CYW920819M2EVB-01 evaluation kit user guide

About this document

Scope and purpose

CYW20819M2EVB-01 is an evaluation kit for the AIROC™ CYW20819 Bluetooth® & Bluetooth® LE SoC, designed to support several medical, security, and industrial applications. The system features an Arm® Cortex® - M4 core with programmable and reconfigurable analog and digital blocks.

It is a combination of a microcontroller with the following:

- Auxiliary ADC with up to 28 analog channels
- Digital peripherals such as PWMs
- Bluetooth® stack, peripheral drivers, security functions built into ROM allowing application to efficiently use on-chip flash
- 5-dBM Tx output power (LE), 11.5-dBM Tx output power (BR), 2.5-dBM Tx output power (EDR)
- Serial communication interfaces such as I^2C, UART, PCM, and Quad-SPI
- Over-the-air (OTA) firmware updates

Intended audience

This document is intended for anyone using the CYW20819M2EVB-01 evaluation board.

Document conventions

Table 1   Conventions

Convention	Explanation
Bold	Emphasizes heading levels, column headings, table and figure captions, screen names, windows, dialog boxes, menus and sub-menus
Italics	Denotes variable(s) and reference(s)
`Courier New`	Denotes APIs, functions, interrupt handlers, events, data types, error handlers, file/folder names, directories, command line inputs, code snippets
>	Indicates that a cascading sub-menu opens when you select a menu item

About this document

Abbreviations and definitions

Table 2   **Abbreviations**

Abbreviation	Definition
API	Application Programming Interface
BR	Basic Rate
BT / BLE	Bluetooth® / Bluetooth® Low Energy
EEPROM	Electrically Erasable Programmable Read-Only Memory
EM	Electro-magnetic
EVB	Evaluation Board
GPIO	General Purpose Input Output
HCI	Host Controller Interface
I2C	Inter-Integrated Circuit
IDE	Integrated Development Environment
JTAG	Joint Test Action Group
LE	Low Energy
LED	Light Emitting Diode
LHL	Lean High Land
LPO	Low Power Oscillator
MEMS	Micro Electro-Mechanical System
NTC	Negative Temperature Coefficient
PCB	Printed Circuit Board
PUART	Peripheral UART
RF	Radio Frequency
SDK	Software Development Kit
SIG	Special Interest Group
SoC	System-On-Chip
SPI	Serial Peripheral Interface
SWD	Serial Wire Debug
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
WICED	Wireless Internet Connectivity for Embedded Devices
XTAL	Crystal Oscillator

About this document

Reference documents

This user manual should be read in conjunction with the following documents available at **CYW20819 Product page**:

Table 3   Reference documents

Application notes	
AN225684 – Getting started with CYW208XX	Describes CYW208XX Bluetooth® SoC and how to build your first Bluetooth® LE application using the device with ModusToolbox™.
Code examples	
Visit the **Infineon GitHub repository** for a comprehensive collection of code examples using ModusToolbox™.	
Device documentation	
CYW20819 device datasheet	**CYW20819 feature and peripheral guide**
Tool documentation	
ModusToolbox™	The Infineon IDE for IoT designers

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Safety information

The CYW920819M2EVB-01 evaluation kit is intended for use as a development platform for hardware or software in a laboratory environment. The board is an open-system design, which does not include a shielded enclosure. Due to this reason, the board may cause interference to other electrical or electronic devices in close proximity. In a domestic environment, this product may cause radio interference. In such cases, take adequate preventive measures. Also, do not use this board near any medical equipment or RF devices.

Attaching additional wiring to this product or modifying the product operation from the factory default may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures must be taken.

	CYW920819M2EVB-01 evaluation board contains electrostatic discharge (ESD)-sensitive devices. Electrostatic charges readily accumulate on the human body and any equipment and can 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 CYW920819M2EVB-01 in the protective shipping package.

	End-of-Life/Product Recycling This kit has an end-of-life cycle of five years from the year of manufacturing mentioned on the back of the box. Contact your nearest recycler for discarding 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 not available, use appropriate ESD protection by wearing an antistatic wrist strap attached to the chassis ground (any unpainted metal surface) on the board when handling parts.

Handling boards

CYW920819M2EVB-01 evaluation boards are 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. Any physical action on CYW920819M2EVB-01 such as changing wires, jumper settings, or measuring voltages can cause stress on the CYW920819M2EVB-01 printed circuit board assembly (PCBA). You must ensure that the PCBA has proper support on the bottom side to avoid stress on the PCBA when the EVB is in operation.

1 Introduction

Thank you for your interest in the CYW920819M2EVB-01 evaluation kit. CYW920819M2EVB-01 enables customers to evaluate and develop single-chip Bluetooth® and Bluetooth® Low Energy (LE) applications using CYW20819, dual-mode Bluetooth 5.2 (Bluetooth® LE and BR/EDR) wireless MCU.

CYW920819M2EVB-01 can be used with ModusToolbox™ software to develop and debug your CYW20819 project. The evaluation board (EVB) offers footprint-compatibility with Arduino shields. The development environment is compatible with Windows, macOS, and Linux operating systems. In addition, the kit features an onboard programmer/debugger (KitProg3). The EVB supports 1.8 V, 3.0 V, and coin-cell operation.

Note: *This document applies to ModusToolbox™ software 2.4 (or later).*

The EVB is available through the **Infineon Online Store** or through our distributors.

1.1 CYW920819M2EVB-01 kit contents

The EVB includes the following:

- CYW920819M2EVB-01 evaluation board
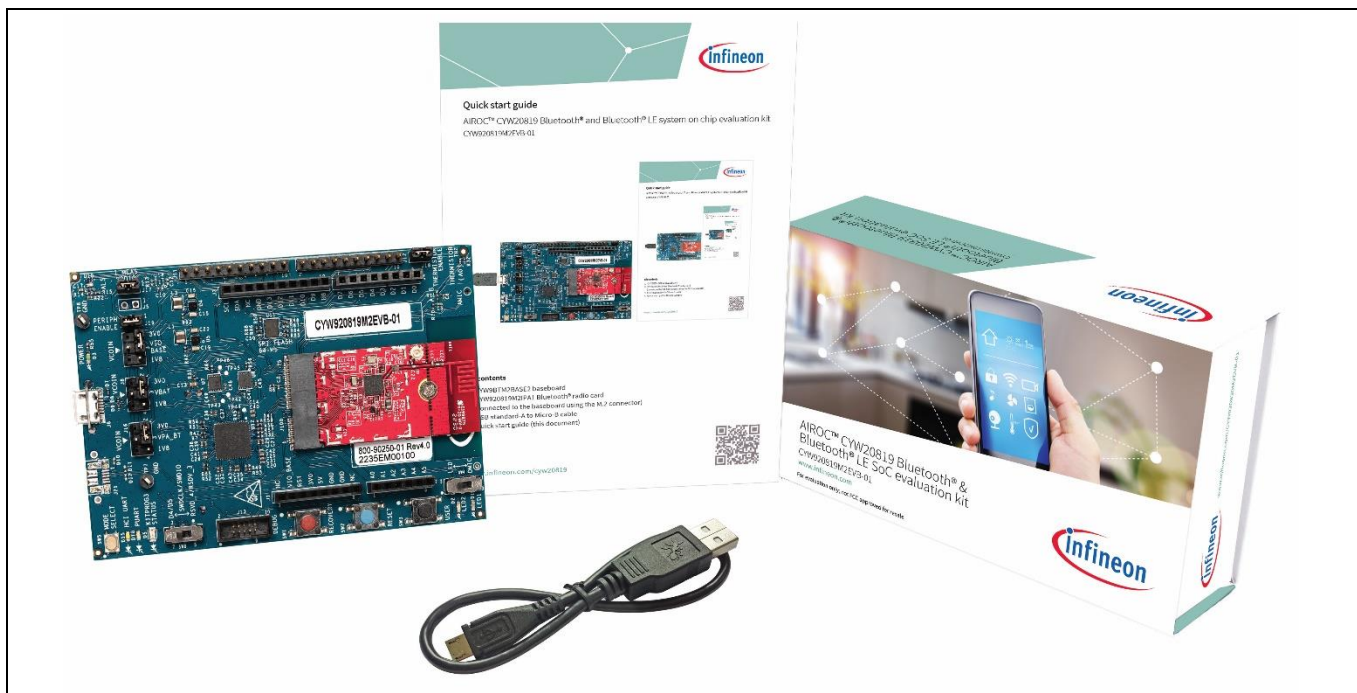- USB 2.0 Type-A to micro-B cable
- Quick start guide

Figure 1   CYW920819M2EVB-01 kit contents

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

1.2   CYW920819M2EVB-01 evaluation board details

Figure 2 shows CYW920819M2EVB-01 evaluation board with the following features:

1. CYW20819 carrier module with onboard antenna
2. Expansion headers compatible with Arduino shields
3. Support for 1.8 V, 3.0 V, and coin-cell operation of the CYW20819M2EVB-01 device
4. Recovery button (Red), Reset button (Blue), and User button (Black)
5. Onboard micro-USB connector (J6) for programming and debug purposes

The USB micro-B connector (J6) supports UART connections and provides +5 V power to the board. See **Jumpers** and **Buttons and switches** for complete information on DIP switches and jumper settings.

Do the following before connecting the board and verifying the driver installation:

1. Verify that all the jumpers are in the default configuration as shown in **Table 4** to **Table 9**, so that Peripheral UART is selected and can display embedded application trace messages. **Figure 2** shows the default jumper locations.
2. Connect the USB connector (J6) of the evaluation board to the development PC with the provided USB cable. The USB UART driver should load automatically. If the evaluation board is not detected as a USB device, reinstall the USB UART driver in ModusToolbox™ installation directory.

   For Windows and macOS: *<install>\tools_2.4\driver_media\dpinst.*

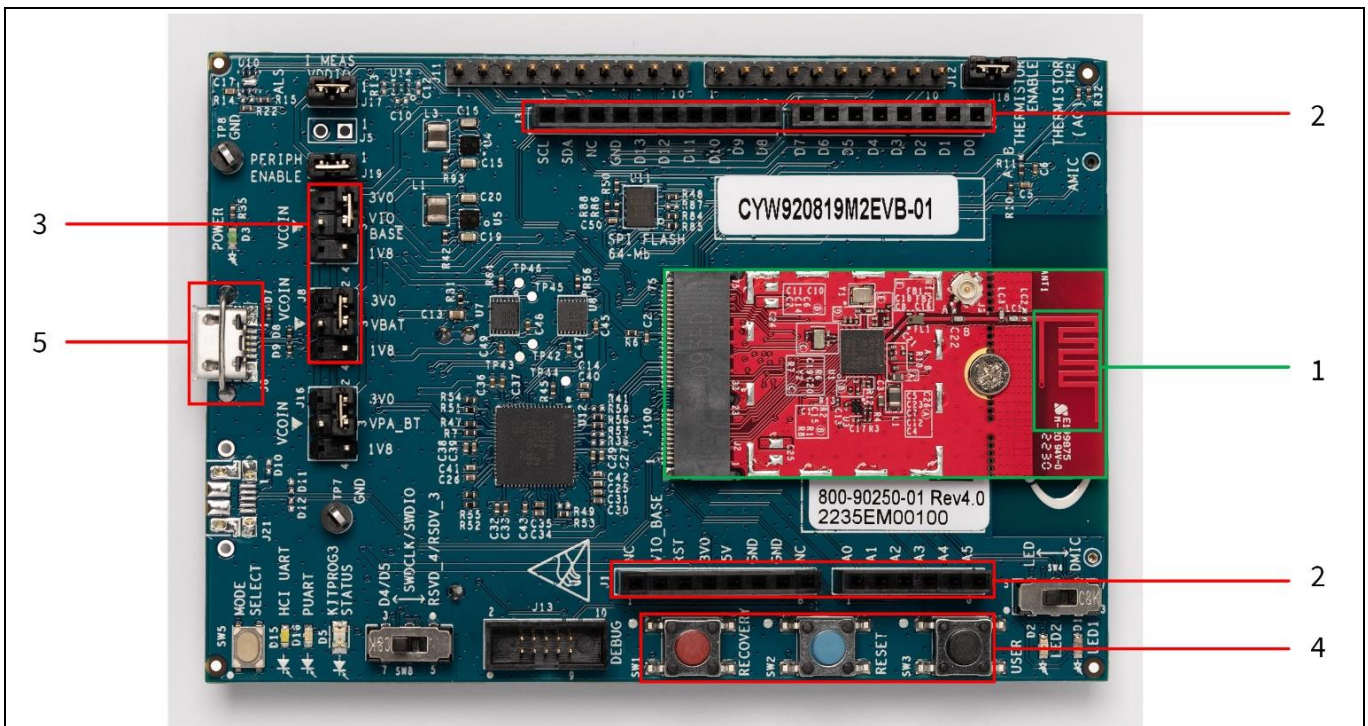   For Linux: *<install>\tools_2.4\driver_media\install_driver\dpinst.*

