CMOSEnvi EvalBoard

Multi-pixel gas sensing element

User Guide v1.0

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1. Introduction

CMOSEnvi™ is a multi-pixel gas sensing element for ammonia, Formaldehyde, Acetaldehyde, CO, NO2, … detection. The document provides an overview of the CMOSEnvi™ evaluation board (Eval Board) and covers the following sections: hardware description, how to start-up the Eval Board and how to setup serial USB.

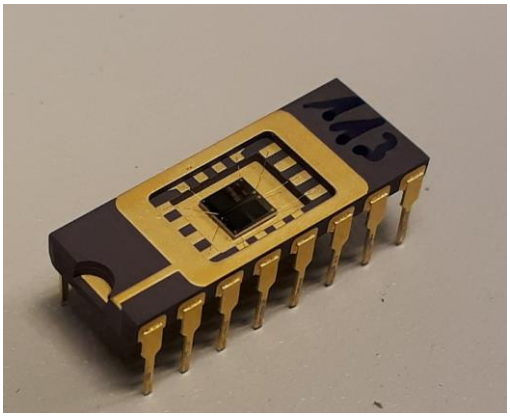


Figure 1 CMOSEnvi™ multi-pixel gas sensing element

2. Hardware

CMOSEnvi™ Eval Board, represented by Figure 2, can accommodate one CMOSEnvi™ and has the capability to measure gas concentration of one to eight CMOSEnvi™ pixels (to know the targeted gases on each pixel, please contact the technical support team).

All the CMOSEnvi™ conditioning interfaces are embedded and the Eval Board has a temperature and relative humidity sensor (SHT-31).

It is powered through an USB-C cable and data retrieved with the same cable when configured for serial communication (note that only one of the two USB-C differential pair is connected, switch the cable if the board is not detected as port COM. Section 4 provides information about serial USB configuration.

There are two ways to power-up the board and JP2 selects one of them. Short-circuit red JP2 for USB power supply or blue JP2 for battery operation (care must be taken to not connect both power-supply at the same time). For battery operation connect it to the bottom connector (battery, e.g. 103450AR2-1S-3M) and charge it with USB-C cable.

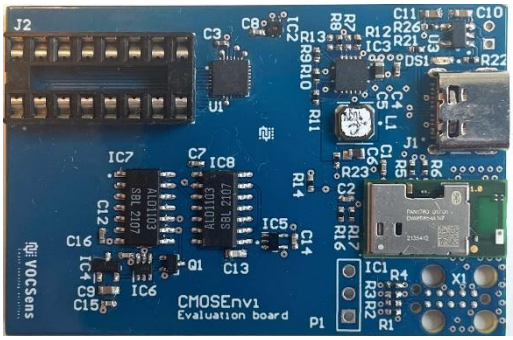


Figure 2.CMOSEnvi™ evaluation board.

3. Start-up

You place the CMOSEnvi™ Eval board in its baseline environment and startup the board by putting an USB-C cable inside the dedicated connector.

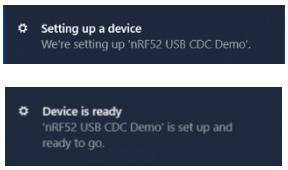
Now the device sends gas concentration, temperature and relative humidity through serial communication depending on the configuration. With serial configuration the board sends data to the terminal after 30 seconds of calibration.

A good practice after power up is to take measurements during a short period (above 30" or a couple of minutes after a long period of storage) in the baseline environment before measuring the target gas concentrations.

4. Serial USB

When configured with serial communication software, the CMOSEnvi™ Eval Board sends data by serial communication (port COM) through the USB-C connector.

Connect the Eval Board with the USB-C cable to the computer. If this is the first time, wait that Windows installs the driver. With Windows 10 , the two following boxes should appear at the bottom right of the screen.



To show the data the user need to configure a terminal like PuTTY. Apply the settings shown in Fig. 1, Fig. 2 and Fig. 3 to PuTTY. Note that if other serial terminal is used, it has to be configured in the same way.

