

CYW920820M2EVB-01 evaluation kit user guide

CYW20820

About this document

Scope and purpose

CYW20820M2EVB-01 is an evaluation kit for the AIROC™ CYW20820 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, and security functions built into the ROM allowing applications 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 I²C, UART, PCM, and Quad-SPI
- Over-the-air (OTA) firmware updates

Intended audience

This document is intended for anyone using the CYW20820M2EVB-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
<i>Italics</i>	Denotes file/folder names
Courier New	Denotes APIs, functions, interrupt handlers, events, data types, error handlers, 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
EEPROM	Electrically Erasable Programmable Read-Only Memory
EM	Electromagnetic
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 the [CYW20820 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 in ModusToolbox™.
Code examples	
Visit the Infineon GitHub repository for a comprehensive collection of code examples using ModusToolbox™.	
Device documentation	
CYW20820 device datasheet	CYW20820 feature and peripheral guide
Tool documentation	
ModusToolbox™	The Infineon IDE for IoT designers

Important notice

Important notice

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Safety precautions

Safety precautions

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

Table 4 Safety precautions

	<p>Warning: The evaluation or reference board contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait five minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.</p>
	<p>Caution: The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.</p>

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1 Introduction

1 Introduction

Thank you for your interest in the CYW920820M2EVB-01 evaluation kit. This kit enables customers to evaluate and develop single-chip Bluetooth® and Bluetooth® Low Energy applications using the CYW20820, dual-mode Bluetooth® 5.2 (LE and BR/EDR) wireless MCU.

CYW920820M2EVB-01 can be used with ModusToolbox™ software to develop and debug your CYW20820 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 on-board 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 CYW920820M2EVB-01 kit contents

The EVB includes the following:

- CYW920820M2EVB-01 evaluation board
- USB 2.0 Type-A to micro-B cable
- Quick start guide



Figure 1 CYW920820M2EVB-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 Introduction

1.2 CYW920820M2EVB-01 evaluation board details

Figure 2 shows the CYW920820M2EVB-01 evaluation board with the following features:

1. CYW20820 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 CYW20820M2EVB-01 device
4. Recovery button (red), Reset button (blue), and User button (black)
5. Onboard Micro-B USB connector (J6) for programming and debug purposes

The 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 5](#) to [Table 10](#), so that Peripheral UART is selected and can display embedded application trace messages. [Figure 2](#) shows the default jumper locations.
2. Connect 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 the 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.`

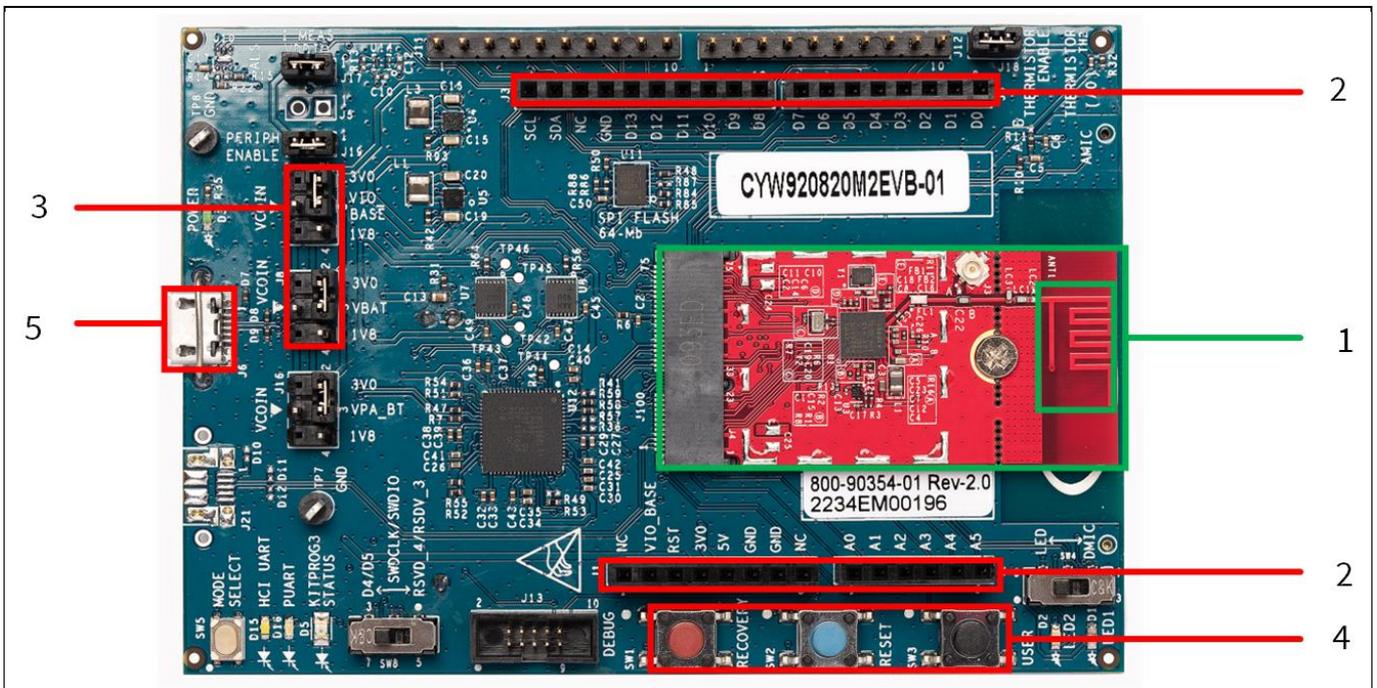


Figure 2 CYW920820M2EVB-01 evaluation board

Figure 3 highlights the LEDs provided on CYW920820M2EVB-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.

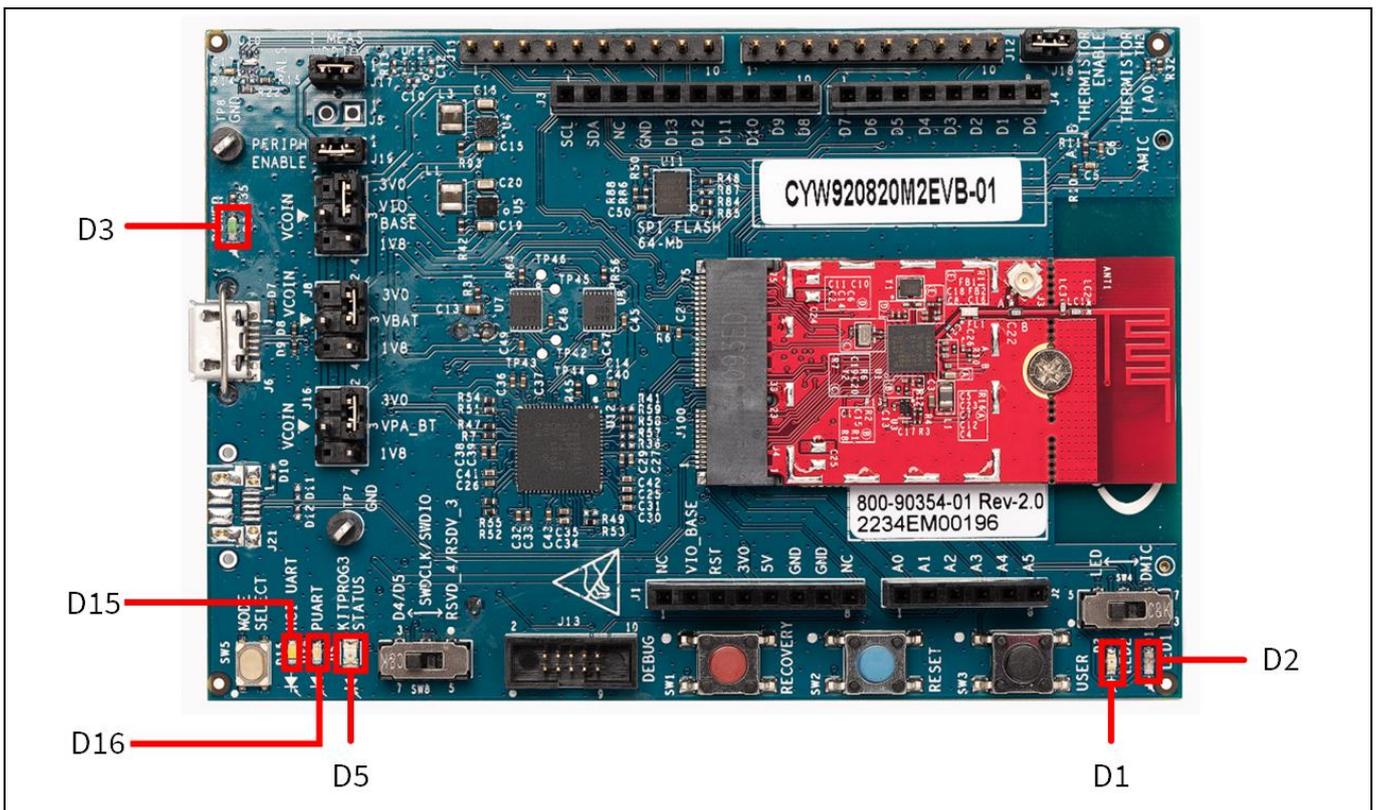


Figure 3 CYW920820M2EVB-01 evaluation board LEDs

1.3 ModusToolbox™

ModusToolbox™ is a free software development ecosystem that includes the Eclipse IDE for ModusToolbox™, BTSDK, and the PSoC™ 6 SDK to develop applications for Infineon IoT products. This IDE is a multi-platform, Eclipse-based 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 BTSDK.

