CYW920819EVB-02 Evaluation Kit User Guide

Contents

Safety Information

The CYW920819EVB-02 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.

	CYW920819EVB-02 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 CYW920819EVB-02 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. Cypress 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

CYW920819EVB-02 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 CYW920819EVB-02 such as changing wires, jumper settings, or measuring voltages can cause stress on the CYW920819EVB-02 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 CYW920819EVB-02 Evaluation Kit. CYW920819EVB-02 enables customers to evaluate and develop single-chip Bluetooth and Bluetooth Low Energy (BLE) applications using the CYW20819, dual-mode Bluetooth 5.0 (BLE and BR/EDR) wireless MCU.

CYW920819EVB-02 can be used with ModusToolbox™ software to develop and debug your CYW20819 project. The 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 and USB-UART chip. The EVB supports 1.8 V and 3.3 V operation.

Note: This document applies to ModusToolbox software 1.1 (or later).

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

1.1 CYW920819EVB-02 Kit Contents

The Evaluation Board (EVB) includes the following:

- CYW920819EVB-02 evaluation board
- USB 2.0 Type-A to micro-B cable
- Quick Start Guide

Figure 1-1. CYW920819EVB-02 Kit Contents

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

1.2   CYW920819EVB-02 Evaluation Board Details

Figure 1-2 shows CYW920819EVB-02 evaluation board with the following features:

1.   CYW20819 carrier module with on-board antenna*

2.   Expansion headers compatible with Arduino shields

3.   Support for 1.8 V, 3.3 V and coin cell operation of the CYW20819 device

4.   Recovery button (Red), Reset button (Blue) and User button (Black)

5.   On-board micro-USB connector (J6) for programming and debug purposes

* **Note:** The carrier module overhanging from the baseboard is subject to damage if handled incorrectly.

The micro-USB 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 default configuration as shown in Table 2-1 to Table 2-6, so that Peripheral UART is selected and can display embedded application trace messages. Figure 1-2 shows the default jumper locations.

2.   Connect USB connector (J6) of the WICED 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 an USB device, see the *readme.txt* file in in ModusToolbox installation directory depending on the OS platform.

   For Windows and macOS: *<install>\tools\wiced-tools-1.0\drivers\readme.txt*.

   For Linux: *<install>\tools\wiced-tools-1.0\install_driver\readme.txt*.

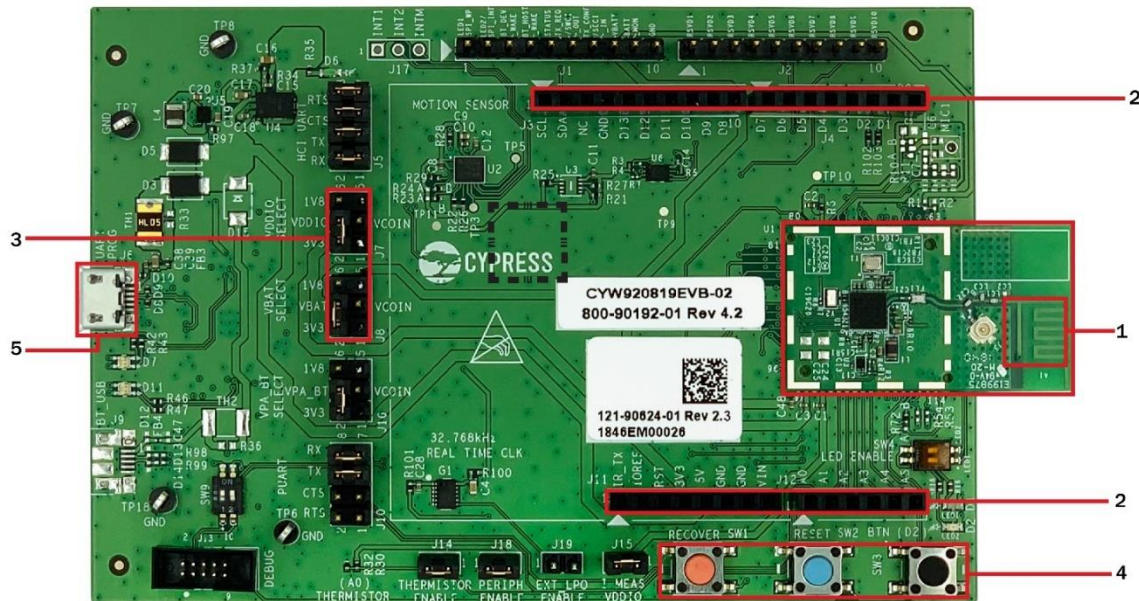*Figure 1-2. CYW920819EVB-02 Evaluation Board*

LEDs shows the CYW920819EVB-02 with the following features:

The LEDs labelled on the board serve the following purposes:

- D6 (Green) indicates that VDD3P3 (3.3 V) power is ON

- D7 (Red and Green) indicates HCI UART activity

- D11 (Red and Green) indicates peripheral UART activity

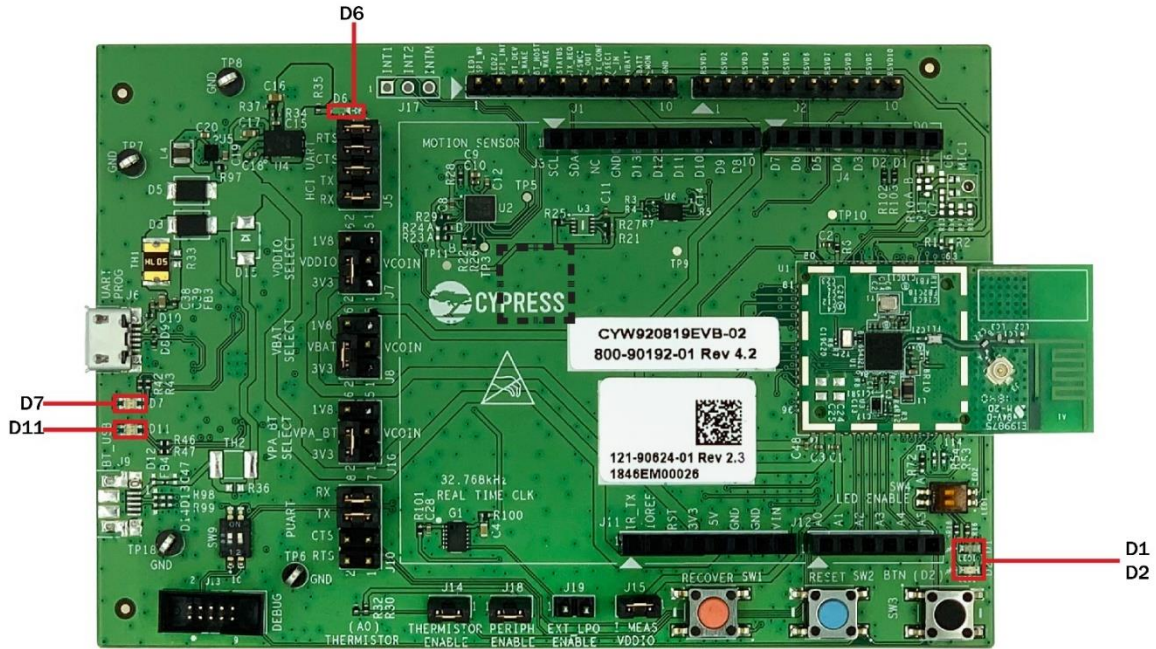- D1 (Yellow) and D2 (Red) are generic user LEDs controlled by GPIOs

Figure 1-3. CYW920819EVB-02 Evaluation Board LEDs

1.3 ModusToolbox

ModusToolbox is a free software development ecosystem that includes the ModusToolbox IDE, BT_20819A1 SDK, and the PSoC 6 SDK to develop applications for Cypress IoT products. ModusToolbox 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 IDE, you can enable and configure device resources, middleware libraries; write C source code; and program and debug the device. The IDE does provide hooks for launching various tools provided by the SDK, called BT_20819A1 SDK.

