RAB1 – SENSORFUSION User Manual
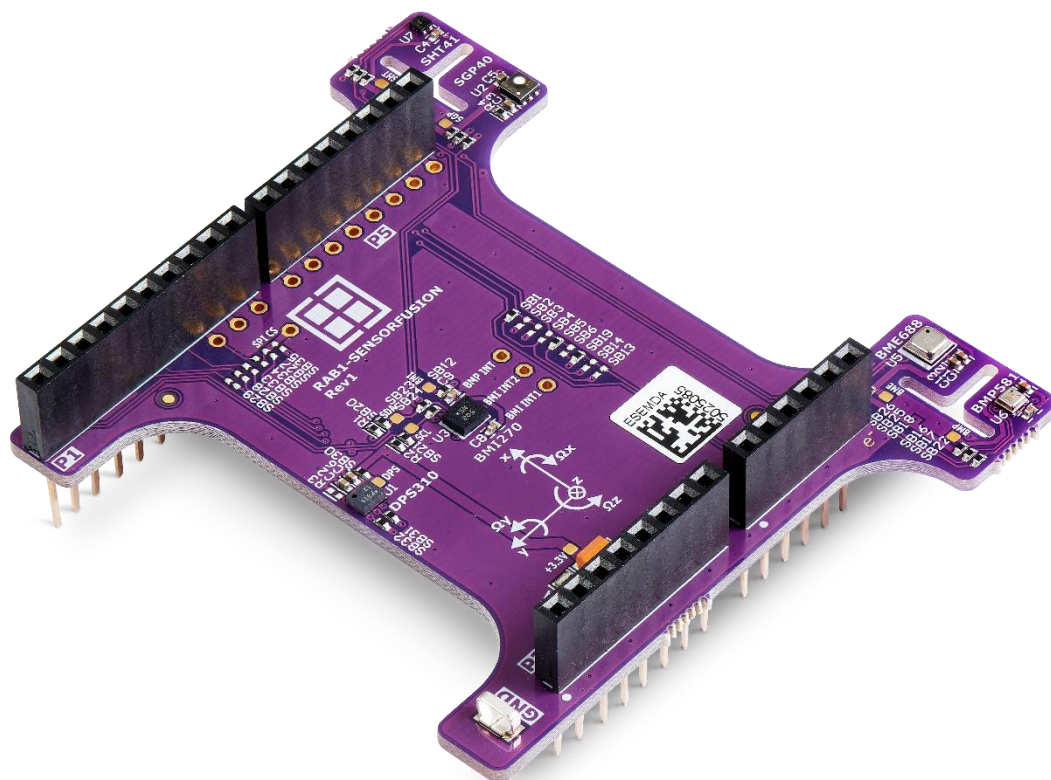
Versions

Version	Date	Rationale
0.1	April 04, 2022	First draft. Author: GDR
1.0	April 20, 2023	New structure, software and firmware description is added. Autor: KOA
1.1	November 3, 2023	Update of Running a Demo. Author: KOA