Figure 2   **CYW920819M2EVB-01 evaluation board**

Introduction

Figure 3 highlights the LEDs provided on CYW920819M2EVB-01:

- D3 (Green) indicates that VDD3P0 (3.0 V) power is ON
- D15 (White) indicates HCI UART activity
- D16 (Purple) indicates peripheral UART activity
- D5 (Yellow) indicates KitProg3 status
- D1 (Yellow) and D2 (Red) are generic user LEDs controlled by GPIOs. A label on the back of the kit provides the pin mapping.
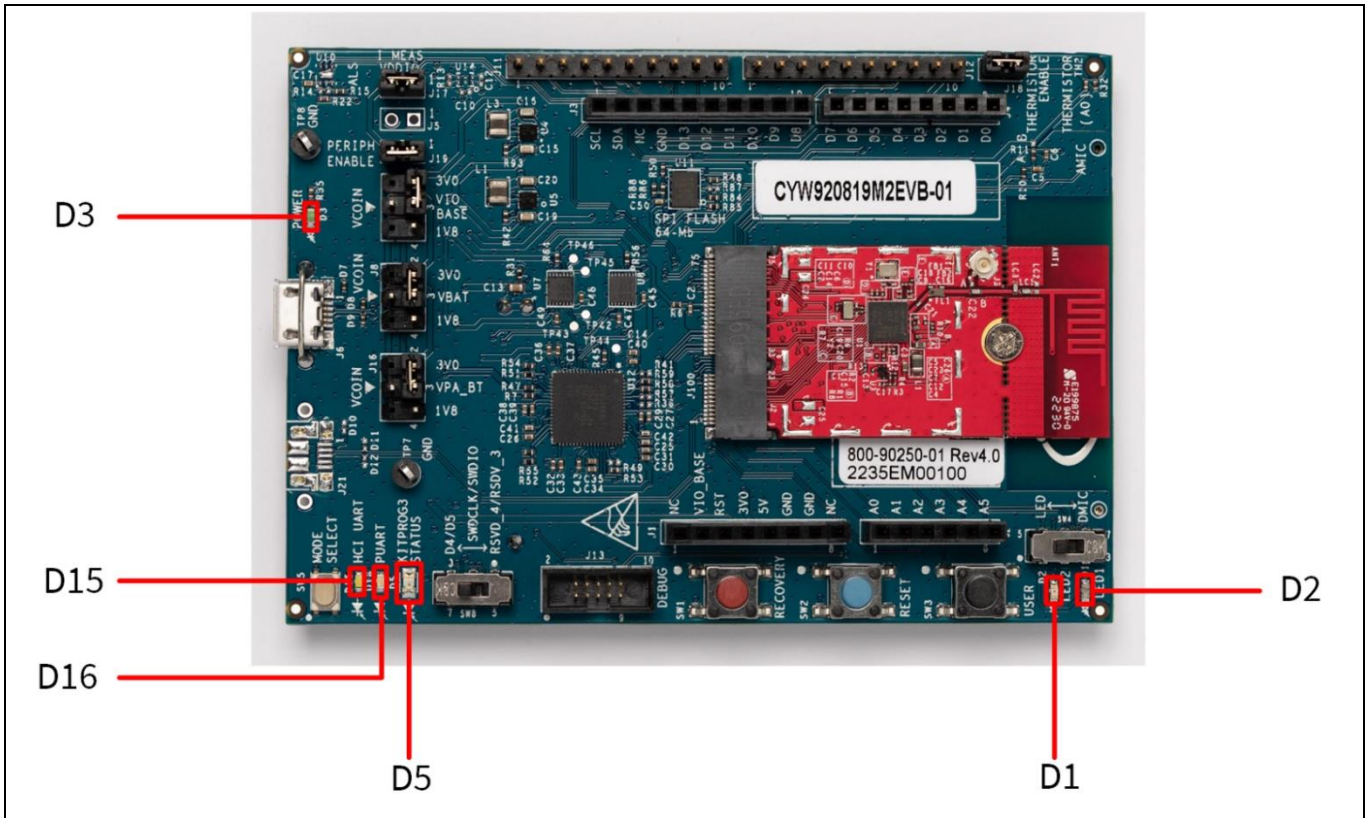

Figure 3   CYW920819M2EVB-01 evaluation board LEDs

1.3   ModusToolbox™

ModusToolbox™ is a free software development ecosystem that includes the Eclipse IDE for ModusToolbox™, Bluetooth® SDK, and the PSoC™ 6 SDK to develop applications for Infineon IoT products. Eclipse IDE for ModusToolbox™ is a multi-platform, integrated development environment (IDE) used to create new applications, update application code, change middleware settings, and program/debug applications.

Using ModusToolbox™, you can enable and configure device resources and middleware libraries, write C source code, and program and debug the device. The IDE provides hooks for launching various tools provided by the SDK, called Bluetooth® SDK (BT SDK).

The BT SDK provides the central core of the ModusToolbox™ software for creating Bluetooth® applications. It contains configuration tools, drivers, libraries, middleware, make files, as well as various utilities, and scripts. You may use these tools in any development environment you prefer.

For detailed information on ModusToolbox™ installation and usage, see the **ModusToolbox™ user guide**.

1.3.1 ModusToolbox™ code examples

ModusToolbox™ includes many code examples. Many of these code examples are compatible with this kit. You can either browse the collection of starter applications during application set up through **File** > **New** > **ModusToolbox™ Application** or browse the collection of code examples on Infineon' **GitHub** repository. See **Figure 4** and **Figure 5** for details.
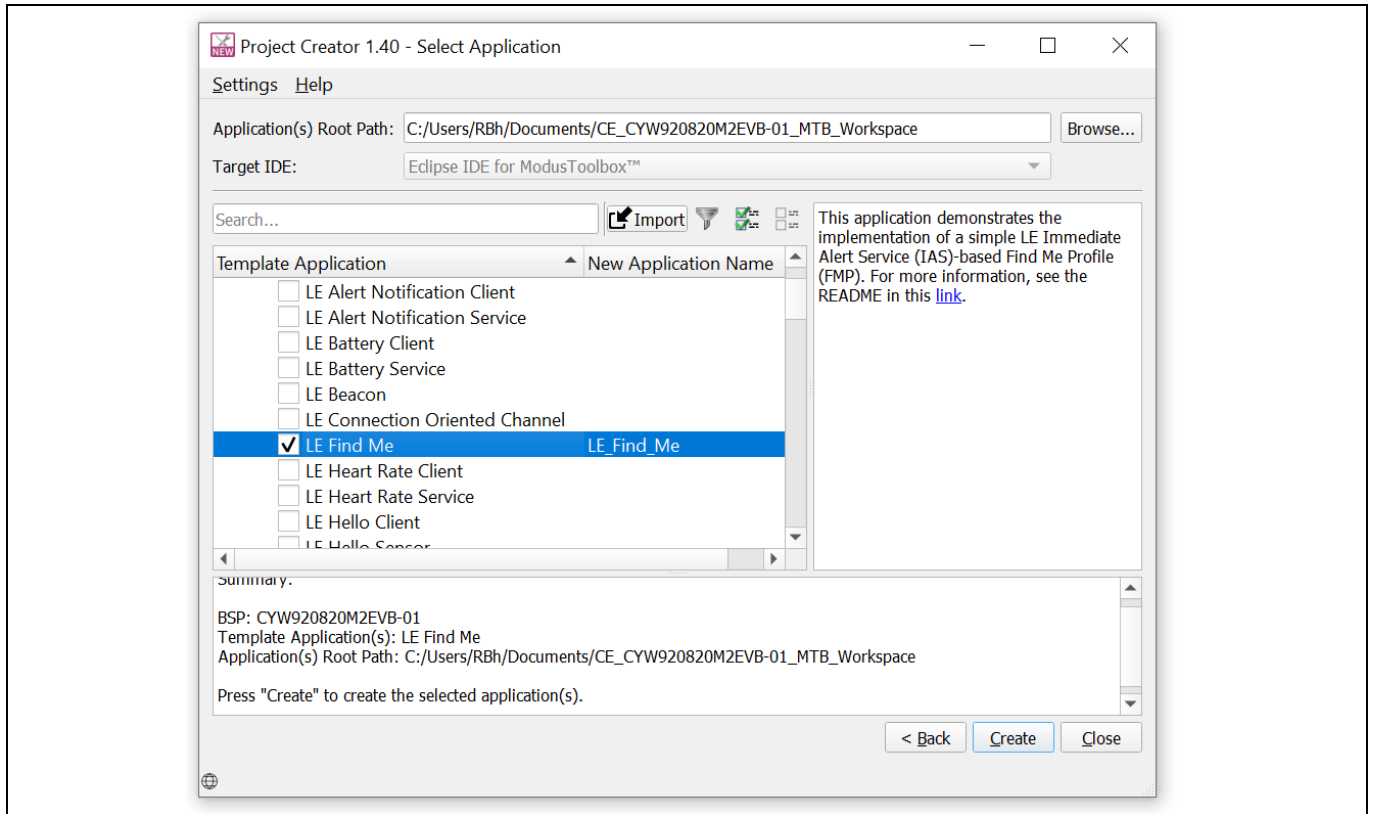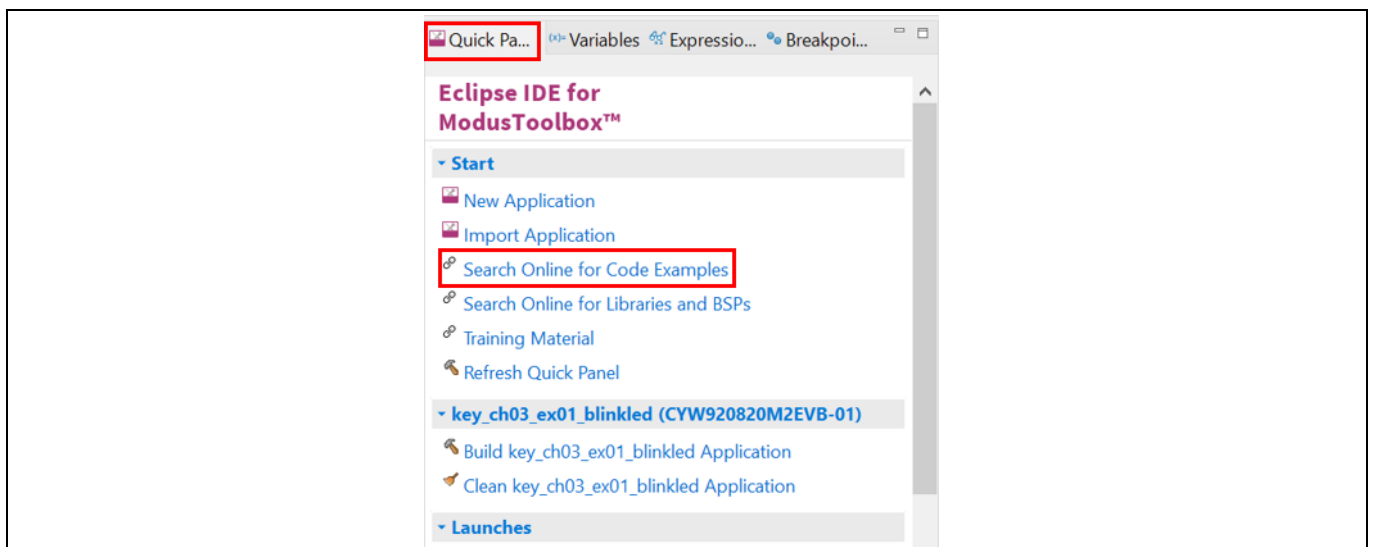

Figure 4 Code examples in ModusToolbox™

Figure 5 Searching for online code examples in ModusToolbox™

1.3.2 Related code examples

You can access the kit code examples from the **GitHub** repository. The CYW920819M2EVB-01 evaluation board is pre-programmed with the Find Me Profile (CE226123 – BLE Find Me with CYW20819) code example out-of-the-box.

This code example is available in ModusToolbox™ as shown in **Figure 4**. For the most recent version of the code example, check the GitHub repository. You can find the CE226123 code example in *github.com/Infineon/mtb-example-btsdk-ble-findme*.

For more details on the functionality, design and implementation of the code example, see the code example document present in the same folder as that of the code example. To import the most recent version of the GitHub code examples into ModusToolbox™, see the ModusToolbox™ user guide document (**Help** > **ModusToolbox™ Documentation** > **User guide**).