BTSDK provides the central core of the ModusToolbox™ software for creating Bluetooth® applications. It contains configuration tools, drivers, libraries, middleware, Makefiles, 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™ IDE user guide](#).

1 Introduction

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’s [GitHub](#) repository. See [Figure 4](#) and [Figure 5](#) for details.

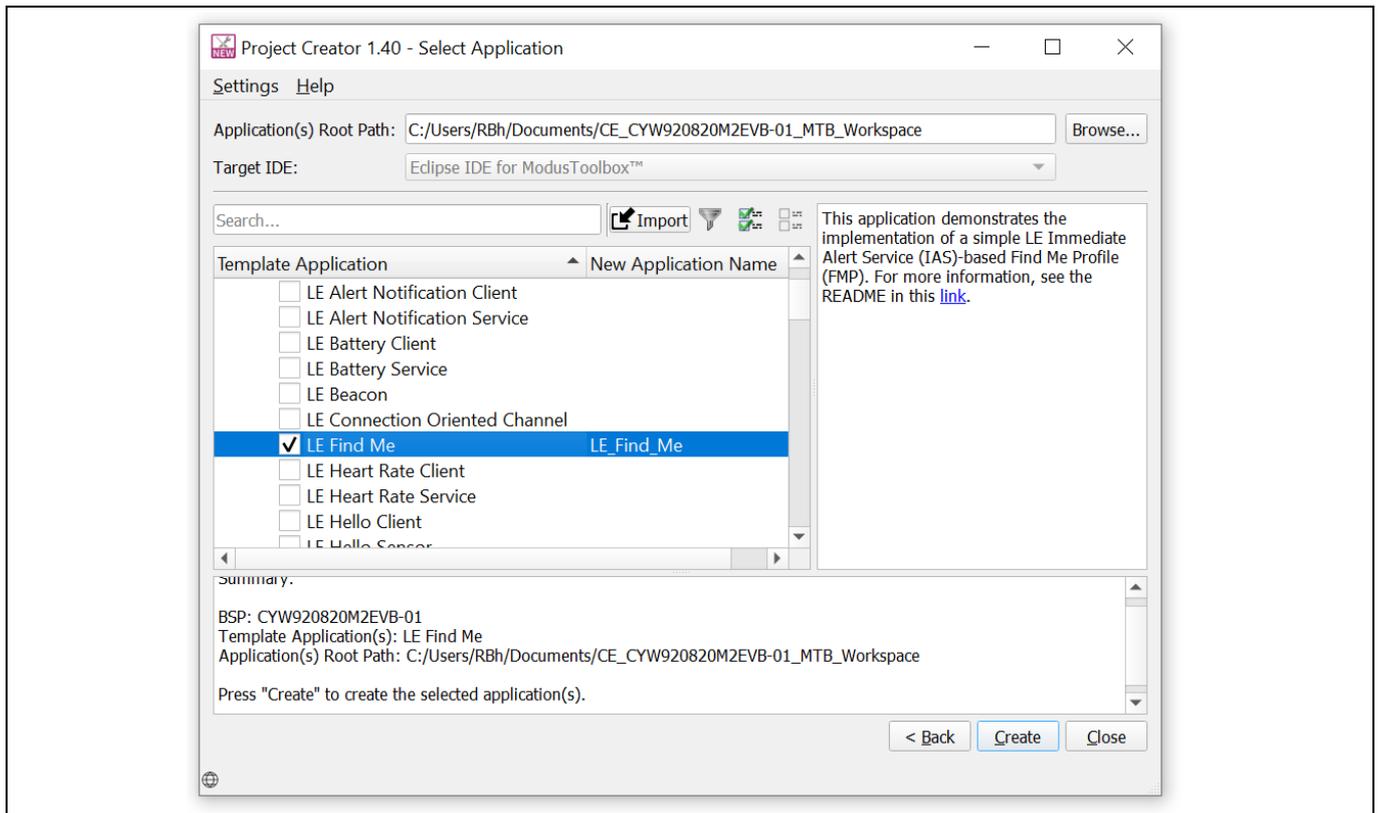


Figure 4 Code examples in ModusToolbox™

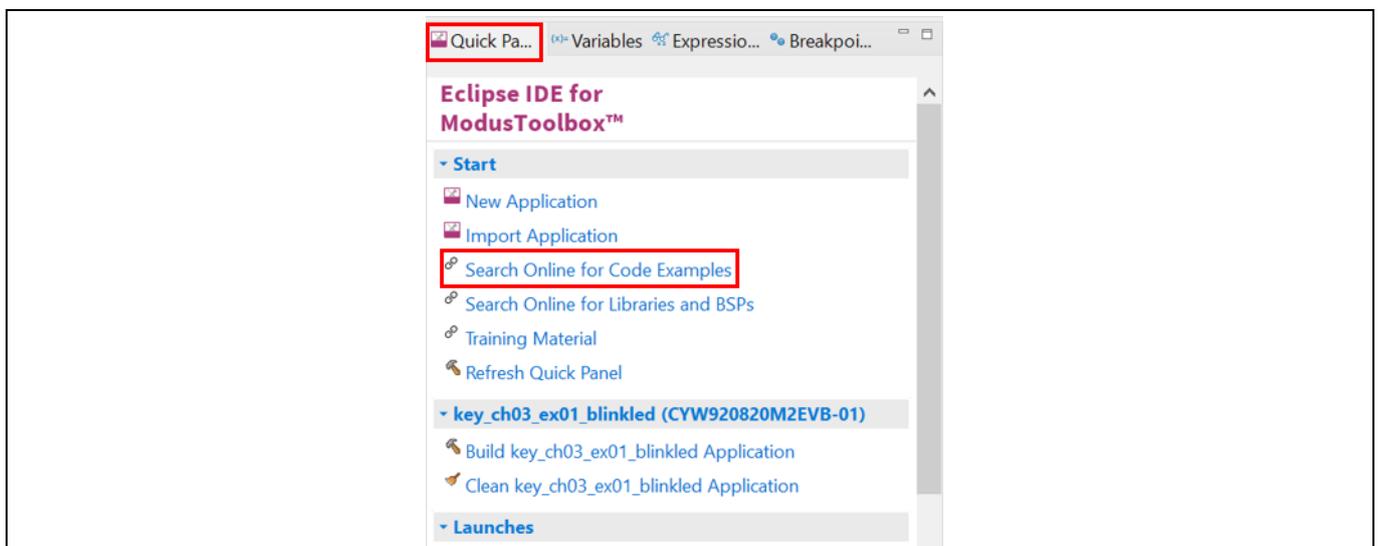


Figure 5 Searching for online code examples in ModusToolbox™

1 Introduction

1.3.2 Related code examples

You can access the kit code examples from the Infineon [GitHub](#) repository. The CYW920820M2EVB-01 evaluation board is pre-programmed with the Find Me Profile (CE226123 – Bluetooth® LE Find Me with CYW20820) 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 (**Help > ModusToolbox IDE 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™ IDE.
- **ModusToolbox™ general documentation:** Choose **Help > ModusToolbox™ General Documentation > ModusToolbox™ Documentation Index**. This page provides link to various ModusToolbox™ documents.
- **Eclipse IDE for ModusToolbox™ user guide:** Choose **Help > Eclipse IDE for ModusToolbox™ IDE 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 CYW920820M2EVB-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 CYW920820M2EVB-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 CYW920820M2EVB-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 CYW920820M2EVB-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 CYW20820-A1 device on this EVB.

