

OB1203SD-BT2-EVK

Evaluation kit for Heart Rate, SpO2, and Respiration Rate

The OB1203SD-BT2-EVK evaluation kit for Heart Rate, SpO2, and Respiration Rate uses Renesas' highly integrated OB1203 biosensor for reflective photoplethysmography.

With the provided algorithm, the kit can determine Heart Rate, Oxygen Saturation (SpO2), and Respiration Rate. Data can be monitored locally by connecting a USB cable between the EVK and a computer and using a terminal program. Data is also sent by a wireless Bluetooth (BLE) link and available for monitoring using the Renesas OB1203 Web App running on a Windows™ v10 or later PC.

The design incorporates a Dialog DA14531MOD SmartBond TINY™ Module for MCU+BLE capability and a Renesas ISL9111 DC-DC boost converter.

Functions

- Collects data from Renesas OB1203 sensor module through I2C communication
- Calculates the oxygen saturation, pulse, and respiration rate using the provided algorithm
- Reports oxygen saturation, pulse, and respiration rate raw data and tabular summary values plus battery level
- Boosts battery voltage to system's voltage needs

Target Devices

- MCU+BLE: Dialog DA14531MOD module
- Sensor: OB1203 module
- Boost: ISL9111 (ISL9111EH33Z)

When applying the provided algorithm to another microcontroller, modify the program to the specifications for the target microcontroller and conduct an extensive evaluation of the modified program. Changes in analog or power supply components also must be fully evaluated.

Specifications

The OB1203SD-BT2-EVK monitors heart rate, blood oxygen saturation, and respiration rate. Battery-operated and portable, the evaluation kit is suitable for monitoring at home, during exercise, or travel.

- Operating voltage: 3.0V (AAA battery × 2)
- Measurement range: Oxygen saturation: 70% to 100%
- Pulse rate: 25 to 200 bpm
- Operating temperature: -40 to 85°C
- Operating humidity: 5 to 99% RH (No condensate water)

