



USER MANUAL

EVALUATION BOARD FOR
WSEN-ISDS

2536030320091

VERSION 1.1

OCTOBER 17, 2024

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

Revision history

Manual version	Product version	Notes	Date
1.0	1.0	<ul style="list-style-type: none">• Initial release of the manual	January 2023
1.1	1.0	<ul style="list-style-type: none">• Updated chapter Important notes• Updated chapter Legal notice	October 2024

Abbreviations

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

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1 General description

1.1 Introduction

The EV-Board of the IMU (Inertial Measurement Unit) 6 axis sensor provides an opportunity to verify the sensor performance and develop a prototype using an extension board e.g. Sensor shield for Arduino (Part No. 2501000101291). It can be directly plugged to sensor shield using the mounted I²C and SPI interface pins. The EV-Board can also be mounted on a bread board using through hole pin header connections. The 6 axis IMU sensor (Part No: 2536030320091) is a 16-bit digital ultra-low-power and high-performance MEMS sensor. It includes 3 axis linear accelerometer and 3 axis gyroscope. The digital host interface offers either I²C or SPI to communicate with the sensor.

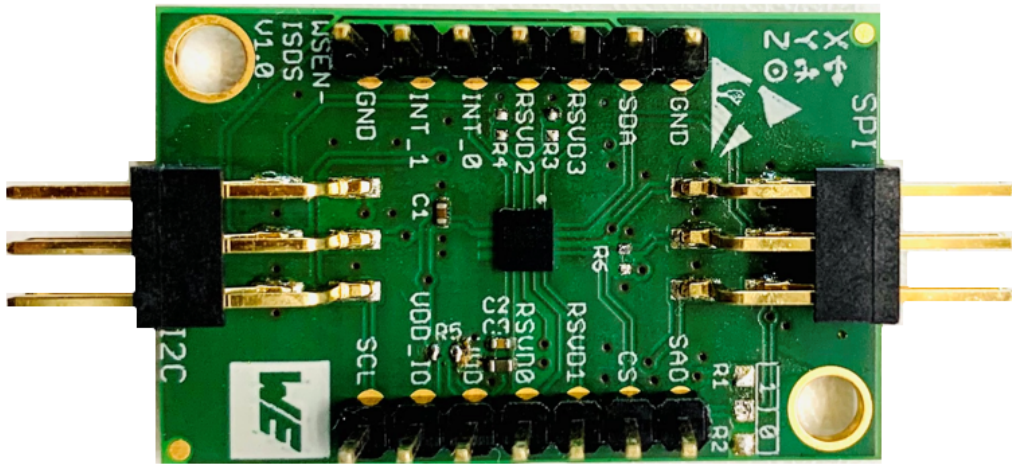


Figure 1: EV-Board for the IMU 6 axis sensor

1.2 Pin header compatibility

6-pin right angle headers mounted on this EV-Board can be directly plugged into the sensor shield for Arduino or sensor FeatherWing. This serves a plug-and-play solution to quickly take the EV-Board into operation.



Sensor shield for Arduino is a stackable extension board for Arduino UNO and DUE to connect the sensor EV-Boards. More information can be found on our [website](#).

2 Functional description

The acceleration sensor EV-Board supports the standard I²C and SPI communication interface. By default, I²C communication interface is enabled in the EV-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 0 Ω resistor R6.
- The I²C communication is enabled by connecting *CS* pin to *VDD_IO*. The *CS* pin is connected to *VDD_IO* using 100 kΩ resistor R5.
- The 7-bit slave address of the acceleration sensor is 110101xb. LSB of the 7-bit slave address can be modified using the *SAO* pin.

