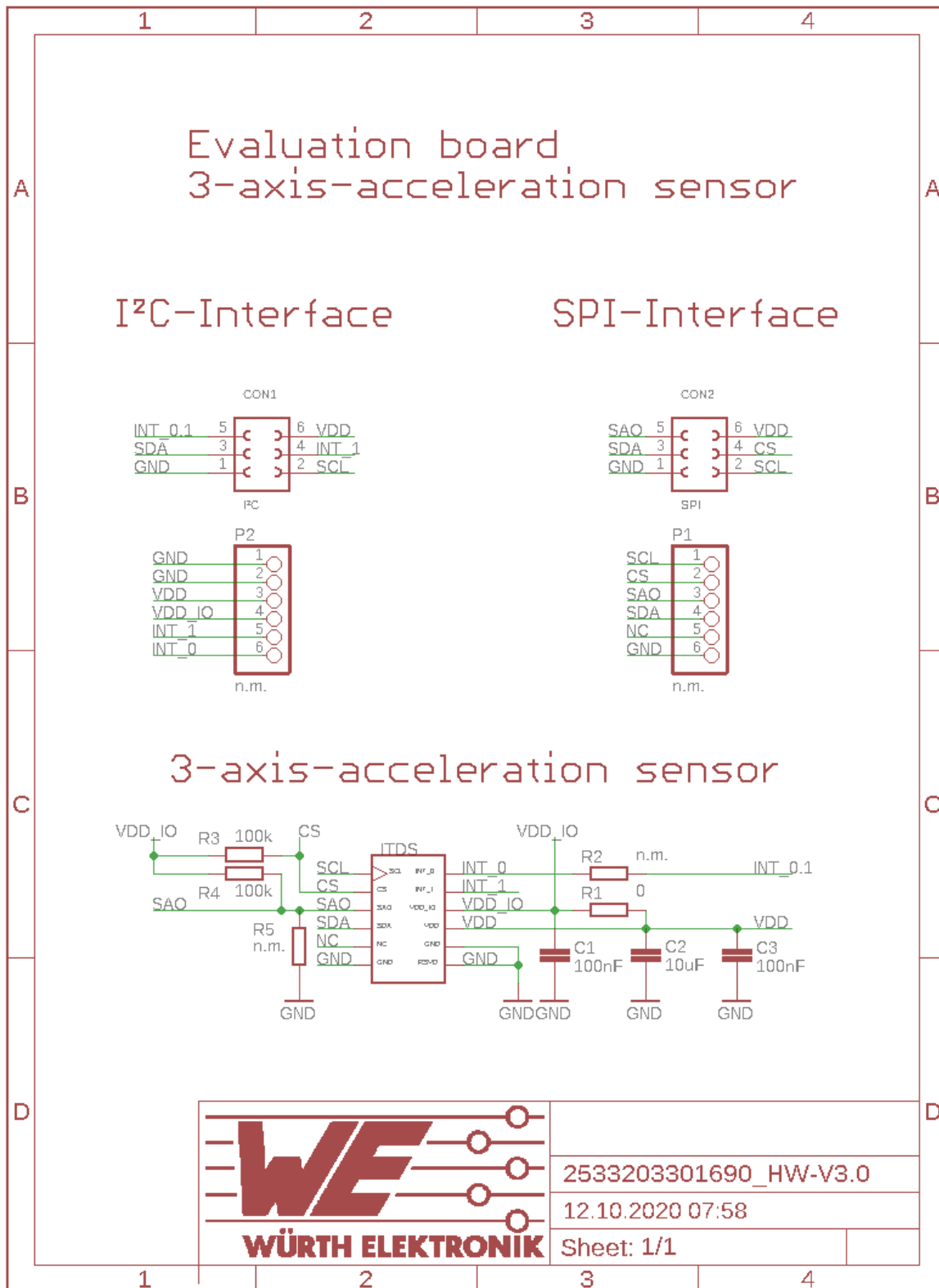


Figure 7: Schematic diagram

3.2 Layout

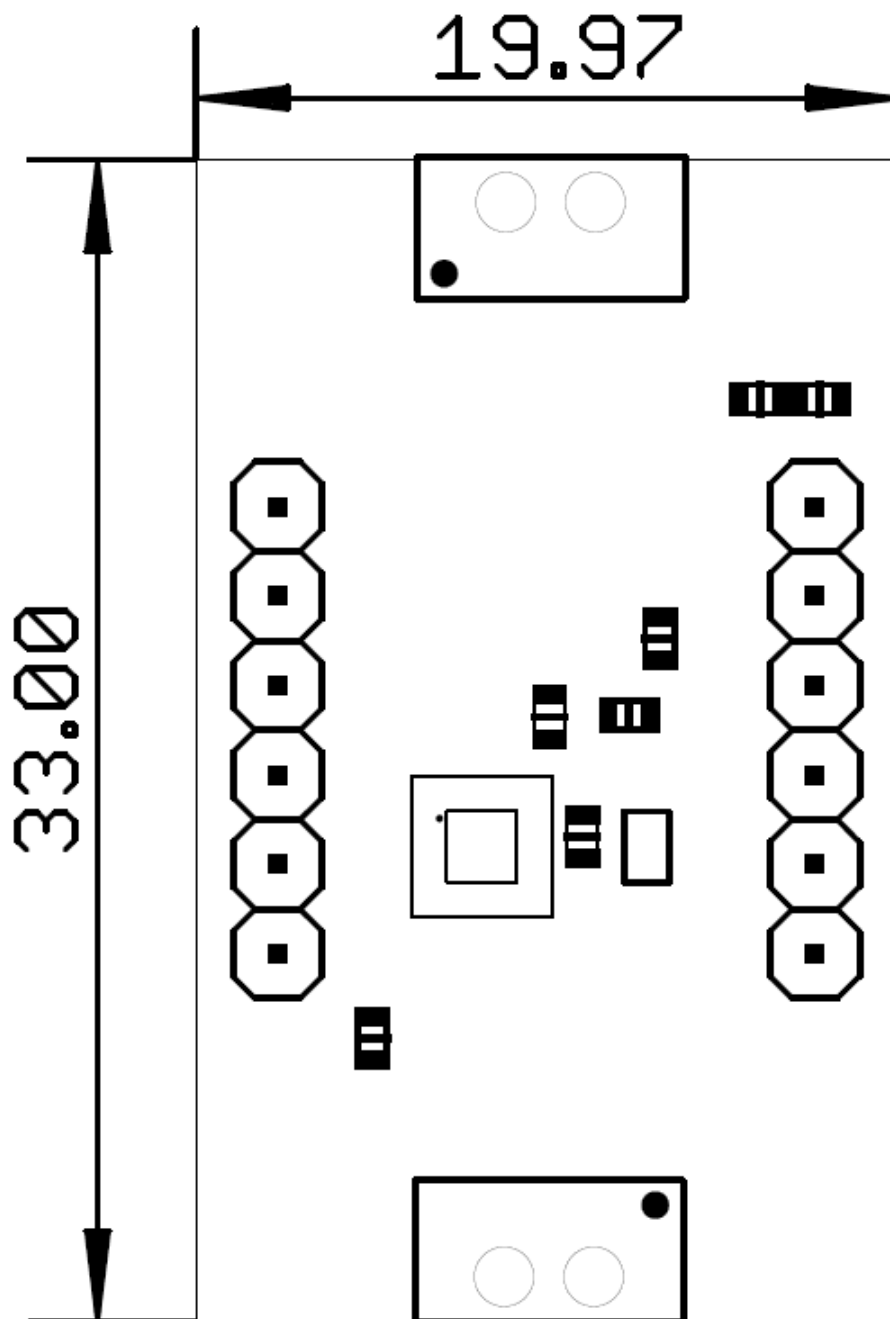


Figure 8: Assembly diagram

