



EBV IoT – Infineon PAS CO2 Evaluation Shield

Quick Start Guide



Version: 1.0
Date: May 2023

Foreword

The EBV-IoT – Infineon PAS CO2 Evaluation Shield is a quick evaluation tool based on Infineon PAS CO2 and DPS310 barometric sensors in the Arduino header. It enables a quick exploration of the most recent CO₂ sensor which uses photoacoustic effect and is part of Infineon's XENSIV™ environmental sensors portfolio. The tool can be either operated directly using USB port – no external adaptors needed, either by using your favorite MCU platform board in an Arduino form factor. It can be self-powered through USB, or Arduino header. And the most importantly, the tool enables you faster time-to-market, since your proof of concept can start out-of-the-box.

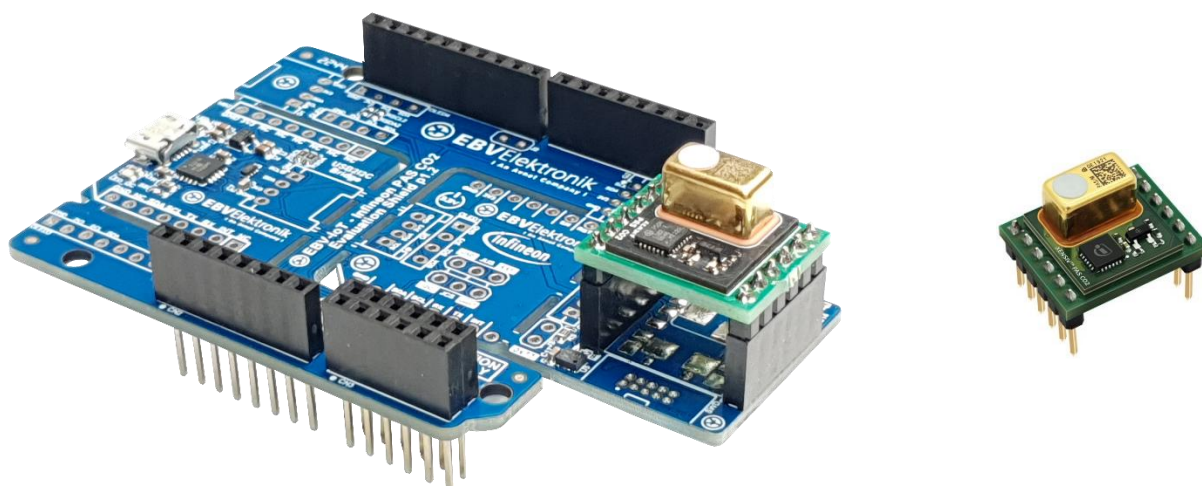


Figure 1: EBV-IoT – Infineon PAS CO2 Evaluation Shield with mini board (left), PAS CO2 mini board only (right)

The kit includes:

- EBV-IoT – Infineon PAS CO2 Evaluation Shield
- Infineon XENSIV™ PAS CO2 Mini Evaluation Board

Key Benefits

- Easy to use and out-of-the-box ready environmental sensing evaluation tool
- USB powered (No external battery or supply needed)
- Arduino Uno header compatibility
- Access through integrated USB2I2C/UART bridge or through Arduino header
- Easy configuration for various serial interface communication
- Various MCU vendor Arduino compatible evaluation boards examples available
- Multiple break-away board options available: MikroBus, sensors only (I2C bus only)
- Grove system ready: I2C Grove connectors
- Comes with OLED access pins for simple displaying values using OLED display
- USB2I2C/UART bridge can be reused for accessing different products over I2C or UART interface (break-away possible)

Table of Contents

Foreword	2
Table of Contents	3
1. Overview	4
1.1. Power supply.....	5
1.2. Schematics.....	6
1.3. Sensors.....	7
1.4. I2C addresses	7
1.5. Evaluation shield hardware configuration options	7
1.5.1 Out-of-box setup	8
1.5.2 USB2UART interface configuration	8
1.5.3 External UART interface configuration.....	8
1.5.4 I2C interface configuration (after using any other jumper configuration)	9
1.5.5 INT hardware configuration	9
2. USB interface	10
2.1. Driver installation.....	10
2.2. Virtual serial port	11
3. Arduino interface	11
4. Quick start	12
4.1. Installing “EBV-IoT – Environmental sensing” PC application	12
4.2. Running the PC application	13
4.3. “PAS CO2” tab	14
4.4. “PAS CO2 REGs” tab	14
4.5. “Chart” tab	15
4.6. “LOGs” tab	15
4.7. GUI “Scan I2C” tab.....	16
5. Embedded platform & cloud connectivity	Error! Bookmark not defined.
5.1. Software Architecture	Error! Bookmark not defined.
5.2. Cloud Connectivity	Error! Bookmark not defined.
Revision history	17

1. Overview

The EBV-IoT – Infineon PAS CO2 Evaluation Shield (the shield) can be used in a standalone operation as well as through Arduino headers. Simple block diagram is depicted on Figure 2. Following please find brief overview of components of the shield.

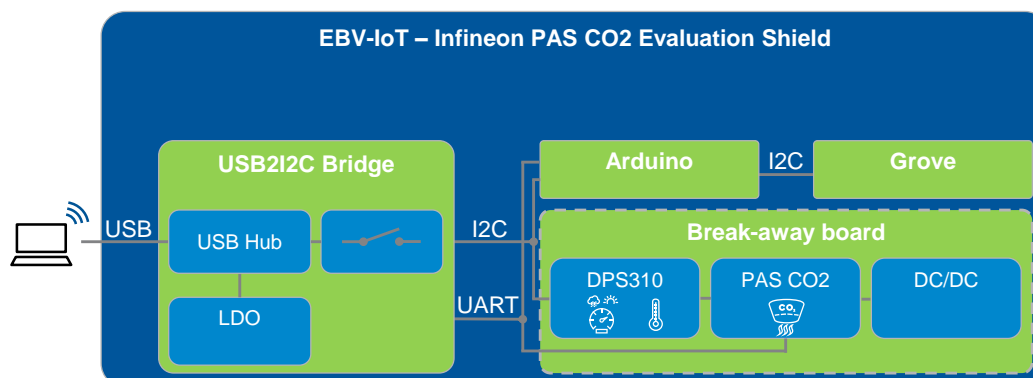
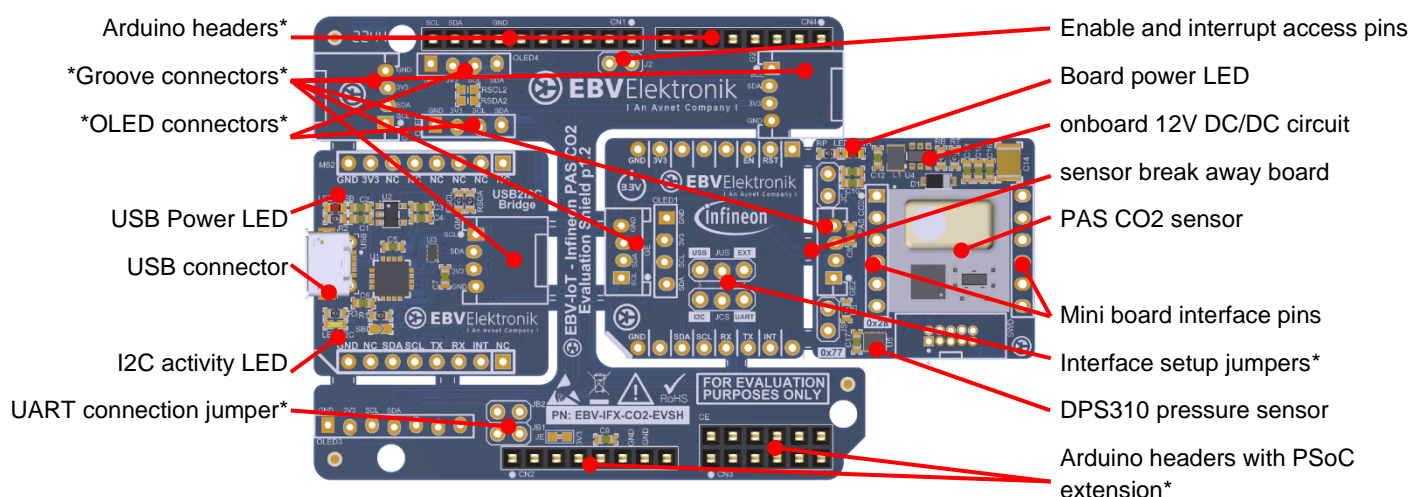


Figure 2: Block diagram

The core are **Infineon PAS CO2** and **DPS310** environmental and barometric pressure and sensors. Please refer to products pages for more information. The shield is Arduino compatible using **Arduino headers**. On the board there is **USB connector** used for powering the board and PC communication.