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.
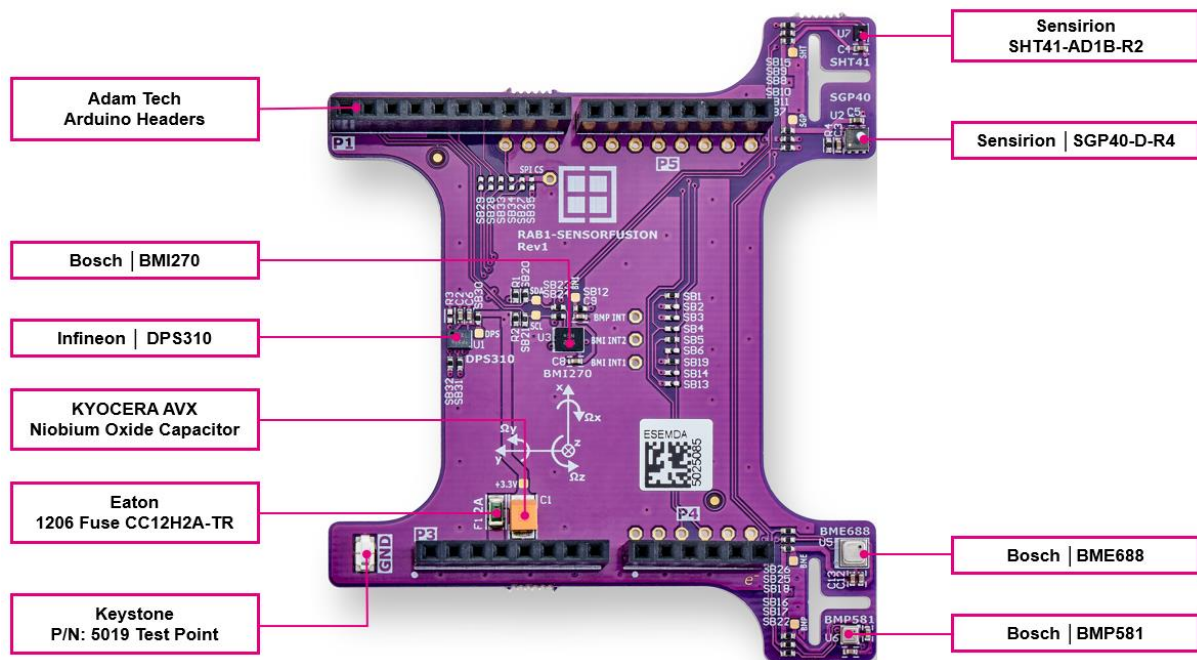
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Overview

Features

RAB1-SENSORFUSION is an Arduino shield adapter board 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].
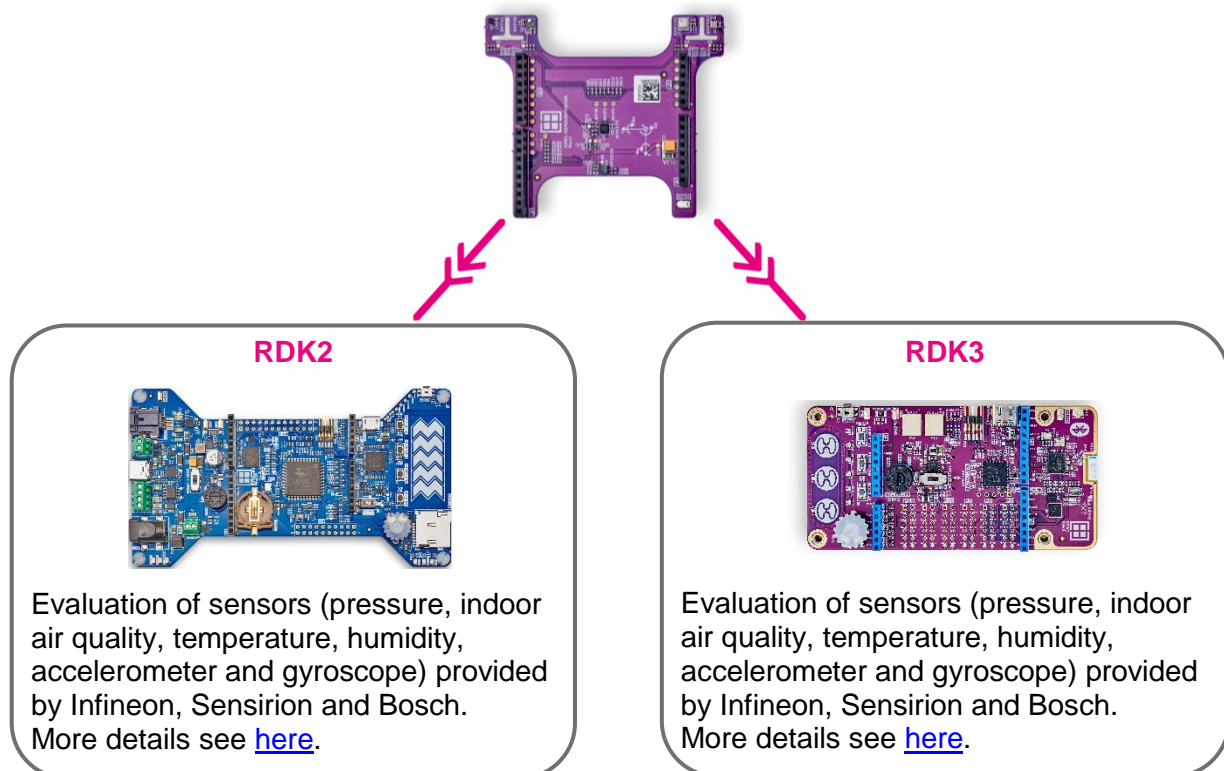
- DPS310 – Infineon's digital XENSIV^{TM} barometric pressure sensor.
- BMP581 – Bosch's digital pressure sensor.
- SGP40 – Sensirion's indoor air quality sensor for VOC measurements.
- BME688 – Bosch's digital low power gas, pressure, temperature and humidity sensor with AI.
- SHT41 – Sensirion's high-accuracy 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.