The BT_20819A1 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 IDE 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 IDE Application** or browse the collection of code examples on Cypress' GitHub repository. See Figure 1-4 and Figure 1-5 for details.
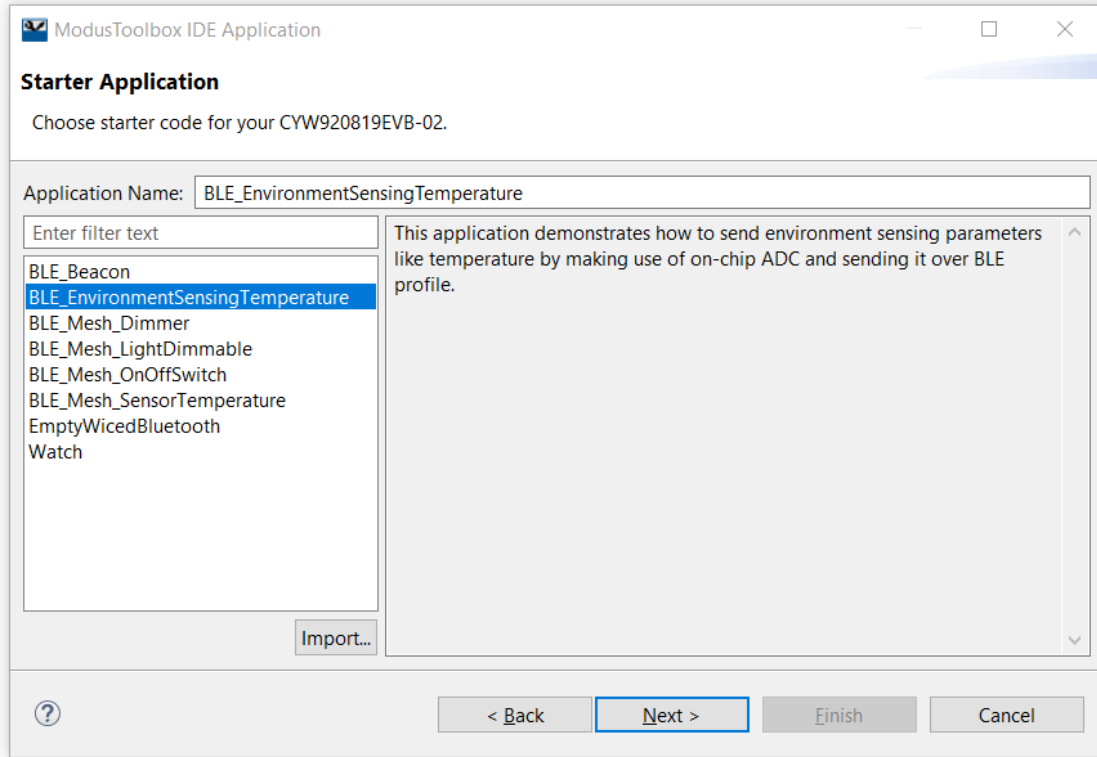
Figure 1-4. Code Examples in ModusToolbox IDE
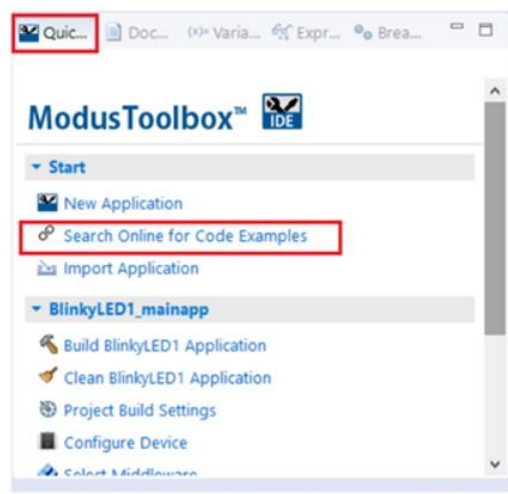
Figure 1-5. Searching for Online Code Examples in ModusToolbox IDE

1.3.2 Related Code Examples

You can also access the kit code examples from the GitHub repository. The CYW920819EVB-02 evaluation board is pre-programmed with the Environment Sensing Profile (CE226300 – BLE Environment Sensing Temperature with CYW20819) code example out-of-the-box.

This code example is available in ModusToolbox as shown in Figure 1-4. For the most recent version of the code example, check the GitHub repository. You can find the CE226300 code example in *CYW920819EVB-02/apps/demo/env_sensing_temp*.

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 recent version of the GitHub code examples into ModusToolbox, see the ModusToolbox User Guide document (**Help** > **ModusToolbox IDE Documentation** > **User Guide**).

1.3.3 ModusToolbox Help

Launch ModusToolbox and navigate to the following items:

- **Quick Start Guide:** Choose **Help** > **ModusToolbox IDE 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.

- **ModusToolbox IDE User Guide:** Choose **Help** > **ModusToolbox IDE Documentation** > **User Guide**. This is a comprehensive guide for creating, building, and programming ModusToolbox applications.

- **WICED API Reference:** Choose **Help** > **ModusToolbox API Reference** > **WICED API Reference**. This page provides WICED Bluetooth API Reference Guide.

1.4 Getting Started

This user guide will help you find details of the CYW920819EVB-02 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 CYW920819EVB-02 hardware blocks.

1.4 IoT Resources and Technical Support

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

1.5 Additional Learning Resources

Visit the CYW920819EVB-02 webpage for additional learning resources including datasheets and application notes.

1.6 Document Conventions

Convention	Usage
Courier New	Displays source code examples.
Consolas	API and function names (when mentioned within body text) The WICED_BT_TRACE() macro can be used to generate printf-style messages from the application code.
Italics	Displays file names, file locations, and reference documentation: C:\ ...cd\icc\
File > Open	Represents menu paths: **File** > **Open** > **New Project**
Bold	Displays commands, menu paths, and icon names in procedures: Click the **File** icon and then click **Open**.
Times New Roman	Displays an equation: $2 + 2 = 4$
Text in gray boxes	Describes Cautions or unique functionality of the product.

Table 1-1. Document Conventions

1.7 Acronyms

Acronym	Definition
ADC	Analog to Digital Converter
API	Application Programming Interface
BR	Basic Rate
BT / BLE	Bluetooth / Bluetooth Low Energy
EEPROM	Electrically Erasable Programmable Read-Only Memory
EM	Electro-magnetic
ESS	Environment Sensing Service
EVB	Evaluation Board
GAP	Generic Access Profile
GATT	Generic Attribute Profile
GPIO	General Purpose Input Output
HAL	Hardware Abstraction Layer
HCI	Host Controller Interface
I2C	Inter-Integrated Circuit
IDE	Integrated Development Environment
JRE	Java Runtime 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
PWM	Pulse Width Modulation
RF	Radio Frequency
SDK	Software Development Kit
SIG	Special Interest Group
SoC	System-On-Chip

Acronym	Definition
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

Table 1-2. List of Acronyms used in this Document

2 Kit Operation

This section provides detailed instructions to set up the Cypress CYW920819EVB-02 evaluation board to use with Cypress ModusToolbox for Bluetooth Classic (aka BR - Basic Rate and EDR – Enhanced Data Rate) and Low Energy (LE) applications.

This chapter introduces you to the CYW920819EVB-02 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

