PSOC™ 4 HVPA 144K: KIT_PSOC4-HVPA-144K_LITE kit user guide

About this document

Scope and purpose

KIT_PSOC4-HVPA-144K_LITE is a lite kit for the PSOC™ high-voltage (HV) precision-analog (PA) microcontroller, a fully integrated programmable embedded system for lead acid battery monitoring and management. 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:

- Two Precision ΔΣ ADCs (16-20+ bits) with automatic gain current channel and HV input divider voltage channel
- Digital peripherals, such as PWMs
- Serial communication interfaces along with a LIN 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, body, and powertrain applications.

Important notice

“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”).

Environmental conditions have been considered in the design of the Evaluation Boards and Reference Boards provided by Infineon Technologies. The design of the Evaluation Boards and Reference Boards has been tested by Infineon Technologies only as described in this document. The design is not qualified in terms of safety requirements, manufacturing and operation over the entire operating temperature range or lifetime.

The Evaluation Boards and Reference Boards provided by Infineon Technologies are subject to functional testing only under typical load conditions. Evaluation Boards and Reference Boards are not subject to the same procedures as regular products regarding returned material analysis (RMA), process change notification (PCN) and product discontinuation (PD).

Evaluation Boards and Reference Boards are not commercialized products, and are solely intended for evaluation and testing purposes. In particular, they shall not be used for reliability testing or production. The Evaluation Boards and Reference Boards may therefore not comply with CE or similar standards (including but not limited to the EMC Directive 2004/EC/108 and the EMC Act) and may not fulfill other requirements of the country in which they are operated by the customer. The customer shall ensure that all Evaluation Boards and Reference Boards will be handled in a way which is compliant with the relevant requirements and standards of the country in which they are operated.

The Evaluation Boards and Reference Boards as well as the information provided in this document are addressed only to qualified and skilled technical staff, for laboratory usage, and shall be used and managed according to the terms and conditions set forth in this document and in other related documentation supplied with the respective Evaluation Board or Reference Board.

It is the responsibility of the customer’s technical departments to evaluate the suitability of the Evaluation Boards and Reference Boards for the intended application, and to evaluate the completeness and correctness of the information provided in this document with respect to such application.

The customer is obliged to ensure that the use of the Evaluation Boards and Reference Boards does not cause any harm to persons or third party property.
The Evaluation Boards and Reference Boards and any information in this document is provided "as is" and Infineon Technologies disclaims any warranties, express or implied, including but not limited to warranties of non-infringement of third party rights and implied warranties of fitness for any purpose, or for merchantability.

Infineon Technologies shall not be responsible for any damages resulting from the use of the Evaluation Boards and Reference Boards and/or from any information provided in this document. The customer is obliged to defend, indemnify and hold Infineon Technologies harmless from and against any claims or damages arising out of or resulting from any use thereof.

Infineon Technologies reserves the right to modify this document and/or any information provided herein at any time without further notice.

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 five minutes for 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. Hence, 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 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. Hence, 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

About this document **1**
Important notice **2**
Safety precautions **3**
Table of contents **4**
1 KIT_PSOC4-HVPA-144K_LITE kit contents **5**
1.1 Overview 5
1.2 Block diagram 6
1.3 Board function 6
2 Getting started **8**
2.1 Description of the functional blocks 8
2.2 Power up the lite kit 8
2.2.1 Power from USB 9
2.2.2 Power from wall adapter 9
2.3 Hands on shipping firmware 10
2.3.1 Hardware and tool setup 10
2.3.2 Software checks 11
3 Hardware **12**
3.1 PSOC™ HVPA device 12
3.2 Power supply 12
3.3 Pseudo load 13
3.4 Potentiometer and temperature sensor 14
3.5 LIN interface 14
3.6 KitProg3 USB program interface 15
3.7 Third-party debugger connector 16
3.8 Extension headers 16
3.8.1 Arduino-compatible header 17
3.8.2 Infineon standard header 19
3.8.3 mikroBUS-compatible header 20
3.8.4 Groove header 21
3.8.5 XENSIV™ header 22
3.9 Other peripherals 22
4 Programming and debugging **24**
4.1 Program using AutoFlash utility 24
4.2 Program and debug using an IAR Embedded Workbench 25
5 Schematics and designs **29**
5.1 KIT_PSOC4-HVPA-144K_LITE kit schematics 29
5.2 KIT_PSOC4-HVPA-144K_LITE kit assembly drawings 37
References **38**
Glossary **39**
Revision history **40**
Disclaimer **41**

1 KIT_PSOC4-HVPA-144K_LITE kit contents

The kit includes one main board and a USB cable.

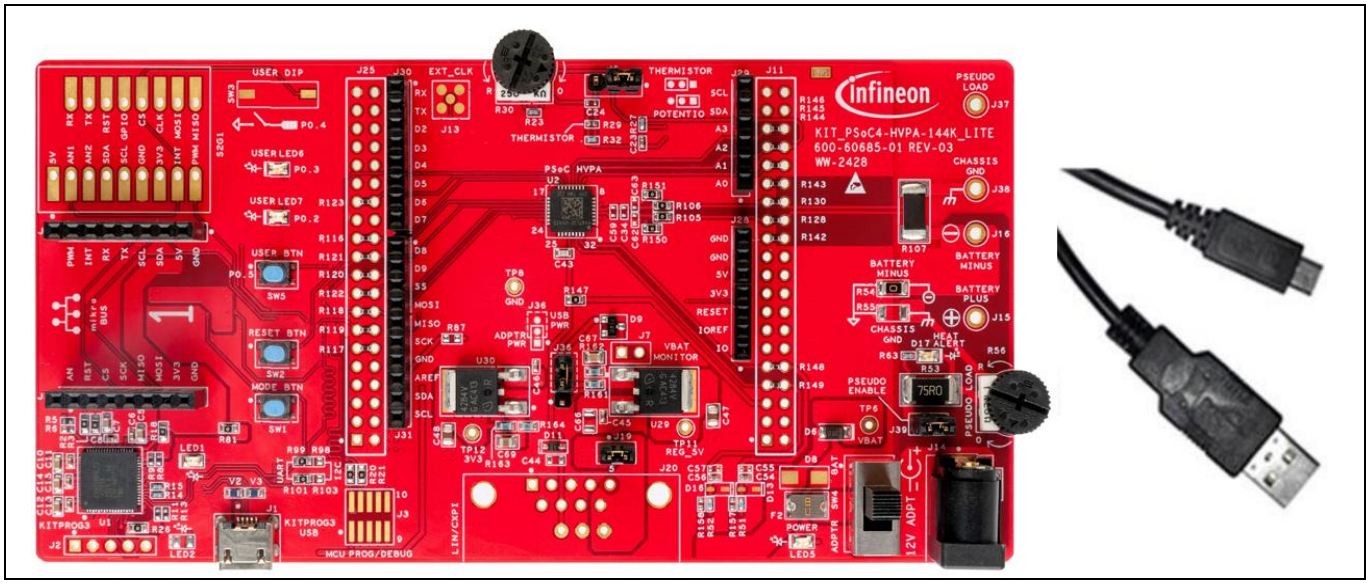


Figure 1 KIT_PSOC4-HVPA-144K_LITE kit contents

1.1 Overview

The KIT_PSOC4-HVPA-144K_LITE board can mount the 56-QFN package of PSOC™ 4 HVPA 144K microcontrollers (MCU). The kit features and blocks are shown in Figure 2.

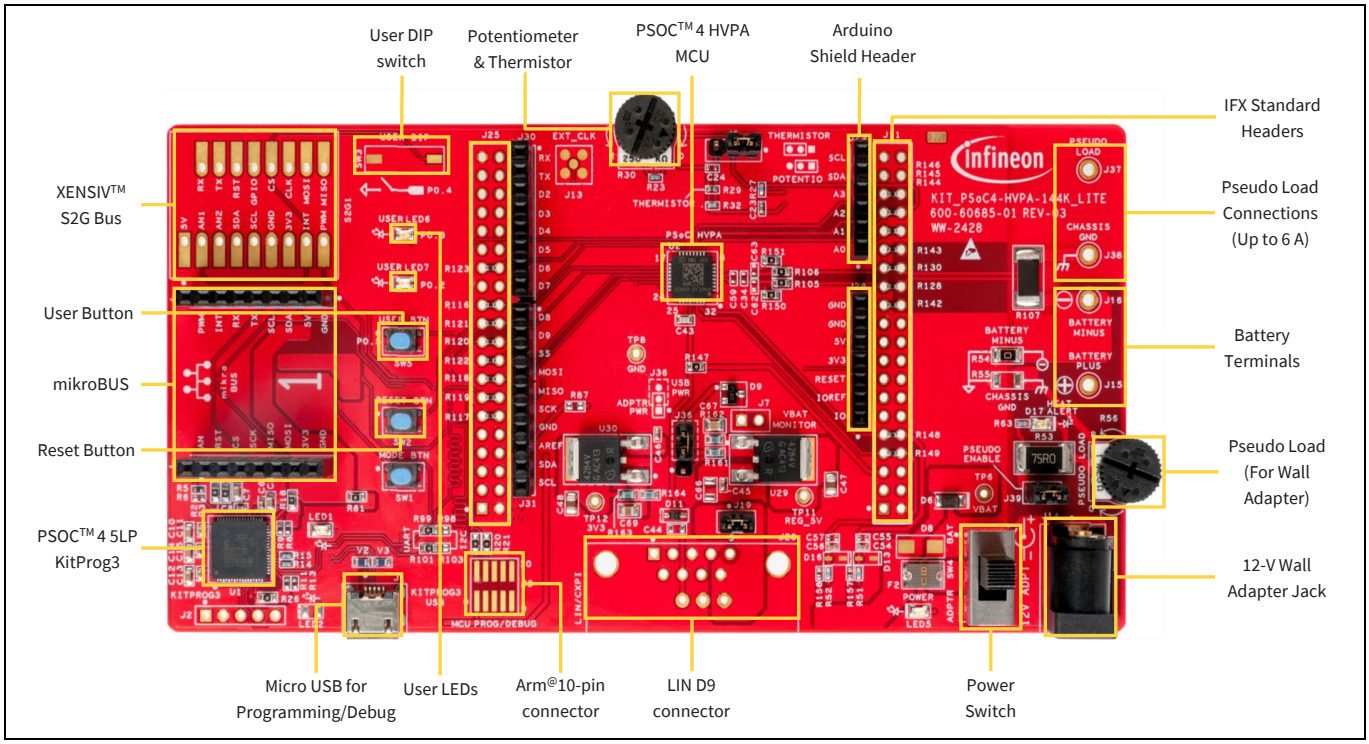


Figure 2 KIT_PSOC4-HVPA-144K_LITE kit contents

1.2 Block diagram

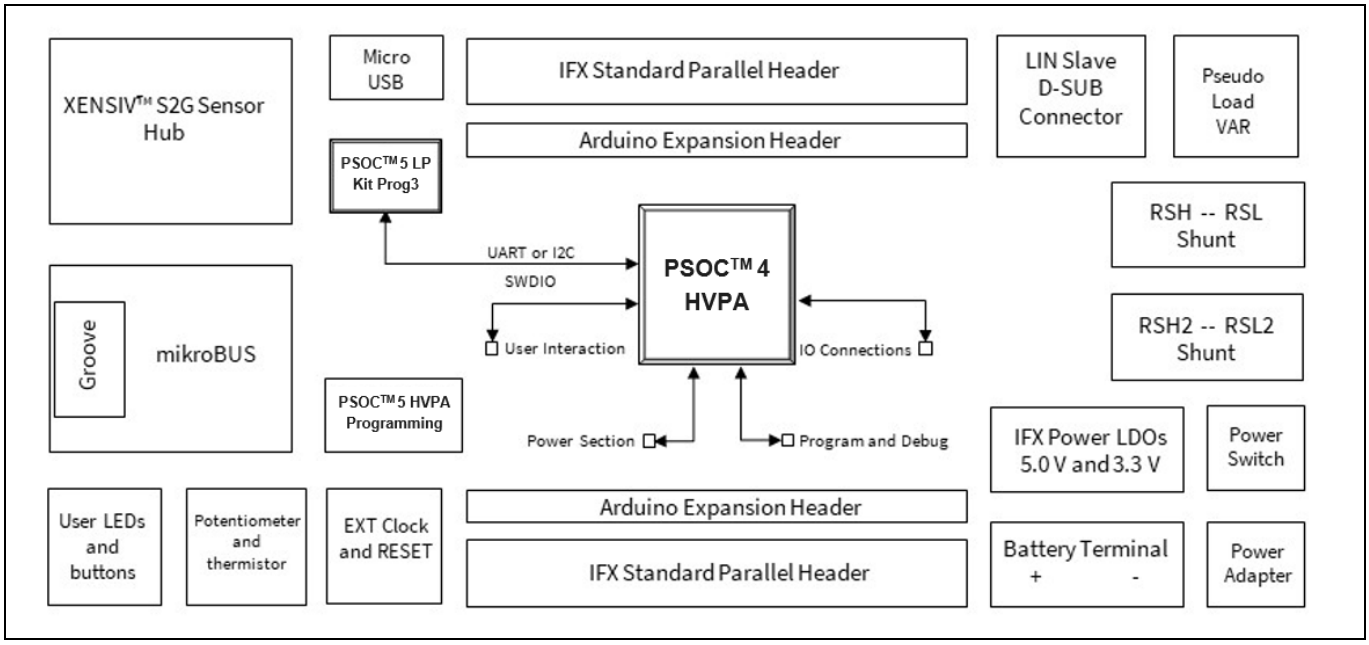


Figure 3 KIT_PSOC4-HVPA-144K_LITE kit board – block diagram

1.3 Board function

Table 2 KIT_PSOC4-HVPA-144K_LITE kit board functions

#	Function	Specification	Remarks	Note
1	PSOC™ HVPA MCU	CY8C4147LCE-HV413	U2: 32-OFN	–
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	–
5	Power input	Power input select jumper (USB or 12-V wall adapter)	J36	–
6	Power switch	Input power select switch	SW4	–
7	Power LED	VBAT monitor LED	LED 5	–
8	USB connector	Micro USB connector	J1	–
9	Power LED	USB VBUS monitor LED	LED 2	No load
10	Status LED	KitProg3 status LED	LED 1	–
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	CTBm shunt resistor	4.02 Ω 1% 1W	R107	–
14	Resistors	Serial connect resistors (I2C or UART)	R98 / R103 (I2C), R99 / R101 (UART)	–
15	Pseudo load for wall adapter	For 12-V wall adapter (0.72 A)	R56	–
16	Pseudo load for battery connector	Connects external load (Up to 6 A)	J37/J38	–

KIT_PSOC4-HVPA-144K_LITE kit contents

#	Function	Specification	Remarks	Note
17	Temperature sensor selector	Temperature sensor select jumper (thermistor or potentiometer)	J6 (3 pins)	–
18	LIN connector	Connects LIN interface from DUT	J20	No load
19	Extension header	40-pin (2-row) female header for extension boards	J11/J25	No load
20	External clock	SMA connector for clock input	J13	No load
21	Test header	Current measurement header for DUT	J7	No load
22	Arduino headers	1x6 (1), 1x8 (2) and 1x10 (1) for Arduino compatibility	J29 / J28 / J30 / J31	–
23	mikroBUS header	Two 1x8 mikroBUS headers	J32 / J33	–
24	Groove connector	5-pin, 100mils, SMBus	J26	No load
25	XENSIV™ S2G Bus connector	Infineon's XENSIV™ bus sensor 17-pin interface	S2G1	No load
26	User LED	User LED connected to DUT	LED 7	–
27	User LED	User LED connected to DUT	LED 6	–
28	User DIP switch	User DIP switch connects to DUT	SW3	No load
29	User button	User push switch connects to MCU	SW5	–
30	Reset button	System reset switch	SW2	–
31	Mode button	KitProg3 mode button	SW1	–

2 Getting started

2.1 Description of the functional blocks

The initial jumpers are configured as per the factory default settings.