1.3.3 ModusToolbox™ help

Launch ModusToolbox™ and navigate to the following items:

- **Quick Start Guide:** Choose **Help** > **Eclipse IDE for ModusToolbox™ Documentation** > **Quick Start Guide**. This guide gives you the basics for using ModusToolbox™.
- **ModusToolbox™ General Documentation:** Choose **Help** > **ModusToolbox™ General Documentation** > **ModusToolbox™ Documentation Index**. This page provides link to various ModusToolbox™ documents.
- **ModusToolbox™ User Guide:** Choose **Help** > **Eclipse IDE for ModusToolbox™ Documentation** > **User Guide**. This is a comprehensive guide for creating, building, and programming ModusToolbox™ applications.

1.4 Getting started

This user guide will help you find details of the CYW920819M2EVB-01 Evaluation Kit:

- The **Kit operation** chapter describes the operation of the kit and how to use its various features.
- The **Hardware** chapter describes the design details of the CYW920819M2EVB-01 hardware blocks.

1.5 IoT resources and technical support

Infineon provides a wealth of product documentation at **https://www.infineon.com/products/wireless-connectivity** to help you to select the right IoT device for your design. Also, a professional community at **community.infineon.com** supplies developers the latest software and tools to solve common evaluation and integration problems while interacting directly with both Infineon engineers and experienced peers.

2 Kit operation

This section provides detailed instructions to set up the Infineon CYW920819M2EVB-01 evaluation board to use with Infineon ModusToolbox™ for Bluetooth® Classic (aka BR - Basic Rate and EDR – Enhanced Data Rate) and Low Energy (LE) applications.

This chapter introduces you to CYW920819M2EVB-01 and the features that will be used as part of the kit operation. This chapter also discusses features such as the Bluetooth® connectivity and programming/debugging as well as the USB-UART bridge device that can be used to communicate with the CYW20819-A1 device on this EVB.

2.1 Theory of operation

CYW920819M2EVB-01 is built around the CYW20819 device. **Figure 6** shows the block diagram of the CYW20819-A1 device. See the device **datasheet** for details on device features.
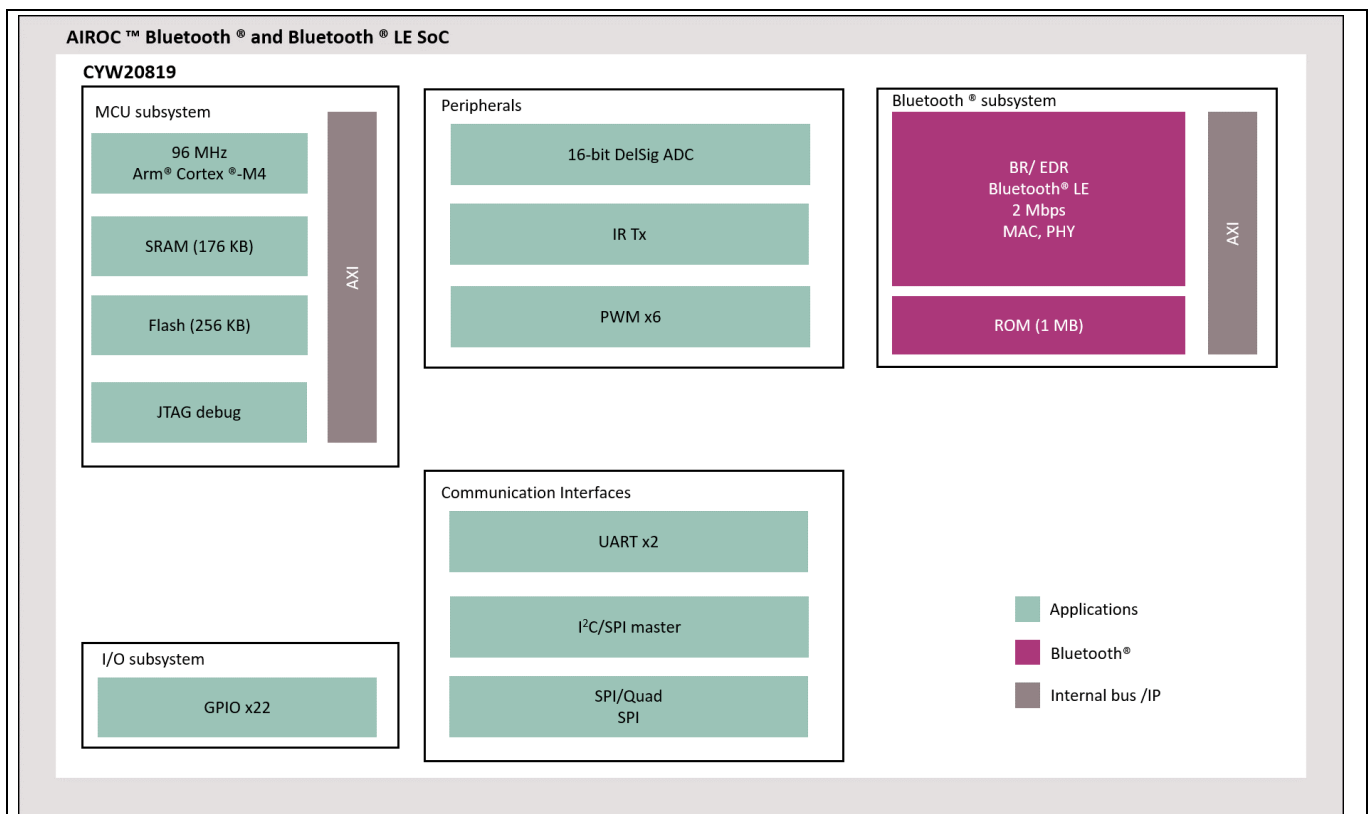

Figure 6 **Block diagram of CYW20819**

Kit operation

Figure 7 illustrates the block diagram of CYW920819M2EVB-01. This board contains a CYW20819 Bluetooth® SoC and a USB-Serial interface/programmer. The kit features Arduino form-factor-compatible headers, which enable Arduino shields to be plugged in, extending the EVB's capabilities. It also features one user switch, one reset switch, one recovery switch, two user LEDs, a thermistor, an ambient light sensor, and multiple power supply options.
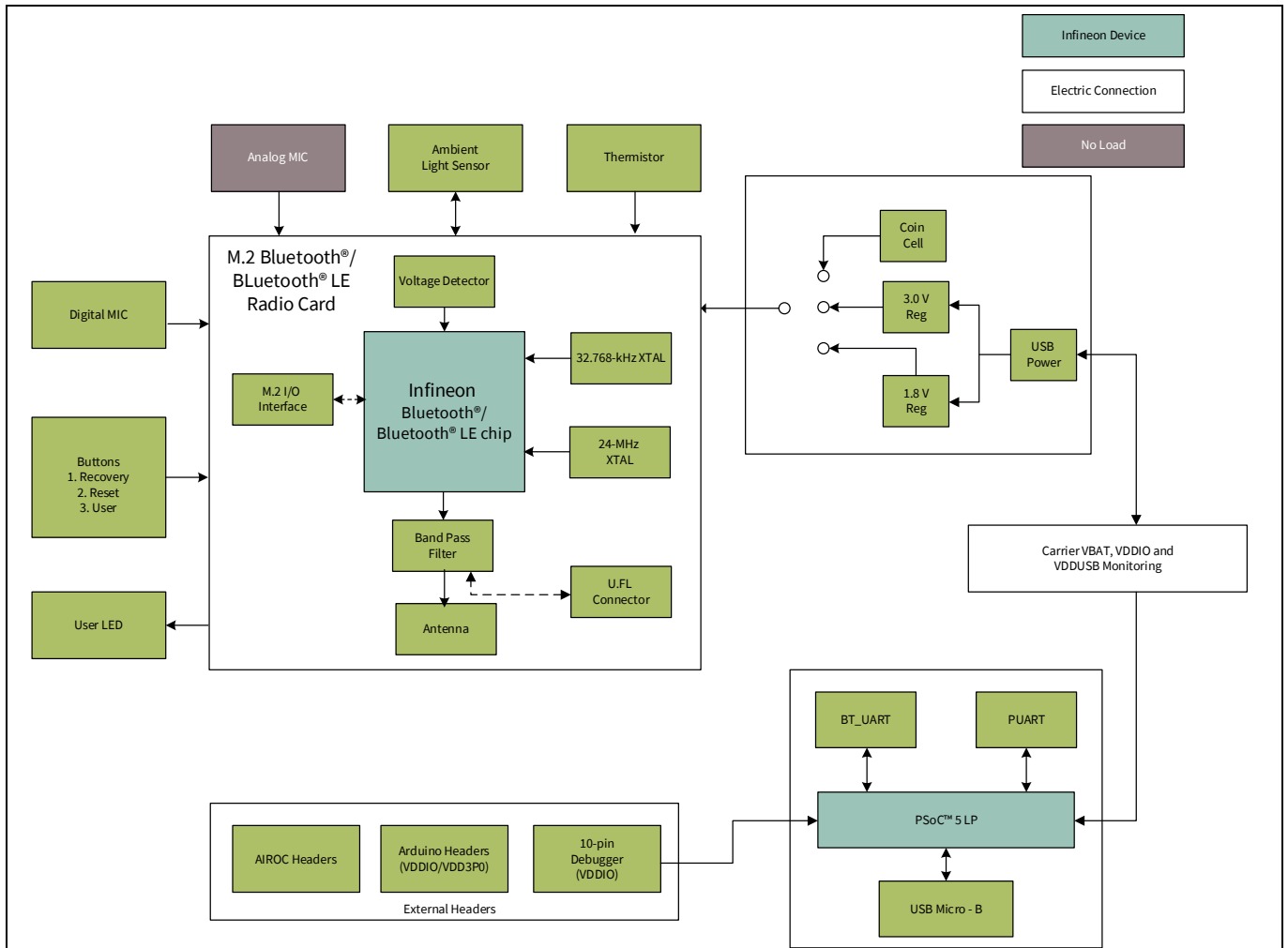

Figure 7   **Block diagram of CYW920819M2EVB-01**

Figure 8 and **Figure 9** show the markup of the CYW920819M2EVB-01 evaluation board. See the list below for a description of the numbered items.
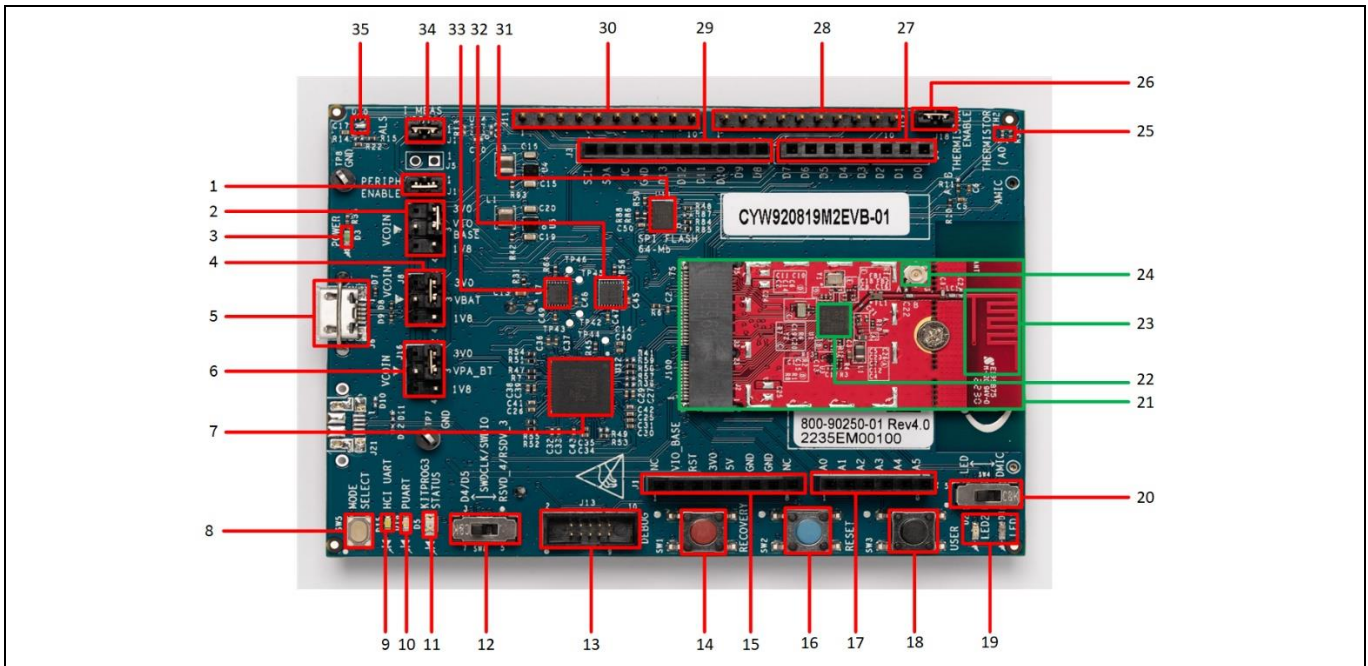
Figure 8   **CYW920819M2EVB-01 evaluation board (Top view)**
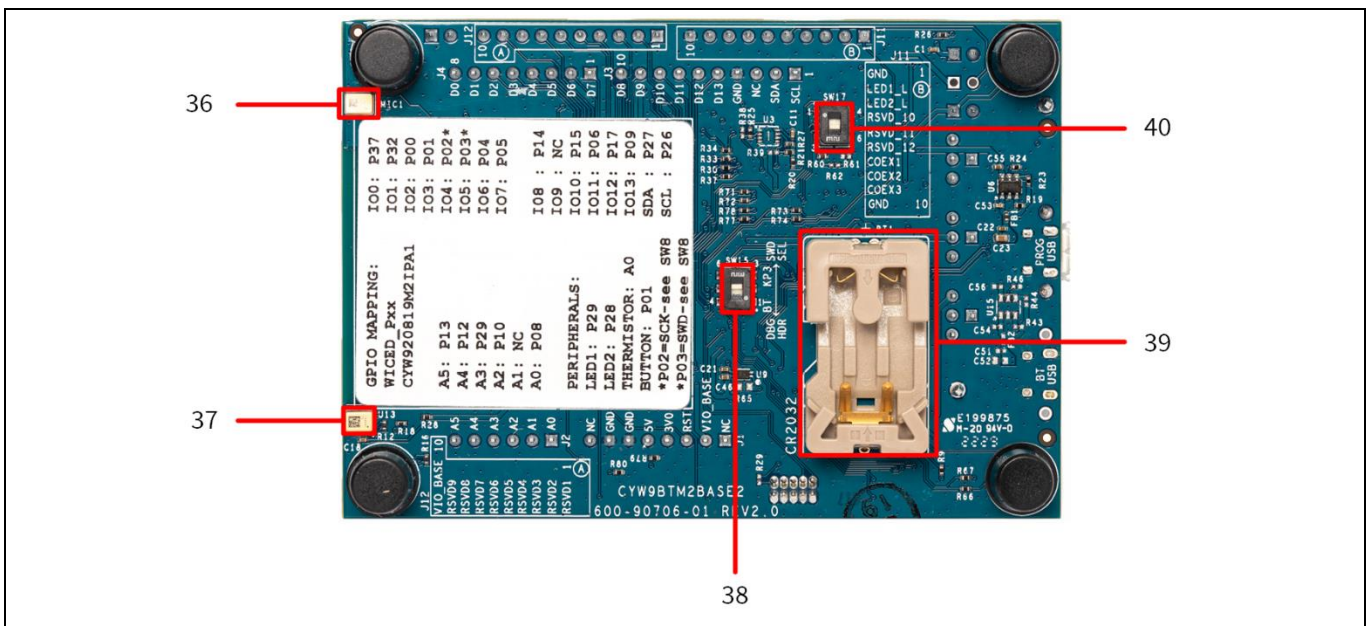
Figure 9   **CYW920819M2EVB-01 evaluation board (Bottom view)**