The onboard LEDs show basic status details. **USB power LED** indicates the board is powered up over USB. The **Board power LED** indicates sensor power on status. **I2C activity LED** indicates I2C communication status.

Multiple **jumpers** (JB1, JB2, JCS, JUS, JS) offer sensor interface mode selection as well as selection using either on-board USB bridge interface or external serial interfaces. Solder bridges (SB1, SB2, SB6, SB7) and “cut” bridges (JU, JE, JEN, JSCL, JSDA) can be used to “hard-wire” configuration using no jumpers. Please refer to sections 1.5 Evaluation shield hardware configuration options for more information. Additional **Grove** and **OLED connectors** placeholders allow using Grove I2C extension or OLED displays.



* optional configuration (not populated in default configuration)

Figure 3: The shield overview

1.1. Power supply

The shield can be powered either by USB using on-board 3.3V LDO, either by Arduino 3.3V power pin.



Warning: All sensors input power as well as I/O pins are 3.3V compliant. Please make sure external voltages applied are within required specifications.

When used as standalone, the shield is supplied from USB over 3.3V LDO as shown on Figure 4.

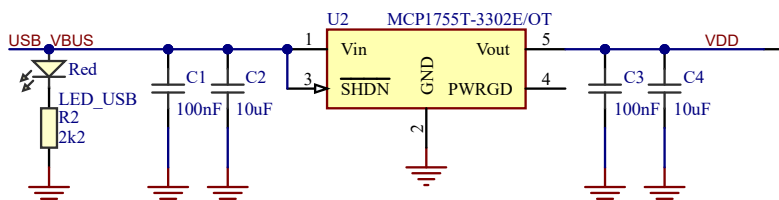


Figure 4: Shield USB power supply schematics

PAS CO2 sensor additionally requires 12V during CO₂ level acquisition. Step-up DC/DC circuit is integrated close to PAS CO2 sensor which allows small “sensor-only” evaluation using break-away board and I2C interface.

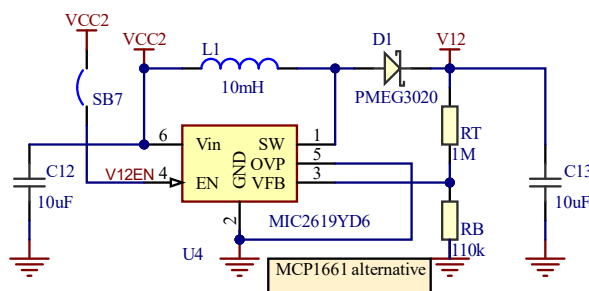


Figure 5: Step-up DC/DC converter for 12V required by PAS CO2



Note: Version 1.0 did not use solder bridge SBI and U1/GPIO0 was short circuited directly to INT. On shields version 1.0 DC/DC enable is wired to instant “ON” using SB7 and disconnected from INT by cutting JEN.



Warning: If “sensor-only” break-away board is being used (broken-away), only I2C communication is possible using onboard access pins. Please make sure jumper JS is open. Use 3.3V supply voltage on Grove connector



Warning: In case of using the shield and being powered concurrently from USB as well as external 3.3V from Arduino headers the two voltages are “short circuited” over “cut” bridges JU – USB power and JE – external power. In general this should not cause any issues, but eventually in case of excessive cross currents either of the JU or JE can be cut to prevent the current flow between the two sources.

1.3. Sensors

As already mentioned, the shield is enabling evaluation of two Infineon's XENSIV™ family of sensors:

- PAS CO2 – High performance in a small size – disruptive CO₂ sensor based on photoacoustic spectroscopy (PAS)
- DPS310 – a barometric pressure sensor

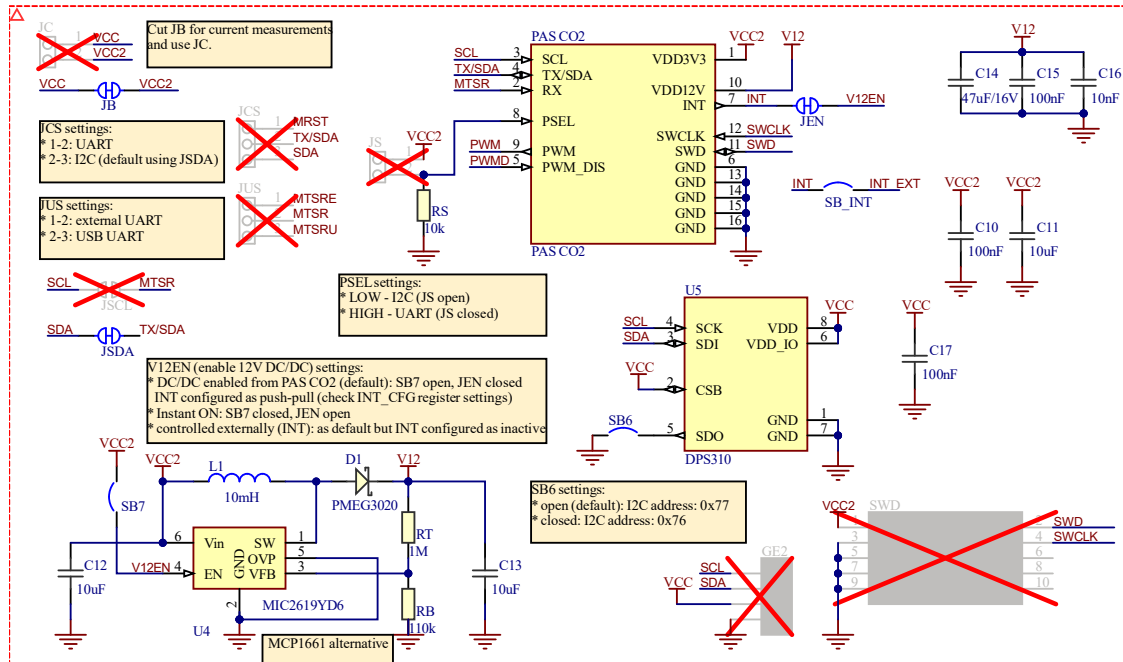


Figure 6: "Sensor only" break-away board schematics



Note: PAS CO2 sensor and the shield enable I2C and UART serial interface modes evaluation. Jumper JS defines the mode:

- Open – I2C mode; I2C 7bit address 0x28 (HEX) (default configuration)
- Closed – UART mode (please refer to section 1.5 for details)

1.4. I2C addresses

7bit I2C addresses (HEX) of the sensors are:

- PAS CO2 (when in I2C mode): 0x28
- DPS310: 0x77 (default and if SB6 open i.e. U5/SDO high) or 0x76 (when SB8 closed i.e. U5/SDO low)

1.5. Evaluation shield hardware configuration options

While Infineon DPS310 barometric pressure sensor is only accessible through I2C bus either using onboard USB2I2C bridge or external I2C, Infineon PAS CO2 sensor uses two serial interfaces to access it: 1. I2C over onboard USB2I2C bridge or external I2C or 2. UART using onboard USB2UART interface or external UART pins. Following please find possible configurations for jumper setup.