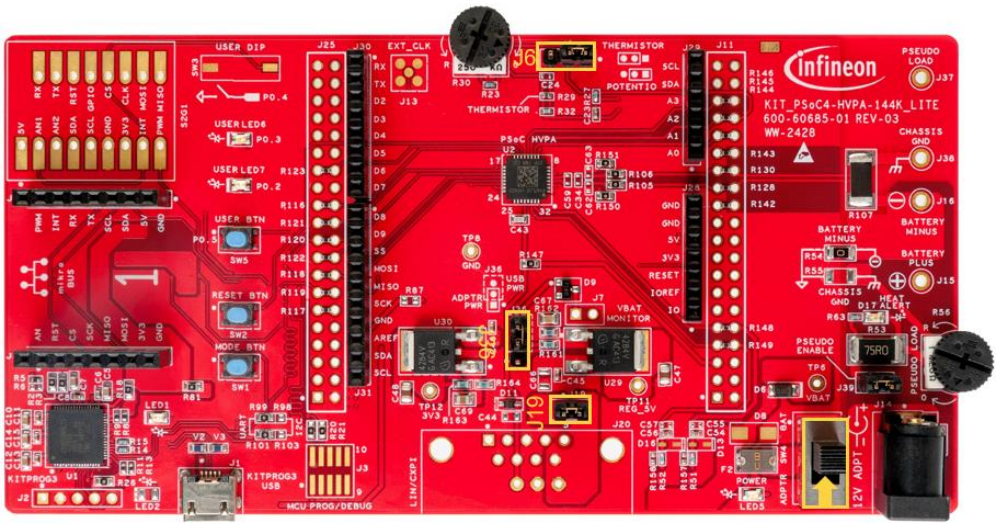


Figure 4 Initial jumper configuration and switch setting

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)	Thermistor (2-3)
J19	Connects VBAT (12V) to the LIN bus voltage	LIN bus (1-2)	-
J36	Configures the power inputs for the entire board	5V power from USB (2-3)	12V power from adapter (1-2)

2.2 Power up the lite kit

The KIT_PSOC4-HVPA-144K_LITE kit can be powered either from USB port or from wall adapter. Set the appropriate jumper configuration before connecting any of the power source.

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 from the USB. Make sure that the power jumpers J36 are closed on position (J36_2-J36_3) for USB-powered configuration. In case of USB power, the following are the power requirements for different sections:

- 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. Make sure that the power jumper J36 is closed on position (J36_1-J36_2) for 12V-powered configuration. The following are the power requirements for different sections:

- MCU power: VBAT from power adapter (12V)
- 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 adapter, connect the wall adapter to J14, and slide SW4 to the ADPTER side. The power LED (LED5) lights up when the power switch is set to the wall adapter.

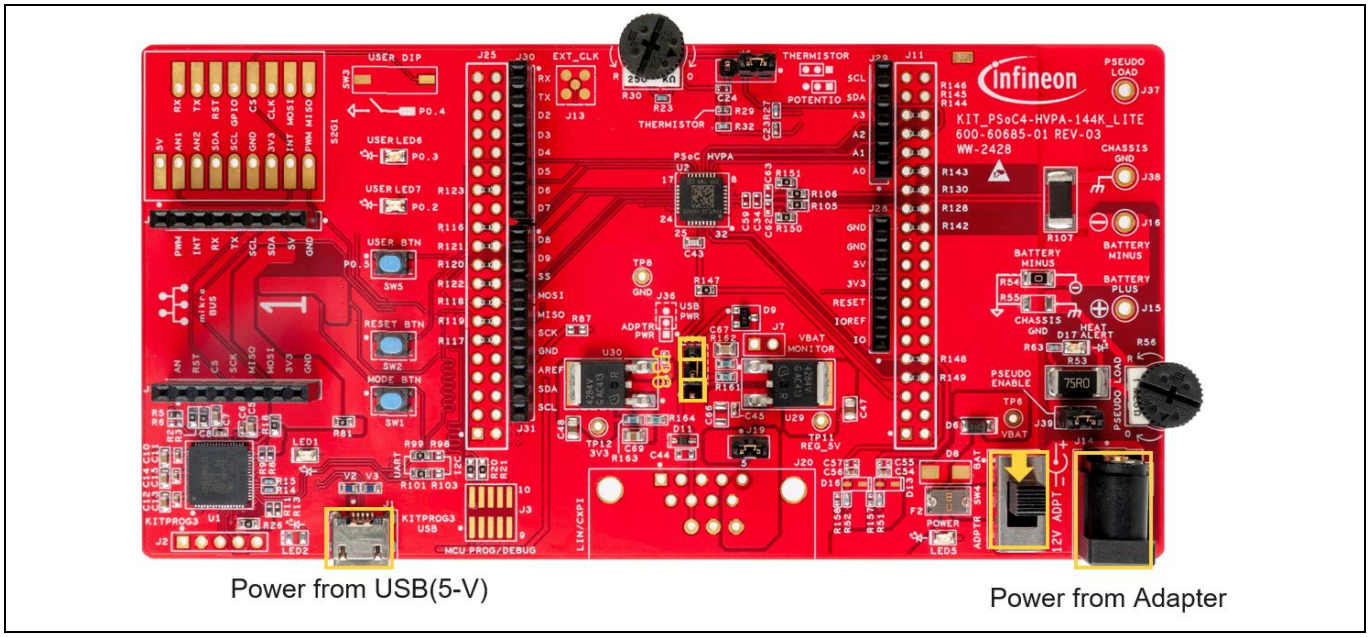


Figure 5 Available power inputs for Lite kit

Note: With the USB power mode, the PSOC™ 4 HVPA device supports LIN slave configuration only.

2.3 Hands on shipping firmware

The KIT_PSOC4-HVPA-144K_LITE kit comes with pre-installed firmware to check all the onboard peripherals. The firmware logs different events on either the serial USB interface or the LIN slave interface for the user's reference. For simplicity, serial console is set as the default mode, and all the events are sent to the serial terminal with fixed event IDs.

2.3.1 Hardware and tool setup

To check the pre-installed firmware on KIT_PSOC4-HVPA-144K_LITE kit, follow these steps to set up and communicate with the host system:

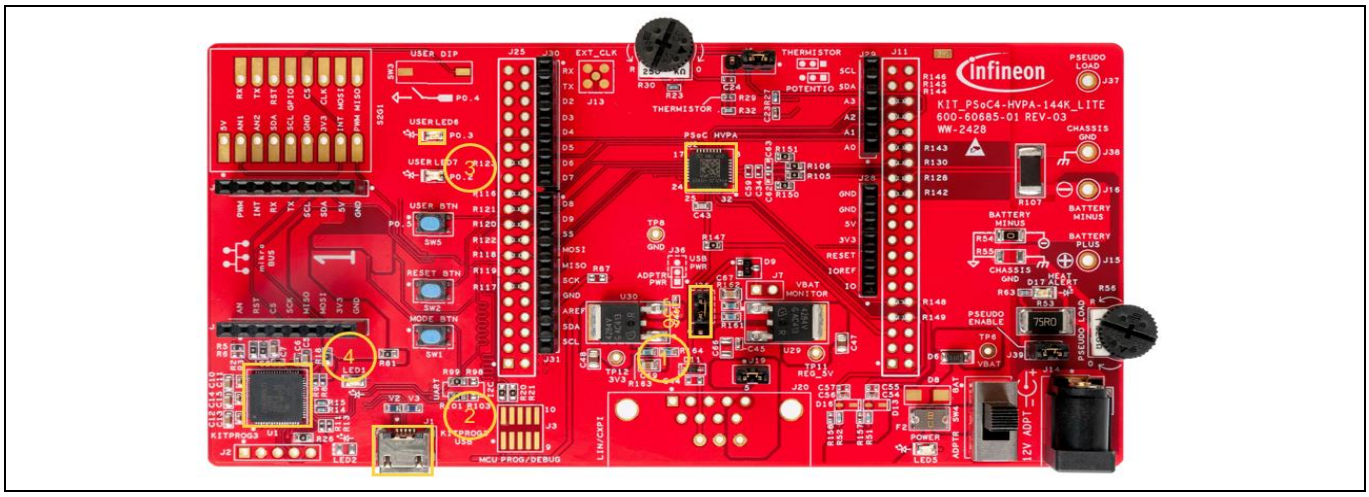


Figure 6 KIT_PSOC4-HVPA-144K_LITE kit and tool setup

1. Before powering up the lite kit, ensure that the power selection jumper J36 is closed on position (J36_2-J36_3).
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). Make sure that the power LED5 (blue LED) is turned ON.
3. When powered ON, the PSOC™ HVPA device starts executing the pre-installed firmware. This is indicated by the blinking User LED6 (red LED) and the slightly blinking User LED7 (green LED).
4. To establish communication with the PC, configure TeraTerm on the PC to send and receive messages to or from the lite kit. Set the following configurations in TeraTerm:

   Port: COMx: KitProg3 USB-UART (COMx)

   Speed: 115200

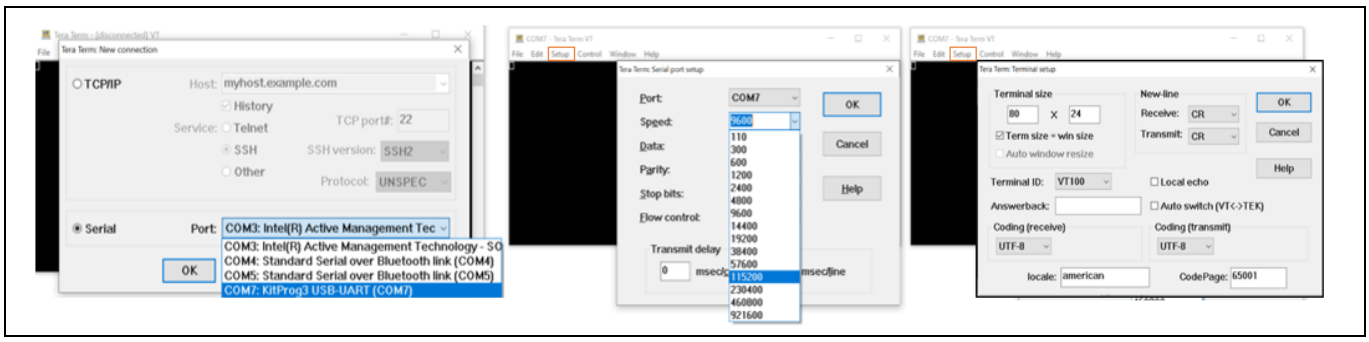


Figure 7 TeraTerm setup

2.3.2 Software checks

The lite kit comes with pre-installed firmware, which starts executing immediately upon power-on. After the completion of the tool setup, proceed with the following steps to check the firmware and lite kit's features:

5. Reset the PSOC™ HVPA device using Reset switch SW2, User LED6 and LED7 will start blinking.
6. Monitor the switch event in TeraTerm window for test results. Upon completion, it displays "All tests Passed".

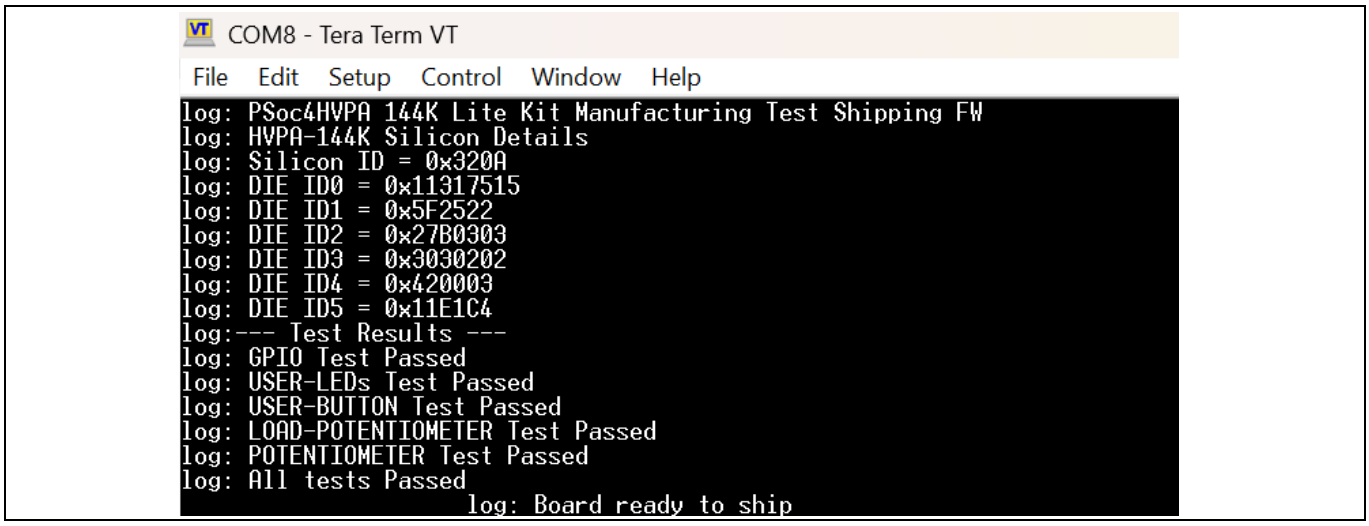


Figure 8 Firmware checks with onboard peripheral

3 Hardware

3.1 PSOC™ HVPA device

The KIT_PSOC4-HVPA-144K_LITE kit comes with PSOC™ HVPA device CY8C4147LCE-HV413 soldered on to the board.