1. **Peripheral enable (J19):** The jumper allows the user to connect and disconnect the VDDIO supply to on-board peripheral devices like motion sensor, thermistor, analog mic, and real-time clock by disabling VDDP.
2. **VIO_BASE select jumper (J7):** This jumper is used to select the VIO_BASE power source. Possible selections are 3.0 V, 1.8 V, or VCOIN, which is the coin-cell power supply on the bottom side of the board.
3. **Power indicator LED (D3):** This LED is used to indicate the status of power supplied to board.
4. **VBAT select jumper (J8):** This jumper is used to select the VBAT (core power supply) power source. The possible selections are 3.0 V, 1.8 V, or VCOIN which is the coin-cell power supply on the bottom side of the board.

Kit operation

5. **USB connector (J6):** J6 is a micro-B USB female connector for connecting the kit to PC using the provided USB cable. It is used for programming and USB-UART communication.

6. **VPA_BT select jumper (J16):** This jumper is used to select the VPA_BT (power amplifier supply) power source. This select header applies to evaluation boards that has an internal power amplifier and it is not connected to CYW20819 in CYW920819M2EVB-01 evaluation board.

7. **KitProg3 (PSoC™ 5LP) programmer and debugger (CY8C5868LTI-LP039, U12):** The PSoC™ 5LP (CY8C5868LTI-LP039) serving as KitProg3, is a multi-functional system, which includes a Serial Wire Debug (SWD) programmer, debugger, USB-I2C bridge and USB-UART bridge. For more details, see the **KitProg3 user guide**.

8. **KitProg3 programming mode selection button (SW5):** This switch can be used to switch between various modes of operation of KitProg3 (CMSIS-DAP BULK, CMSIS-DAP HID or DAPLink modes). This switch is not used for CYW920819M2EVB-01 because the board supports only one mode.

9. **HCI-UART indication LED (D15):** This White LED indicates the status of HCI-UART.

10. **PUART indication LED (D16):** This Purple LED indicates the status of PUART.

11. **KitProg3 status indication LED (D5):** This Yellow LED indicates the status of KitProg3.This is not useful for CYW920819M2EVB-01 because the board supports only one mode.

12. **SWD/GPIO switch (SW8):** This switch allows you to route the functionality of GPIO/SWD lines to either J4 Arduino-compatible header or the J13 debug header.

13. **Debug header (J13):** J13 is a 10-pin interface header that can be used to connect an external debugger via SWD.

    Note: J13 should only be used to connect a debugger. If something else is connected to J13 to communicate with KitProg3, a voltage mismatch can occur.

14. **Recovery button (SW1):** This button is used to put the device in recovery mode. To put the device in recovery mode, press and hold the recovery button, press and release the reset button, and then release the recovery button. You may need to put the device in recovery mode when the application download fails.

15. **Arduino-compatible header (J1):** The Arduino-compatible I/O header brings out pins from CYW20819 to interface with Arduino shields.

16. **Reset button (SW2):** This button can be used to reset the device.

17. **Arduino-compatible header (J2):** The Arduino-compatible I/O header brings out pins from CYW20819 to interface with Arduino shields.

18. **User button (SW3):** This button can be used to provide an input to the CYW20819 device. Note that the button connects the CYW20819 pin to ground when pressed; therefore, the CYW20819 pin must be configured as a digital input with resistive pull-up for detecting the button press.

19. **User LEDs (D1 and D2):** These onboard LEDs can be controlled by the CYW20819 device. The LEDs are active LOW; therefore, these pins must be driven to ground to turn ON the LEDs.

20. **LED enable switch (SW4):** This switch is used to connect/disconnect the user-controlled LEDs from the CYW20819 device.

21. **Carrier module (U1):** The carrier module has the CYW20819 SoC on it. A Bluetooth® antenna is etched on the carrier module PCB. The carrier module is interface with the baseboard through M.2 interface.

22. **CYW20819 (U1. U1):** The Bluetooth® (BR/EDR- Basic Rate and Enhanced Data Rate) and Bluetooth® Low Energy 5 qualified system-on-chip from Infineon is the heart of this evaluation kit.

23. **PCB antenna (A1):** The PCB antenna is the EM wave radiating part of the evaluation board, which is fed from the BT_RFIO pad of CYW20819 followed by a band-pass filter and an antenna matching circuit.

24. **External antenna connector (U1.J3):** The external antenna connector is an RF connector fed from the BT_RFIO pad of the CYW20819 device followed by a band pass filter. See **Hardware design guidelines** on the product page for more details.

25. **Thermistor (TH2):** The on-board thermistor is an NTC analog thermistor that can be used to measure temperature.

26. **Thermistor enable jumper (J18):** This jumper can be used to connect or disconnect the onboard thermistor from the CYW20819 device.

27. **Arduino-compatible header (J4):** The Arduino-compatible I/O header brings out pins from CYW20819 to interface with Arduino shields.

28. **WICED header (J12):** This header brings out some pins of the CYW20819 device that are not connected to the Arduino compatible headers. These pins can be used for testing or for custom applications.

29. **Arduino-compatible header (J3):** The Arduino-compatible I/O header brings out pins from CYW20819 to interface with Arduino shields.

30. **WICED header (J11):** This header brings out some pins of the CYW20819 device that are not connected to the Arduino compatible headers. These pins can be used for testing or for custom applications.

31. **64-Mb serial flash (U11):** This is the 64-Mbit SPI flash used for application purpose.

32. **PUART voltage level translator (U8):** This voltage level translator IC allows the interoperability of devices (CYW20819 device and USB/Serial IC) with different high – level and low – level voltages for input and output operations.

33. **HCI-UART voltage level translator (U7):** This voltage level translator IC allows interoperability of devices (CYW20819 device and USB/Serial IC) with different high-level and low-level voltages for input and output operations.

34. **VDDIO current measurement jumper (J17):** This jumper is used to power the carrier module. To measure the current consumed by the carrier module, remove this jumper and connect an ammeter to the two pins.

35. **Ambient light sensor (U14):** This is an I^2C-based ambient light sensor.

36. **Analog mic (MIC1):** It is not supported by CYW20819.

37. **Digital mic (U13):** The digital microphone ASIC contains an extremely low – noise preamplifier and a high-performance sigma-delta ADC.

38. **Debug/programming mode select switch (SW15):** This switch allows you to route the functionality of KitProg3/GPIO lines to either the PSoC™ 5LP based KitProg3 or J4 Arduino-compatible header.

39. **Coin cell holder (BT1):** This is a coin cell battery holder located on the bottom side of the development kit. If the evaluation board needs to use the power supplied from the coin cell, then the VDDIO, VBATT and VPA_BT select headers must be set to VCOIN.

40. **P-UART flow control switch (SW17):** This switch allows you to enable and disable the PUART flow control functionality.

2.2 Jumpers

Table 4 to **Table 9** list the jumper settings on the CYW920819M2EVB-01 board.

Table 4 **Jumper J7 pin configurations**

Jumper J7 (VIO_BASE selection)	Default state	Connection on CYW20819	Description
2 and 3	Shorted	VDDO1, VDDO2	Short these pins to supply 3.0 V to VIO_BASE of the CYW20819 device, as well as all peripherals and sensors.
3 and 4	Open		Short these pins to supply 1.8 V to VIO_BASE of the CYW20819 device, as well as all peripherals and sensors.

Kit operation

Jumper J7 (VIO_BASE selection)	Default state	Connection on CYW20819	Description
1 and 3	Open		Short these pins to supply VIO_BASE of the CYW20819 device, as well as all peripherals and sensors from the coin cell supply (VCOIN).

Table 5   Jumper J8 pin configurations

Jumper J8 (VBAT selection)	Default state	Connection on CYW20819	Description
2 and 3	Shorted	SR_PVDD, PMU_AVDD	Short these pins to supply 3.0 V to VBAT of the CYW20819 device. Also, use this jumper to measure the current consumption of VBATT when using 3.0-V supply.
3 and 4	Open		Short these pins to supply 1.8 V to VBATT of the CYW20819 device. Also, use this jumper to measure the current consumption of VBATT when using 1.8-V supply.
1 and 3	Open		Short these pins to use the coin cell supply VBATT of the CYW20819 device. Also, use this jumper to measure the current consumption of VBATT when using the coin cell supply (VCOIN).

Table 6   Jumper J18 pin configuration

Jumper J18 (Thermistor connect/ disconnect)	Default state	Connection on CYW20819	Description
1 and 2	Shorted	P8	Short this jumper to connect the on-board thermistor to CYW20819.

Table 7   Jumper J17 pin configuration

Jumper J17 (VDDIO current measurement)	Default state	Connection on CYW20819	Description
1 and 2	Shorted	VDDIO1, VDDIO2	Short this jumper to supply power to the I/O domain (VDDIO) of CYW20819. Also, use this jumper to measure the current consumption of the I/O domain.

Table 8   Jumper J19 pin configuration

Jumper J19 (Peripheral enable)	Default state	Connection on CYW20819	Description
1 and 2	Shorted	NA	Allows power to on-board peripherals such as ambient light sensor.

Kit operation

Table 9   Jumper J16 pin configurations

Jumper J16 (VPA_BT current measurement)	Default state	Connection on CYW20819 device	
2 and 3	Shorted	NC_0 (PALDO_VDDIN)	This select header applies to evaluation boards that has an internal power amplifier and it is not connected to CYW20819 in the CYW920819M2EVB-01 evaluation board.
3 and 4	Open		This select header applies to evaluation boards that has an internal power amplifier and it is not connected to CYW20819 in the CYW920819M2EVB-01 evaluation board.
1 and 3	Open		This select header applies to evaluation boards that has an internal power amplifier and it is not connected to CYW20819 in the CYW920819M2EVB-01 evaluation board.

