

RAB1-SENSORFUSION User Manual

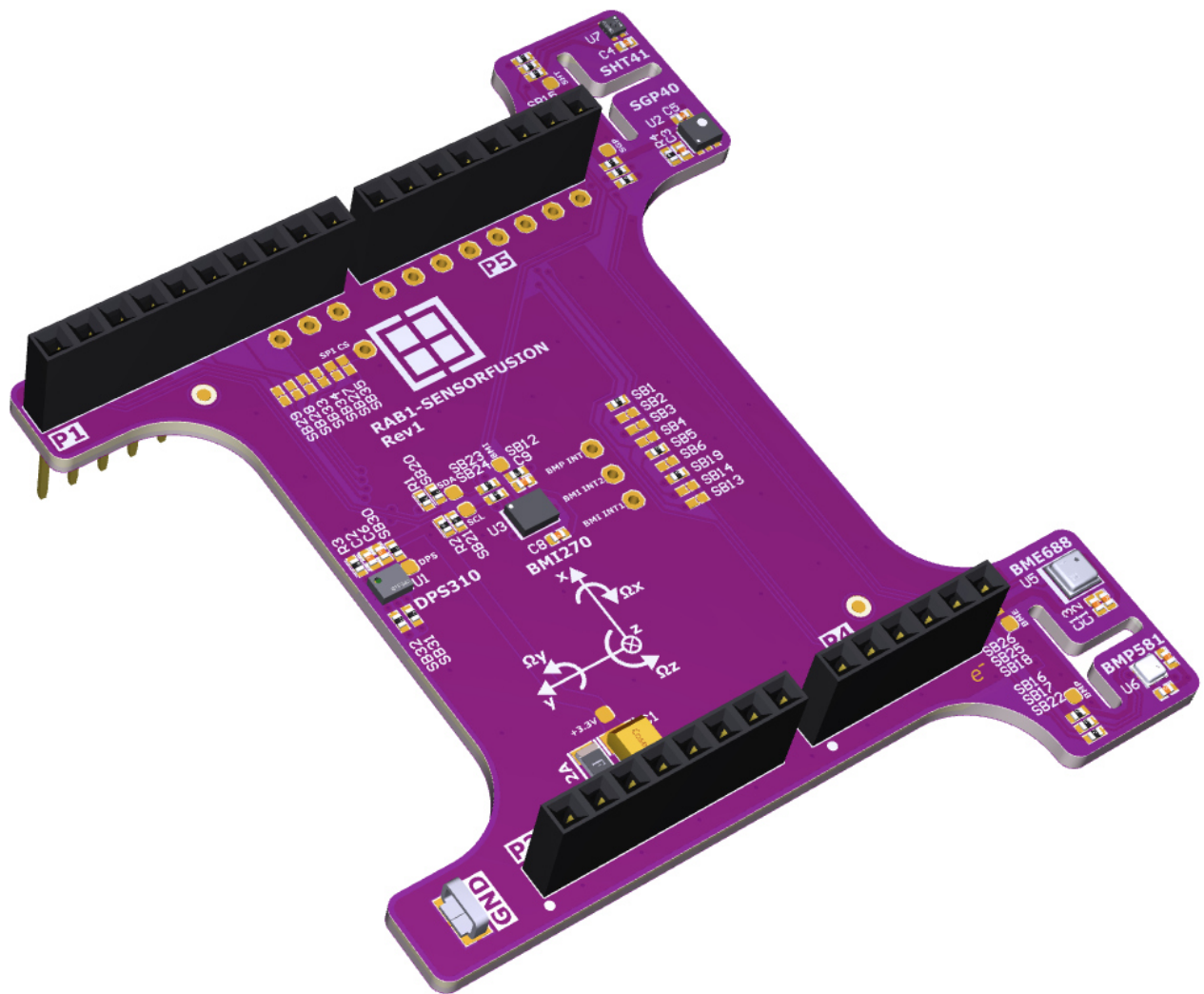


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Versions

Table 1

Version	Date	Rationale
0.1	April 04, 2022	First draft. Author: GDR

Introduction

RAB1-SENSORFUSION is an Arduino shield adapter for the environment and inertial sensors from Infineon, Sensirion and Bosch evaluation and prototyping. It is powered via Arduino headers with a single 3.3V supply. No overvoltage, polarity protection or voltage regulator included. All the sensors are configured to work with the I2C interface only, except the DPS310XTSA – it can be used with SPI as well as with I2C [I2C is default]. All the I2C addresses are fixed for all the sensors and cannot be reconfigured. Every particular sensor could be disconnected from the power supply and I2C circuits by unsoldering solder bridges. The interrupts of BMI270 and BMP581 could be connected to almost any Arduino pin using solder bridges configuration or simply using wires [the holes at every pin are provided for that purpose].