Table 4 IC description

Reference	Manufacturer	Part number	Supported package
U2	Infineon Technologies	CY8C4147LCE-HV413	32-QFN

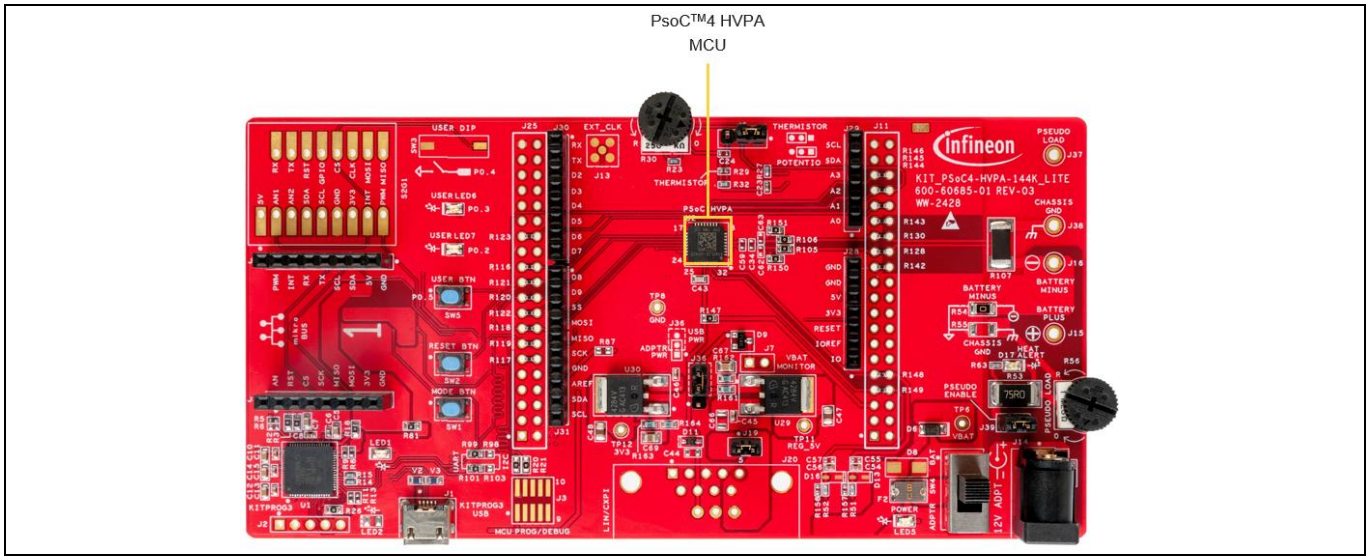


Figure 9 PSOC™ HVPA device

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 a main power supply for devices with VDDD = 3.3 V (see ordering information from PSOC™ HVPA datasheet [1]) and the cable comes with the kit package.

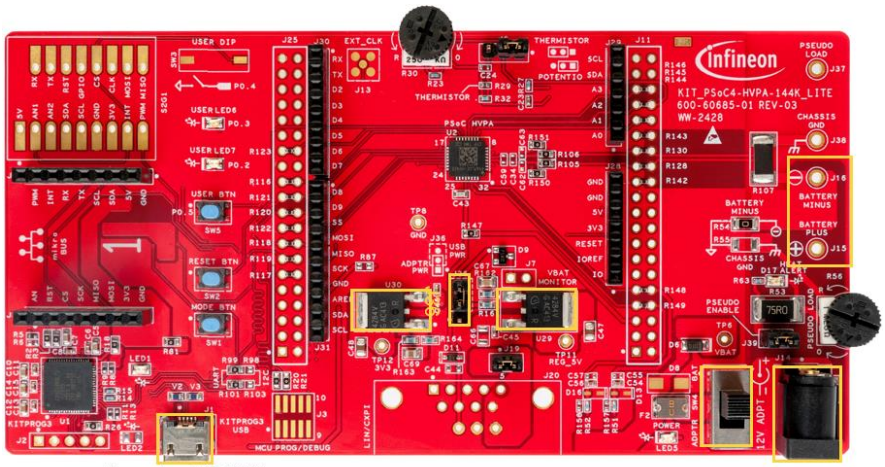


Figure 10 Power supply configuration on lite kit

Note: By default, KIT_PSOC4-HVPA-144K_LITE kit supports 5V power input from USB port. The power input configuration can be changed by removing the resistor from position 2-3 of connector J36 and installing resistor on position 1-2 of connector J36.

Note: To power-up the entire lite kit, two LDO's are used to generate the 5V (U29) and 3.3V (U30). In case of using the USB(5V) power, LDO used for generating 5V (U29) is bypassed.

3.3 Pseudo load

The following are the two pseudo loads:

- For 5-V USB power: On-board load with 75 Ω, 1 kΩ with LED, and 1 MΩ potentiometer.
- For battery connector: External load (up to 6 A) using load equipment.

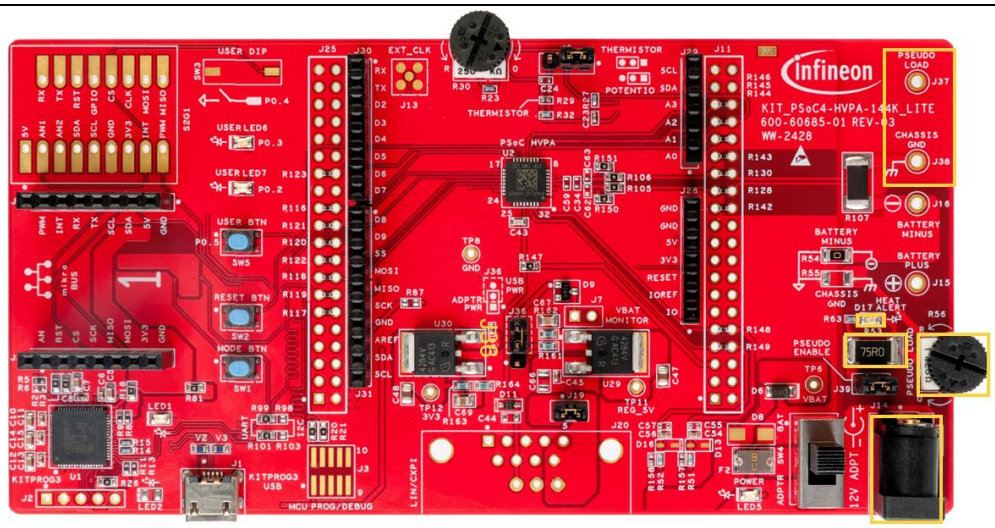


Figure 11 Pseudo load on lite kit

3.4 Potentiometer and temperature sensor

The KIT_PSOC4-HVPA-144K_LITE kit has temperature sensor and potentiometer on-board to evaluate the analog functions. The temperature sensor uses a thermistor (R29) with a divider resistor and potentiometer (R30) uses 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%, 1/2W

Note: See the vendor page for resistance temperature characteristics.

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

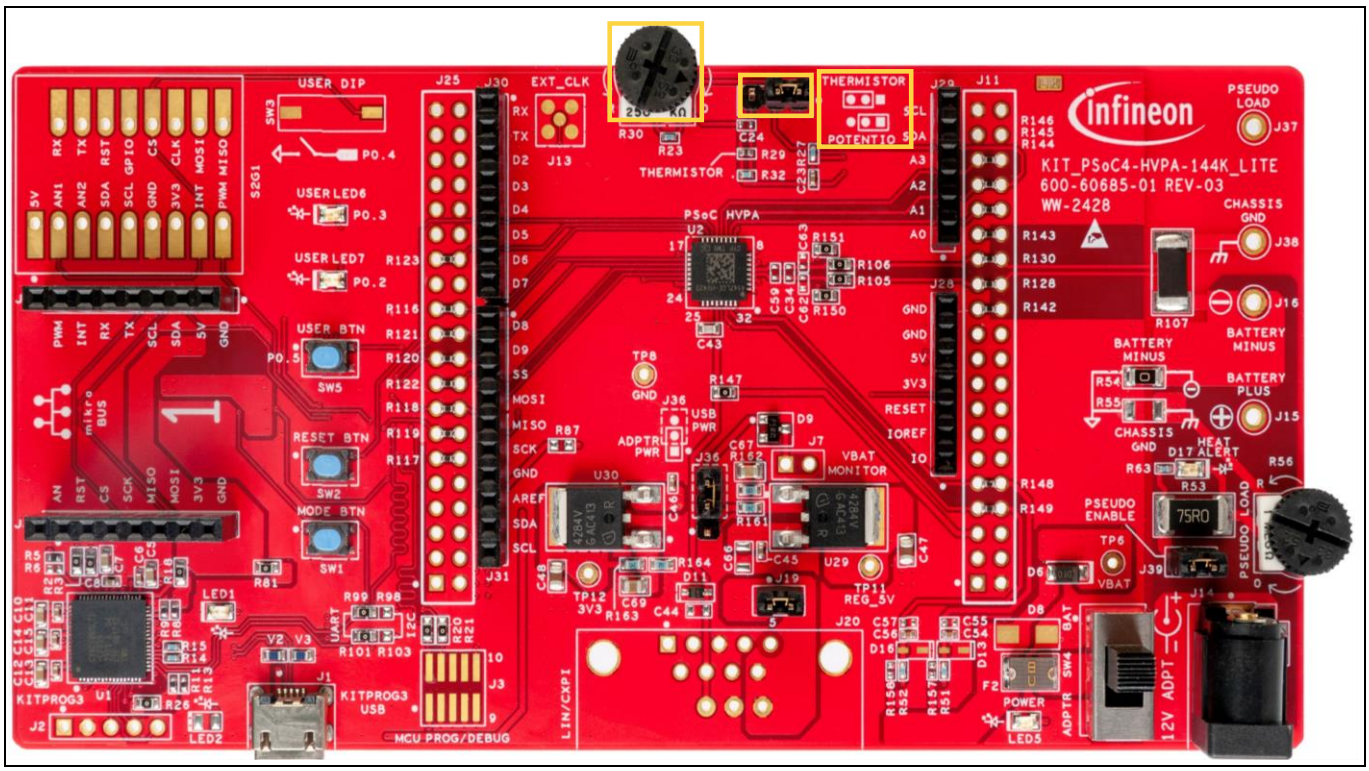


Figure 12 Temperature sensor block of Lite kit

3.5 LIN interface

The PSOC™ HVPA devices include a Local Interconnect Network (LIN) transceiver and controller. It can connect the physical layer directly to the device. The KIT_PSOC4-HVPA-144K_LITE kit supports D-SUB9 male type connector and 3-pin male connector (should be installed separately) for interfacing to the LIN bus. The VBAT voltage is connected to pin 9 of the connector via a jumper J19.

Table 6 LIN 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, 2.54MM

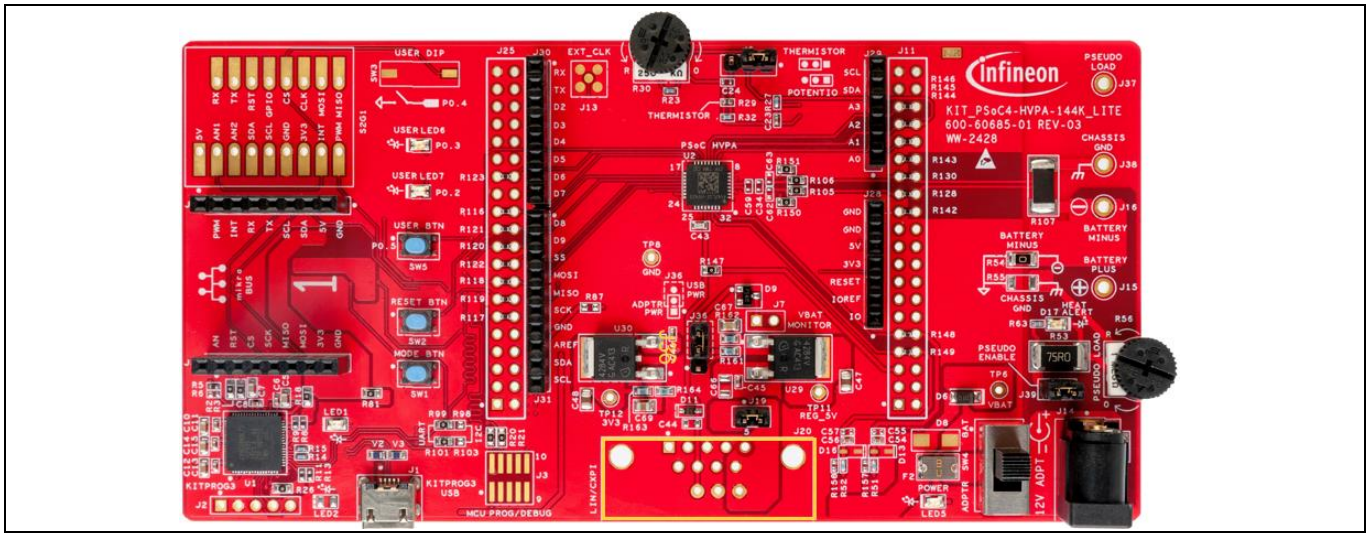


Figure 13 LIN interface on lite kit

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™ HVPA 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-UART and USB-I2C. For more information, see the KitProg3 user guide [2].

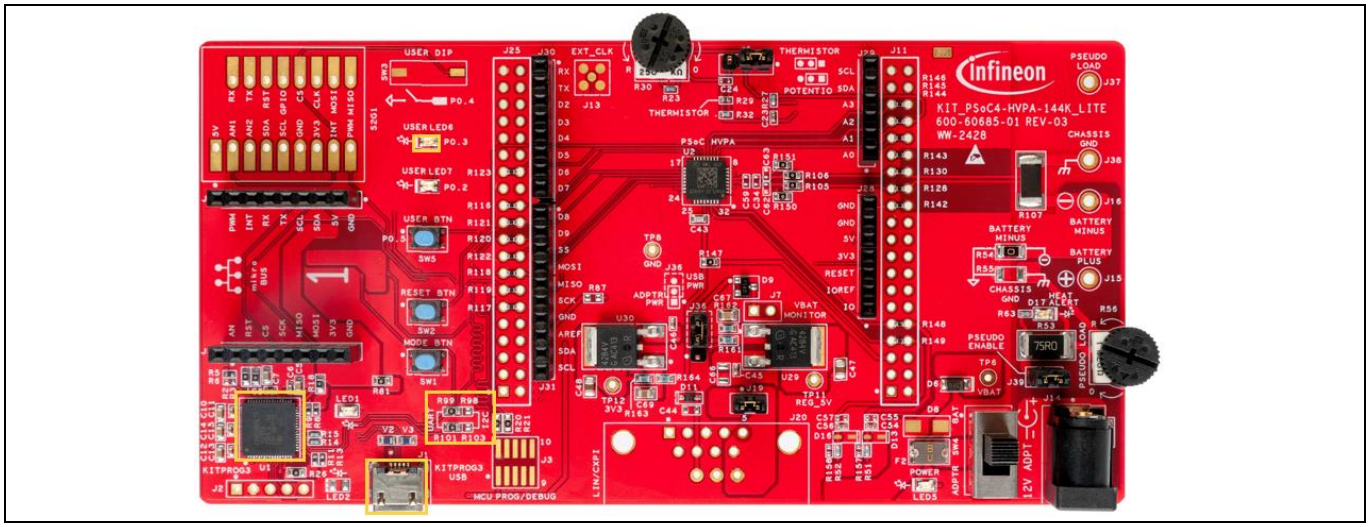


Figure 14 KitProg3 USB program interface on llite kit

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

3.7 Third-party debugger connector

The KIT_PSOC4-HVPA-144K_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™ HVPA device through the SWD interface. The connector J3 should be assemble separately in case.