Component Placement

Adam Tech Arduino Headers	Sensirion SHT41-AD1B-R2
Bosch │ BMI270	Sensirion │ SGP40-D-R4
Infineon │ DPS310	
KYOCERA AVX Niobium Oxide Capacitor	
Eaton 1206 Fuse CC12H2A-TR	Bosch │ BME688
Keystone P/N: 5019 Test Point	Bosch │ BMP581

Applicable Boards

The following Rutronik System Solution boards are compatible with Sensorfusion and can be connected to it to provide the additional functionality.

RDK2

Evaluation of sensors (pressure, indoor air quality, temperature, humidity, accelerometer and gyroscope) provided by Infineon, Sensirion and Bosch. More details see here.

RDK3

Evaluation of sensors (pressure, indoor air quality, temperature, humidity, accelerometer and gyroscope) provided by Infineon, Sensirion and Bosch. More details see here.

Hardware

I2C Addresses

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

Designator	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

The locations of the solder bridges can be found in 3D model and assembly drawings of Sensorfusion.
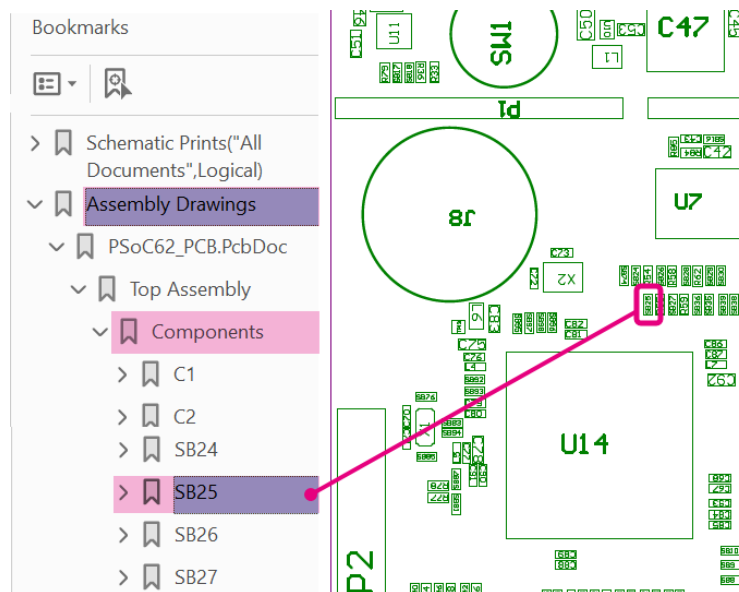
How to find a component on the layout

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.

