# KIT_CSK_PASCO2_5V

## XENSIV™ PASCO2V15 Connected Sensor Kit

## About this document

### Scope and purpose

This user guide describes the function, circuitry, and performance of the XENSIV™ PASCO2V15 Wing board, part of Infineon's XENSIV™ PASCO2V15 Connected Sensor Kit (KIT_CSK_PASCO2_5V).

### Intended audience

The intended audience for this document is design engineers, technicians, and developers of electronic systems, working with Infineon's XENSIV™ photoacoustic spectroscopy (PAS) CO2 gas sensors or XENSIV™ DPS368 barometric pressure sensor.

### Reference Board/Kit

Product(s) embedded on a PCB with a focus on specific applications and defined use cases that may include software. PCB and auxiliary circuits are optimized for the requirements of the target application.

*Note: Boards do not necessarily meet safety, EMI, quality standards (for example UL, CE) requirements.*

## Important notice

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# Safety precautions

*Note:* *Please note the following warnings regarding the hazards associated with development systems.*

**Table 1 Safety precautions**

| | |
|---|---|
|  | **Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.* |

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# 1 The board at a glance

The XENSIV™ PASCO2V15 Connected Sensor Kit supports customers in testing sensor-driven IoT products and CO2 use cases as well as in prototyping. It offers a real-time sensor evaluation with custom configurations and cloud- and PAS CO2-based solution output visualization. The KIT_CSK_PASCO2_5V (Figure 1) comes with:

- Rapid IoT Connect Developer Kit (CYSBSYSKIT-DEV-01)
- XENSIV™ PASCO2V15 Wing (EVAL_PASCO2_WING_5V)

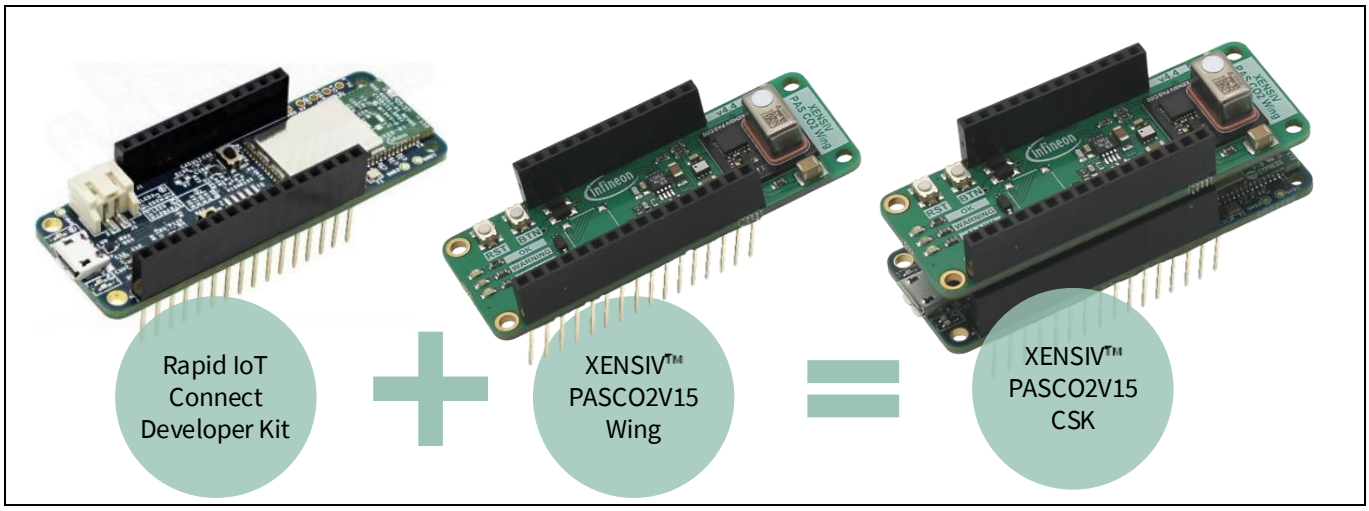


**Figure 1 XENSIV™ PASCO2V15 Connected Sensor Kit**

The Rapid IoT Connect Developer Kit (CYSBSYSKIT-DEV-01) shown in Figure 2 allows the evaluation of the Rapid IoT Connect module (CYSBSYS-RP01) on a standard Feather form-factor. The CYSBSYS-RP01 Rapid IoT Connect module is a turnkey module that enables secure, scalable, and reliable compute and connect.

The Rapid IoT Connect Developer Kit carries a CYSBSYS-RP01 Rapid IoT connect system-on-module (SoM), which includes a PSOC™ 6 MCU, an AIROC™ CYW43012 single-chip radio, onboard crystals, oscillators, chip antenna, and passive components.

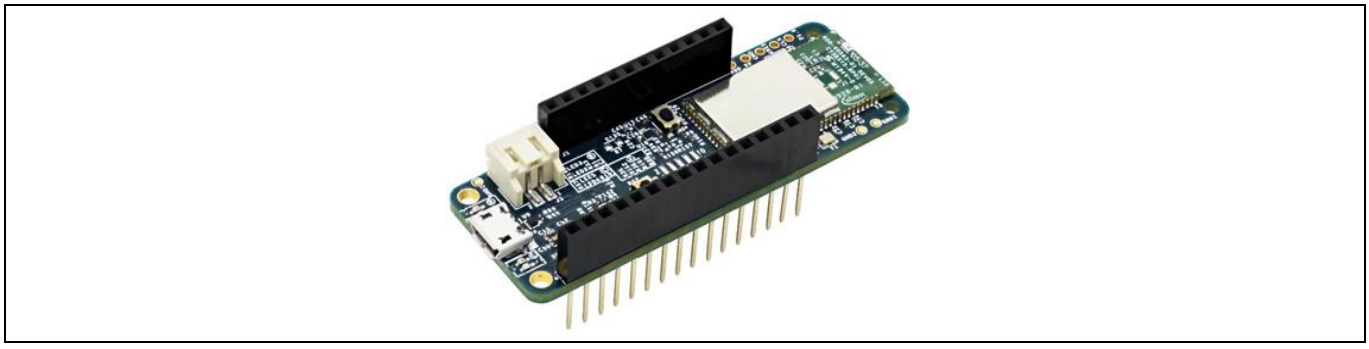

**Figure 2 Rapid IoT Connect Developer Kit**

# 1 The board at a glance

The XENSIV™ PASCO2V15 Wing board shown in Figure 3 is based on the PASCO2V15 CO2 sensor. The sensor is based on the photoacoustic spectroscopy (PAS) principle, where CO2 molecules within the sensor cavity absorb the infrared light, generating small pressure changes that are detected by an acoustic detector. The integrated microcontroller provides a direct readout of CO2 concentration in parts per million (ppm). Precise CO2 readings are guaranteed.

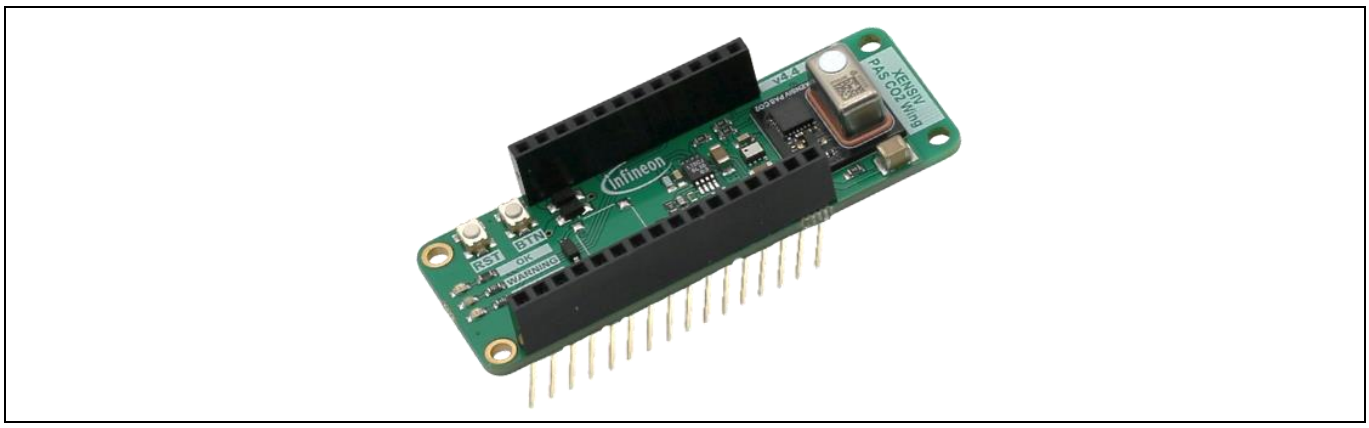


**Figure 3 XENSIV™ PASCO2V15 Wing board**

The board also comprises the XENSIV™ DPS368 digital barometric pressure sensor. This high-precision pressure sensor can detect very small changes in barometric pressure, which makes it an ideal device where accurate pressure event detection is required (for example, opening of doors or windows or fall detection).

Having both the CO2 sensor and pressure sensor on the board gives the possibility to develop and test more complex scenarios where data from both sensors is combined for more reliable event detection.

## 1.1 Scope of supply

The kit can be powered from a 3.7 V LiPo battery or via a USB cable from an external 5 V power supply. The battery is automatically charged when the system is connected to an external power supply.

## 1.2 Block diagram

A block diagram of the wing board is shown in Figure 4. The wing board comprises the XENSIV™ PASCO2V15 CO2 gas sensor and the required power supply components. Power lines are highlighted in red. It is also equipped with push buttons and LEDs.

