# PSOC™ 4 HVMS 128K: KIT_PSoC4-HVMS-128K_LITE kit user guide

## About this document

### Scope and purpose

KIT_PSoC4-HVMS-128K_LITE is a lite kit for the PSOC™ high-voltage (HV) mixed signal (MS) 128K microcontrollers, a fully integrated programmable embedded systems for automotive HMI, low-end body control, PTC heaters, safety applications, such as hands-on detect, passenger occupant detection, and other smart edge sensors. The system features an Arm® Cortex®-M0+ processor with programmable and reconfigurable analog and digital blocks.

It is a combination of a microcontroller with the following:

- A 12-bit SAR ADC
- Fifth-generation multi-sense converter (MSC) block supporting capacitive sensing (CAPSENSE™)
- Digital peripherals, such as PWMs
- Serial communication interfaces along with a LIN/CXPI interface with integrated PHY
- High-voltage subsystem to operate directly off the 12-V car battery

### Intended audience

This document is intended for design engineers and evaluation for automotive HMI, low-end body control, PTC heaters, safety applications such as hands-on detect, passenger occupant detection, and other smart edge sensors.

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"Evaluation Boards and Reference Boards" shall mean products embedded on a printed circuit board (PCB) for demonstration and/or evaluation purposes, which include, without limitation, demonstration, reference and evaluation boards, kits, and design (collectively referred to as "Reference Board").

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## Safety precautions

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

**Table 1**     **Safety precautions**

| | |
|---|---|
| ⚠️ | **Warning***: The evaluation or reference board contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait for five minutes for the capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.* |
| ⚠️ | **Warning:** *The evaluation or reference board is connected to the grid input during testing. Therefore, high-voltage differential probes must be used when measuring voltage waveforms by oscilloscope. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.* |
| ⚠️ | **Warning:** *Remove or disconnect power from the drive before you disconnect or reconnect wires or perform maintenance work. Wait for five minutes after removing power to discharge the bus capacitors. Do not attempt to service the drive until the bus capacitors have discharged to zero. Failure to do so may result in personal injury or death.* |
| ⚠️ | **Caution:** *The heat sink and device surfaces of the evaluation or reference board may become hot during testing. Therefore, necessary precautions are required while handling the board. Failure to comply may cause injury.* |
| ⚠️ | **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.* |
| ⚠️ | **Caution:** *A drive that is incorrectly applied or installed can lead to component damage or reduction in product lifetime. Wiring or application errors such as undersizing the motor, supplying an incorrect or inadequate AC supply, or excessive ambient temperatures may result in system malfunction.* |
| ⚠️ | **Caution:** *The evaluation or reference board is shipped with packing materials that need to be removed prior to installation. Failure to remove all packing materials that are unnecessary for system installation may result in overheating or abnormal operating conditions.* |

# Table of contents

# 1 KIT_PSoC4-HVMS-128K_LITE kit contents

The kit includes one main board and a USB cable.



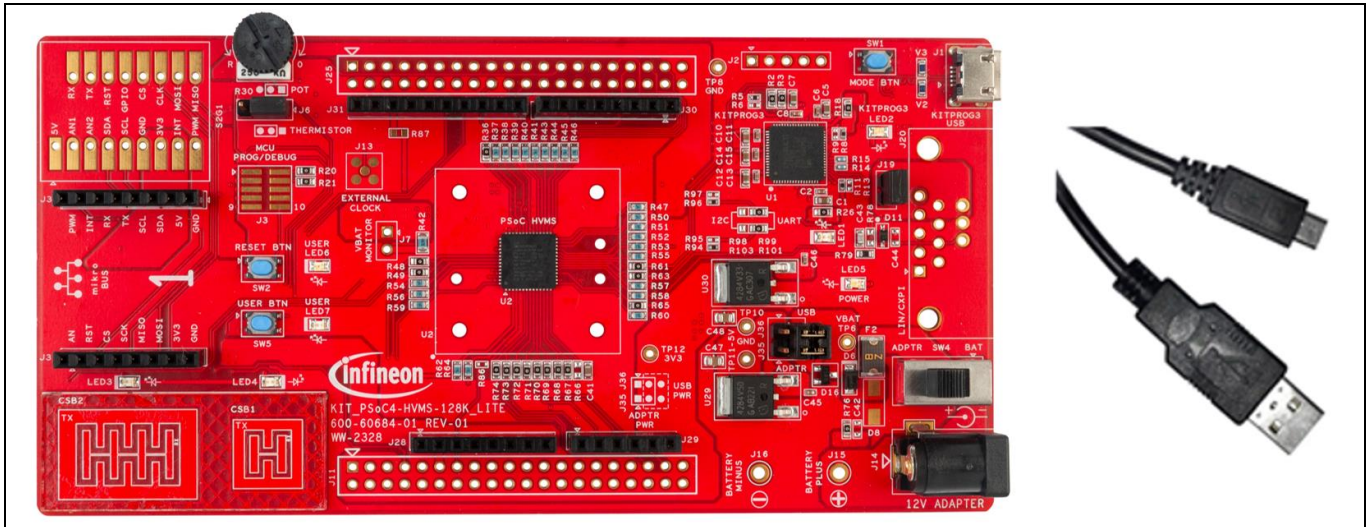**Figure 1**        **KIT_PSoC4-HVMS-128K_LITE kit contents**

KIT_PSoC4-HVMS-128K_LITE kit contents

## 1.1 Overview

The KIT_PSoC4-HVMS-128K_LITE board can mount the 56-QFN package of PSOC™ 4 HVMS 128K microcontrollers (MCU). The kit features and blocks are shown in Figure 2.
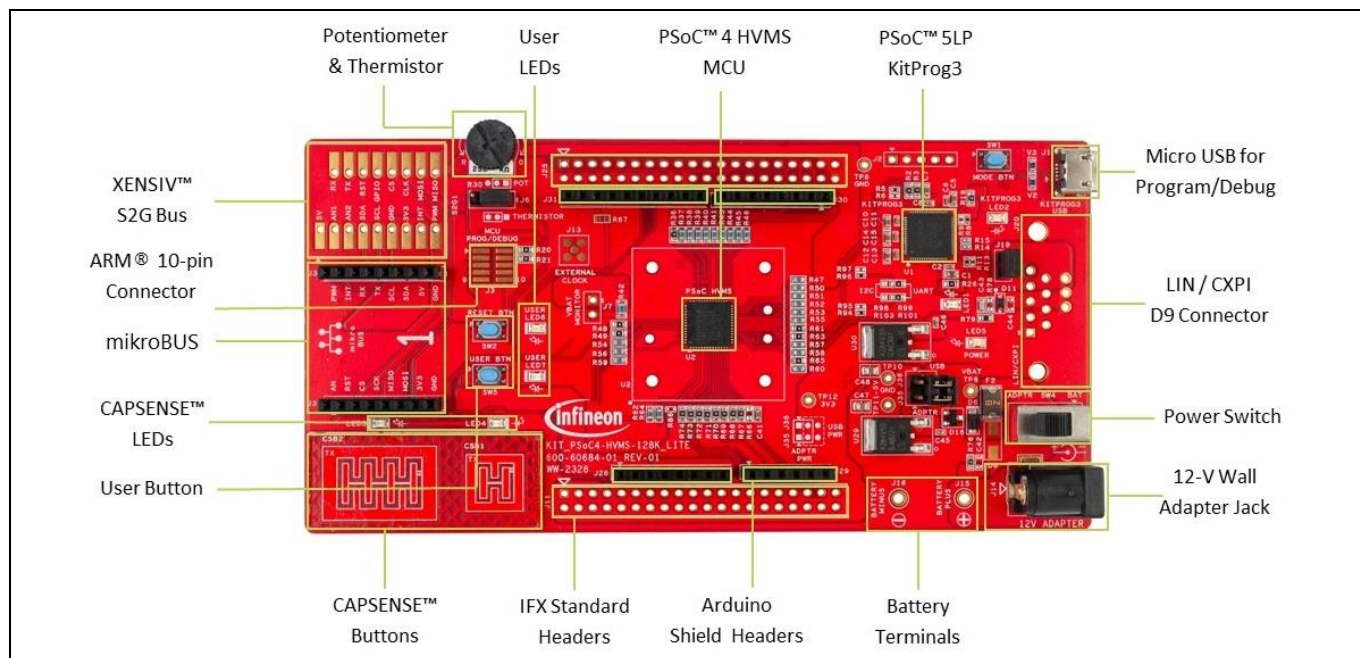


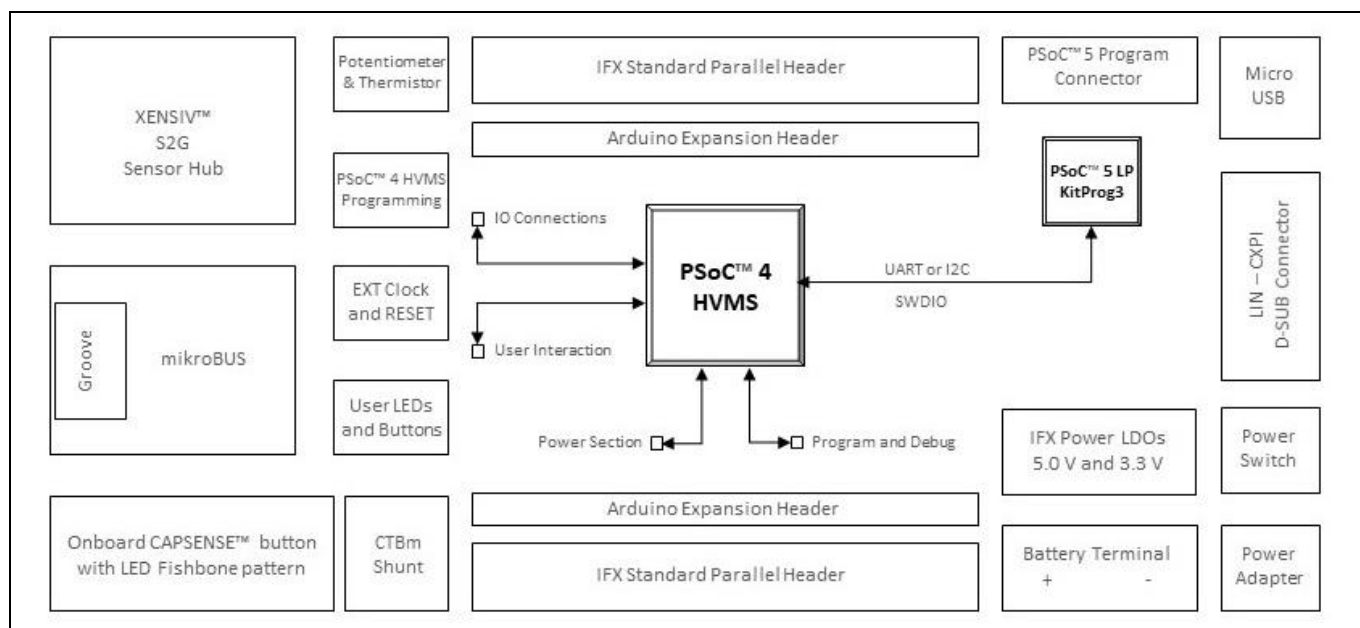**Figure 2** KIT_PSoC4-HVMS-128K_LITE board - top view

## 1.2 Block diagram



**Figure 3** KIT_PSoC4-HVMS-128K_LITE kit board – block diagram

## 1.3        Board functions

**Table 2        KIT_PSoC4-HVMS-128K_LITE kit board functions**

| # | Function | Specification | Remarks | Note |
|---|----------|---------------|---------|------|
| 1 | PSOC™ 4 HVMS MCU | CY8C4147LWE | U2: 56-QFN (0.5-mm pitch) | – |
| 2 | PSOC™ 5LP KitProg3 | CY8C5868LTI-LP039 | U1: 68-QFN | – |
| 3 | Power input | 12-V wall adapter (1 A) | J14 (DC Jack) | – |
| 4 | Power input | Automotive battery input | J15/J16 | No load |
| 5 | Power input | Power input select jumpers (USB or 12-V wall adapter) | J35/J36 | – |
| 6 | Power switch | Input power select switch | SW4 | – |
| 7 | Power LED | VBAT monitor LED | LED5 (blue) | – |
| 8 | USB connector | Micro USB connector | J1 | – |
| 9 | Power LED | USB VBUS monitor LED | LED2 (blue) | – |
| 10 | Status LED | KitProg3 status LED | LED1 (Green) | – |
| 11 | Program connector | 10-pin MIPI connector for MCU | J3 | No load |
| 12 | Program connector | 2.54-pitch connector for KitProg3 | J2 (5 pins) | No load |
| 13 | CAPSENSE™ button | CSX button 100x100 | CSB1 | PCB tracks |
| 14 | CAPSENSE™ button | CSX button 200x130 | CSB2 | PCB tracks |
| 15 | CAPSENSE™ LEDs | Button LEDs for CAPSENSE™ | LED3/LED4 (green) | – |
| 16 | Temperature sensor selector | Temperature sensor select jumper (thermistor or potentiometer) | J6 (3 pins) | – |
| 17 | LIN/CXPI connector | DSUB-9 connector for LIN/CXPI | J20 | No load |
| 18 | Resistors | Serial connect resistors (I2C or UART) | R98/R103 (I2C), R99/R101 (UART) | – |
| 19 | CTBm shunt resistor | 100 mΩ shunt resistor | R107 | – |
| 20 | Extension header | 40-pin (2-row) female header for CAPSENSE™ extension boards | J11/J25 | No load |
| 21 | External clock | SMA connector for clock input | J13 | No load |
| 22 | Test header | Current measurement header for MCU | J7 | No load |
| 23 | Arduino headers | 1x6 (1), 1x8 (2) and 1x10 (1) for Arduino compatibility | J29/J28/J30/J31 | – |
| 24 | mikroBUS header | Two 1x8 mikroBUS headers | J32/J33 | – |
| 25 | Groove connector | 5-pin, 100mils, SMBus | J26 | No load |
| 26 | XENSIV™ S2G bus connector | Infineon's XENSIV™ bus sensor 17-pin interface | S2G1 | No load |
| 27 | User LED | User LED connected to MCU | LED6 (red) | – |
| 28 | User LED | User LED connected to MCU | LED7 (green) | – |
| 29 | User switch | User push switch connects to MCU | SW5 | – |
| 30 | Reset switch | System reset switch | SW2 | – |

# 2 Getting started

## 2.1 Initial jumper configuration

The initial jumpers are configured according to the factory default settings.