Board Pinout
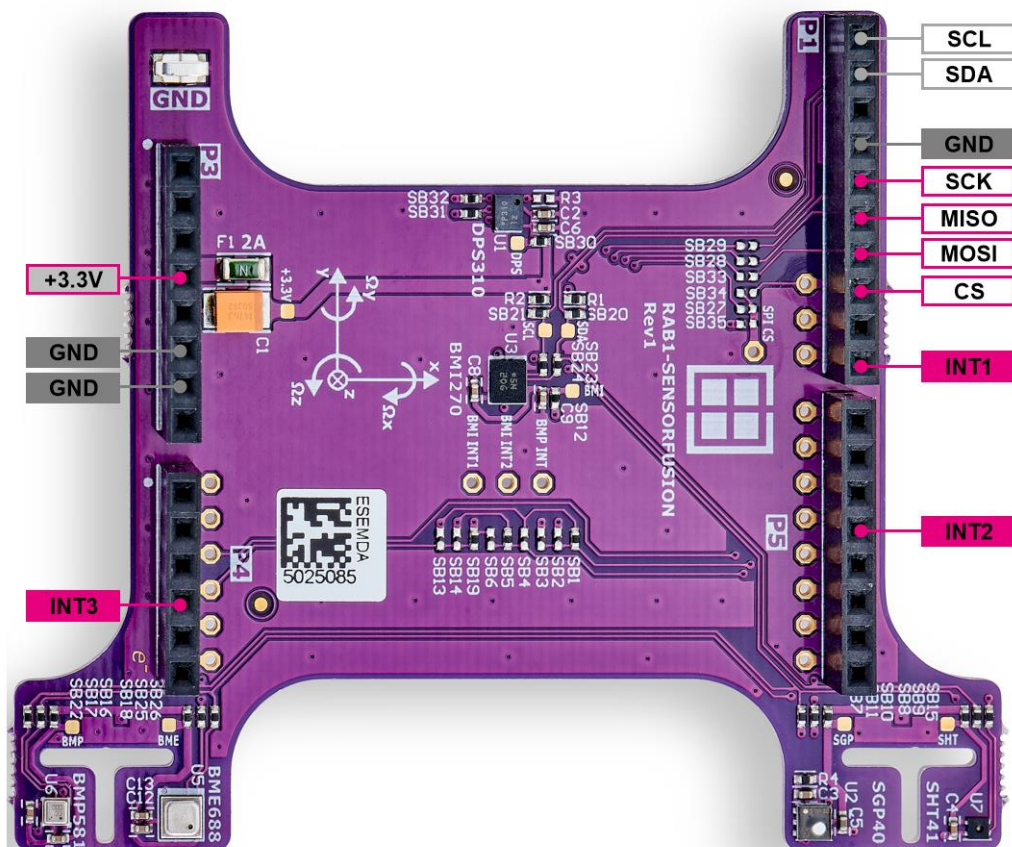
Software and Firmware

Getting Started

1. Register or/and login at <u>Infineon</u> website (myInfineon tab). License generation takes up to several days.
2. Download and install the latest version of <u>ModusToolbox™</u> software.
3. Mount the RAB1 - SensorFusion board on the RDK2 Arduino headers.
4. Ensure the switch SW1 of RDK2 is set to "3.3V" and connect the Micro USB cable (A to Micro B) to "KitProg3". Connect the RDK2 and SENSORFUSION assembly with a PC via cable.
5. Follow the procedure described in the paragraph "<u>Running a Demo</u>".
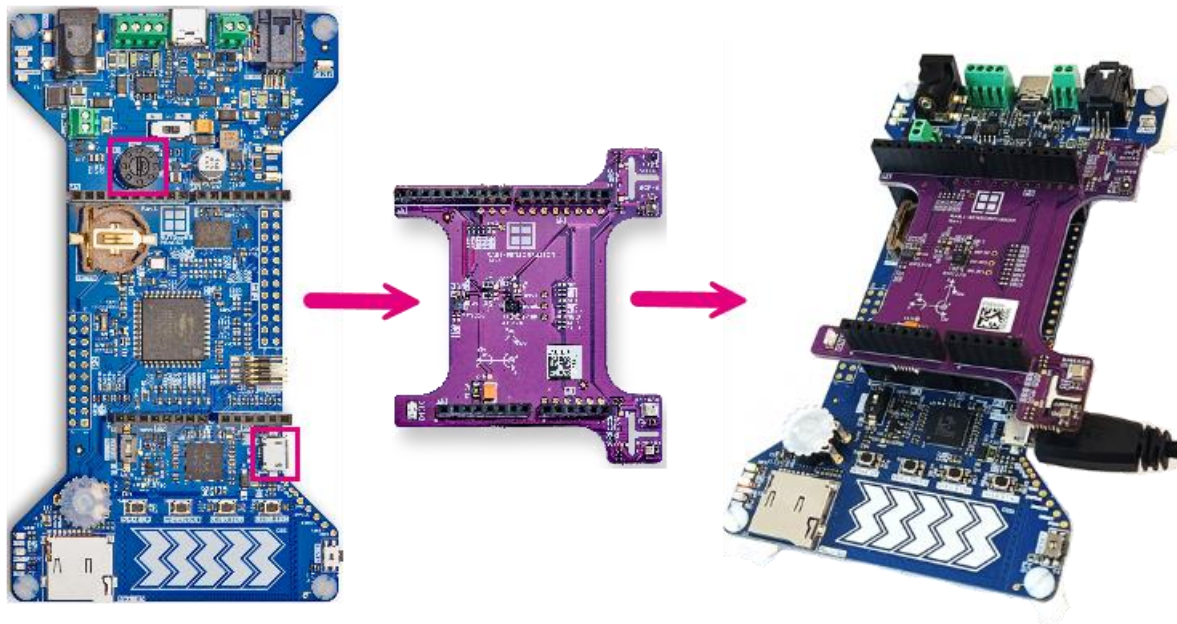
Running a Demo