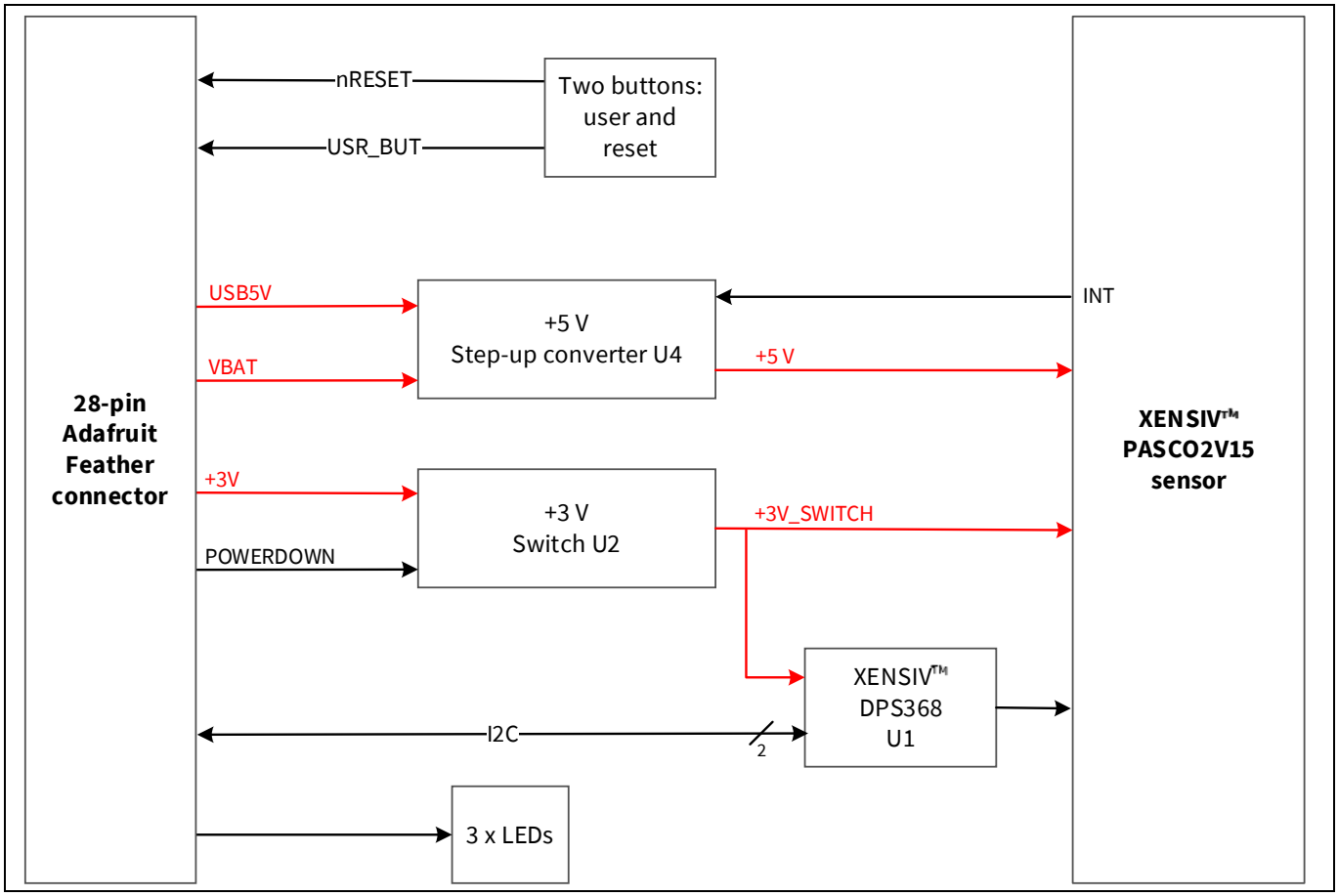


**Figure 4 XENSIV™ PASCO2V15 Wing board block diagram**

A system block diagram showing the shield connected to the CSK rapid IoT baseboard is shown in Figure 4. The interface from the shield to the rapid IoT baseboard includes I²C, digital signals, analog signals and power lines. The baseboard can interact with the outside world using Wi-Fi, Bluetooth®, USB, or a combination of them depending on the firmware/software (FW/SW) installed on the baseboard. The kit can be powered from an external power supply or from a LiPo battery.

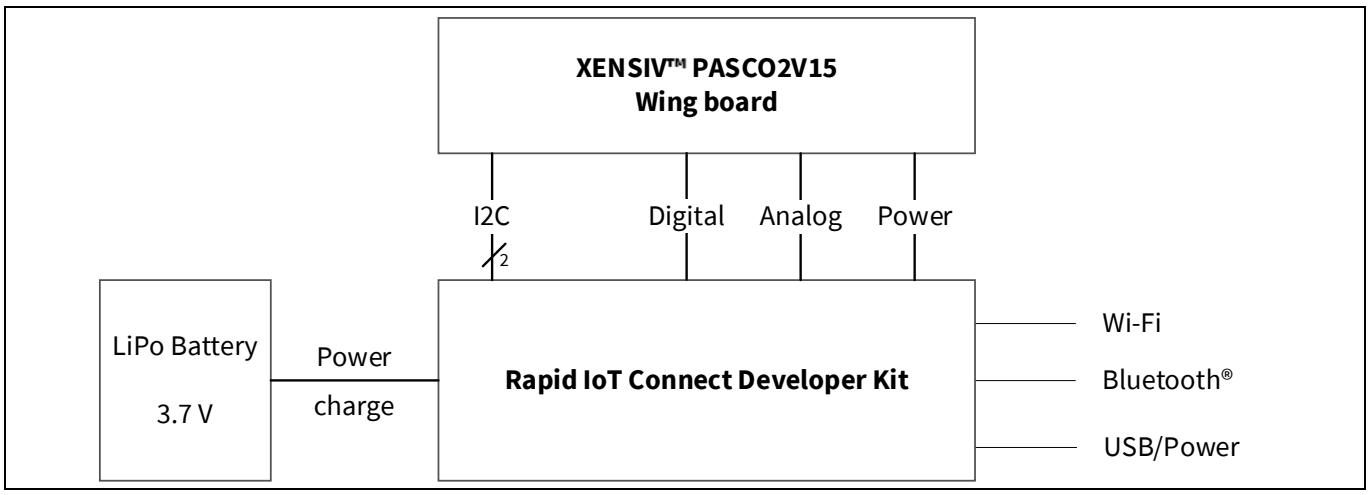


**Figure 5 CSK system block diagram**

## 1.3 Main features

- XENSIV™ PASCO2V15 gas sensor
  - Exceptionally small form factor 14 mm x 13.8 mm x 7.5 mm sensor
  - Accurate and robust performance at ppm level (±50 ppm ±5 percent of reading)
  - Advanced compensation and self-calibration algorithms
  - Configurable sampling rate via UART and $I^2C$ interfaces
- XENSIV™ DPS368 barometric pressure sensor
  - Package dimensions: 8-pin PG-VLGA-8-2, 2.0 mm x 2.5 mm x 1.1 mm
  - IPx8 certified: Temporary immersion at 50 m for 1 hour
  - Interface: $I^2C$ and SPI (both with optional interrupt)
  - Operating modes: Command (manual), background (automatic), and standby
  - Pressure sensor precision: ± 0.002 hPa (or ±0.02 m) (high precision mode)
  - Absolute accuracy: ± 1 hPa (or ±8 m)
- XENSIV™ PASCO2V15 Wing board
  - 63 mm x 23 mm size on standard FR4 laminate
  - 3 LEDs and 2 configurable user buttons
  - Form-factor compatibility with Adafruit
- CYSBSYSKIT-DEV-01 Rapid IoT Connect Developer Kit (MCU board)
  - Operates with ModusToolbox™ and Infineon Rapid IoT Connect cloud platform

## 1.4 Board parameters and technical data

**Table 2 Parameters**

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Supply voltage | – | – | 3 (logic and pressure sensor)<br>5 (step up powering PAS sensor) | V |

# 2 System and functional description

## 2.1 Getting started

The Connected Sensor Kit is a cutting-edge IoT development platform that empowers engineers to swiftly design, test, and refine innovative IoT devices. By providing pre-configured sensor scenarios and real-time data visualization, this kit enables developers to achieve the 10-minute IoT experience, allowing them to rapidly evaluate and validate their ideas.

To further accelerate development, a comprehensive suite of code examples is available within ModusToolbox™, offering a one-stop-shop for developers to kick-start their IoT projects with ease.

## 2.2 Quick IoT experience

### 2.2.1 Signup and login

1. Create an account with the Infineon Rapid IoT Connect Platform by signing up with your email address and other required details as shown in Figure 6

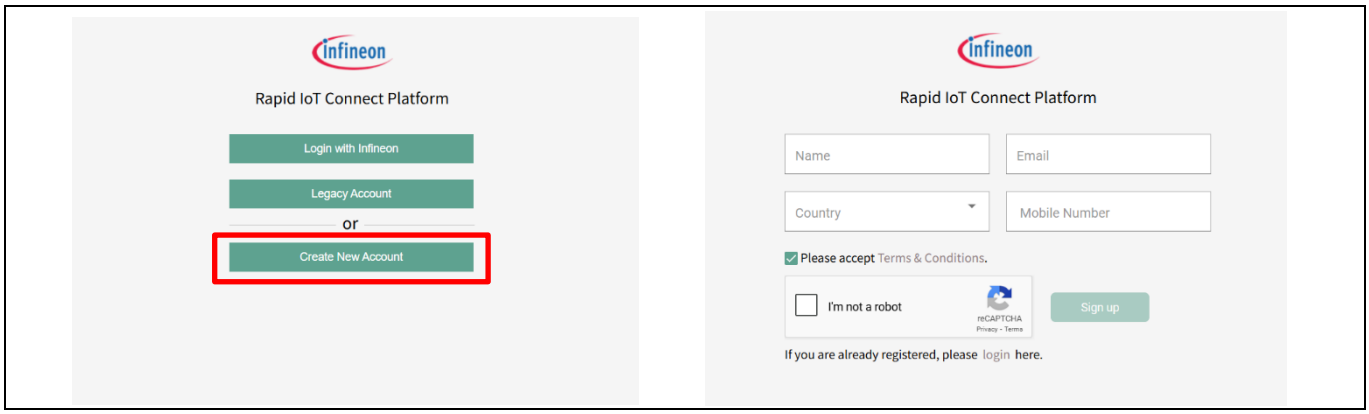


**Figure 6 Rapid IoT Connect Platform signup**

2. You will receive a password via email, which you will be prompted to change upon your first login to one of your choosing
3. Enter the credentials to login as shown in Figure 7

