CY8CPROTO-062S2-43439 PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit guide

About this document

Scope and purpose

This document serves as a guide for using the CY8CPROTO-062S2-43439 PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit. The document explains about the kit contents, design and operation.

Intended audience

This prototyping kit is intended for all technical specialists who are familiar with connectivity and this board is intended to be used under laboratory conditions.

Reference documents

This user guide should be read in conjunction with the following documents:

- **AN228571 - Getting started with PSoC™ 6 MCU on ModusToolbox™ software**
- **PSoC™ 62 CY8C62x8, CY8C62xA datasheet**

Table of contents

About this document **1**
Table of contents **2**
Safety and regulatory compliance information **4**
Regulatory compliance information 4
General safety instructions 5
ESD protection 5
Handling boards 5
1 Introduction **6**
1.1 Kit contents 6
1.2 Board details 6
1.3 Getting started 12
1.4 Additional learning resources 12
1.5 Technical support 12
1.6 Documentation conventions 13
1.7 Abbreviations and definitions 13
2 Kit operation **15**
2.1 Theory of operation 15
2.2 KitProg3 19
2.2.1 Programming and Debugging using ModusToolbox™ software 19
2.2.2 Using OOB Example 21
2.2.3 USB-UART Bridge 21
2.2.4 USB-I2C Bridge 22
3 Hardware **23**
3.1 Schematics 23
3.2 Hardware functional description 23
3.2.1 CY8CMOD-062S2-43439 (U15) 23
3.2.2 PSoC™ 5LP (U1) 24
3.2.3 Serial interconnection between PSoC™ 5LP and PSoC™ 6 MCU 25
3.2.4 Power supply system 26
3.2.5 Expansion connectors 27
3.2.5.1 PSoC™ 6 MCU I/O Headers (J1 and J2) 27
3.2.5.2 KitProg3 GPIO Headers (J6 and J7) 27
3.2.6 CAPSENSE™ circuit 28
3.2.7 LEDs 28
3.2.8 Push Buttons 29
3.2.9 Infineon Quad SPI NOR Flash and microSD card 29
3.2.10 PDM Microphones and Thermistor 30
3.2.11 Digilent Pmod™ Headers 30
3.3 PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board rework 31
3.3.1 CAPSENSE™ Shield 31
3.3.2 BT (Bluetooth®) UART 31

Table of contents

3.4 Bill of Materials 31
3.5 Frequently Asked Questions 32
Revision history 34

Safety and regulatory compliance information

Regulatory compliance information

Contains Transmitter Module FCC ID: VPYLB1DX and IC: 772C-LB1DX

This kit is intended to use for ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY and is not considered by Infineon Semiconductor to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

The kit contains **Murata's Type 1YN (LBEE5KL1YN)** certified module. Due to change in the antenna pattern/type and gain used in CY8CPROTO-062S2-43439 PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit, class II permissive changes are required to recertify this kit. The radiated emission tests must be performed again to obtain a new FCC ID for this host kit. Most conducted RF test results may still be reused. Customer also needs to take their product through other FCC/ISED testing such as unintentional radiators (FCC sub part 15B) and any other required regional product certifications including but not limited to EU directives. Refer **FCC Regulatory Certification Guide** by Murata on information on pre-certified and reference certified module concepts and information on what additional test are required for FCC certification. Customer should consult a Telecommunication Certification Body (TCB) lab for guidance on other requirements for the device certification.

For more details on Murata Type 1YN module refer **www.murata.com/en-global/products/connectivitymodule/wi-fi-bluetooth/overview/lineup/type1yn**.

	PSoC™ 62S2 Wi-Fi Bluetooth® prototyping boards contain electrostatic discharge (ESD)- sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment, which can cause a discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused PSoC™ 62S2 Wi-Fi Bluetooth® prototyping boards in the protective shipping package.
	End-of-Life/Product Recycling The end-of-life cycle for this kit is five years from the date of manufacture mentioned on the back of the box. Contact your nearest recycler to discard the kit.

General safety instructions

ESD protection

ESD can damage boards and associated components. Infineon recommends that you perform procedures only at an ESD workstation. If an ESD workstation is unavailable, use appropriate ESD protection by wearing an anti-static wrist strap attached to a grounded metal object.

Handling boards

This kit is sensitive to ESD. Hold the board only by its edges. After removing the board from its box, place it on a grounded, static-free surface. Use a conductive foam pad, if available. Do not slide the board over any surface.

1 Introduction

Thank you for your interest in the CY8CPROTO-062S2-43439 PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit. This kit enables you to evaluate and develop your applications using the **PSoC™ 62 series MCU** (hereafter called "PSoC™ 6 MCU")and CYW43439 AIROC™ Wi-Fi & Bluetooth® combo device.

PSoC™ 6 MCU is an ultra-low-power device specifically designed for wearables and IoT products. PSoC™ 6 MCU integrates a 150-MHz Arm® Cortex®-M4 as the primary application processor, a 100-MHz Arm® Cortex®-M0+ that supports low-power operations, up to 2 MB Flash and 1 MB SRAM, Secure Digital Host Controller (SDHC) supporting SD/SDIO/eMMC interfaces, CAPSENSE™ touch-sensing, and programmable analog and digital peripherals that allow higher flexibility, in-field tuning of the design, and faster time-to-market.

You can use ModusToolbox™ to develop and debug your PSoC™ 6 MCU and CYW43439 applications. **ModusToolbox™ software** is a set of tools that enable you to integrate Infineon devices into your existing development methodology. One of the tools is a multi-platform, Eclipse-based Integrated Development Environment (IDE) that supports configuration and application development, called ModusToolbox™ IDE.

If you are new to PSoC™ 6 MCU and ModusToolbox™ IDE, you can find introductions in the application note **AN228571 - Getting started with PSoC™ 6 MCU on ModusToolbox™ software**.

1.1 Kit contents

The PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit has the following contents.

- PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board
- USB Type-A to Micro-B cable
- Quick Start Guide (printed on the kit package)

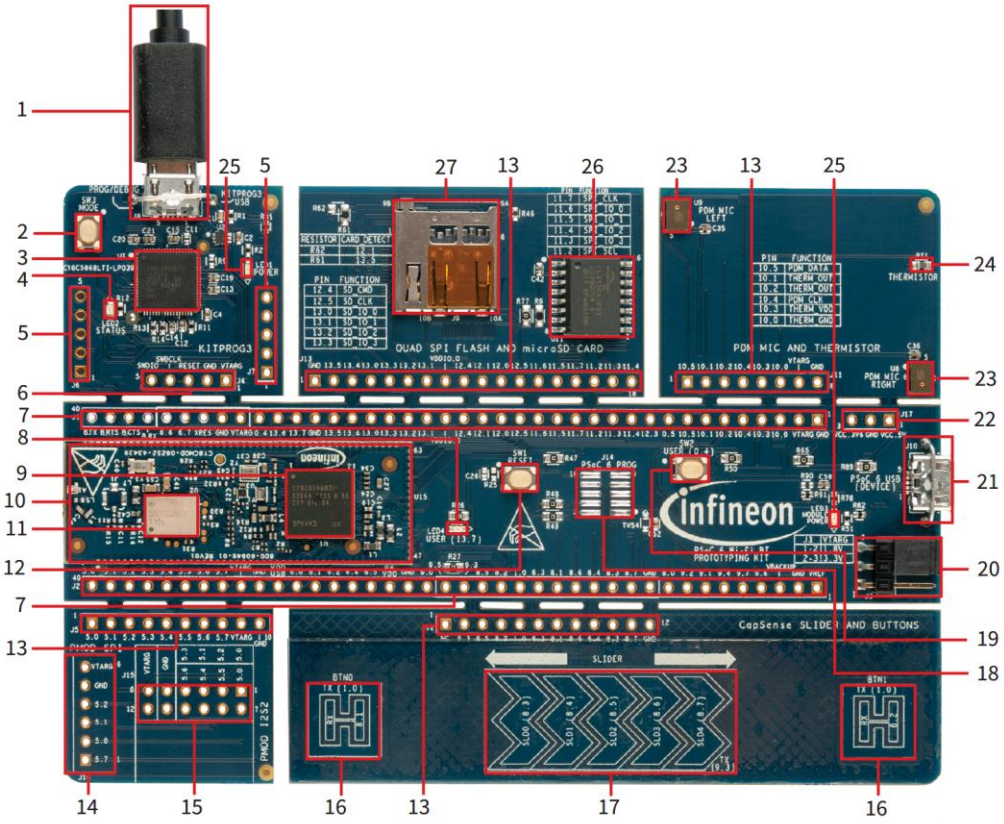
Inspect the contents of the kit; if you find any part missing, contact your nearest Infineon sales office for help: **www.infineon.com/support**.

1.2 Board details

Figure 1 shows the PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board, that has the following features:

- PSoC™ 6 MCU (**CY8C624ABZI-S2D44**)
- Murata Type 1YN module based on AIROC™ CYW43439
- microSD card slot
- 512-Mbit external Quad SPI NOR Flash that provides a fast, expandable memory for data and code
- A thermistor to measure ambient temperature and two PDM microphones for voice input
- KitProg3 onboard SWD programmer/debugger with USB-UART and USB-I2C bridge functionality
- CAPSENSE™ touch-sensing slider (5 elements) and two CAPSENSE™ buttons, all of which are capable of both self-capacitance (CSD) and mutual-capacitance (CSX) operation
- A Micro-B connector for USB device interface and a separate Micro-B connector for program-ming/debug using the KitProg3
- Expansion headers that are compatible with Digilent® Pmod™ modules
- 1.8 V and 3.3 V operation of PSoC™ 6 MCU is supported

- One user LED, a user button, and a reset button for PSoC™ 6 MCU
- One Mode selection button and one Mode LED for KitProg3



1. KitProg3 USB connector (J8)
2. KitProg3 programming mode selection button (SW3)
3. KitProg3 (PSoC™ 5LP) programmer and debugger (CY8C5868LTI-LP039, U1)
4. KitProg3 status LED (LED2)
5. KitProg3 I/O headers (J6, J7)
6. KitProg3 5-pin programming header (J4)
7. PSoC™ 6 MCU I/O headers (J1, J2)
8. PSoC™ 6 MCU user LED (LED4)
9. PSoC™ 6 MCU (CY8C624ABZI-S2D44)
10. PSoC™ 6 Wi-Fi Bluetooth® Module (CY8CMOD-062S2-43439, U15)
11. CYW43439 based Murata Type 1YN Module (LBEE5KL1YN)
12. Reset switch (SW1)
13. On-board peripheral headers (J5, J11, J12 and J13)
14. Digilent® Pmod™ SPI compatible I/O header (J16)
15. Digilent® Pmod™ I2S2 compatible I/O header (J15)
16. CAPSENSE™ buttons
17. CAPSENSE™ slider
18. PSoC™ 6 MCU program and debug header (J14)
19. PSoC™ 6 MCU user button (SW2)
20. Power selection jumper (J3)
21. PSoC™ 6 USB device Connector (J10)
22. External power supply connector (J17)
23. PDM microphones (U8, U9)
24. Thermistor (RT1)
25. Power LEDs (LED1, LED3)
26. 512-Mbit serial NOR flash memory (S25FL512S, U11)
27. MicroSD Card holder (J9)