1. Run **Modus Toolbox** application.

2. Go **File - New – Modus Toolbox Application** and wait for a while.
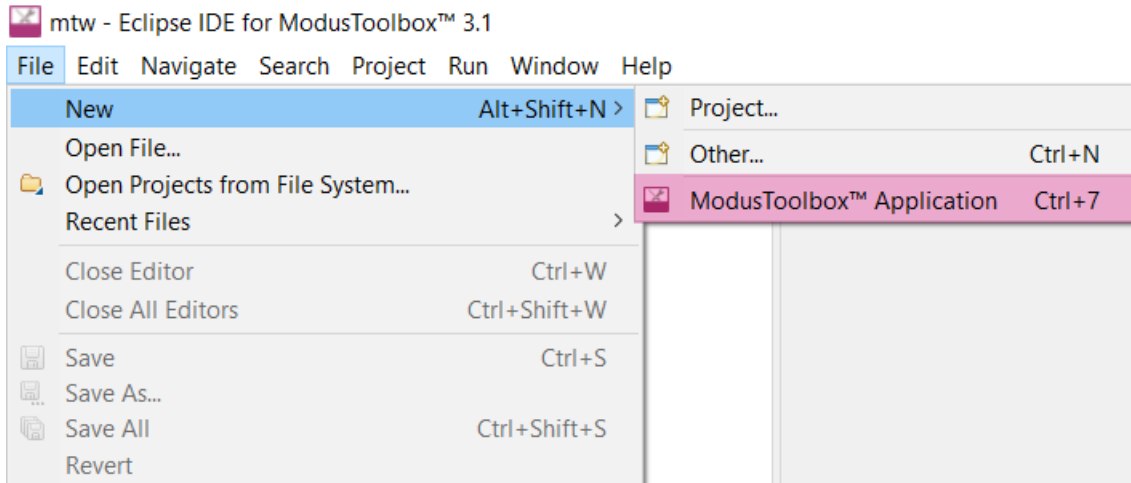
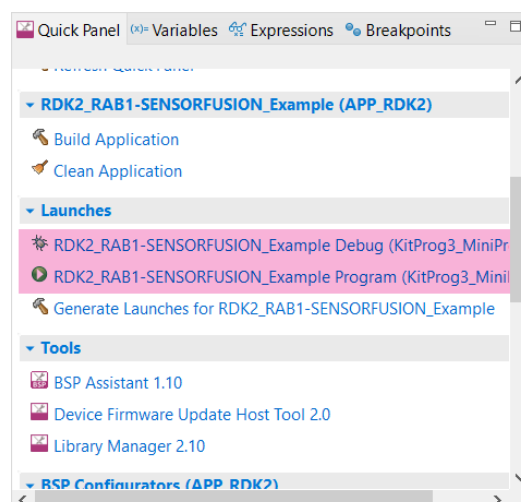3. Open **PSoC 6** block, select **RDK2** and press **Next**.