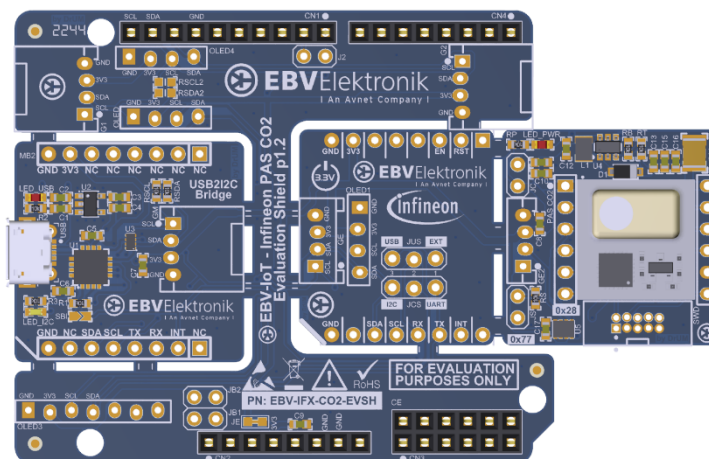
Note: Following notation is being used for hardware configurations:

- Closed – short circuited
- Open – no electrical connection

1.5.1 Out-of-box setup

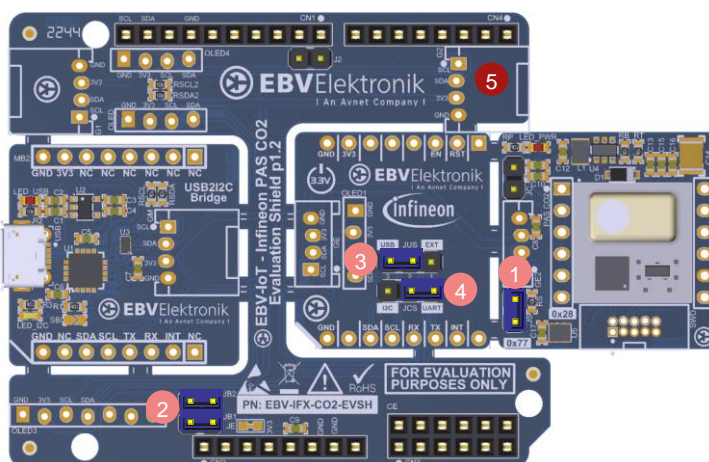
Shipped configuration is preset to support I2C over USB2I2C bridge or external I2C communication.

- Configured to be used in I2C mode
- I2C master can be either
 - integrated USB2I2C bridge or
 - external I2C master using external MCU/MPU platform
- Comes with no through-hole jumpers populated



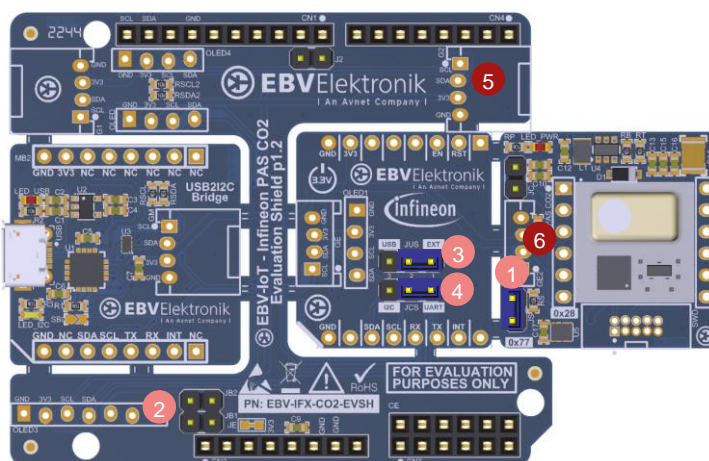
1.5.2 USB2UART interface configuration

1. JS - closed
2. JB1, JB2 – closed (alternatively SB1 and SB2 solder bridges located on bottom side can be closed using excessive solder)
3. JUS – 2-3 closed (USB)
4. JCS – 1-2 closed (UART)
5. Make sure SB3 and SB4 solder bridges located on bottom side are open (please check Figure 7)



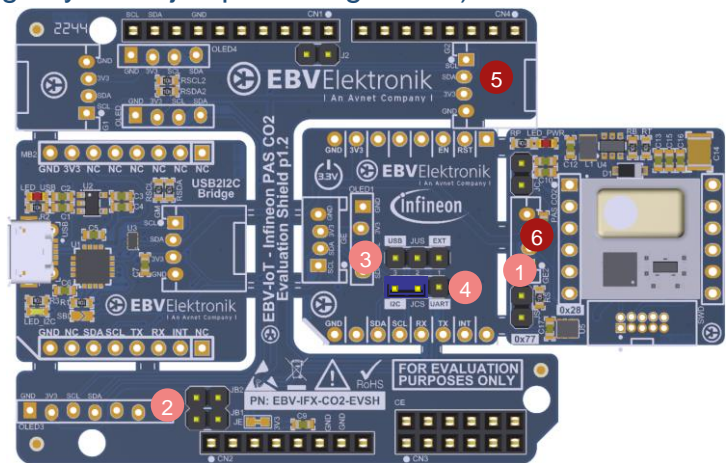
1.5.3 External UART interface configuration

1. JS - closed
2. JB1, JB2 – open (make sure SB1 and SB2 solder bridges located on bottom side are open as well)
3. JUS – 1-2 closed (EXT)
4. JCS – 1-2 closed (UART)
5. Close SB3 and SB4 solder bridges located on bottom side using excessive solder (please check Figure 7)
6. If external I2C interface is being used for other I2C devices cut JSCL and JSDA lines (bottom side)



1.5.4 I2C interface configuration (after using any other jumper configuration)

1. JS - open
2. JB1, JB2 – open (make sure SB1 and SB2 solder bridges located on bottom side are open as well)
3. JUS – no jumper
4. JCS – 2-3 closed (I2C)
5. Make sure SB3 and SB4 solder bridges located on bottom side are open
6. Make sure JSCL and JSDA lines located on bottom side are closed



1.5.5 INT hardware configuration

INT pin from PAS CO2 can be used to read conversion start trigger signal. Eventually can be used also to control DC/DC enable (only version 1.1. or above).

PAS CO2 INT pin is routed to Arduino header CN1 pin 1. Alternatively, the INT signal can be routed to CN1 pin 2 using J2 jumper (not populated in default configuration). If CN1 pin 1 is already used for other purposes, you can cut line between J2 and CN1 pin 1.

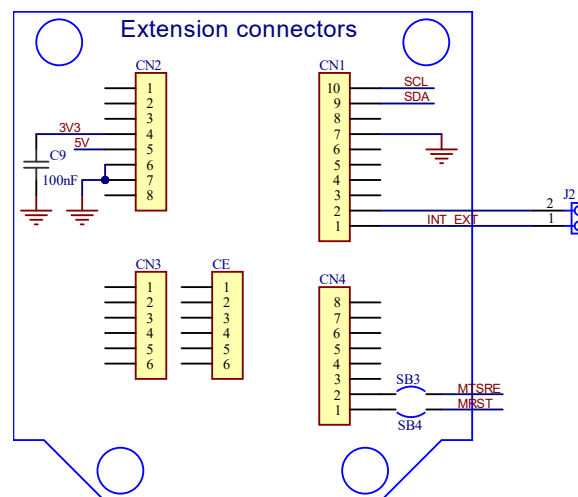


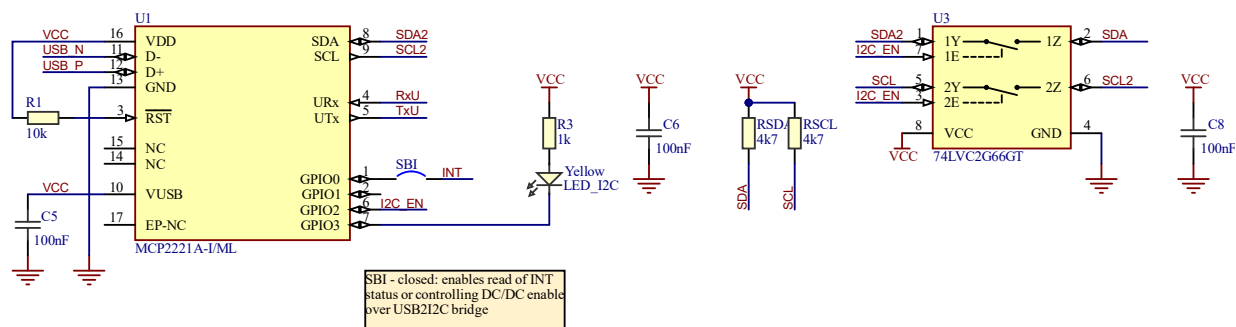
Figure 7: INT pin hardware and external UART configurations



Note: Version 1.0 did not use solder bridge SBI and U1/GPIO0 was short circuited directly to INT. On shields version 1.0 DC/DC enable is wired to “ON” using SB7 and disconnected from INT by cutting JEN.

2. USB interface

The shield uses USB2I2C/UART bridge enabling interfacing both I2C and UART buses.