The CYW920819EVB-02 is built around the CYW20819-A1 device. Figure 2-1 shows the block diagram of the CYW20819-A1 device. See the device datasheet for details on device features.
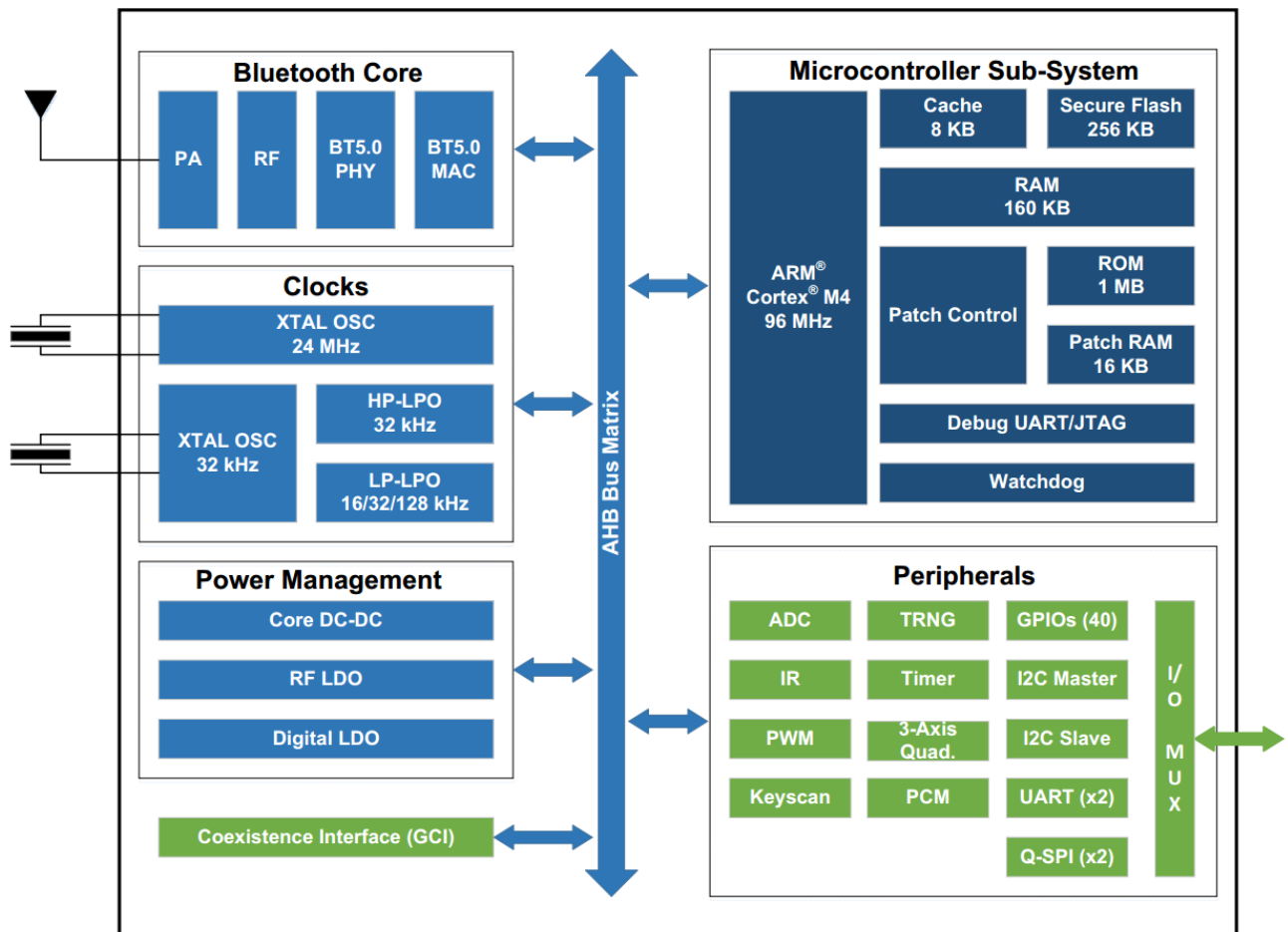

Figure 2-1. Block Diagram of CYW20819-A1

Figure 2-2 illustrates the block diagram of CYW920819EVB-02. This board contains a CYW20819-A1 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 EVB's capabilities. It also features one user switch, one reset switch, one recovery switch, two user LEDs, a thermistor, and a motion sensor.
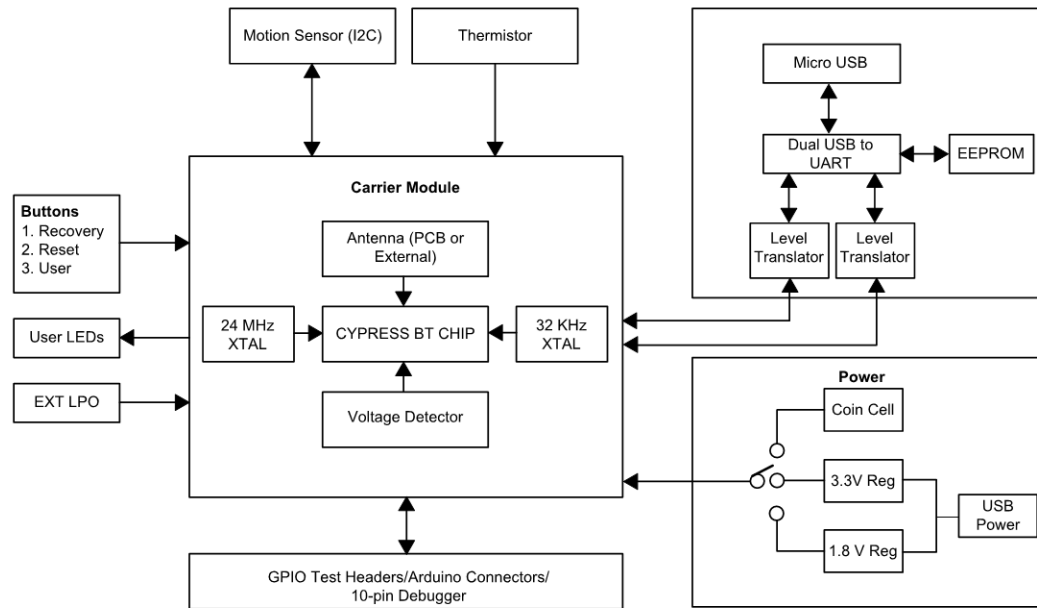

Figure 2-2. Block Diagram of CYW920819EVB-02

Figure 2-3 and Figure 2-4 show the markup of the CYW920819EVB-02 evaluation board. See the list below for a description of the numbered items.
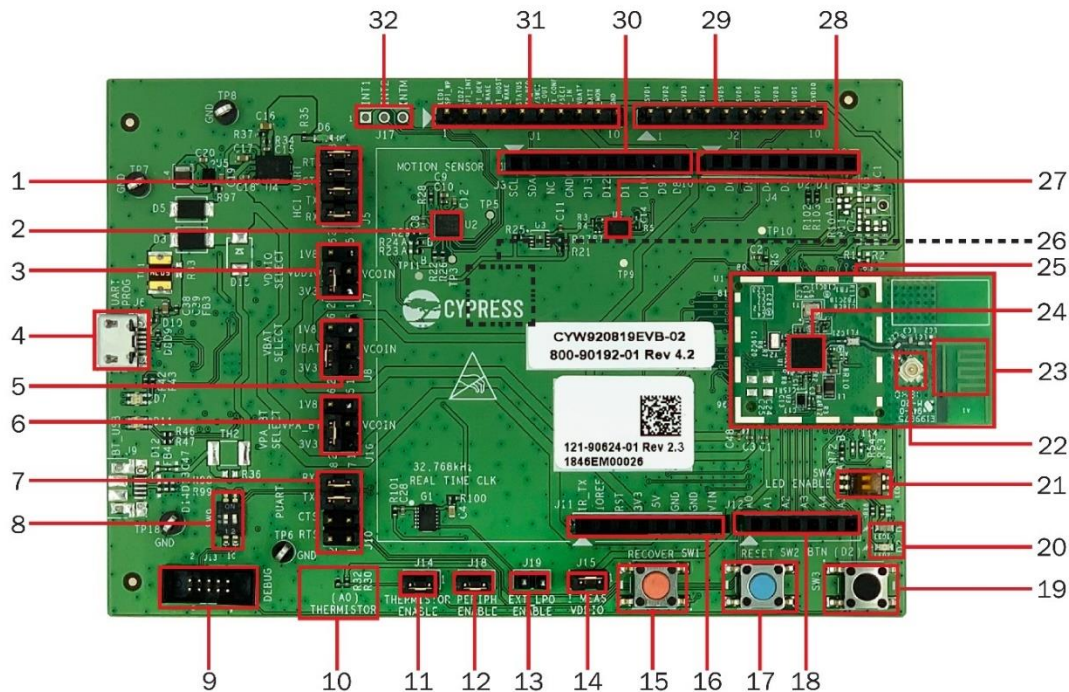