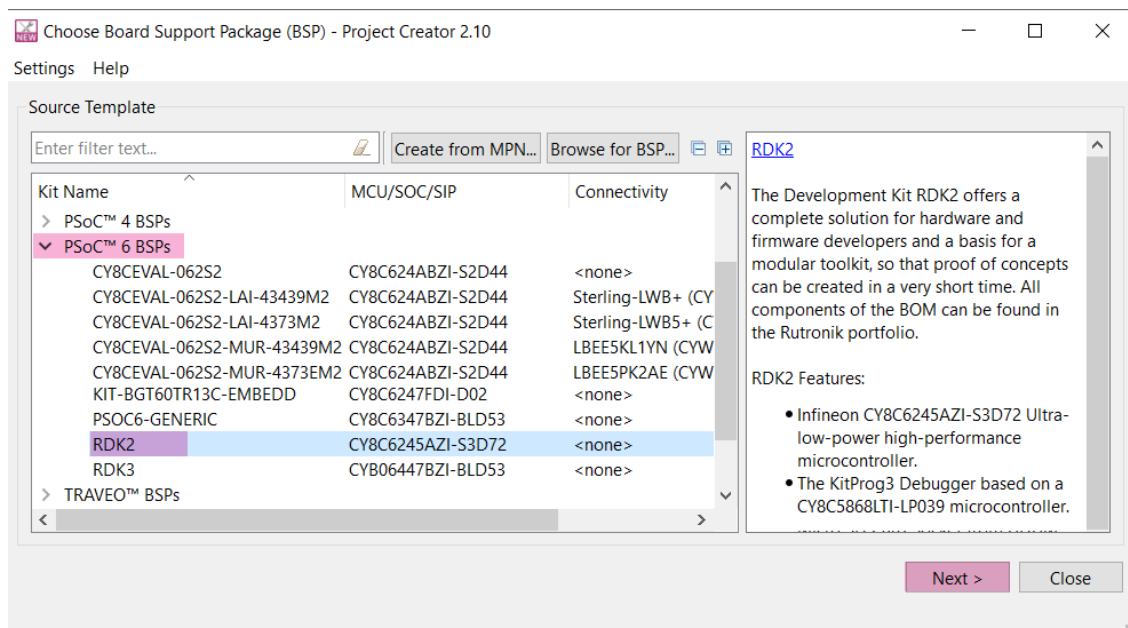
4. Open **Sensing** block, check **RDK2 SensorFusion Example** and press **Create**.
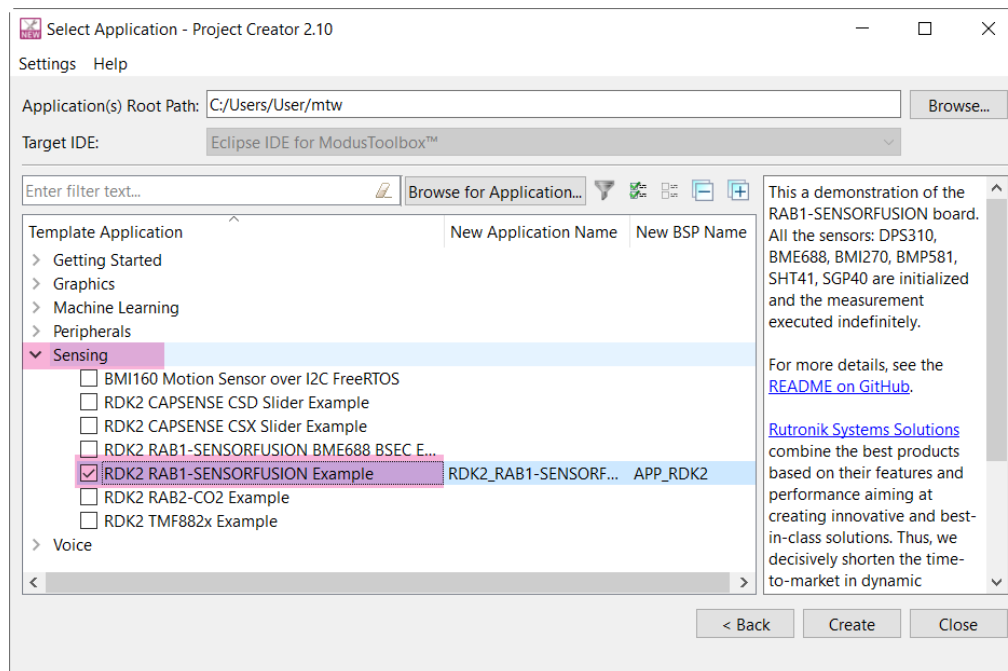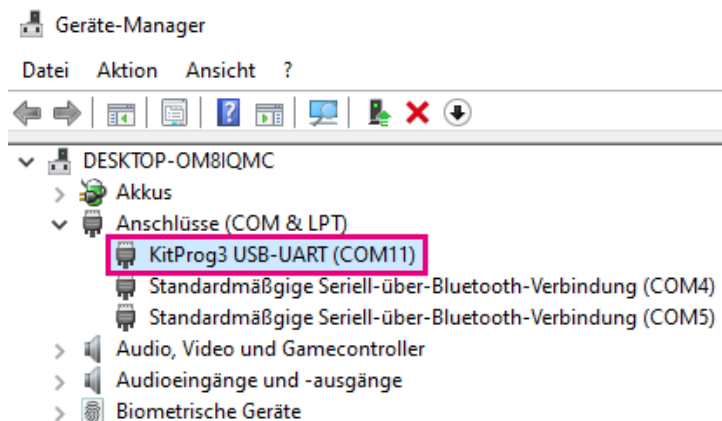