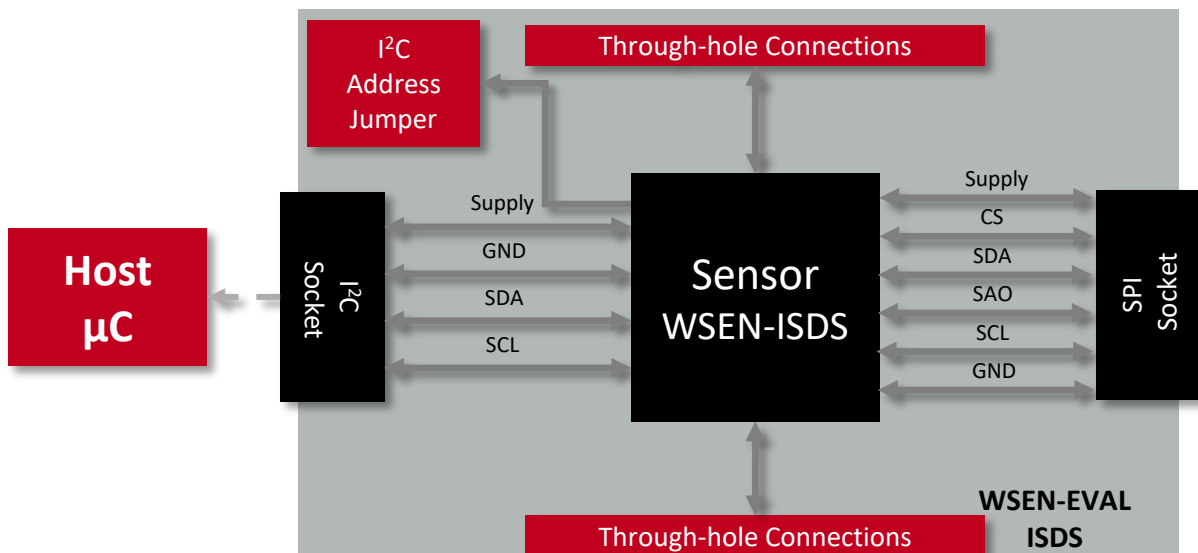


Figure 2: Block diagram of the EV-Board



By default the 7-bit slave address of the acceleration sensor on the EV-Board is 1101011b (0x6B). i.e. *SAO* pin of the sensor is connected to *VDD_IO* using 100 kΩ resistor ADR.



The 7-bit slave address of the acceleration sensor can be changed to 1101010b (0x6A) by removing 100 kΩ resistor ADR from '1' part and mounting 0 Ω resistor on the '0' part of the EV-Board. i.e. *SAO* pin is connected to *GND*.



Please refer to the data sheet and user manual of the IMU 6 axis sensor (Part No: 2536030320001) for more information about the electrical properties.

2.1 EV-Board in operation

2.1.1 I²C connection (CON1)

The pinning of connector CON1 provides I²C communication interface, which fits directly to the *sensor shield for Arduino* and *sensor FeatherWing* as mentioned in section 1.2. The I²C communication interface is the default state of the board.

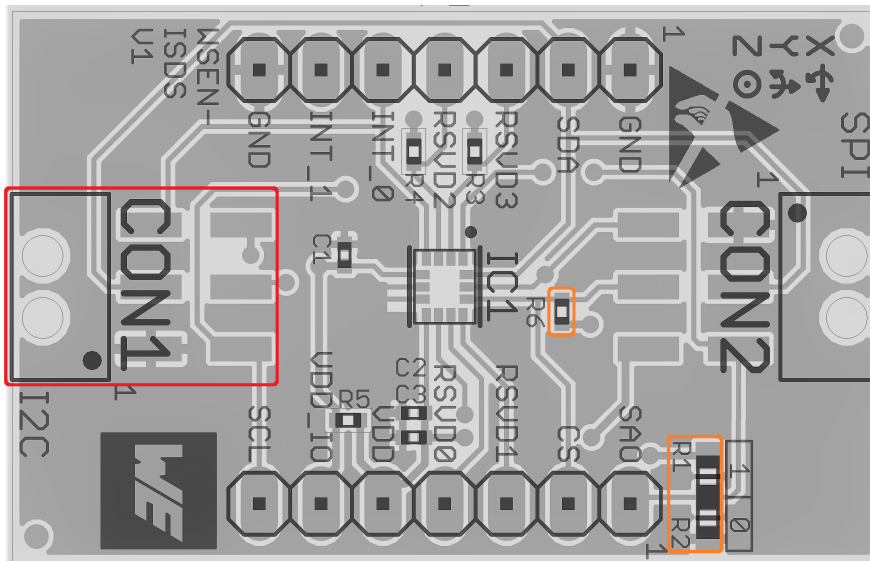
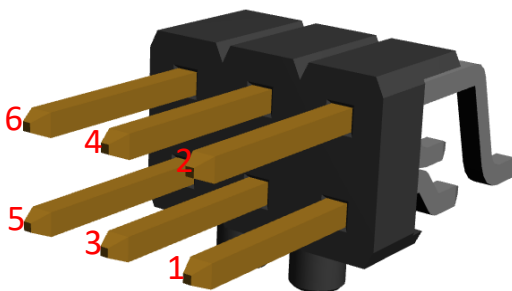