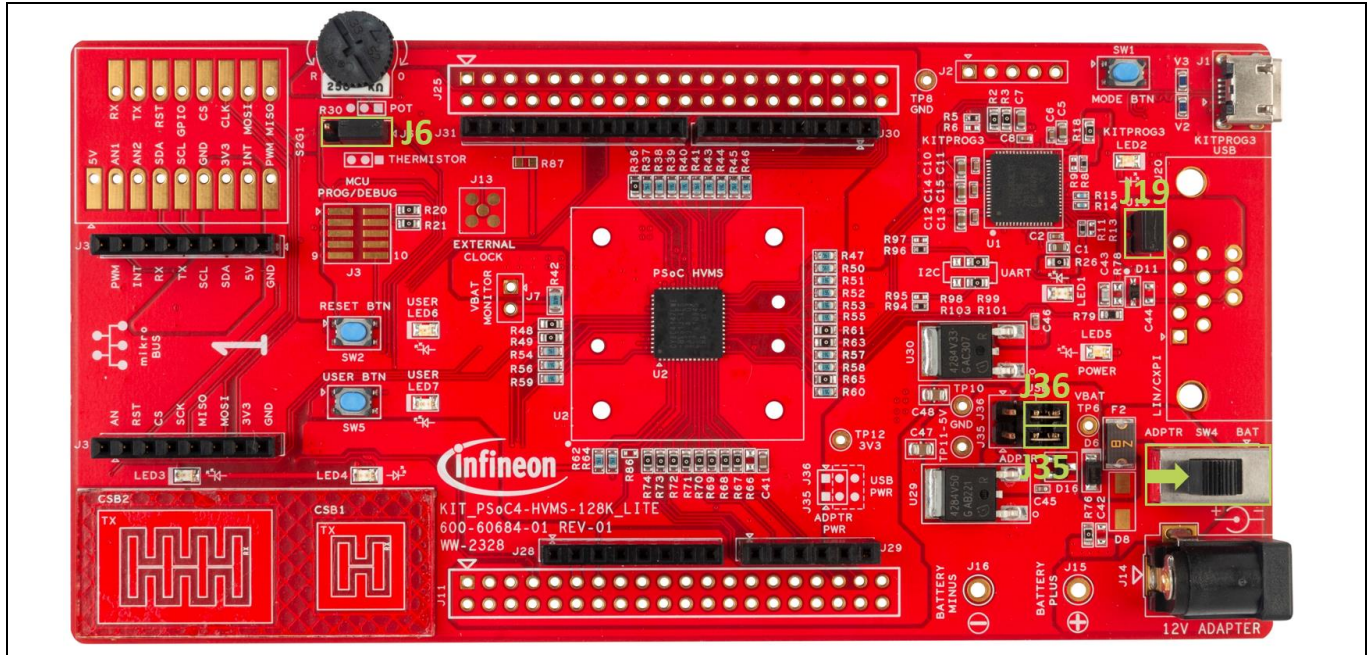**Figure 4**     **Initial jumper configuration and switch setting**

Table 3 lists the jumper's configuration.

**Table 3**     **Jumper details**

| Reference | Details | Default function | Alternate function |
|---|---|---|---|
| J6 | Configure analog input connected to the IO port pin P5.3 of MCU | Potentiometer (1-2) | Thermister (2-3) |
| J19 | Connects VBAT (12 V) to the LIN/CXPI bus voltage | LIN/CXPI bus (1-2) | - |
| J35, J36 | Configures the power inputs for the entire board | 5-V power from USB (2-3) | 12-V power from the adapter (1-2) |

## 2.2 Power up the lite kit

The KIT_PSoC4-HVMS-128K_LITE kit can be powered either from the USB port or from the wall adapter. Set the appropriate jumper configuration before connecting any of the power sources.

To power up the lite kit, connect the Micro-USB cable between the lite kit and the host system. The same connection (KitProg3) also provides the programming and debugging over the CMSIS-DAP interface.

### 2.2.1 Power from USB

By default, the lite kit is configured to run on 5 V. Ensure the power jumpers J35 and J36 are closed on position (J35_2-J35_3 and J36_2-J36_3) for USB-powered configuration. In case of USB power, the different sections power requirements are as follows:

- MCU power: VBAT from USB (5 V)
- mikroBUS power: 5 V from USB (5 V) and 3V3 from LDO
- XENSIV™ bus power: 5 V from USB (5 V) and 3V3 from LDO
- Arduino bus power: 5 V from USB (5 V) and 3V3 from LDO
- IFX bus power: 5 V from USB (5 V) and 3V3 from LDO
- Peripheral power: 3V3 from LDO

### 2.2.2 Power from wall adapter

The lite kit provides an option to run on 12 V from the power adapter or the automotive battery. Ensure the power jumpers J35 and J36 are closed on positions (J35_1-J35_2 and J36_1-J36_2) for a 12 V powered configuration. In case of the power adapter, the different sections power requirements are as follows:

- MCU power: VBAT from power adapter (12 V)
- mikroBUS power: 5 V from LDO (5 V) and 3V3 from LDO
- XENSIV™ bus power: 5 V from LDO (5 V) and 3V3 from LDO
- Arduino bus power: 5 V from LDO (5 V) and 3V3 from LDO
- IFX bus power: 5 V from LDO (5 V) and 3V3 from LDO
- Peripheral power: 3V3 from LDO

To power up the lite kit from the battery or adapter, connect the wall adapter to J14, and slide SW4 to the adapter side. The power LED (LED5) lights up when the power switch is set to the wall adapter.

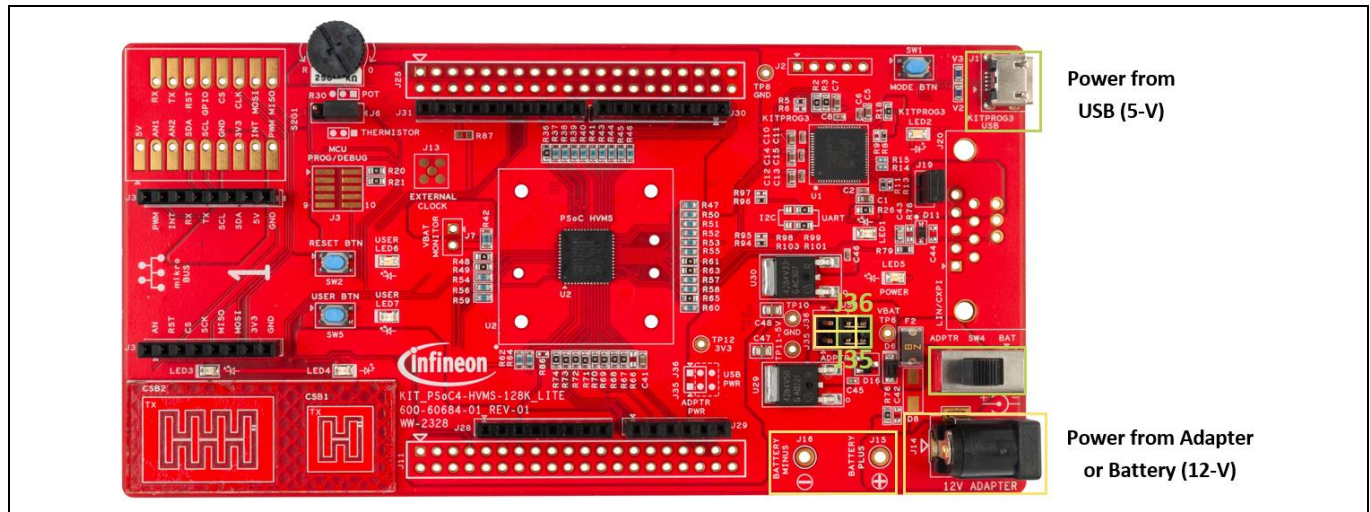**Figure 5**       **Available power inputs for lite kit**

*Note:*           *With the USB Power mode, the PSOC™ 4 HVMS device supports LIN/CXPI slave configuration only.*

## 2.3       Hands-on shipping firmware

The KIT_PSoC4-HVMS-128K_LITE kit comes with preinstalled firmware to check all the onboard peripherals. The firmware logs different events on the serial USB or LIN slave interface. For simplicity, the serial console is set as a default mode and all the events will be sent to the serial terminal with the fixed event IDs.

## 2.3.1       Hardware and tool setup

To check the preinstalled firmware on the KIT_PSoC4-HVMS-128K_LITE kit, follow these steps to set up and communicate with the host system:
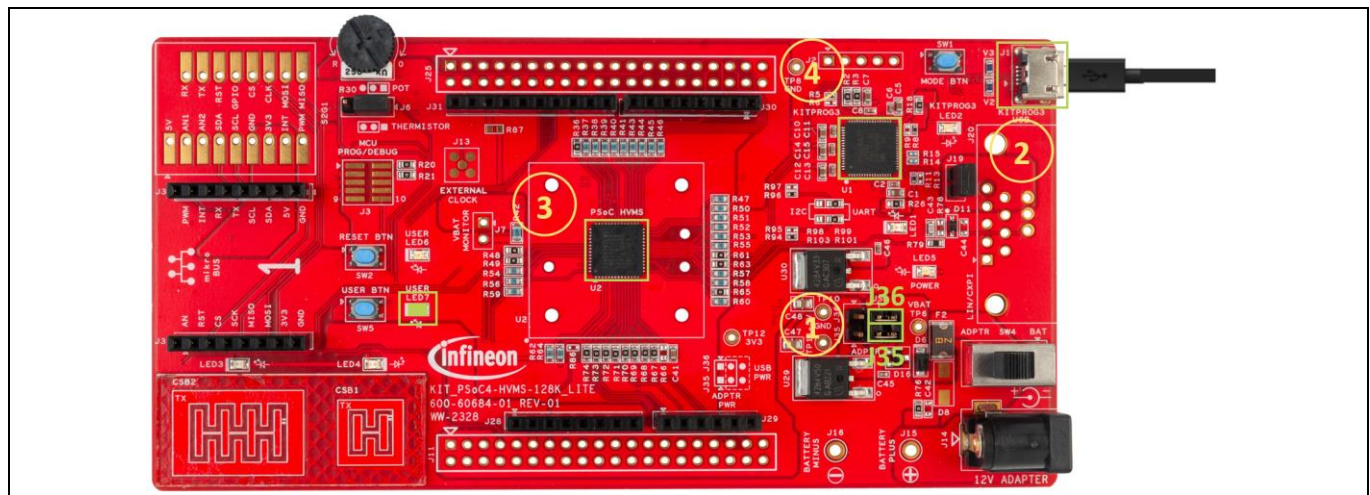


**Figure 6**       **KIT_PSoC4-HVMS-128K_LITE kit and tool setup**

1. Before powering up the lite kit, ensure that the power selection jumpers J35 and J36 are at the 5-V position.
2. Connect the USB cable from the PC to the lite kit. The lite kit is powered by the PC via the USB cable (5 V). Ensure that the power LED5 (blue LED) is turned ON.
3. When powered on, the PSOC™ HVMS device starts executing the pre-installed firmware, which is indicated by the blinking User LED7 (green LED).

4. To communicate with the PC, set up TeraTerm on the PC to send and receive messages to or from the lite kit. Follow these configurations in the TeraTerm:

   **Port**: COMx: KitProg3 USB-UART (COMx)
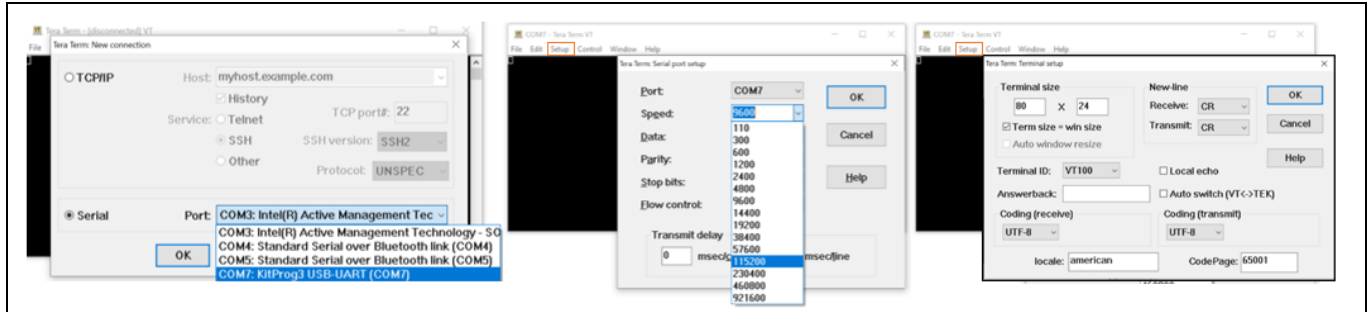
   **Speed**: 115200



**Figure 7          TeraTerm setup**

## 2.3.2          Software checks

The lite kit comes with the pre-installed firmware and as soon as it is powered on, it will start executing. After completing the tool setup, follow these steps to check the firmware and lite kit features:

1. Reset the PSOC™ HVMS device using the reset switch SW2; User LED7 starts blinking.
2. Press the user switch SW5 to toggle the user LED6 (red LED) and monitor the switch event in the TeraTerm window with event ID 1.
3. Touch on any of the CAPSENSE™ buttons CSB1 or CSB2 to trigger the event with event ID 2, and the same can be verified using the onboard LEDs (LED3 and LED4).
4. Move the potentiometer R30 to check the voltage applied to the ADC pin; the millivolt readings will be logged as event ID 3 on the TeraTerm window.
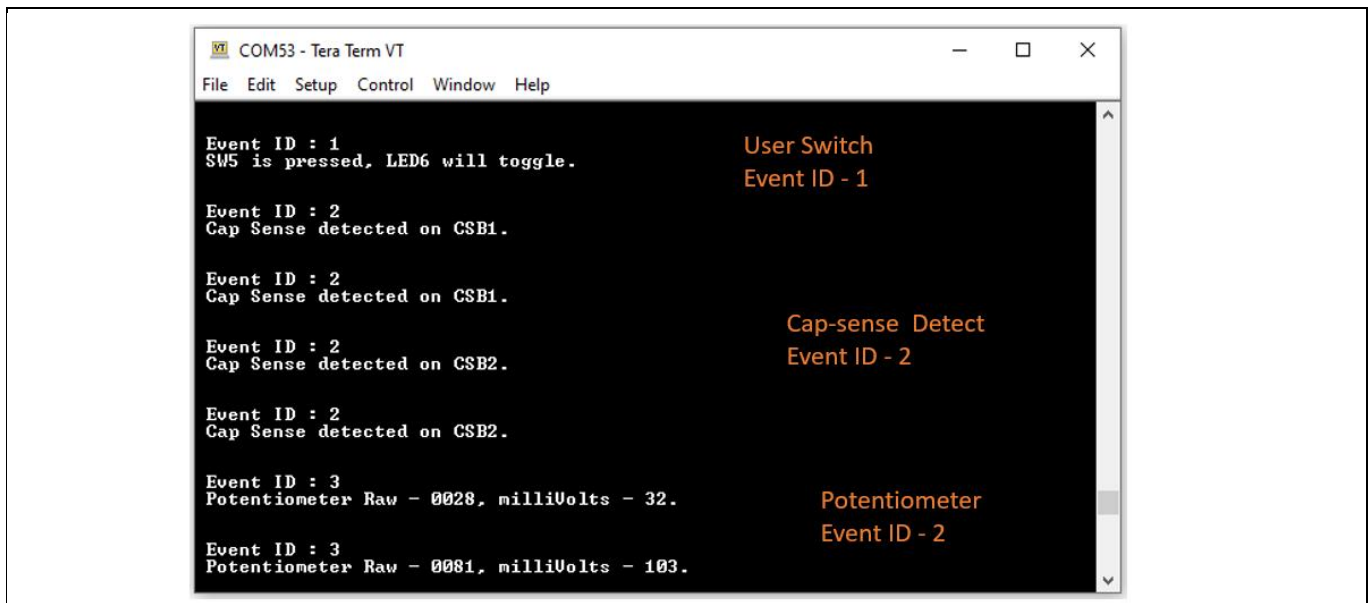


**Figure 8          Firmware checks with onboard peripherals**

# 3 Hardware

## 3.1 PSOC™ HVMS device

The KIT_PSoC4-HVMS-128K_LITE kit comes with the PSOC™ HVMS device CY8C4147LWE soldered onto the board. The board also has a provision to install the MCU socket; a supported socket part is given for reference.