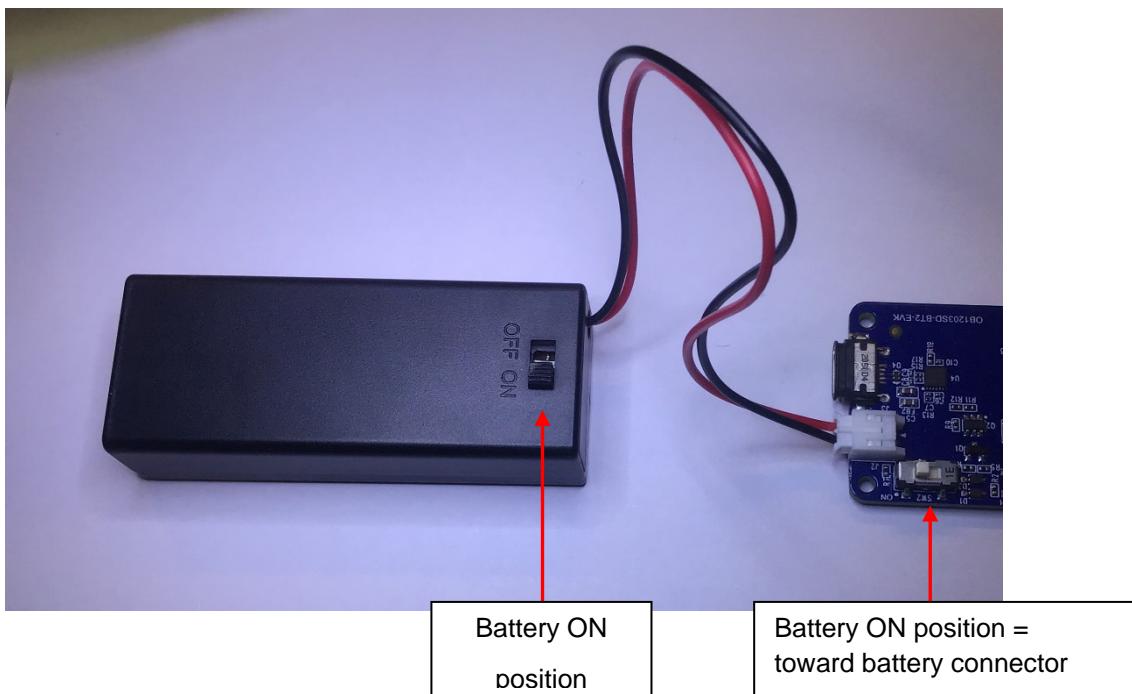
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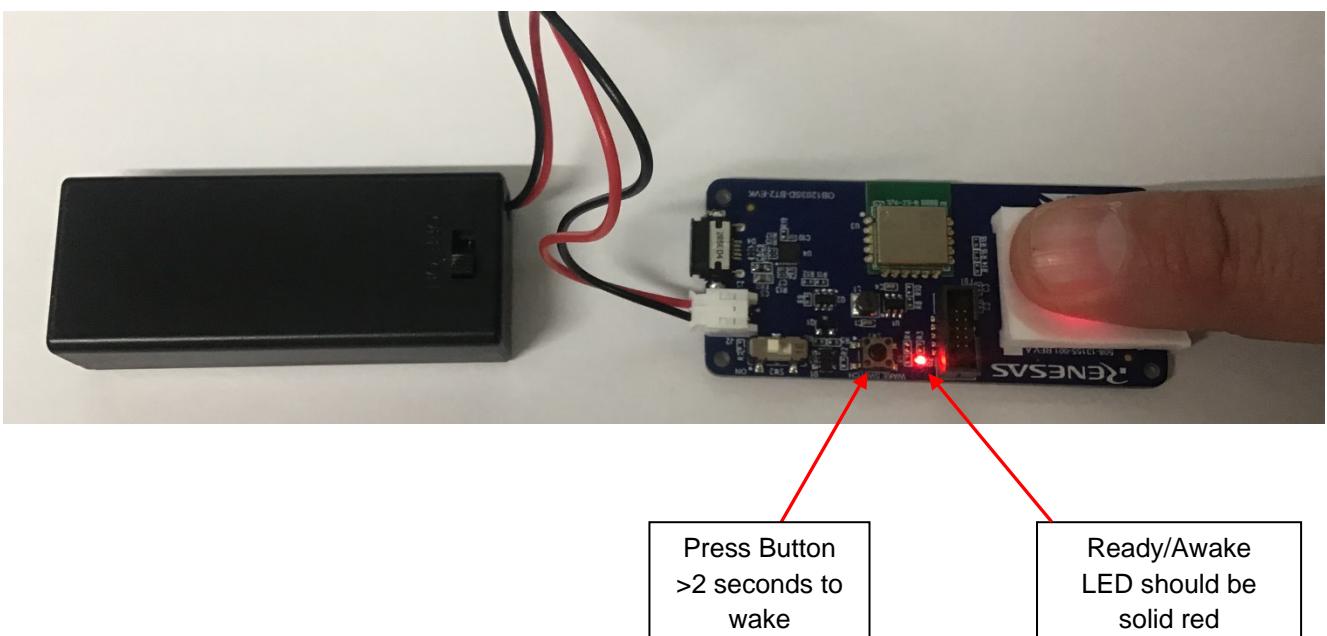
1. Setup and Configuration

The evaluation kit runs on battery power. Complete the following to set up the kit:

1. Plug the battery cable to the connector on the EVK.
2. Slide the battery switch on the battery case to ON.
3. Slide the switch on the PC board toward the battery connector (ON position).



4. Press the push-button switch (SW1) for at least two seconds to wake the EVK electronics. If the battery voltage is above the threshold limit (about 2.2V), the LED next to the switch should turn on solid red indicating that the system is ready for processing sensor measurements.



2. Data Acquisition and Illustration Using BLE

1. Using Microsoft Windows 10 (or later) open a web browser and go to renesas.com/ob1203sd-bt2-evk/dashboard.html.
2. Ensure the computers Bluetooth capability is enabled.

Note: The Web Application runs on Microsoft Edge or Google Chrome using a Windows PC (V10 or above). It uses the computer's built in Bluetooth (BLE) capability to connect to the EVK. PC's Bluetooth must be enabled.