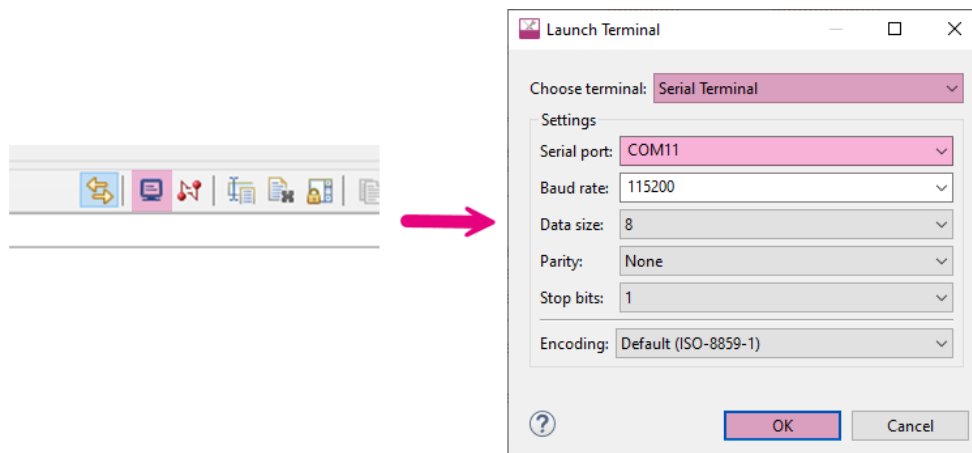5. Open **Library Manager**, press **Update** and **Close** (this step is optional).
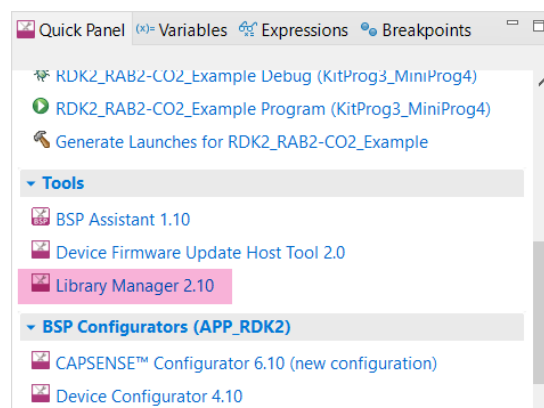
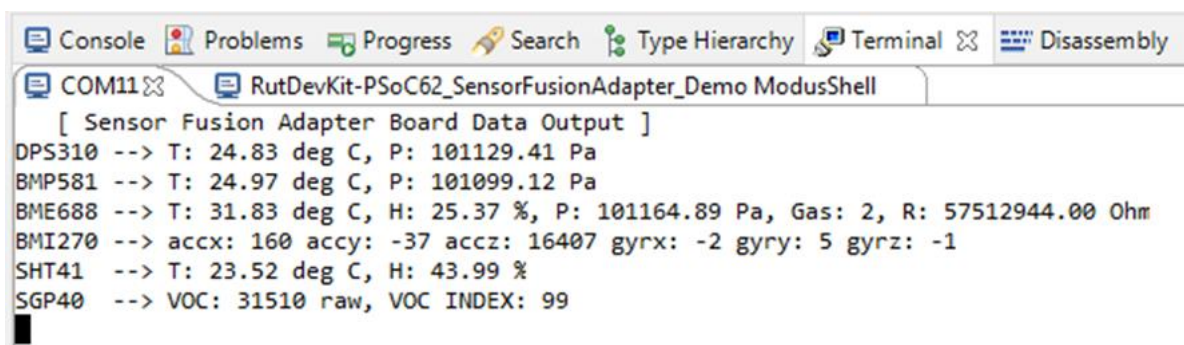6. **Build** and **Debug** the project.