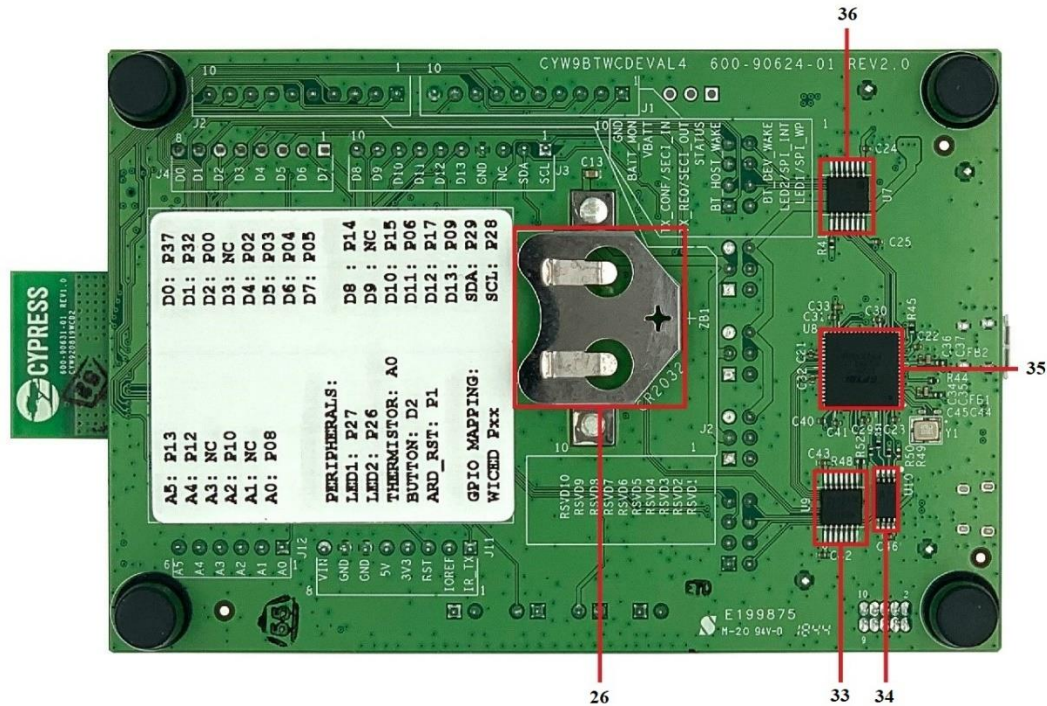*Figure 2-3. CYW920819EVB-02 Evaluation Board (Top View)*

Figure 2-4. CYW920819EVB-02 Evaluation Board (Bottom View)

1. **HCI UART Header (J5):** This header can be used to connect or disconnect HCI UART from the USB-Serial device.

2. **Motion Sensor (U2):** This is an I²C-based 9-axis inertial motion sensor.

3. **VDDIO Select Jumper (J7):** This header is used to select the VDDIO power source. Possible selections are 3.3 V, 1.8 V, or VCOIN, which is the coin cell power supply on the bottom side of the board.

4. **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.

5. **VBATT Select Header (J8):** This header is used to select the VBATT (Core power supply) power source. The possible selections are 3.3 V, 1.8 V, or VCOIN which is the coin cell power supply on the bottom side of the board.

6. **VPA_BT Select Header (J16):** This header is used to select the VPA_BT (Power Amplifier supply) power source. This select header applies to evaluation boards that has an external power amplifier and it is not connected to CYW20819 in CYW920819EVB-02 evaluation board.

7. **PUART Header (J10):** This header can be used to connect or disconnect the PUART pins from the USB-Serial device.

8. **SWD/GPIO Switch (SW9):** This DIP switch allows you to route the functionality of GPIO/SWD lines to either J4 Arduino-compatible header or the J13 debug header.

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

10. **Thermistor (R30):** The onboard thermistor is an NTC analog thermistor that can be used to measure temperature.

11. **Thermistor Enable Header (J14):** This jumper can be used to connect or disconnect the on-board thermistor from the CYW20819 device.

12. **Peripheral Enable (J18):** The jumper allows the user to disconnect the VDDIO supply to onboard peripheral devices like motion sensor, thermistor, analog mic and real-time clock by disabling VDDP.

13. **EXT_LPO Enable Jumper (J19):** This jumper is open by default. When the jumper is closed, the RTC (G1 in schematics) provides a 32.768-kHz clock source to the CYW20819's EXT_LPO pin. When the jumper is open, the Y2 crystal provides 32.768-kHz to XTAL_32K(I/O) pins of CYW20819. To use the EXT_LPO instead of Y2 crystal, the user needs to remove the entire Y2 circuit which includes R6, Y2, C19 and C20 and populate R7 with zero-ohm resistor.

14. **VDDIO Current Measurement Header (J15):** 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.

15. **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. The user may need to put the device in recovery mode when the application download fails.

16. **Arduino Compatible Header (J11):** The Arduino-compatible I/O header brings out pins from CYW20819 to interface with Arduino shields.

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

18. **Arduino Compatible Header (J12):** The Arduino-compatible I/O header brings out pins from CYW20819 to interface with Arduino shields.

19. **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.

20. **User LEDs (D1 and D2):** These on-board 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.

21. **LED Enable Switch (SW4):** These DIP switches are used to connect/disconnect the user-controlled LEDs from the CYW20819 device.

22. **External Antenna Connector (U1.J3):** The external antenna connector is an RF connector fed from the BT_RFIO pad of the CYW20819 followed by a band pass filter. See Hardware Design Guidelines for more details.

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

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

25. **Carrier Module (U1):** The carrier module has the CYW20819 SoC on it. A Bluetooth antenna is etched on the carrier module PCB. The UART and GPIOs are brought out from the SoC pads to interface with the baseboard.

26. **Coin Cell Holder (ZB1):** 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 and VBAT select headers must be set to VCOIN.

27. **8-Mb Serial Flash (U6):** This is the 8-Mbit SPI flash used for application purpose.

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

29. **WICED Header (J2):** 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.

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

31. **WICED Header (J1):** 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.

32. **Motion Sensor Interrupt Test points (J17):** This header has three test points for probing the interrupts from the motion sensor (U2).

33. **PUART Voltage Level Translator (U9):** 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.

34. **EEPROM (U10):** This EEPROM contains the configuration information for the USB to UART Converter for acting as a USB Slave device.

35. **USB to UART converter (U8):** This is a 2-channel USB to UART IC for communicating between CYW20819 and a PC.

BT UART (HCIUART) 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.

2.2 Jumpers

Table 2-1 to Table list the jumper settings on the CYW920819EVB-02 board.

Jumper J5 (HCI UART)	Default State	Connection on CYW20819	Description
1 and 2	Shorted	UART_RXD	Connects CYW20819's UART_RX pin to the USB-Serial chip via level translators for USB-to-UART functionality.
3 and 4	Shorted	UART_TXD	Connects CYW20819's UART_TX pin to the USB-Serial chip via level translators for USB-to-UART functionality.
5 and 6	Shorted	UART_CTS_N	Connects CYW20819's UART_CTS_N pin to the USB-Serial chip via level translators for USB-to-UART functionality.
7 and 8	Shorted	UART_RTS_N	Connects CYW20819's UART_RTS_N pin to the USB-Serial chip via level translators for USB-to-UART functionality.

Table 2-1. Jumper J5 Pin Configurations

Jumper J7 (VDDIO Selection)	Default State	Connection on CYW20819	Description
2 and 4	Shorted	VDDO1, VDDO2	Short these pins to supply 3.3 V to VDDIO of the CYW20819 device, as well as all peripherals and sensors.
4 and 6	Open		Short these pins to supply 1.8 V to VDDIO of the CYW20819 device, as well as all peripherals and sensors.
3 and 4	Open		Short these pins to supply VDDIO of the CYW20819 device, as well as all peripherals and sensors from the coin cell supply (VCOIN).

Table 2-2. Jumper J7 Pin Configurations

Jumper J8 (VBAT Selection)	Default State	Connection on CYW20819	Description
2 and 4	Shorted	SR_PVDD, PMU_AVDD	Short these pins to supply 3.3 V to VBAT of the CYW20819 device. Also, use this jumper to measure the current consumption of VBAT when using 3.3 V supply.
4 and 6	Open		Short these pins to supply 1.8 V to VBAT of the CYW20819 device. Also, use this jumper to measure the current consumption of VBAT when using 1.8 V supply.
3 and 4	Open		Short these pins to use the coin cell supply VBAT of the CYW20819 device. Also, use this jumper to measure the current consumption of VBAT when using the coin cell supply (VCOIN).