Note: Onboard USB2I2C bridge accesses I2C bus as a master but only when enabled by PC application using U3 switch. If connected to external system, please make sure external I2C master support multi master access when using concurrently with onboard USB2I2C bridge and PC application.



Note: Version 1.0 did not use solder bridge SBI and U1/GPIO0 was short circuited directly to INT. On shields version 1.0 DC/DC enable is wired to “ON” using SB7 and disconnected from INT by cutting JEN.

2.1. Driver installation

MS Windows® 10 or above recognizes the USB2I2C/UART bridge products and automatically installs the USB driver. There is no need to install any drivers; just make sure Windows is up-to-date. For previous versions of MS Windows and for Linux driver please refers to MCP2221A product pages (<https://www.microchip.com/en-us/product/MCP2221A>).

I2C bridge part of the product is recognized “Human Interface Device – HID” and is listed as “USB Input Device” as shown on

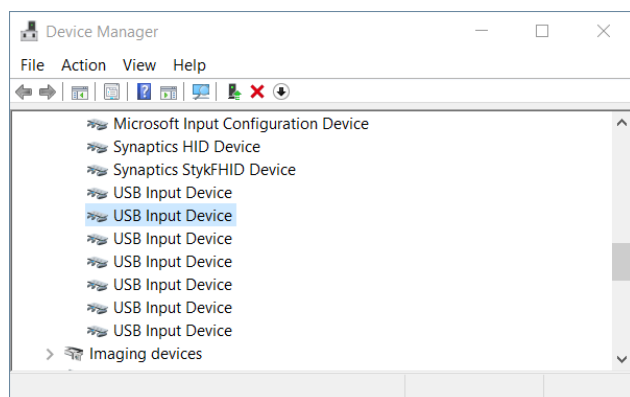


Figure 8: Windows Device Manager - USB HID part listing

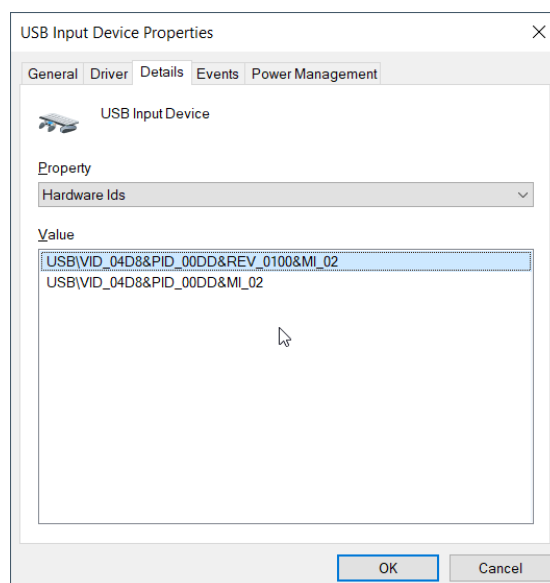


Figure 9: USB HID Device Properties - HW IDs

2.2. Virtual serial port

After driver installation there should be two virtual ports shown on your computer. Please note your COM number is very likely to be different to the one displayed below.

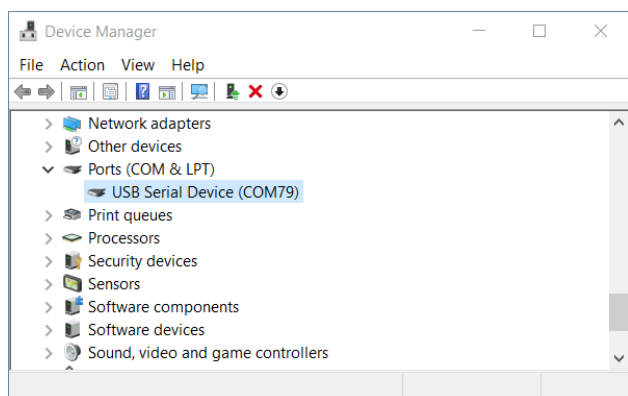


Figure 10: Windows Device Manager - virtual serial port

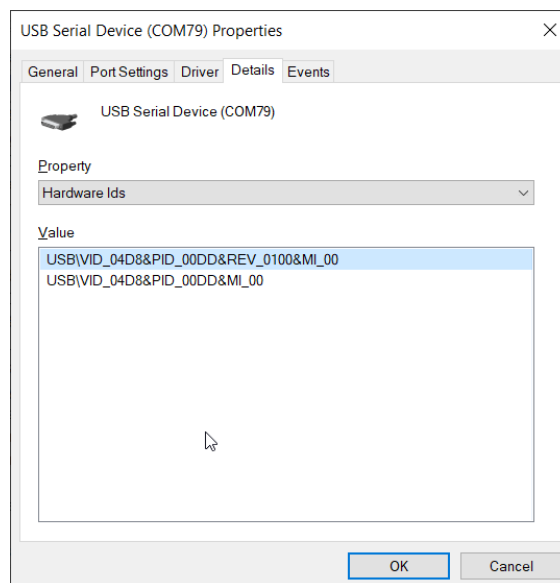


Figure 11: Virtual Port Device Properties - HW IDs

3. Arduino interface

External Arduino layout MCU board can be used to read sensors over I2C lines.

Table 1: The shield Arduino interface layout

Pin function	DIR		DIR	Pin function
			IN	I2C SCL
			IN/OUT	I2C SDA
3,3V	OUT/IN			
GND	GND		IN/OUT	Interrupt (alt)
GND	GND		IN/OUT	Interrupt
			IN	UART RX
			OUT	UART TX



Warning: All I/O pins are 3.3V compliant.

4. Quick start

The shield is fully compatible with Infineon – XENSIV™ PAS CO2 Sensor2Go GUI software which is recommended to be used to fully evaluate the PAS CO2 sensor. Please download “User Manual” from this page ([link](#)) and follow *Section 3. Software* from the downloaded manual. Please configure the shield as shown in *1.5.2 USB2UART interface configuration* of this guide.

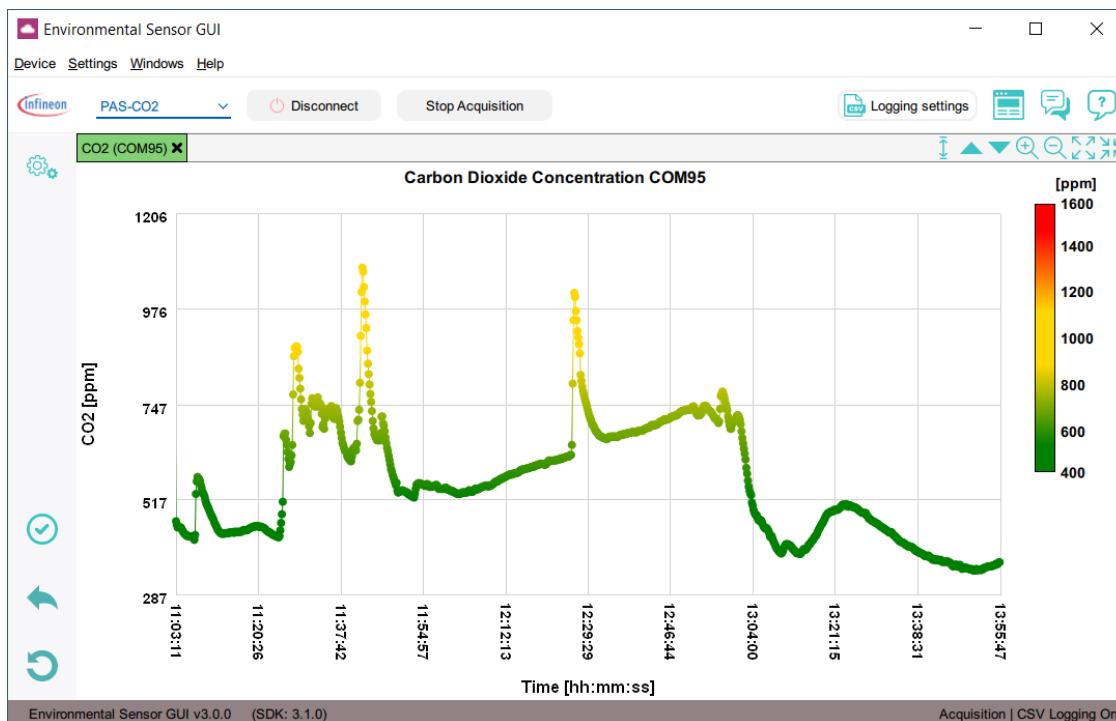


Figure 12: Infineon – XENSIV™ PAS CO2 Sensor2Go GUI



Note: The shield is fully compatible with Infineon – XENSIV™ PAS CO2 Sensor2Go GUI software which is recommended to be used to fully evaluate the PAS CO2 sensor.