2.1 Theory of operation

CYW920820M2EVB-01 is built around the CYW20820 device. See the device [datasheet](#) for details on device features.



Figure 6 CYW20820 block diagram

Figure 7 illustrates the block diagram of CYW920820M2EVB-01. This board contains a CYW20820 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.

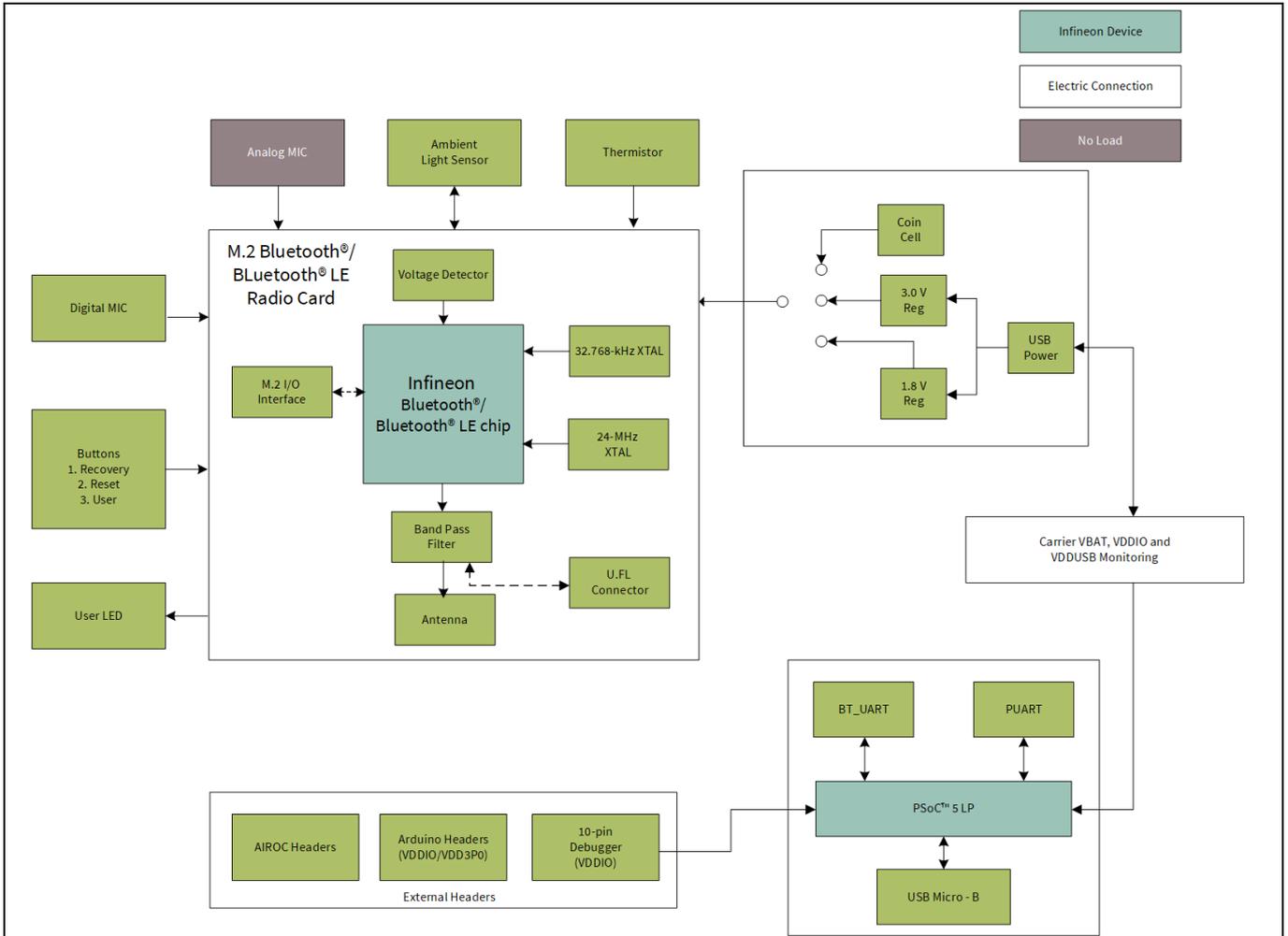


Figure 7 CYW920820M2EVB-01 block diagram

2 Kit operation

Figure 8 and Figure 9 show the markup of the CYW920820M2EVB-01 evaluation board. See the list below for a description of the numbered items.

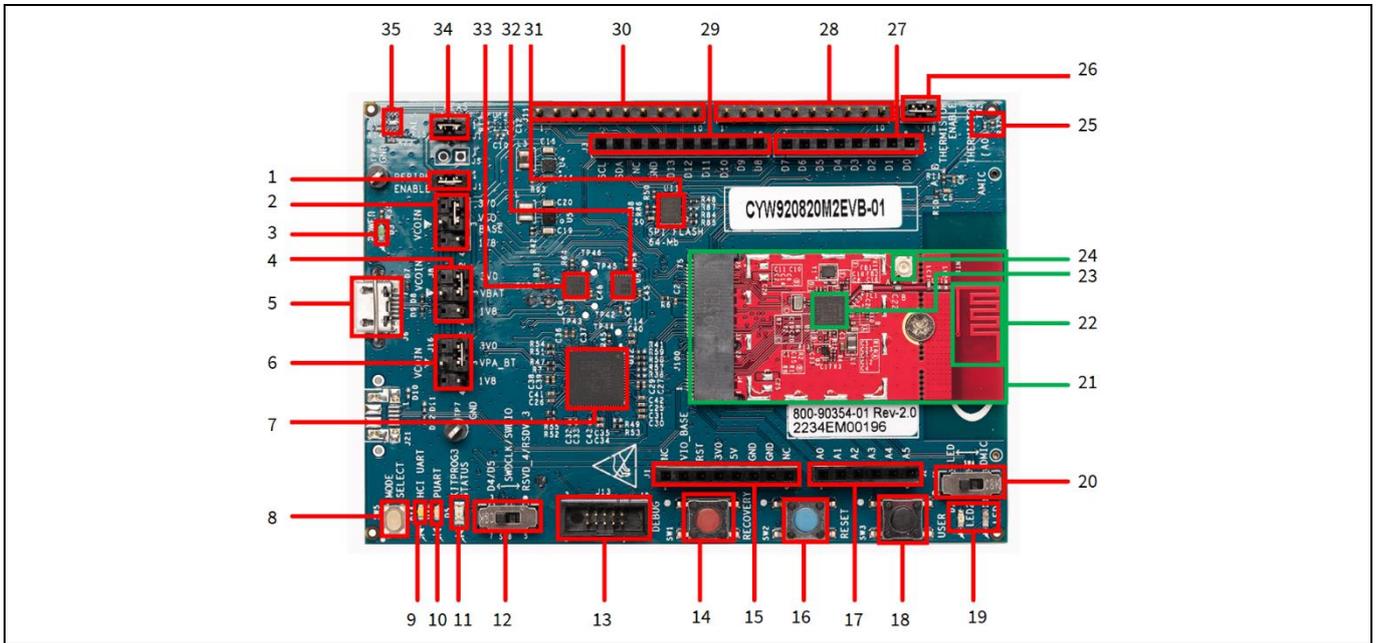


Figure 8 CYW920820M2EVB-01 evaluation board (top view)