Features

- DPS310 – Infineon’s digital XENSIV™ barometric pressure sensor.
- BMP581 – Bosch’s digital pressure sensor.
- SGP40 – Sensirion’s indoor air quality sensor for VOC measurements.
- BME688 – Bosch’s digital low power gas, pressure, temperature and humidity sensor with AI.
- SHT41 – Sensirion’s high-accuracy and low power relative humidity and temperature sensor.
- BMI270 – Bosch’s 6-axis, smart, low power inertial measurement unit.
- I2C and SPI interface via Arduino compatible ADAM-TECH connectors.
- A Keystone Electronics Test Point connector for a ground signal.

Overview

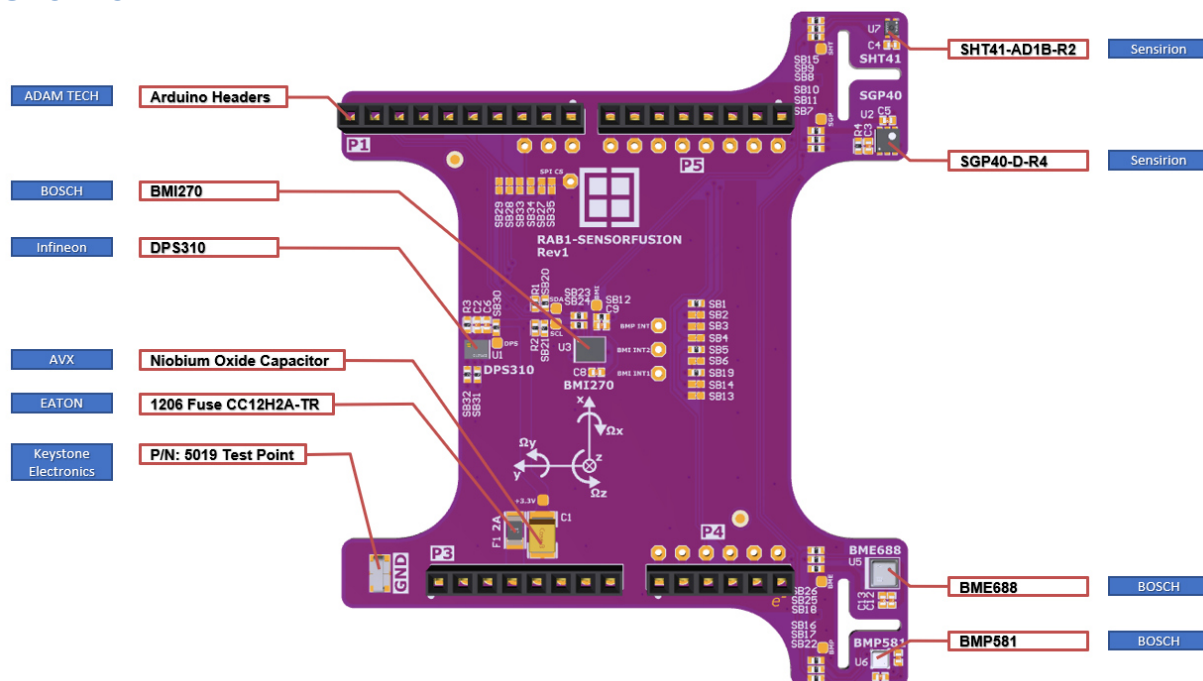


Fig. 1. Adapter Board's layout.