Figure 1 Board components

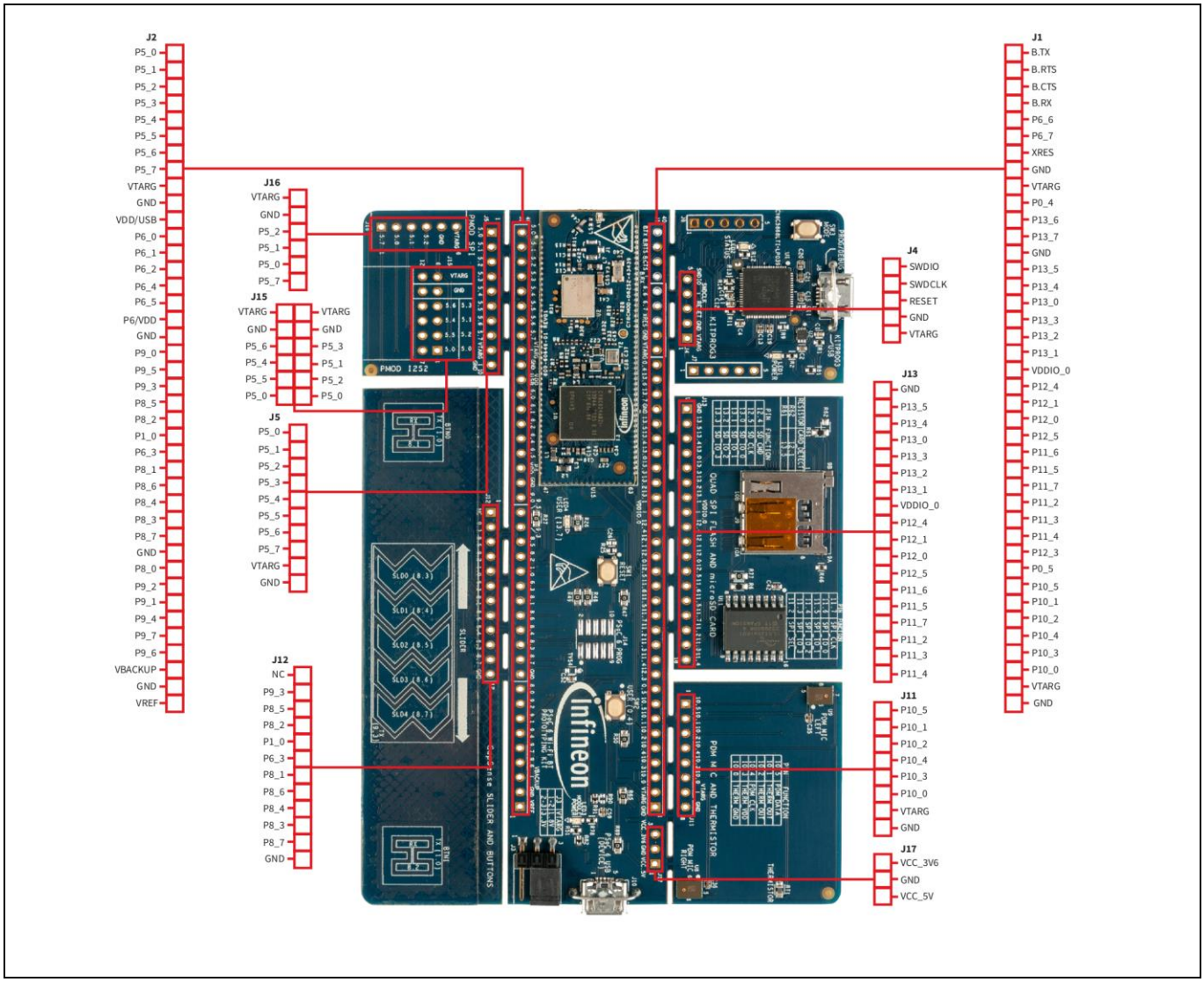


Figure 2 Prototyping board pinout

Table 1 Board pinout

PSoC™ 6 MCU pin	Primary onboard function	Secondary onboard function	Connection details
XRES	Hardware Reset	–	Remove R47 to disconnect it from KitProg3 reset.
P0.4	User Button with Hibernate wakeup capability	–	Connected to ground as active low logic by default. Remove R24, R22 and populate R21, R23 to change the switch to active high logic.
P0.5	GPIO	–	–
P1.0	CAPSENSE™ Button TX	GPIO	Connected to CAPSENSE™ by default. Remove R35 to disconnect CAPSENSE™.

PSoC™ 6 MCU pin	Primary onboard function	Secondary onboard function	Connection details
P5.0	UART RX	MCLK	To use PMOD, Remove R72 to disconnect from KitProg3 UART TX.
P5.1	UART TX	TX_SCK	To use PMOD, Remove R73 to disconnect from KitProg3 UART RX.
P5.2	UART RTS	TX_WS	To use PMOD, Remove R75 to disconnect from KitProg3 UART CTS.
P5.3	UART CTS	TX_SDO	To use PMOD, Remove R74 to disconnect from KitProg3 UART RTS.
P5.4	GPIO	RX_SCK	–
P5.5	GPIO	RX_WS	–
P5.6	GPIO	RX_SDO	–
P5.7	GPIO	–	–
P6.0	I2C_SCL	–	EEPROM (U16) can be accessed by this line.
P6.1	I2C_SDA	–	EEPROM (U16) can be accessed by this line.
P6.2	GPIO	–	–
P6.3	GPIO	CAP_SH	Remove R76 and populate R55 to connect Hatch to CAPSENSE™ Shield pin.
P6.4	GPIO	TDO_SWO	–
P6.5	GPIO	TDI	–
P6.6	SWDIO	GPIO	Remove R49 to disconnect from KitProg3 SWDIO.
P6.7	SWDCLK	GPIO	Remove R48 to disconnect from KitProg3 SWDCLK.
P8.0	GPIO	–	–
P8.1	CAPSENSE™ Button0 Rx	GPIO	Connected to CAPSENSE™ by default. Remove R34 to disconnect CAPSENSE™.
P8.2	CAPSENSE™ Button1 Rx	GPIO	Connected to CAPSENSE™ by default. Remove R45 to disconnect CAPSENSE™.
P8.3	CAPSENSE™ Silder0 Rx	GPIO	Connected to CAPSENSE™ by default.

PSoC™ 6 MCU pin	Primary onboard function	Secondary onboard function	Connection details
			Remove R40 to disconnect CAPSENSE™.
P8.4	CAPSENSE™ Silder1 Rx	GPIO	Connected to CAPSENSE™ by default. Remove R41 to disconnect CAPSENSE™.
P8.5	CAPSENSE™ Silder2 Rx	GPIO	Connected to CAPSENSE™ by default. Remove R42 to disconnect CAPSENSE™.
P8.6	CAPSENSE™ Silder3 Rx	GPIO	Connected to CAPSENSE™ by default. Remove R43 to disconnect CAPSENSE™.
P8.7	CAPSENSE™ Silder4 Rx	GPIO	Connected to CAPSENSE™ by default. Remove R44 to disconnect CAPSENSE™.
P9.0	GPIO	–	–
P9.1	GPIO	–	–
P9.2	GPIO	–	–
P9.3	CAPSENSE™ Slider Tx	GPIO	Connected to CAPSENSE™ by default. Remove R79 to disconnect CAPSENSE™.
P9.4	GPIO	–	–
P9.5	GPIO	–	–
P9.6	GPIO	–	–
P9.7	GPIO	–	–
P10.0	Thermistor VDD	–	–
P10.1	Thermistor Output	–	To disconnect from thermistor, remove R36.
P10.2	Thermistor Output	–	To disconnect from thermistor, remove R37.
P10.3	Thermistor GND	–	–
P10.4	PDM Clock	–	–
P10.5	PDM Data	–	–
P11.2	QSPI FLASH CS	–	–
P11.3	QSPI FLASH DATA3	–	–
P11.4	QSPI FLASH DATA2	–	–
P11.5	QSPI FLASH DATA1	–	–

PSoC™ 6 MCU pin	Primary onboard function	Secondary onboard function	Connection details
P11.6	QSPI FLASH DATA0	–	–
P11.7	QSPI FLASH CLK	–	–
P12.0	GPIO	–	–
P12.1	GPIO	CARD DETECT	Remove R61 and populate R62 to connect to Card Detect of microSD card slot.
P12.3	GPIO	–	–
P12.4	SDHC CMD	–	–
P12.5	SDHC CLK	–	–
P13.0	SDHC DATA0	–	–
P13.1	SDHC DATA1	–	–
P13.2	SDHC DATA2	–	–
P13.3	SDHC DATA3	–	–
P13.4	GPIO	–	–
P13.5	CARD DETECT	GPIO	Remove R61 to disconnect from card detect of microSD card slot.
P13.6	GPIO	–	–
P13.7	Red User LED (LED4)	GPIO	–
USB.DP	–	–	–
USB.DM	–	–	–
BT_UART.RXD	–	–	To connect to KitProg3, remove R72 and populate R68.
BT_UART.TXD	–	–	To connect to KitProg3, remove R73 and populate R69.
BT_UART.CTS	–	–	To connect to KitProg3, remove R74 and populate R70.
BT_UART.RTS	–	–	To connect to KitProg3, remove R75 and populate R71.
VREF	SAR BYPASS, J2.1, AREF	–	–
VDDIO.0	–	–	R63 is loaded by default, connects VDDIO.0 to VCC_3V3. Remove R63 and populate. R64 to connect VDDIO.0 to VCC_1V8.

1.3 Getting started

This guide will help you to get acquainted with the PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit:

- PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit requires ModusToolbox™ 3.0 to design and debug applications. Download and install ModusToolbox™ from **www.infineon.com/modustoolbox**. See the **ModusToolbox™ Installation Guide** for additional information.
- The **Kit operation** chapter describes the major features of the board and functionalities such as programming, debugging, and the USB-UART and USB-I2C bridges.
- The **Hardware** chapter provides a detailed hardware description, methods to use the onboard NOR Flash, kit schematics, and the bill of materials (BOM).
- There are wide range of code examples to evaluate the PSoC™ 62S2 evaluation board. These examples help you familiarize PSoC™ 6 MCU and create your own design. These examples can be accessed through ModusToolbox™ Project Creator tool. Alternatively, you can also visit Infineon's code example page to access these examples:
  - **Code examples for ModusToolbox™ software**

1.4 Additional learning resources

Infineon provides a wealth of data at **www.infineon.com/psoc6** to help you to select the right PSoC™ device for your design and to help you to quickly and effectively integrate the device into your design.

1.5 Technical support

For assistance, go to **www.infineon.com/support**. Visit **community.infineon.com** to ask your questions in Infineon developer community.

1.6 Documentation conventions

Table 2 Document conventions for guides

Convention	Usage
`Courier New`	Displays user-entered text and source code
Italics	Displays file names and reference documentation: Read about the *sourcefile.hex* file in the *PSoC™ Creator user guide*.
File > **Open**	Represents menu paths: File > Open > New Project
Bold	Displays commands, menu paths, and icon names in procedures: Click the **File** icon and then click **Open**.
Times New Roman	Displays an equation: 2 + 2 = 4
Text in gray boxes	Describes Cautions or unique functionality of the product.