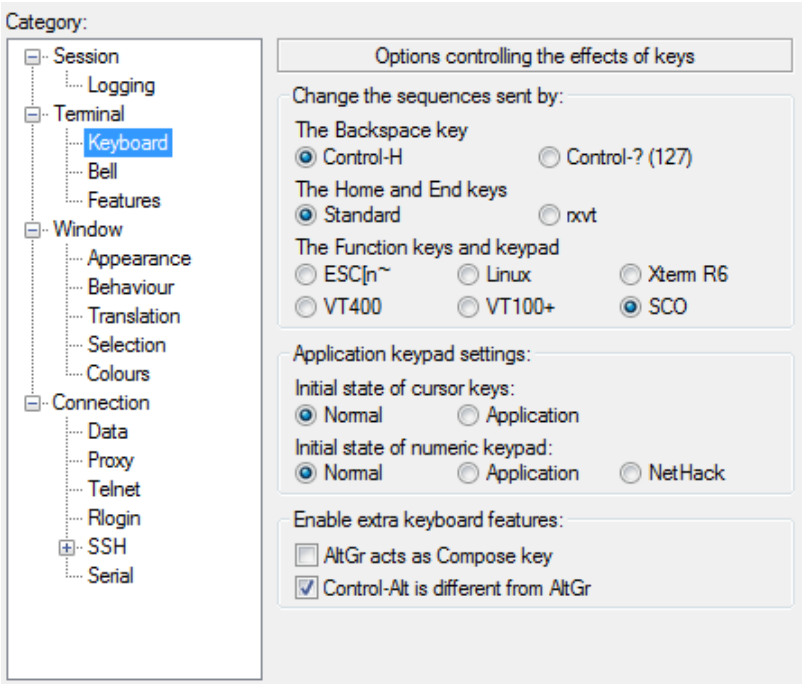


Figure 3. PuTTY keyboard settings.

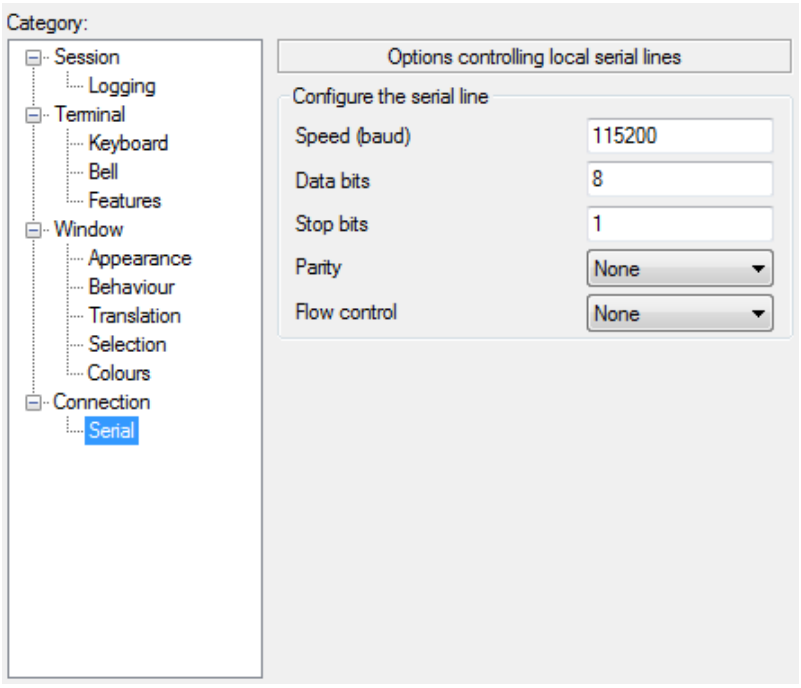


Figure 4. PuTTY Serial settings.