I2C Addresses

Table 2

Designator	Device	7-bit Hex I2C Address
U1	DPS310XTSA1	0x77
U2	SGP40-D-R4	0x59
U3	BMI270	0x68
U5	BME688	0x76
U6	BMP581	0x47
U7	SHT41-AD1B-R2	0x44

Solder Bridges

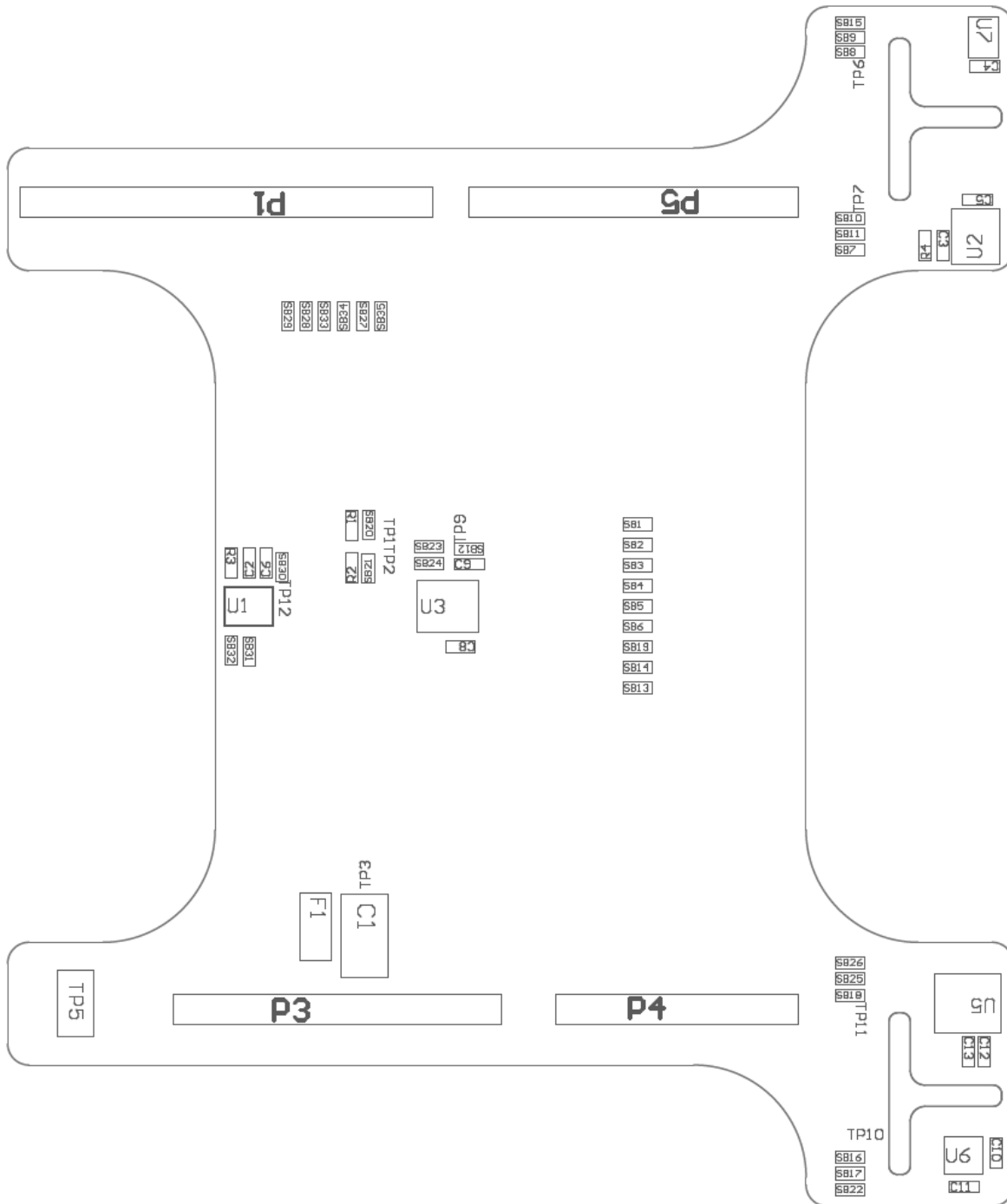


Fig. 2. Locations of the Solder Bridges [SBxx] (please check the schematics and layout document to see in detail).