**Table 4** **IC socket description**

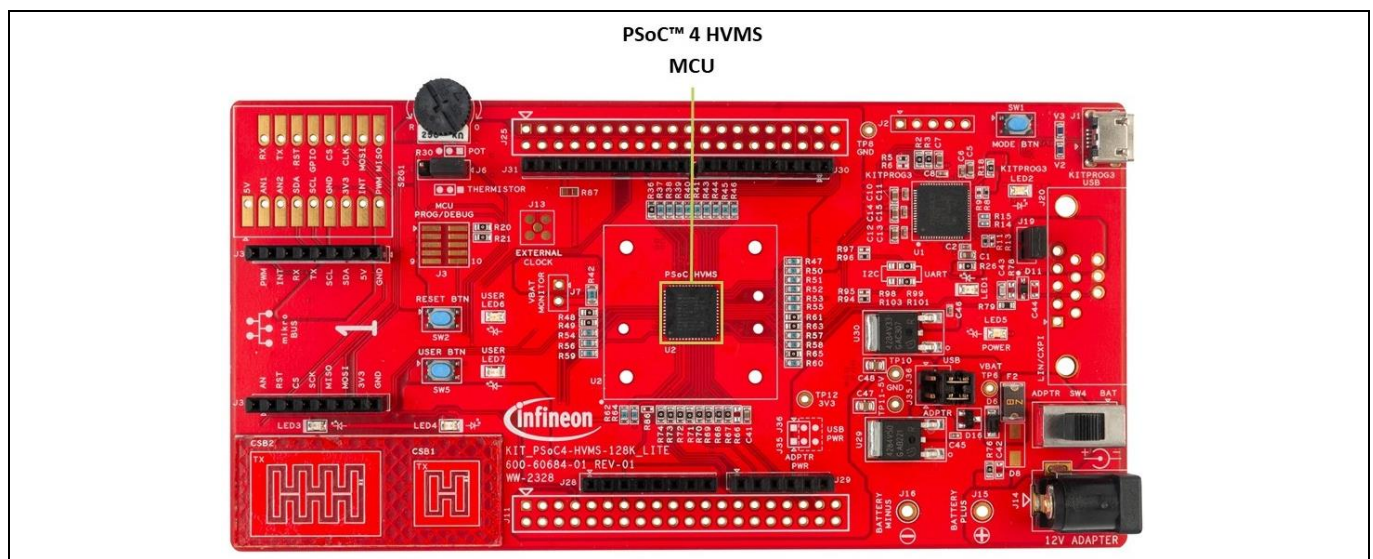| Reference | Manufacturer | Part number | Size | Supported package |
|---|---|---|---|---|
| U2 | Infineon Technologies | CY8C4147LWE | 8 mm × 8 mm | 56-QFN |
| Socket | Enplas Corporation | QFN-56AMG-0.5-005S-00 | 25 mm × 25 mm | 56-QFN (8 x 8 mm) |



**Figure 9** **PSOC™ HVMS device**

## 3.2 Power supply

The following are three power inputs:

- 5 V from the USB connector
- 12 V from the wall adapter
- 12 V from battery connector (optional)

The power switch SW4 controls the wall adapter and battery connector. The USB connector is diode-ORed with the VBAT input of the CPU. It is the main power supply for devices with VDDD = 3.3 V (see ordering information from PSOC™ HVMS datasheet [1]) and the cable comes with the kit package.
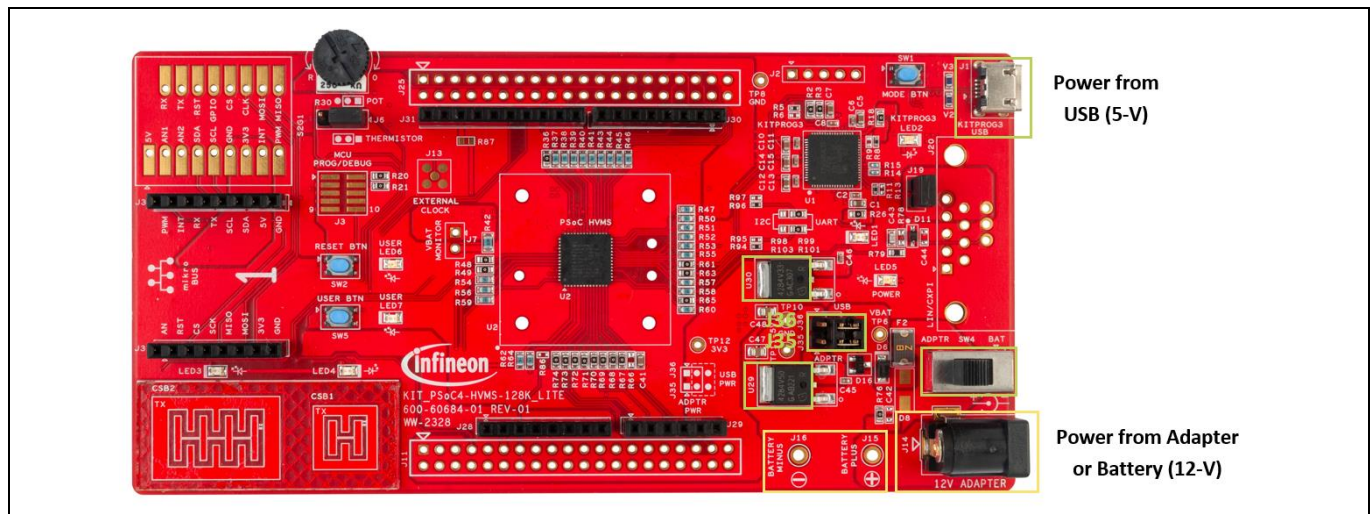
**Figure 10**       **Power supply configuration on lite kit**

*Note:*

1. *By default, the KIT_PSoC4-HVMS-128K_LITE kit supports 5-V power input from the USB port. To change the power input configuration, remove the resistor from positions 2-3 of connectors J35 and J36 and install the resistor on positions 1-2 of connectors J35 and J36.*
2. *To power up the entire lite kit, two LDOs are used to generate the 5 V (U29) and 3.3 V (U30). If using USB (5 V) power, bypass the LDO used for generating 5 V (U29).*

## 3.3       CAPSENSE™ buttons

The KIT_PSoC4-HVMS-128K_LITE kit has two onboard CSX buttons (100 x 100 mm (CSB1) and 200 x 130 mm (CSB2)). The board uses a fishbone pattern for mutual-capacitance CAPSENSE™ buttons. The Tx terminal forms a box or ring around the button for shielding the Rx terminal from noise. There are interlaced Tx and Rx prongs inside the border to form an electric field (for more details, see AN85951- PSOC™ 4 and PSOC™ 6 MCU CAPSENSE™ design guide).

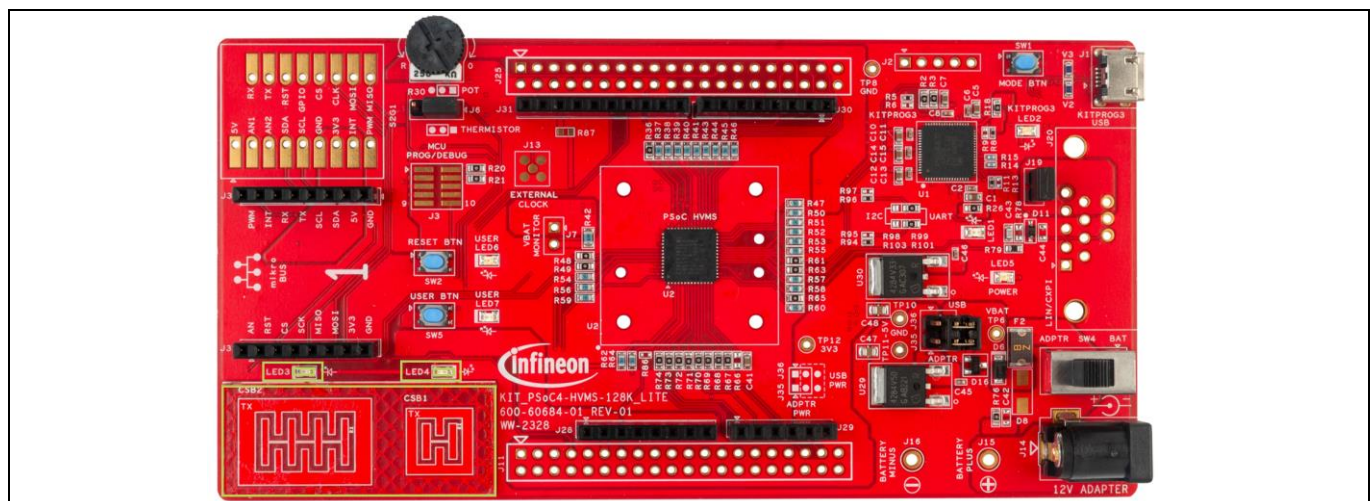Two dedicated LEDs are available on board (LED3 and LED4) to indicate the events on the CSX buttons (CSB1 and CSB2).



**Figure 11**       **CAPSENSE™ buttons on lite kit**

## 3.4 Potentiometer and temperature sensor

The KIT_PSoC4-HVMS-128K_LITE kit has a temperature sensor and potentiometer onboard to evaluate the analog functions. The temperature sensor uses a thermistor (R29) with a divider resistor and the potentiometer (R30) uses a 250k variable resistor.

**Table 5        Thermistor description**

| Reference | Manufacturer | Part number | Description |
|---|---|---|---|
| R29 | TDK Corporation | NTCG103JF103FT1S | 10 kΩ, 1%, 1/8 W, 0402 |
| R30 | Bourns | 3352T-1-254LF | POT, 250k, 20%, 1/2 W |

*Note:        See the vendor page for resistance and temperature characteristics.*

The source for temperature monitoring can be selected by jumper J6 between a thermistor (by closing positions 2-3) and a potentiometer (by closing positions 1-2).
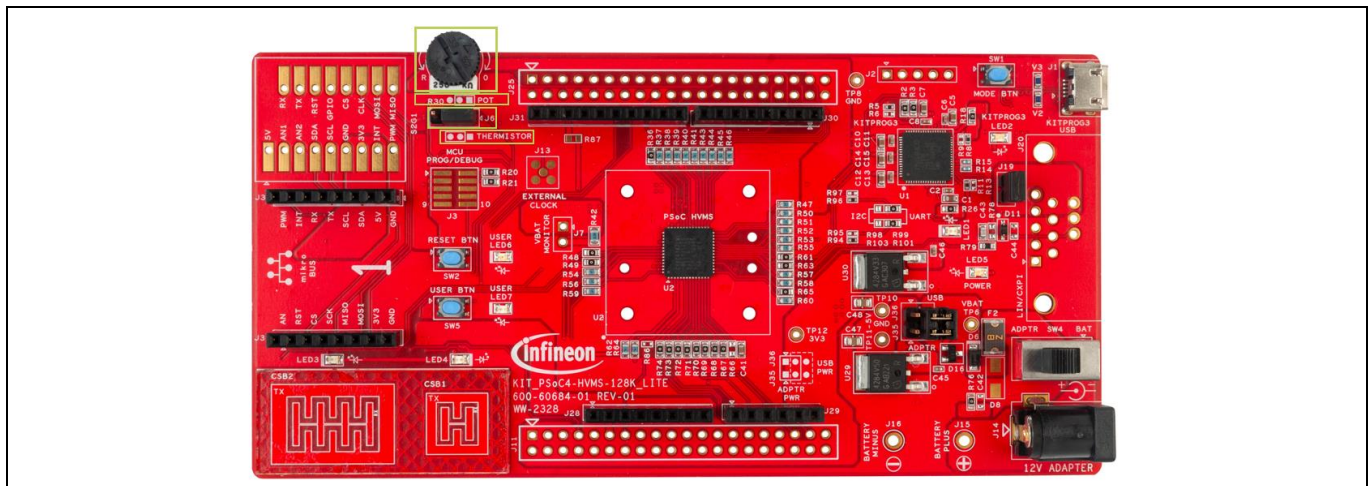


**Figure 12        Temperature sensor block of lite kit**

## 3.5 LIN and CXPI interfaces

The PSOC™ HVMS devices include a Local Interconnect Network (LIN)/Clock Extension Peripheral Interface (CXPI) transceiver and controller. It can connect the physical layer directly to the device. The KIT_PSoC4-HVMS-128K_LITE kit supports D-SUB9 male type connector and a 3-pin male connector (should be installed separately) for interfacing to the LIN/CXPI bus. The VBAT voltage is connected to pin 9 of the connector via a jumper J19.

**Table 6        LIN/CXPI connector description**

| Reference | Manufacturer | Part number | Description |
|---|---|---|---|
| J20 | NorComp Inc. | 182-009-113R531 | CONN D-SUB PLUG, 9POS |
| TP | Würth Elektronik | 61300311121 | Header Vertical, 3-pin, 2.54 mm |

*Note:        To use LIN/CXPI on kit, connect the power adapter to the kit J14.*
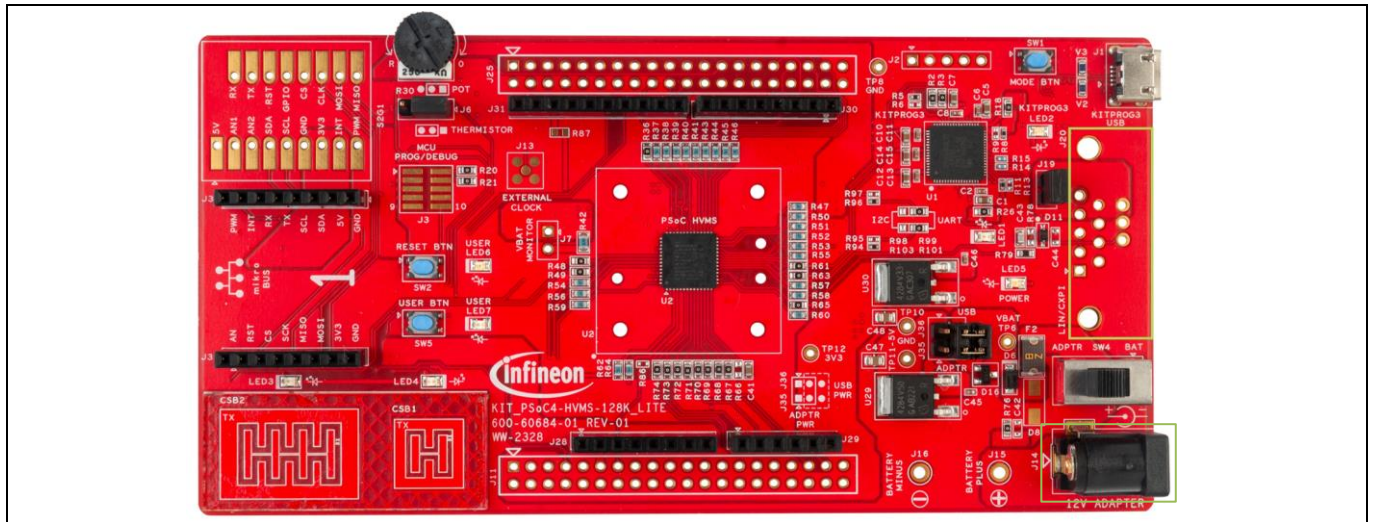
**Figure 13          LIN/CXPI interface on lite kit**

## 3.6          KitProg3 USB program interface

KitProg3 is the Infineon low-level communication firmware for programming and debugging. It provides communication between the programming tool (AutoFlash Utility) and a target PSOC™ HVMS device.

KitProg3 uses the industry-standard Serial Wire Debug (SWD) protocol. It uses CMSIS-DAP V2.0.0 and V1.2.0 as the bulk and HID endpoint transport mechanisms.