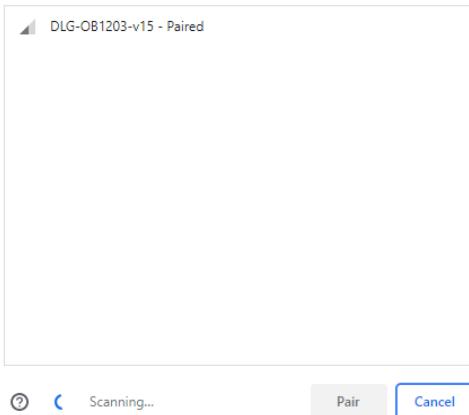
Compatible browsers are listed on the [Can I Use](#) website.

The OB1203SD-BT2-EVK will time out after ~30s without a finger on the sensor to extend battery life.

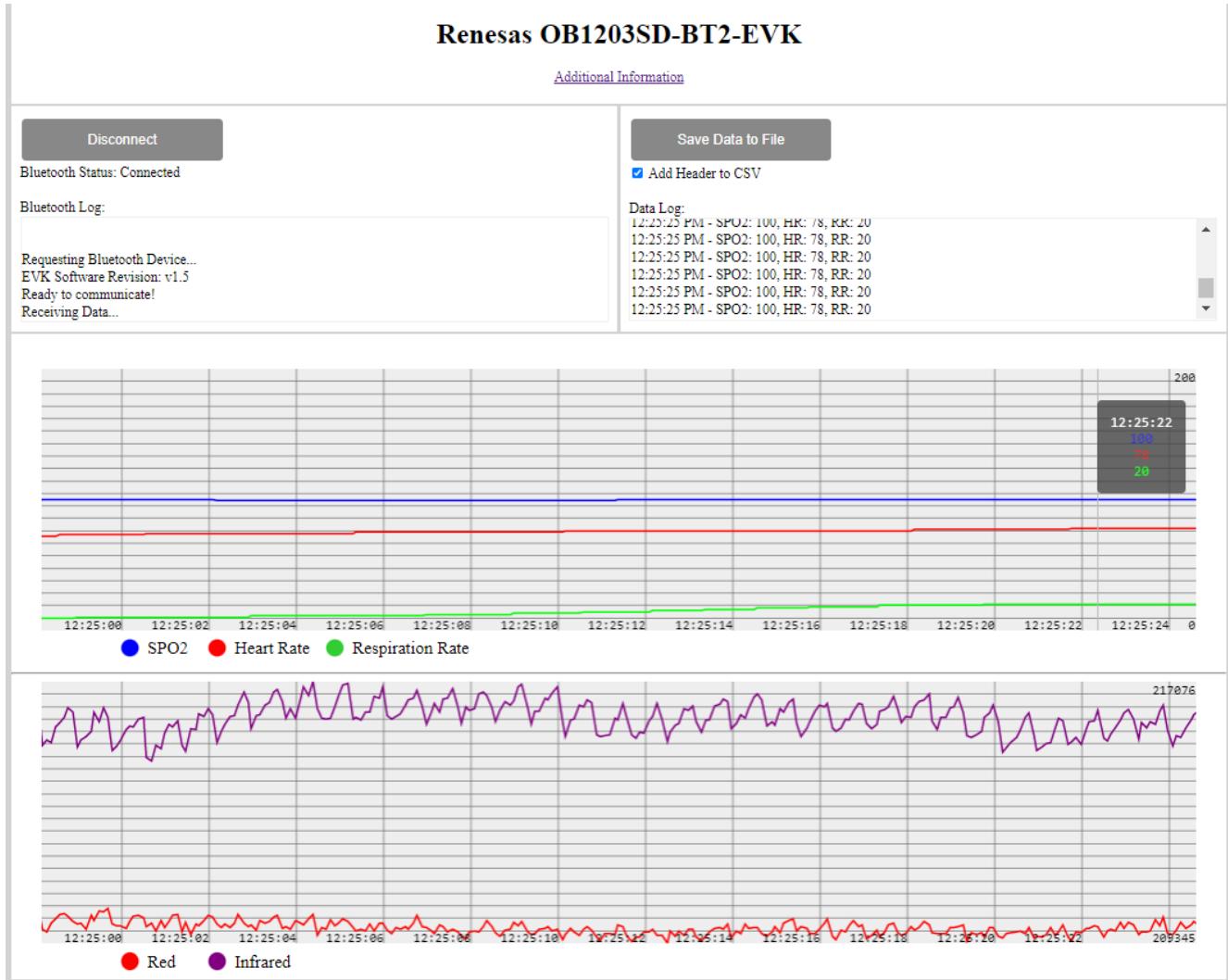
3. Click Connect.