Table 3

Solder Bridge	Circuit	Default
SB1	BMI270 INT1 connection with Arduino INT1.	Closed
SB2	BMI270 INT2 connection with Arduino INT1.	Opened
SB3	BMP581 INT connection with Arduino INT1.	Opened
SB4	BMI270 INT1 connection with Arduino INT2.	Opened
SB5	BMI270 INT2 connection with Arduino INT2.	Closed
SB6	BMP581 INT connection with Arduino INT2.	Opened
SB7	SGP40 I2C SDA connection.	Closed
SB8	SHT41 +3.3V power supply.	Closed
SB9	SHT41 I2C SCL connection.	Closed
SB10	SGP40 +3.3V power supply.	Closed
SB11	SGP40 I2C SCL connection.	Closed
SB12	BMI270 +3.3V power supply.	Closed
SB13	BMI270 INT1 connection with Arduino INT3.	Opened
SB14	BMI270 INT2 connection with Arduino INT3.	Opened
SB15	SHT41 I2C SDA connection.	Closed
SB16	BMP581 +3.3V power supply.	Closed
SB17	BMP581 I2C SCL connection.	Closed
SB18	BME688 +3.3V power supply.	Closed
SB19	BMP581 INT connection with Arduino INT3.	Closed
SB20	I2C SCL Pull-up resistor R1 enable.	Closed
SB21	I2C SDA Pull-up resistor R2 enable.	Closed
SB22	BMP581 I2C SDA connection.	Closed
SB23	BMI270 I2C SCL connection.	Closed
SB24	BMI270 I2C SDA connection.	Closed
SB25	BME688 I2C SDA connection.	Closed
SB26	BME688 I2C SCL connection.	Closed
SB27	DPS310 SPI CS connection with Arduino IO.	Opened
SB28	DPS310 SPI MISO connection with Arduino IO.	Opened
SB29	DPS310 SPI SCK connection with Arduino IO.	Opened
SB30	DPS310 +3.3V power supply.	Closed
SB31	DPS310 I2C SDA connection.	Closed
SB32	DPS310 I2C SCL connection.	Closed
SB33	DPS310 SPI MOSI connection with Arduino IO.	Opened
SB34	Arduino SPI CS select between P4[3] and P1[3].	Opened
SB35	Arduino SPI CS select between P4[3] and P1[3].	Opened

Fuses

The RAB1-SENSORFUSION board has only one 2A fast acting fuse F1 in a 1206 package; Part No: CC12H2A-TR „Eaton“.

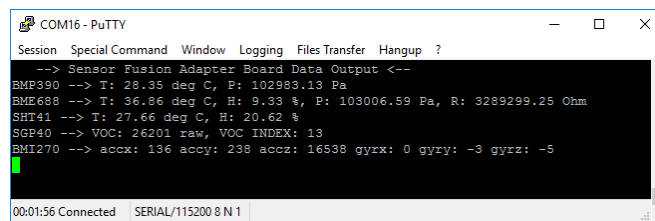
Changing the fuses or solder bridges

The SMD „Chipping Tool“ is recommended to use for SMD solder bridges or fuses soldering on the RAB1-SENSORFUSION development board.