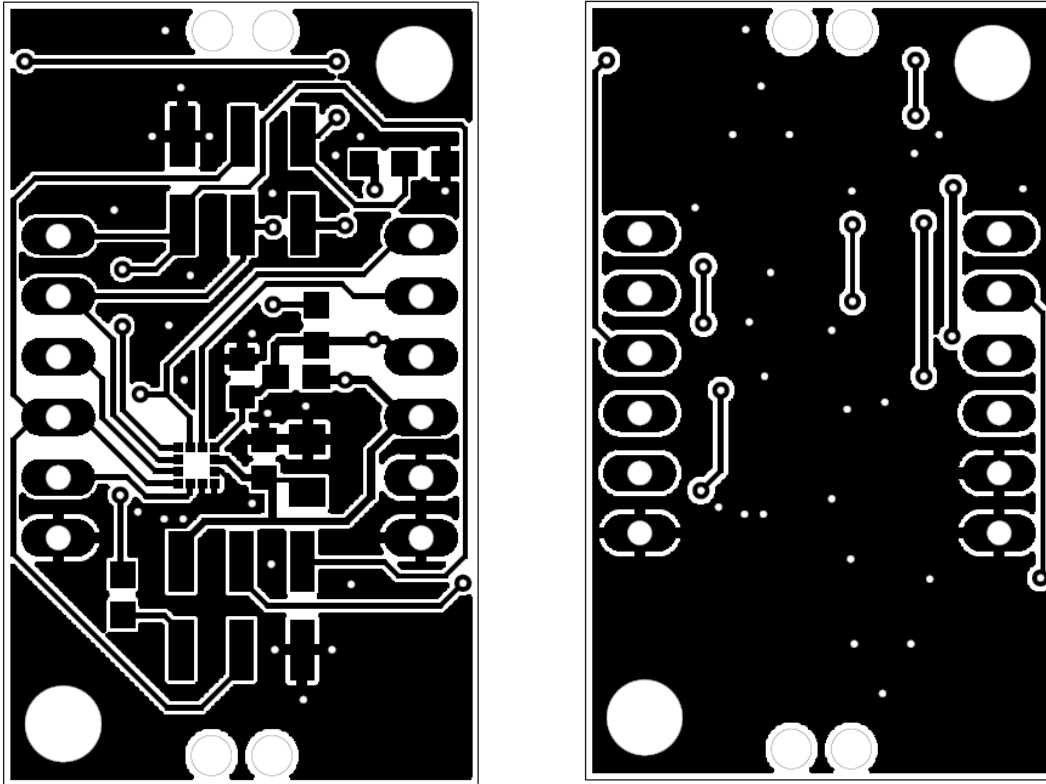


Figure 9: Top (left) and bottom (right) layers

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