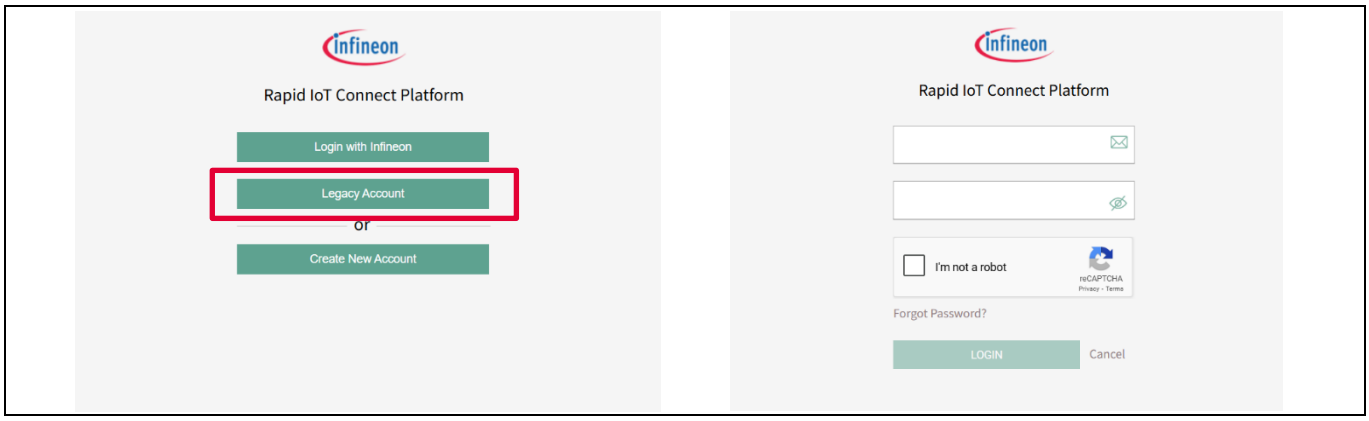


**Figure 7 Rapid IoT Connect Cloud Platform login**

### 2.2.2 Add your device

1. Click on the **Add device** button to start the process of adding your new KIT_CSK_PASCO2_5V device. A pop-up wizard appears to guide you through the process

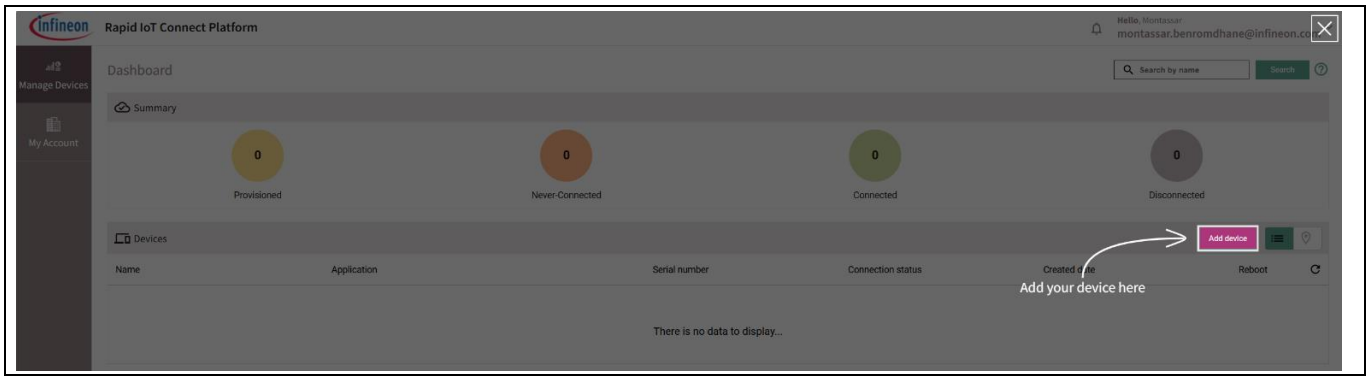


**Figure 8 Add your device**

2. On the **Device Details**, provide a name for your device, and enter the development kit serial number as shown Figure 9. Click the **Next** button to proceed further

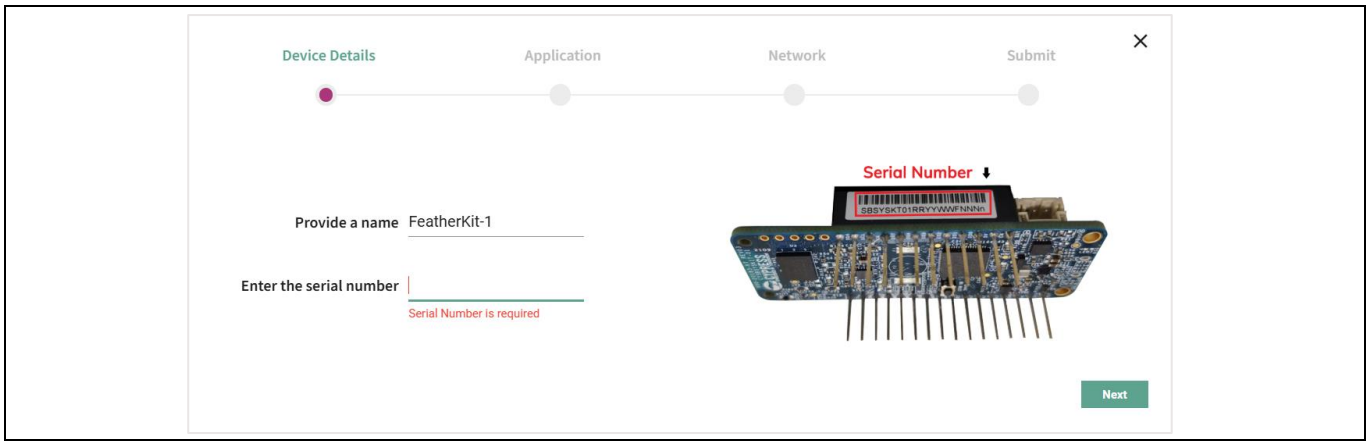


**Figure 9 Add device wizard**

### 2.2.3 Application

- With the Quick IoT Experience in **Application**, you can complete an IoT sensor experience that includes telemetry and fleet monitoring, in less than ten minutes
- After you complete the setup wizard, download and program your development kit with a built-in *hex* file. This *hex* file prepares and configures your development kit with the latest Wi-Fi firmware, an example application, and all the credentials required to securely connect to the cloud
- Note that the example application automatically uses the integrated temperature sensor. Ensure to select your desired application based on the XENSIV™ wing board you have, in this case it is XENSIV™ PASCO2V15 wing

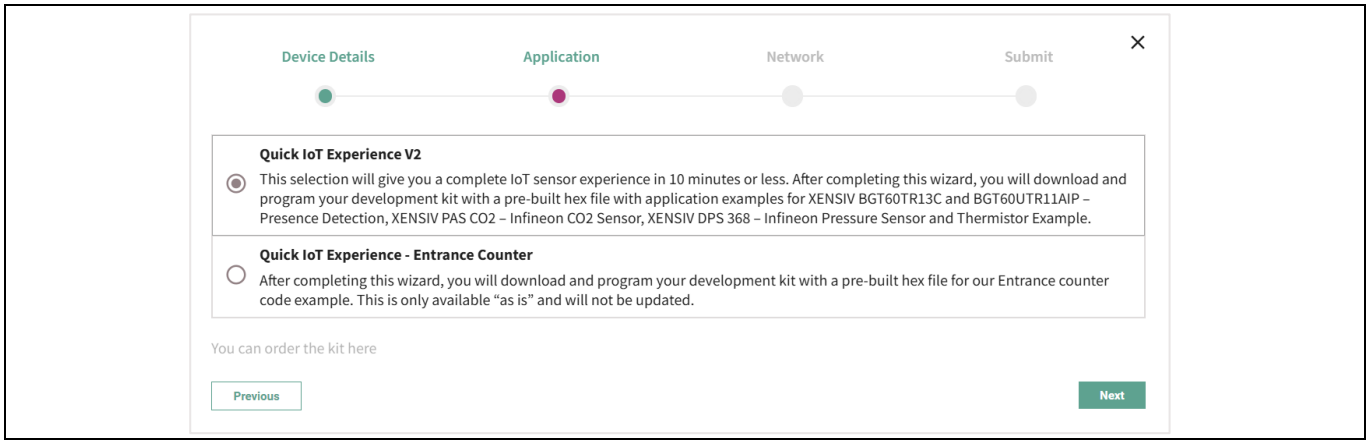


**Figure 10 Select application**

## 2.2.4 Configure Wi-Fi network

You can connect to your preferred WPA2 network by providing the Wi-Fi SSID and password by selecting **Create New Network**, or set up an access point/hotspot with WPA2-PSK security by using the following credentials:

- SSID: IFX_Sensor
- Security: WPA2-PSK
- Password: S66M14022021

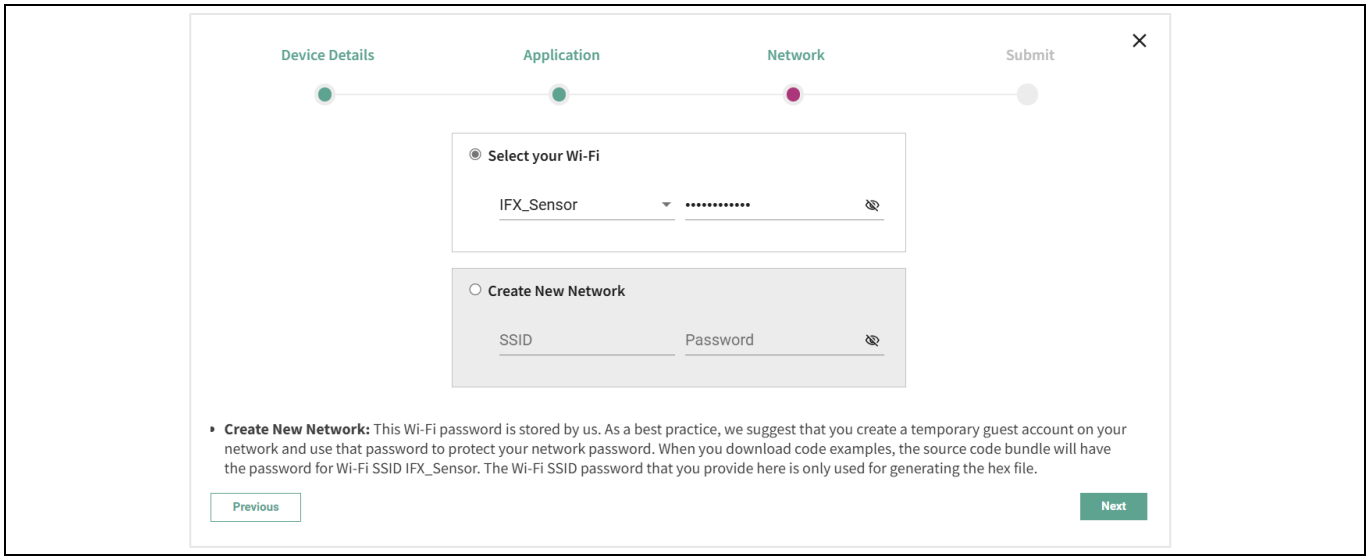


**Figure 11 Configure and select network**

## 2.2.5 Submit your device configurations

- Ensure all the information that you have entered is accurate before clicking the **Submit** button
- If you need to make changes, you can go back to earlier screens by pressing the **Previous** button
- After you click **Submit**, a custom *hex* file will be built for your device, and a software bundle will be generated for programming your development kit, as shown in Figure 13

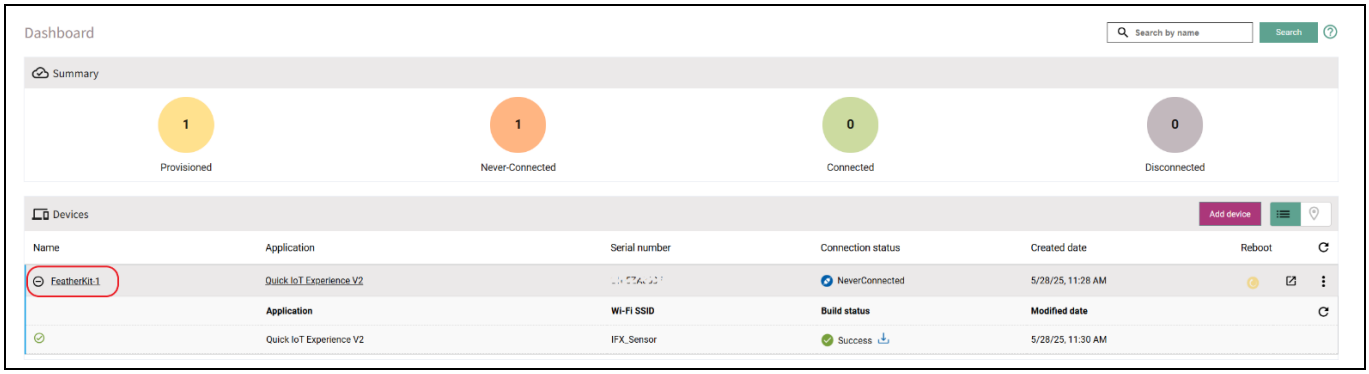


**Figure 12 Device management dashboard**

*Note: You can add/register a maximum of five devices with the Rapid IoT Connect Cloud Platform account.*

### 2.2.6 Download the zip package

Depending on your laptop or PC's operating system (Windows/Linux/Mac), you will receive a downloadable package that includes a *hex* file firmware image and a programming tool for your KIT_CSK_PASCO2_5V kit. The package will be in the form of a zip file. To view the detailed device status, click on the ⊕ (expand) button. To download the zip package, click (download) next to **Success** on the application as shown in Figure 13.

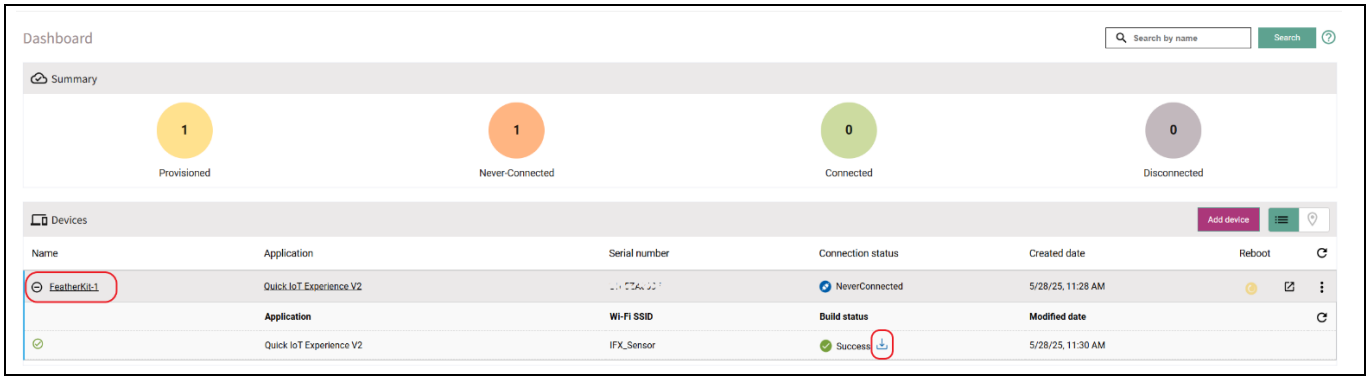


**Figure 13 Device management dashboard**

### 2.2.7 Program the KIT_CSK_PASCO2_5V

- Use a Micro-USB cable to connect your development kit to your PC or laptop
- Extract the zip file and run the *program_kit* script

  For Windows users, the script will be a *.cmd* file, while Linux and Mac users will see a *.sh* and *.command* files, respectively. If you are using Linux or Mac, ensure to run the script from a terminal with the necessary permissions. For detailed instructions, see the README.md file as shown in Figure 14

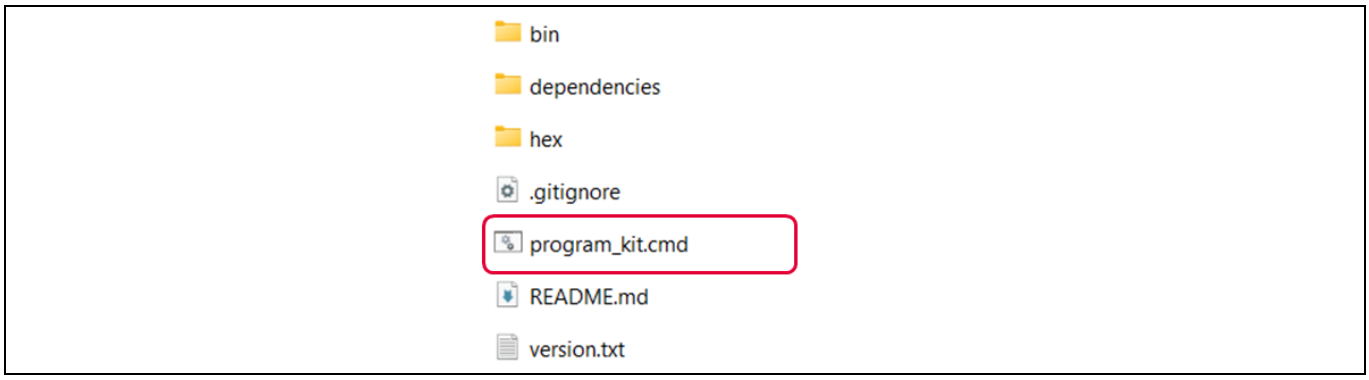


**Figure 14 Package content**

The successful kit programming command line logs are illustrated in Figure 15.

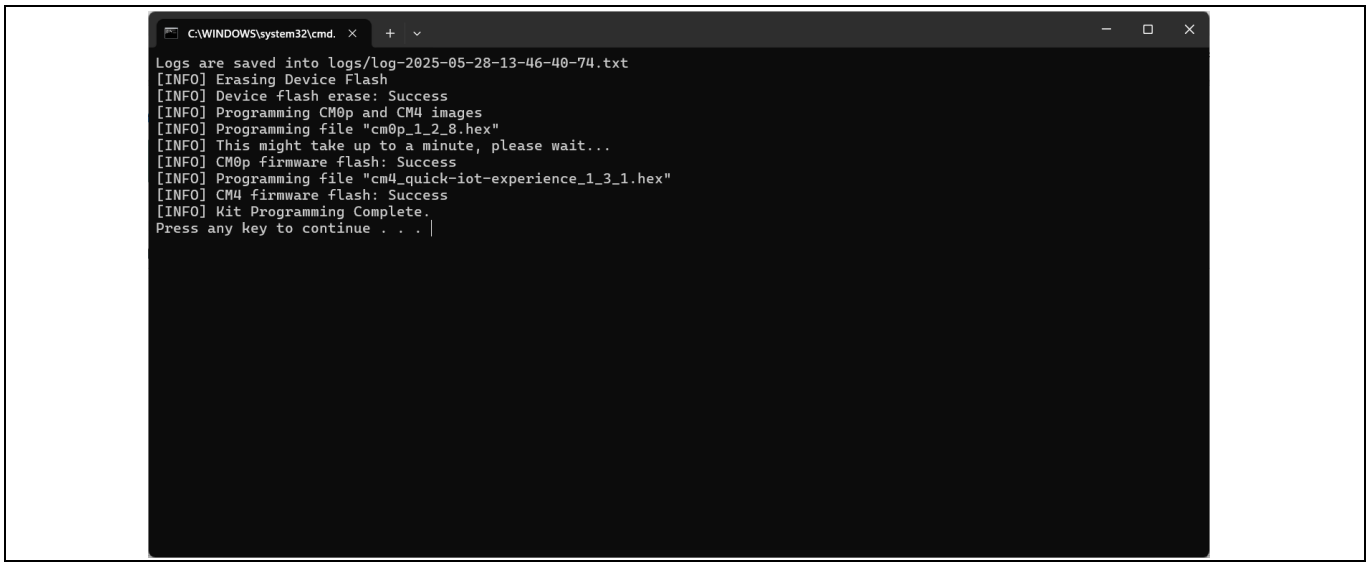


**Figure 15 Kit programming complete**

### 2.2.8 Device management

Manage your device (s) and their configurations in the device management tab. To view the details of a particular device, click on the expand icon next to the **Created date** to view the respective device details.