Figure 3: I²C Pin header connection to the external boards



Pin No	I ² C Pins (CON1)
1	GND
2	SCL
3	SDA
4	INT_1
5	INT_0
6	VDD

Table 1: I²C Pin header



R6 shall be populated to enable I²C communication.



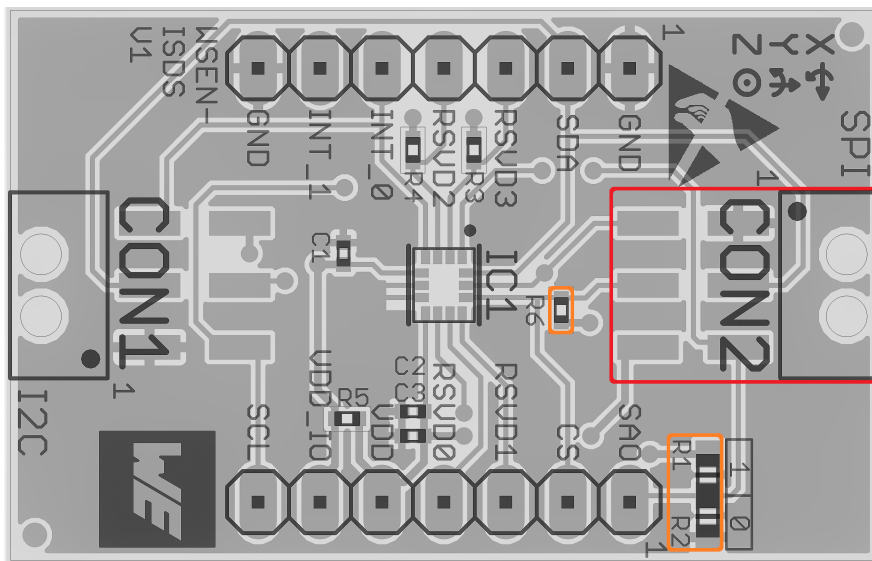
Either R1 or R2 shall be populated to define the LSB of sensor's address.

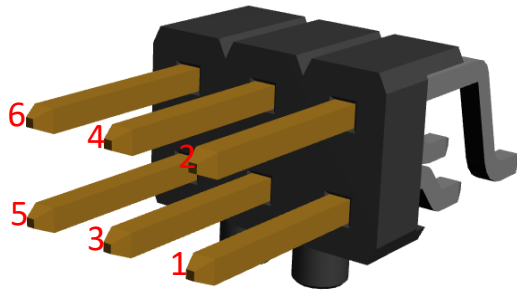


Connecting the sensor EV-Board to the sensor FeatherWing using I²C or SPI interface pins will disable INT_0 and INT_1 interrupt pin functions.

2.1.2 SPI connection (CON2)

The pinning of connector CON2 provides SPI communication interface, which fits directly to the *sensor shield for Arduino* and *sensor FeatherWing* as mentioned in section 1.2.





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 R1, R2, and R6 resistors.