KitProg3 also supports bridging: USB-to-UART and USB-I2C. See the KitProg user guide **Error! Reference source not found.** for more information.
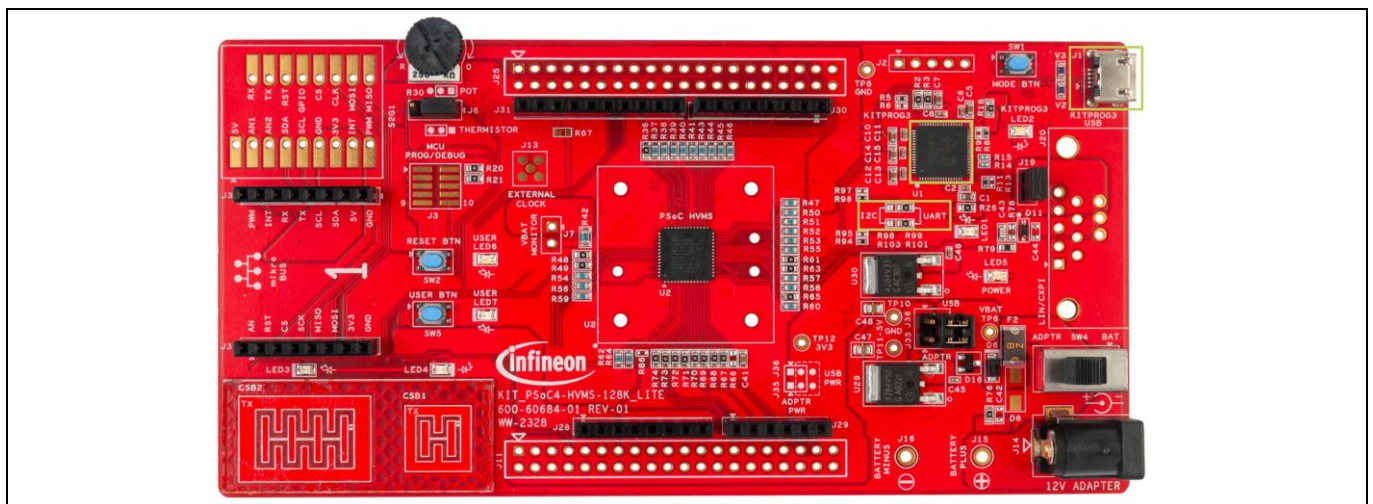


**Figure 14          KitProg3 USB program interface on lite kit**

*Note:*          *By default, the bridging between the KitProg3 and CPU is configured for the USB-to- UART interface. To use the USB-I2C bridge on the kit, remove the resistors from the UART position and install resistors in the I2C position, see Figure 14.*

## 3.7 Third-party debugger connector

The KIT_PSoC4-HVMS-128K_LITE kit supports an Arm® 10-pin MIPI connector for programming and debugging. The connector is wired-ORed with the KitProg3 program interface and is directly connected to the PSOC™ HVMS device through the SWD interface. The connector J3 should be assembled separately.

**Table 7      Arm® 10-pin MIPI connector**

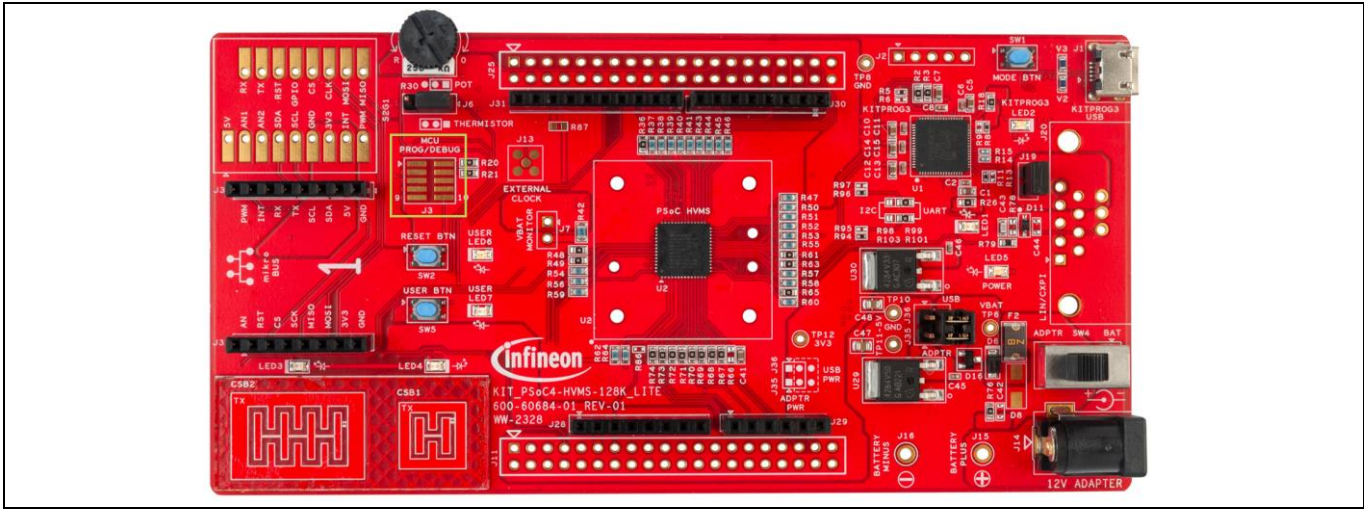| Reference | Manufacturer | Part number | Description |
|---|---|---|---|
| J3 | Samtec Inc. | FTSH-105-01-L-DV-K | Header Male, 10-pin, 1.27 mm, SMD |



**Figure 15      Third-party debugger connector on lite kit**

## 3.8 Extension headers

The KIT_PSoC4-HVMS-128K_LITE kit provides a variety of header expansions to be compatible with the most popular interfaces. The kit is designed to have an Arduino-compatible connection header, Infineon standard connector interface, mikroBUS header, and XENSIV™ bus.
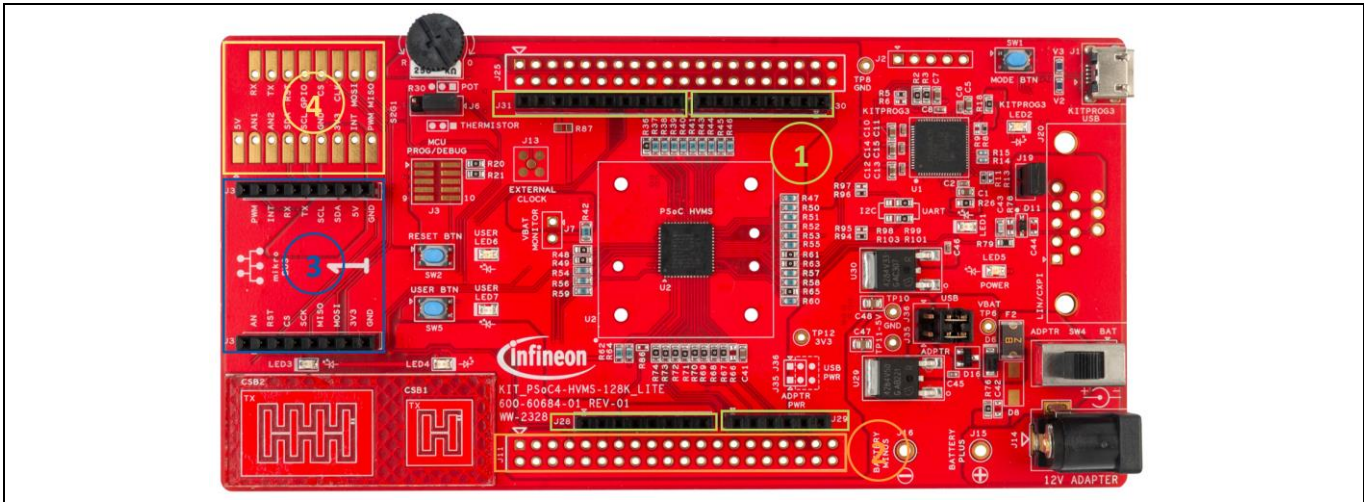


**Figure 16      Extension headers on lite kit**

## 3.8.1 Arduino-compatible header

**Table 8** **Pin assignment of Arduino-compatible connections**

| Connector | Pin number | Pin name | KIT_PSoC4-HVMS-128K_LITE connections |
|---|---|---|---|
| J28 | 1 | NC | - |
| J28 | 2 | IOREF | VDDIO |
| J28 | 3 | RESET | XRES |
| J28 | 4 | 3V3 | 3P3V_LDO |
| J28 | 5 | 5V | 5V_LDO |
| J28 | 6 | GND | DGND |
| J28 | 7 | GND | DGND |
| J28 | 8 | VIN | VBAT |
| J29 | 1 | A0 | P5_2 |
| J29 | 2 | A1 | P5_3 |
| J29 | 3 | A2 | P5_4 |
| J29 | 4 | A3 | P5_5 |
| J29 | 5 | A4/SDA | P5_0 |
| J29 | 6 | A5/SCL | P5_1 |
| J30 | 1 | D0/RX | P0_1 |
| J30 | 2 | D1/TX | P0_1 |
| J30 | 3 | D2 | P0_5 |
| J30 | 4 | D3 | P0_2 |
| J30 | 5 | D4 | P0_3 |
| J30 | 6 | D5 | P0_4 |
| J30 | 7 | D6 | P3_3 |
| J30 | 8 | D7 | P3_2 |
| J31 | 1 | D8 | P3_0 |
| J31 | 2 | D9 | P3_1 |
| J31 | 3 | D10/SS | P1_3 |
| J31 | 4 | D11/MOSI | P5_1 |
| J31 | 5 | D12/MISO | P5_0 |
| J31 | 6 | D13/SCK | P1_1 |
| J31 | 7 | GND | DGND |
| J31 | 8 | AREF | VDDA |
| J31 | 9 | SDA | P5_0 |
| J31 | 10 | SCL | P5_1 |

### 3.8.2 Infineon standard header

**Table 9** **Pin assignment of Infineon standard connections**

| Connector | Pin number | Pin name | KIT_PSoC4-HVMS-128K_LITE connections |
|-----------|-----------|----------|--------------------------------------|
| J11 | 1 | 3V3 | 3P3V_LDO |
| J11 | 2 | GND | DGND |
| J11 | 39 | GND | DGND |
| J11 | 40 | 5V | 5V_LDO |
| J25 | 1 | 3V3 | 3P3V_LDO |
| J25 | 2 | GND | DGND |
| J25 | 39 | GND | DGND |
| J25 | 40 | 5V | 5V_LDO |

### 3.8.3 mikroBUS-compatible header

**Table 10** **Pin assignment of mikroBUS-compatible connections**

| Connector | Pin number | Pin name | KIT_PSoC4-HVMS-128K_LITE connections |
|-----------|-----------|----------|--------------------------------------|
| J32 | 1 | AN | P5_6 |
| J32 | 2 | RST | P0_5 |
| J32 | 3 | CS | P1_2 |
| J32 | 4 | SCK | P1_1 |
| J32 | 5 | MISO | P5_0 |
| J32 | 6 | MOSI | P5_1 |
| J32 | 7 | 3V3 | 3P3V_LDO |
| J32 | 8 | GND | DGND |
| J33 | 1 | GND | DGND |
| J33 | 2 | 5V | 5V_LDO |
| J33 | 3 | SDA | P0_1 |
| J33 | 4 | SCL | P0_0 |
| J33 | 5 | TX | P0_1 |
| J33 | 6 | RX | P0_0 |
| J33 | 7 | INT | P0_6 |
| J33 | 8 | PWM | P0_4 |

### 3.8.4 XENSIV™ header

**Table 11    Pin assignment of XENSIV™ bus connections**

| Connector | Pin number | Pin name | KIT_PSoC4-HVMS-128K_LITE connections |
|---|---|---|---|
| S2G1 | 1 | 5V | 5V_LDO |
| S2G1 | 2 | AN1 | P5_6 |
| S2G1 | 3 | AN2 | P5_7 |
| S2G1 | 4 | SDA | P0_1 |
| S2G1 | 5 | SCL | P0_0 |
| S2G1 | 6 | GND | DGND |
| S2G1 | 7 | 3V3 | 3P3V_LDO |
| S2G1 | 8 | INT | P3_2 |
| S2G1 | 9 | PWM | P0_2 |
| S2G1 | 10 | MISO | P5_0 |
| S2G1 | 11 | MOSI | P5_1 |
| S2G1 | 12 | CLK | P1_1 |
| S2G1 | 13 | CS | P1_6 |
| S2G1 | 14 | GPIO | P3_1 |
| S2G1 | 15 | RST | P3_0 |
| S2G1 | 16 | TX | P0_1 |
| S2G1 | 17 | RX | P0_0 |

### 3.8.5 Groove header

**Table 12    Pin assignment of Groove bus connections**

| Connector | Pin number | Pin name | KIT_PSoC4-HVMS-128K_LITE connections |
|---|---|---|---|
| J26 | 1 | SCL | P5_1 |
| J26 | 2 | SDA | P5_0 |
| J26 | 3 | 3V3 | 3P3V_LDO |
| J26 | 4 | GND | DGND |

## 3.9 Other peripherals

The GPIO pins are grouped into ports; a port can have up to eight GPIOs. See Table 13 for GPIO pin assignments of the KIT_PSoC4-HVMS-128K_LITE board. Table 13 shows the connection to other peripherals.

**Table 13** GPIO pins used by peripherals

| GPIO pin assignment | Description |
|---|---|
| XRES pin | Connected to an external reset switch (SW2) with a 0.1-µF capacitor |
| User switch | SW5 (GPIO P5.5) |
| User LEDs | LED7 (GPIO P0.6 - green), LED6 (GPIO P0.7 - red) |
| External clock input | J13 (GPIO P0.1) |
| CTBm shunt resistor | 100 mΩ shunt resistor R107 (connected across GPIO P7.0 and GPIO P7.1) |
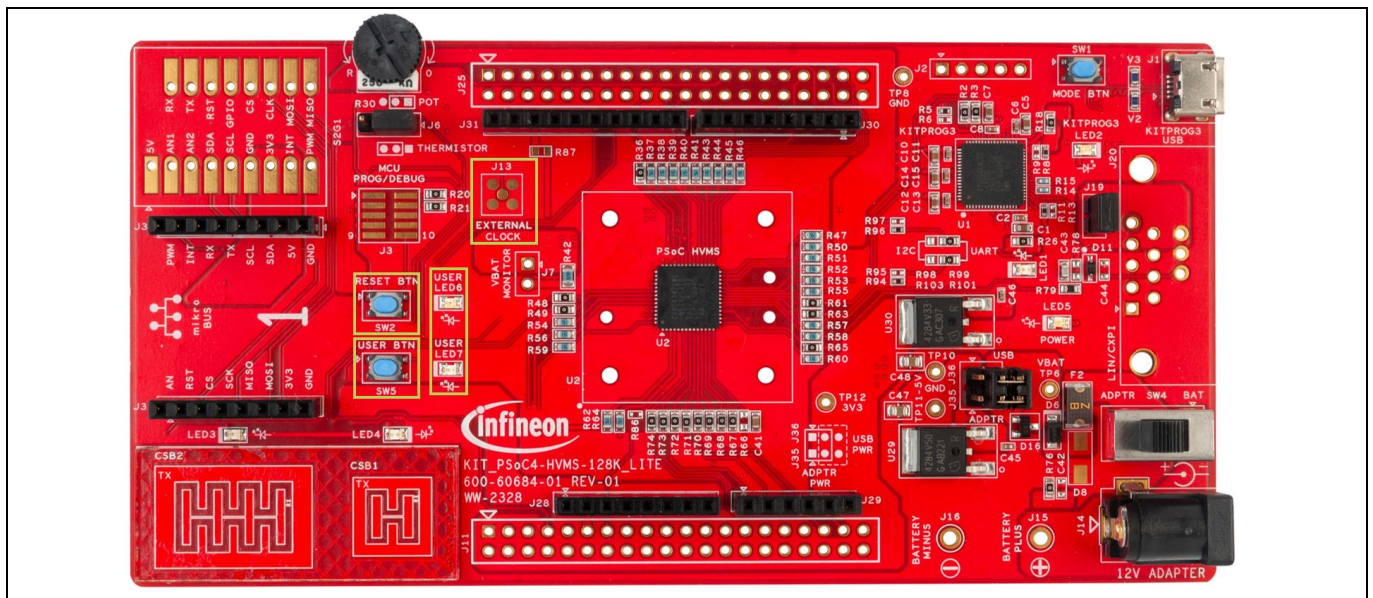


**Figure 17** Onboard peripherals

# 4 Programming and debugging

## 4.1 Program using AutoFlash utility

Download and install the AutoFlash utility (contact Technical support to obtain the program tool).