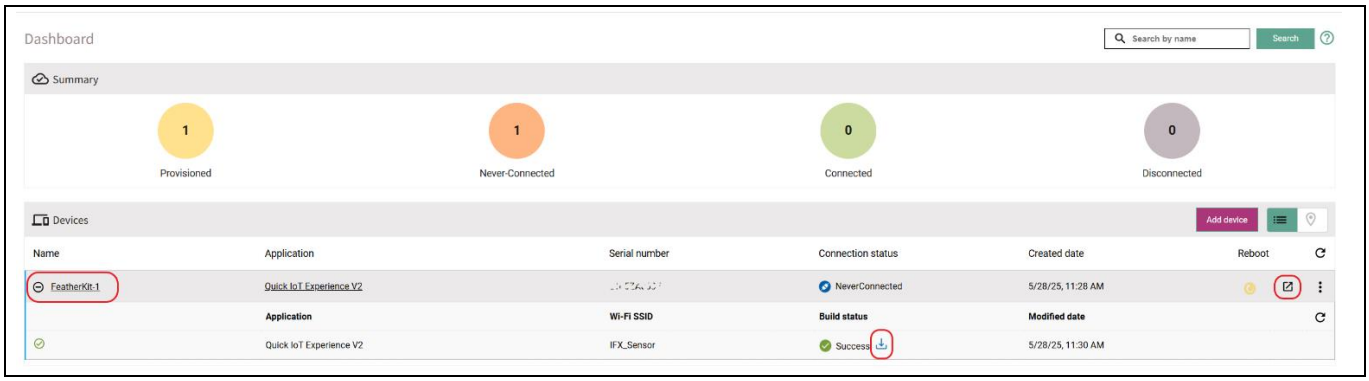


**Figure 16 Device connection status**

### 2.2.9 Select desired application

- To select the desired application for your connected Infineon sensor wing board (in this case, XENSIV™ PASCO2V15 wing), go to the **Attributes** tab in the device details
- Click on the dropdown menu for **Sensors** and select "**XENSIV PAS CO2**"
- After you select the application, the attributes will be pushed to the device, and it will reboot to the desired application

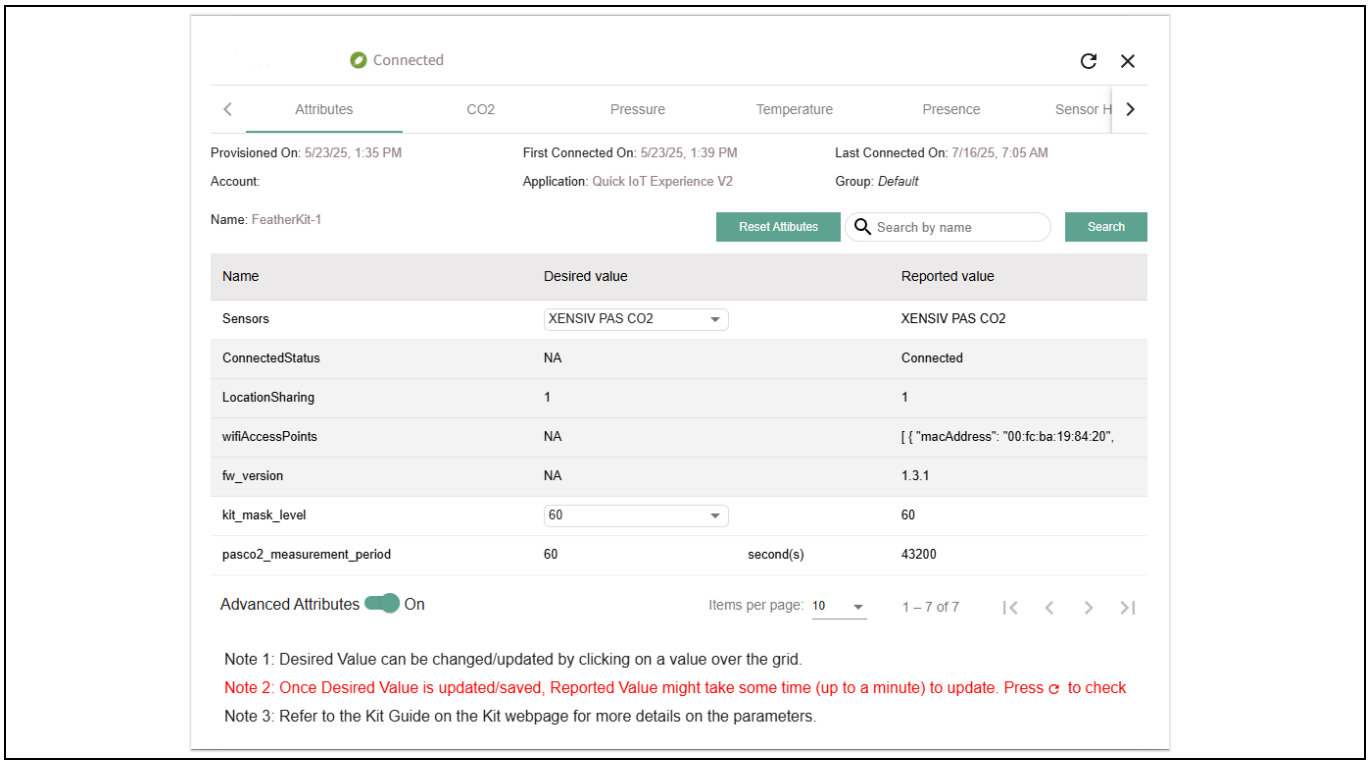


**Figure 17 Attributes tab for connected device**

*Note: Selecting a new application can cause the connectivity to temporarily disconnect and reconnect from the Rapid IoT Connect Cloud Platform.*

### 2.2.10 Selected application attributes

- To view all attributes on one page, click on the **Items per page** dropdown menu at the bottom of the **Attributes** tab and adjust the number of items accordingly
- For the Presence Detection use case, see the list of attributes as shown in Table 3

**Table 3 CO2 measurement application attributes**

| Attribute | Description |
|---|---|
| kit_mask_level | Disable logs, enable minimal logs or full logs to cloud<br>60: WARN, MINOR, MAJOR, FATAL all to UART terminal<br>62: INFO, WARN, MINOR, MAJOR, FATAL all to UART terminal<br>124: WARN, MINOR, MAJOR, FATAL all to Cloud UI as well as UART terminal |
| pasco2_measurement_period | 10 – 43200<br>PAS CO2 measurement period<br>Default is 60 second(s) |

### 2.2.11 View sensor data

- To view your sensor data on the cloud, click on the desired tab at the top of the device details window
- By default, your application will be set to Thermistor. Click on the **CO2** tab to view the data represented as a graph for easy viewing. You can also download the raw data in .CSV format by clicking the **Download** button in the top-right corner

*Note: As a standard user, your data is retained for 14 days. After this period, the data will no longer be available for retrieval. If you require a longer data retention period, contact Infineon Support to discuss upgrading your account.*


**Figure 18 CO2 measurement data visualization**

# 3 System design

This section introduces you to the various features of the XENSIV™ PASCO2V15 Wing board. Apart from the headers, all components are mounted on the top side of the Wing board, which has male headers facing downwards to either plug the board directly on the Rapid IoT baseboard or on top of another Wing board such as the Infineon XENSIV™ PASCO2V15 Wing board.

Figure 19 and Table 4 provide a description of the components mounted on the XENSIV™ PASCO2V15 Wing board.