4. Select DLG-OB1203-vxx and click Pair.



5. Observe and evaluate.



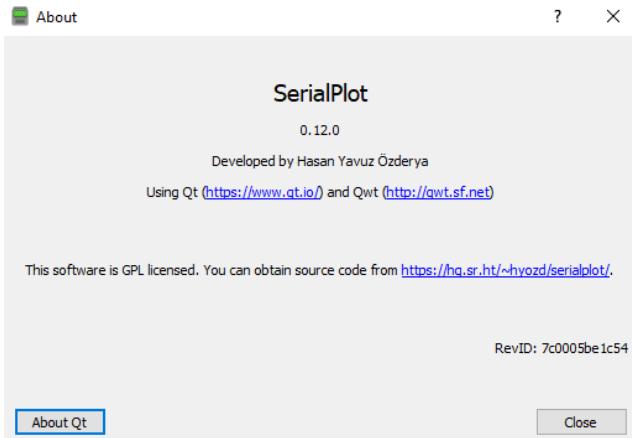
3. Data Acquisition and Illustration Using the USB Port

Note: Connection between the EVK and PC must be made *after/while* the red power LED is ON. In other words, plugging in the USB and then turning on the EVK will not work. The EVK must first be on and then the USB plugged.

For local terminal prints, connect a USB cable between a computer and the EVK. The EVK uses a USB Micro B socket.

3.1 Using SerialPlot

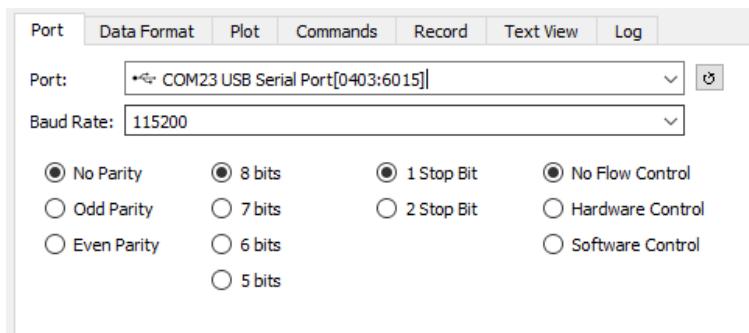
1. Download [SerialPlot](#) and install the software. At the time of this writing SerialPlot version 0.12.0 was used.



2. Set up SerialPlot as shown below.

- a. In the Port tab select:

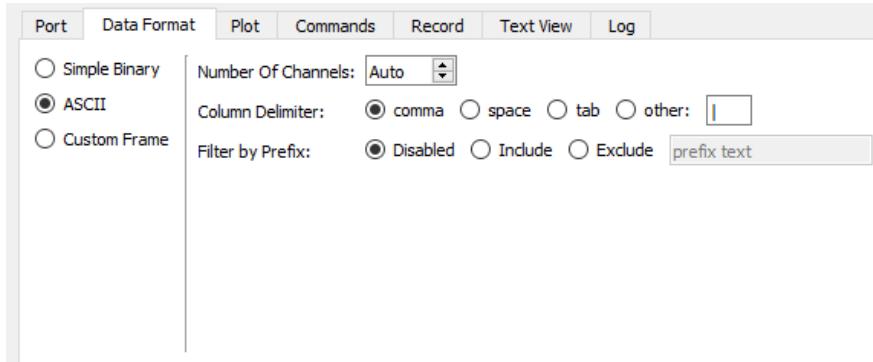
- i. Baud Rate 115200
- ii. No Parity
- iii. 8 bits
- iv. 1 Stop Bit
- v. No Flow Control