1.7 Abbreviations and definitions

Table 3 Abbreviations

Abbreviation	Definition
ADC	Analog-to-Digital Converter
BLE	Bluetooth® Low Energy
BOM	Bill of Materials
CINT	Integration Capacitor
CMOD	Modulator Capacitor
CPU	Central Processing Unit
CSD	CAPSENSE™ Sigma Delta
CSX	CAPSENSE™ Crosspoint
DC	Direct Current
Del-Sig	Delta-Sigma
DMA	Direct Memory Access
ECO	External Crystal Oscillator
ESD	Electrostatic Discharge
FPC	Flexible Printed Circuit
GDB	GNU Debugger
GPIO	General-Purpose Input/Output
HID	Human Interface Device
I^2C	Inter-Integrated Circuit
I^2S	Inter-IC Sound
IC	Integrated Circuit
ICSP	In-Circuit Serial Programming
IDAC	Current Digital-to-Analog Converter

Abbreviation	Definition
IDE	Integrated Development Environment
IoT	Internet of Things
LED	Light-emitting Diode
LPO	Low Power Oscillator
OOB	Out Of Box
PC	Personal Computer
PDL	Peripheral Driver Library
PDM	Pulse Density Modulation
PMOD	Peripheral Modules
PSoC™	Programmable System-on-Chip
PTC	Positive Temperature Coefficient
PWM	Pulse Width Modulation
QSPI	Quad Serial Peripheral Interface
RTOS	Real Time Operating System
SAR	Successive Approximation Register
SDHC	Secure Digital Host Controller
SDIO	Secure Digital Input Output
SDK	Software Development Kit
SMIF	Serial Memory Interface
SPI	Serial Peripheral Interface
SRAM	Static Random-Access Memory
SWD	Serial Wire Debug
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

2 Kit operation

This chapter introduces you to various features of the PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit, including the theory of operation and the onboard programming and debugging functionality, KitProg3 USB-UART and USB-I2C bridges.

2.1 Theory of operation

The PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit is built around a PSoC™ 6 MCU. **Figure 3** shows the block diagram of the PSoC™ 6 MCU device used in the kit. For details of device features, see the **device datasheet**.

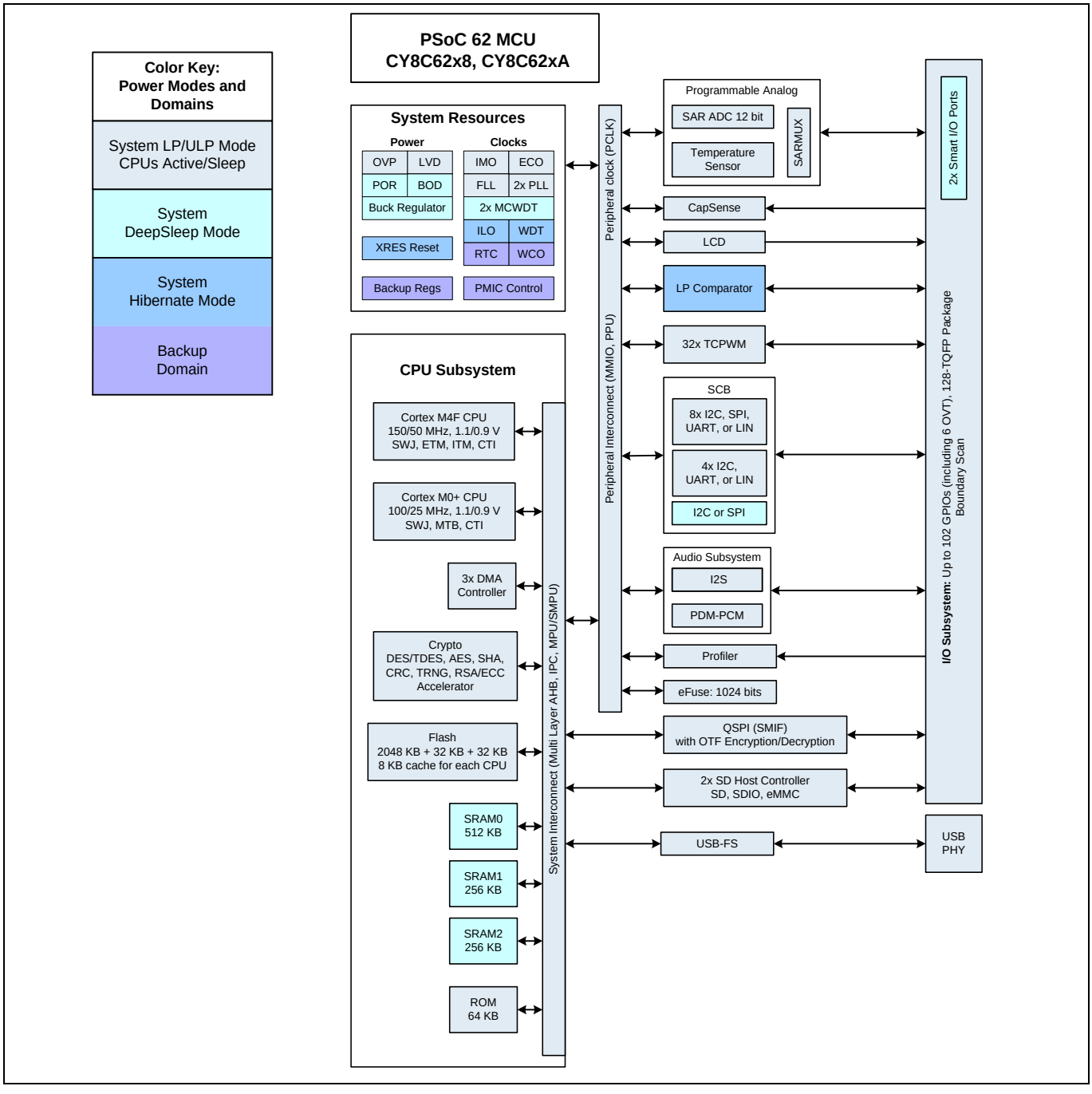


Figure 3 PSoC™ 6 MCU block diagram

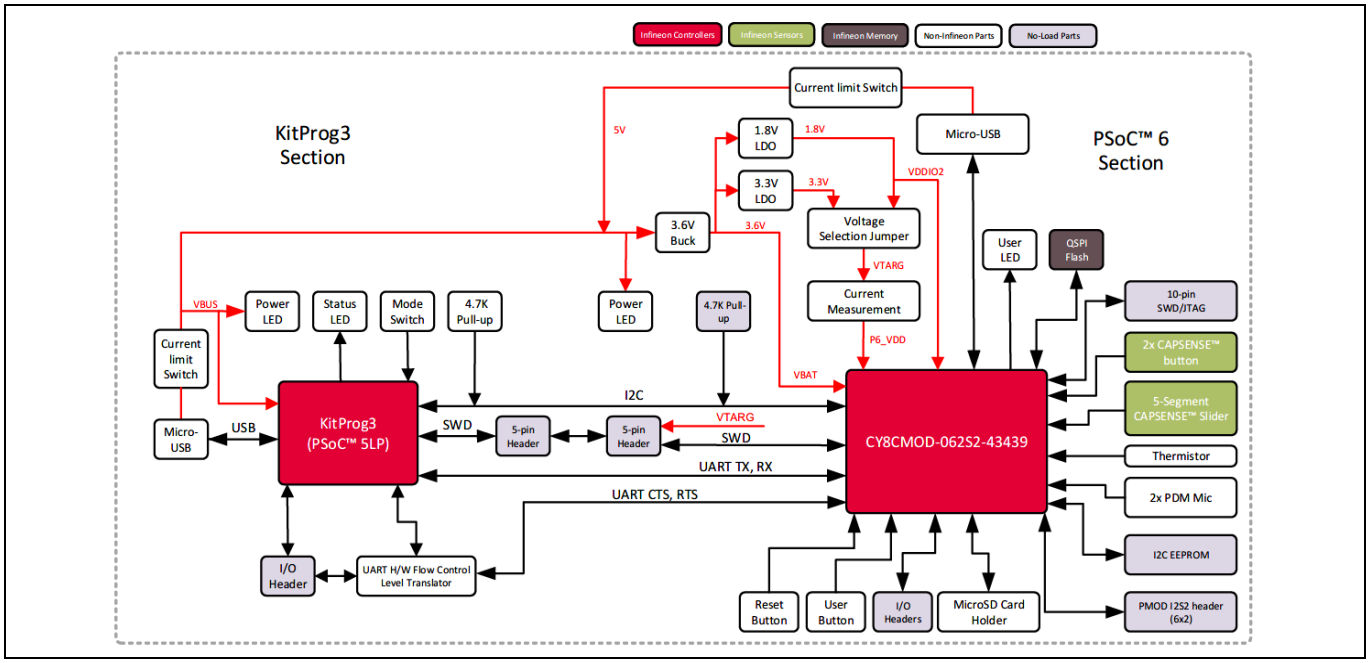


Figure 4 Block diagram of the board

The PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board consists of multiple sections, a KitProg3 section, PSoC™ 6 MCU section and other peripheral sections. An on-board programmer, KitProg3 is used to program and debug the target PSoC™ 6 MCU. Refer to **2.2 KitProg3** and **3.2 Hardware functional description** for more details on these sections.

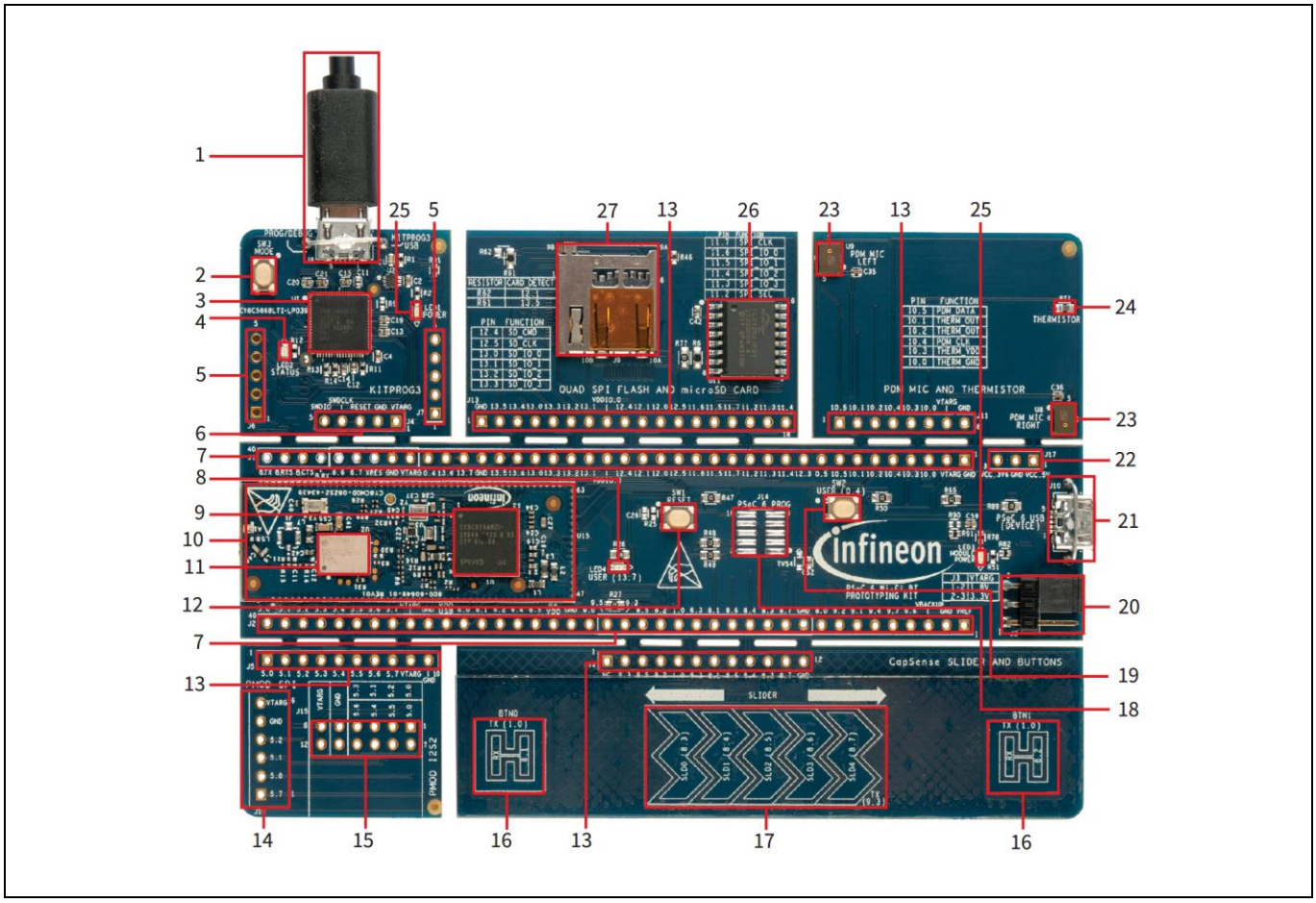


Figure 5 Board – top view

The board has the following peripherals:

1. **KitProg3 USB connector (J8):** The USB cable provided along with the PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board connects between this USB connector and the PC to use the KitProg3 onboard programmer and debugger and to provide power to the board.
2. **KitProg3 programming mode selection button (SW3):** This button can be used to switch between various modes of operation of KitProg3 (CMSIS-DAP/Bulk or CMSIS-DAP/HID mode). This button can also be used to provide input to PSoC™ 5LP in custom application mode. For more details, see the **KitProg3 user guide**. By default, the programming mode is set to CMSIS-DAP/ Bulk which allows faster programming than CMSIS-DAP/HID.
3. **KitProg3 (PSoC™ 5LP) programmer and debugger (CY8C5868LTI-LP039, U1):** The PSoC™ 5LP device (CY8C5868LTI-LP039) serving as KitProg3, is a multi-functional system, which includes a SWD programmer, debugger, USB-I2C bridge and USB-UART bridge. KitProg3 also supports custom applications. For more details, see the **KitProg3 user guide**.
4. **KitProg3 status LED (LED2):** Amber LED (LED2) indicates the status of KitProg3. For details on the KitProg3 status, see the **KitProg3 user guide**. By default, this LED should be ON which indicates CMSIS-DAP/Bulk mode.
5. **KitProg3 I/O headers (J6, J7):** These headers bring out the USB-UART and USB-I2C interface pins of the KitProg3. If the KitProg3 Section is broken away, it is also necessary to connect VTARG and GND as those are used for voltage level translation. For more details on the KitProg3, see the **KitProg3 user guide**.

6. **KitProg3 5-pin programming header (J4):** This header brings out the SWD interface pins of the KitProg3. This is used to program and debug the PSoC™ 6 MCU. If KitProg3 section is broken away, it can be used to program any device over the 5-pin interface. Please note that VTARG is an input to KitProg3, and hence the target must be powered externally in that case. The on-board regulators on the PSoC™ 6 MCU section provide VTARG. For more details on the KitProg3, see the **KitProg3 user guide**.
7. **PSoC™ 6 MCU I/O headers (J1, J2):** These headers provide connectivity to PSoC™ 6 MCU GPIOs. Most of these I/Os are also connected to on-board peripherals.
8. **PSoC™ 6 MCU user LED (LED4):** The user LED can operate at the entire operating voltage range of PSoC™ 6 MCU. The LED is active LOW, so the pins must be driven to ground to turn ON the LED.
9. **PSoC™ 6 MCU:** This kit is designed to highlight the features of the PSoC™ 6 MCU. For details on PSoC™ 6 MCU pin mapping, see **Table 1**.
10. **Infineon PSoC™ 6 Wi-Fi BT Module (CY8CMOD-062S2-43439, U1):** This kit is designed to highlight the features of the PSoC™ 6 MCU on the CY8CMOD-062S2-43439.
11. **CYW43439 based Murata 1YN Module**: The Type 1YN module supports Wi-Fi 802.11b/g/n + Bluetooth® 5.2 BR/EDR/LE up to 65Mbps PHY data rate on Wi-Fi and 3Mbps PHY data rate on Bluetooth®. The WLAN section supports SDIO v2.0 interface and the Bluetooth® section supports high-speed 4-wire UART interface and PCM for audio data. Type 1YN module facilitates integration into size- and power-sensitive applications such as IoT applications, handheld wireless system, gateway.
12. **Reset button (SW1):** This button is used to reset the PSoC™ 6 MCU. This button connects the PSoC™ 6 MCU reset (XRES) pin to ground.
13. **On-board peripheral headers (J5, J11, J12 and J13):** On-board peripherals are divided into sections. Each section is independent and can be broken away from the PSoC™ 6 MCU section.
14. **Digilent Pmod compatible SPI header (J16):** This header can be used to connect Digilent Pmod 1 × 6 pin SPI modules.
15. **Digilent Pmod compatible I2S2 header (J15):** This header can be used to connect Digilent Pmod 2 × 6 pin I2S2 modules.
16. **CAPSENSE™ buttons (BTN0 and BTN1):** CAPSENSE™ touch-sensing buttons, capable of both self-capacitance (CSD) and mutual-capacitance (CSX) operation, let you evaluate Infineon' fourth-generation CAPSENSE™ technology.
17. **CAPSENSE™ slider:** CAPSENSE™ touch-sensing slider capable of both self-capacitance (CSD) and mutual-capacitance (CSX) operation. The slider and the buttons have a 1-mm acrylic overlay for smooth touch sensing.
18. **PSoC™ 6 MCU program and debug header (J14):** This 10-pin header allows you to program and debug the PSoC™ 6 MCU using an external programmer such as **MiniProg4**. Please note that this header is not loaded by default.
19. **PSoC™ 6 MCU user button (SW2):** This button can be used to provide an input to the PSoC™ 6 MCU. Note that by default the button connects the PSoC™ 6 MCU pin to ground when pressed, so you need to configure the PSoC™ 6 MCU pin as a digital input with resistive pull-up for detecting the button press. This button also provides a wake-up source from low-power modes of the device. In addition, this button can be used to activate the PMIC control from PSoC™ 6 MCU.
20. **System power selection jumper (J3):** This jumper is used to select the PSoC™ 6 MCU's supply voltage (P6.VDD) between 1.8 V and 3.3 V.
21. **PSoC™ 6 USB Device Connector (J10):** The USB cable provided with the PSoC™ 62S2 Wi-Fi Bluetooth® prototyping kit can also be connected between this USB connector and the PC to use the PSoC™ 6 MCU USB device applications.
22. **External Power Supply connector (J17):** This connector connects an external DC power supply input to the onboard regulators. The voltage input from the external supply should be between 4.5 V and 5.5 V.

23. **PDM Microphones (U8, U9):** Two microphones convert voice inputs to Pulse-Density Modulated (PDM) digital signals.
24. **Thermistor (RT1):** This thermistor can be used for temperature compensation or as a general-purpose ambient temperature sensor.
25. **Power LEDs (LED1, LED3):** LED1 and LED3 are amber LEDs that indicate the status of power supplied to PSoC™ 5LP and PSoC™ 6 MCU respectively.
26. **Infineon 512-Mbit serial NOR flash memory (S25HL512T, U11):** The S25HL512T NOR flash of 512Mb capacity is connected to the serial memory interface (SMIF) of the PSoC™ 6 MCU. The NOR flash can be used for both data and code memory with execute-in-place (XIP) support and encryption.
27. **microSD Card holder (J9):** Provide SDHC interface with microSD cards with the option to detect the presence of the card.

See **3.2 Hardware functional description** for details on various hardware blocks.

2.2 KitProg3

KitProg3 is an onboard programmer/debugger with USB-UART and USB-I2C functionality. An Infineon PSoC™ 5LP device is used to implement KitProg3 functionality. For more details on the KitProg3 functionality, see the **KitProg3 user guide**.

Before programming the device, ensure that ModusToolbox™ software is installed on the computer.

2.2.1 Programming and Debugging using ModusToolbox™ software

This section presents a quick overview of programming and debugging using ModusToolbox™. For detailed instructions, see **Help** > **Eclipse IDE for ModusToolbox™ Documentation** > **User Guide**.

1. Connect the board to the PC using the provided USB cable through the KitProg3 USB connector, as shown in **Figure 6**. It enumerates as a USB Composite Device if you are connecting it to your PC for the first time.
2. KitProg3 on this kit supports CMSIS-DAP Bulk mode (default). The status LED (amber) is always ON in the CMSIS-DAP Bulk mode. If you do not see the desired LED status, see the **KitProg3 user guide** for details on the KitProg3 status and troubleshooting instructions.

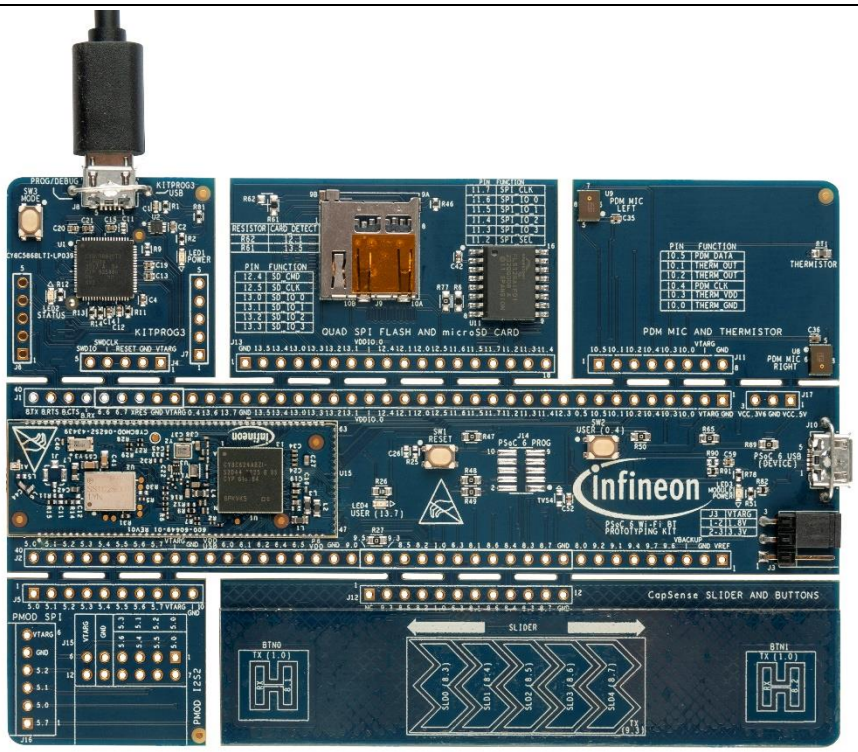


Figure 6 Connect USB cable to USB connector on the board

3. In the ModusToolbox™ IDE, import the desired application into a new workspace. If you aren't familiar with this process, see section 1 of **ModusToolbox™ user guide**.
4. To build and program a PSoC™ 6 MCU application, in the Project Explorer, select **<App_Name>** project. In the Quick Panel, scroll to the **Launches** section and click the **<App_Name> Program (KitProg3_Miniprog4)** configuration as shown in **Figure 7**.