Table 2-3. Jumper J8 Pin Configurations

Jumper J10 (Peripheral UART)	Default State	Connection on CYW20819	Description
1 and 2	Open	NC**	The PUART's RTS on the USB-Serial chip is not connected to any of the CYW20819 GPIOs.
3 and 4	Open	P10	Connects CYW20819's P10 pin as UART CTS to the USB-Serial chip via level translators for the USB-to-UART functionality when shorted.
5 and 6	Shorted	P32	Connects CYW20819's P32 pin as UART TX to the USB-Serial chip via level translators for the USB-to-UART functionality.
7 and 8	Shorted	P37	Connects CYW20819's P37 pin as UART RX to the USB-Serial chip via level translators for the USB-to-UART functionality.

Table 2-4. Jumper J10 Pin Configuration

** **Note**: Because PUART RTS is not routed to the FT-2232HQ-REEL chip, any of the available LHL GPIOs can be assigned as PUART RTS using Device Configurator Utility and connected using a jumper to the PUART (J12) header to avail the flow control mechanism provided by UART.

Jumper J14 (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 2-5. Jumper J14 Pin Configuration

Jumper J15 (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 2-6. Jumper J15 Pin Configuration

Jumper J18 (Peripheral Enable)	Default State	Connection on CYW20819	Description
1 and 2	Shorted	NA	This jumper allows the user to allow power to on-board peripherals such as motion sensor.

Table 2-7. Jumper J18 Pin Configuration

Jumper J19 (EXT_LPO Enable)	Default State	Connection on CYW20819	Description
1 and 2	Open	XTALI_32K, XTALO_32K	When the jumper is open, the Y2 crystal provides 32.768-kHz to XTAL_32K(I/O) pins of CYW20819.

Table 2-8. Jumper J19 Pin Configuration

Jumper J16 (VPA_BT Current Measurement)	Default State	Connection on CYW20819 Device	Description
2 and 4	Shorted	NC_0 (PALDO_VDDIN)	This select header applies to evaluation boards that has an external power amplifier and it is not connected to CYW20819 in the CYW920819EVB-02 Evaluation Board.
4 and 6	Open		This select header applies to evaluation boards that has an external power amplifier and it is not connected to CYW20819 in the CYW920819EVB-02 Evaluation Board.
3 and 4	Open		This select header applies to evaluation boards that has an external power amplifier and it is not connected to CYW20819 in the CYW920819EVB-02 Evaluation Board.

Table 2-9. Jumper J16 Pin Configuration

NOTE: VDDIO must be greater or equal to VBAT. CYW20819 uses an on-chip low voltage detector to shut down the chip when supply voltage (VBAT) 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

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)

Table 2-10. Button Functionality

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

DIP SW4	Default State	Connection on CYW20819	Description
1	ON	P27	Enables LED1
2	ON	P26	Enables LED2

Table 2-11. SW4 DIP Switches Configuration

SW9 is a 2-pole DIP switch. Pole 1 allows P2 to be switched between the SWDCK functionality for the debugger interface and GPIO functionality for the Arduino-compatible header. Pole 2 allows P3 to be switched between the SWDIO functionality for the debugger interface and GPIO functionality for the Arduino-compatible header. When using P2 and P3 as GPIOs, keep SW9 in ON position.

DIP SW9	Default State	Connection on CYW20819	Description
1	ON	P2	Connects P2 to the Arduino-compatible header pin D4 if the switch pole 1 is in the ON state. Connects P2 to the debugger header if the switch pole is in the OFF state.
2	ON	P3	Connects P3 to the Arduino-compatible header D5 if the switch pole 2is in the OFF state. Connects P3 to the debugger header if the switch pole is in the OFF state.

Table 2-12. SW9 DIP Switches Configuration

2.4 Arduino-Compatible Headers

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

Header J3	Arduino PIN	Connection on CYW20819	WICED Enum Name	Description
1	SCL	P28	WICED_P28	I2C SCL
2	SDA	P29	WICED_P29	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 2-13. Header J3 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	NC		NC.
6	D2	P0	WICED_P00	User button.
7	D1	P32	WICED_P32	PUART TX.
8	D0	P37	WICED_P37	PUART RX.

Table 2-14. Header J4 Pin Configuration

Header J11	Arduino PIN	Connection on CYW20819	Description
1	IR_TX	NC	NC
2	IOREF	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 3.3 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	3V3	VDD3P3	3.3-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	VIN	NC	NC.

Table 2-15. Header J11 Pin Configuration

Header J12	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

Table 2-16. Header J12 Pin Configuration

When accessing the Arduino pins, remove the jumpers that may interfere with the Arduino pins e.g. PUART jumpers, thermistor jumper.

2.5 Other Headers

J1 and J2 are test headers which bring out certain pins of CYW20819 for testing.

Header J1	Connection to Header Pin	Connection on CYW20819	WICED Enum Name	Description
1	LED1/SF_WP	P27	WICED_P27	LED1 connection.
2	LED2/SPI_INT	P26	WICED_P26	LED2 or SPI interrupt connection.
3	BT_DEV_WAKE	DEV_WAKE		Signal to wake up the device.
4	BT_HOST_WAKE	HOST_WAKE		Signal to wake up the host
5	STATUS	NC		No Connect.
6	TX_REQ/SECI_OUT	NC		No Connect.
7	TX_CONF/SECI_IN	NC		No Connect.
8	VBATT	NC		No Connect.
9	BATT_MON	NC		No Connect.
10	GND	GND		Ground.

Table 2-17. Header J1 Pin Description

Header J2	Connection to Header Pin	Connection on CYW20819	Description
1	RSVD1	NC	No Connect.
2	RSVD2	NC	No Connect.
3	RSVD3	NC	No Connect.
4	RSVD4	NC	No Connect.
5	RSVD5	NC	No Connect.
6	RSVD6	NC	No Connect.
7	RSVD7	NC	No Connect.
8	RSVD8	NC	No Connect.
9	RSVD9	P11 (WICED_P11)	SPI (Slave Select) External Flash Memory.
10	RSVD10	NC	

Table 2-18. Header J2 Pin Description

J13 is a 10-pin debugger header to debug CYW920819EVB-02 using SWD.

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.
3	GND	GND		Ground.
4	D4/SWDCK	P2	WICED_P02	Serial Wire Debug Clock.
5	GND	GND		Ground.
6	NC	NC		No Connect.
7	NC	NC		No Connect.
8	NC	NC		No Connect.
9	NC	NC		No Connect.
10	BT_RST	RST_N		CYW20819 device reset.

Table 2-19. Header J13 Pin Description

2.6 USB Serial Interface Chip

An FT-2232HQ-REEL 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 2-2 the USB power is connected to two Buck regulators, one regulating the voltage to 1.8 V and the other to 3.3 V. A coin cell battery can be directly connected without the need of a regulator. See Table 2-2, Table 2-3, Table 2-6, and Table 2-9 to understand the jumper settings for power selection.

2.8 Test Points

There are four 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).

Label	Description
TP6, TP7, TP8, TP18	Test points for Ground

Table 2-20. Ground Test Points Available in CYW920819EVB-02

J17 is a 3-pin test point for testing 9-axis motion sensor (U2) interrupts.

Test-Point J17	Connection to Header Pin	Description
1	INT1_A/G	Interrupt 1 from Accelerometer/Gyroscope.
2	INT2_A/G	Interrupt 2 from Accelerometer/Gyroscope.
3	INT_M	Interrupt from Magnetometer.

Table 2-21. Test Point J17 Description

2.9 Current Measurement

The CYW20819 device has two power domains: VDDIO to power the Lean High Land (LHL) pins and VBAT to power the core. The total current consumption by the device is the sum of the current consumed by the VDDIO and the VBAT domains. To measure the current consumed by the VDDIO domain, an ammeter can be connected across jumper J15. To measure the current consumed by the VBAT domain, connect an ammeter across pin 4 and one of pins 2, 3, or 6 (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 CYW920819EVB-02 through SWD (Serial Wire Debug) signals. SWD is a two-wire interface that uses SWDIO (SWD Input Output) and SWDCK (Serial Wire Clock) for debugging the device. These two lines can be brought out to any of the LHL GPIOs on CYW20819. In CYW920819EVB-02, P2 will act as SWDIO and P3 will act as SWDCK. See Table 2-12 to enable SWD pins to the debug connector (J13).