Note: *VDDIO must be greater or equal to VBATT. CYW20819 uses an on-chip low-voltage detector to shut down the chip when supply voltage (VBATT) drops below the operating range. The shutdown voltage (V_{SHUT}) lies between a minimum of 1.5 V and a maximum of 1.7 V. See the datasheet for more details.*

2.3   Buttons and switches

Table 10   Button functionality

Buttons	Pressed state	Connection on CYW20819	Description
SW1	GND	RECOVER	Recovery button* (Red)
SW2	GND	RST_N	Active LOW Reset button (Blue)
SW3	GND	P0	User application button (Black)

Note: **See the **Recovery button (SW1):** under **Theory of operation**.*

The switch SW4 enables or disables the two onboard user LEDs. By default, both LED1 and LED2 are enabled.

Table 11   SW4 slide switches configuration

SW4	Default state	Connection on CYW20819	Description
POS 1	ON	NC	Enables LED1
	ON	NC	Enables LED2
POS 2	OFF	NC	Enables DMIC_CLK
	OFF	NC	Enables DMIC_DATA

SW8 is a slide switch. Pos 1 allows RSVD_4 and RSVD_5 to be used for SWD functionality for the debugger interface. Pos 2 allows P2 and P3 to be used for SWD functionality for the debugger interface and when using P2 and P3 as GPIOs, keep SW8 in the Pos2 position.

Kit operation

Table 12   SW8 slide switches configuration

Slide SW8	Default state	Connection on CYW20819	Description
POS 1	OFF	RSVD_4	Connects RSVD_4 to the Arduino-compatible header pin RSVD_4 if the slide switch is in the OFF state. Connects RSVD_4 to the debug header if the slide switch is in the ON state.
	OFF	RSVD_5	Connects RSVD_5 to the Arduino-compatible header RSVD_5 if the slide switch is in the OFF state. Connects RSVD_5 to the debug header if the switch is in the ON state.
POS 2	ON	P2	Connects P2 to the Arduino-compatible header pin ARD_D4_SWDCLK if the slide switch is in the OFF state. Connects P2 to the debug header if the slide switch is in the ON state.
	ON	P3	Connects P3 to the Arduino-compatible header pin ARD_D45SWDIO if the slide switch is in the OFF state. Connects P3 to the debug header if the slide switch is in the ON state.

2.4   Arduino-compatible headers

J3, J4, J11, and J12 are the Arduino-compatible headers.

Table 13   Header J3 pin configuration

Header J3	Arduino pin	Connection on CYW20819	WICED Enum name	Description
1	SCL	P26	WICED_P26	I2C SCL
2	SDA	P27	WICED_P27	I2C SDA
3	AREF	NC	-	NC
4	GND	GND	-	Ground
5	D13	P9	WICED_P09	GPIO
6	D12	P17	WICED_P17	GPIO
7	D11	P6	WICED_P06	GPIO
8	D10	P15	WICED_P15	GPIO
9	D9	NC	-	NC
10	D8	P14	WICED_P14	GPIO

Table 14   Header J4 pin configuration

Header J4	Arduino pin	Connection on CYW20819	WICED Enum name	Description
1	D7	P5	WICED_P05	GPIO
2	D6	P4	WICED_P04	GPIO
3	D5	P3	WICED_P03	GPIO
4	D4	P2	WICED_P02	GPIO
5	D3	P1	WICED_P01	GPIO
6	D2	P0	WICED_P00	User button

Kit operation

Header J4	Arduino pin	Connection on CYW20819	WICED Enum name	Description
7	D1	P32	WICED_P32	PUART RX
8	D0	P37	WICED_P37	PUART TX

Table 15   Header J1 pin configuration

Header J1	Arduino pin	Connection on CYW20819	Description
1	NC	NC	NC
2	VIO_BASE	VDDIO	I/O reference pin used by shields to determine the I/O voltage. Connected to VDDIO on this board. Therefore, IOREF follows 1.8 V or 3.0 V, or VCOIN of VDDIO.
3	RST	ARD_RST/P1	Arduino Reset (R72 install position A) (See **Device reset**) / P1 (R72 install position B).
4	3V0	VDD3P0	3.0-V supply output to the Arduino Shield.
5	5V	VDD5V	5-V supply output to the Arduino Shield.
6	GND	GND	Ground
7	GND	GND	Ground
8	NC	NC	NC

Table 16   Header J2 pin configuration

Header J2	Arduino pin	Connection on CYW20819	WICED Enum name	Description
1	A0	P8	WICED_P08	GPIO/Thermistor
2	A1	NC	-	-
3	A2	P10	WICED_P10	GPIO/PUART CTS
4	A3	NC	-	-
5	A4	P12	WICED_P12	GPIO
6	A5	P13	WICED_P13	GPIO

Note: When accessing Arduino pins, remove the jumpers that may interfere with the Arduino pins such as PUART jumpers and thermistor jumper.

2.5   Other headers

J11 and J12 are test headers which bring out certain pins of CYW20819 for testing.

Table 17   Header J11 pin description

Header J11	Connection to header pin	Connection on CYW20819	WICED Enum name	Description
1	BT_UART_CTS_L	BT_UART_CTS	WICED_P27	BT_UART_CTS
2	LED1_L	P29	WICED_P26	LED1 connection.
3	LED2_L	P28	–	LED2 connection.
4	RSVD_10	P9	–	SF_SCLK
5	RSVD_11	DEV_WAKE	–	Signal to wake up the device

Kit operation

Header J11	Connection to header pin	Connection on CYW20819	WICED Enum name	Description
6	RSVD_12	HOST_WAKE	–	Signal to wake up the host
7	COEX1	NC	–	No connect.
8	COEX2	NC	–	No connect.
9	COEX3	NC	–	No connect.
10	GND	GND	–	Ground.

Table 18   Header J12 pin description

Header J12	Connection to header pin	Connection on CYW20819	Description
1	RSVD_1_USER_BTN	P0	SW3 user button connection.
2	RSVD_2	NC	No connect.
3	RSVD_3	NC	No connect.
4	RSVD_4	NC	No connect.
5	RSVD_5	NC	No connect.
6	RSVD_6	P6	SF_MOSI.
7	RSVD_7	P17	SF_MISO.
8	RSVD_8	NC	Ambient light sensor INT.
9	RSVD_9	P11 (WICED_P11)	SPI (Slave select) external flash memory.
10	VIO_BASE	NC	

J13 is a 10-pin debugger header to debug CYW920819M2EVB-01 using SWD.

Table 19   Header J13 pin description

Header J13	Connection to header pin	Connection on CYW20819	WICED Enum name	Description
1	VDDIO	VDDIO		VDDIO reference.
2	D5/SWDIO	P3	WICED_P03	Serial wire debug input output. SW9 switch 2 must be in the OFF position for this connection to be made.
3	GND	GND		Ground.
4	D4/SWDCK	P2	WICED_P02	Serial wire debug clock. SW9 switch 1 must be in the OFF position for this connection to be made.
5	GND	GND	–	Ground.
6	NC	NC	–	No connect.
7	GND	GND	–	Ground.
8	NC	NC	–	No connect.
9	GND	GND	–	Ground.
10	SWD_RST	BT_RST_N	–	CYW20819 device reset.

Note: J13 should be used only to connect a debugger. If not, a voltage mismatch can occur.

2.6 USB serial interface chip

A CY8C5868LTI-LP039 PSoC™ 5 LP chip is used for onboard programming and USB-Serial functionality. It connects to the computer over a USB interface and connects to the CYW20819-A1 device through the HCI UART and PUART pins.

2.7 Kit power supply

The kit can be powered by one of two power sources: USB or coin-cell battery.

As shown in **Figure 7**, the USB power is connected to two buck regulators, one regulating the voltage to 1.8 V and the other to 3.0 V. A coin-cell battery can be directly connected without the need of a regulator. See **Table 4**, **Table 5**, **Table 7**, and **Table 9** to understand the jumper settings for power selection.

2.8 Test points

There are two ground test points for easy connection of probes. The voltage from various power domains can be measured from their respective headers (J7, J8, and J16).

Table 20   Ground test points available in CYW920819M2EVB-01

Label	Description
TP7, TP8	Test points for ground

2.9 Current measurement

The CYW20819 device has two power domains:

- VIO_BASE to power the always ON GPIO pins
- VBAT to power the core

The total current consumption by the device is the sum of the current consumed by the VIO_BASE and VBAT power domains.

- To measure the current consumed by the VIO_BASE domain, connect an ammeter across jumper J17.
- To measure the current consumed by the VBAT domain, connect an ammeter across pin 3 and one of pins 1, 2, or 4 (depending on the power source) of jumper J8.

2.10 SWD debugging

ModusToolbox™ supports multiple Arm®-JTAG adapters for debugging Bluetooth® products like CYW20819. Debugging is possible on CYW920819M2EVB-01 through SWD signals. SWD is a 2-wire interface that uses SWD input output (SWDIO) and serial wire clock (SWDCK) for debugging the device. These two lines can be brought out to any of the LHL GPIOs on CYW20819. In CYW920819M2EVB-01, P3 will act as SWDIO and P2 will act as SWDCK. See **Table 19** to enable SWD pins to the debug connector (J13).

After making these hardware configurations, see the Debugger guide (*<install>/libraries/bt_sdk-<version>/docs/BT-SDK/ WICED-Hardware-Debugging.pdf)* for debugging your application using ModusToolbox™. This guide can also be accessed from Eclipse IDE for ModusToolbox™ under the menu item **Help** > **ModusToolbox™ General Documentation** > **ModusToolbox™ Documentation Index** > **Bluetooth® Documentation** > **Hardware Debugging for WICED Devices**.

2.11 Pin configuration

GPIOs on the CYW20819 device can be multiplexed to various peripherals. For more information on the peripherals that can be routed to the various GPIOs, see the device **datasheet**.

For this board, the ModusToolbox™ software initializes GPIOs to the platform default configuration. For example, P26 and P27 are configured as I2C SCL and I2C SDA, respectively.

3 Hardware

This chapter describes the CYW920819M2EVB-01 hardware and its different blocks such as reset control, Arduino-compatible headers, and module connectors.

The schematics for the baseboard and carrier module can be found on the **CYW920819M2EVB-01 kit** page.

3.1 Carrier module

The baseboard of the CYW920819M2EVB-01 board is designed to be modular so that various carrier modules can be used with the same baseboard. In this kit, the CYW920819M2IPA1 carrier M.2 radio card module, which employs the CYW20819 device, is connected to the baseboard through M.2 Interface. The carrier module interface is a generic interface that can be used across may devices. See **CYW20819 device I/O mapping** for a detailed interface description. The Bluetooth® antenna is etched on the carrier module PCB. UART signals and GPIOs are brought out to module pins to interface with the baseboard.

3.1.1 CYW20819

The CYW920819M2EVB-01 board employs the CYW20819A1KFBG device which is a 62-BGA package. This board uses all 22 LHL GPIOs provided by the 62-BGA package.

3.1.2 Antenna

A PCB antenna is etched on the carrier module. This antenna is matched to 50 Ω when the CYW920819M2EVB-01 board is placed on a table. **Table 21** lists the S11 measurement. See **AN91445 – Antenna design and RF layout guidelines** for additional information.

Table 21   Antenna S11 measurement

2402 MHz	2441 MHz	2480 MHz
-13.2 dB	-14.6 dB	-12.6 dB

3.1.3 Crystal

The CYW20819 carrier module has two crystals on-board. A 24-MHz crystal (XTAL) is the main crystal. This XTAL must have an accuracy of +/-20 ppm as defined by the Bluetooth® specification. A 32.768-kHz crystal provides accurate timing during low-power operation. See the CYW20819 **datasheet** for crystal requirements.

3.2 Baseboard

CYW9BTM2BASE2 is a baseboard on which the CYW20819 carrier module is connected to.

3.3 Serial communication between CYW20819 and PSoC™ 5 KitProg3

The onboard CY8C5868LTI-LP039 PSoC™ 5LP device is a true programmable embedded system-on-chip responsible for two channel USB-Serial conversion on this baseboard. The USB-serial pins of the PSoC™ 5LP device are hard-wired to the HCI UART and PUART pins of the CYW20819 device. Because PUART RTS is not routed to the USB-Serial device, any of the available LHL GPIOs can be assigned as PUART RTS using the Device Configurator utility and connected using a jumper wire to the assigned Arduino header to use the flow control mechanism provided by the PUART.

Note: *For applications involving low-power modes, the CYW920819M2EVB-01 evaluation board needs to be reset after plugging it into the computer. This is due to the behavior of the serial communication chip where it asserts the CTS pin for some time on power-up, which prevents the CYW920819M2EVB-01 evaluation board from entering the low-power mode.*

3.4 Power

The power supply system on this board is versatile, allowing the input supply to come from the following sources:

- 1.8 V or 3.0 V from the on-board USB connector.
- 3 V from a coin cell battery.