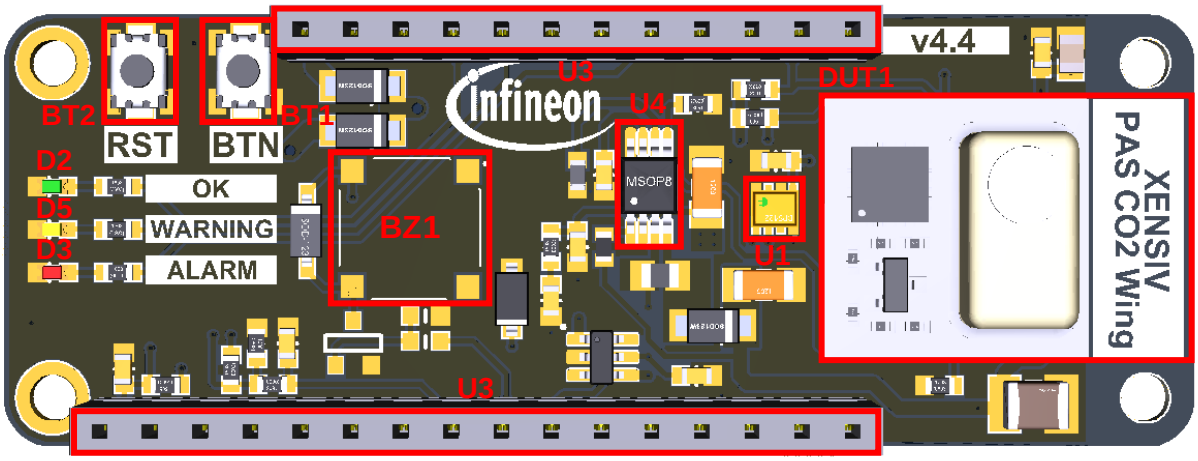


**Figure 19 Front view of the XENSIV™ PASCO2V15 Wing board**

**Table 4 Onboard hardware**

| Ref designator | Function |
|---|---|
| U1 | XENSIV™ DPS368 digital barometric pressure sensor |
| U2 | 2:1 (SPDT), 1-channel analog switch, programmable control of the on and off output 3 V |
| U3 | 28-pin Adafruit feather-compatible adaptor headers |
| U4 | Boost/inverting DC-DC converter with 2 A switch, soft-start and synchronization |
| DUT1 | XENSIV™ PASCO2V15 gas sensor |
| BT1 | Touch button; active LOW |
| BT2 | Touch button; active LOW, system reset function |
| D2 | Green color LED for acceptable level of CO2 concentration |
| D3 | Red color LED for alarm level of CO2 concentration |
| D5 | Yellow color LED for warning level of CO2 concentration |
| BZ1 | Option for buzzer (not populated by default) |

## 3.1 Schematics

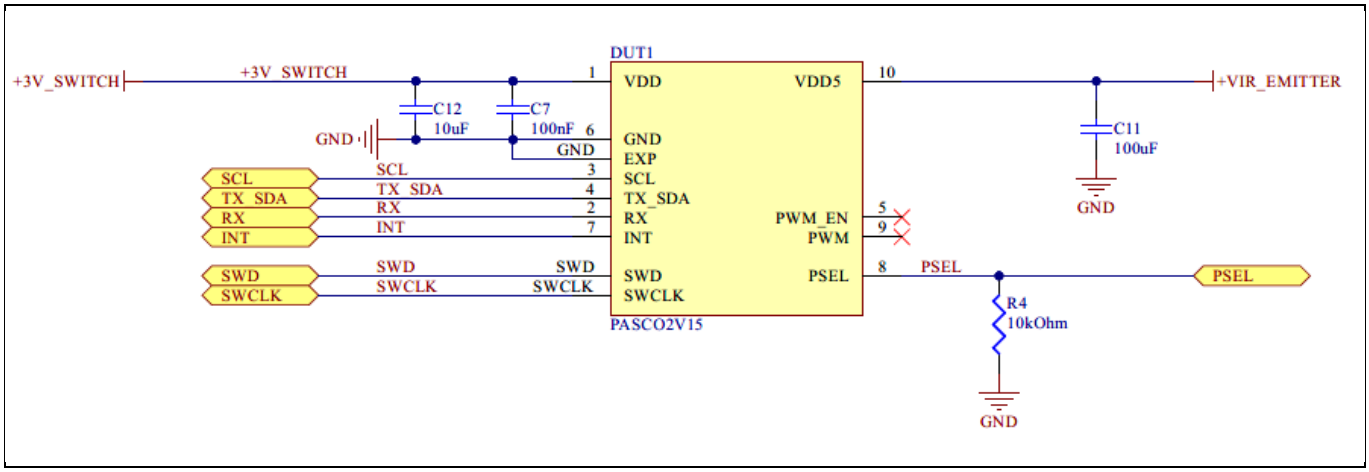


**Figure 20 XENSIV™ PASCO2V15 schematic**

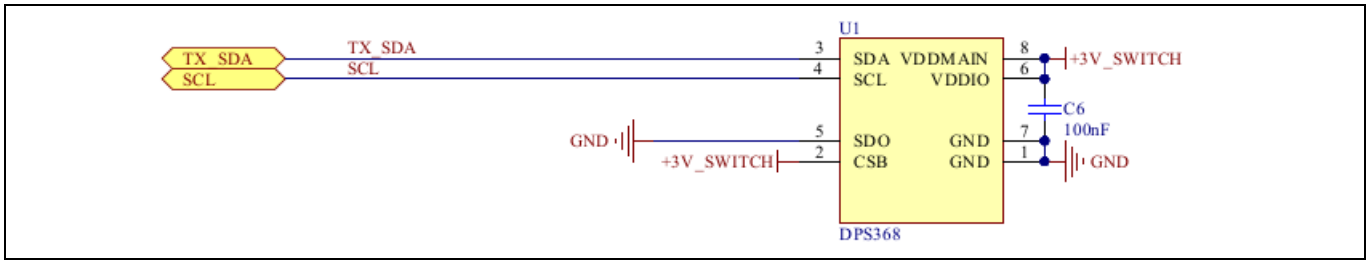


**Figure 21 XENSIV™ DPS368 schematic**

The user interface on the wing board consists of two mechanical buttons (Figure 22) and three LEDs (Figure 23).

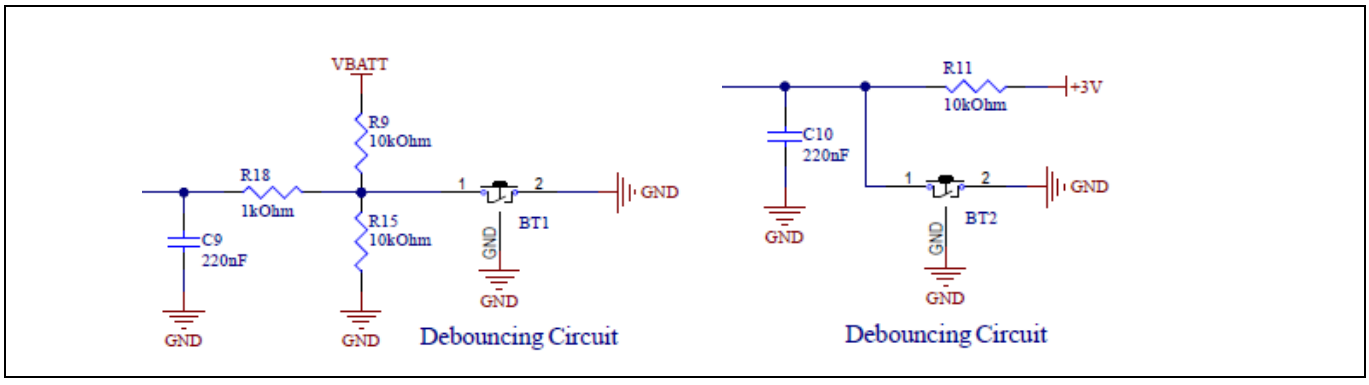


**Figure 22 User (BT1) and reset button (BT2) schematic**

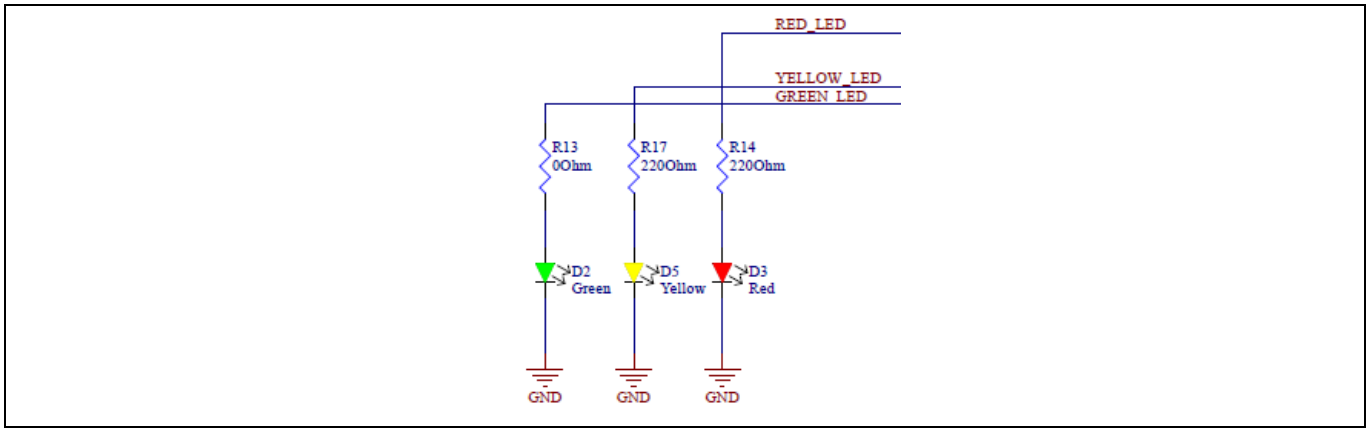


**Figure 23 LEDs schematic**

Figure 24 shows the 1-channel analog switch, which provides programmable control of the 3 V output status, (on/off). This function is used to switch only the PAS module on to measure the CO2 concentration so that the board's power consumption is reduced.