After making the above hardware configurations, see the Debugger guide (*<install>/libraries/bt_20819A1-<version>/docs/BT-SDK/ WICED-Hardware-Debugging.pdf*) for debugging your application using ModusToolbox.

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, P28 and P29 are configured as I2C SCL and I2C SDA, respectively.

3 Hardware

This chapter describes the CYW920819EVB-02 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 at CYW920819EVB-02 Evaluation kit page.

3.1 Carrier Module

The baseboard of the CYW920819EVB-02 board is designed to be modular so that various carrier modules can be used with the same baseboard. In this kit, the CYW920819WCD2 carrier module, which employs the CYW20819 device, is soldered on the baseboard. The carrier module interface is a generic interface that can be used across may devices. See Appendix A 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 CYW920819EVB-02 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 printed on the carrier module. This antenna is matched to 50 Ω when the CYW920819EVB-02 board is placed on a table. Table 3-1 lists the S11 measurement. See AN91445 – Antenna Design and RF Layout Guidelines for additional information.

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

Table 3-1. Antenna S11 Measurement

3.1.3 Crystal

The CYW20819 carrier module has two crystals onboard. 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.

3.1.4 External Serial Flash

The CYW20819EVB has an 8-Mbit serial flash on the baseboard, which can be useful when the user application requires more memory. The GigaDevice GD25WD80CEIG is the 8-Mbit serial flash used in CYW920819EVB-02. The BT_20819A1 SDK is compatible with most of the JEDEC CFI-compliant SPI flash ICs. The SPI driver should configure the respective pins in the user application in order to use the on-board serial flash.
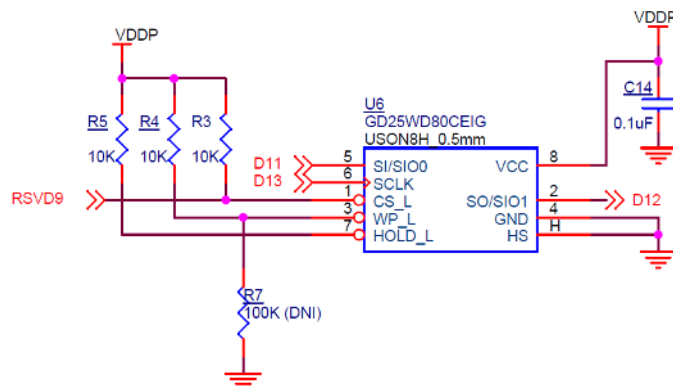
Figure 3-1. External Serial Flash

3.2 Baseboard

CYW9BTWCDEVAL4 is a baseboard on which the CYW20819 carrier module is soldered.

3.3 Serial Communication Between CYW20819 and FT2232HQ-REEL USB-Serial Device

The onboard FT2232HQ-REEL device is a two-channel USB-Serial converter. The USB-serial pins of the FT2232HQ-REEL device is hard-wired to the HCI UART and PUART pins of the CYW20819 device. An EEPROM device is connected to the FT2232HQ-REEL USB-Serial device to store its configuration. Because PUART RTS is not routed to the USB-Serial device, any of the available LHL GPIOs can be assigned as PUART RTS using Device Configurator Utility and connected using a jumper wire to the PUART header to avail the flow control mechanism provided by UART.

NOTE: For applications involving low power modes, the CYW920819EVB-02 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 CYW920819EVB-02 evaluation board to go 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 3.3 V from the onboard USB connector.
- 3 V from a coin cell battery.

Figure 3-2 shows the power architecture of the evaluation board.
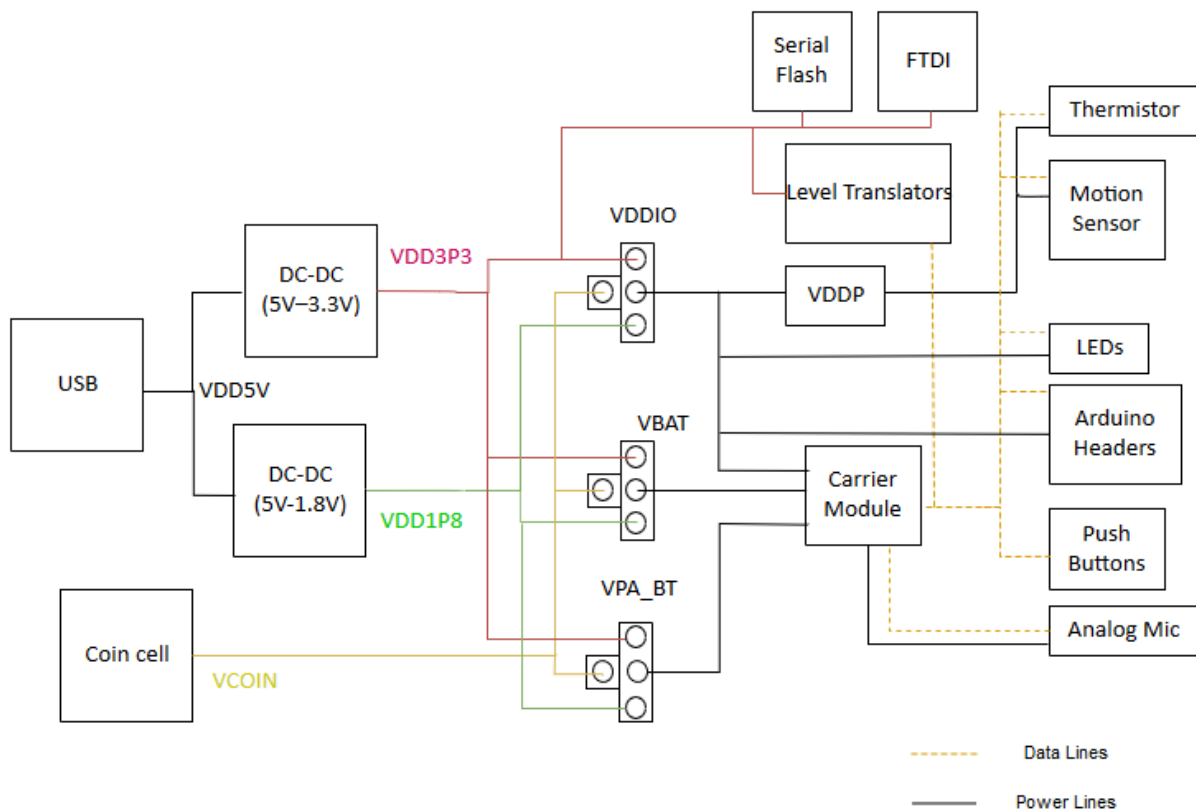
Figure 3-2. Power Architecture