Table 7 Arm® 10-pin MIPI connector

Reference	Manufacturer	Part number	Description
J6	Samtec Inc.	FTSH-105-01-L-DV-K	Header Male, 10-pin, 1.27mm, SMD

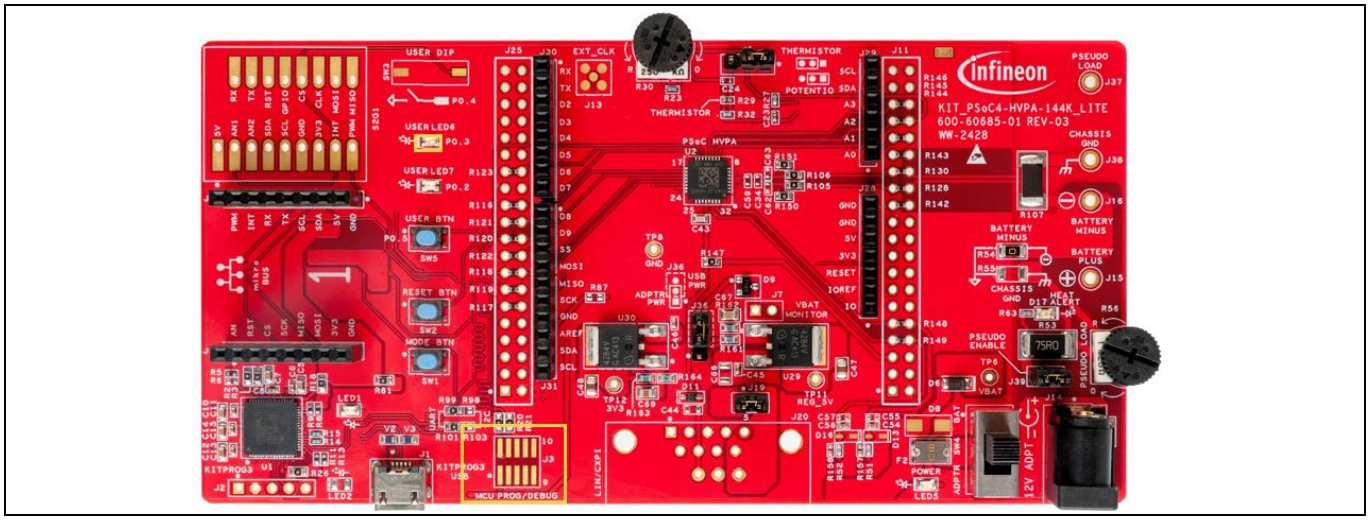


Figure 15 Third party debugger connection on the lite kit

3.8 Extension headers

The KIT_PSOC4-HVPA-144K_LITE kit provides a variety of header expansion to compatible with the most popular interfaces. The kit is designed to have compatibility for Arduino connection header, mikroBUS header, XENSIV™ bus and Infineon standard connector interface.

Hardware

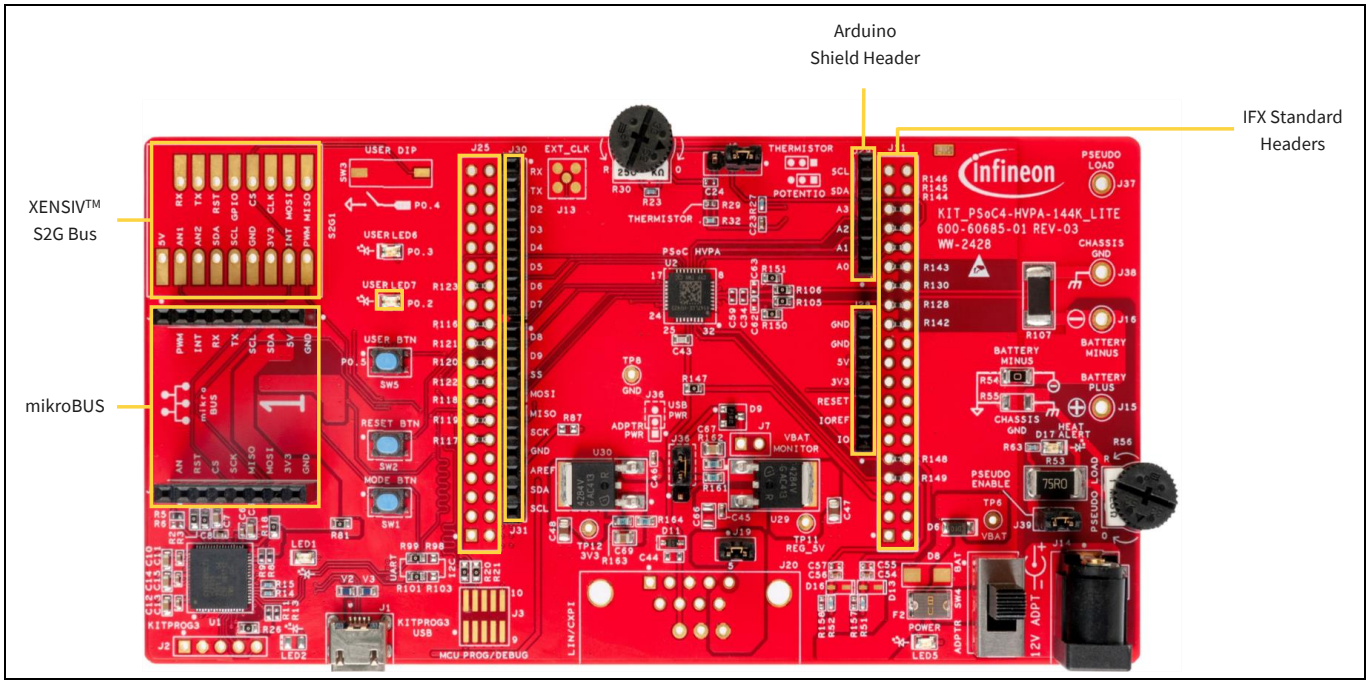


Figure 16 Extension headers on lite kit

3.8.1 Arduino-compatible header

Table 8 Pin assignment of arduino-compatible connections

Connector	Pin number	Pin name	KIT_PSOC4-HVPA-144K_LITE connections
J28	1	NC	–
J28	2	IOREF	VDDD_L
J28	3	RESET	XRES
J28	4	3.3V	3P3V_LDO
J28	5	5V	5V_LDO
J28	6	GND	DGND
J28	7	GND	DGND
J29	1	ADC_0	–
J29	2	ADC_1	–
J29	3	ADC_2	–
J29	4	ADC_3	–
J29	5	ADC_4/I2C_SDA	–
J29	6	ADC_5/I2C_SCL	–
J30	1	D0/RX	P0_0
J30	2	D1/TX	P0_1
J30	3	D2	–
J30	4	D3	–
J30	5	D4	–
J30	6	D5	–
J30	7	D6	–

Hardware

Connector	Pin number	Pin name	KIT_PSOC4-HVPA-144K_LITE connections
J30	8	D7	–
J31	1	D8/ IO_3	P0_4
J31	2	D9/ PWM_3	P0_3
J31	3	D10/SS	P0_5
J31	4	D11/MOSI	P0_1
J31	5	D12/MISO	P0_2
J31	6	D13/SCK	P0_0
J31	7	GND	DGND
J31	8	AREF	VDDA
J31	9	SDA	P0_1
J31	10	SCL	P0_0

3.8.2 Infineon standard header

Table 9 Pin assignments of Infineon standard connections

Connector	Pin number	Pin name	KIT_PSOC4-HVPA-144K_LITE connections
J11	1	3V3	3P3V_LDO
J11	2	GND	DGND
J11	3-4	VBAT	VBAT
J11	5	LIN	LIN_EXT
J11	6	NC	–
J11	7-8	VDIAG	VDIAG
J11	9-10	VSENSE	VSENSE
J11	11-22	NC	–
J11	23-24	RSH2	RSH2
J11	25-26	RSH	RSH
J11	27-28	RSL	RSL
J11	29-30	RSL2	RSL2
J11	31-32	VTEMP_RET	VTEMP_RET
J11	33-34	VTEMP	VTEMP
J11	35-36	VTEMP_SUP	VTEMP_SUP
J11	37-38	NC	–
J11	39	GND	DGND
J11	40	5V	5V_LDO
J25	1	3V3	3P3V_LDO
J25	2	GND	DGND
J25	3-10	NC	–
J25	11-12	P0_0	P0_0
J25	13-14	P0_2	P0_2
J25	15-16	P0_1	P0_1
J25	17-18	P0_5	P0_5
J25	19-20	P0_3	P0_3
J25	21-22	P0_4	P0_4
J25	23	SWDIO	SWDIO
J25	24	P0_6	P0_6
J25	25	SWDCLK	SWDCLK
J25	26	P0_7	P0_7
J25	27-38	NC	–
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-HVPA-144K_LITE connections
J32	1	AN	EXT_P03_IO1_CS0
J32	2	RST	EXT_P03_IO1_CS0
J32	3	CS	EXT_P03_IO1_CS0
J32	4	SCK	EXT_P00_SDA_CLK
J32	5	MISO	EXT_P02_IO0_MISO
J32	6	MOSI	EXT_P01_SCL_MOSI
J32	7	3V3	3P3V_LDO
J32	8	GND	DGND
J33	1	GND	DGND
J33	2	5V	5V_LDO
J33	3	SDA	EXT_P00_SDA_CLK
J33	4	SCL	EXT_P01_SCL_MOSI
J33	5	TX	EXT_P01_TX
J33	6	RX	EXT_P00_RX
J33	7	INT	–
J33	8	PWM	–

3.8.4 Groove header

Table 11 Pin assignment of Groove bus connections

Connector	Pin number	Pin name	KIT_PSOC4-HVPA-144K_LITE connections
J26	1	SCL	P5_1
J26	2	SDA	P5_0
J26	3	3V3	3P3V_LDO
J26	4	GND	DGND

3.8.5 XENSIV™ header

Table 12 Pin assignment of XENSIV™ bus connections

Connector	Pin number	Pin name	KIT_PSOC4-HVPA-144K_LITE connections
S2G1	1	5V	5V_LDO
S2G1	2	AN1	P0_4
S2G1	3	AN2	-
S2G1	4	SDA	EXT_P00_SDA_CLK
S2G1	5	SCL	EXT_P01_SCL_MOSI
S2G1	6	GND	DGND
S2G1	7	3V3	3P3V_LDO
S2G1	8	INT	P0_4
S2G1	9	PWM	EXT_P02_IO0_MISO
S2G1	10	MISO	EXT_P02_IO0_MISO
S2G1	11	MOSI	EXT_P01_SCL_MOSI
S2G1	12	CLK	EXT_P00_SDA_CLK
S2G1	13	CS	P0_4
S2G1	14	GPIO	-
S2G1	15	RST	-
S2G1	16	TX	EXT_P01_TX
S2G1	17	RX	EXT_P00_RX

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-HVPA-144K_LITE board, which 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 P0.5)
User DIP	SW3 (GPIO P0.4)
User LEDs	LED6 (GPIO P0.3 -- red), LED7 (GPIO P0.2 -- green)
External clock input	J13 (GPIO P0.5)

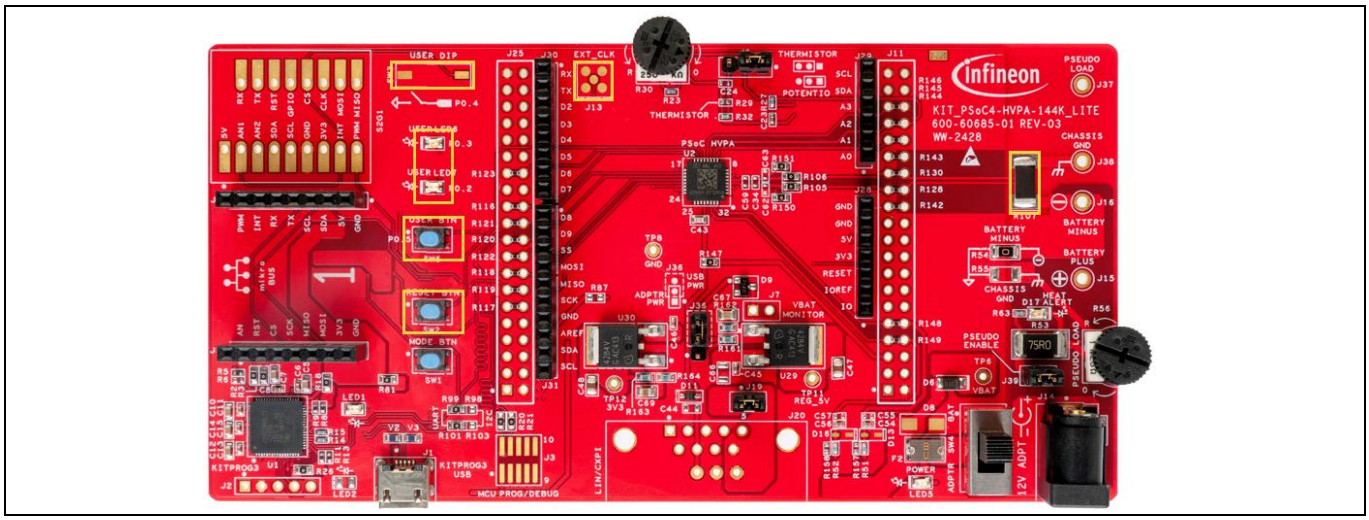


Figure 17 Onboard peripherals

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™ HVPA 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 same will be used for programming.

The DUT flash data is programmed via the PSOC™ 5 LP device in KitProg3, which is the Infineon low-level communication firmware for programming and debugging. For more information, see the PSOC™ programmer user guide and KitProg3 user guide [2].

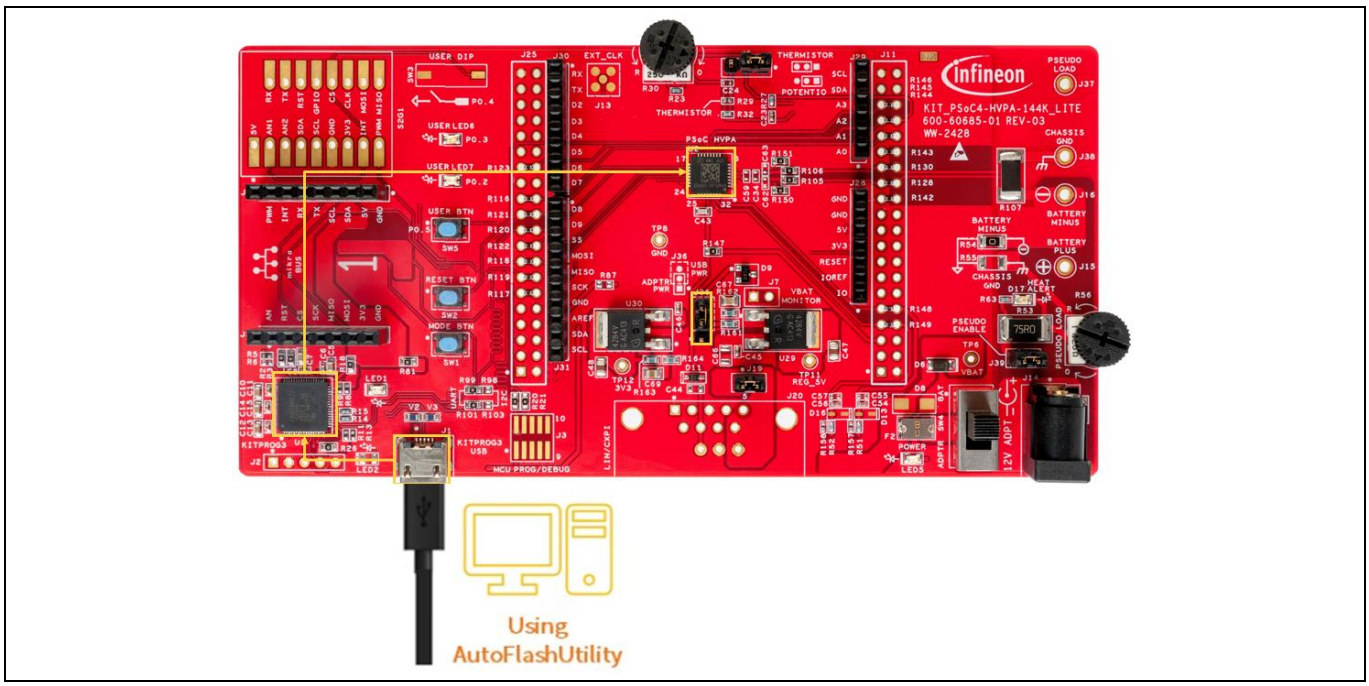


Figure 18 Program via KitProg3

1. Connect the micro-USB cable from the host system to the lite kit.
2. Open a command prompt and go inside 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 *bin* folder.
4. Enter the following command in 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 reset button SW2.