4.1. Installing “EBV-IoT – Environmental sensing” PC application

The EBV-IoT – Environmental sensing PC application can be requested at your local EBV elektronik representative. The software is coming as a “portable” version with no installation needed upfront. Only **.NET Framework 4.6.1 or higher** has to be installed prior running the application. The PC application executable is titled “EBV-IoT - Environmental Sensing.exe”.

4.2. Running the PC application

When starting the PC application main window pops up as shown in Figure 13. There are three main tabs: basic tab (2), registers tab (3), and chart tab (4). There are log (5) and tab Scan I2C (6), which shows messaging queue or can be used to scan I2C bus for any I2C device returning ACK (acknowledge signal) at given I2C address, respectively.

The application automatically detects the shield connected to USB port. The connection status is displayed in the title bar (1) of the GUI window. If the shield and sensors are detected, the application starts the initialization process.

“About” button (7) is showing “About” window with some application info and basic support request contacts (Figure 14).

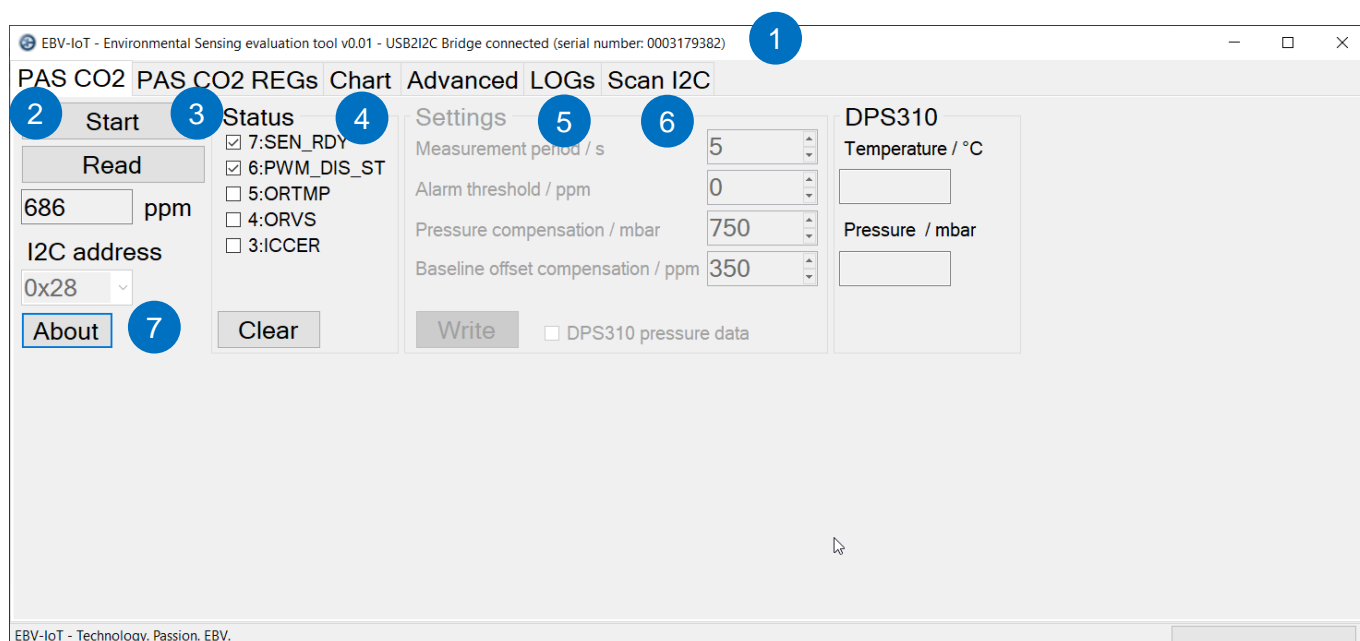


Figure 13: PC application Graphical User Interface



Figure 14: About window

4.3. “PAS CO2” tab

The “PAS CO2” tab enables basic functionality. PAS CO2 sensor can be manually initialized using button “Start” (1). CO2 value and “Status” (5) are read by clicking “Read” (2). CO2 is value displayed (3) as well as “Status” flags (5). “I2C Address” (4) is displayed and is fixed to 0x28 (hex). but cannot be changed. Advanced “Settings” (7) are to be implemented in future releases. DPS310 pressure values and compensation are also planned in future.

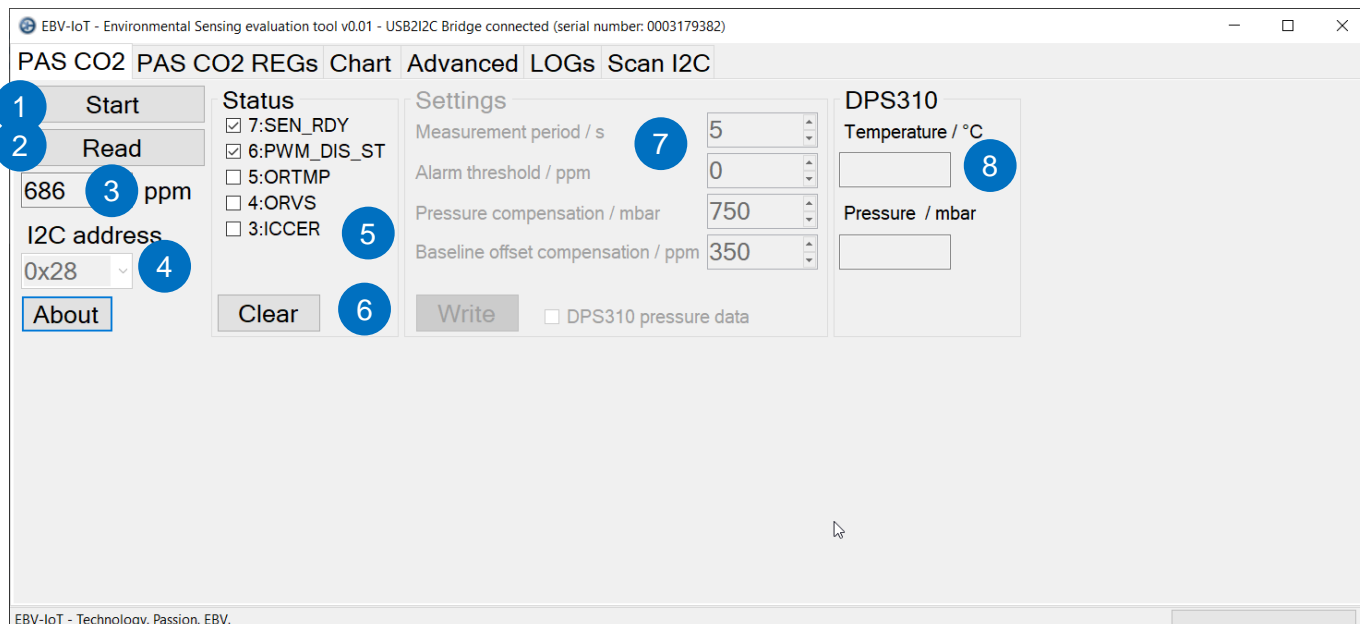


Figure 15: PAS CO2 tab – PAS CO2 device control and status display

4.4. “PAS CO2 REGs” tab

In this tab PAS CO2 register names and descriptions including readout values are displayed. Click “Read” to retrieve PAS CO2 sensor registers value.