Power supply options can be selected via jumper settings on J7, J8, and J16. See Table 2-2, Table 2-3, and Table 2-9 for the different jumper settings for J7, J8, and J16. Resistors R25 and R21 are the pull-up resistors for I^{2}C lines to the motion sensor i.e., SCL and SDA. Note that J18 (PERIPH ENABLE) should be shorted for any I^{2}C 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 external power amplifier and it is not connected to CYW20819 in CYW920819EVB-02 Evaluation Kit.
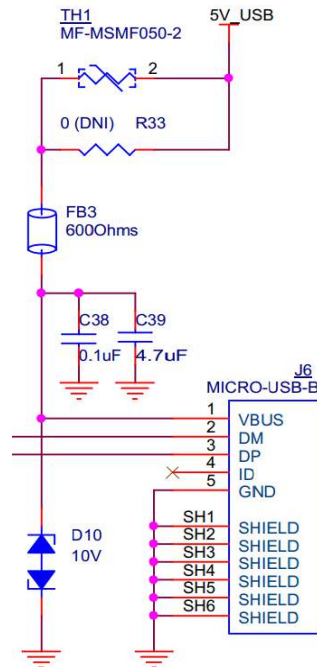
Figure 3-3. 5-V Power Supply from USB
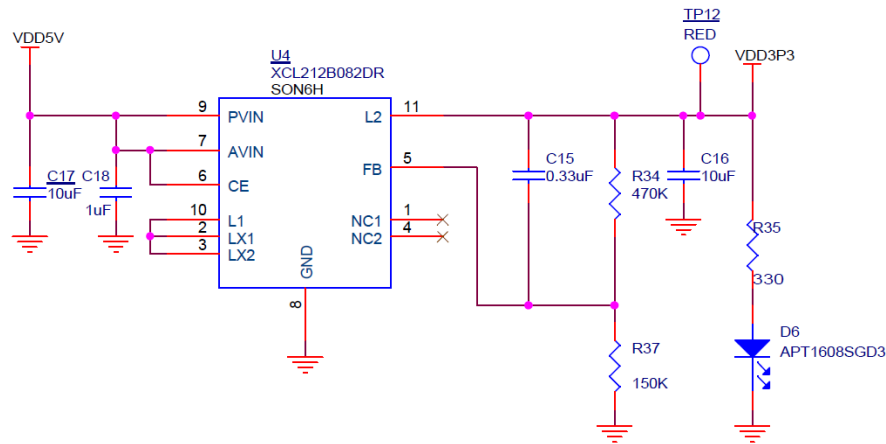
Figure 3-4. 3.3-V Regulator Circuit
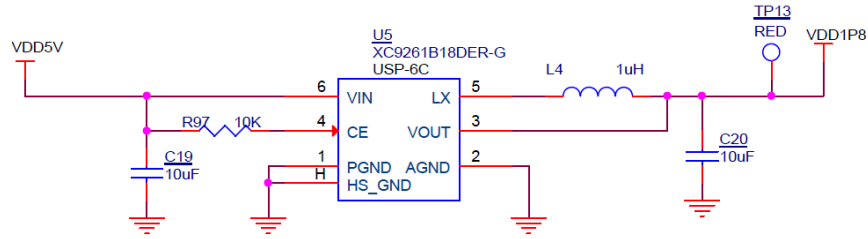
Figure 3-5. 1.8-V Regulator Circuit
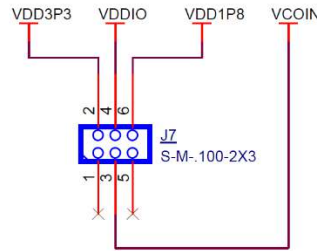
Figure 3-6. Jumper J7 for VDDIO Selection
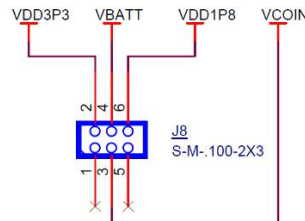
Figure 3-7. Jumper J8 for VBAT Selection
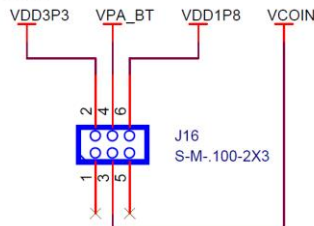
Figure 3-8. Jumper J16 for VPA_BT Selection (NC)

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.
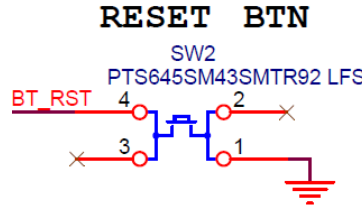
Figure 3-9. Reset Button Circuit
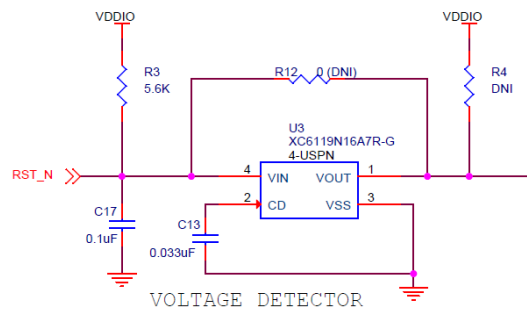
Figure 3-10. Voltage Detector Circuit in the Carrier Module

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 the default configuration of R72 shown below (position B-C), device pin P1 will be routed to the ARD_RST header 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.

When R72 is in position (B-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.
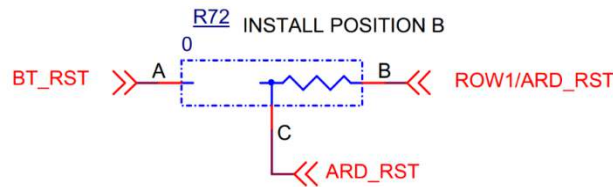
Figure 3-11. Reset to Arduino-Compatible Header

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.
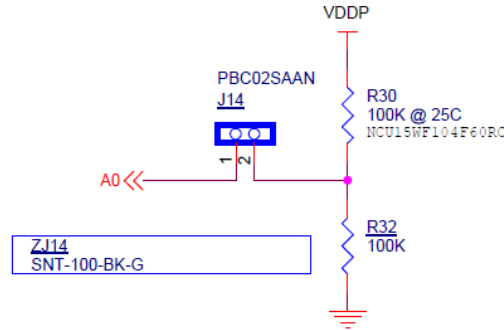
Figure 3-12. Thermistor Circuit

3.7 Motion Sensor

CYW920819EVB-02 has an onboard 9-axis motion sensor (STMicroelectronics LSM9DS1). It has three acceleration channels, three angular rate channels, and three magnetic field channels. The CYW20819 device communicates with this sensor over I²C. The I²C address to access the accelerometer and gyroscope is 0xD4 and to access the magnetometer, the address is 0x38. The sensor supports 100-kHz and 400-kHz speeds. See the LSM9DS1 datasheet to understand how to access the registers.
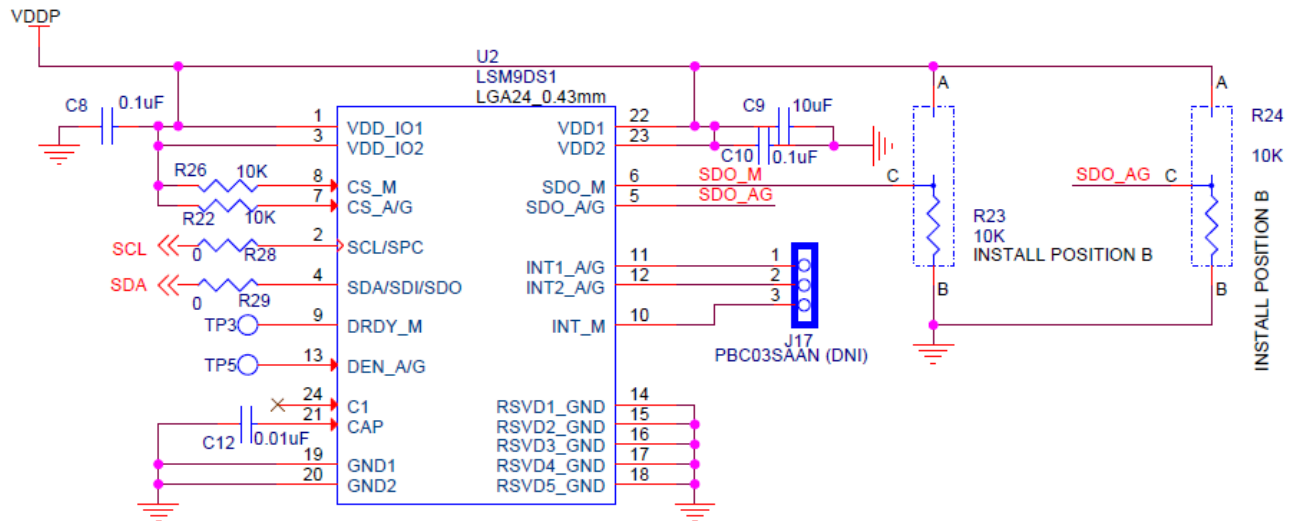
Figure 3-13. Motion Sensor Circuit

3.8 LEDs

There are two onboard user LEDs on this kit. LED1 is controlled by P27. LED2 is controlled by P26. You can enable or disable the LEDs using the DIP switch SW4. See Table 2-11 for DIP 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 bootup. See the following file for the LED enumeration in the SDK:

<install>\libraries\bt_20819A1-<version>\components\BT-SDK\20819-A1_Bluetooth\platforms\CYW920819EVB_02\wiced_platform.h
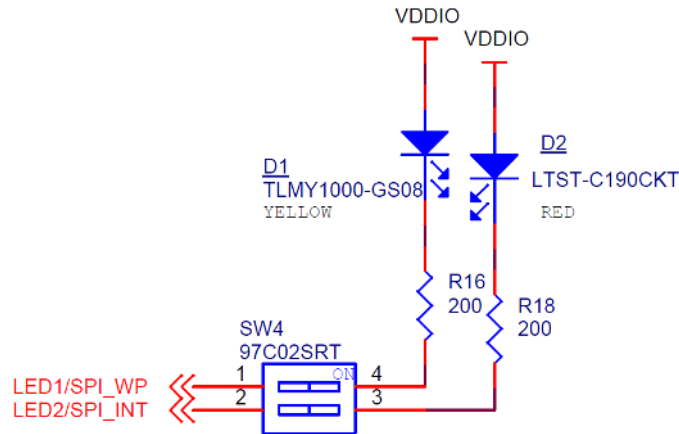
Figure 3-14. LED Circuit

3.9 Push Buttons

CYW920819EVB-02 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 the P0 pin of the CYW20819 device.