4.2 Program and debug using an IAR Embedded Workbench

Download the latest AutoPDL for the PSOC™ HVPA Lite kit on the target system. Install the AutoPDL outside the default program files to allow the IDE to access and create temporary files.

Open the *Readme.pdf* from the root folder of the AutoPDL and use the same link to download the version of IAR EWARM supported by the AutoPDL.

Download the software and run the installation (note that the installation might take 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 recommended to register for a Code size limited license type.

The PSOC™ HVPA Lite kit is now ready to use after a successful environment setup (USB driver installation, AutoPDL installation, and IAR installation). The PSOC™ HV devices have a Cortex®-M0+ core, and the AutoPDL workspace details for the same is listed in Table 14.

Table 14 IAR Flash workspaces and functions

Workspace	Application core	Number of Cores supported	Details
Single core CM0+ workspace “psoc4hvpa144k_Eva_license”	Yes	Single	Single core download and debug for CM0+ core.

Do the following to download and debug using the Cortex®-M0+ core workspace.

Note: If you have not finished setting up your IAR environment, please refer to this URL.

1. Start IAR EWARM and open the AutoPDL template workspace file:

   INFINEON_AUTO_SW\PSoC4HV_PDL_MW\examples\Tools\psoc4hvpa144k\psoc4hvpa144k_Eva_license