2.1.3 Resistor functionality

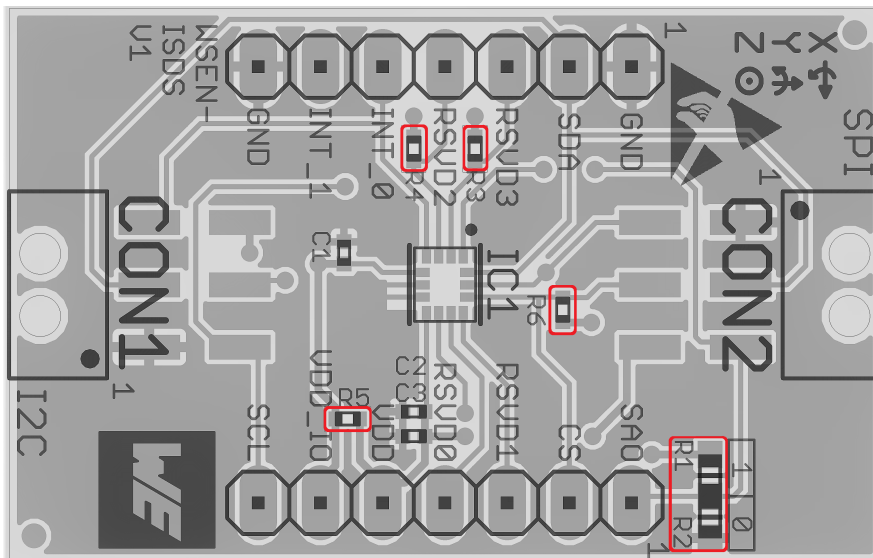


Figure 5: Resistor functionality

Resistor	Description
R1, R2	R1 is by default populated. SAO is connected to the VDD_IO, therefore the I ² C address of sensor is 1101011b. If R2 is assembled the the I ² C address of sensor is 1101010b.
R3, R4	Reserved functionality. Do not remove.
R5	VDD and VDD_IO pins are connected together.
R6	I ² C enabled by default. CS is connected to VDD_IO. To enable SPI communication, remove R1, R2 and R6 resistors.

Table 3: Functionality of the resistors on the EV-Board



Check in your configuration, if the resistors R1, R2 and R6 have to be removed before connecting the EV-Board to a processor.

2.1.4 Through hole connection

Through hole pin headers connection gives direct access to each sensor pin. Please refer to table 4 and 5 for the pin description of P1 and P2 respectively.

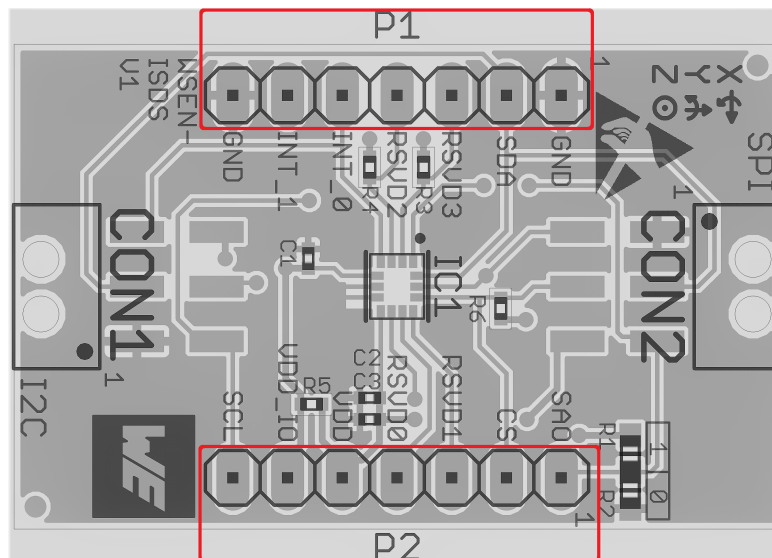


Figure 6: Through hole connection P1 and P2

Pin No.	EV-Board pins	Description	Input/Output
1	<i>GND</i>	Negative supply voltage	Supply
2	<i>SDA</i>	I ² C serial data, SPI serial data input	Input/Output
3	<i>RSVD3</i>	Reserve functionality. Corresponds to sensor's pin 2	Input/Output
4	<i>RSVD2</i>	Reserve functionality. Corresponds to sensor's pin 3	Input/Output
5	<i>INT_0</i>	Interrupt pin 0	Output
6	<i>INT_1</i>	Interrupt pin 1	Output
7	<i>GND</i>	Negative supply voltage	Supply