Supported firmware and software examples

RutDevKit-PSoc62_SensorFusionAdapter_Demo

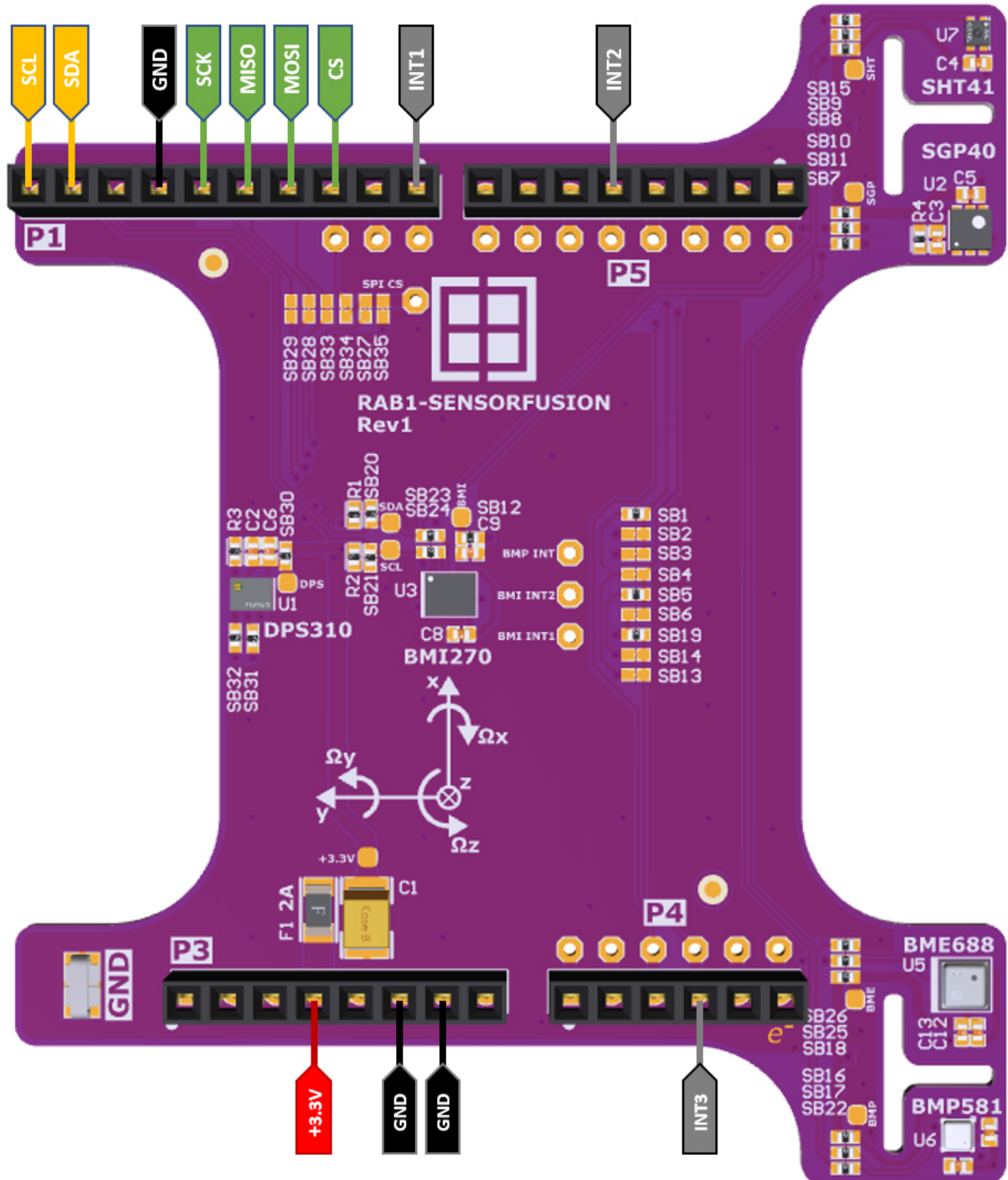
The firmware example uses KitProg3 Debug UART for debugging output. All sensor raw values are presented once per second: BMP390 Temperature & Pressure; BME688 Temperature, Humidity, Pressure & Gas Resistance with Index; SHT41 Temperature and Humidity; SGP40 VOC Raw Value and VOC Index; BMI270 Accelerometer and Gyroscope x, y, z-axis values.



```
COM16 - PuTTY
--> Sensor Fusion Adapter Board Data Output <--
BMP390 --> T: 28.35 deg C, P: 102983.13 Pa
BME688 --> T: 36.86 deg C, H: 9.33 %, P: 103006.59 Pa, R: 3289299.25 Ohm
SHT41 --> T: 27.66 deg C, H: 20.62 %
SGP40 --> VOC: 26201 raw, VOC INDEX: 13
BMI270 --> accx: 136 accy: 238 accz: 16538 gyrx: 0 gyry: -3 gyryz: -5
00:01:56 Connected SERIAL/115200 8 N 1
```

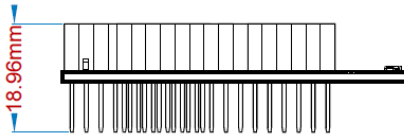
Fig. 3. Running the demo.