The AutoFlash utility is a flexible, cross-platform, integrated application to allow programming Infineon devices. It can perform program, erase, verify, and read operations on the flash of the target device. It can target an entire device, a specific region, a sector, and even a byte in a device.

To program the PSOC™ HVMS device (CPU) using the AutoFlash utility, connect the Micro-USB cable to the board. The board gets the power supply from the USB bus power and the same will be used for programming.

The MCU flash data is programmed via the PSOC™ 5 LP device in KitProg3, which is the Infineon low-level communication firmware for programming and debugging. See the PSOC™ programmer user guide and KitProg3 user guide **Error! Reference source not found.** for more information.
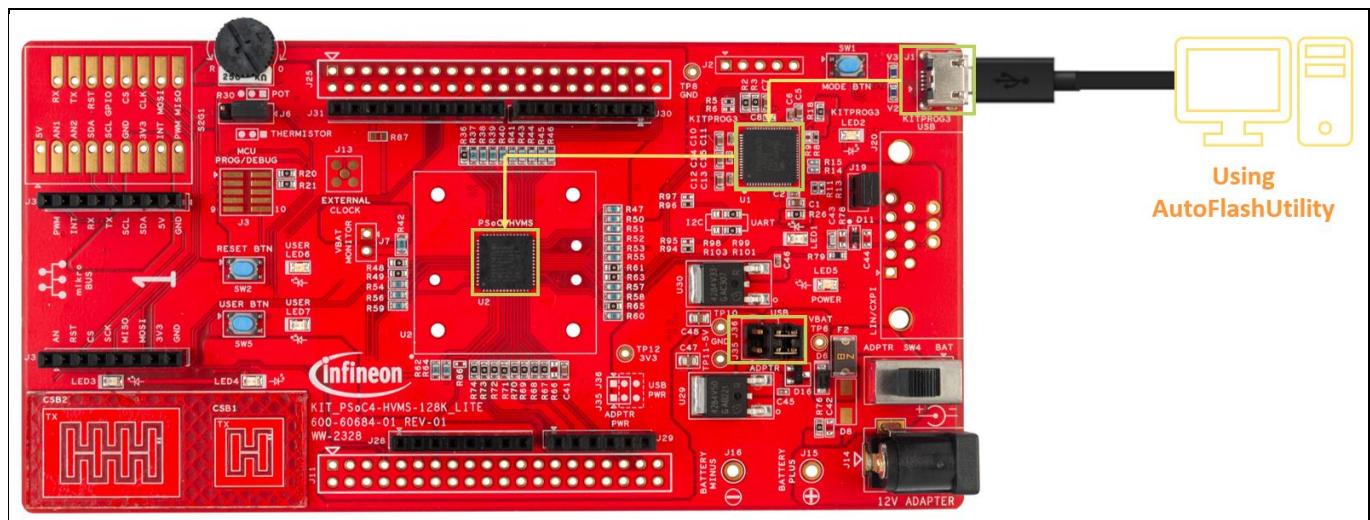


**Figure 18        Program via KitProg3**

1.  Connect the Micro-USB cable from the host system to the lite kit.
2.  Open a command prompt and navigate to the *AutoFlashUtility* installation path:
    *cd C:\Program Files (x86)\Infineon\Auto Flash Utility 1.x\bin\*
3.  Copy and paste the executable file *cm0plus.hex or cm0plus.out* into the *bin* folder.
4.  Enter the following command in the command prompt on your PC.

    *openocd -s ../scripts -f interface/kitprog3.cfg -c "transport select swd" -f target/psoc4hv_a0.cfg -c "program cm0plus.hex verify exit"*

5.  Wait for the "*program completed*" message to appear on the command prompt.
6.  Reset the lite kit using the reset button SW2.

## 4.2 Program and debug using an IAR Embedded Workbench

Download and install the latest AutoPDL for the PSOC™ HV devices on the target system. Install the AutoPDL outside the default program files to allow the IAR to access and create temporary files.

Follow the installation steps given in *"PSoC4HV_AutoPDL-MW_InstallationManual.pdf"* inside the *"Product"* folder. Install the below executables:

**Table 14      Executables**

| File | Description |
|------|-------------|
| *Product\PSoC4HV_AutoPDL-MW_V1.4.0.exe* | AutoPDL Driver and Middleware package |
| *Sample\PSoC4HV_DeviceHeaderFiles_V1.4.0.exe* | PSOC™ HV Device Headers |
| *Sample\PSoC4HV_AutoPDL_CodeExample_V1.0.1.exe* | PSOC™ HV Device Specific Examples |

*Note:      The code example package "PSoC4HV_AutoPDL_CodeExample_V1.0.1.exe" is specifically released for the KIT_PSOC4-HVMS-128K_LITE kit.*

Open the *"PSoC4HV_AutoPDL-MW_V1.4.0_DeliveryNotes.pdf"* from the installation folder of the AutoPDL and download the same version of IAR EWARM supported by the AutoPDL as mentioned in the document.

Download the software and run the installation (note that the installation might take some time). When you open the IAR EWARM for the first time, select the license in the license wizard. If you do not have the license, it is strongly recommended to register for a 'code size limited' license type.

The PSOC™ HVMS lite kit is now ready to use after a successful environment setup (USB driver installation, AutoPDL installation and IAR installation).

The IAR EWARM supports the debugging and programming using the Flash Program mode only.

The PSOC™ HV devices have a CM0+ core and the AutoPDL workspace details for the same are listed in Table 15.

**Table 15      IAR flash workspaces and functions**

| Workspace | Application core | Number of cores supported | Details |
|-----------|------------------|---------------------------|---------|
| Single-core CM0+ workspace "psoc4hvms128k_flash_cm0plus_template" | Yes | Single | Single-core download and debug for CM0+ core. |

Do the following to download and debug using the CM0+ core workspace:

1. Start IAR EWARM and open the AutoPDL template workspace file from:
   *AutoPDL_Installation_Directory \examples\Tools\psoc4hvms128\psoc4hvms128k_flash_cm0plus_template*
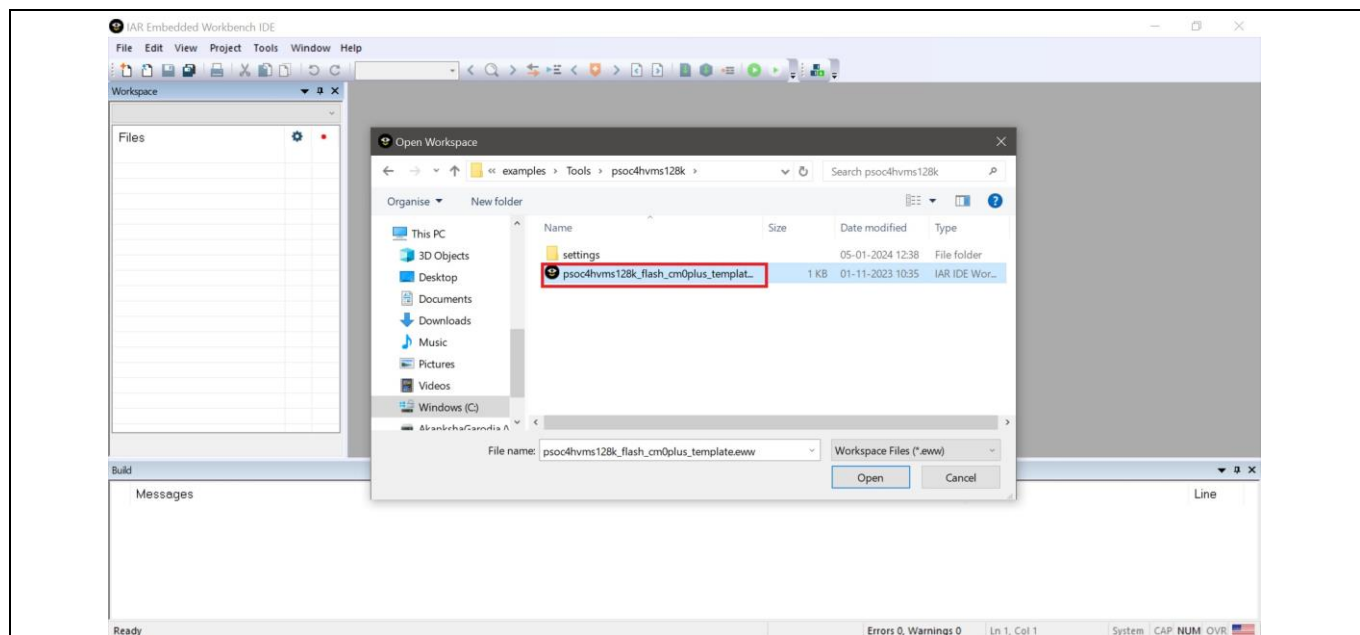
**Programming and debugging**



**Figure 19**       **Selecting CM0+ single-core template**

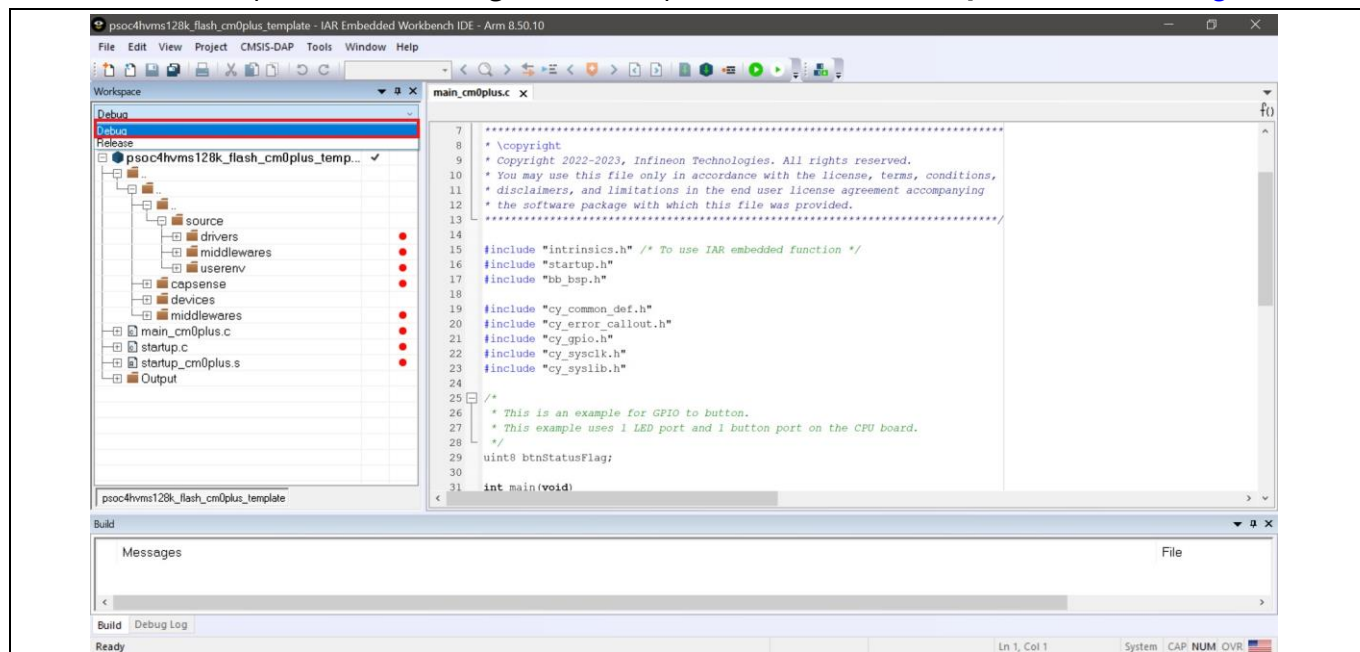2. Select the workspace revision **Debug** from the drop-down list under **Workspace**, as shown in Figure 20.



**Figure 20**       **Selecting workspace revision**

**Programming and debugging**

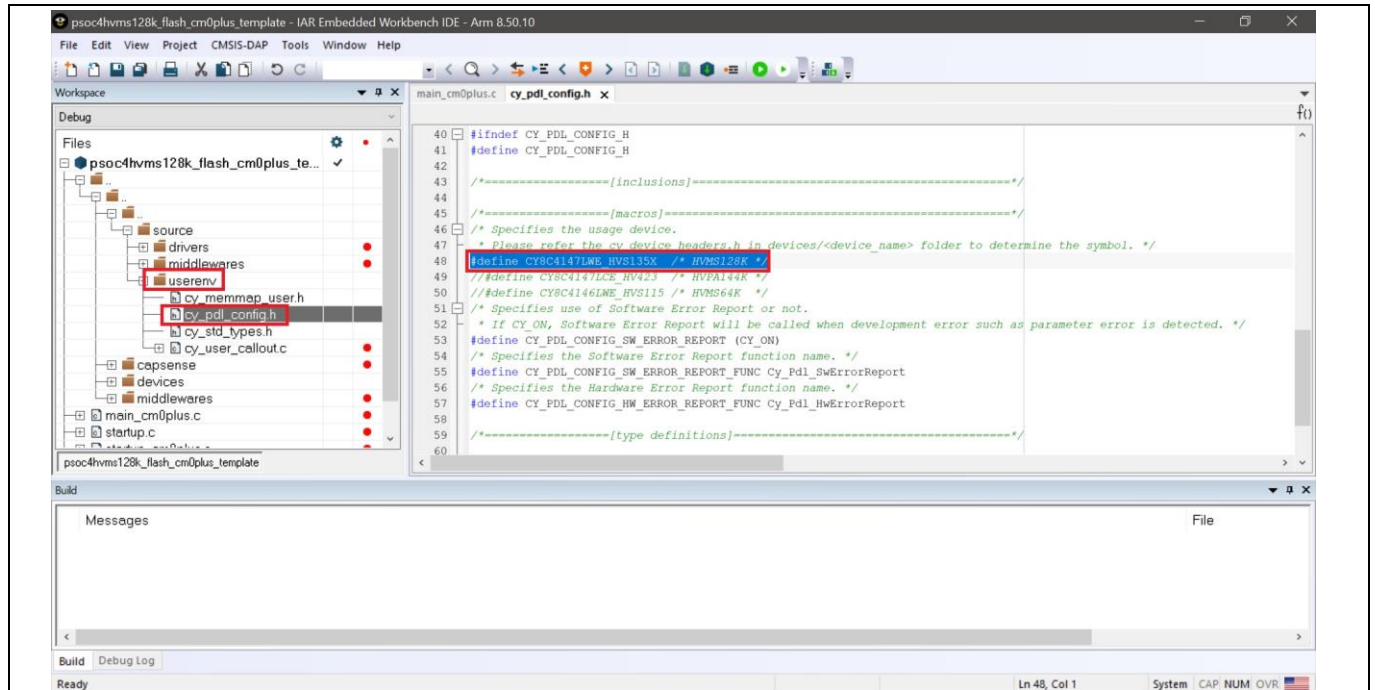3. Open "*cy_pdl_config.h*" present under "*userenv*" folder and select device for HVMS128K, as shown in Figure 21.