Figure 10 shows the power architecture of the CYW920819M2EVB-01 evaluation board.
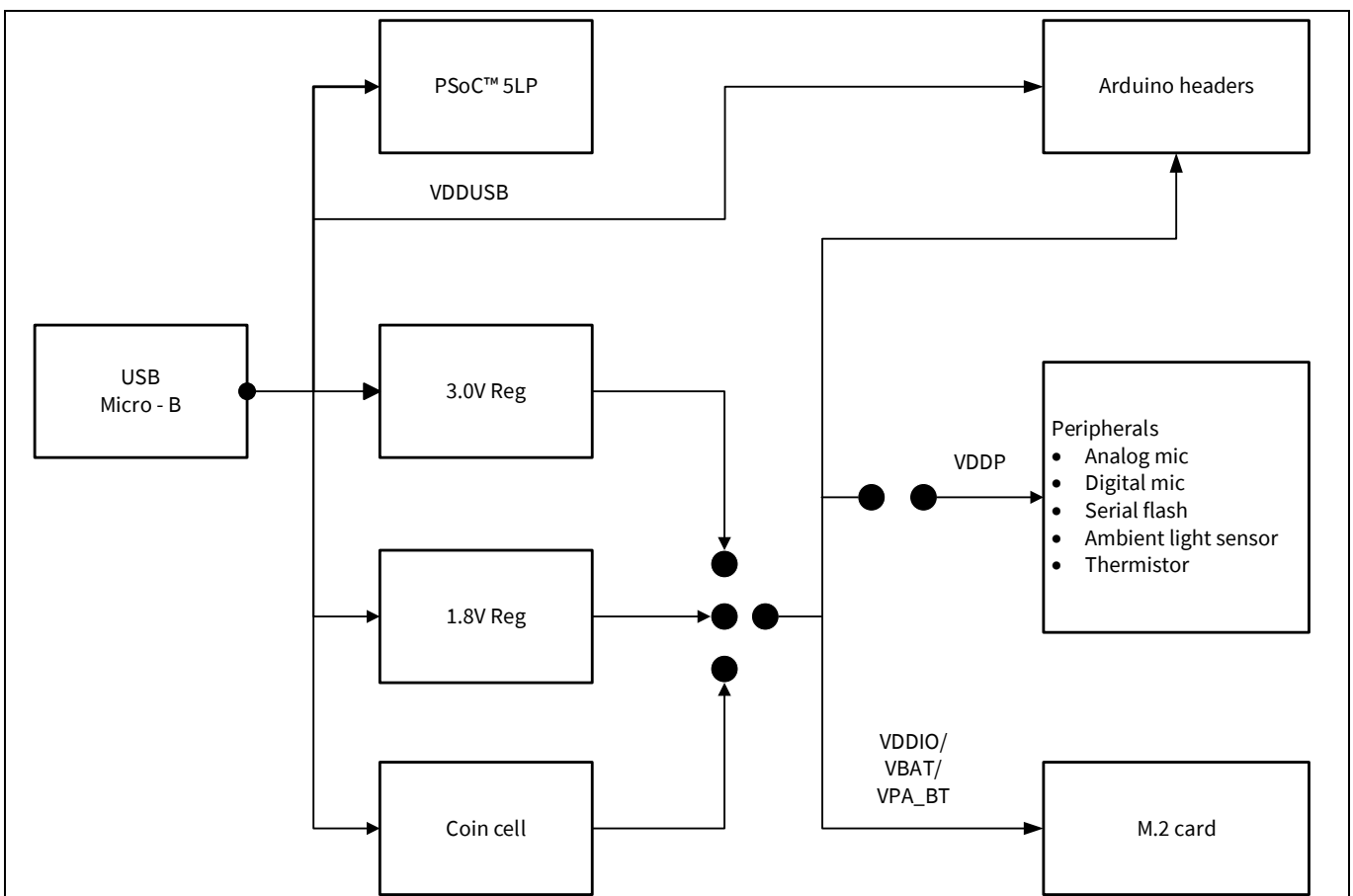
Figure 10   Power Hi

Hardware

Power supply options can be selected via jumper settings on J7, J8, and J16. See **Table 4**, **Table 5**, and **Table 9** for the different jumper settings for these jumpers. Resistors R25 and R21 are pull-up resistors for the I²C lines to the ambient light sensor i.e., SCL and SDA. Note that J19 (PERIPH ENABLE) should be shorted for any I²C devices to be connected because the pull-up voltages for SCL and SDA are supplied from VDDP. The VPA_BT selection jumper (J16) applies to evaluation boards that has an internal power amplifier connected to the Bluetooth® chip and does not apply to CYW920819M2EVB-01 evaluation kit.
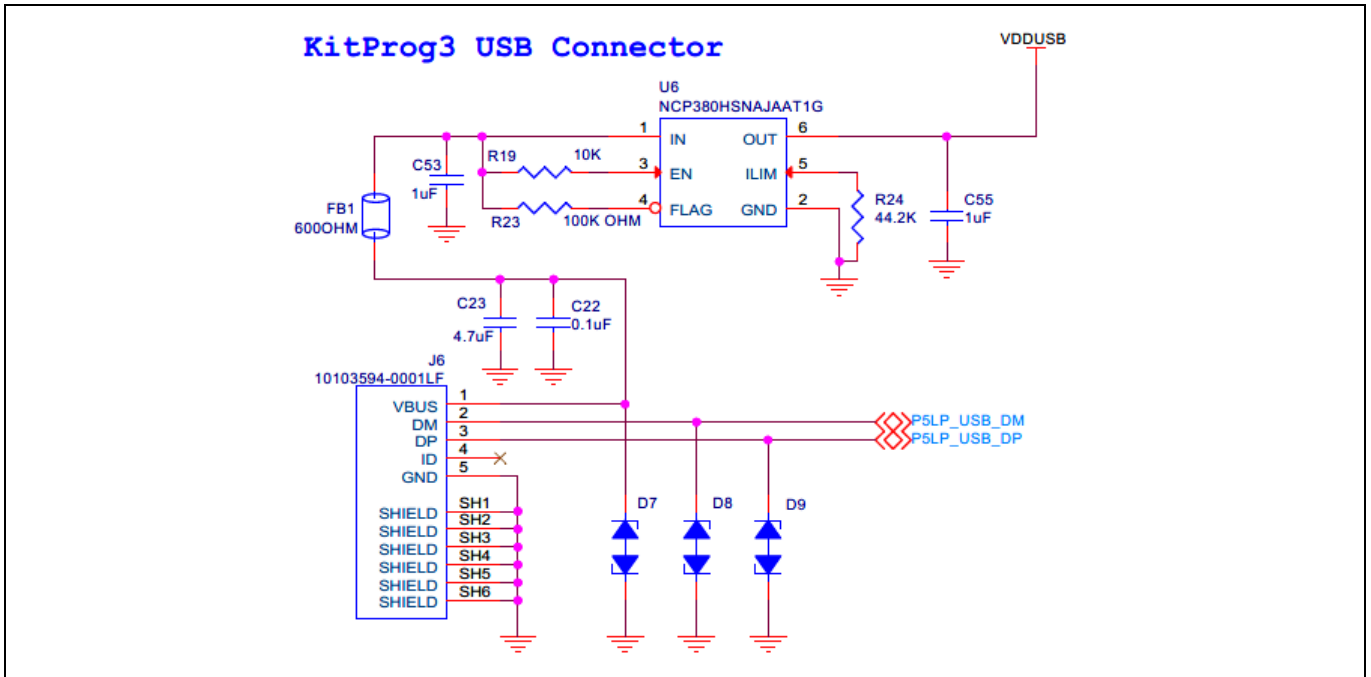
Figure 11   **5-V power supply from USB**
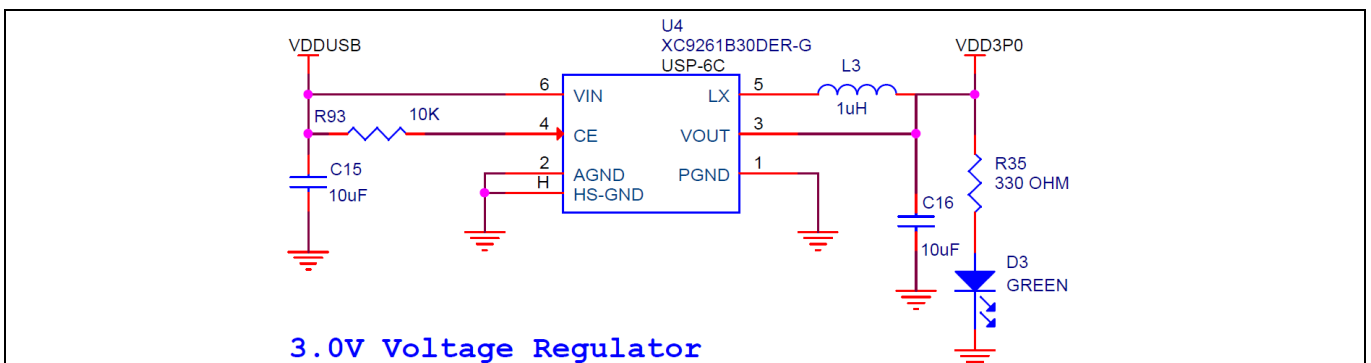
Figure 12   **3.0-V regulator circuit**
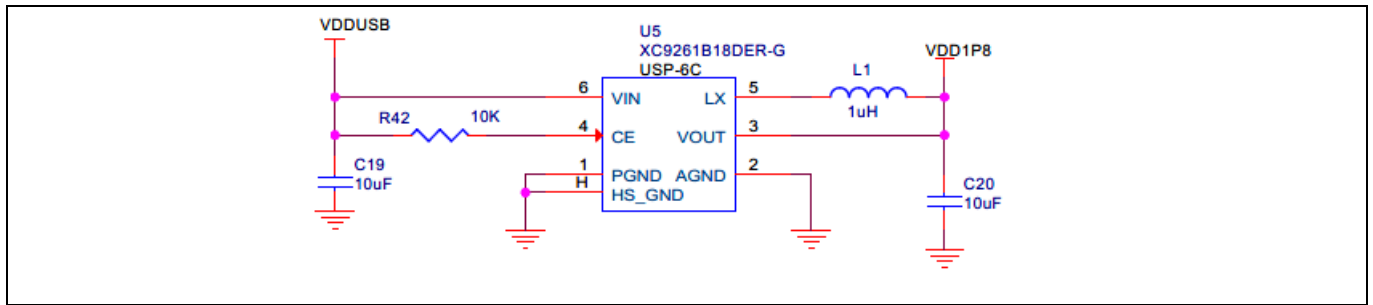
Figure 13   1.8-V regulator circuit
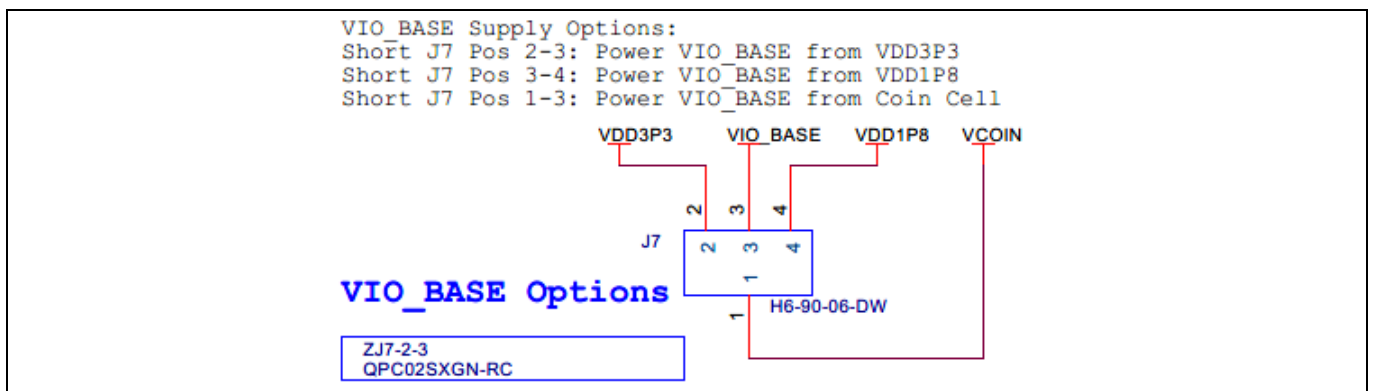
Figure 14   Jumper J7 for VDDIO selection
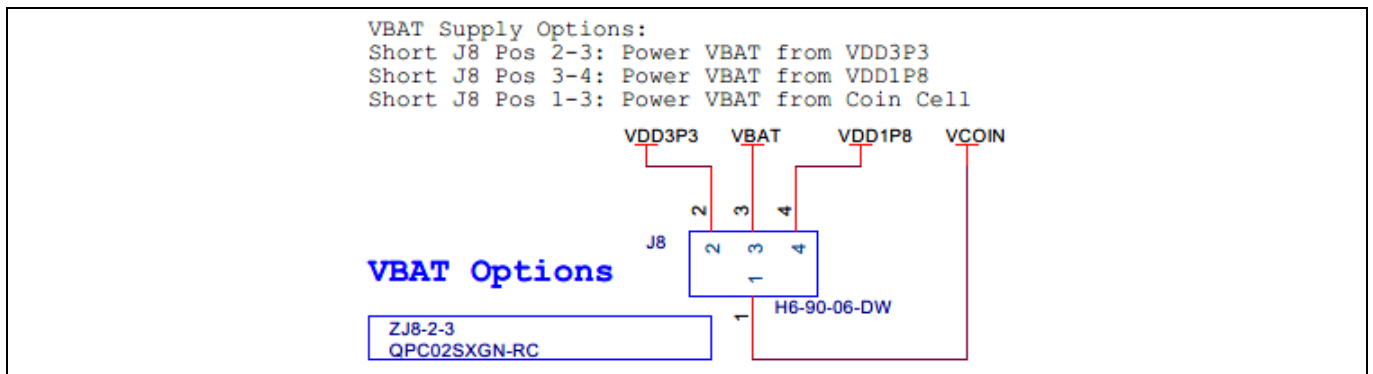
Figure 15   Jumper J8 for VBAT selection
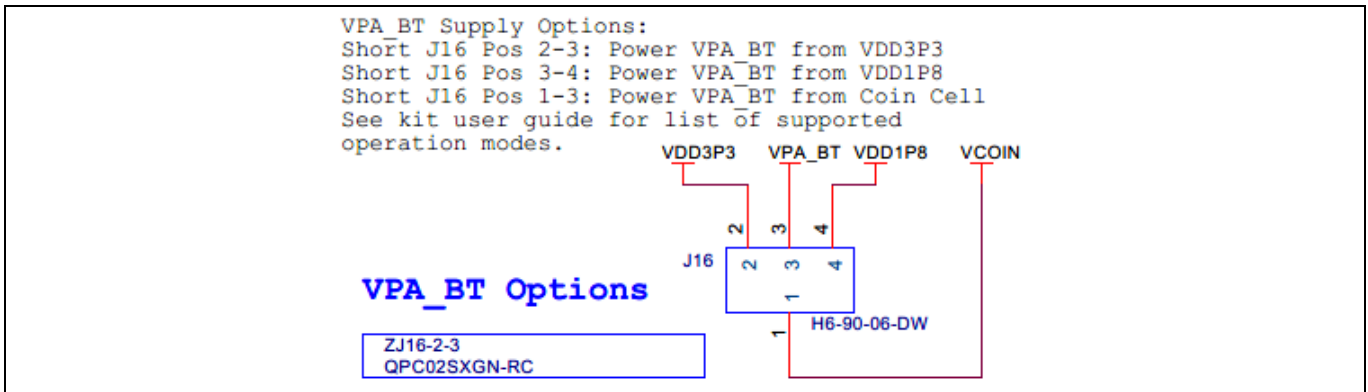
Figure 16   Jumper J16 for VPA_BT selection (NC)