Note: The user button is initialized by default on bootup. See the *<install>\libraries\bt_20819A1-<version>\components\BT-SDK\20819-A1_Bluetooth\platforms\CYW920819EVB_02\wiced_platform.h* file for button enumeration in the SDK.

Appendix A. CYW20819 Device I/O Mapping

Table A.1 maps the CYW20819 device I/Os to headers and sensors on the baseboard. It also lists the carrier module interface definition.

** **Note:** The on-board MIC1 is not supported in CYW20819 BGA62 package.

Carrier Module Pin	Carrier Module Pin Name	CYW20819 Pin	Baseboard Connection 1	Baseboard Connection 2	Baseboard Connection 3	WICED Enum Name
HS5	GND_HS5					
63	BATT_MON	NC		J1.9		
64	RSVD10	NC		J2.10		
65	RSVD9	P11		J2.9	U6.1 (SPI Flash – Chip Select)	WICED_P11
66	RSVD8	NC		J2.8		
67	RSVD7	NC		J2.7		
68	RECOVER	NC	SW1 (RECOVERY BTN)			
69	BT_UART_RXD	UART_RXD		J5.1		
70	BT_UART_TXD	UART_TXD		J5.3		
71	BT_UART_RTS_N	UART_RTS_N		J5.7		
72	BT_UART_CTS_N	UART_CTS_N		J5.5		
73	GND_73	VSSC1, VSSC2, VSSC3	Ground			
74	MIC_BIAS	NC	Mic (Power Supply)		MIC1**	
75	MICP	NC	Mic (Output)		MIC1**	
76	MICN	NC	Mic (Output)		MIC1**	
77	MIC_AVDD	NC	VDDIO			
78	GND_78	VSSC1, VSSC2, VSSC3	Ground			
79	EXT_LPO	XTALI_32K, XTALO_32K	RTC (J19.2)			
80	GND_80	VSSC1, VSSC2, VSSC3	Ground			
HS6	GND_HS6	VSSC1, VSSC2, VSSC3	Ground			
81	COL7/SPI_CS/D10	P15		J3.8		WICED_P15
82	COL8/SPI_MISO/D12	P17		J3.6	U6.2 (SPI Flash)	WICED_P17
83	ROW2/DMIC_CLK/D4	P2	SW9.2 (DIP Switch)	J4.4 (SW9.2 ON for Arduino-compatible Headers)	J13.2 (SW9.2 OFF for Debugger)	WICED_P02
84	ROW3/DMIC_DATA/D5	P3	SW9.1 (DIP Switch)	J4.3 (SW9.1 ON for Arduino-compatible Headers)	J13.4 (SW9.1 OFF for Debugger)	WICED_P03
85	ROW4/PCM_OUT/I2S_D0/D6	P4		J4.2		WICED_P04

Carrier Module Pin	Carrier Module Pin Name	CYW20819 Pin	Baseboard Connection 1	Baseboard Connection 2	Baseboard Connection 3	WICED Enum Name
86	RSVD6	NC		J2.6		
87	GND_87	VSSC1, VSSC2, VSSC3	Ground			
88	ROW5/PCM_IN/I2S_DI/D7	P5		J4.1		WICED_P05
89	ROW6/SPI_MOSI/D11	P6		J3.7	U6.5 (SPI Flash)	WICED_P06
90	ROW7/SPI_CLK/D13	P9		J3.5	U6.6 (SPI Flash)	WICED_P09
91	RSVD5	NC		J2.5		
92	COL0/A0	P8	J14.1	J12.1	Thermistor	WICED_P08
93	COL6/MCLK/D8	P14		J3.10		WICED_P14
94	GND_94	VSSC1, VSSC2, VSSC3	Ground			
95	BT_USB_DP	NC		J9.3		
96	BT_USB_DM	NC		J9.2		
HS7	GND_HS7	Ground	Ground			
97	VPA_BT	NC_0 (PALDO_VDDIN)	VPA_BT	J16.4		
98	VBATT	PMU_AVDD, SR_PVDD	VBATT	J8.4		
99	GND_99	VSSC1, VSSC2, VSSC3	Ground			
100	VDDIO	VDDO1, VDDO2	VDDIO	J15.1, J11.2, J7.4	J18 (VDDP-Peripheral Enable)	
101	BT_REG_ON	NC	NC			
102	COL1/A1	NC		J12.2		
103	PUART_CTS_N/COL2/A2	P10		J12.3, J10.3		WICED_P10
104	PUART_RTS_N/COL3/A3	NC		J12.4, J10.1		
105	COL4/PCM_CLK/I2S_CLK/A4	P12		J12.5		WICED_P12
106	COL5/PCM_SYNC/I2S_WS/A5	P13		J12.6		WICED_P13
107	GND_107	VSSC1, VSSC2, VSSC3				
108	LED4/D9	NC		J3.9		
109	LED3/D3	NC		J4.5		
110	ROW0/BUTTON/D2	P0	SW3 (User Button)	J4.6		WICED_P00
111	ROW1/ARD_RST	P1	If Install position of R72 is in B position, it routes P1 pin	J11.3		WICED_P01
112	SCL	P28		J3.1	U2.2 (Motion Sensor)	WICED_P28
113	IR_TX	NC	NC			
114	BT_RST	RST_N	SW2 (RST Button)	J13.10		
HS8	GND_HS8	VSSC1, VSSC2, VSSC3	Ground			

Carrier Module Pin	Carrier Module Pin Name	CYW20819 Pin	Baseboard Connection 1	Baseboard Connection 2	Baseboard Connection 3	WICED Enum Name
115	SDA	P29		J3.2	U2.4 (Motion Sensor)	WICED_P29
116	LED2/SPI_INT	P26	SW4.2 (DIP Switch)	J1.2		WICED_P26
117	LED1/SF_WP	P27	SW4.1 (DIP Switch)	J1.1		WICED_P27
118	PUART_TXD/D1	P32		J4.7, J10.5		WICED_P32
119	PUART_RXD/D0	P37		J4.8, J10.7		WICED_P37
120	GND_120	VSSC1, VSSC2, VSSC3	Ground			
121	RSVD4	NC		J2.4		
122	RSVD3	NC		J2.3		
123	RSVD2	NC		J2.2		
124	RSVD1	NC		J2.1		
125	GND_125	VSSC1, VSSC2, VSSC3	Ground			
126	STATUS	NC		J1.5		
127	TX_REQ/BT_SECI_OUT	NC		J1.6		
128	TX_CONF/BT_SECI_IN	NC		J1.7		
129	BT_HOST_WAKE	HOST_WAKE		J1.4		
130	BT_DEV_WAKE	DEV_WAKE		J1.3		

Table A-1. Carrier Module Interface and Pin Connections

Related Documents

Application Notes	
AN225684 – Getting Started with CYW20819	Describes CYW20819 Bluetooth SoC and how to build your first BLE application using the device in ModusToolbox IDE
Code Examples	
Visit the Cypress GitHub repository for a comprehensive collection of code examples using ModusToolbox IDE	
Device Documentation	
CYW20819 Device Datasheet	CYW20819 Feature and Peripheral Guide
Tool Documentation	
ModusToolbox IDE	The Cypress IDE for IoT designers

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**	6493428	RANM	02/25/2019	Initial release.

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