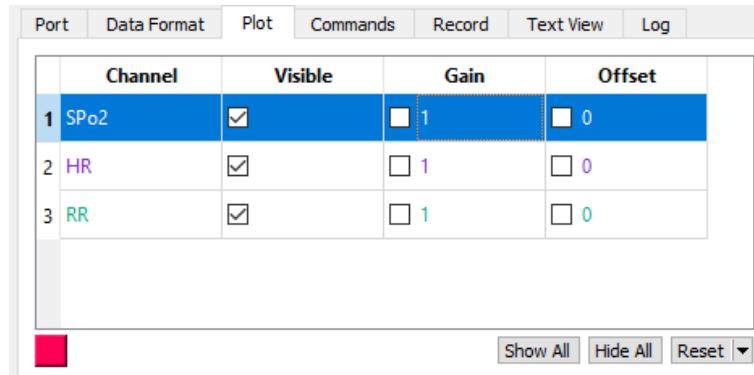
- vi. Click the refresh Port button on the right-hand side next to the Port pull-down menu. This will refresh the COM port → select the COM Port the OB1203SD-BT2-EVK is connected to.

- b. In the Data Format tab select:

- i. ASCII
- ii. Number of Channels: Auto
- iii. Column Delimiter: Comma



c. A suggested Plot Tab is shown below:

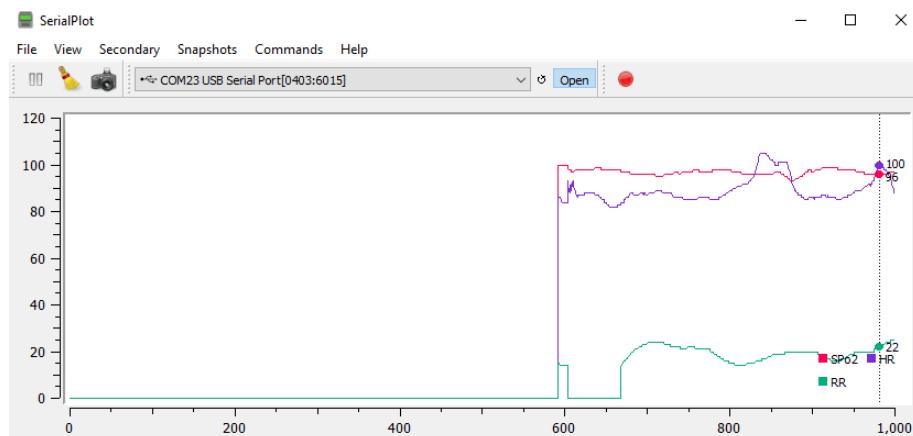


3. Establish connection and stream measured data to SerialPlot:

- Connect the battery pack and make sure the sliding switch on the battery pack is ON.
- Turn on the OB1203SD-BT2-EVK power by sliding the power switch to the ON position (slider close to the battery pack connector).
- Push the push button for at least 2 seconds – the red status light will stay lit.
- Put your finger on the finger cradle to start streaming the measured data over the USB port.

Note: If there is no finger placed on the finger cradle the OB1203SD-BT2-EVK will time out after 30 seconds to conserve power.

Keep pressure on the sensor low to avoid blood flow restriction. With the finger on the sensor, the built-in proximity sensor will trigger the PPG sensor to stream HR/SPo2 and RR data.



- e. Click the Open button in SerialPlot and observe the data being graphed.
- f. *Optional:* Click the red record button if you want to export the measurement data into a file.