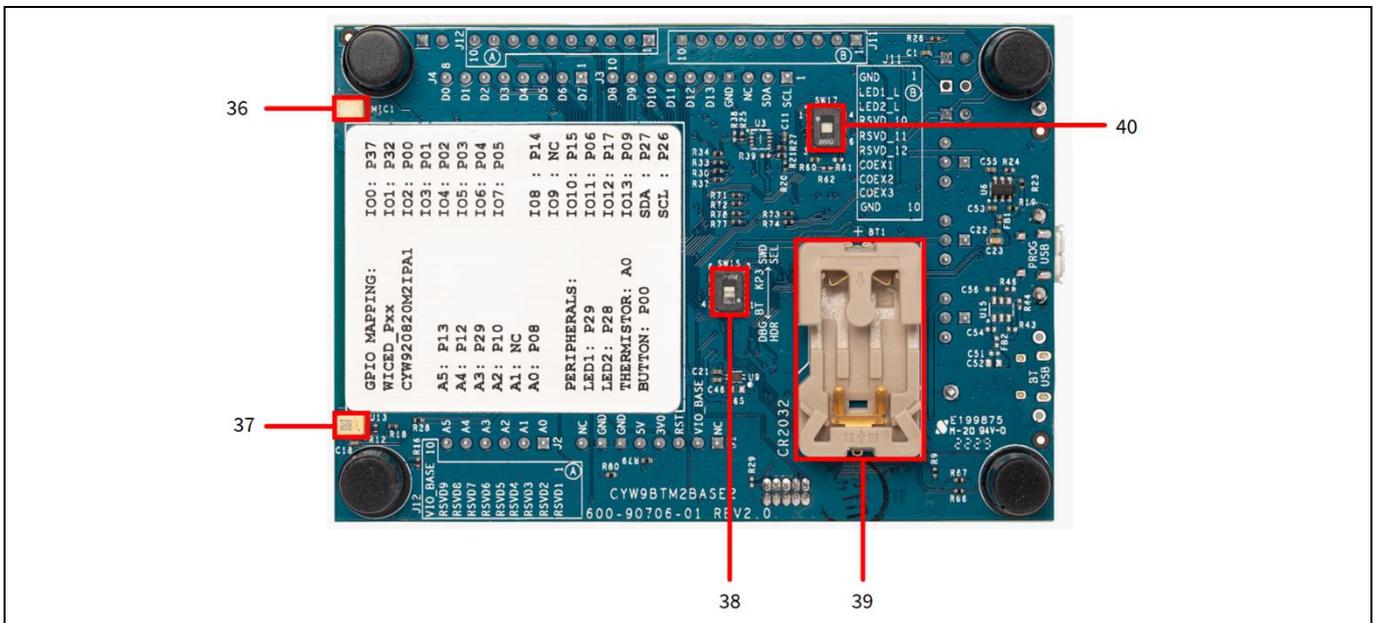


Figure 9 CYW920820M2EVB-01 evaluation board (bottom view)

2 Kit operation

1. **Peripheral enable (J19):** The jumper allows the user to connect and disconnect the VDDIO supply to onboard peripheral devices like motion sensor, thermistor, analog microphone, 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 the 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.
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 selection header applies to evaluation boards that have an internal power amplifier. VPA_BT is not connected to CYW20820 in CYW920820M2EVB-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 CYW920820M2EVB-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 used for CYW920820M2EVB-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):** This is a 10-pin interface header that can be used to connect an external debugger via SWD.

Note: Use J13 only 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 do so, 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 an application download fails.
15. **Arduino-compatible header (J1):** The Arduino-compatible I/O header brings out pins from CYW20820 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 CYW20820 to interface with Arduino shields.
18. **User button (SW3):** This button can be used to provide an input to the CYW20820 device. Note that the button connects the CYW20820 pin to ground when pressed; therefore, the CYW20820 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 CYW20820 device. The LEDs are active LOW; therefore, these pins must be driven to ground to turn ON the LEDs.

2 Kit operation

20. **LED enable switch (SW4):** This switch is used to connect/disconnect the user-controlled LEDs from the CYW20820 device.
21. **Carrier module (U1):** The carrier module has the CYW20820 SoC on it. A Bluetooth® antenna is etched on the carrier module PCB. The carrier module is interface with the baseboard through the M.2 interface.
22. **PCB antenna (A1):** The PCB antenna is the electromagnetic (EM) wave radiating part of the evaluation board, which is fed from the BT_RFIO pad of CYW20820 followed by a band-pass filter and an antenna-matching circuit.
23. **CYW20820 (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.
24. **External antenna connector (U1.J3):** The external antenna connector is an RF connector fed from the BT_RFIO pad of the CYW20820 device followed by a band-pass filter. See [Hardware design guidelines](#) on the product page for more details.
25. **Thermistor (TH2):** The onboard 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 CYW20820 device.
27. **Arduino-compatible header (J4):** The Arduino-compatible I/O header brings out pins from CYW20820 to interface with Arduino shields.
28. **WICED header (J12):** This header brings out some pins of the CYW20820 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 CYW20820 to interface with Arduino shields.
30. **WICED header (J11):** This header brings out some pins of the CYW20820 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 (CYW20820 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 (CYW20820 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 I²C-based ambient light sensor.
36. **Analog mic (MIC1):** It is not supported by CYW20820.
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 5 to Table 10 list the jumper settings on the CYW920820M2EVB-01 board.

Table 5 Jumper J7 pin configurations

Jumper J7 (VIO_BASE selection)	Default state	Connection on CYW20820	Description
2 and 3	Shorted	VDDO1, VDDO2	Short these pins to supply 3.0 V to VIO_BASE of the CYW20820 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 CYW20820 device, as well as all peripherals and sensors.
1 and 3	Open		Short these pins to use coin cell supply for VIO_BASE of the CYW20820 device, as well as all peripherals and sensors from the coin-cell supply (VCOIN).

Table 6 Jumper J8 pin configurations

Jumper J8 (VBAT selection)	Default state	Connection on CYW20820	Description
2 and 3	Shorted	SR_PVDD, PMU_AVDD	Short these pins to supply 3.0 V to VBAT of the CYW20820 device. Also, use this jumper to measure the current consumption of VBATT when using the 3.0-V supply.
3 and 4	Open		Short these pins to supply 1.8 V to VBATT of the CYW20820 device. Also, use this jumper to measure the current consumption of VBATT when using the 1.8-V supply.
1 and 3	Open		Short these pins to use the coin cell supply VBATT of the CYW20820 device. Also, use this jumper to measure the current consumption of VBATT when using the coin-cell supply (VCOIN).

Table 7 Jumper J18 pin configuration

Jumper J18 (Thermistor connect/disconnect)	Default state	Connection on CYW20820	Description
1 and 2	Shorted	P8	Short this jumper to connect the onboard thermistor to CYW20820.

2 Kit operation

Table 8 Jumper J17 pin configuration

Jumper J17 (VDDIO current measurement)	Default state	Connection on CYW20820	Description
1 and 2	Shorted	VDDIO1, VDDIO2	Short this jumper to supply power to the I/O domain (VDDIO) of CYW20820. Also, use this jumper to measure the current consumption of the I/O domain.

Table 9 Jumper J19 pin configuration

Jumper J19 (Peripheral enable)	Default state	Connection on CYW20820	Description
1 and 2	Shorted	NA	Allows power to onboard peripherals such as ambient light sensor

Table 10 Jumper J16 pin configurations

Jumper J16 (VPA_BT current measurement)	Default state	Connection on CYW20820	Description
2 and 3	Shorted	NC_0 (PALDO_VDDIN)	This select header applies to evaluation boards that have an internal power amplifier; VPA_BT is not connected to CYW20820 in the CYW920820M2EVB-01 evaluation board.
3 and 4	Open		This select header applies to evaluation boards that have an internal power amplifier; VPA_BT is not connected to CYW20820 in the CYW920820M2EVB-01 evaluation board.
1 and 3	Open		This select header applies to evaluation boards that have an internal power amplifier; VPA_BT is not connected to CYW20820 in the CYW920820M2EVB-01 evaluation board.

Note: VDDIO must be greater than or equal to VBATT. CYW20820 uses an on-chip low-voltage detector to shut down the chip when the 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 Kit operation

2.3 Buttons and switches

Table 11 Button functionality

Buttons	Pressed state	Connection on CYW20820	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*.

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

Table 12 SW4 slide switches configuration

SW4	Default state	Connection on CYW20820	Description
Pos1	ON	NC	Enables LED1
	ON	NC	Enables LED2
Pos2	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.

Table 13 SW8 DIP switches configuration

Slide SW8	Default state	Connection on CYW20820	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_SWDCCLK 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 Kit operation

2.4 Arduino-compatible headers

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

Table 14 Header J3 pin configuration

Header J3	Arduino pin	Connection on CYW20820	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 15 Header J4 pin configuration

Header J4	Arduino pin	Connection on CYW20820	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
7	D1	P32	WICED_P32	PUART RX
8	D0	P37	WICED_P37	PUART TX

2 Kit operation

Table 16 Header J1 pin configuration

Header J1	Arduino pin	Connection on CYW20820	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 17 Header J2 pin configuration

Header J2	Arduino pin	Connection on CYW20820	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 Arduino pins such as PUART jumpers and thermistor jumper.

2 Kit operation

2.5 Other headers

J11 and J12 are test headers which bring out certain pins of CYW20820 for testing.

Table 18 Header J11 pin description

Header J11	Connection to header pin	Connection on CYW20820	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
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 19 Header J12 pin description

Header J12	Connection to header pin	Connection on CYW20820	WICED Enum Name	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	–	

2 Kit operation

J13 is a 10-pin debugger header to debug CYW920820M2EVB-01 using SWD.