Table 4: Pin description of P1

Pin No.	EV-Board pins	Description	Input/Output
1	<i>SAO</i>	I ² C device address selection, SPI serial data output	Input/output
2	<i>CS</i>	I ² C enable/disable, SPI chip select	Input
3	<i>RSVD1</i>	Reserved functionality. Corresponds to sensor's pin 11	Input/Output
4	<i>RSVD0</i>	Reserved functionality. Corresponds to sensor's pin 10	Input/Output
5	<i>VDD</i>	Positive supply voltage	Supply
6	<i>VDD_IO</i>	Positive supply voltage for I/O pins	Supply
7	<i>SCL</i>	I ² C/SPI serial clock	Input

Table 5: Pin description of P2

3 EV-Board

3.1 Schematic diagram

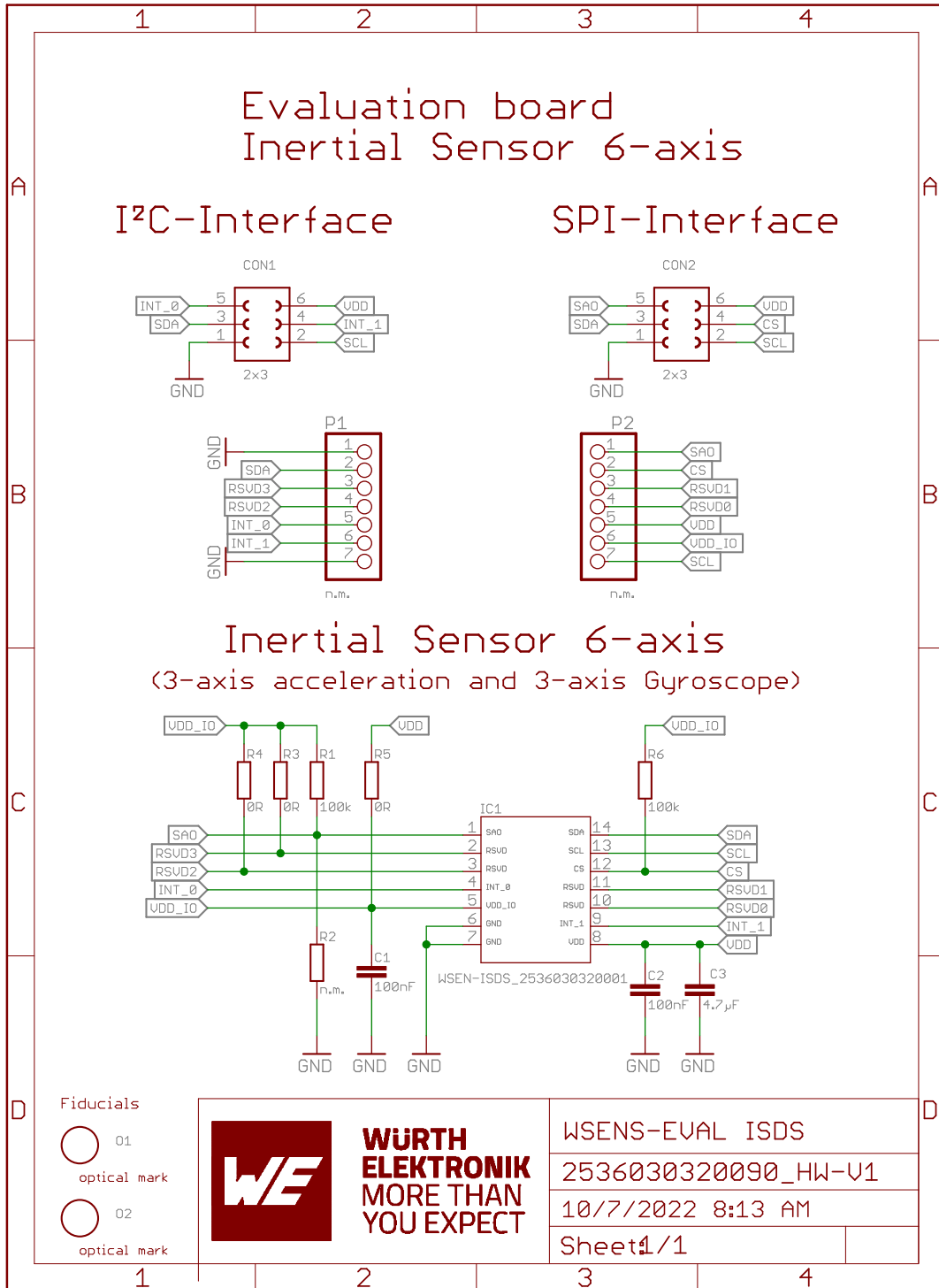


Figure 7: Schematic diagram

3.2 Layout

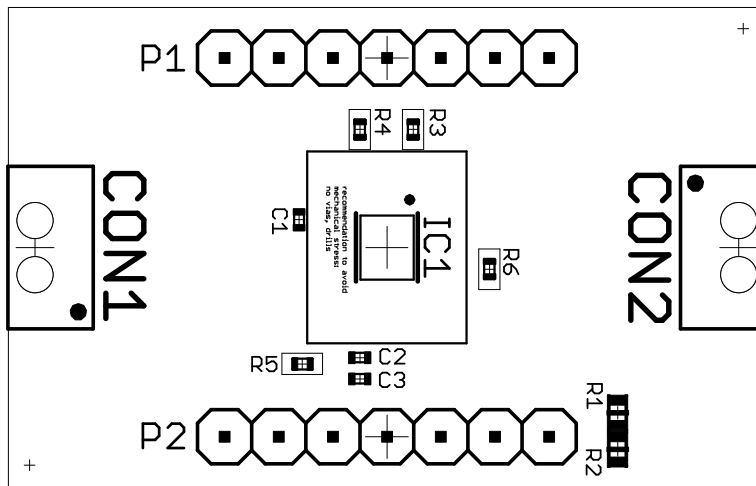


Figure 8: Assembly diagram

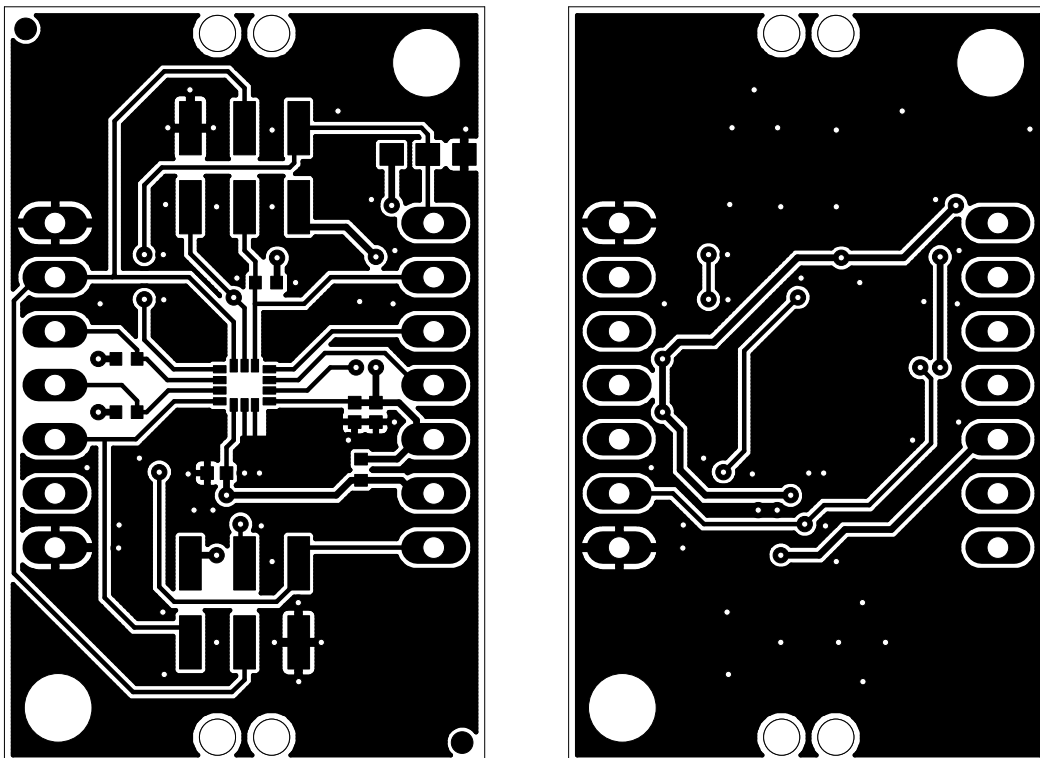


Figure 9: Top (left) and bottom (right) layers

3.3 Bill of materials

Part	Value	Pack	Manufacturer	NR
C1	100 nF	0402	Würth Elektronik eiSos	885012205037
C2	100 nF	0402	Würth Elektronik eiSos	885012205037
C3	4.7 μ F	0402	Würth Elektronik eiSos	885012105008
CON1	2x3	THT	Würth Elektronik eiSos	610106249121
CON2	2x3	THT	Würth Elektronik eiSos	610106249121
IC1	WSEN-ISDS	SMT	Würth Elektronik eiSos	2536030320001
P1	n.m.	SMT	n.m.	n.m.
P2	n.m.	SMT	n.m.	n.m.
R1	100 k Ω	0603	Yageo	RC0603FR-10100KL
R2	n.m.	SMT	n.m.	n.m.
R3	0 Ω	0402	Yageo	RC0402FR-070RL
R4	0 Ω	0402	Yageo	RC0402FR-070RL
R5	0 Ω	0402	Yageo	RC0402FR-070RL
R6	100 k Ω	0402	Yageo	RC0402FR-07100KL

Table 6: Bill of materials