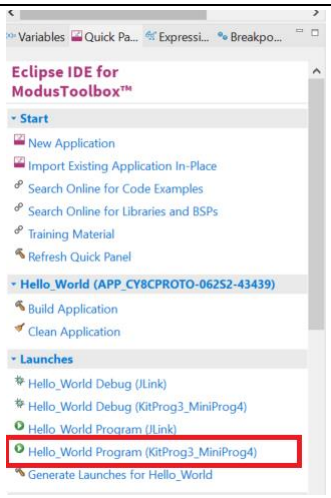


Figure 7 Programming in ModusToolbox™

5. ModusToolbox™ has an integrated debugger. To debug a PSoC™ 6 MCU application, in the Project Explorer, select **<App_Name>** project. In the Quick Panel, scroll to the **Launches** section and click the **<App_Name> Debug (KitProg3_Miniprog4)** configuration as shown in **Figure 8**.
   For a detailed explanation on how to debug using ModusToolbox™, see section 5 of **ModusToolbox™ user guide**.

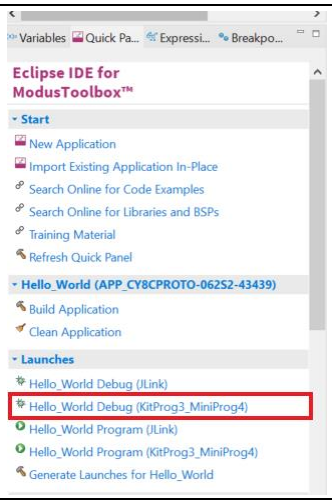


Figure 8 Debugging in ModusToolbox™

2.2.2 Using OOB Example

The kit comes pre-programmed with the **mtb-example-psoc6-capsense-button-slider** code example. See the **Operation** section of the code example README.md for information on how to run the code example.

2.2.3 USB-UART Bridge

The onboard KitProg3 can function as a USB-UART bridge. The UART and flow-control lines between the PSoC™ 6 MCU and the KitProg3 are hard-wired on the board, as **Figure 9** shows. For more details on the KitProg3 USB-UART functionality, see the **KitProg3 user guide**.

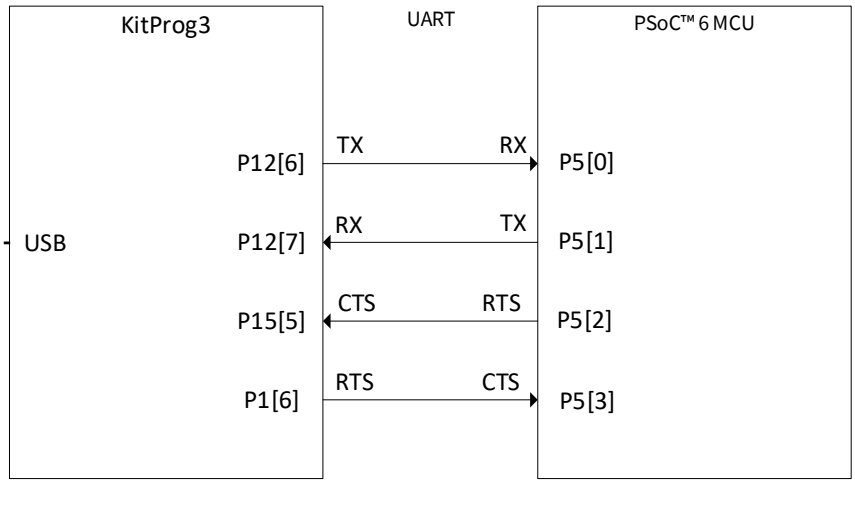


Figure 9 UART connection between KitProg3 and PSoC™ 6 MCU

2.2.4 USB-I2C Bridge

The onboard KitProg3 also functions as a USB-I2C bridge, for example, to communicate with the CAPSENSE™ Tuner. The I2C lines on the PSoC™ 6 MCU are hard-wired on the board to the I2C lines of the KitProg3 with onboard pull-up resistors as **Figure 10** shows. The USB-I2C supports I2C speeds of 50 kHz, 100 kHz, 400 kHz, and 1 MHz. For more details on the KitProg3 USB-I2C functionality, see the **KitProg3 user guide**.

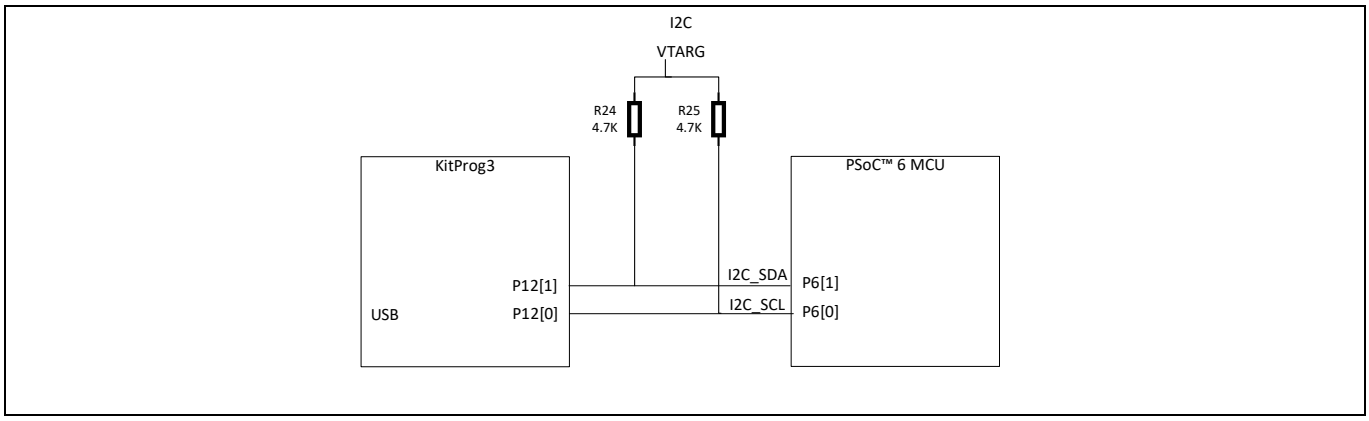


Figure 10 I2C connection between KitProg3 and PSoC™ 6 MCU

3 Hardware

3.1 Schematics

Schematics can be downloaded from **www.infineon.com/CY8CPROTO-062S2-43439**.

3.2 Hardware functional description

This section explains in detail the individual hardware blocks of the PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board.

3.2.1 CY8CMOD-062S2-43439 (U15)

The Infineon CY8CMOD-062S2-43439 module supports 2.4 GHz WLAN and Bluetooth® functionality. The CY8CMOD-062S2-43439 module is a turnkey solution and includes PSoC™ 6 MCU, CYW43439 Single-Chip radio, onboard oscillators, chip antenna and passive components. The CY8CMOD-062S2-43439 module provides up to 80 I/Os of PSoC™ 6 MCU and 9 I/Os of CYW43439 in a 47 × 16 × 2 mm package.

63 I/Os of PSoC™ 6 MCU and 4 I/Os of CYW43439 have been brought out on headers J1 and J2.

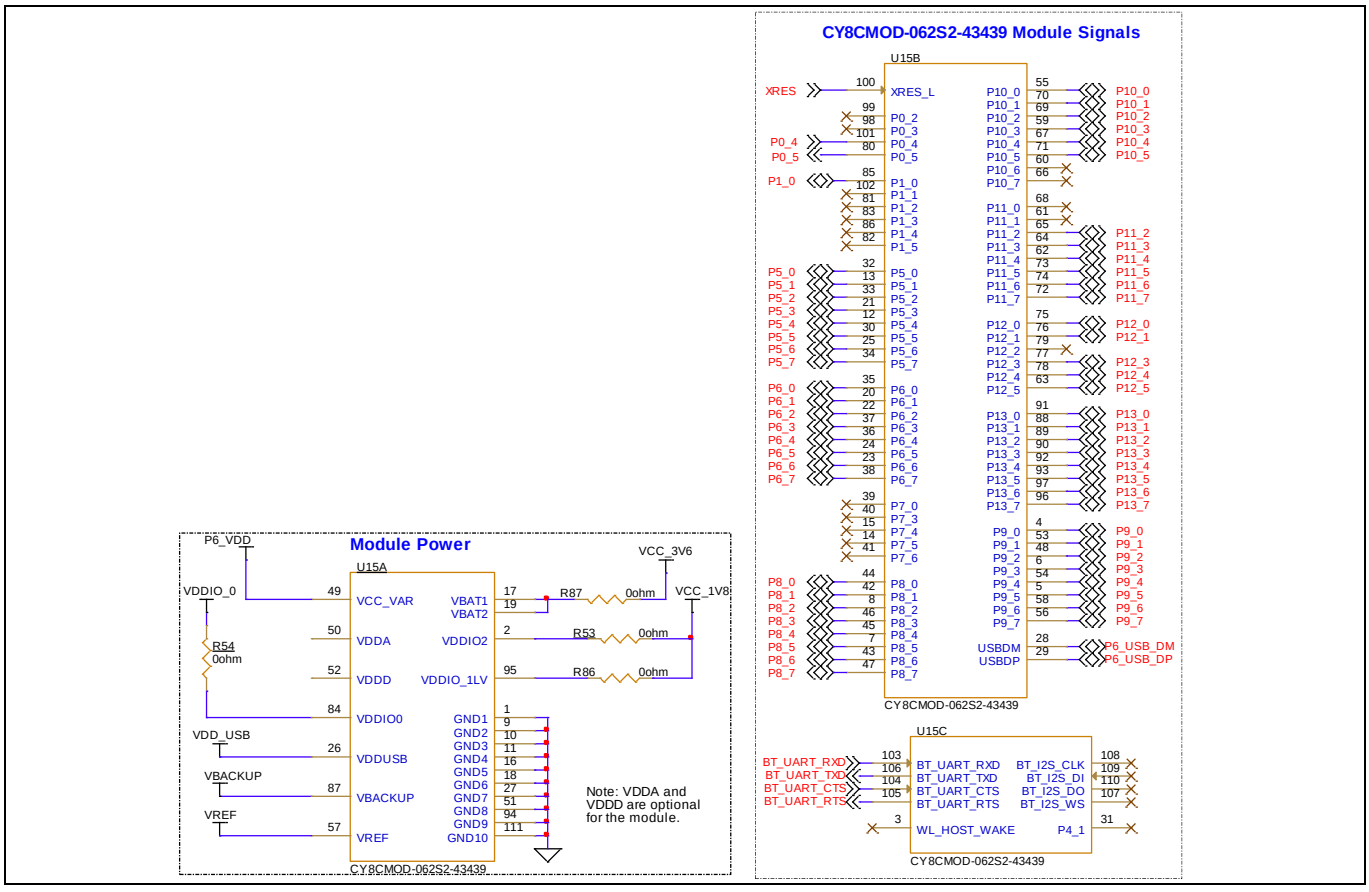


Figure 11 Schematics of CY8CMOD-062S2-43439 (U15)

For more information, see the kit **webpage** and the **datasheet**.