Table 20 Header J13 pin description

Header J13	Connection to header pin	Connection on CYW20820	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	-	CYW20820 device reset

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

2.6 USB serial interface chip

An 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 CYW20820-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](#), 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 5](#), [Table 6](#), [0](#), and [Table 10](#) to understand the jumper settings for power selection.

2 Kit operation

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 21 Ground test points available in CYW920820M2EVB-01

Label	Description
TP7, TP8	Test points for ground

2.9 Current measurement

The CYW20820 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 CYW20820. Debugging is possible on CYW920820M2EVB-01 through SWD signals. SWD is a two-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 CYW20820. In CYW920820M2EVB-01, P3 will act as SWDIO and P2 will act as SWDCK. See [Table 20](#) 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™ from **Help > ModusToolbox™ General Documentation > ModusToolbox™ Documentation Index > Bluetooth® Documentation > Hardware Debugging for WICED Devices**.

2.11 Pin configuration

GPIOs on the CYW20820 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

For schematics for the baseboard and carrier module, see the [CYW920820M2EVB-01 kit](#) page.

3.1 Carrier module

The baseboard of the CYW920820M2EVB-01 board is designed to be modular so that various carrier modules can be used with the same baseboard. In this kit, the CYW920820M2IPA1 carrier M.2 radio card module, which employs the CYW20820 device, is connected to the baseboard through the M.2 Interface. The carrier module interface is a generic interface that can be used across many devices. See [CYW20820 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 CYW20820

The CYW920820M2EVB-01 board employs the CYW20820A1KFBG 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 CYW920820M2EVB-01 board is placed on a table. [Table 22](#) lists the S11 measurement. See [AN91445 – Antenna design and RF layout guidelines](#) for additional information.

Table 22 Antenna S11 measurement

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

3.1.3 Crystal

The CYW20820 carrier module has two onboard crystals. 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 CYW20820 [datasheet](#) for crystal requirements.

3.2 Baseboard

CYW9BTM2BASE1 is a baseboard to which the CYW20820 carrier module is connected.

3.3 Serial communication between CYW20820 and PSoC™ 5 KitProg3

The onboard CY8C5868LTI-LP039 PSoC™ 5 LP device is responsible for 2-channel USB-Serial conversion on this baseboard. The USB-serial pins of the PSoC™ 5 LP device are hard-wired to the HCI UART and PUART pins of the CYW20820 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 CYW920820M2EVB-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 CYW920820M2EVB-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 onboard USB connector
- 3 V from a coin-cell battery

Figure 10 shows the power architecture of the CYW920820M2EVB-01 evaluation board.

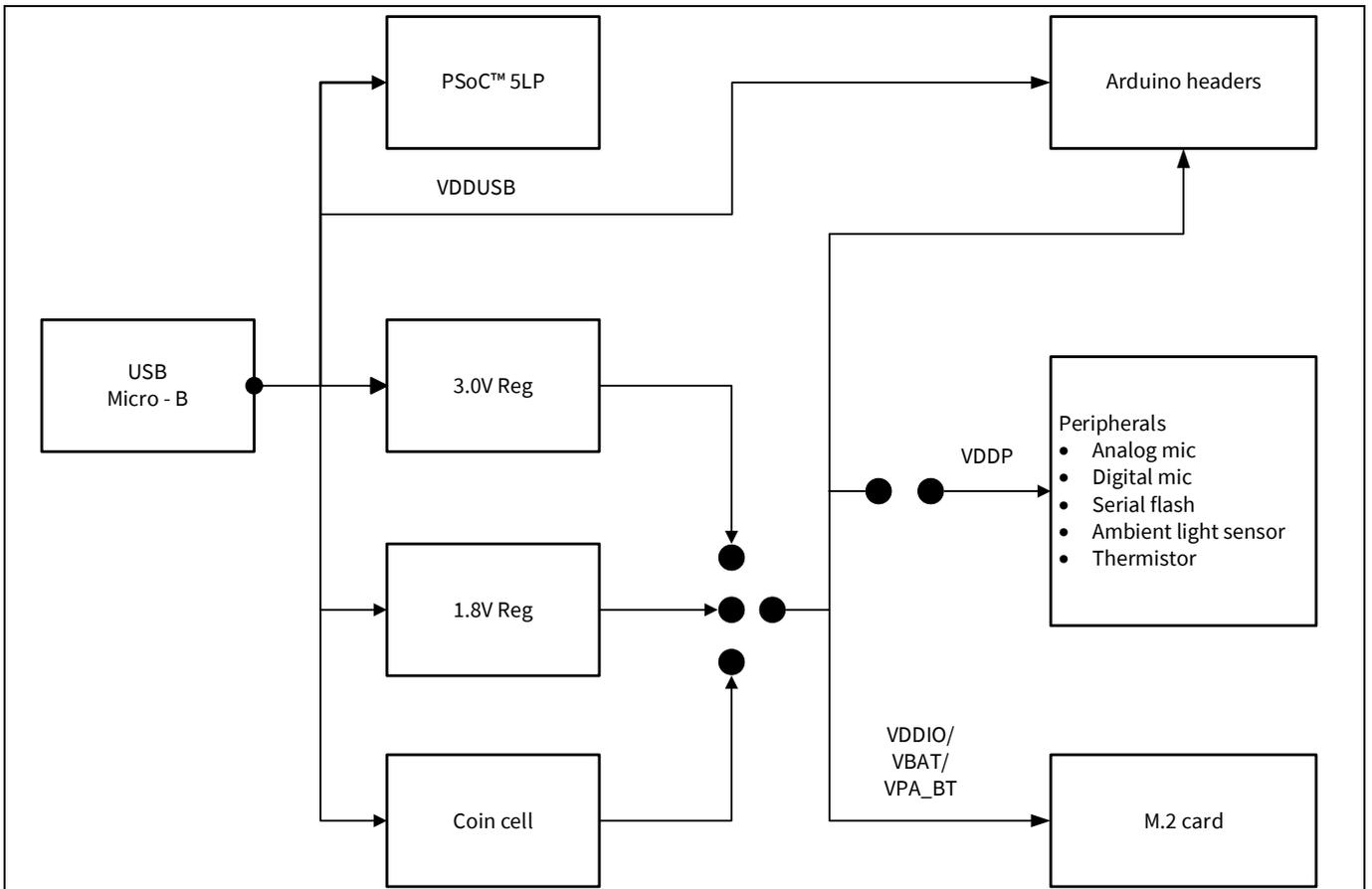


Figure 10 Power architecture

Power supply options can be selected via jumper settings on J7, J8, and J16. See [Table 5](#), [Table 6](#), and [Table 10](#) 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 have an internal power amplifier connected to the Bluetooth chip and does not apply to CYW920820M2EVB-01 evaluation kit.