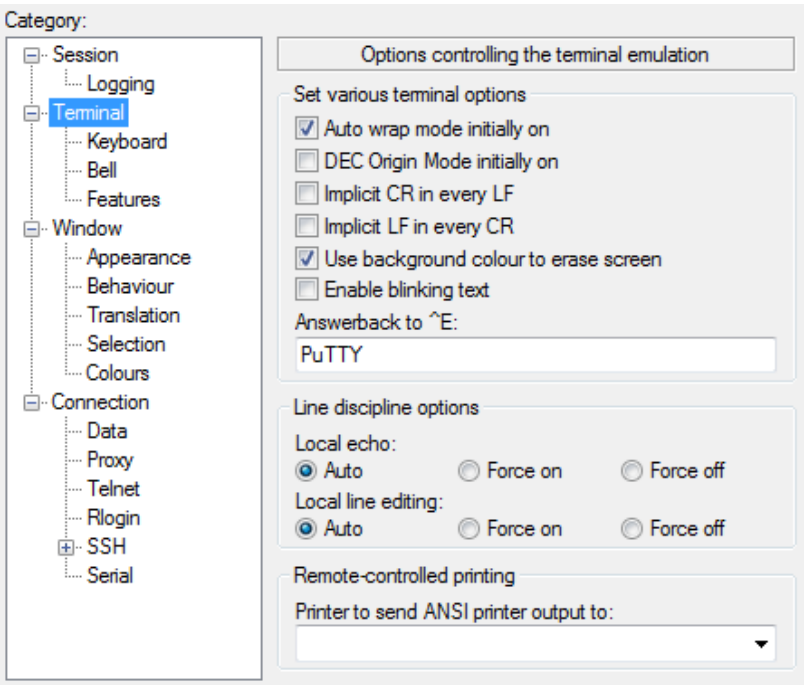


Figure 5. PuTTY Terminal settings.

The formatted output is a proprietary version of cayenne LPP:

Cayenne LPP stands for Cayenne Low Power Payload and is used as the format to transmit data over Lora Wan. We will also use it for the UART interface of the Demo Boards.

It consists of a sequence of bytes described in this table:

1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes	...

Data1 Ch.	Data1 Type	Data1	Data2 Ch.	Data2 Type	Data 2	...

- The first byte defines the channel of the sensor
- The second byte defines the type of sensor (temperature, humidity, ...) and the format of the data (decimal position and the number of bytes).
- The following sequence of bytes contains the data.

Channel-Id:

channel	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08
Sensor	Gas sensing element 01	Gas sensing element 02	Gas sensing element 03	Gas sensing element 04	Gas sensing element 05	Gas sensing element 06	Gas sensing element 07	Gas sensing element 08

Temperature & Relative humidity sensors:

Channel	Sensor
0x80 (128)	Temperature
0x81 (129)	Relative humidity

Type

Type	IPSO	LPP	Hex	Data Size	Data Resolution per bit
Digital Input	3200	0	0	1	1
Digital Output	3201	1	1	1	1
Analog Input	3202	2	2	2	0.01
Analog Output	3203	3	3	2	0.01
Illuminance Sensor	3301	101	65	2	1
Presence Sensor	3302	102	66	1	1
Temperature Sensor	3303	103	67	2	0.1°C Signed MSB
Humidity Sensor	3304	104	68	1	0.5 % Unsigned
Accelerometer	3313	113	71	6	0.001 G Signed MSB per axis

VosSens decided to use some of the unused types to send values for the sensors. The custom *style* for each information we want to send on the same channel-id (sensing element) is described below:

Type	LPP	Hex	Data Size	Data Resolution per bit	range

f [Hz]	255	0xFF	3	1	[0: 1: 16_777_215]
R_S [Ω]	254	0xFE	3	1	[0: 1: 16_777_215]
$R0$ [Ω]	253	0xFD	3	1	[0: 1: 16_777_215]
C_{Raw} [ppm]	252	0x7D	3	0.01	[0: 0.01: 167_772.15]
V_{bias}	251	0xFC	3	0.000001	[0: 0.000001: 16.77215]

Example output on terminal:

80670100816 87E**01FE000194**01FD00017502FE0D8A8902FD0C67C703FE09A42E03FD009D0C04FE00017F04FD00016B05FE03243A05FD00006306FEFFFFFF06FD00155C07FEFFFFFF07FD016EC708FE112447 08FD10F7F8

80670100: channel = 80 = temperature | type = 67 = temp sensor | value = 2 bytes = 0100

81687E: channel = 81 = Relative humidity | type = 68 = humidity sensor | value = 1 byte = 7E

01FE000194: channel = 01 = sensing element (pixel) 1 | type = FE = Rs |value = 3 bytes = 000194

…

08FD10F7F8: Channel = 08 = sensing element (pixel) 8 | type = FD = C [ppm] |value = 3 bytes = 10F7F8

Compensation Application for gas actionable concentration:

The concentration value C on the terminal is the raw value from the sensor without compensation for temperature and humidity. VOCSens will provide a standalone software application for the compensation. The output will be an excel file with the calculated gas concentration.

5. Document revision

User Guide version	Modification/addition
V1.0	Initial