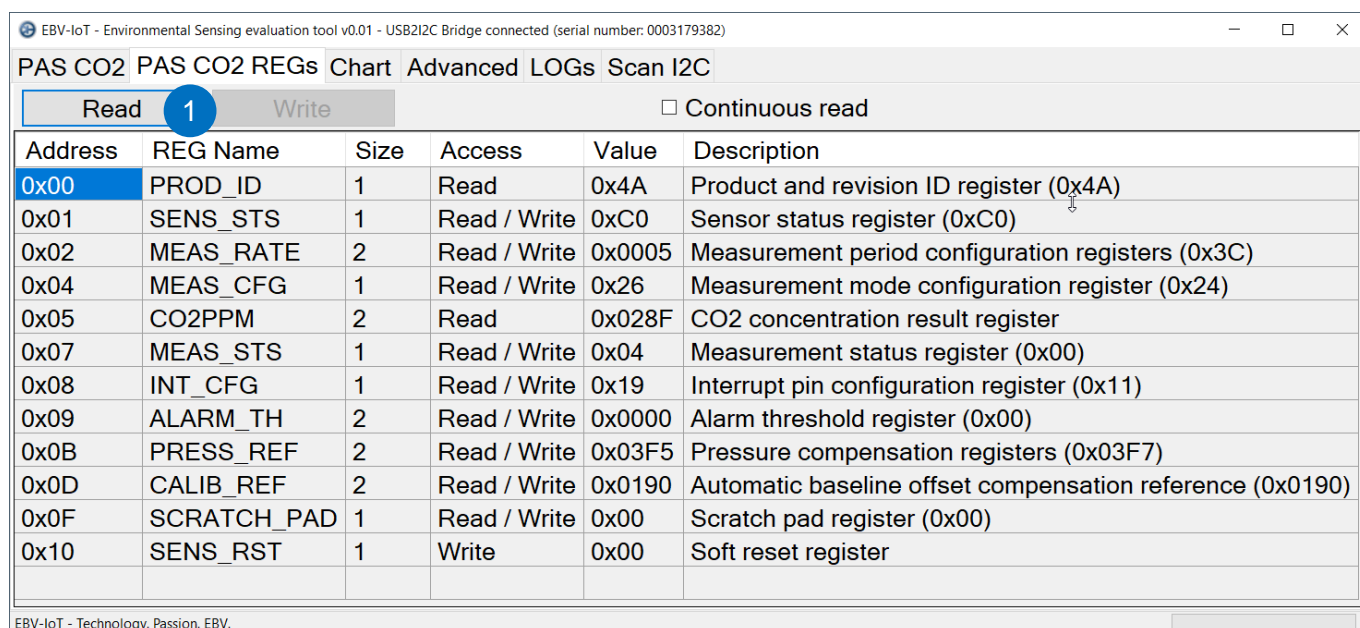


Figure 16: PAS CO2 register list with readouts

4.5. “Chart” tab

The “Chart” tab (Figure 17) displays a chart of continuous sensor values readouts. The acquisition is started/stopped by clicking “Start/Stop” button (1) and sampling interval is set by using dropdown menu (3). The values are displayed in a chart title (4) and in a chart (5) as color coded lines. The chart can be cleared by clicking “Clear” button (2). Sensor values can be saved (6) to “CSV” file for further processing and displaying with e.g. Excel.

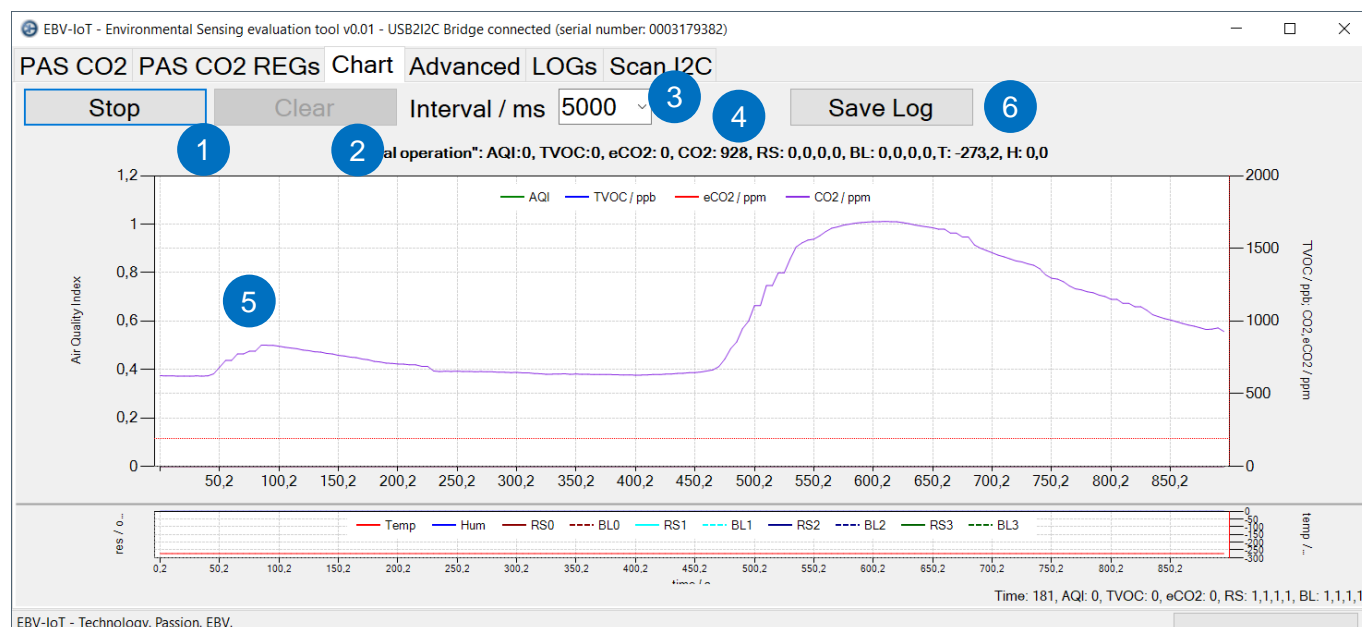


Figure 17: Chart tab

4.6. “LOGs” tab

The tab displays messages related to board activity or manual operations.

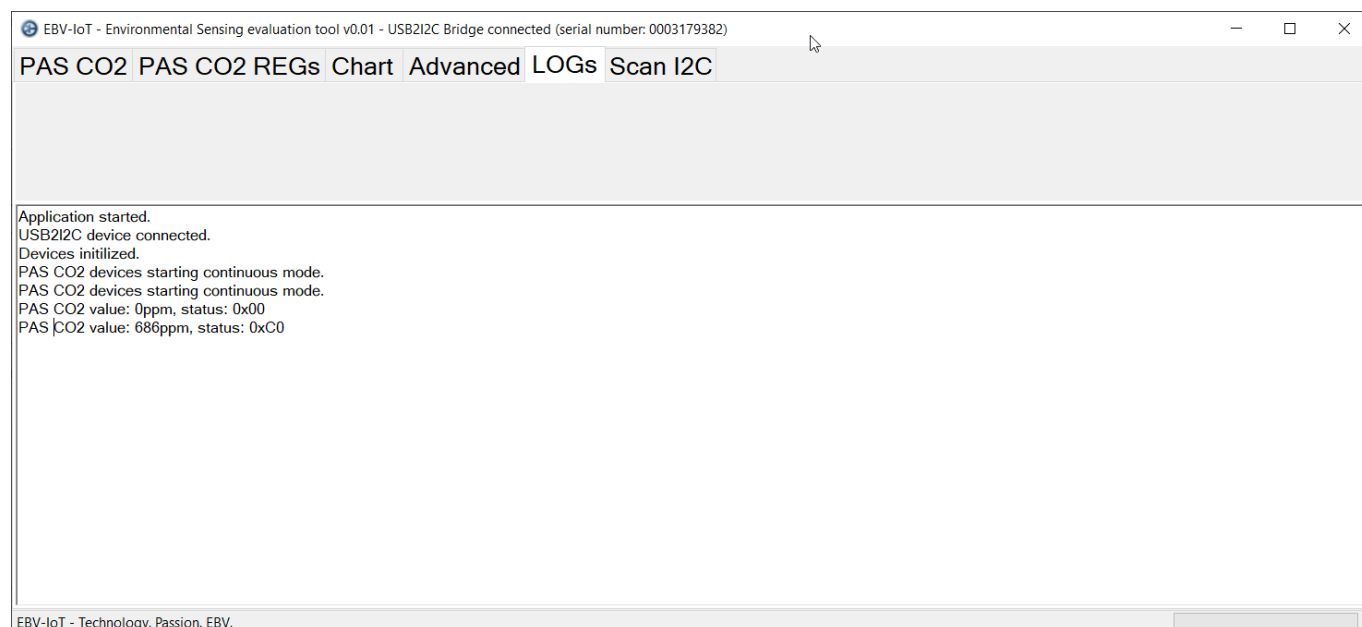


Figure 18: Messaging tab

4.7. GUI “Scan I2C” tab

Nothing special about the “Scan I2C tab (Figure 19). It can be used to scan for all I2C devices returning ACK (acknowledge signal) at the specific I2C address. There is a button to start scanning “Scan I2C” (1) and status window (2) where all the ACK-ed devices are listed.