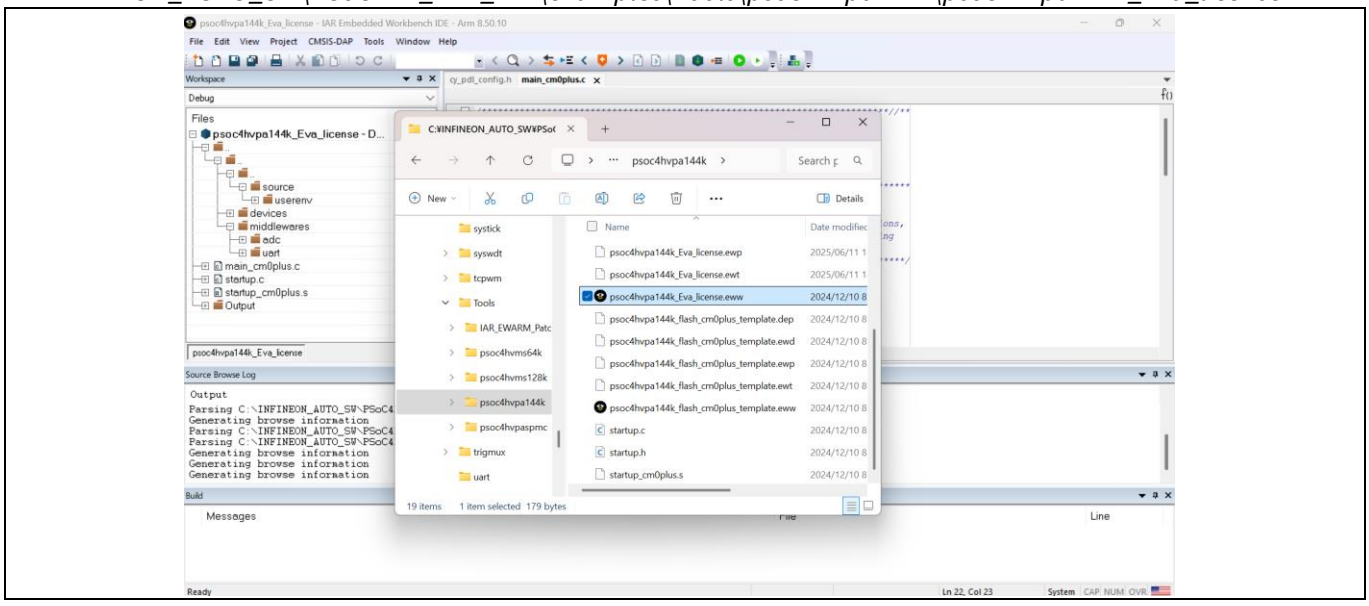


Figure 19 Selecting CM0+ single core evaluation license code

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

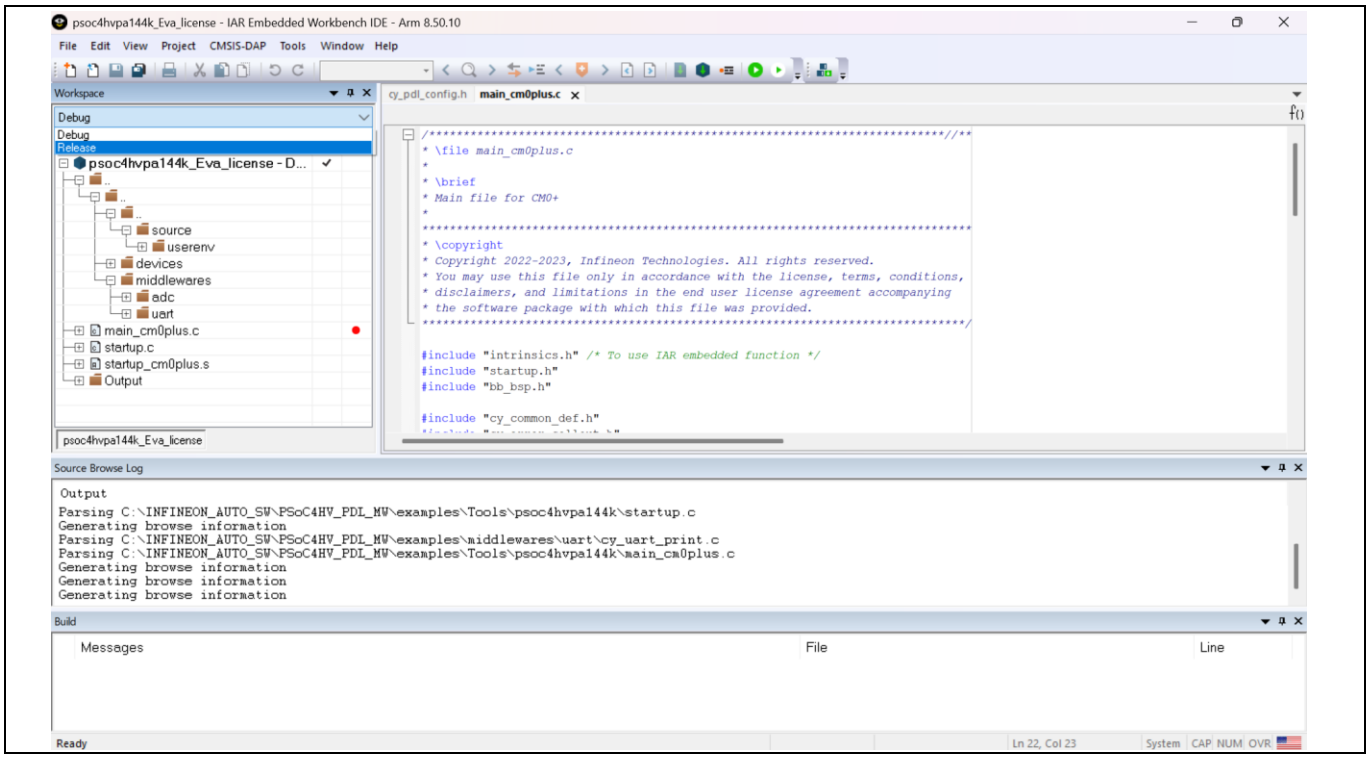


Figure 20 Selecting workspace revision

3. Right-click **psoc4hvpa144k_Eva_license** and select **Rebuild All**.

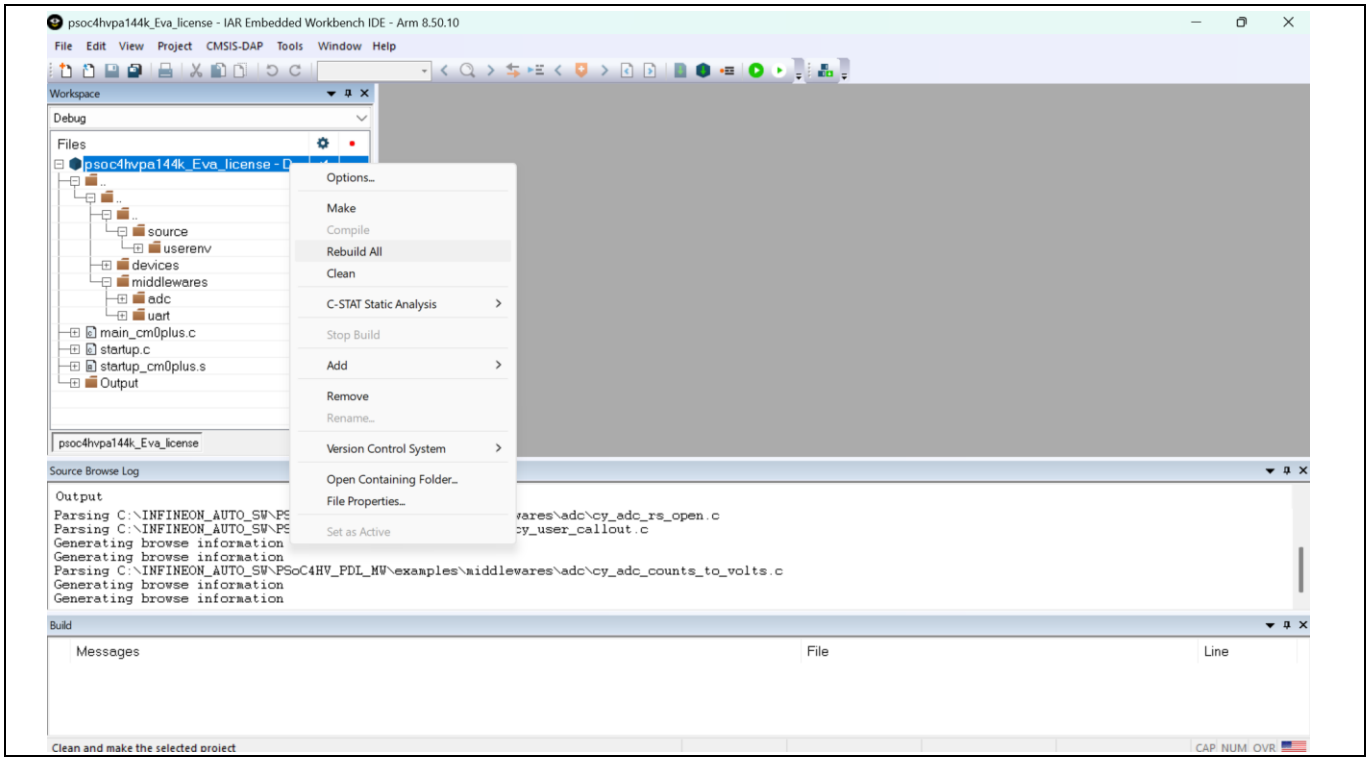


Figure 21 Rebuilding workspace revision

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

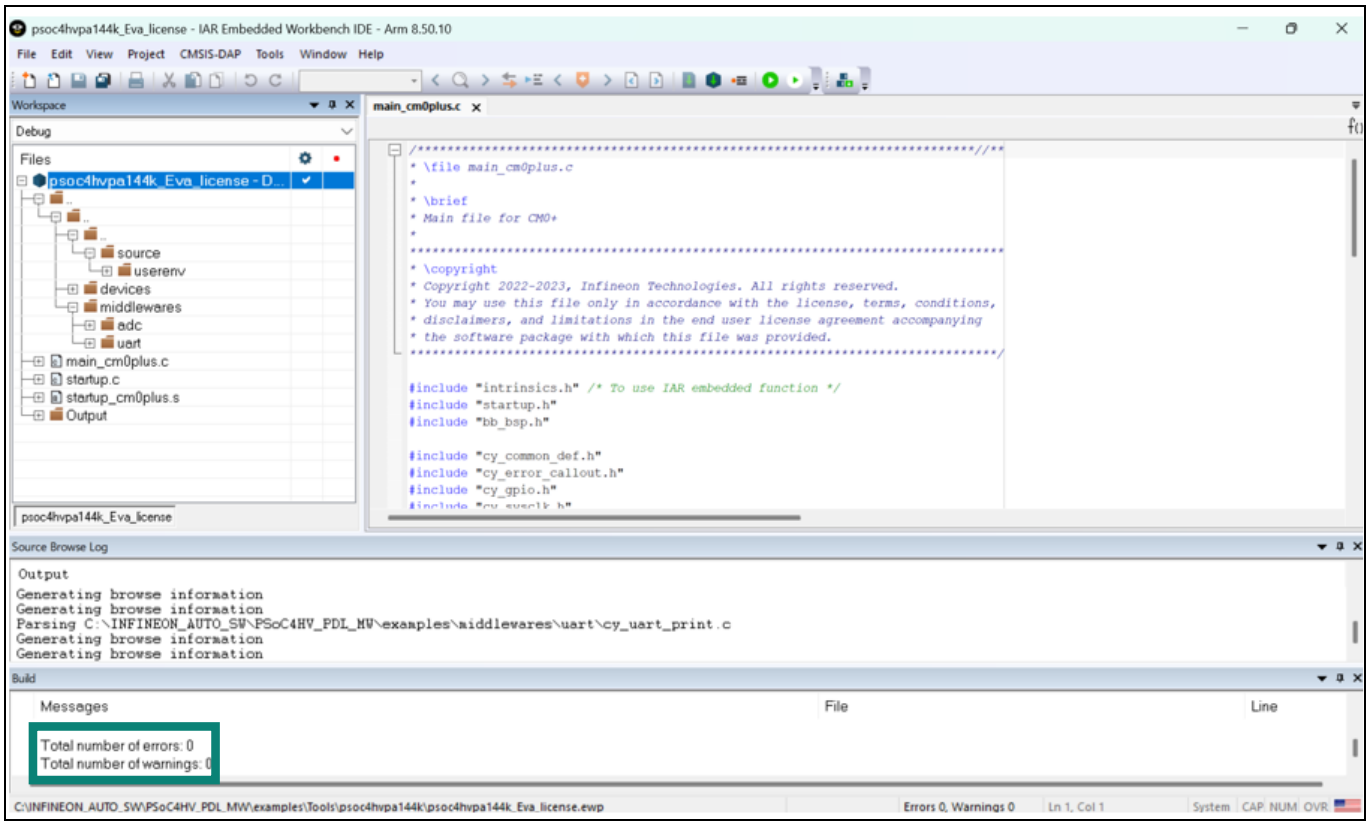


Figure 22 Checking building status in build log

5. To load the program to the flash region of Cortex®-M0+ core, click the green **Download and Debug** icon.

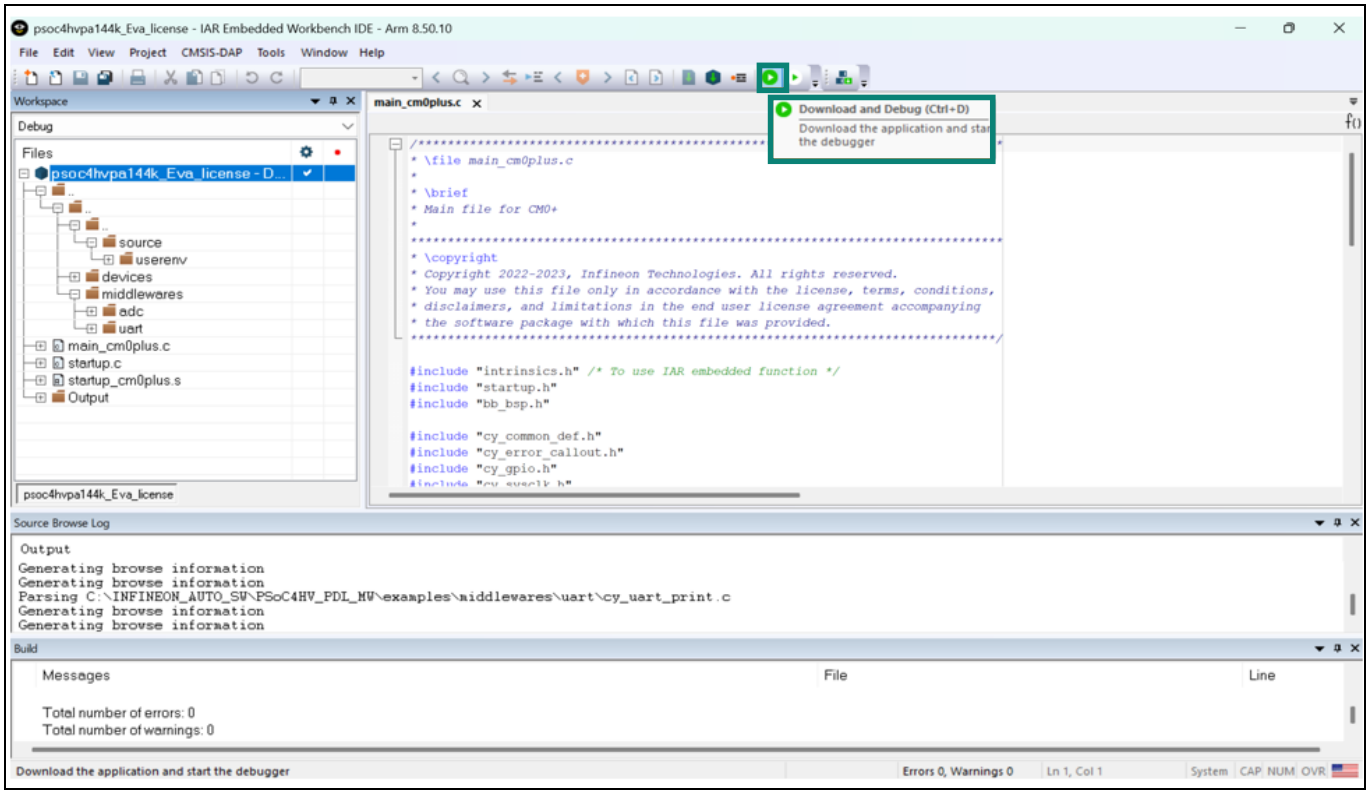


Figure 23 Downloading and debugging

6. Click on the **Go** icon to start execution.

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

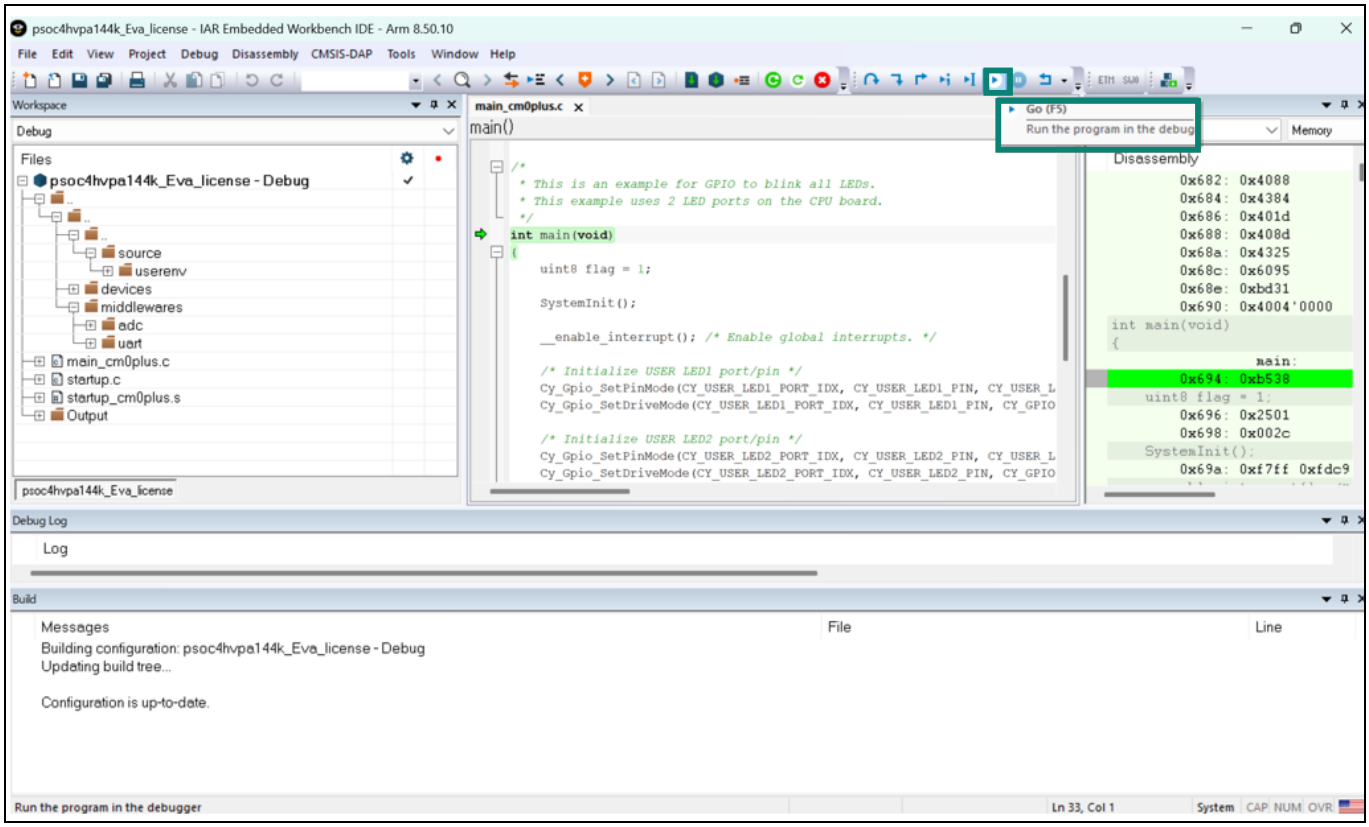


Figure 24 Debugging with Cortex®-M0+ core

7. In free running execution, LED6 & LED7 should start blinking on the board.

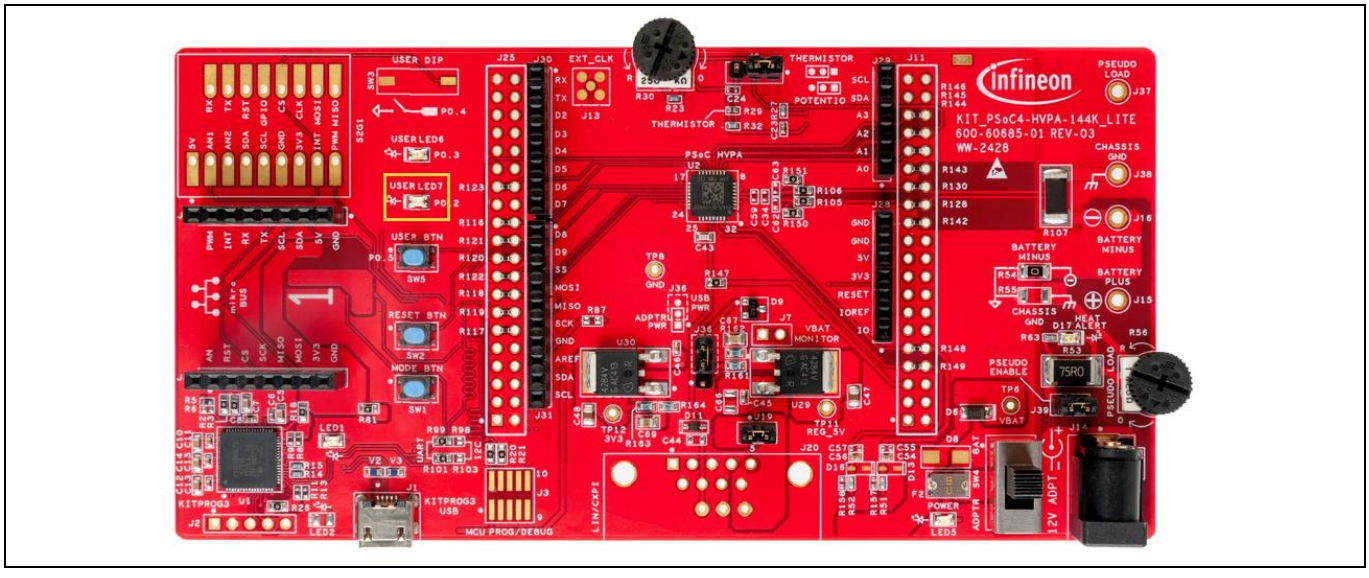


Figure 25 Blinking LED6 & LED7

5 Schematics and designs

5.1 KIT_PSOC4-HVPA-144K_LITE kit schematics

The section provides the KIT_PSOC4-HVPA-144K_LITE kit schematics.