Board Pinout

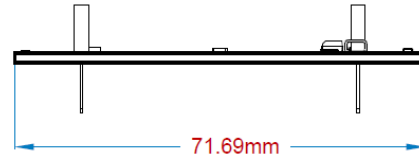


Mechanical Layout

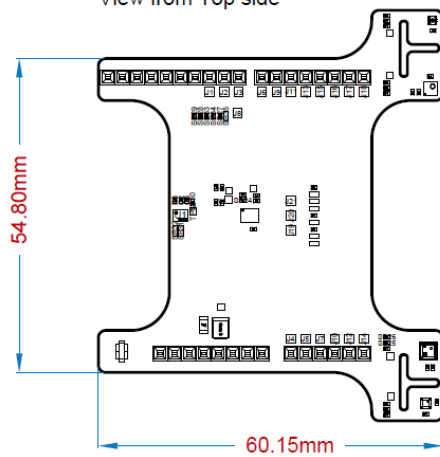
View from Front side



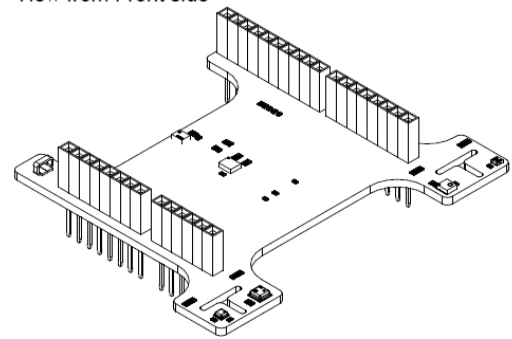
View from Left side



View from Top side



View from Front side



Bill of Materials

Designator	Value	Specification	Quantity	Manufacturer	Manufacturer Part No.	Supplier	Supplier part number
C1	47uFx6V	6V, 20%	1	AVX	NOJB476M006RWJ	Rutronik	KTA6684
C2, C4, C6, C8, C9, C10, C11, C12, C13	100nF	X7R, 25V, 10%	9	AVX	04023C104KAT2A	Rutronik	KKK20175
C3, C5	1uF	X5R, 25V, 10%	2	Samsung EM	CL05A105KA5NQN C	Rutronik	KKS2216
F1	CC12H2A-TR	63V, 2A	1	EATON	CC12H2A-TR	Rutronik	FUSE10755
P1	RS1-10-G-413	10 pos. 2,54mm	1	ADAM TECH	RS1-10-G-413	Rutronik	CONN9323
P3, P5	RS1-08-G-413	8 pos. 2,54mm	2	ADAM TECH	RS1-08-G-413	Rutronik	CONN9321
P4	RS1-06-G-413	6 pos. 2,54mm	1	ADAM TECH	RS1-06-G-413	Rutronik	CONN9319
R1, R2	10K	5% 0,063W	2	Yageo	RC0402JR-1310KL	Rutronik	WRC51147
R4	4.7R	5% 0,063W	1	Yageo	RC0402JR-074R7L	Rutronik	WRC34495
SB1, SB5, SB7, SB8, SB9, SB10, SB11, SB12, SB15, SB16, SB17, SB18, SB19, SB20, SB21, SB22, SB23, SB24, SB25, SB26, SB27, SB28, SB29, SB30, SB33, SB34	0R	5% 0,063W	26	Yageo	RC04020R	Rutronik	WRC52534
TP5	P/N5019	3.81*2.03	1	Keystone Electronics	P/N5019	Rutronik	BAT4950
U1	DPS310XTSA1	1.7V, 3.6V, 1mA	1	Infineon	DPS310XTSA1	Rutronik	ICMEMS1148
U2	SGP40-D-R4	3.6V, 3mA	1	Sensirion	SGP40-D-R4	Rutronik	ICENVI1294
U3	BMI270	1.7V, 1mA	1	Bosch	BMI270	Rutronik	ICMEMS1423
U5	BME688	1.7V, 3.9mA	1	Bosch	BME688	Rutronik	ICENVI1322
U6	BMP581	30 .. 125kPa	1	Bosch	BMP581	Rutronik	ICENVI1434
U7	SHT41-AD1B-R2	1.08V, 0.5mA	1	Sensirion	SHT41-AD1B-R2	Rutronik	ICENVI1393

Legal Disclaimer

The evaluation board is for testing purposes only and, because it has limited functions and limited resilience, is not suitable for permanent use under real conditions. If the evaluation board is nevertheless used under real conditions, this is done at one's responsibility; any liability of Rutronik is insofar excluded.