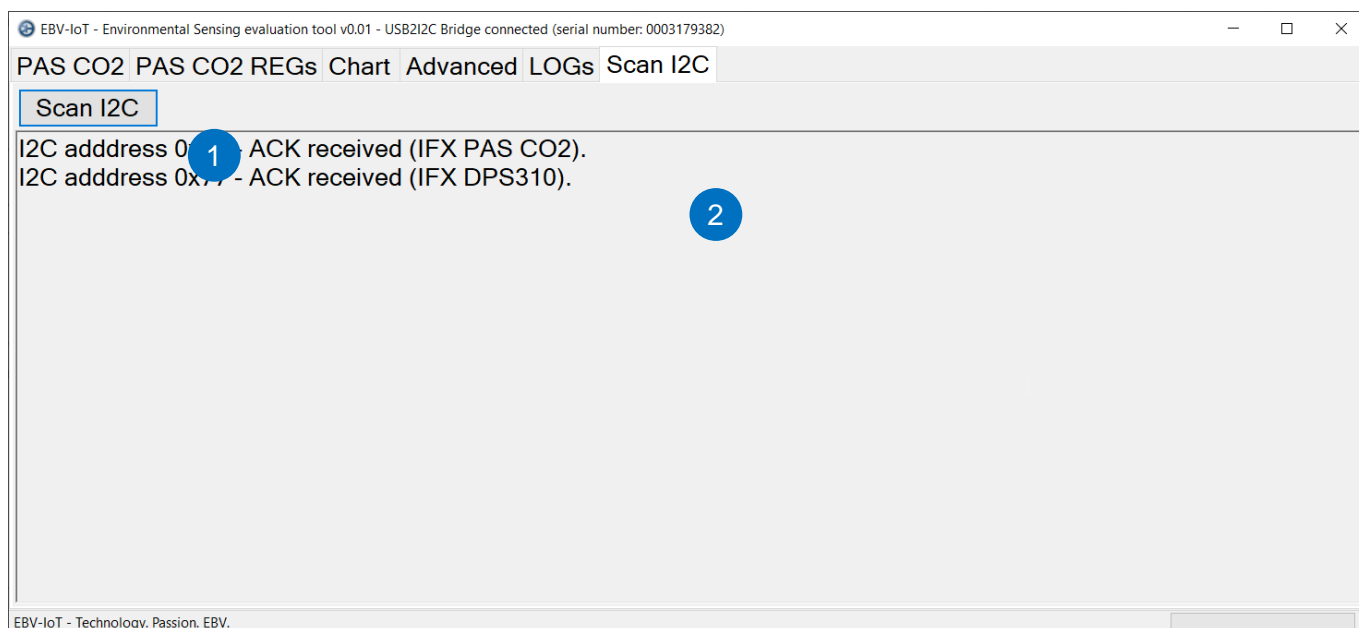
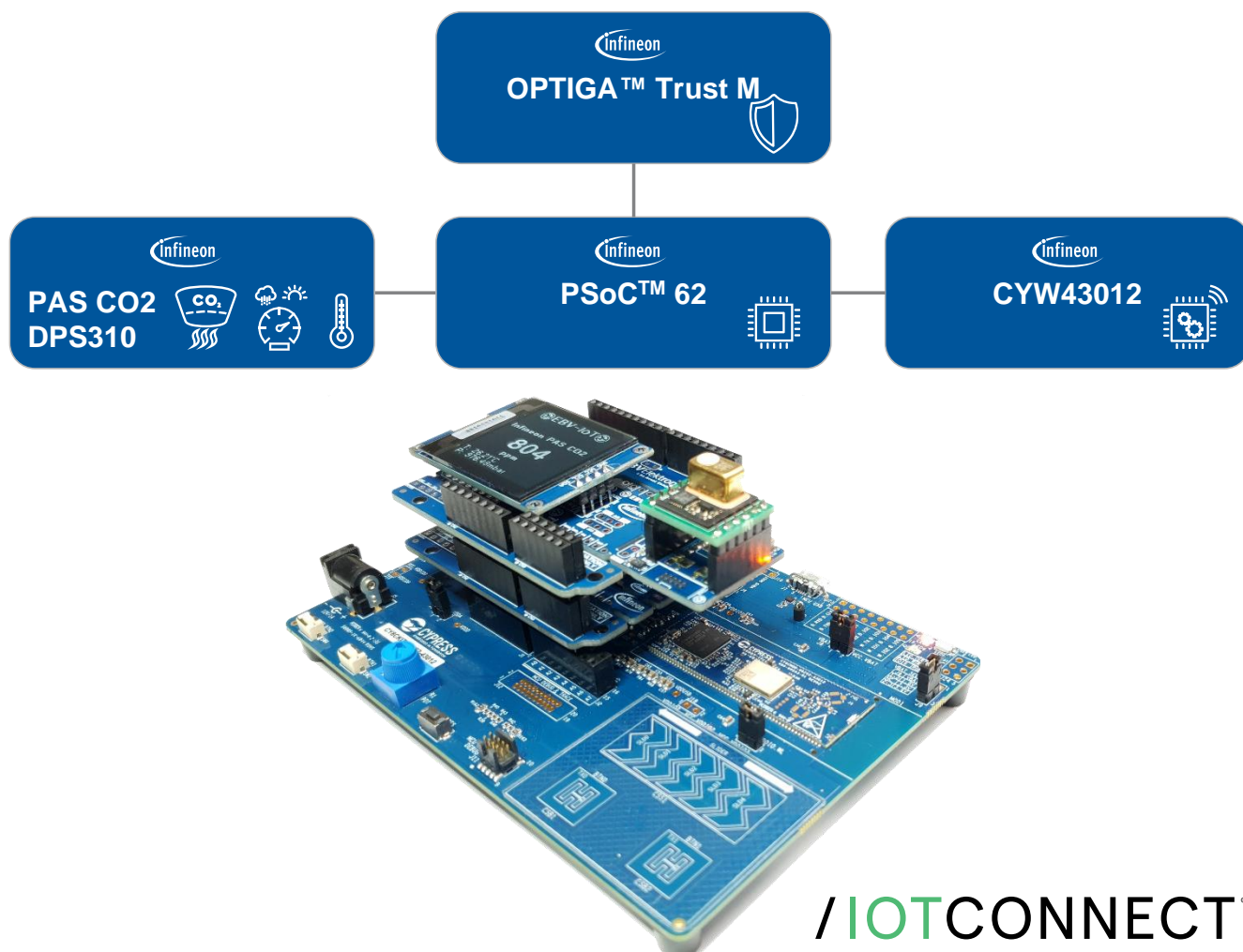


Figure 19: Scan I2C tab

Please contact your EBV elektronik representative for more information or at ssc@ebv.com.

5. Embedded platform & cloud connectivity

The shield is included in a complete solution demo utilizing Infineon PSoC™, Xensiv™ PAS CO2 and DPS310 pressure sensors, AIROC™ CYW43012 based muRata Type 1LV module and Avent IoTConnect cloud platform.



Please contact your EBV elektronik representative for more information or at ssc@ebv.com.