7. Check the number of KitProg3 COM port in Windows **Device Manger**.

8. Open **Terminal** tab, press **Open a Terminal**, select the serial port with the number from previous step and press **OK**.

9. The sensor data is refreshed every second in the COM terminal window.

Firmware Examples

All these examples can be found at [GitHub](#).

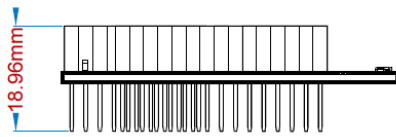|	
RDK3_SensorFusionAdapter_Demo	This project demonstrates how RAB1-SENSORFUSION adapter board works together with [RDK3](#).
RDK3_BLE_SensorHub	This code example demonstrates the Android OS "CySmart" application's custom BLE service "Sensor Hub". The accelerometer, barometer, thermometer, and battery voltage data may be monitored using this service.
RDK2_RAB1-SENSORFUSION_Demo	This firmware example running on the [RDK2](#) initiates and tests all the sensors on the RAB1-SENSORFUSION board.

Production Data

Schematics

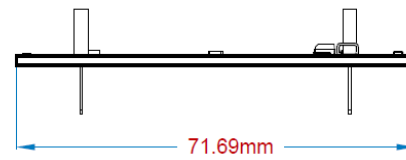You'll find the schematics of Sensorfusion [here](#).

BOM

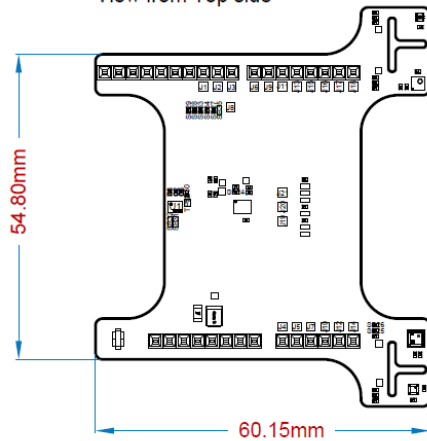You'll find the [BOM](#) for Sensorfusion here.

Mechanical Layout

View from Front side

18.96mm

View from Left side

71.69mm

View from Top side

54.80mm

60.15mm

View from Front side