3.5   Device reset

The reset circuit on the board consists of a Reset button (SW2) connected to ground and a voltage detector IC. The RST_N pin on CYW20819 should be released after 50 ms or more after the VDDIO supply voltage has stabilized. The voltage-detector IC is used to provide this delay.
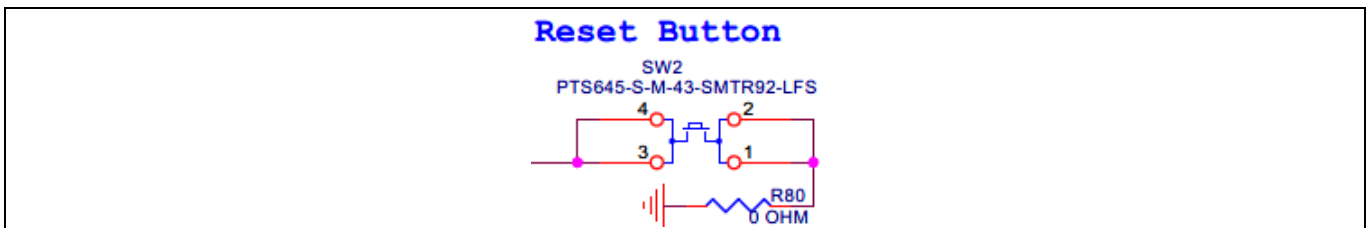
Figure 17   Reset button circuit
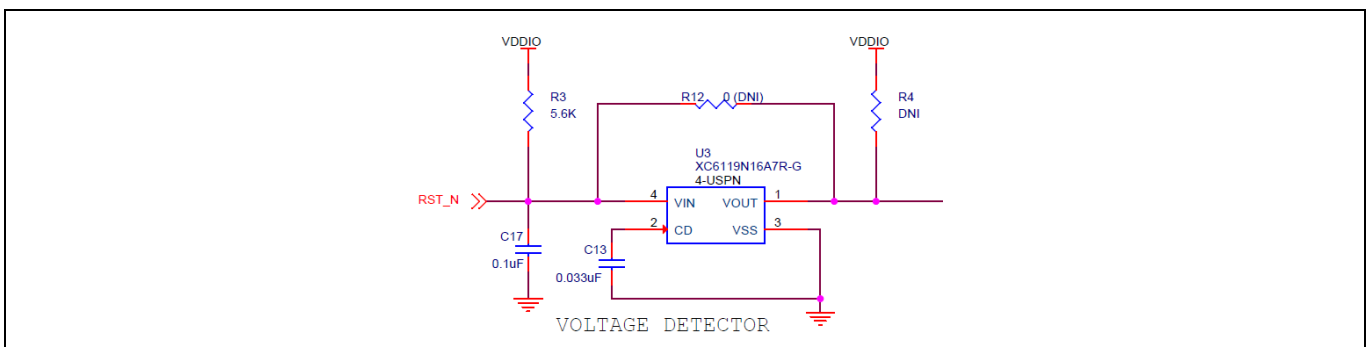
Figure 18   Voltage detector circuit in the carrier module

In the default configuration of R40 shown below (position A-C), the reset button is routed to the Arduino-compatible header reset pin in addition to the device, so both the device and shields can be reset by pressing SW2. Alternatively, in this case, the device can be reset by driving the Arduino-compatible header reset pin LOW allowing for an external reset source.

When R40 is in position (B-C), the device pin P1 will be routed to the ARD_RST header if R13 on device module is installed (default is DNI), so the reset button will not trigger the Arduino-compatible header reset pin, but device pin P1 can be used to monitor or drive the Arduino-compatible header reset pin.

The reset button (SW2) always connects to the BT_RST input on the device so that the device can be reset by pushing the button in either configuration.
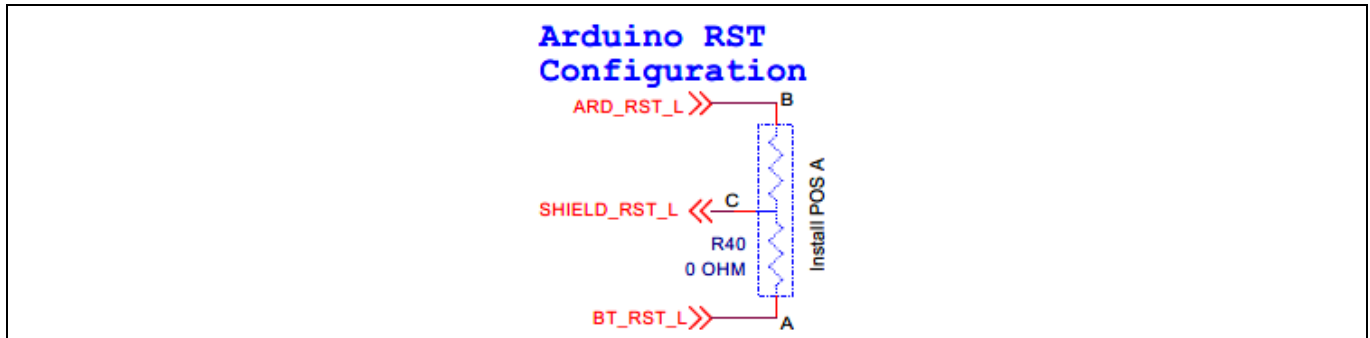

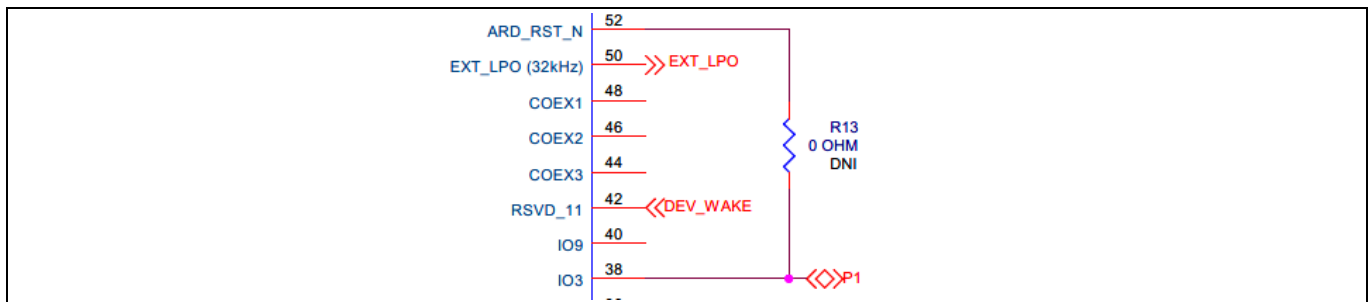**Figure 19   Reset to Arduino-compatible header**

Figure 20   P1 to ARD_RST_N R13 resistor

3.6   Thermistor

The thermistor circuit is a simple voltage divider circuit consisting of an NTC thermistor that is 100 kΩ at 25°C and a fixed 100-kΩ resistor. The divided voltage is fed in to A0 and the voltage level determines the ambient temperature. The part number of the thermistor used on this kit is NCU15WF104F60RC.
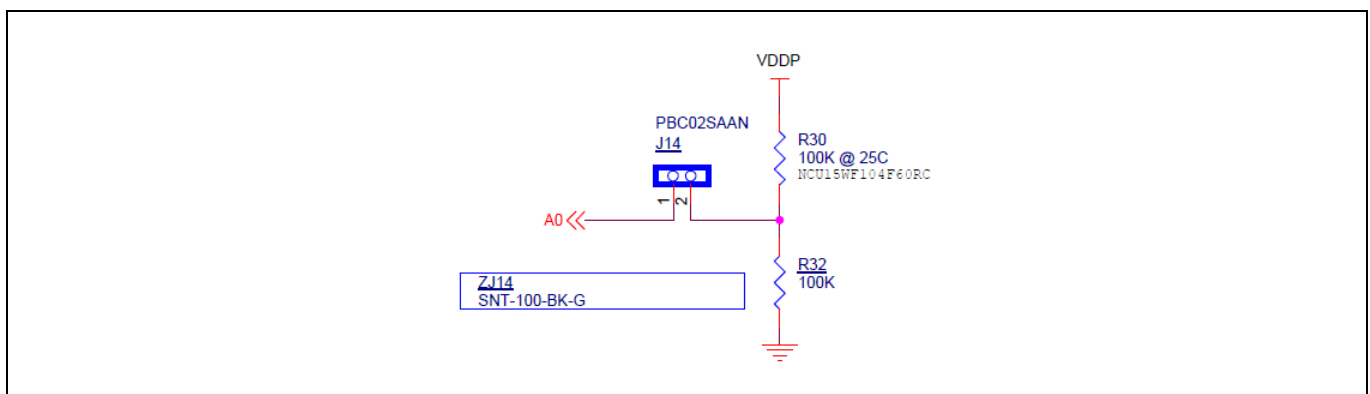
Figure 21   Thermistor circuit