SPo2,HR,RR

99,80,11

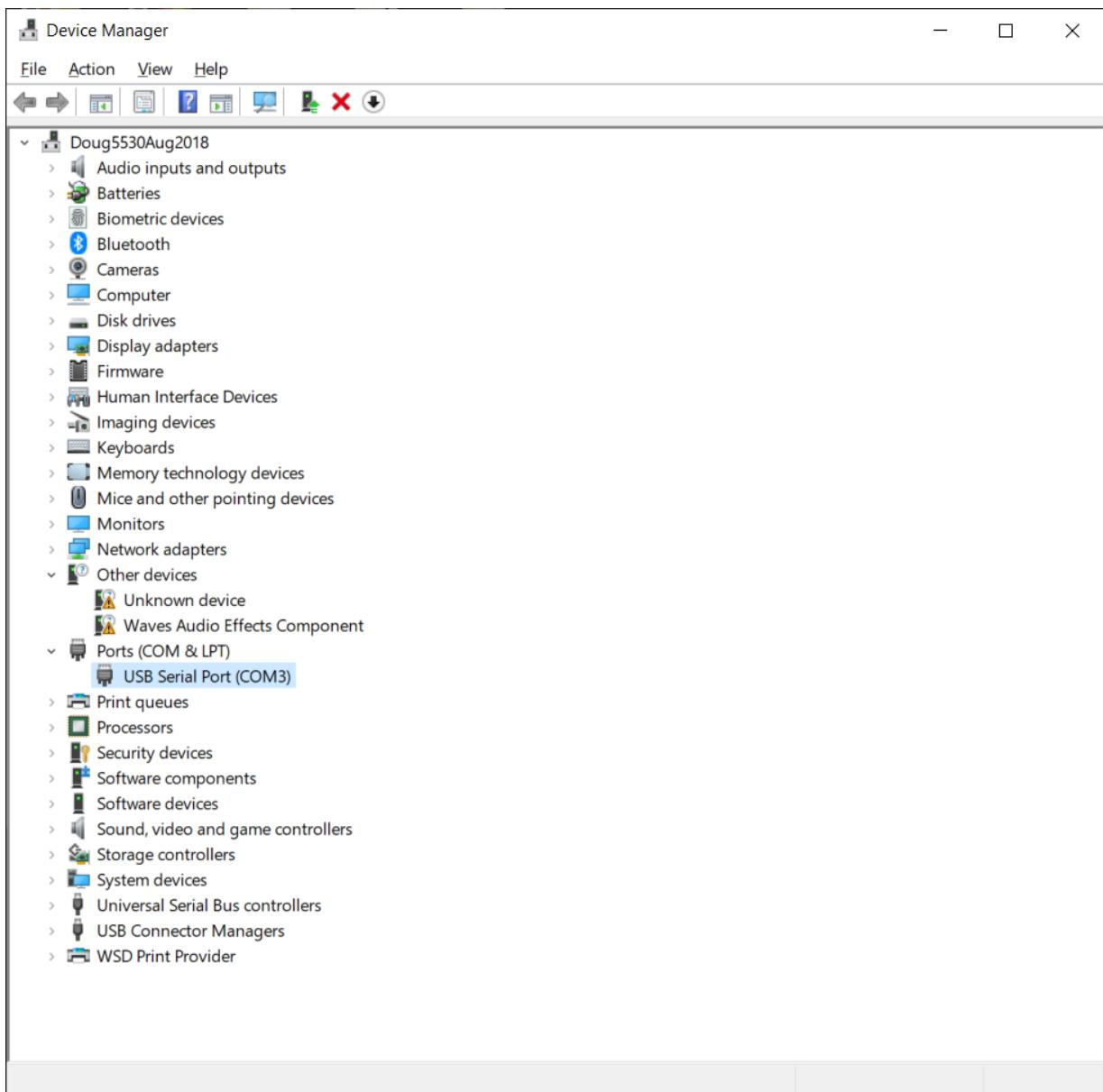
99,79,10

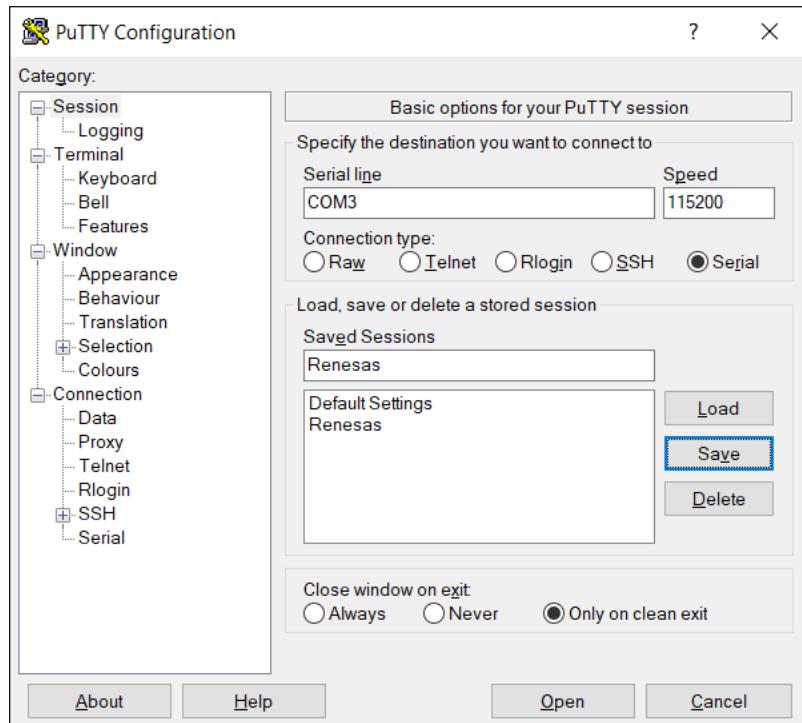
...