Revision history

Revision	Date	Notes
0.1	October 1 st , 2021	First draft
0.2	May 16 th , 2022	Second draft
1.0	May 5 th , 2023	First release, update for HW rel p1.2

EBV European Headquarters

EBV Elektronik GmbH & Co. KG | D-85586 Poing | Im Technologiepark 2-8 | Phone: +49 (0)8121 774-0 | www.ebv.com

EBV Regional Offices | Status January 2021

AUSTRIA

1120 Wien
Grünbergstraße 15/1, 4. Stock
Phone: +43 1 89152 0
Fax: +43 1 89152 30

BELGIUM

1831 Diegem
De Kleetlaan 3
Phone: +32 2 716001 0
Fax: +32 2 72081 52

BULGARIA

1505 Sofia
48 Sitnyakovo Blvd., Serdika
offices, 10th floor, Unit 1006
Phone: +359 2 9264 337
Fax: +359 2 9264 133

CZECH REPUBLIC

18600 Prague
Amazon Court, Karolinska 661/4
Phone: +420 2 34091 011
Fax: +420 2 34091 010

DENMARK

Elkjærvej 19, 1 sal
DK-8230 Åbyhøj
Phone: +45 8 6250 466
Fax: +45 8 6250 660

ESTONIA

80042 Pärnu
Suur-Jõe 63
Phone: +372 5 8864 446

FINLAND

02240 Espoo
Klovinpellontie 1-3, 6th floor
Phone: +358 9 2705279 0
Fax: +358 9 27095498

FRANCE

91300 Massy Cedex (Paris)
Le Copernic bât B
12 rue Jean Bart
Phone: +33 1 644729 29

35700 Rennes
16, Rue de Jouanet
Phone: +33 2 998300 51
Fax: +33 2 998300 60

67400 Illkirch Graffenstaden
35 Rue Gruninger
Phone: +33 3 904005 92
Fax: +33 3 886511 25

31500 Toulouse
8 chemin de la terrasse
Parc de la plaine
Phone: +33 5 610084 61
Fax: +33 5 610084 74

69693 Venissieux (Lyon)
Parc Club du Moulin à Vent
33, Av. du Dr. Georges Lévy
Phone: +33 4 727802 78
Fax: +33 4 780080 81

GERMANY

85609 Aschheim-Dornach
Einsteinring 1
Phone: +49 89 388 882 0
Fax: +49 89 388 882 020

10553 Berlin
Kaiserin-Augusta-Allee 14
Phone: +49 30 747005 0
Fax: +49 30 747005 55

31275 Lehrte
Gaußstr. 10
Phone: +49 5139 8087 0
Fax: +49 5139 8087 70

59439 Holzwickede
Wilhelmstraße 1
Phone: +49 2301 94390 0
Fax: +49 2301 94390 30

41564 Kaarst
An der Gumpgesbrücke 7
Phone: +49 2131 9677 0
Fax: +49 2131 9677 30

71229 Leonberg
Neue Ramtelstraße 4
Phone: +49 7152 3009 0
Fax: +49 7152 759 58

90471 Nürnberg
Lina-Ammon-Straße 19B
Phone: +49 911 817669 0
Fax: +49 911 817669 20

04435 Schkeuditz
Frankfurter Straße 2
Phone: +49 34204 4511 0
Fax: +49 34204 4511 99

78048 VS-Villingen
Marie-Curie-Straße 14
Phone: +49 7721 99857 0
Fax: +49 7721 99857 70

65205 Wiesbaden
Borsigstraße 36
Phone: +49 6122 8088 0
Fax: +49 6122 8088 99

HUNGARY

1117 Budapest
Budafoki út 91-93, West Irodaház
Phone: +36 1 43672 29
Fax: +36 1 43672 20

ISRAEL

4581500 Bnei Dror
Tirosh 1
Phone: +972 9 77802 60
Fax: +972 3 76011 15

ITALY

20095 Cusano Milanino (MI)
Via Alessandro Manzoni, 44
Phone: +39 02 660962 90
Fax: +39 02 660170 20

50019 Sesto Fiorentino (FI)
Via Lucchese, 84/B
Phone: +39 05 543693 07
Fax: +39 05 542652 40

41126 Modena (MO)
Via Scaglia Est, 31
Phone: +39 059 292 4211
Fax: +39 059 292 9486

00155 Roma (RM)
Via de Settebagni, 390
Phone: +39 06 4063 665/789
Fax: +39 06 4063 777

35030 Sarreola di Rubano (PD)
Piazza Adelaide Lonigo, 8/11
Phone: +39 049 89747 01
Fax: +39 049 89747 26

10144 Torino (TO)
Via Treviso, 16
Phone: +39 011 26256 90
Fax: +39 011 26256 91

IRELAND

Fitzwilliam Hall
Fitzwilliam Place
Dublin 2
D02 T292
Phone: +353 1 4097 802
Fax: +353 1 4568 544

NETHERLANDS

Zonnebaan 9
3542 EA Utrecht
Phone: +31 346 5830 10
Fax: +31 346 5830 25

NORWAY

1181 Oslo
Brannfjellveien 11
Phone: +47 22 67 17 80
Fax: +47 22 67 17 89

POLAND

80-838 Gdansk
Targ Rybny 11/12
Phone: +48 58 30781 00

P02-676 Warszawa
Postępu 14
Phone: +48 22 209 88 05

50-062 Wrocław
Pl. Solny 16
Phone: +48 71 34229 44
Fax: +48 71 34229 10

PORTUGAL

4400-676 Vila Nova de Gaia Unipessoal
LDA / Edifício Tower Plaza
Rotunda Eng. Edgar Cardoso, 23 - 14th
Phone: +351 22 092026 0
Fax: +351 22 092026 1

ROMANIA

020334 Bucharest
4C Gara Herastrau Street
Building B, 2nd Floor - 2nd District
Phone: +40 21 52816 12
Fax: +40 21 52816 01

RUSSIA

620028 Ekaterinburg
Tatischeva Street 49A
Phone: +7 343 31140 4
Fax: +7 343 31140 46

127486 Moscow
Korovinskoye Shosse 10,
Build 2, Off. 28
Phone: +7 495 730317 0
Fax: +7 495 730317 1

197374 St. Petersburg
Atlantic City, Savushkina str 126,
lit B, premises 59-H, office 17-2
Phone: +7 812 635706 3
Fax: +7 812 635706 4

SERBIA

11070 Novi Beograd
Milentija Popovica 5B
Phone: +381 11 40499 01
Fax: +381 11 40499 00

SLOVAKIA

82109 Bratislava
Turčianska 2 Green Point Offices
Phone: +421 2 321114 1
Fax: +421 2 321114 0

SLOVENIA

1000 Ljubljana
Dunajska cesta 167
Phone: +386 1 5609 778
Fax: +386 1 5609 877

SOUTH AFRICA

7700 Rondebosch, Cape Town
Belmont Office Park, Belmont Road
1st Floor, Unit 0030
Phone: +27 21 402194 0
Fax: +27 21 4196256

3629 Westville
Forest Square, 11 Derby Place
Suite 4, Bauhinia Building
Phone: +27 31 27926 00
Fax: +27 31 27926 24

2128 Rivonia, Sandton
Johannesburg
33 Riley Road
Pinewood Office Park
Building 13, Ground Floor
Phone: +27 11 23619 00
Fax: +27 11 23619 13

SPAIN

08014 Barcelona
c/Tarragona 149 - 157 Planta 19^a
Phone: +34 93 47332 00
Fax: +34 93 47363 89

39005 Santander (Cantabria)
Racing n° 5 bajo
Phone: +34 94 22367 55
Phone: +34 94 23745 81

28760 Tres Cantos (Madrid)
c/Ronda de Poniente 14 - 2^a planta
Phone: +34 91 80432 56
Fax: +34 91 80441 03

SWEDEN

16440 Kista
Isafjordsgatan 32B, Floor 6
Phone: +46 859 47023 0
Fax: +46 859 47023 1

SWITZERLAND

8953 Dietikon
Bernstrasse 394
Phone: +41 44 74561 61
Fax: +41 44 74561 00

TURKEY

06520 Ankara
Armada Is Merkezi
Eskisehir Yolu No: 6, Kat: 14
Ofis No: 1406, Sogutozu
Phone: +90 312 2956 361
Fax: +90 216 528831 1

34774 Ümraniye / Istanbul
Tatlisu Mahallesi Pakdil Sokak 7
Phone: +90 216 528831 0
Fax: +90 216 528831 1

35580 Izmir
Folkart Towers
Manas Blv. No 39 B Blok
Kat: 31 Ofis: 3121
Phone: +90 232 390 9196
Fax: +90 216 528831 1

UKRAINE

03040 Kiev
Vasilivskaya str. 14
off. 422-423
Phone: +380 44 496222 6
Fax: +380 44 496222 7

UNITED KINGDOM

Maidenhead (South)
Berkshire, SL6 7RJ
2, The Switchback
Gardner Road
Phone: +44 16 28778556
Fax: +44 16 28783811

Manchester (North)
M22 5WB
Manchester International Office Centre
Suite 3E (MIOC) Styal Road
Phone: +44 16 149934 34
Fax: +44 16 149934 74