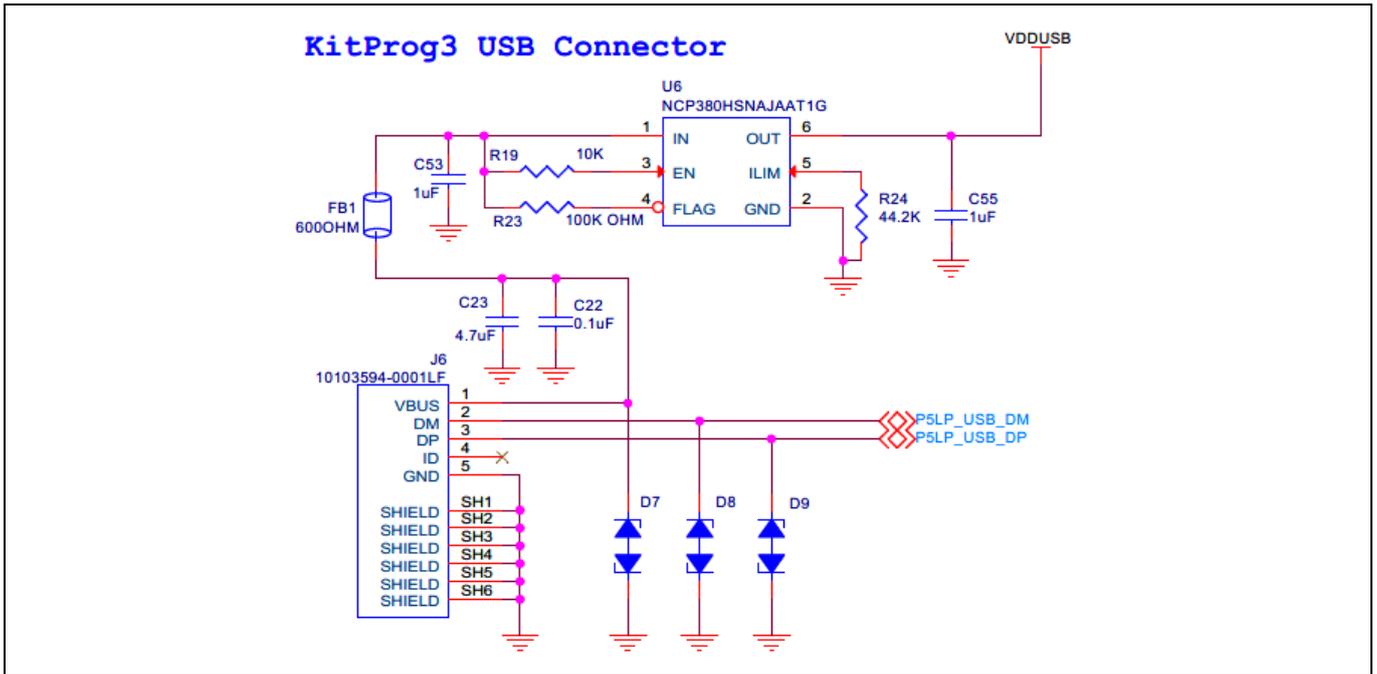


Figure 11 5-V power supply from USB

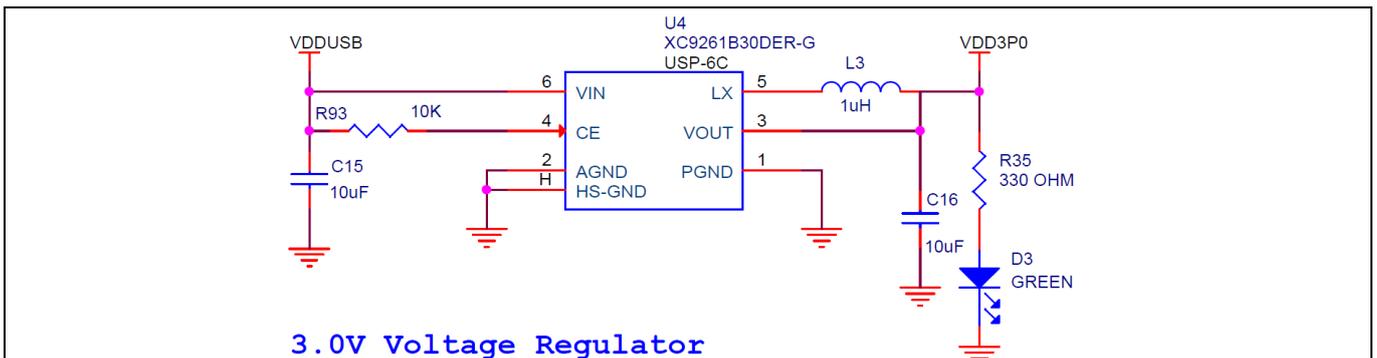


Figure 12 3.0-V regulator circuit

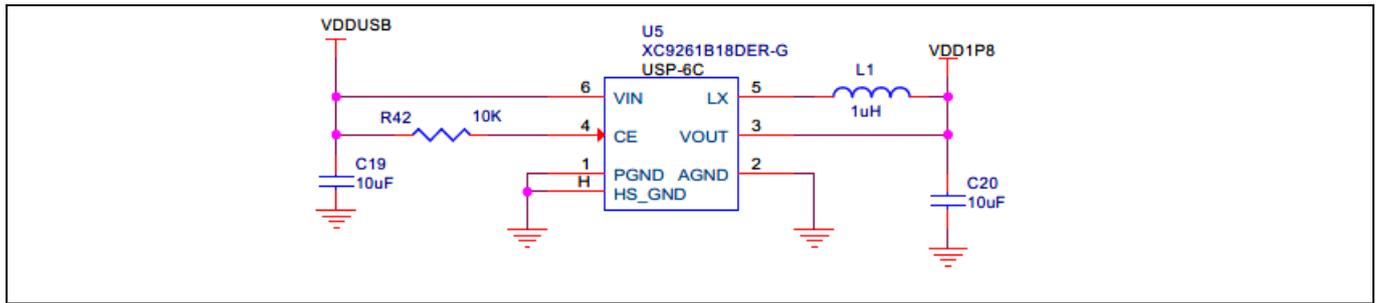


Figure 13 1.8-V regulator circuit

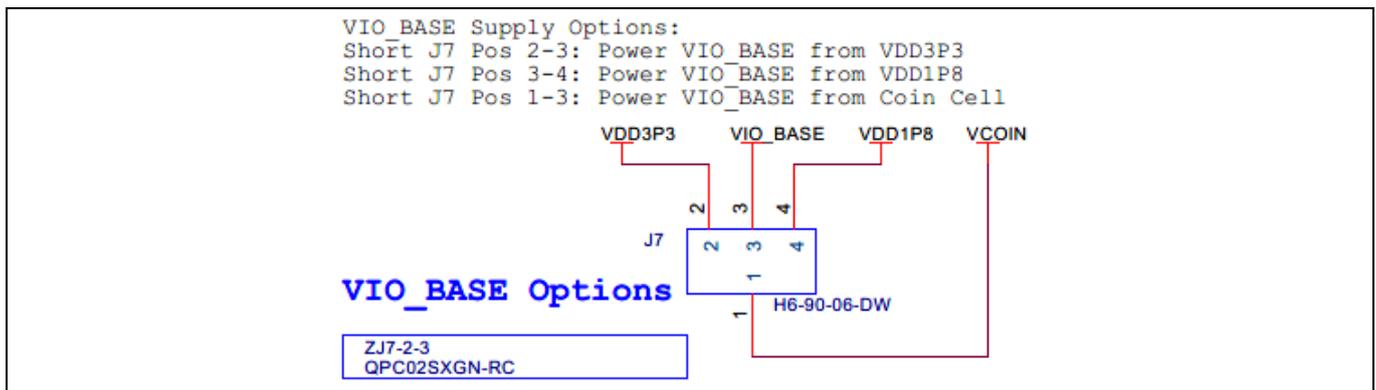


Figure 14 Jumper J7 for VDDIO selection

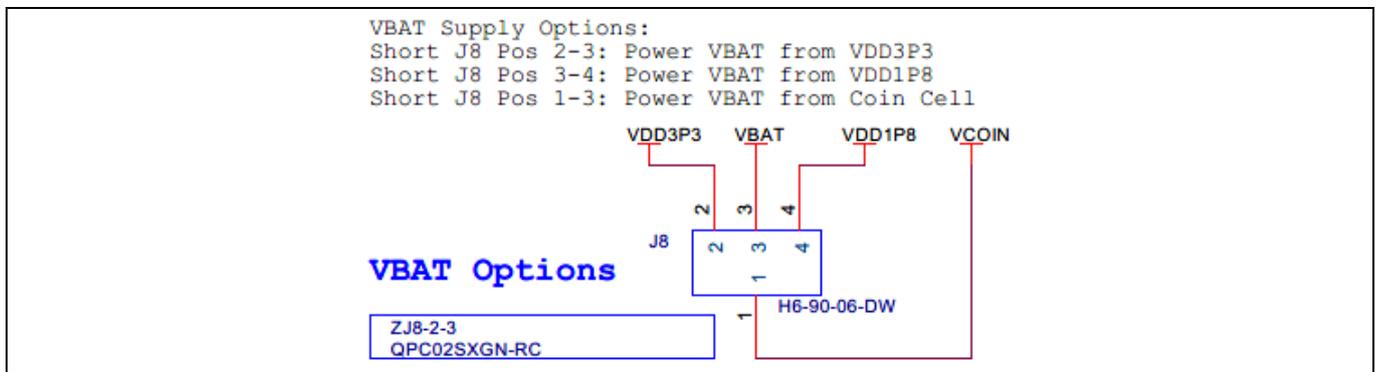


Figure 15 Jumper J8 for VBAT selection

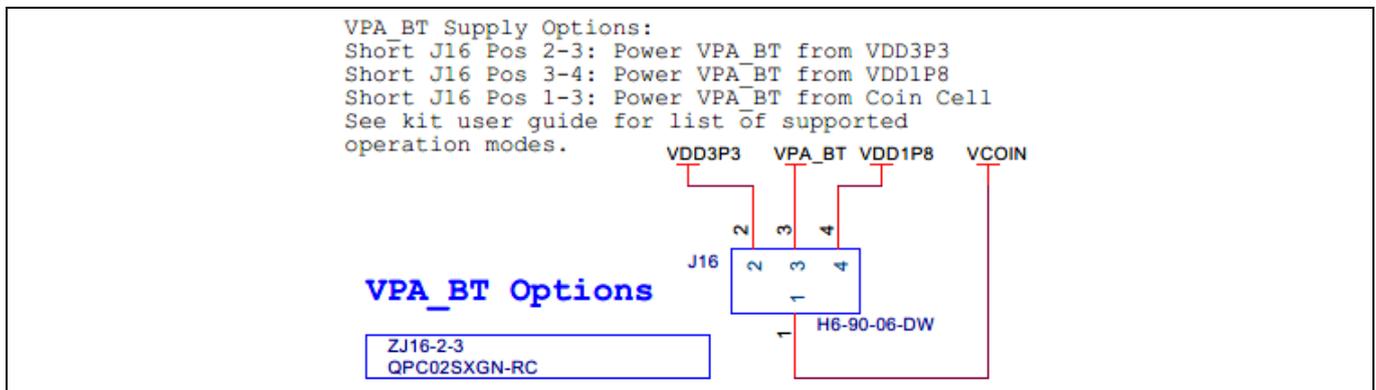


Figure 16 Jumper J16 for VPA_BT selection (NC)