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It has to be clearly pointed out that the possibility of a malfunction of electronic components or failure before the end of the usual lifetime cannot be completely eliminated in the current state of the art, even if the products are operated within the range of the specifications. The same statement is valid for all software source code and firmware parts contained in or used with or for products in the wireless connectivity and sensor product range of Würth Elektronik eiSos GmbH & Co. KG. In certain customer applications requiring a high level of safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health, it must be ensured by most advanced technological aid of suitable design of the customer application that no injury or damage is caused to third parties in the event of malfunction or failure of an electronic component.

Best care and attention

Any product-specific data sheets, manuals, application notes, PCNs, warnings and cautions must be strictly observed in the most recent versions and matching to the products revisions. These documents can be downloaded from the product specific sections on the wireless connectivity and sensors homepage.

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Due to constant product improvement, product specifications may change from time to time. As a standard reporting procedure of the Product Change Notification (PCN) according to the JEDEC-Standard, we inform about major changes. In case of further queries regarding the PCN, the Business Development Engineer (BDM), the internal sales person or the technical support team in charge should be contacted. The basic responsibility of the customer as per section 4 and 4 remains unaffected.

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General warnings

Do not touch the EVB when it is live, and allow charged components, such as capacitors, to discharge completely before handling the EVB. Depending on the individual application, high voltages can occur on the EVB and some components can reach temperatures above 50 °C. Even after disconnecting the EVB from the power source, these conditions remain for a significant time. Please ensure that the appropriate safety precautions are taken when installing and operating this EVB, as one of the following may occur if you handle or use this EVB without observing the relevant safety precautions: - Death - Serious injury - Electric shock - Electric burns - Severe heat burns -

When using the EVB, you undertake to read the instructions for use in full together with the relevant information supplied and/or available on the homepage www.we-online.de/wcs-manuals before putting this EVB into operation. The following points have to be observed in particular:

- Do not touch the EVB while it is live.
- The EVB must be fully assembled and all devices to be tested must be connected before voltage is applied to the EVB.
- The EVB should never be left unattended during operation.
- Capacitors must be completely discharged. The capacitors must be actively discharged using a suitable resistor.