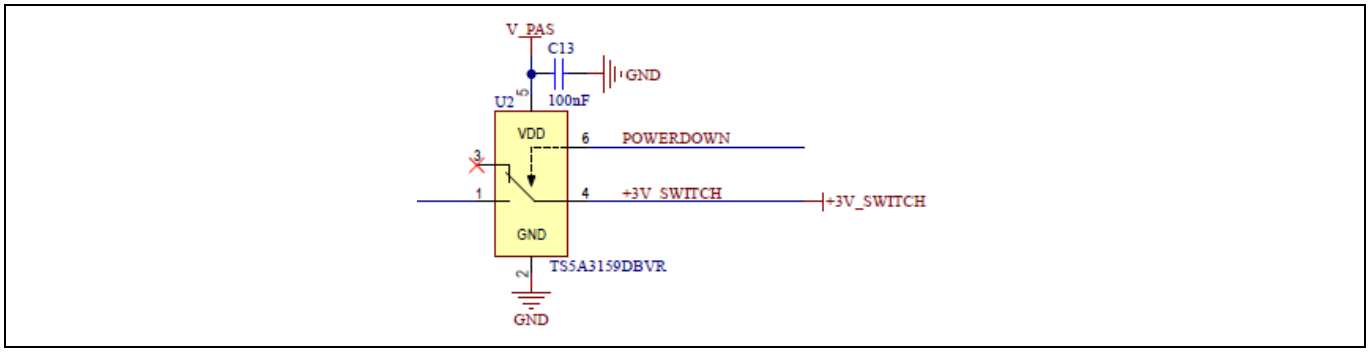


**Figure 24 1-channel analog switch schematic**

Figure 25 shows the voltage booster circuit. It is required to provide stable 5 V supply for the CO2 sensor module.

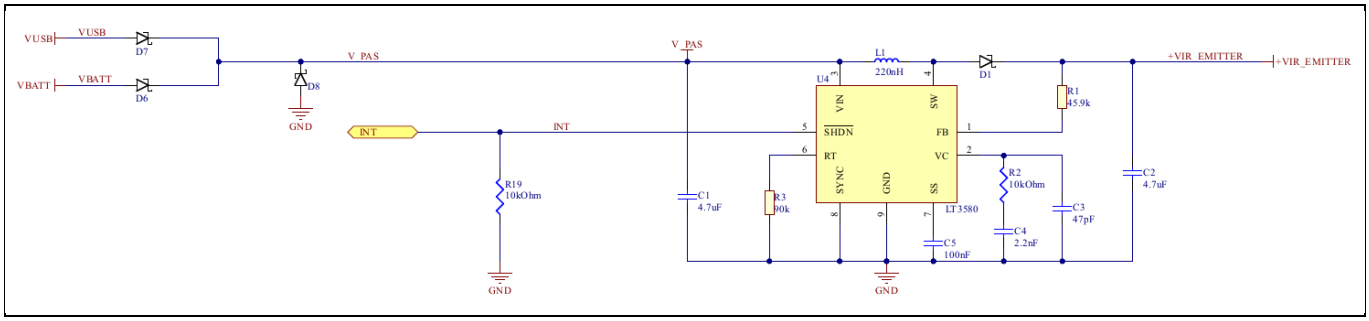


**Figure 25 Boot circuit 5 V schematic**

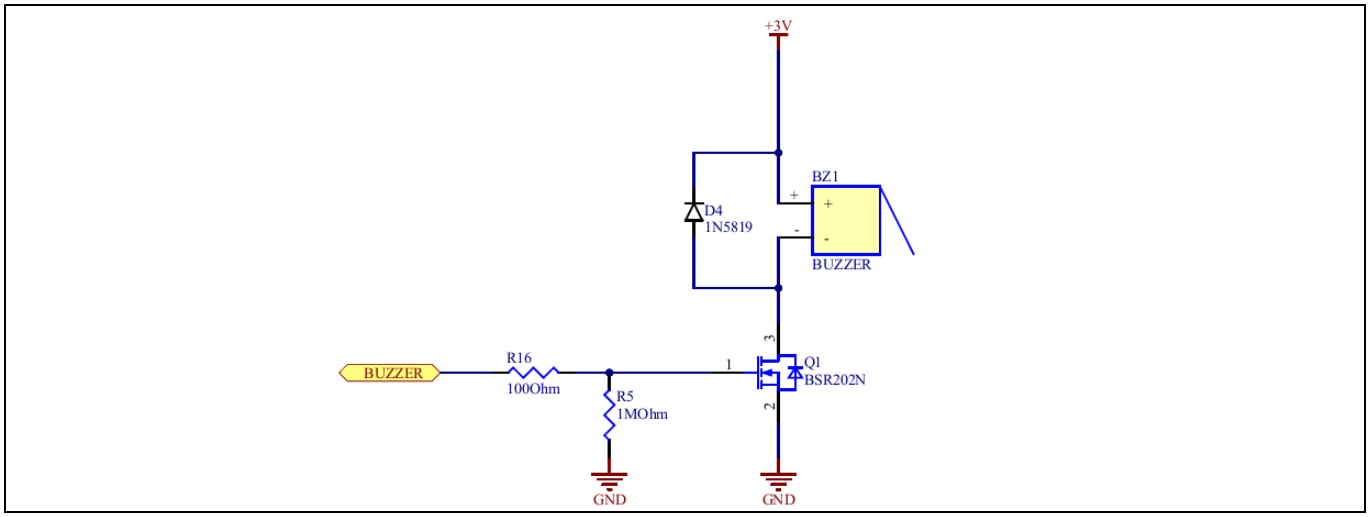


**Figure 26 Optional buzzer circuit (not populated) schematic**

Figure 27 shows the pin assignment of J1 and J2 on the XENSIV™ PASCO2V15 Wing board. The Adafruit feather-compatible header is used to plug into the CYCBSYSKIT-DEV-01 Rapid IoT Connect Developer Kit.

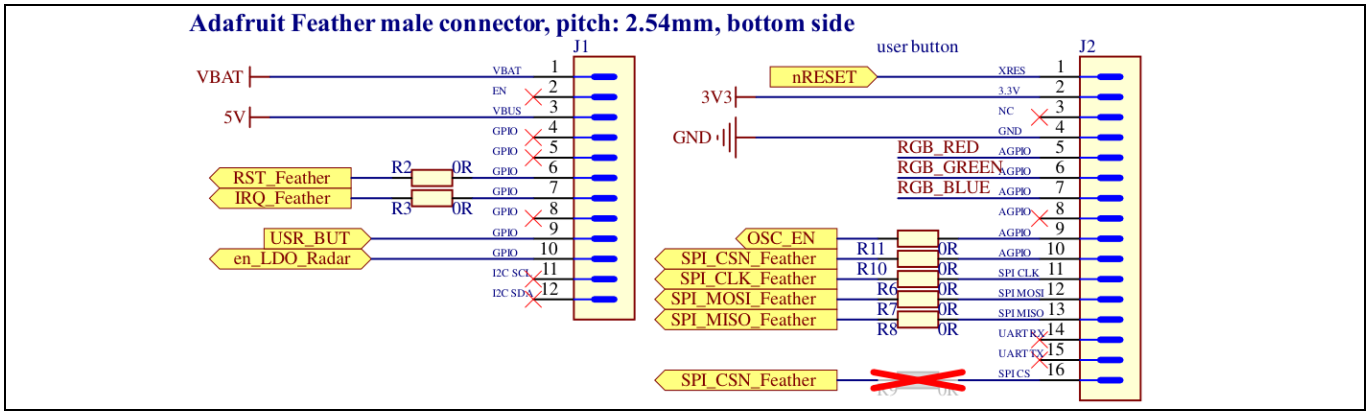


**Figure 27 Adafruit headers schematic**

## 3.2 Layout

The size of the XENSIV™ PASCO2V15 Wing board is 43 mm (L) x 23 mm (W), as shown in Figure 28.

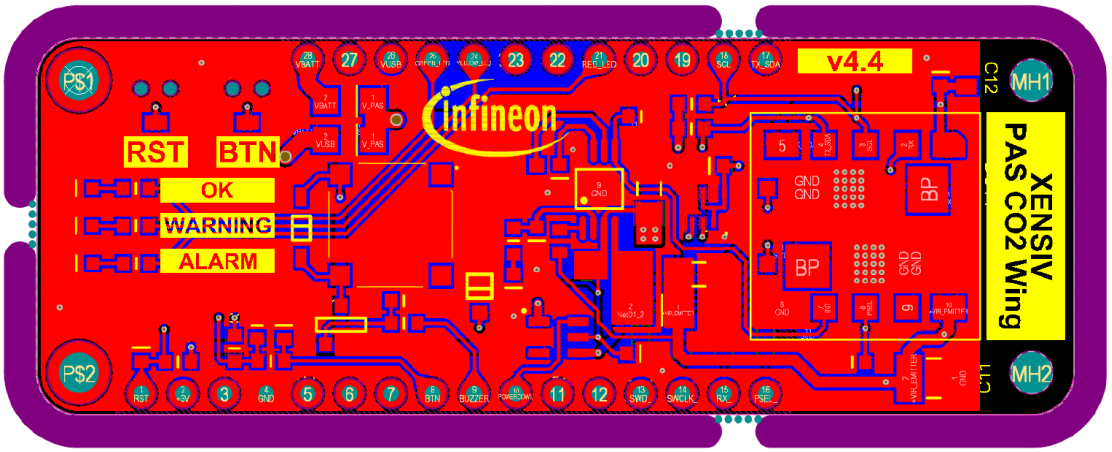


**Figure 28 PCB layout of XENSIV™ PASCO2V15 Wing board**

## 3.3 Bill of materials

Table 5 lists the bill of materials (BOM) of the XENSIV™ PASCO2V15 Wing board.