3.5 Device reset

The reset circuit on the board consists of a reset button (SW2) connected to ground and a voltage detector. The RST_N pin on CYW20820 should be released after 50 ms or more after the VDDIO supply voltage has stabilized. The voltage detector is used to provide this delay.

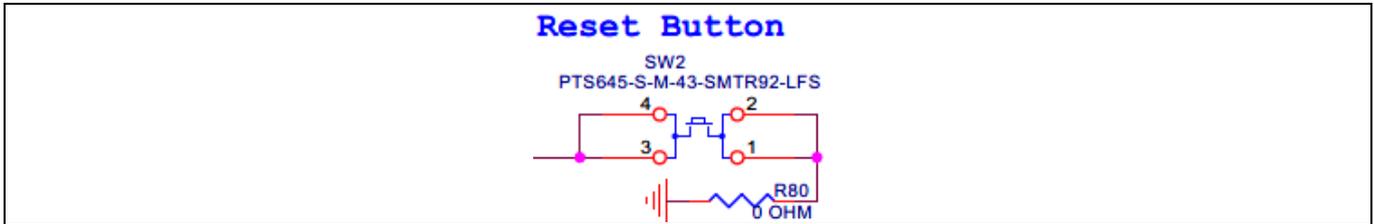


Figure 17 Reset button circuit

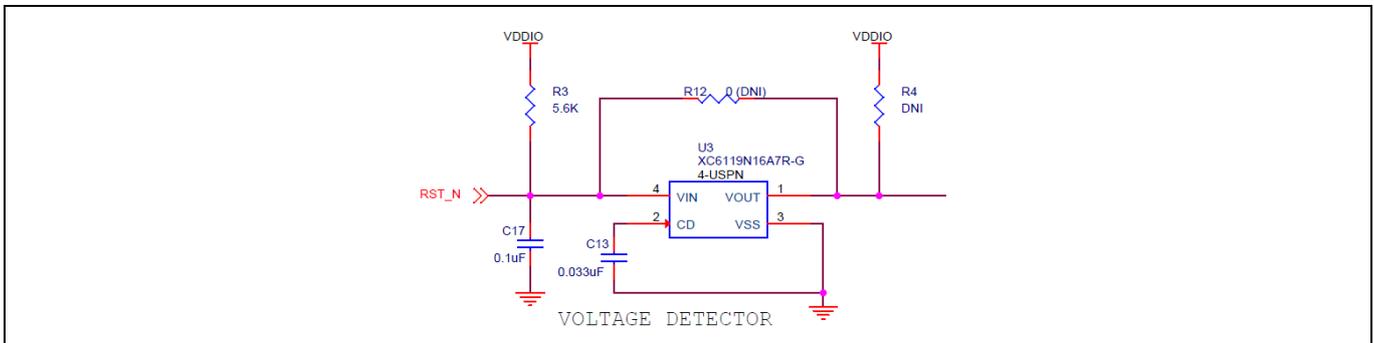


Figure 18 Voltage detector circuit in the carrier module

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.

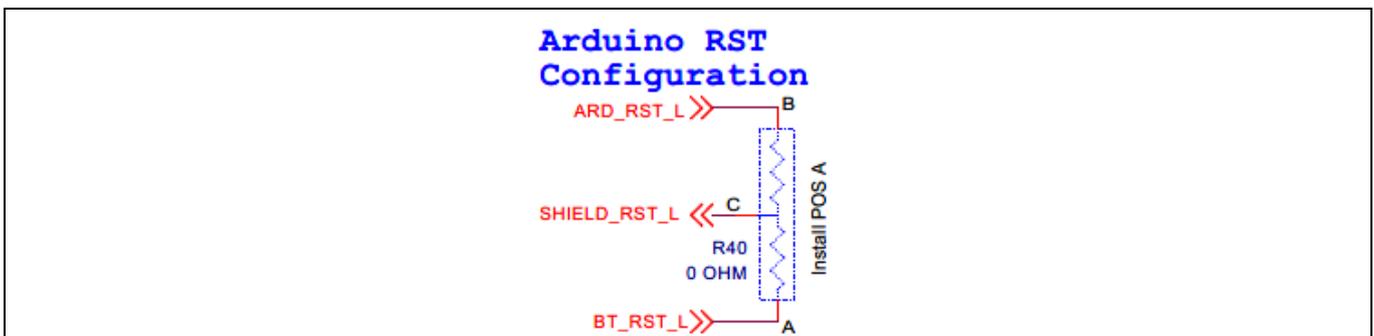


Figure 19 Reset to Arduino-compatible header

3 Hardware

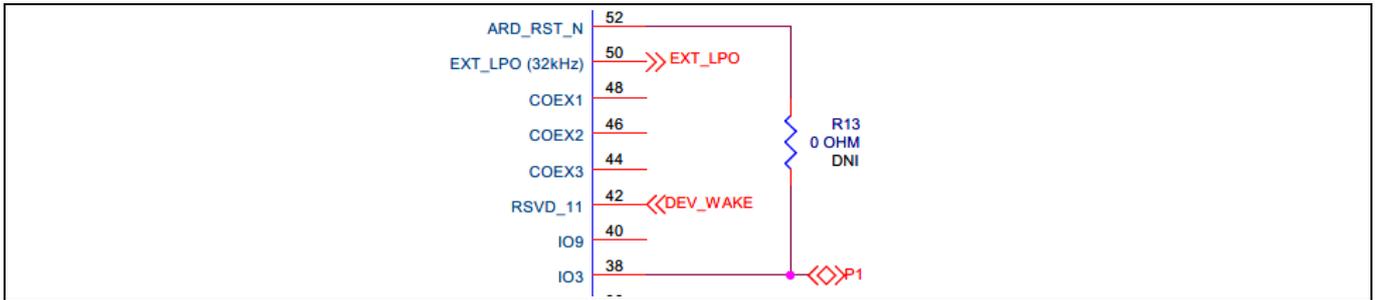


Figure 20 P1 to ARD_RST_N R13 resistor

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.

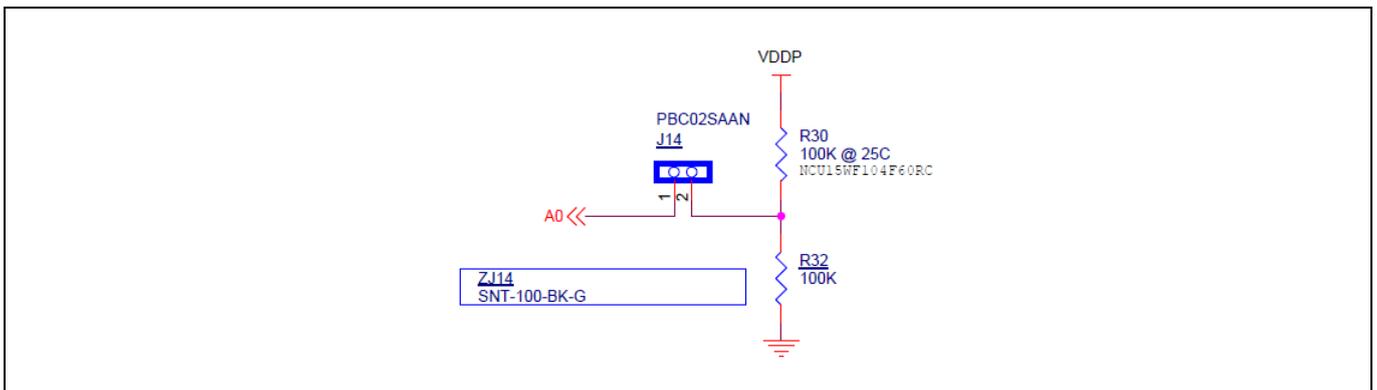


Figure 21 Thermistor circuit

3.7 External serial flash

CYW920820M2EVB-01 has a GigaDevice GD25WQ64ENIG as the 64-Mbit serial flash on the baseboard, which can be useful when the user application requires more memory. BSDK 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.