Protection against static electricity

Use the unpackaged product only in ESD protected areas. Wear the ESD personal protective equipment prescribed for these areas. Ground all conductive components, including personnel, as prescribed in ESD protected areas. Ensure that the product is only used by trained personnel.

Purpose and use

The EVB is not a finished product and is not intended for general use by the consumer. The EVB is intended exclusively for use in the evaluation of WE components in the lab or in development environments by highly qualified technicians or engineers, familiar with the risks involved in handling electrical or mechanical components, systems and subsystems. The use of the EVB is your full and independent responsibility. The EVB is expressly not intended to be installed in a terminal device or to be part of a terminal device in whole or in part. WE reserves the right, at its own discretion, to make corrections, improvements, adjustments or other changes to the EVB or to discontinue the EVB. The EVB is not intended for use in devices and applications for which a higher safety and reliability standard is prescribed. It is also not approved for use in safety-relevant applications or where personal injury or fatal consequences must be expected in the event of failure.

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The EVB may only be operated within the specifications and environmental parameters recommended by WE, as described in the instructions for use. Exceeding the specified parameters (including, but not limited to, input and output voltage, current, power, and ambient conditions) may result in damage to property. If you have questions about these electrical parameters, please contact WE at (regulatory-compliance@we-online.com) prior to connecting peripheral electronics (including the input voltage and intended loads). Any load outside a certain power range may lead to negative consequences, including, but not limited to, unintended or inaccurate evaluations or possibly permanent damage to the EVB or the electronics connected to it. Please ensure that the appropriate safety precautions are taken when working with the EVB, as serious injuries, including severe or even fatal injuries from electric shock or electric burns, may occur if you do not follow the appropriate safety precautions. Under no circumstances should the EVB be touched while live. When the EVB is connected to a power source, some of its components are electrically charged and/or have temperatures above 50 °C. This condition also applies for a short time after disconnecting from the supply voltage until the capacitors are completely discharged and hot components have cooled down. These components include connectors, linear regulators, switching transistors, heat sinks, resistors, diodes, inductors and other components, which can be identified from the documentation in the instructions for use. As with all electronic lab work, only qualified persons with knowledge of electronic performance evaluation, measurement and diagnostic tools, should use the EVB.

Hazards and warnings

Before putting the EVB into operation, please read the instructions for use and especially the various hazards and warnings described therein. The instructions for use contain important safety information on voltages and temperatures. You take full responsibility and liability for the proper and safe handling of the EVB. You agree to comply with all safety requirements, rules and regulations related to the use of the EVB. You also take full responsibility for: (1) establishing safeguards to ensure that the use of the EVB does not cause damage to property, personal injury or death, even if the EVB does not function as described, intended or expected, (2) the test setup in which the EVB is integrated, all safety requirements, rules and regulations and also that no damage to property, personal injury or other hazardous situation occurs even if the EVB fails, and (3) ensuring the safety of all activities performed by you or your employees when using the EVB. In particular, this means that the technical rules VDE [German Electrical Engineering, Electronic and Information Technology Association] 0105-100 and BGI [German trade association information] 891 (or corresponding applicable safety regulations outside Germany) for the operation of electrical test setups must be observed, the test area is protected against unauthorized access or accidental touching, current limitations, and emergency stop mechanisms are functional and test setups are never operated unattended. If you have any questions about the safe use of the EVB, please contact WE at regulatory-compliance@we-online.com for more information.

Your responsibility with regard to the applicable laws

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- The EVB generates, uses and radiates radio frequency energy, but has not been tested for conformity with the limits applicable to the product category, which are applicable according to the European Union regulations for protection against radio frequency interference. Operation of the EVB may cause interference with radio communication. In this case, the costs incurred for necessary measures to remedy the interference are to be borne by the user.

As the EVB is not a finished product, it may not comply with applicable regulatory, safety or certification standards that are normally as-

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