3.2.2 PSoC™ 5LP (U1)

An onboard PSoC™ 5LP (CY8C5868LTI-LP039) is used as a KitProg3 to program and debug the PSoC™ 6 MCU. The PSoC™ 5LP is a bridge between the USB port of a PC and the SWD and other communication interfaces of the PSoC™ 6 MCU. The PSoC™ 5LP is a true system-level solution providing MCU, memory, analog, and digital peripheral functions in a single chip. The CY8C58LPxx family offers a modern method of signal acquisition, signal processing, and control with high accuracy, high bandwidth, and high flexibility. Analog capability spans the range from thermocouples (near DC voltages) to ultrasonic signals.

For more information, visit the **PSoC™ 5LP webpage**. Also, see the **CY8C58LPxx Family Datasheet**.

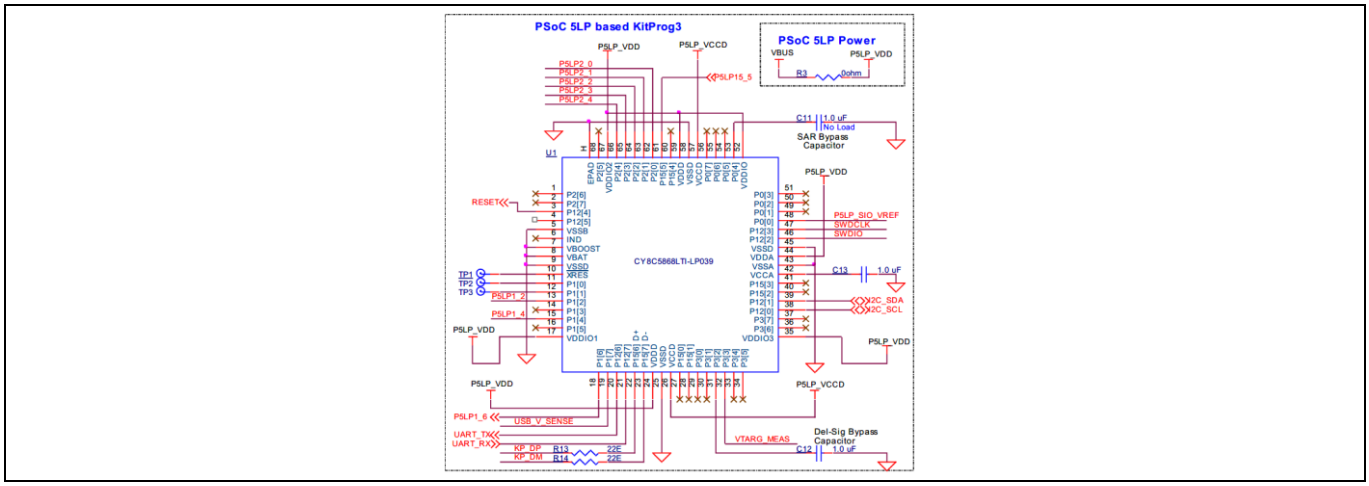


Figure 12 Schematics of PSoC™ 5LP (U1)

3.2.3 Serial interconnection between PSoC™ 5LP and PSoC™ 6 MCU

The PSoC™ 5LP functions as USB-UART and USB-I2C bridge as shown in **Figure 13**. The USB-Serial pins of the PSoC™ 5LP are hard-wired to the I2C/UART pins of the PSoC™ 6 MCU. These pins are also available on the breadboard-compatible I/O headers.

The 10-pin header **J14** allows you to program and debug PSoC™ 6 MCU using an external programmer such as MiniProg4.

Optionally, you can route BT_UART to PSoC™ 5LP. This is used to debug Bluetooth® on CYW43439 using the USB-UART. Note that VTARG must be 1.8 V in this configuration. Detailed instructions can be found in **3.3 PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board rework**.

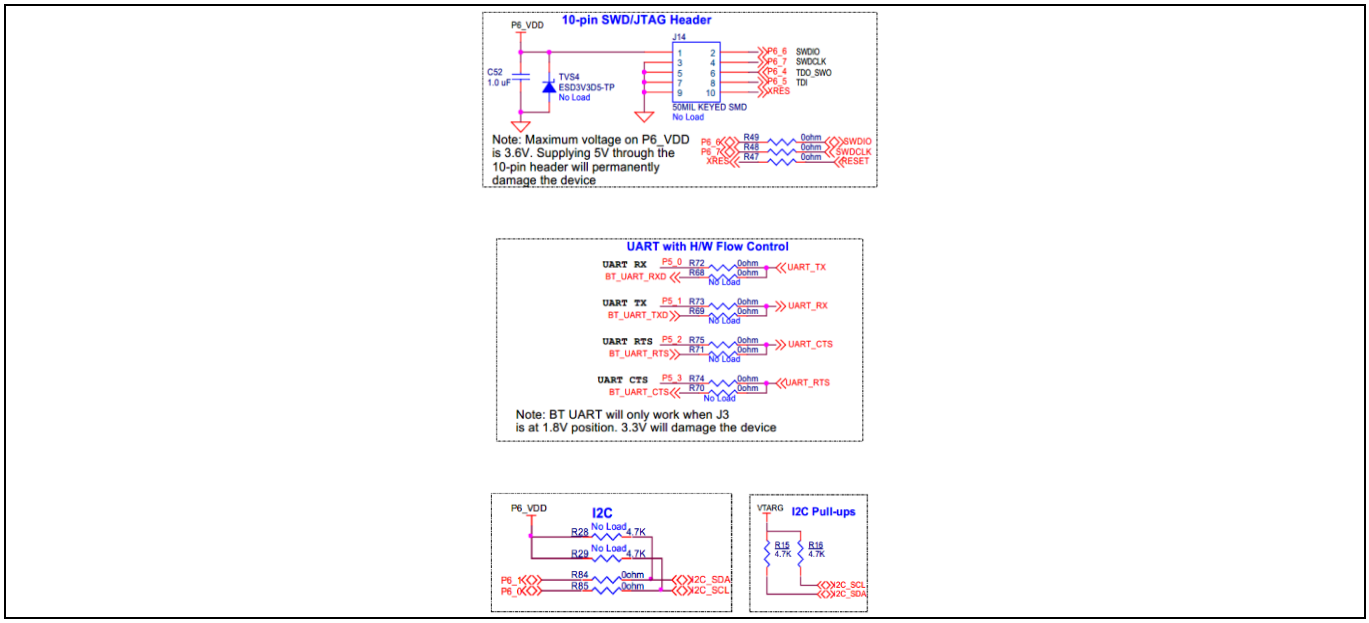


Figure 13 Schematics of programming and serial interface connections

3.2.4 Power supply system

The power supply system on this board allows the input supply to come from the following sources:

- 5 V from the onboard USB Micro-B connectors (**J8** and **J10**)
- 5 V from external power supply through VCC_5V at **J17.1**
- 1.8 V–3.6 V from external programmer through VTARG at **J1.32**
- 1.8 V–3.6 V from external programmer through P6_VDD at **J14**

The power supply system is designed to support 1.8 V to 3.3 V operation of the PSoC™ 6 MCU. A voltage of 5 V is provided from USB port and is required for the operation of KitProg3. Three regulators are used to achieve 1.8 V to 3.3 V and 3.6 V outputs - a buck regulator (**U5**) that generates a fixed 3.6 V from an input of 5 V, a fixed 3.3 V regulator (**U3**) and a fixed 1.8 V regulator (**U6**) is powered from the output of **U5**. **Figure 14** shows the schematics of the voltage regulator and power selection circuits.

The voltage selection is made through jumper **J3**. Populate R20 to change output of U3 to 2.5 V.

*Note: Do not power the board without a Jumper shunt present on **J3**.*

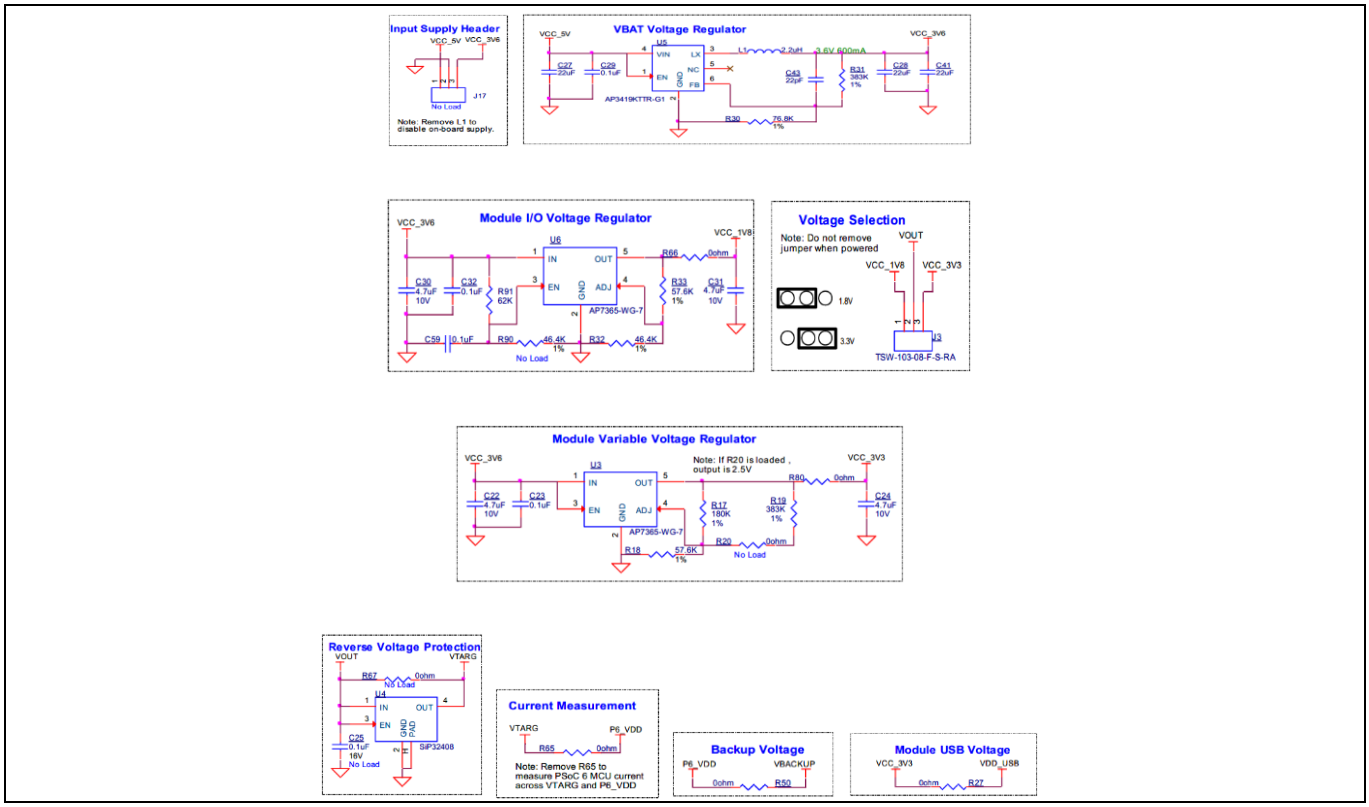


Figure 14 Schematics of power supply system

3.2.5 Expansion connectors

3.2.5.1 PSoC™ 6 MCU I/O Headers (J1 and J2)

These headers provide connectivity to PSoC™ 6 MCU GPIOs. Most of these pins are multiplexed with onboard peripherals.