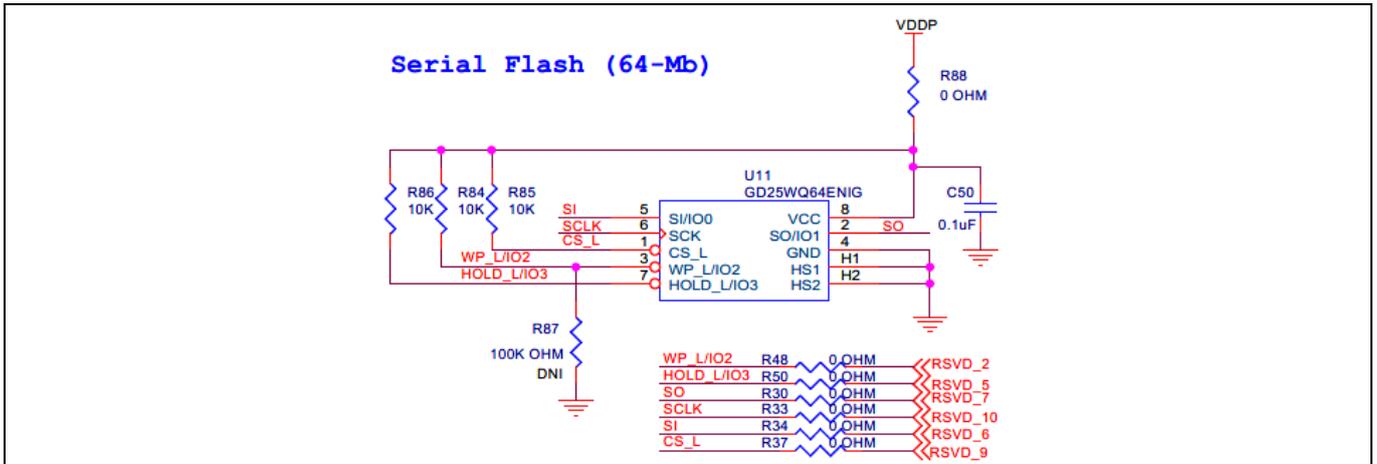


Figure 22 External serial flash

3.8 Ambient light sensor

CYW920820M2EVB-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/cm² up to 10 mW/cm². The CYW20820 device communicates with this sensor over I²C. The I²C address is 0x4D for HIGH; 0x4C for LOW. See the OPT3002DNPT datasheet for more details.

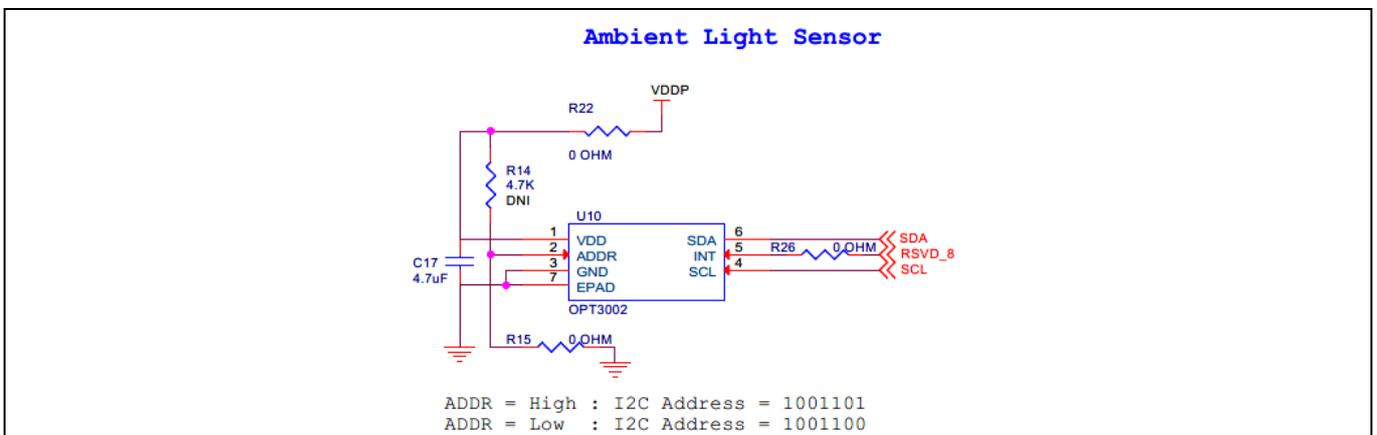


Figure 23 Ambient light sensor circuit

3.9 LEDs

There are two on-board user LEDs on the kit: LED1 controlled by P29 and LED2 controlled by P28. You can enable or disable the LEDs using the slide switch SW4. See [Table 12](#) 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: By default, LEDs are initialized on bootup. See the following file for the LED enumeration in the SDK. This file will also be accessible from the Workspace Explorer in ModusToolbox™ IDE after you create an application for this kit.

```
<install>\libraries\bt_sdk-<version>\components\BT-SDK\208XX-A1_Bluetooth\platforms\CYW920820M2EVB_01\wiced_platform.h
```

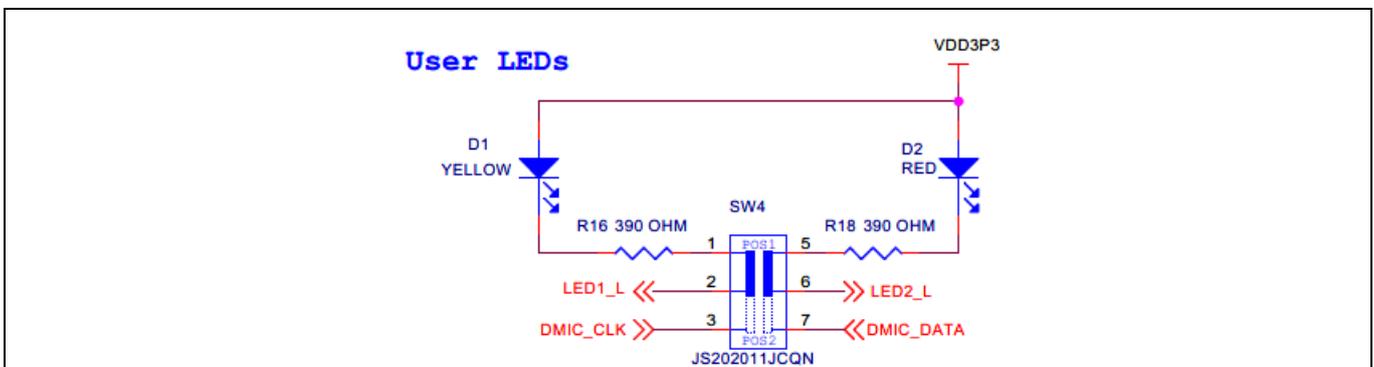


Figure 24 LED circuit

3.10 Push buttons

CYW920820M2EVB-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 CYW20820 device.

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

```
<install>\libraries\bt_sdk-<version>\components\BT-SDK\208XX-A1_Bluetooth\platforms\CYW920820M2EVB_01\wiced_platform.h
```

4 CYW20820 device I/O mapping

Table 23 maps the CYW20820 device I/Os to headers and sensors on the baseboard. It also lists the carrier module interface definition.

Note: **: MIC1 is not populated in CYW920820M2EVB-01.

Table 23 Carrier module interface and pin connections

Carrier module pin	Carrier module pin name	CYW20820 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
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		

CYW20820

4 CYW20820 device I/O mapping

Carrier module pin	Carrier module pin name	CYW20820 pin	Baseboard connection 1	Baseboard connection 2	Baseboard connection 3	WICED Enum name
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
74	VBAT	VBAT	VBAT	J8.3	U12.8	
75	GND	GND	Ground			

Revision history

Revision history

Document revision	Date	Description of changes
**	2022-10-12	Initial release
*A	2024-07-23	Updated the document as per Infineon template.

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Warnings

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

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