98,80,10

3.2 Using Putty

For Windows, use Device Manager to determine the COM port that enumerates when the EVK is tethered to the PC. Once the COM port is known, open a terminal program (e.g., Putty, TerraTerm, MobaXTerm) and configure a serial connection using the appropriate COM port. Set Baud Rate = 115200.





The EVK will time out with no finger over the OB1203 sensor after about 30 seconds. Connect the USB cable within that time or place a finger or cover over the OB1203 sensor to extend the time available for setting up the USB tether.

For measurement, place your finger on the sensor finger cradle. Keep the pressure on the sensor low to avoid blood flow restriction. With the finger on the sensor, the IR LED and red LED light up and the measurement starts.

It can take up to 30 seconds for SpO2 and heart rate data to begin to print. It will take another 30 seconds or more of steady SpO2 and heart rate readings before respiration rate is also displayed and additional time for the result to stabilize.

Local terminal prints are shown below starting from turning the unit on. Updates are once per second. Comma separate prints are: SPO2 [%], HR [bpm], RR [bpm]

Start of prints after power on

```
*****
* OB1203 TEST V10 *
*****
Battery voltage = 2844 mV
Battery voltage is above operating threshold
defaultConfig
init_ps
Skipping first reset
init_ps ended
ob1203_init done!
Woke up! Switch to BIO_MODE.
init_spo2
Sent reset
init_spo2 end
```

Gap time without prints about 30 seconds →

```
reset_oximeter_params
SPO2 [%], HR [bpm], RR [bpm]
100,140,0
100,140,0
100,140,0
100,131,0
100,122,0
100,105,0
100,90,0
100,81,0
100,76,0
100,78,0
100,77,0
100,79,0
.
.
.
100,78,0
100,78,0
100,78,0
100,78,0
100,79,23 ← Respiration rate begins to print
100,79,23
100,79,24
100,79,24
100,78,18
100,78,18
100,78,18
100,78,18
100,77,18 ← Respiration rate stable
100,77,17
100,77,17
100,77,17
100,77,17
init_ps
Sent reset
init_ps ended
.
```

Finger lifted from EVK cradle →

4. Windows BLE Web App

A companion Windows BLE Web App with further instructions is available [here](#). The web app runs in a Chrome based browser (Microsoft Edge or Google Chrome) on a Windows PC (v10 or above) and uses the computer's built in Bluetooth (BLE) capability to connect to the EVK (see [compatible browsers](#)).

The Web App shows plotted and tabular data. The web app is also used for software update over the air (SUOTA) to load new firmware into the EVK.

5. Ordering Information

Part Number	Description
OB1203SD-BT2-EVK	OB1203SD-BT2-EVK Evaluation Kit

6. Notice

The OB1203SD-BT2-EVK is provided for reference, demonstration, and/or evaluation. No performance is guaranteed or warranted, nor is fitness or suitability for any medical device application claimed. Renesas will not indemnify customers using any part of the provided reference code. OEM is responsible for performance of products made using any of the provided reference code. For general questions contact Renesas. In addition, for medical devices Renesas strongly recommends to consult a medical device regulatory compliance advisor.

7. Revision History

Revision	Date	Description
1.01	Dec 19, 2021	Added "Data Acquisition and Illustration Using BLE"
1.00	Dec 7, 2021	Initial release.

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