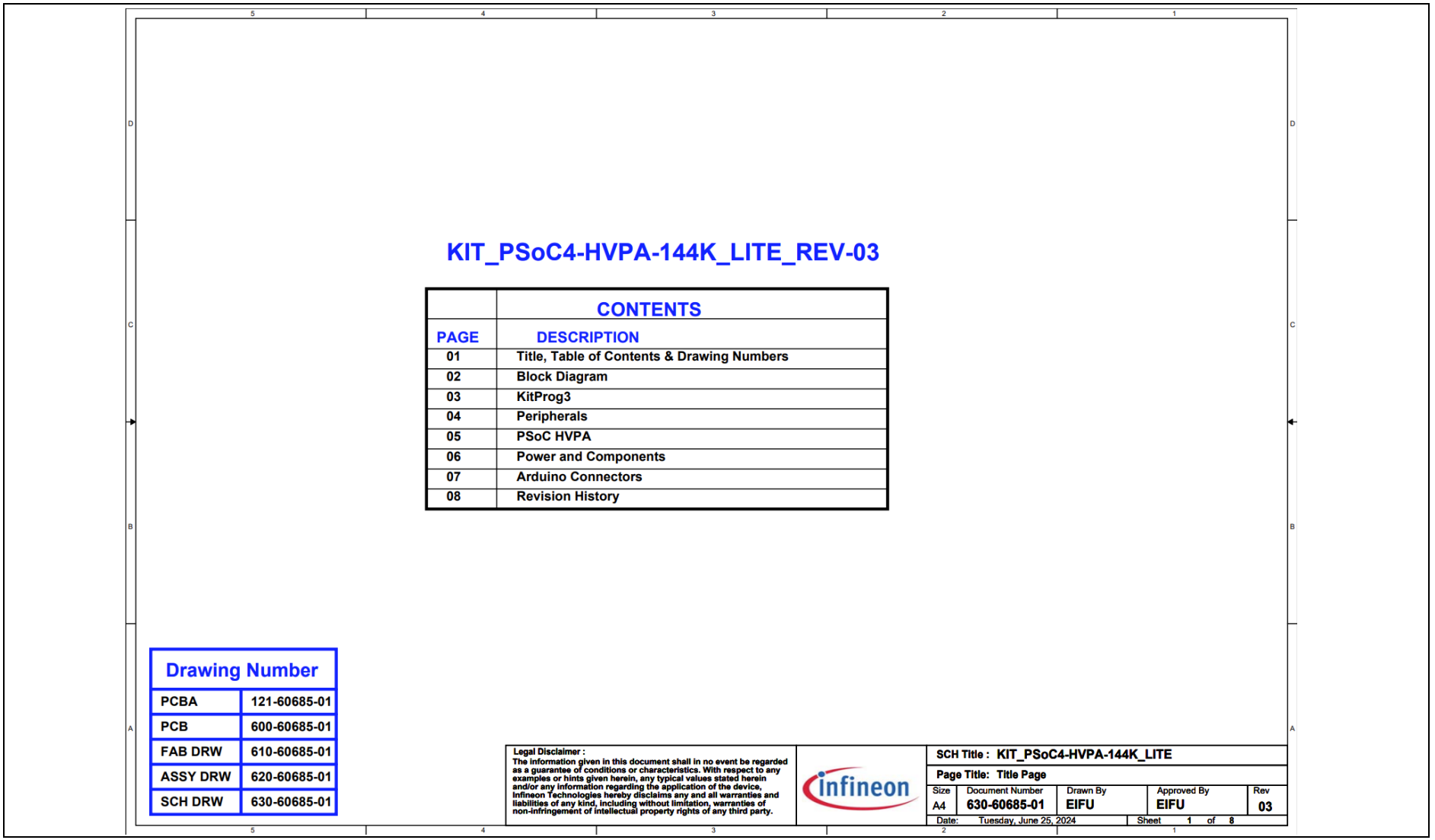


Figure 26 KIT_PSOC4-HVPA-144K_LITE kit schematic

Schematics and designs

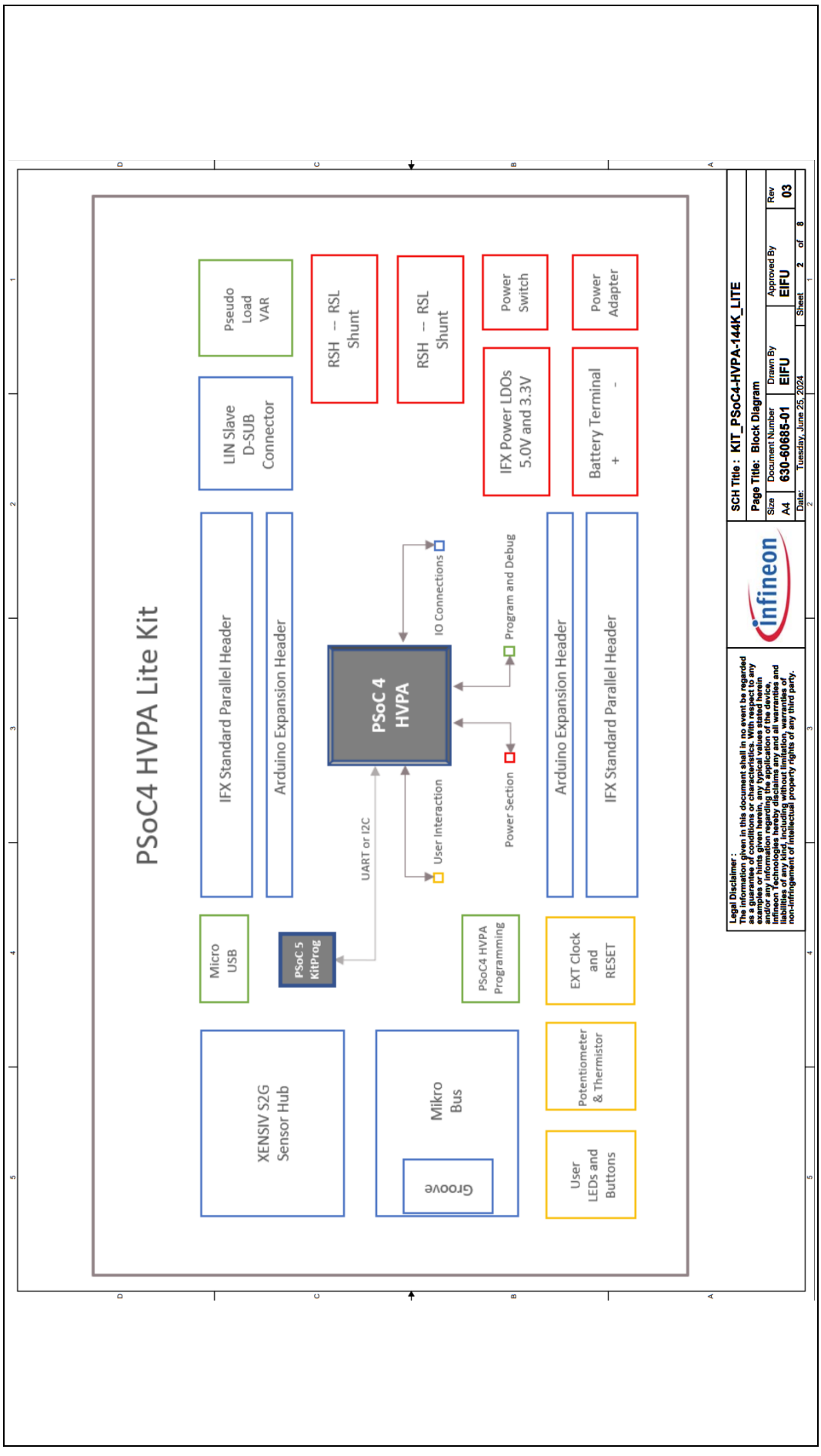


Figure 27 PSOC™ 4 HVPA Lite Kit block diagram

Schematics and designs

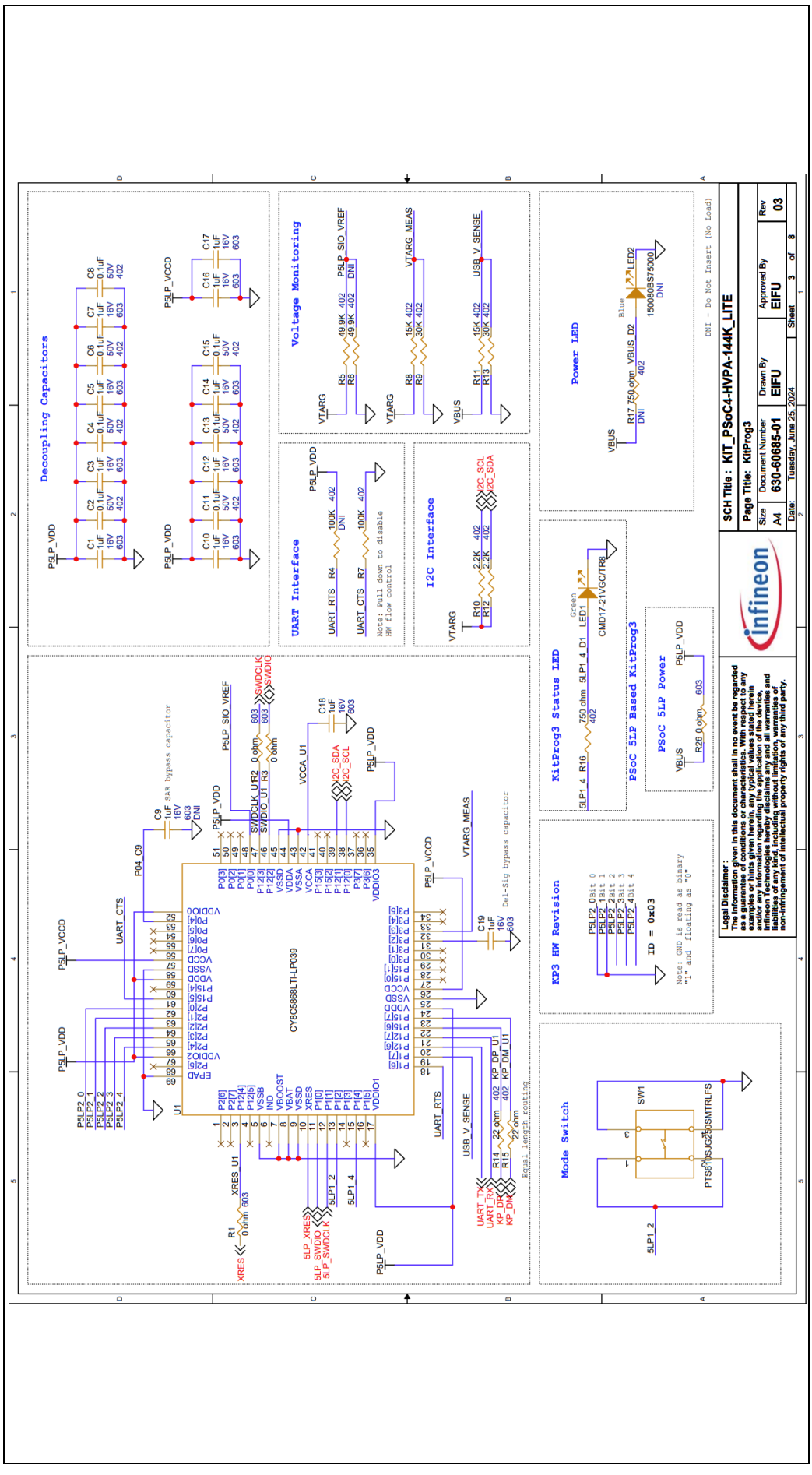


Figure 28 PSOC™ 5 LP-based Kit Prog3 schematics

Schematics and designs

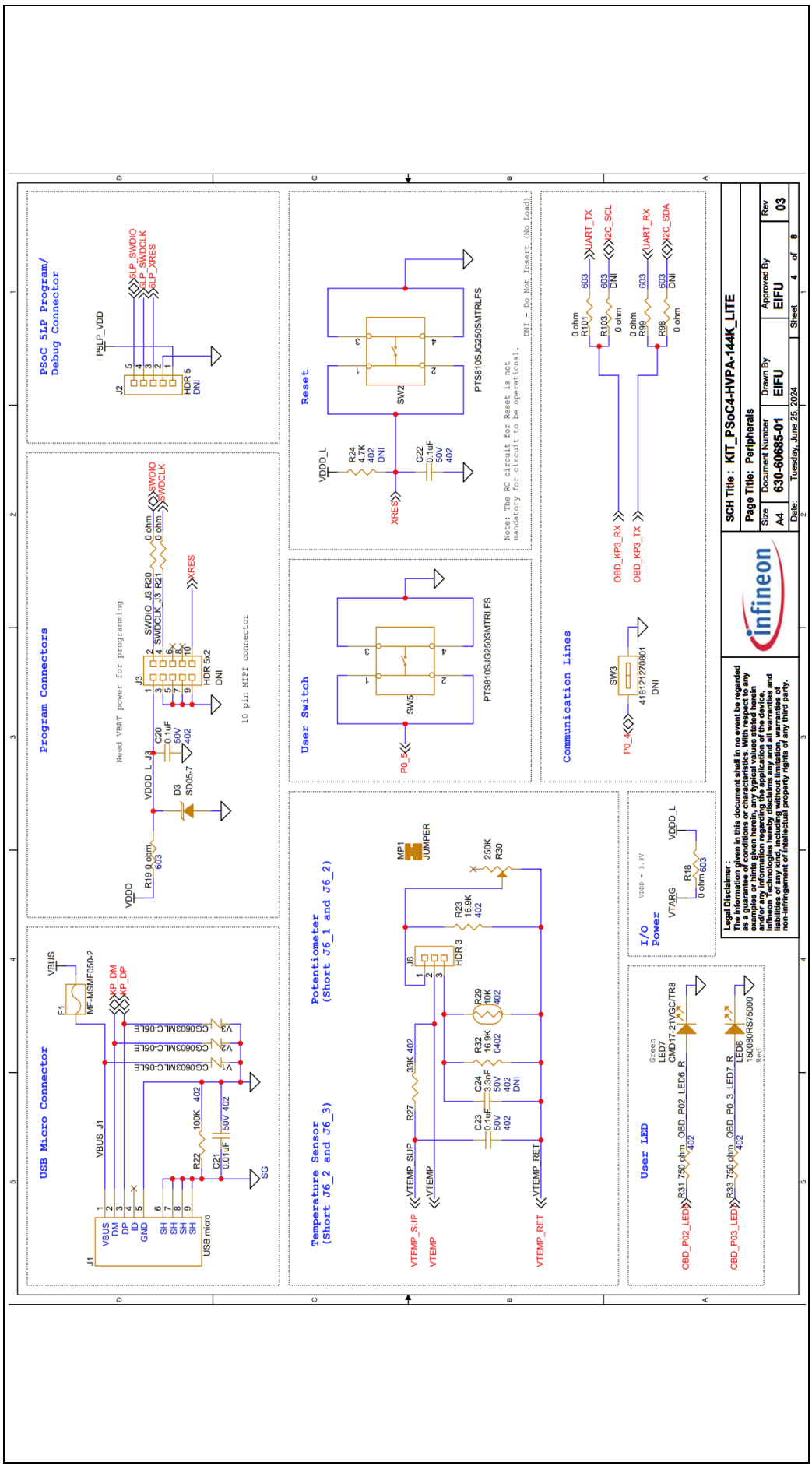


Figure 29 PSOC™ 4 HVPA Lite Kit peripherals

Schematics and designs

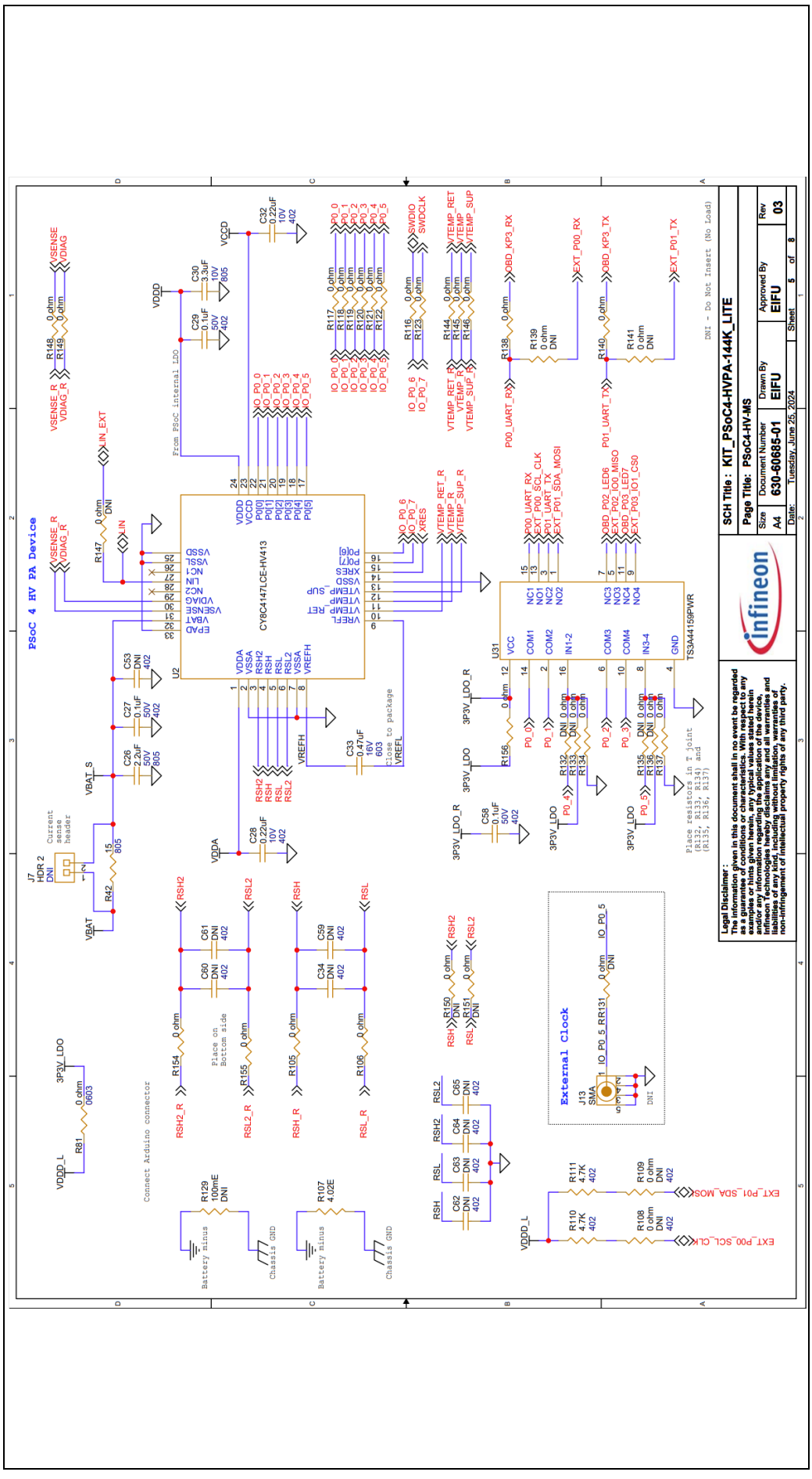


Figure 30 PSOC™ 4 HVPA Lite Kit schematics

Schematics and designs

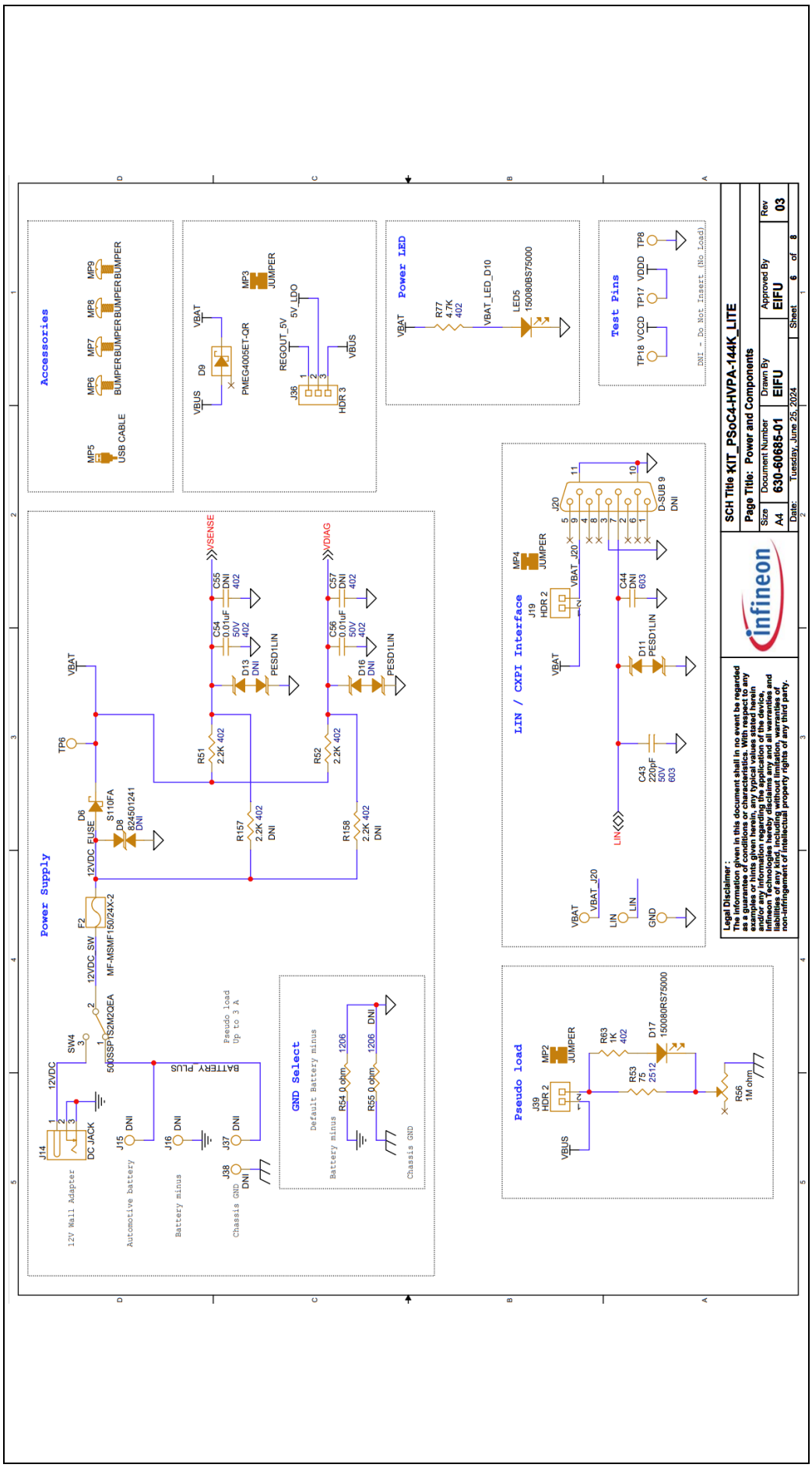


Figure 31 PSOC™ 4 HVPA Lite Kit power and components schematics

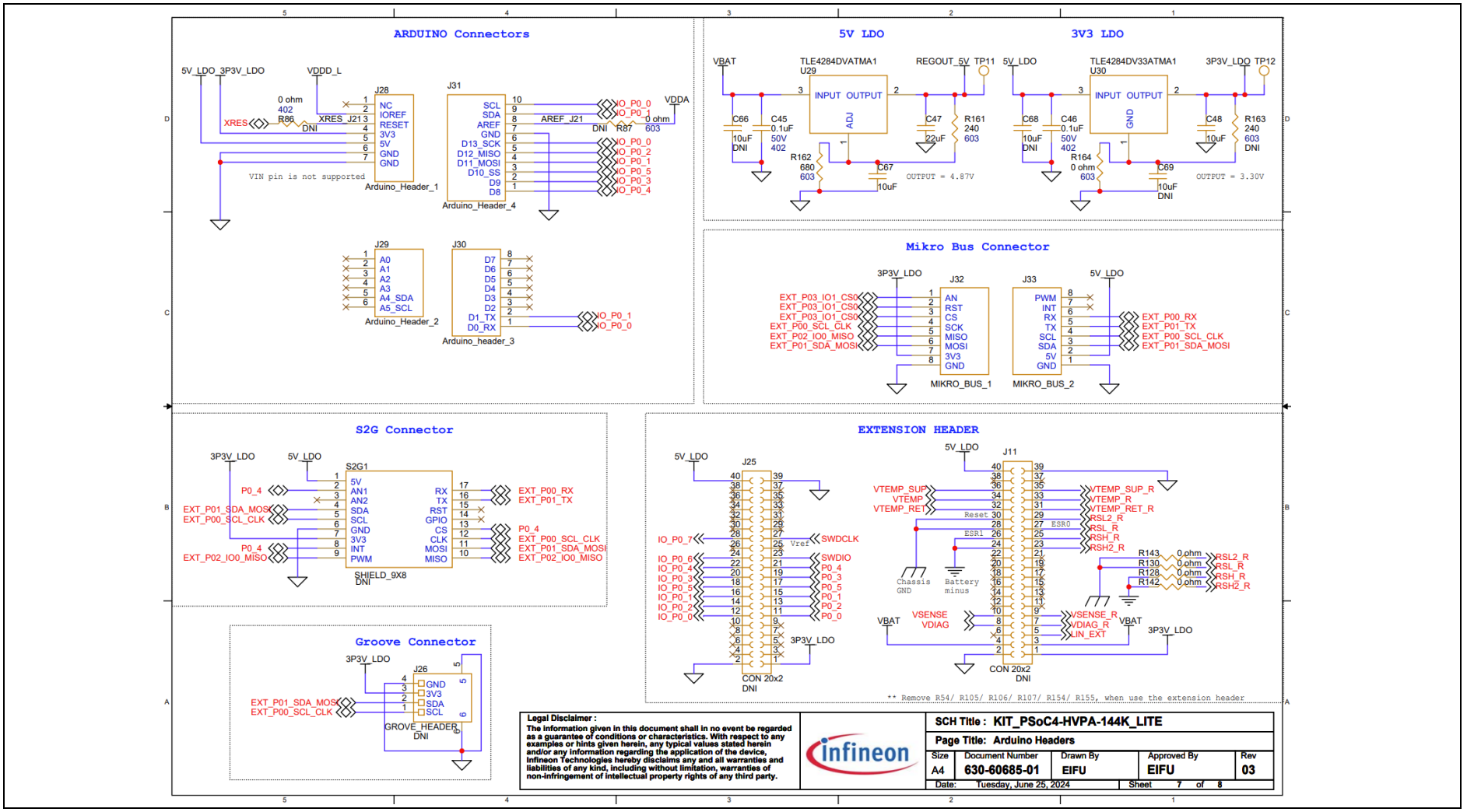


Figure 32 PSOC™ 4 HVPA Lite Kit Arduino-compatible header schematics

5.2 KIT_PSOC4-HVPA-144K_LITE kit assembly drawings

This section shows KIT_PSOC4-HVPA-144K_LITE kit assembly drawings.

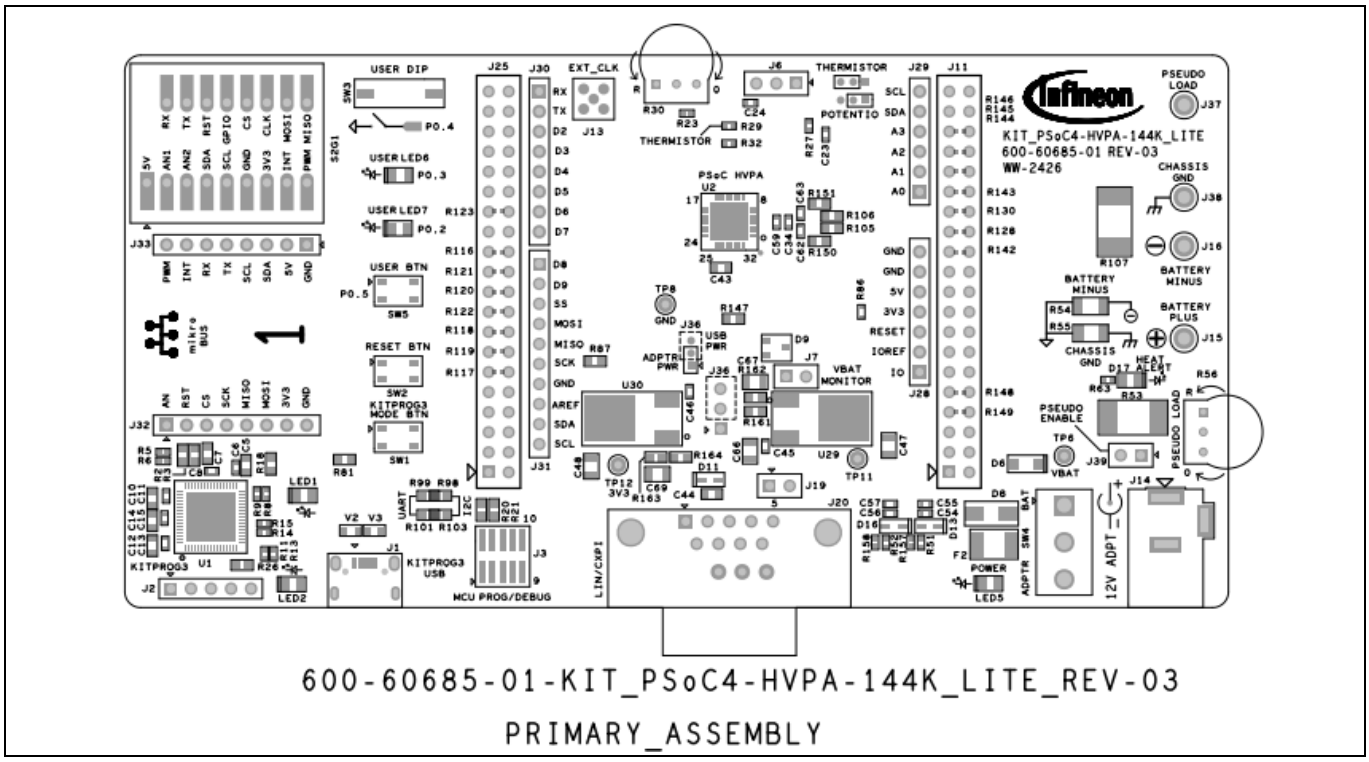


Figure 33 KIT_PSOC4-HVPA-144K_LITE kit assembly drawing top

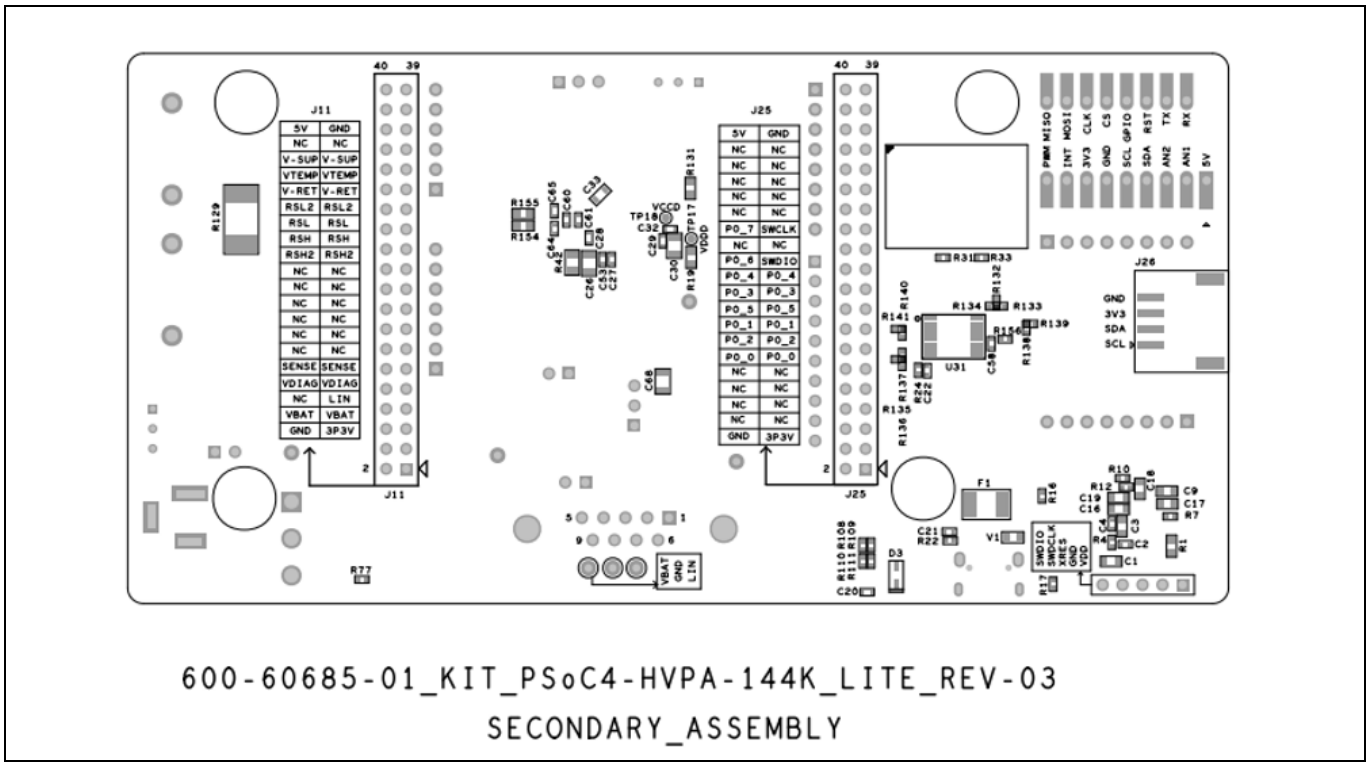


Figure 34 K IT_PSOC4-HVPA-144K_LITE kit assembly drawing bottom

References

Contact Infineon Support to obtain the following documents:

Datasheet

[1] Infineon Technologies AG: CY8C41x7, PSOC™ 4 High Voltage (HV) Precision Analog (PA) Automotive MCU Based on 32-bit Arm® Cortex®-M0+; Available online

Guides

[2] Infineon Technologies AG: *002-24616 - KitProg3 user guide;* Available online

Glossary

HVPA
high-voltage precision analog

LED
light emitting diode

LIN
local interconnect network

MCU
microcontroller

PCB
printed circuit board

PWM
pulse width modulation

USB
Universal Serial Bus

Revision history

Document revision	Date	Description of changes
**	2024-03-27	Initial release.
*A	2025-07-10	Updated section Software checks and Hardware Updated section Program and debug using an IAR Embedded Workbench in which SDL replaced by AutoPDL Added PSOC™ disclaimer

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.
PSOC™, formerly known as PSoC™, is a trademark of Infineon Technologies. Any references to PSoC™ in this document or others shall be deemed to refer to PSOC™.

Edition 2025-07-10

Published by

Infineon Technologies AG

81726 Munich, Germany

© 2025 Infineon Technologies AG. All Rights Reserved.

Do you have a question about this document?

Email: erratum@infineon.com

Document reference

002-38545 Rev. *A

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.