**Figure 21        Selecting target device**

4. Right-click **psoc4hvms128k_flash_cm0plus_template - Debug** and select **Rebuild All**.
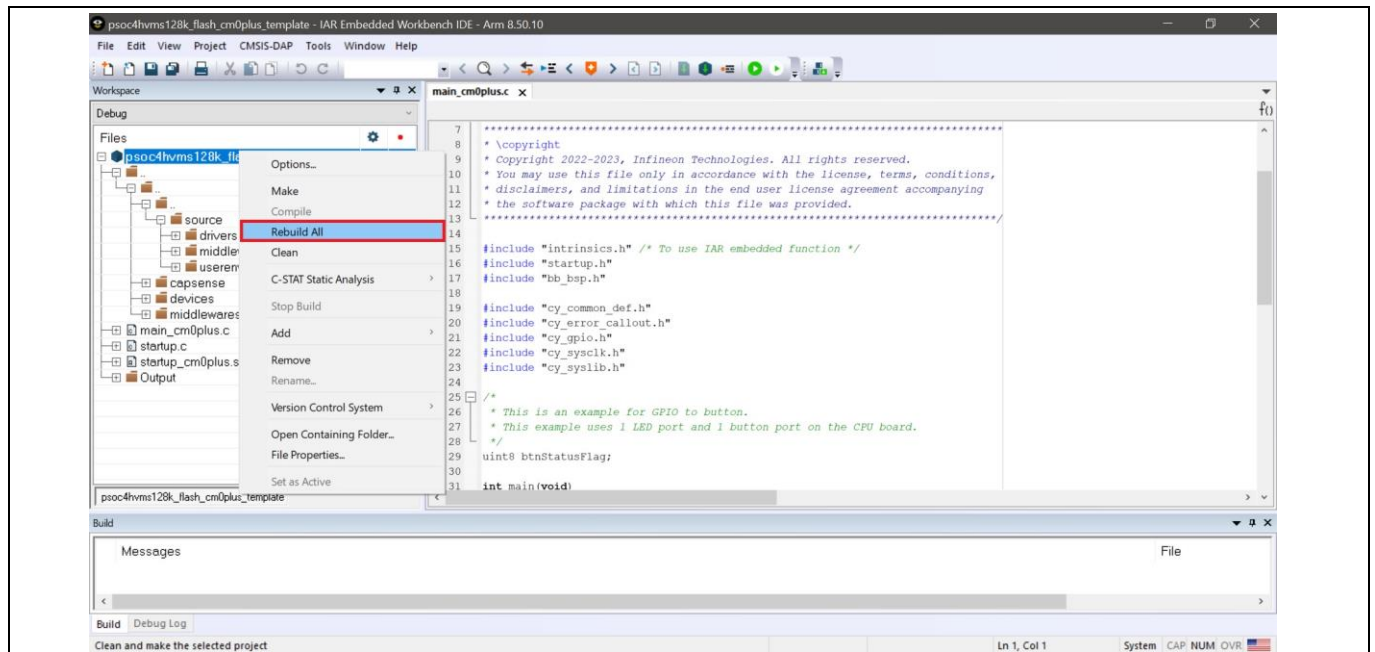


**Figure 22        Rebuilding workspace revision**

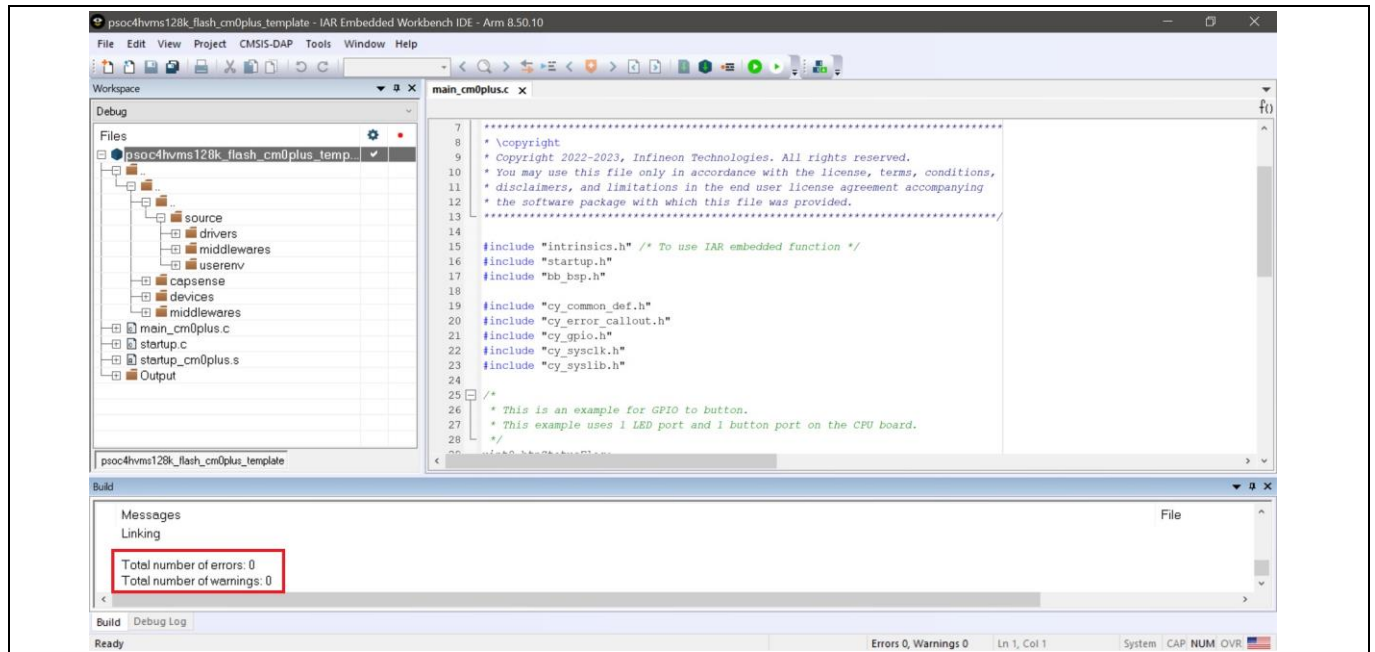5. The rebuild process starts. Check for errors and warnings in the **Build** log.



**Figure 23      Checking build status in build log**

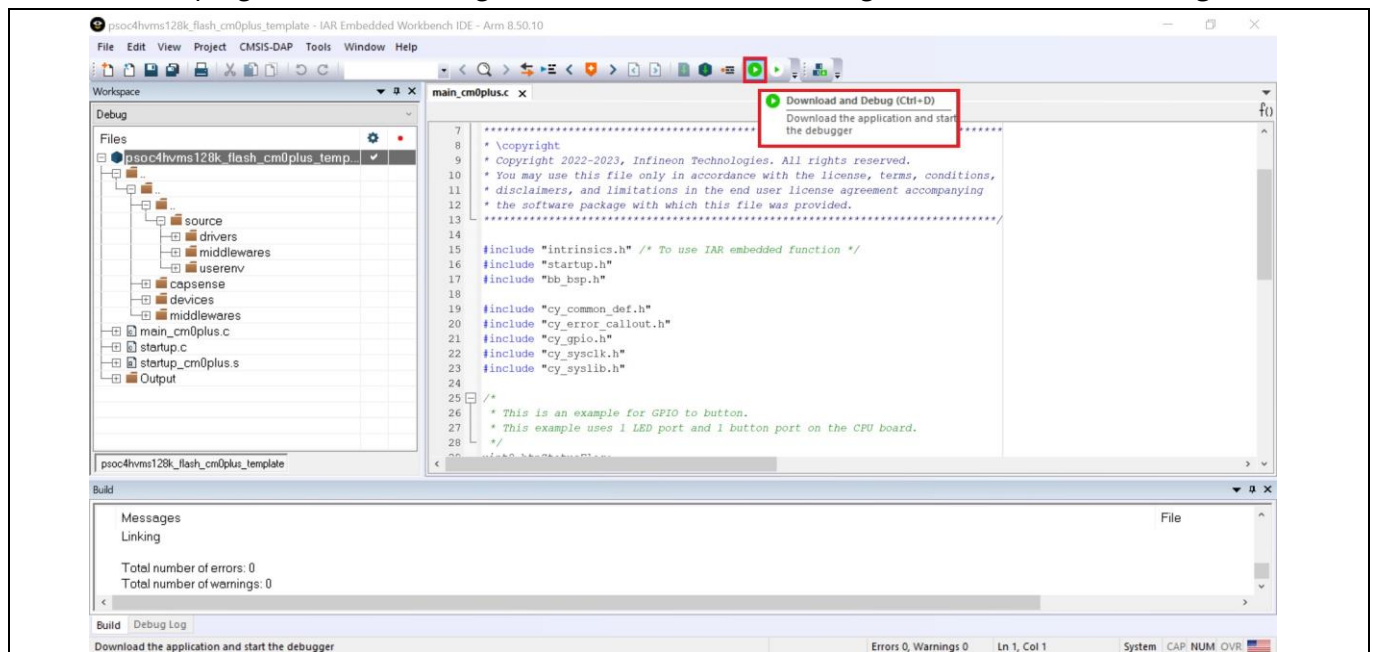6. To load the program to the flash region of the CM0+ core, click the green **Download and Debug** icon.



**Figure 24      Downloading and debugging**

**Programming and debugging**

7.  Click the **Go** button to start executing the code from MCU.

*Note:*           *You can also use the function keys in the Debug window: Go (F5), Step over (F10), Step into (F11), and Download and Debug (Ctrl+D).*
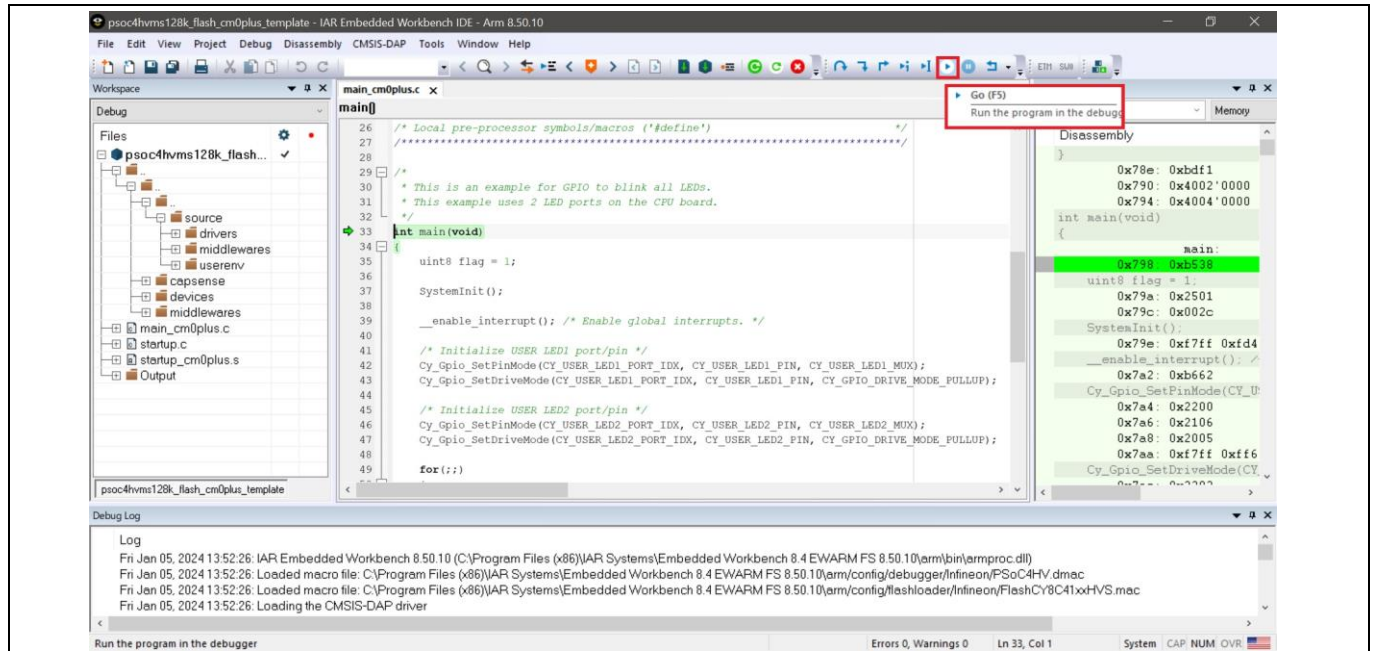


**Figure 25          Debugging with CM0+ core**

8.  In free-running execution, user LED6 and user LED7 should start blinking on the board.
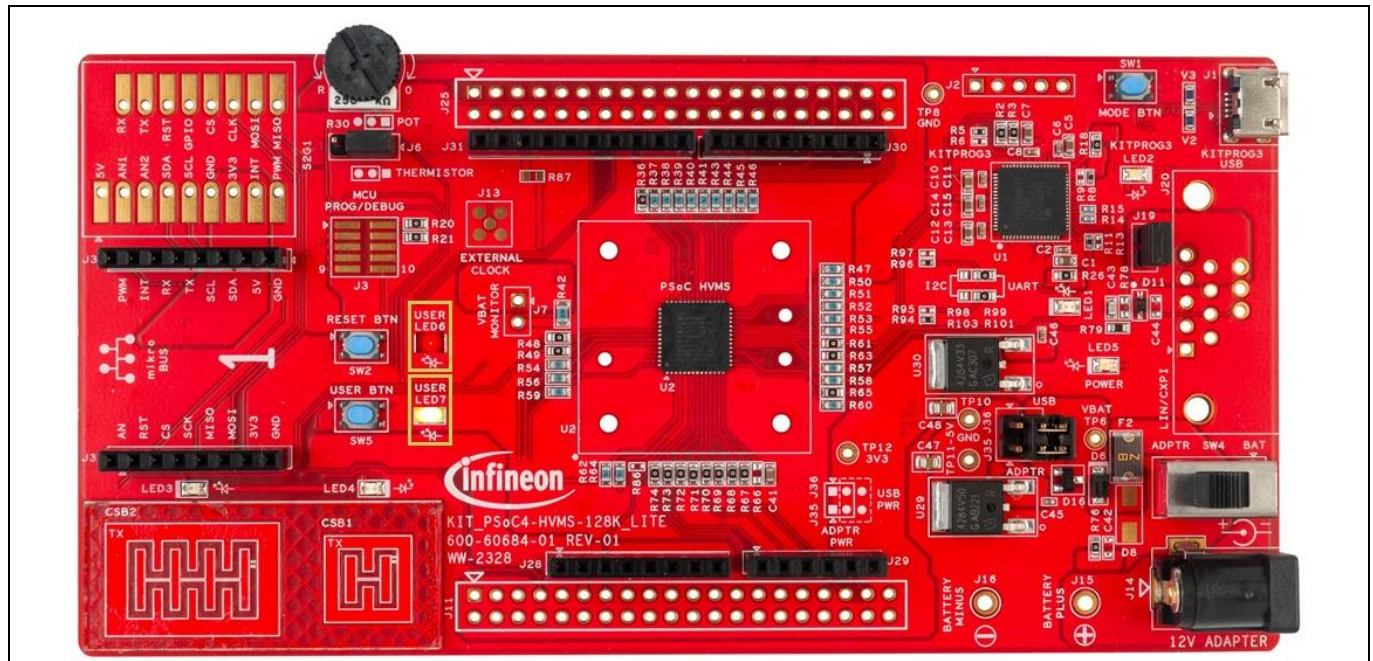