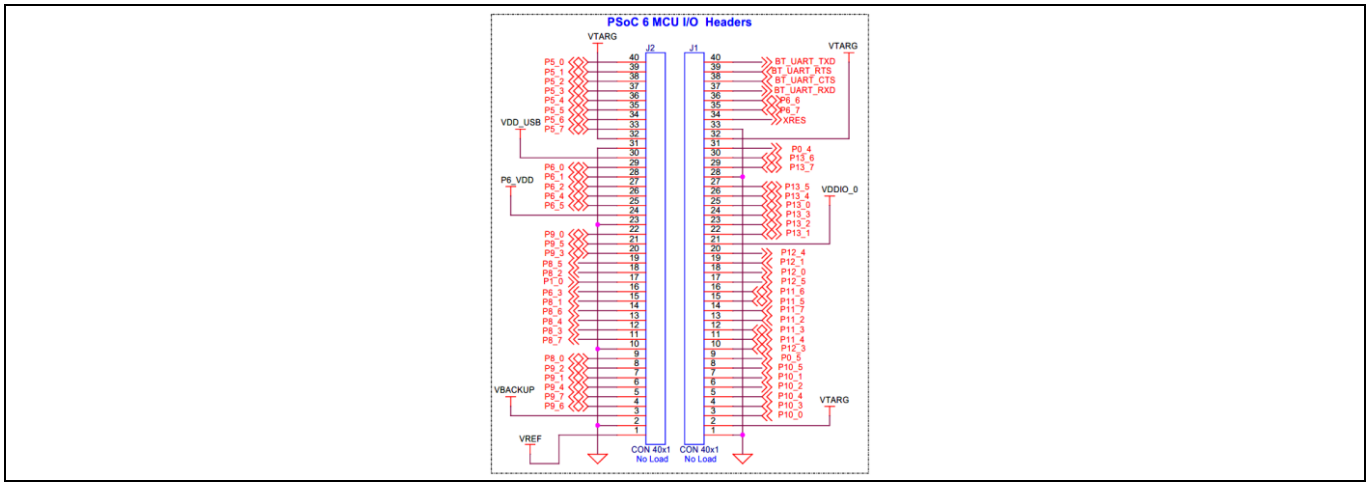


Figure 15 Schematics of PSoC™ 6 MCU I/O Headers (J1 and J2)

On-board peripherals are distributed in sections and each section can be broken away from the PSoC™ 6 MCU section. To re-connect the individual sections, headers **J5**, **J11**, **J12** and **J13** are provided. These are not loaded by default.

3.2.5.2 KitProg3 GPIO Headers (J6 and J7)

J6 and J7 are 5x1 headers provided on the KitProg3 section of the board. These headers bring out the USB-UART and USB-I2C bridge pins that can be used when the section is broken apart. Note that the RTS, and CTS lines on these headers are from the level translators, not directly from PSoC™ 5LP. J6 and J7 are not loaded by default.

Note: When using the module separately for UART and I2C, make sure that VTARG is connected to the target voltage to ensure proper level translation.

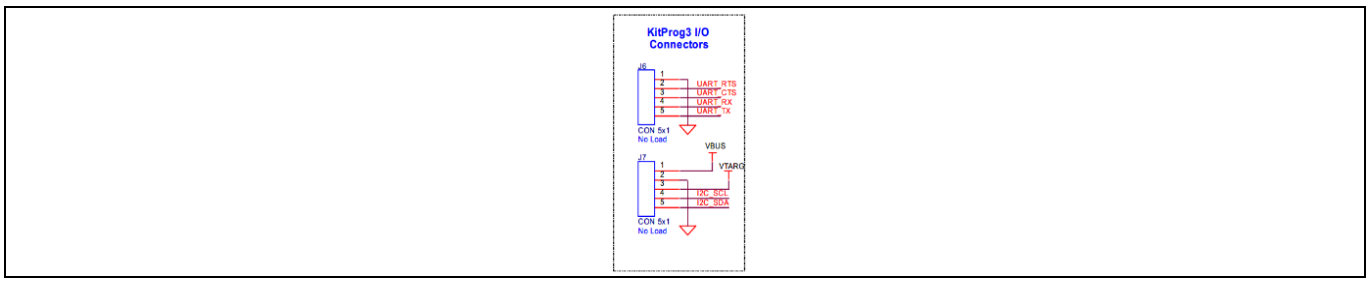


Figure 16 Schematics of PSoC™ 5LP GPIO Headers (J6 and J7)

3.2.6 CAPSENSE™ circuit

There is a CAPSENSE™ slider and two buttons, all of which support both self-capacitance (CSD) and mutual-capacitance (CSX) sensing. These are connected to the PSoC™ 6 MCU as **Figure 17** shows. Three external capacitors - CMOD (P7[7]) for CSD and CINTA (P7[1]), CINTB (P7[2]) for CSX are present on the CY8CMOD-062S2-43439. Note that CINTA can be re-used as CSH. For details on using CAPSENSE™ including design guidelines, see the **Getting Started with CAPSENSE™ Design Guide**.

The CAPSENSE™ section can be broken away and re-connected to PSoC™ 6 MCU at **J2.10** to **J2.21** through **J12**.

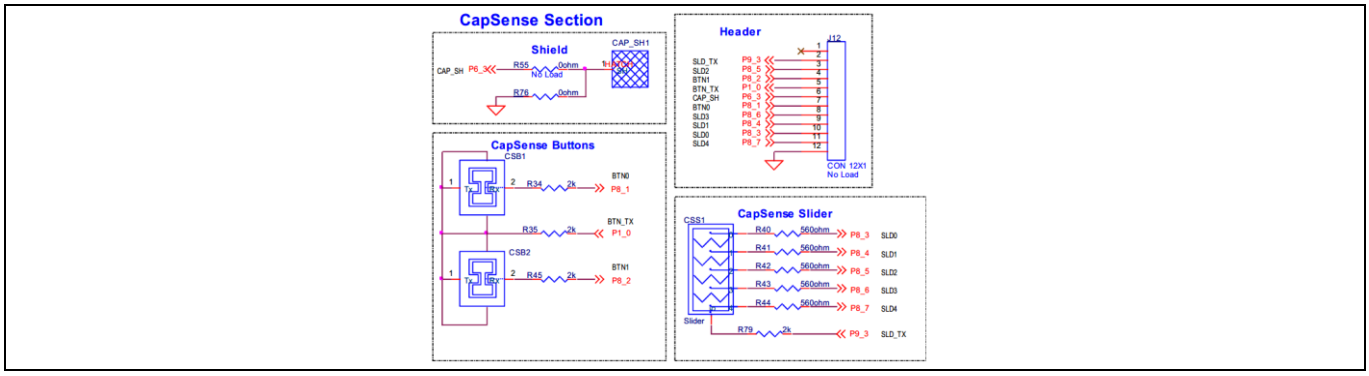


Figure 17 Schematics of CAPSENSE™ circuit

3.2.7 LEDs

LED2 (Amber) indicates the status of the KitProg3 (See the **KitProg3 user guide** for details). **LED1** and **LED3** (Amber LEDs) indicate the status of power supplied to PSoC™ 5LP and CY8CMOD-062S2-43439 respectively.

The board also has one user controllable red LED (**LED4**) connected to PSoC™ 6 MCU pin P13[7] in active-low configuration for user applications.

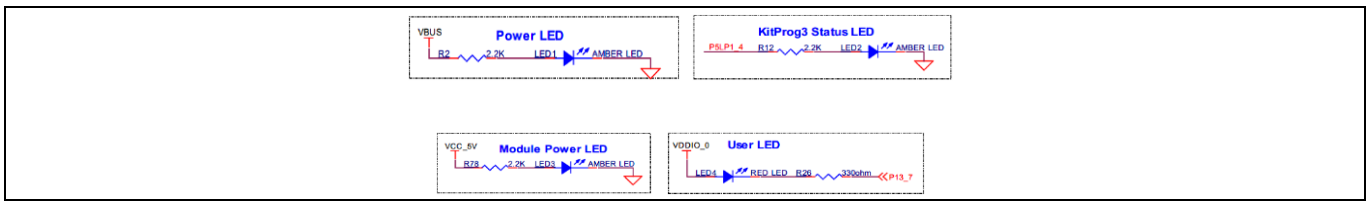


Figure 18 Schematics of LEDs

3.2.8 Push Buttons

The board has a reset button, a user button and a KitProg3 mode selection button. The reset button (**SW1**) is connected to the XRES pin of the PSoC™ 6 MCU and is used to reset the device. One user button (**SW2**) is connected to pin P0[4] of the
PSoC™ 6 MCU. The remaining button - **SW3** is connected to the PSoC™ 5LP device for programming mode and custom app selection (Refer to the **KitProg3 user guide** for details). All the buttons connect to ground on activation (active low) by default. User button (**SW2**) can be changed to active high mode by changing the zero resistors shown below.

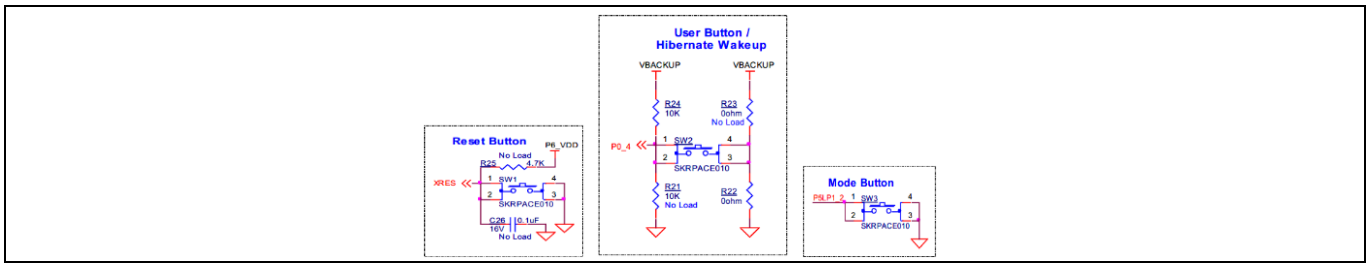


Figure 19 Schematics of Push Buttons

3.2.9 Infineon Quad SPI NOR Flash and microSD card

The board has a Infineon NOR Flash memory (**S25FL512SAGMFI010**) of 512 Mbit capacity. The NOR Flash is connected to the serial memory interface (SMIF) of the PSoC™ 6 MCU. The NOR Flash device can be used for both data and code memory with execute-in-place (XIP) support and encryption.

The board contains a slot to insert a microSD card (see **Figure 20**), which can be accessed through SDHC interface.

This section can be broken apart from the PSoC™ 6 MCU section at the built-in perforated edge between **J1** and **J13**. To connect them back, use right angled male-to-female connectors between **J13** and **J1** (**J1.11** to **J1.28**).