3.7 External serial flash

CYW920819M2EVB-01 has a GigaDevice GD25WQ64ENIG is the 64-Mbit serial flash on the baseboard, which can be useful when the user application requires more memory. The BT SDK is compatible with most JEDEC CFI-compliant SPI flash ICs. The SPI driver should configure the respective pins in the user application in order to use the onboard serial flash.
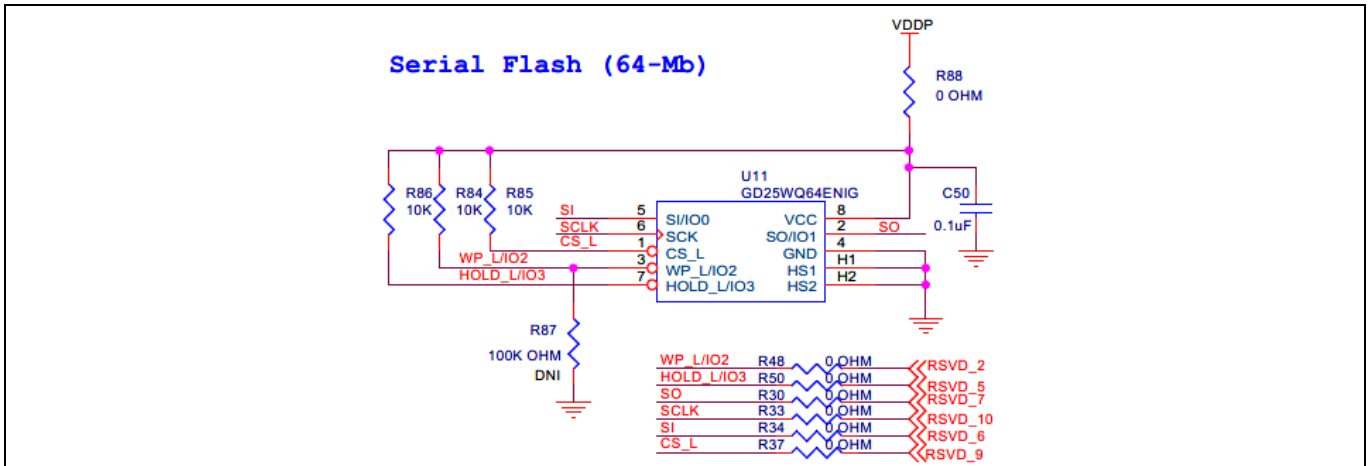

Figure 22   External serial flash

3.8 Ambient light sensor

CYW920819M2EVB-01 has an onboard light-to-digital sensor (Texas Instruments OPT3002DNPT). It has a wide spectral bandwidth, ranging from 300 nm to 1000 nm. Measurements can be made from 1.2 nW/cm^2 up to 10 mW/cm^2. The CYW20819 device communicates with this sensor over I^{2}C. The I^{2}C address is 0x4D for high 0x4C for low. See the OPT3002DNPT datasheet for more details.
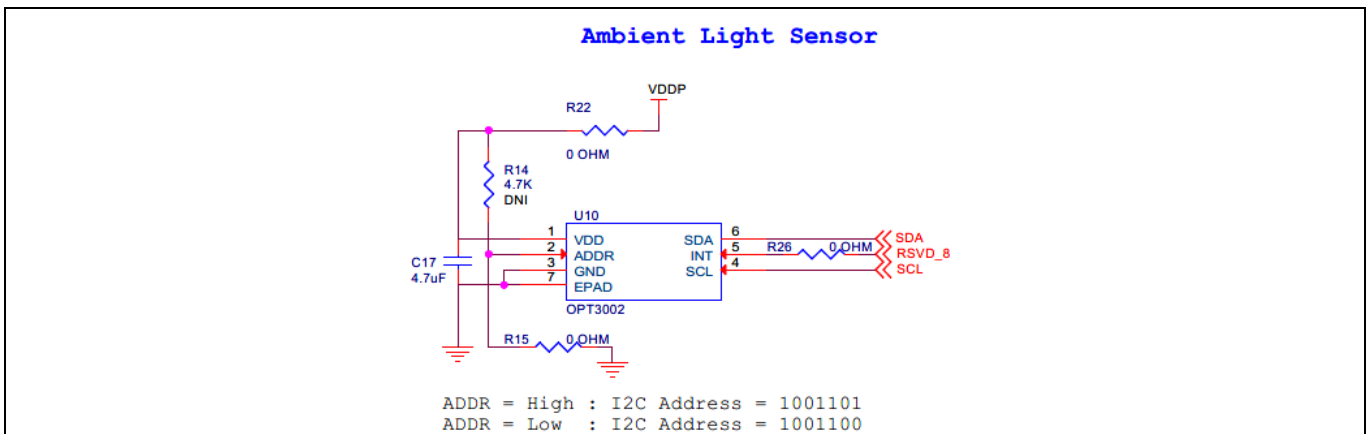

Figure 23   Ambient light sensor circuit

3.9 LEDs

There are two onboard user LEDs on the kit. LED1 is controlled by P29. LED2 is controlled by P28. You can enable or disable the LEDs using slide switch SW4. See **Table 11** for slide switch configuration. TLMY1000-GS08 (Yellow) from Vishay Intertechnology requires a typical voltage of at least 1.8 V (can be as high as 2.6 V) to operate. LTST-C190CKT (Red) from Lite-On Technology Corporation requires a typical voltage of at least 1.8 V (can be as high as 2.4 V) to operate.

Note: *LEDs are initialized by default on boot-up. See the following file for the LED enumeration in the SDK. This file will also be accessible from the Workspace Explorer in Eclipse IDE for ModusToolbox™ after you create an application for this kit.*

<install>\libraries\bt_sdk-<version>\components\BT-SDK\208XX-A1_Bluetooth\platforms\CYW920819M2EVB_01\ wiced_platform.h
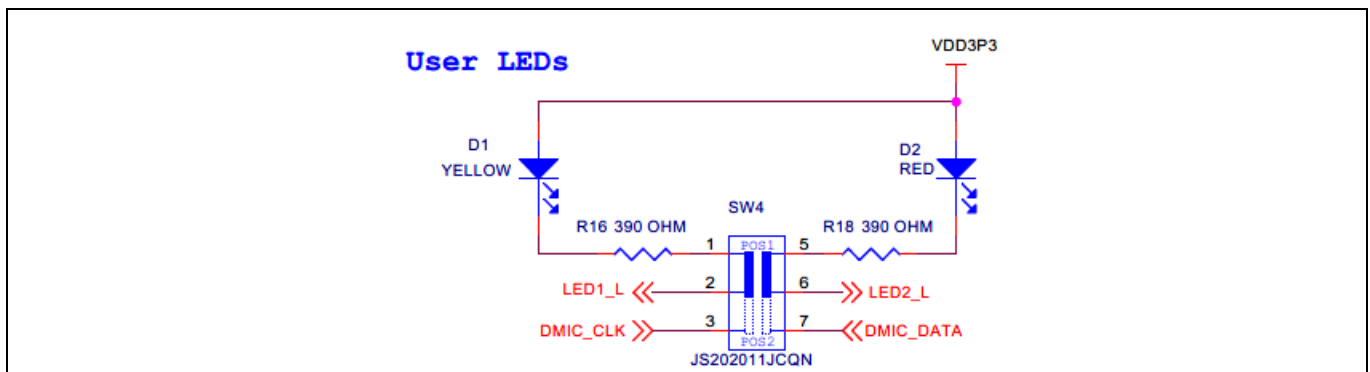

Figure 24   LED circuit

3.10 Push buttons

CYW920819M2EVB-01 has a reset button, recovery button, and a user button. See the **Device reset** section for details on the reset button. See the **Buttons and switches** section for details on using the recovery button during kit programming. One user button (SW3) is connected to pin P0 of the CYW20819 device.

Note: *The user button is initialized by default on bootup. See the following file for the button enumeration in the SDK. This file will also be accessible from the Workspace Explorer in Eclipse IDE for ModusToolbox™ after you create an application for this kit.*

<install>\libraries\bt_sdk-<version>\components\BT-SDK\208XX-A1_Bluetooth\platforms\ CYW920819M2EVB_01\wiced_platform.h

4 CYW20819 device I/O mapping

Table 22 maps the CYW20819 device I/Os to headers and sensors on the baseboard. It also lists the carrier module interface definition.

Note: **: MIC1 is not populated in CYW920819M2EVB-01.*

Table 22 **Carrier module interface and pin connections**

Carrier module pin	Carrier module pin name	CYW20819 pin	Baseboard connection 1	Baseboard connection 2	Baseboard connection 3	WICED Enum name
1	GND	GND	Ground	–	–	–
2	VPA_BT	VPA_BASE	VPA_BT	J16.3	–	–
3	BT_USB_DP	NC		J21.3	–	–
4	VPA_BT	VPA_BASE	VPA_BT	J16.3	–	–
5	BT_USB_DN	NC		J21.2	–	–
6	LED_1L	P29	SW4.2	J11.2	–	WICED_P29
7	GND	GND	Ground	–	–	–
8	ARD_A4	P12	J2.5	–	–	WICED_P12
9	ARD_D13	P9	J3.5	–	–	WICED_P09
10	ARD_A5	P13	J2.6	–	–	WICED_P13
11	ARD_D8	P14	J3.10	–	–	WICED_P14
12	ARD_D6	P4	J4.2	–	–	WICED_P04
13	ARD_D12	P17	J3.6	–	–	WICED_P17
14	ARD_D7	P5	J4.2	–	–	WICED_P05
15	ARD_D11	P6	J3.7	–	MIC1**	WICED_P06
16	LED2_L	P28	SW4.6	J11.3		WICED_P28
17	ARD_A0_THERMISTOR	P8	J2.1	J18.1	–	WICED_P08
18	GND	GND	Ground	–	–	–
19	ARD_A1	NC	J2.2	–	–	–
20	RSVD_12	HOST_WAKE	J11.6	–	–	–
21	ARD_D10	P15	J3.8	–	–	WICED_P15
22	BT_UART_TX	BT_UART_TX	U12.21	–	–	–
23	ARD_D2	P0	J4.6	–	–	WICED_P00
32	BT_UART_RX	BT_UART_RX	U12.20	–	–	–
33	RSVD_10	P9	U11.6	J11.4	–	WICED_P09
34	BT_UART_RTS_L	BT_UART_RTS	U7.5	–	–	–
35	ARD_D4_SWDCLK	P2	J4.4	SW15.4	SW8.3	WICED_P02
36	BT_UART_CTS_L	BT_UART_CTS	U7.6	–	–	–
37	ARD_D5_SWDIO	P3	J4.3	SW15.1	SW8.7	WICED_P03

CYW20819 device I/O mapping

Carrier module pin	Carrier module pin name	CYW20819 pin	Baseboard connection 1	Baseboard connection 2	Baseboard connection 3	WICED Enum name
38	ARD_D3	P1	J4.5	–	–	WICED_P01
39	GND	GND	Ground	–	–	–
40	ARD_D9	NC	J3.9	–	–	–
41	RSVD_4	NC	SW8.1	J12.4	–	–
42	RSVD_11/VDD2P5	DEV_WAKE	J5.1	J11.5	–	–
43	RSVD_3	NC	SW8.5	J12.3	–	–
44	COEX3	NC	J11.9	–	–	–
45	GND	GND	Ground	–	–	–
46	COEX2	NC	J11.8	–	–	–
47	MIC_P	NC	MIC1.1	–	–	–
48	COEX1	NC	J11.7	–	–	–
49	MIC_N	NC	Ground	–	–	–
50	EXT_LPO	EXT_LPO	NC	–	–	–
51	GND	GND	Ground	–	–	–
52	ARD_RST_N	P1	R40.B	–	–	WICED_01
53	MIC_BIAS	NC	–	–	–	–
54	BT_RST_N	RST_N	SW2.3/4 (RESET_ BTN)	J13.10	U12.3	–
55	MIC_AVDD	NC	VIO_BASE	–	–	–
56	RSVD_9	P11	U11.1	J12.9	–	WICED_P11
57	GND	GND	Ground	–	–	–
58	SDA	P27	J3.2	U10.6	U3.2	WICED_P27
59	RSVD_2	NC	U11.3	J12.2	–	–
60	SCL	P26	J3.1	U10.4	U3.6	WICED_P26
61	RSVD_1/ USER_BTN	P0	SW3.2/1 (USER_ BTN)	J12.1	–	–
62	RSVD_8	NC	U10.5	J12.8	–	–
63	RECOVERY	BT_UART_ CTS	SW1.3/4 (RECOVERY_ BTN)	–	–	–
64	VDDIO	VDDIO	J17.1	–	–	–
65	ARD_A3	P29	J2.4	SW17.1	–	WICED_P29
66	RSVD_7	P17	U11.2	J12.7	–	WICED_P17
67	ARD_A2	P10	J2.3	SW17.4	–	WICED_P10
68	RSVD_6	P6	U11.5	J12.6	–	WICED_P06
69	GND	GND	Ground	–	–	–
70	RSVD_5	NC	U11.7	J12.5	–	–
71	ARD_D1	P32	J4.7	U8.1	–	WICED_P32
72	VBAT	VBAT	VBAT	J8.3	U12.8	–
73	ARD_D0	P37	J4.8	U8.2	–	WICED_P37

CYW20819 device I/O mapping

Carrier module pin	Carrier module pin name	CYW20819 pin	Baseboard connection 1	Baseboard connection 2	Baseboard connection 3	WICED Enum name
74	VBAT	VBAT	VBAT	J8.3	U12.8	–
75	GND	GND	Ground	–	–	–

Revision history

Date	Version	Description
2022-10-07	**	Initial release

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