**Figure 26          Blinking user LED6 and user LED7**

# 5 Schematics and designs

## 5.1 KIT_PSoC4-HVMS-128K_LITE kit schematics

The section provides the KIT_PSoC4-HVMS-128K_LITE kit schematics.
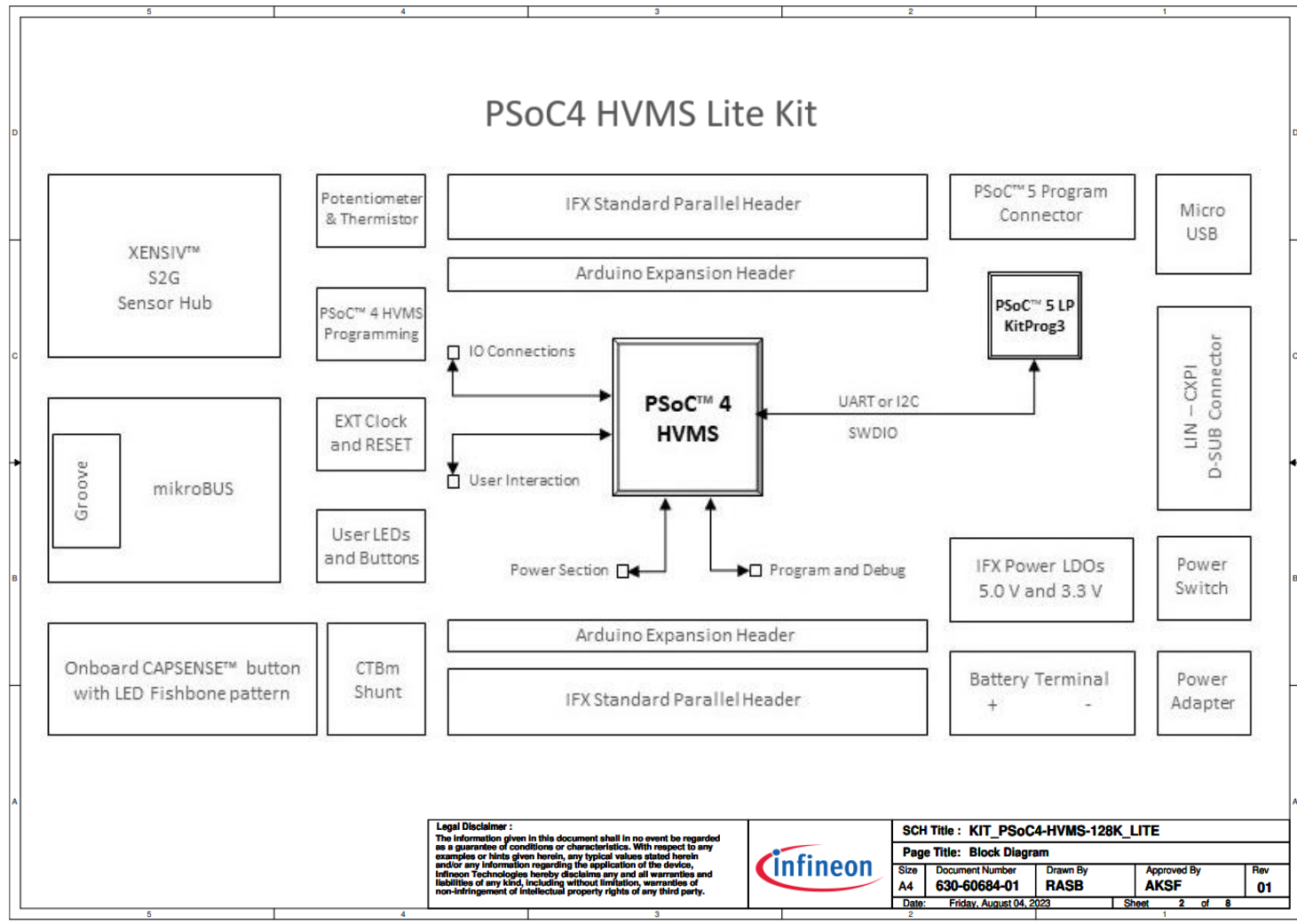
**KIT_PSoC4-HVMS-128K_LITE_REV_01**

| CONTENTS | |
|---|---|
| **PAGE** | **DESCRIPTION** |
| 01 | Title, Table of Contents & Drawing Numbers |
| 02 | Block Diagram |
| 03 | KitProg3 |
| 04 | Peripherals |
| 05 | PSoC HVMS |
| 06 | Power and Components |
| 07 | Arduino Connectors |
| 08 | Revision History |

**Drawing Number**

| PCBA | 121-60684-01 |
|---|---|
| PCB | 600-60684-01 |
| FAB DRW | 610-60684-01 |
| ASSY DRW | 620-60684-01 |
| SCH DRW | 630-60684-01 |

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SCH Title : KIT_PSoC4-HVMS-128K_LITE
Page Title: Title Page

| Size | Document Number | Drawn By | Approved By | Rev |
|---|---|---|---|---|
| A4 | 630-60684-01 | RASB | AKSF | 01 |
| Date: | Thursday, July 13, 2023 | | Sheet 1 of 8 | |

**Figure 27**     **KIT_PSoC4-HVMS-128K_LITE kit schematic**

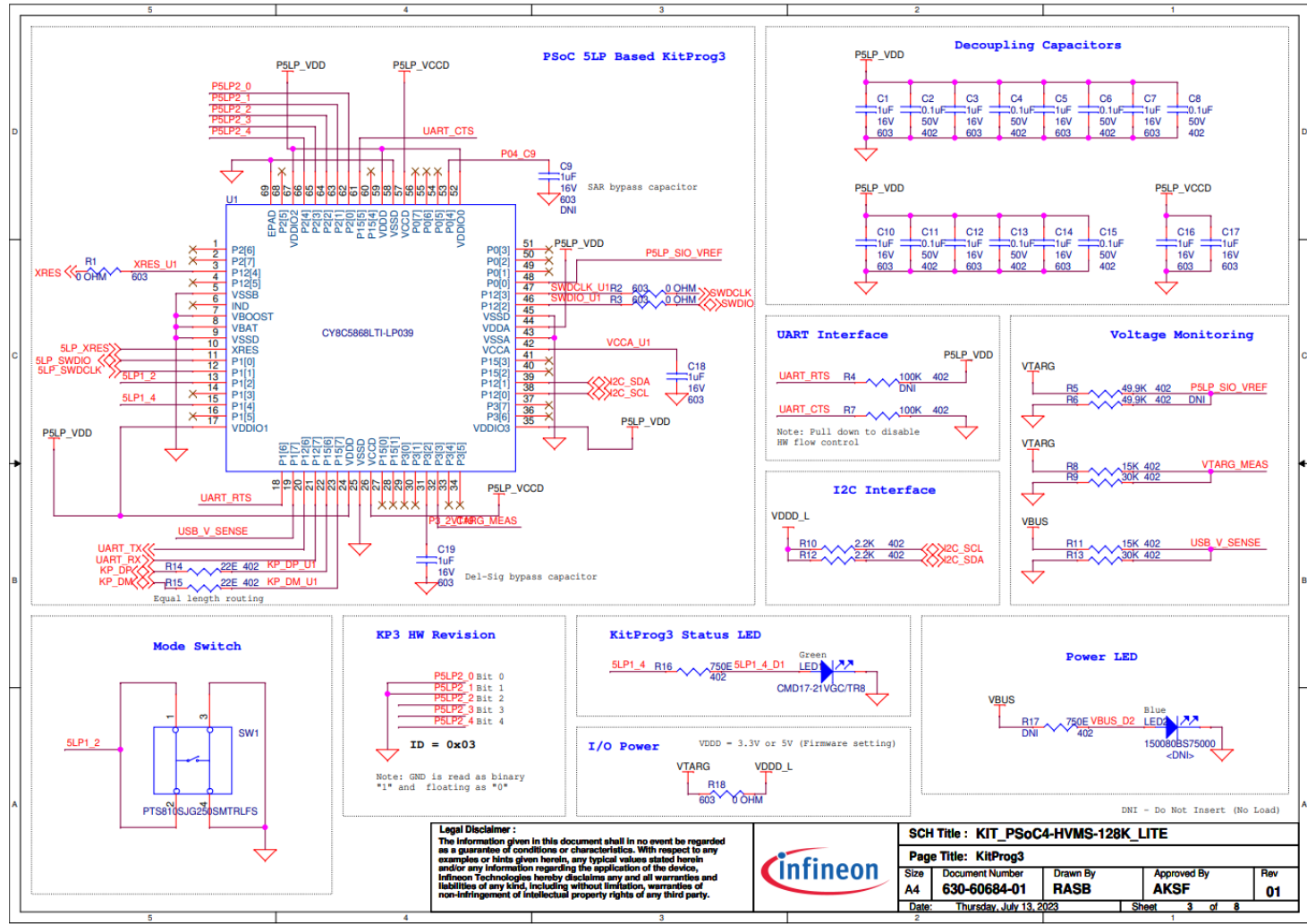**Figure 28** KIT_PSoC4-HVMS-128K_LITE kit block diagram

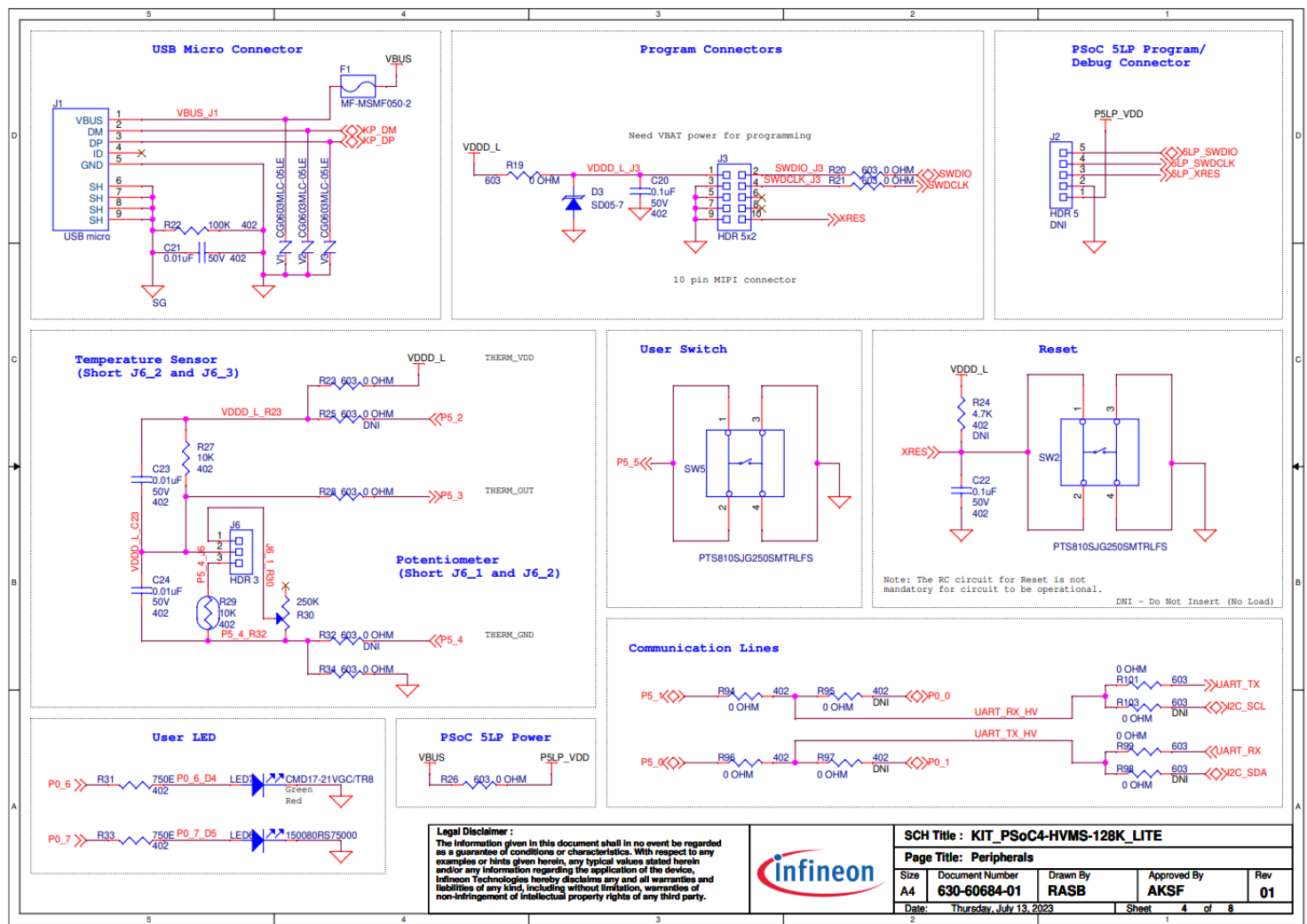**Figure 29    PSOC™ 5 LP-based Kit Prog3 schematics**

**Figure 30** PSOC™ 4 HVMS Lite Kit peripherals
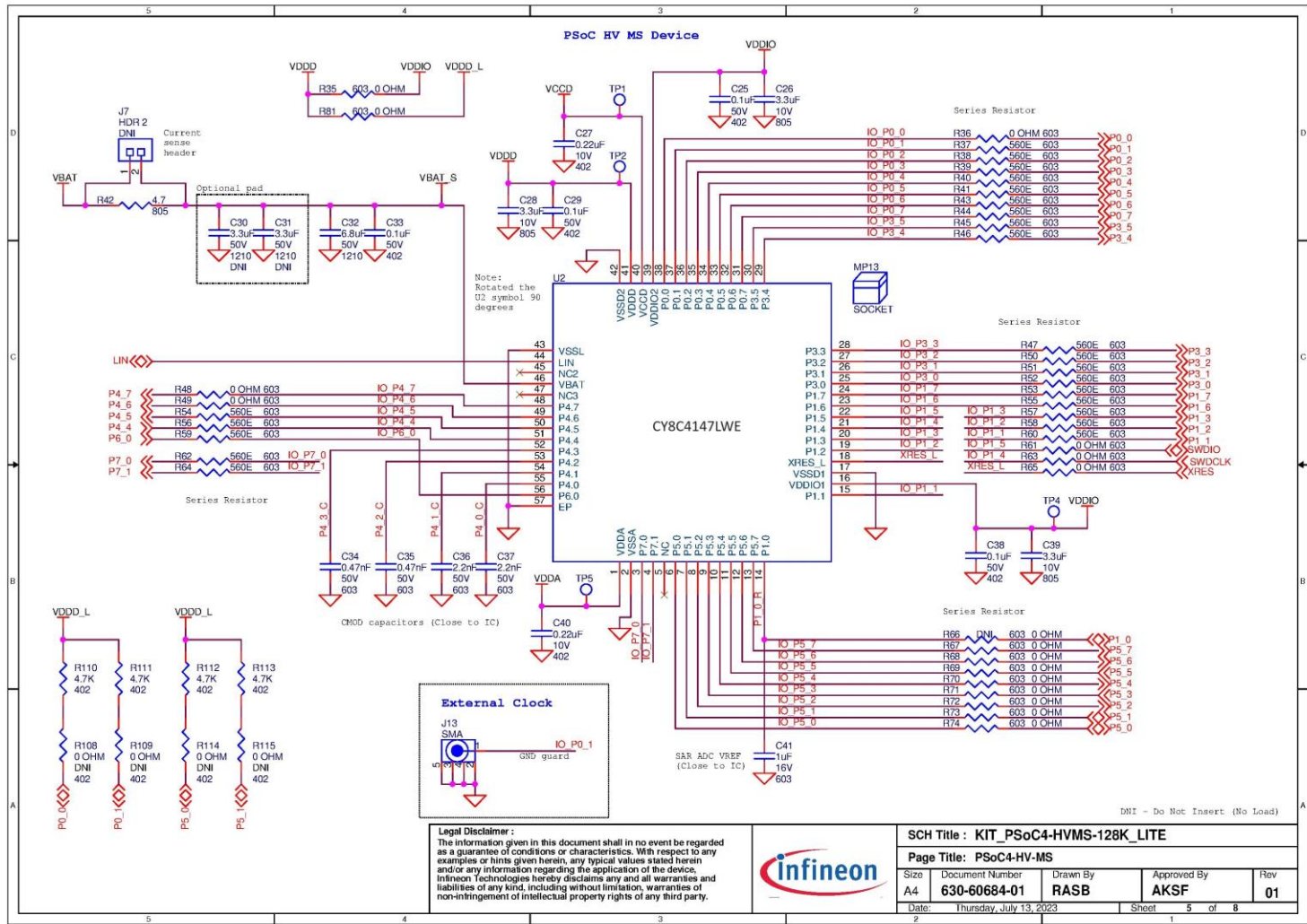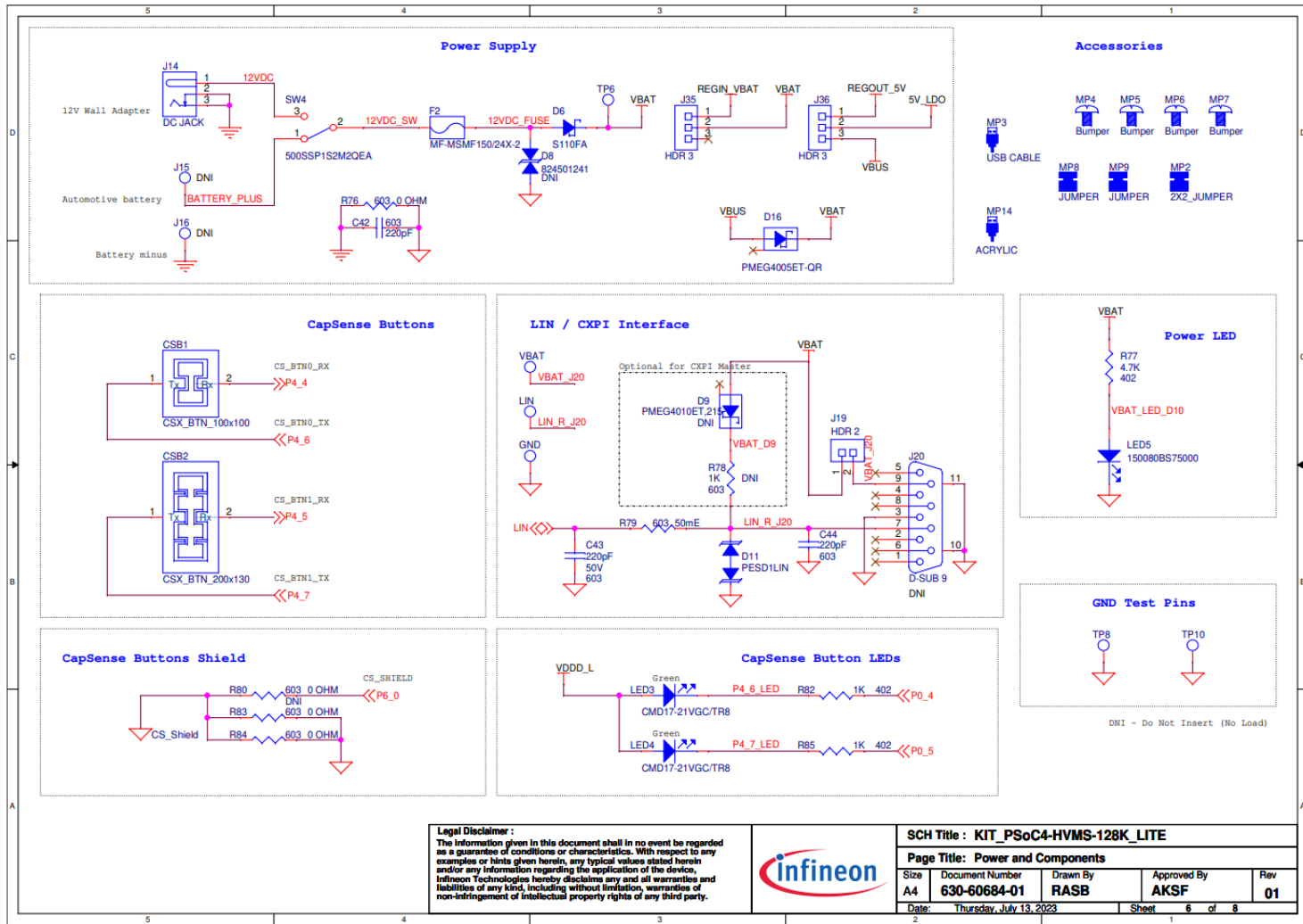
**Figure 31      PSOC™ 4 HVMS Lite Kit schematics**