**Table 5 BOM of the most important/critical parts of the evaluation**

| Ref designator | Description | Manufacturer | Manufacturer P/N | Qty |
|---|---|---|---|---|
| BT1, BT2 | Touch button, 3 mm x 4 mm | ITT C&K | PTS820J20MSMTRLFS | 2 |
| BZ1 | – | Mallory Sonalert | AST7525MATRQ | 0 |
| C1, C2 | Capacitor 1206 4.7 µF 10 V 10% | Samsung | CL31B475KPHNNNE | 2 |
| C3 | Capacitor 0603 47 pF 50 V 5% | KEMET | C0603C470J5GACTU | 1 |
| C4 | Capacitor 0603 2.2 nF 10 V 5% | KEMET | C0603C222J8RACTU | 1 |
| C5, C6, C7, C13 | Capacitor 0603 100 nF 25 V 5% | Kyocera AVX | 06033C104JAT2A | 4 |
| C9, C10 | Capacitor 0603 220 nF 25 V 10% | Murata | GRM188R71E224KA88D | 2 |
| C11 | Capacitor 1210 100 µF 10 V 20% | Murata | GRM32ER61A107ME20L | 1 |
| C12 | Capacitor 0805 10 µF 25 V 10% | Kyocera AVX | 08053D106KAT2A | 1 |
| D1 | 1 A low VF mega Schottky barrier rectifier | Nexperia | PMEG2010ER, 115 | 1 |
| D2 | LED 0603 green 525 nm | Kingbright | KPG-1608ZGC | 1 |
| D3 | LED 0603 red | Dialight | 598-8010-107F | 1 |
| D4 | Diode 1N5819 SOD123 | Diodes | 1N5819HW-7-F | 1 |
| D5 | LED 0603 yellow | Rohm | SML-D12Y8WT86 | 1 |
| D6, D7 | 2 A low VF mega Schottky barrier rectifier | Nexperia | PMEG3020ER, 115 | 2 |
| D8 | STPS0520Z Schottky rectifier 20 V 500 mA single, SOD-123, 2 pins, 320 mV | STMicroelectronics | STPS0520Z | 1 |

| Ref designator | Description | Manufacturer | Manufacturer P/N | Qty |
|---|---|---|---|---|
| DUT1 | PAS CO2 5V gas sensor | Infineon | PASCO2V15AUMA1 | 1 |
| L1 | Coil MLZ2012DR22DT 220 nH | TDK | MLZ2012DR22DT000 | 1 |
| Q1 | OptiMOS™ N-channel enhancement small signal transistor, 20 V | Infineon | BSR202NL6327HTSA1 | 0 |
| R1 | Resistor 0603 45.9 kΩ 0.1 W 1% | Vishay | TNPW060345K9BEEA | 1 |
| R2, R4, R9, R10, R11, R12, R15, R19 | Resistor 0603 10 kΩ 0.1 W 1% | Bourns | CR0603-FX-1002ELF | 8 |
| R3 | Resistor 0603 90 kΩ 0.1 W 1% | Vishay | MCT06030E9002BP100 | 1 |
| R5 | Resistor 0603 1 MΩ 0.1 W 1% | Bourns | CR0603-JW-105GLF | 0 |
| R13 | Resistor 0603 0 Ω | Vishay | CRCW06030000Z0EA | 1 |
| R14, R17 | Resistor 0603 220 Ω 0.1 W 1% | Panasonic | ERJ-3GEYJ221V | 2 |
| R16 | Resistor 0603 100 Ω 0.1 W 1% | Bourns | CR0603-FX-1000ELF | 0 |
| R18 | Resistor 0603 1 kΩ 0.125 W 1% | Multicomp | MCHP03W8F1001T5E | 1 |
| U1 | Digital barometric pressure sensor | Infineon | DPS368XTSA1 | 1 |
| U2 | 1 Ω, 5 V, 2:1 (SPDT), 1-channel analog switch | Rochester Electronics | TS5A3159DBVR | 1 |
| U3 | Adafruit Connector 1x12 and 1x16 Female | Adafruit | Adafruit 2830 | 1 |
| U4 | Boost/ inverting DC-DC converter with 2 A switch, soft-start and synchronization | Analog Devices/ Linear Technology | LT3580IMS8E#PBF | 1 |

## 3.4 Connector details

Figure 29 highlights the 28-pin Adafruit Feather-compatible headers. The function of the respective header pins is described in Table 6. The image also shows the test points which were used for testing the boards in the lab or production.

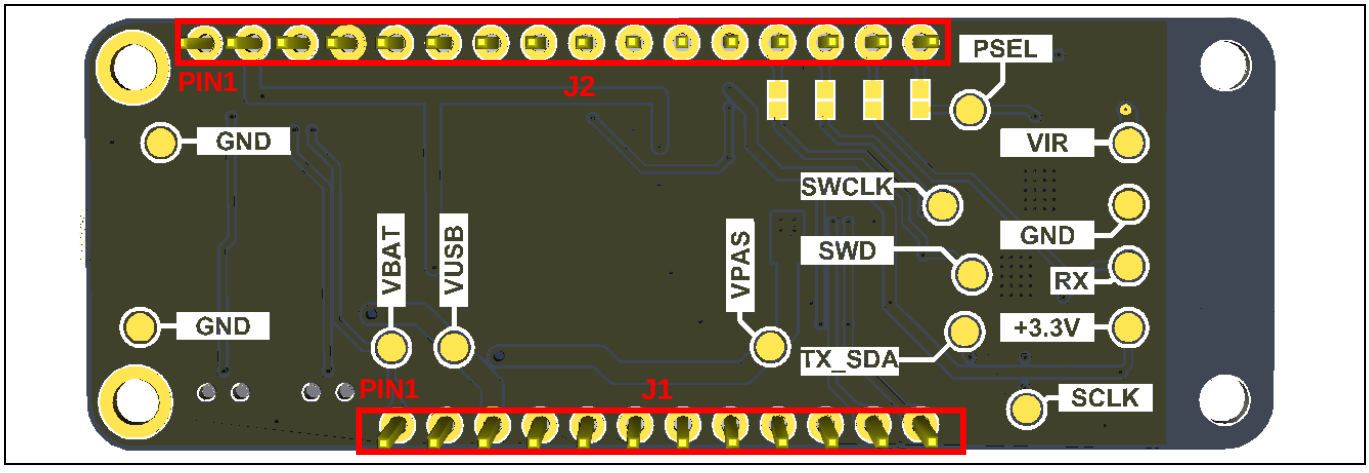


**Figure 29 Adafruit headers and test points on bottom of the XENSIV™ PASCO2V15 Wing board**

**Table 6 Adafruit Feather-compatible pinout**

| Header mapping | Primary onboard function | PSOC™ 6 MCU pin (Rapid IoT baseboard) | Adafruit Feather-compatible mapping (Rapid IoT baseboard) | Adafruit Feather-compatible mapping (PASCO2V15 Wing board) | Details |
|---|---|---|---|---|---|
| J1.1 | VBAT | – | – | VBAT | LiPo battery voltage |
| J1.2 | EN | – | – | – | Not connected |
| J1.3 | VBUS | – | – | VUSB | USB power |
| J1.4 | GPIO | P9_0 | GPIO13 | GREEN_LED | Green LED |
| J1.5 | GPIO | P9_1 | GPIO12 | YELLOW_LED | Yellow LED |
| J1.6 | GPIO | P9_2 | GPIO11 | – | Not connected |
| J1.7 | GPIO | P9_3 | GPIO10 | – | Not connected |
| J1.8 | GPIO | P9_4 | GPIO9 | RED_LED | Red LED |
| J1.9 | GPIO | P9_7 | GPIO6 | – | Not connected |
| J1.10 | GPIO | P8_4 | GPIO5 | – | Not connected |
| J1.11 | $I^2C$ SCL | P6_0 | SCL | SCL | Connected to KitProg3. Note that this pin has a 4.7 kΩ pull-up for $I^2C$ communication |
| J1.12 | $I^2C$ SDA | P6_1 | SDA | TX_SDA | Connected to KitProg3. Note that this pin has a 4.7 kΩ pull-up for $I^2C$ communication |
| J2.1 | XRES | XRES | XRES | RST | Reset button |
| J2.2 | 3.3 V | VDDA, VDDIO | VCC | +3V | Analog voltage for PSOC™ 6 MCU |
| J2.3 | NC | – | NC | – | Not connected |
| J2.4 | GND | – | GND | GND | Ground |
| J2.5 | Analog GPIO | P10_0 | A0 | – | Not connected |
| J2.6 | Analog GPIO | P10_1 | A1 | – | Not connected |
| J2.7 | Analog GPIO | P10_2 | A2 | – | Not connected |
| J2.8 | Analog GPIO | P10_3 | A3 | BTN | User button / VBAT voltage monitoring |
| J2.9 | Analog GPIO | P10_4 | A4 | BUZZER | PAS buzzer |
| J2.10 | Analog GPIO | P10_5 | A5 | POWERDOWN | PAS board POWERDOWN |

| Header mapping | Primary onboard function | PSOC™ 6 MCU pin (Rapid IoT baseboard) | Adafruit Feather-compatible mapping (Rapid IoT baseboard) | Adafruit Feather-compatible mapping (PASCO2V15 Wing board) | Details |
|---|---|---|---|---|---|
| J2.11 | SPI Clock | P5_2 | SCK | – | Not connected |
| J2.12 | SPI MOSI | P5_0 | MOSI | – | Not connected |
| J2.13 | SPI MISO | P5_1 | MISO | SWD | SWD |
| J2.14 | UART RX | P6_4 | RX | SWCLK | SWCLK |
| J2.15 | UART TX | P6_5 | TX | RX | RX |
| J2.16 | SPI CS | P5_3 | GPIO | PSEL | PSEL at PAS sensor |

# References

[1] Infineon Technologies AG. *PASCO2V15 gas sensor datasheet*; Available online

[2] Infineon Technologies AG: *AN228571 – Getting started with PSOC™ 6 MCU on ModusToolbox™ application note*; Available online

[3] Infineon Technologies AG: *Code examples for ModusToolbox™*; Available online

# Glossary

**BSP**
*board support package (BSP)*

**CSK**
*connected sensor kit (CSK)*

**GPIO**
*general-purpose input/output (GPIO)*

**HW**
*hardware (HW)*

**I²C**
*inter-integrated circuit (I²C)*

**IoT**
*internet of things (IoT)*

**LED**
*light-emitting diode (LED)*

**PAS**
*photoacoustic spectroscopy (PAS)*

**PCB**
*printed circuit board (PCB)*

**SPI**
*serial peripheral interface (SPI)*

**UART**
*Universal asynchronous receiver transmitter (UART)*

# Revision history

| Document revision | Date | Description of changes |
|---|---|---|
| 1.00 | 2025-08-08 | Initial release |

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