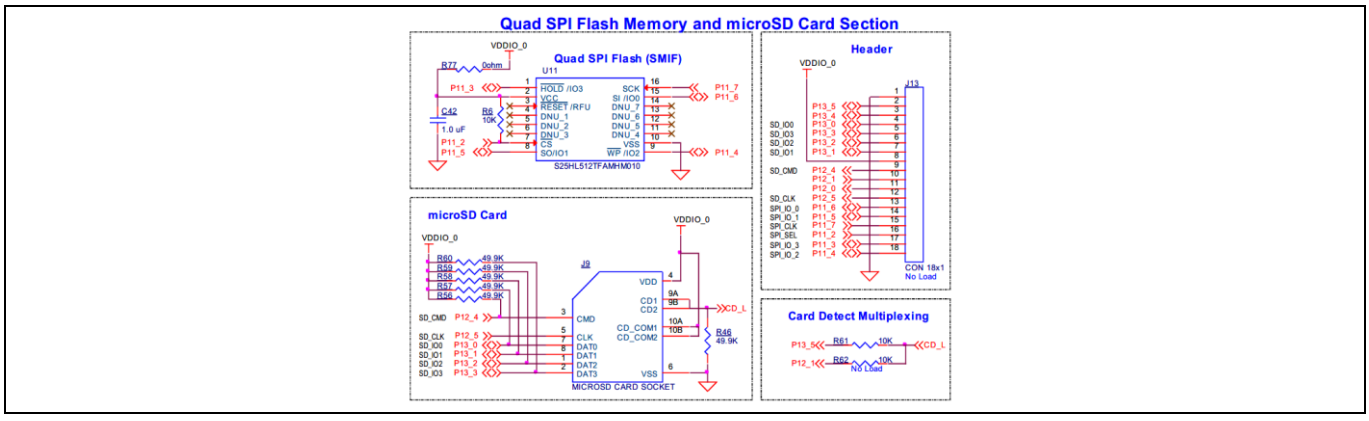


Figure 20 Schematics of Quad SPI Flash and microSD card holder

3.2.10 PDM Microphones and Thermistor

The board includes two PDM Microphones (U8 and U9) and a thermistor (RT1) connected to the PSoC™ 6 MCU device.

The PDM mics share the same clock and data lines and one is configured on the left channel and the other on the right channel. They are 40 mm apart.

This section can be broken apart from the PSoC™ 6 MCU section at the built-in perforated edge between **J1** and **J11**. To connect them back, use right angled male-to-female connectors between **J11** and **J1** (**J1.1** to **J1.8**).

Note: P10[1] and P10[2] are connected to THERM_OUT by default. Remove R36 and R37 to disconnect P10[1] and P10[2] respectively.

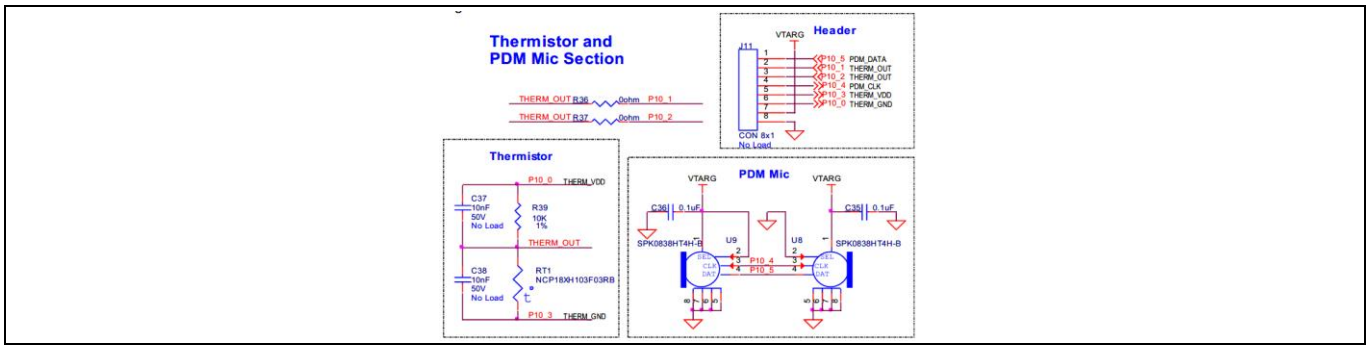


Figure 21 Schematics of PDM Mic and Thermistor

3.2.11 Digilent Pmod™ Headers

There are two Digilent Pmod™ headers present on the board. 6x1 pin header (J16) is compatible with Pmod SPI and a 6x2 pin header (J15) is compatible with Pmod I2S2.

Both are not loaded by default.

This section can be broken apart from the PSoC™ 6 MCU section at the built-in perforated edge between **J2** and **J5**. To connect them back, use right angled male-to-female connectors between **J5** and **J2** (**J2.31** to **J2.40**).

Note: Remove R72, R73, R74, R75 to use Pmod because the same pins (Port 5 of the PSoC™ 6 MCU) are used for UART by default.

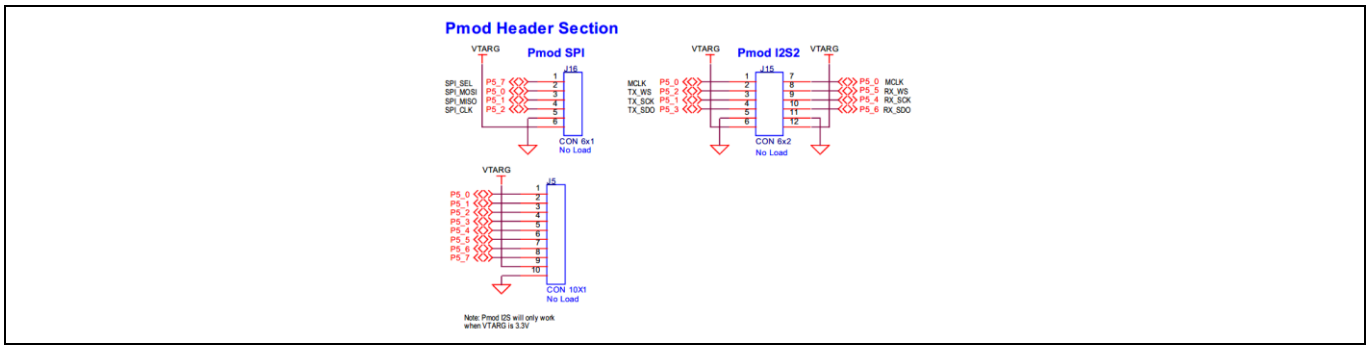


Figure 22 Schematics of Pmod Headers

3.3 PSoC™ 62S2 Wi-Fi Bluetooth® prototyping board rework

This section explains modifications that can be made to the board to evaluate different use cases.

3.3.1 CAPSENSE™ Shield

The hatched pattern around the CAPSENSE™ buttons and slider are connected to ground. In case liquid tolerance is required, this pattern needs to be connected to the shield pin. This pattern can be connected to pin P6[3] by populating resistor R55. The resistor R76 connecting the hatched pattern to ground needs to be removed in that case. P6[3] needs to be configured as a shield pin in ModusToolbox™.

Connecting the hatched pattern to shield instead of ground will also reduce parasitic capacitance of the sensors.

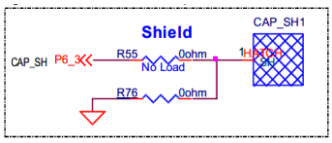


Figure 23 Schematics of CAPSENSE™ Shield

3.3.2 BT (Bluetooth®) UART

The BT_UART Port is accessible on J1.37 to J1.40. The operating voltage for these pins is VDDIO_2. By default, this is 1.8 V and there is no option to change it.

This option allows for debug of the Bluetooth® core on the CWY43439 using KitProg3 USB-UART bridge interface.

Remove R72, R73, R74 and R75. Populate R68, R69, R70 and R71.

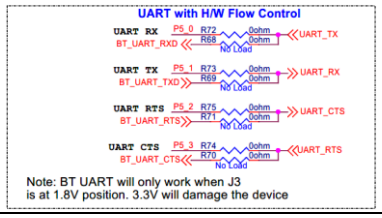


Figure 24 Schematics of Bluetooth® UART

3.4 Bill of Materials

BOM can be downloaded from **www.infineon.com/CY8CPROTO-062S2-43439**.

3.5 Frequently Asked Questions

1. How does CY8CPROTO-062S2-43439 handle voltage connection when multiple power sources are plugged in?

   There are five different options to power the board; KitProg3 USB connector (**J8**), PSoC™ 6 Device USB connector (**J10**), External DC supply through VCC_5V at **J17.1**, from an external programmer through VTARG at **J1.32**, and from an external programmer through P6_VDD at **J14**. The voltage from each of the USB connectors passes through a current limiting switch that also protects against reverse voltage. The output of both current limit switches is given to the VCC.5V that is also present on **J17**.

   Note that powering the board from an external programmer (VTARG at **J1.32** or P6_VDD at **J14**) powers the P6_VDD power domain only.

2. What are the input voltage tolerances? Is there any overvoltage protection on this kit? Input voltage level are as follows:

Table 4 Input voltage levels

Supply	Typical i/p voltage	Absolute max
USB Micro-B connector (**J8**, **J10**)	4.5 V to 5.5 V	5.5 V
VCC_5V connector (**J17**)	4.5 V to 5.5 V	6 V
Program and Debug header (**J14**)	1.8 V to 3.3 V	3.6 V

There is no overvoltage protection on this kit.

3. Why is the voltage of the board restricted to 3.3 V? Can't it drive external 5 V interfaces?

   PSoC™ 6 MCU is not meant to be powered at more than 3.6 V. Powering PSoC™ 6 MCU at more than 3.3 V may damage the chip. You cannot drive the IO system with > 3.3 V supply voltages.

4. I am unable to program the target device.

a) Check **J3** to ensure it is connected.

b) Make sure that no external devices are connected from **J1.32** to **J1.36**.

c) Update your KitProg3 firmware to v1.01 or later using the steps mentioned in the **KitProg3 user guide**.

d) Ensure that target device used in the ModusToolbox™ application is CY8C624ABZI-S2D44.

5. Does the board get powered when I power it from another Infineon kit through the **J17** header?

   Yes, VCC_5V pin on **J17** header is a supply input/output pin and can take up to 5.5 V.

6. What additional overlays can be used with the CAPSENSE™?

   Any kind of overlays (up to 5 mm thickness) like wood, acrylic, and glass can be used with CAPSENSE™. Note that additional tuning may be required when the overlay is changed.

7. What is Pmod?

   Pmod interface or Peripheral Module interface is an open standard defined by Digilent Inc. in the Digilent Pmod Interface Specification for peripherals used with FPGAs or microcontrollers. Several types of modules are available from simple push buttons to more complex modules with network interfaces, analog to digital converters or LCD displays. PMOD peripheral modules are available from multiple vendors such as Diligent, Maxim Integrated, and Analog Devices. This Kit supports 1x6 pin Pmod SPI modules and 2x6 pin Pmod I2S2 modules.

8. Can I use this Kit as a programmer to program external PSoC™ devices?

   Yes, the onboard KitProg3 can program any PSoC™ 4/5/6 devices connected to header **J4**. This is possible only after breaking away the KitProg3 section. Connecting two or more target devices will cause programming to fail.

9. Which third-party debuggers does this Kit support?

   Multiple third-party IDEs are supported; IAR is one example. For more details on all supported devices and procedures to export to these IDEs, see the ModusToolbox™ 'Help' menu.

Revision history

Major changes since the last revision

Date	Version	Description
2023-03-29	**	New kit guide.
2023-07-03	*A	Updated Kit operation: Updated KitProg3: Updated Using OOB Example: Updated hyperlinks.

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