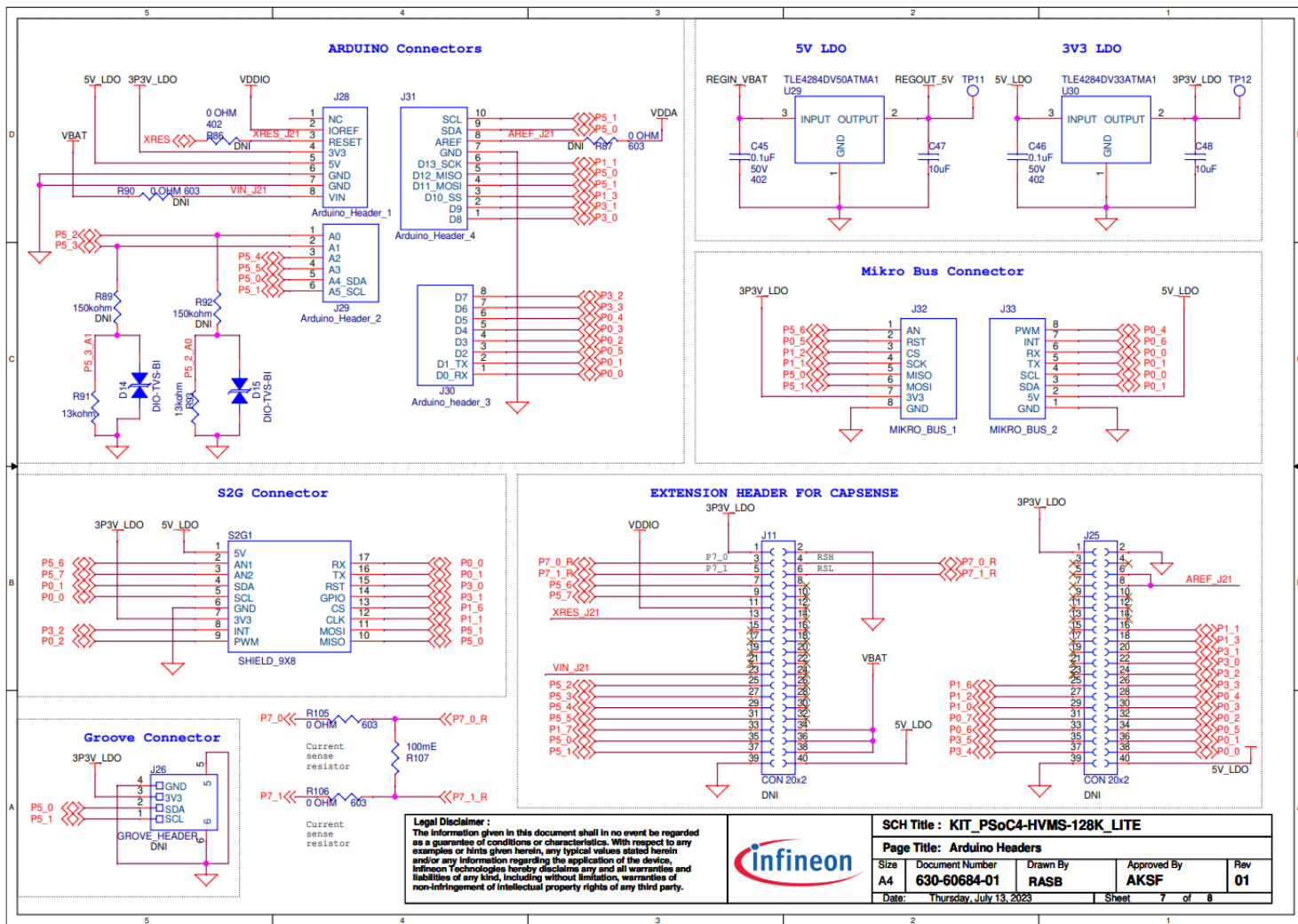**Figure 32    PSOC™ 4 HVMS Lite Kit power and components schematics**

**Figure 33**      PSOC™ HVMS Lite Kit Arduino-compatible header schematics

## 5.2 KIT_PSoC4-HVMS-128K_LITE kit assembly drawings

This section shows the KIT_PSoC4-HVMS-128K_LITE kit assembly drawings.
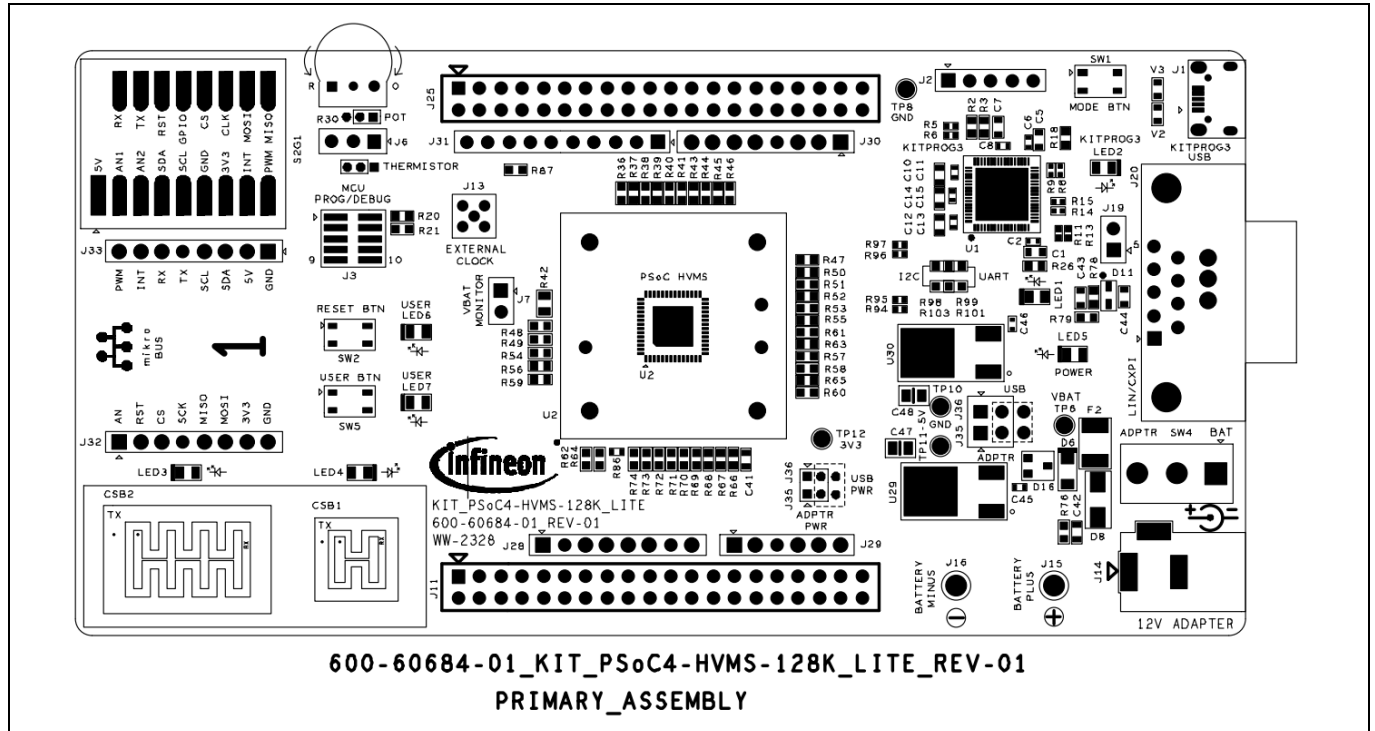


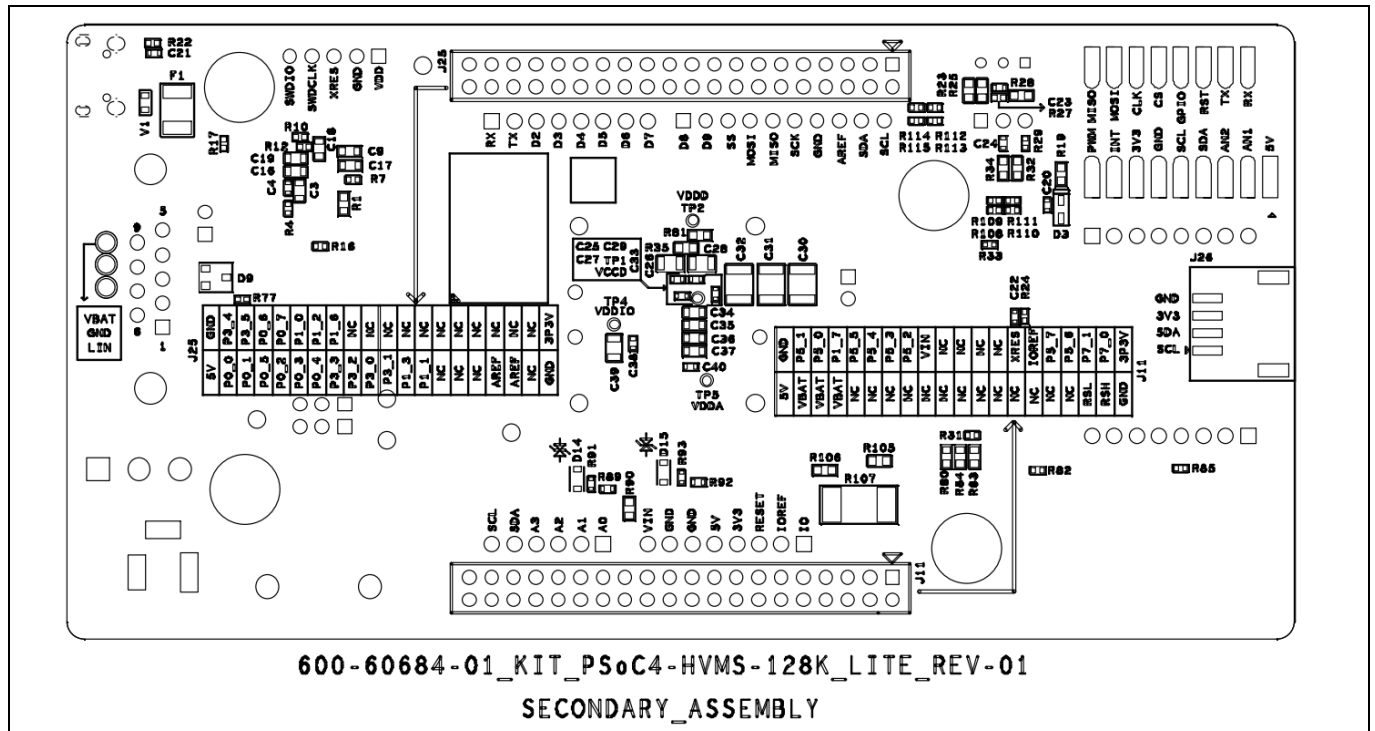**Figure 34** KIT_PSoC4-HVMS-128K_LITE kit assembly drawing – top view



**Figure 35** KIT_PSoC4-HVMS-128K_LITE kit assembly drawing – bottom view

# References

## Datasheet

Contact Infineon Support to obtain this document.

[1]   CY8C41x7, PSOC™ 4 High Voltage (HV) Mixed Signal (MS) Automotive MCU Based on 32-bit Arm® Cortex®-M0+

## Glossary

**CSD**
capacitive sigma-delta

**CSX**
CAPSENSE™ mutual sensing

**CXPI**
clock extension peripheral interface

**HMI**
human machine interface

**HVMS**
high-voltage mixed signal

**LED**
light emitting diode

**LIN**
local interconnect network

**MCU**
microcontroller

**MSC**
multi-sense converter

**PCB**
printed circuit board

**PWM**
pulse width modulation

**SAR ADC**
successive approximation resistor analog-to-digital converter

**USB**
Universal Serial Bus

## Revision history

| Document revision | Date | Description of changes |
|---|---|---|
| ** | 2023-08-22 | Initial release. |
| *A | 2023-09-22 | Updated the document title.<br>Updated About this document.<br>Updated Table 2. |
| *B | 2024-02-06 | Updated pointer from 3P3V to 3V3 in section 2.2.1 and section 2.2.2.<br>Updated AutoPDL in section 4.2. |
| *C | 2025-03-17 | Updated note for LIN in section 3.5.<br>Removed the "restricted" status from the document header.<br>Updated the "PSOC™" branding throughout the document. |

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