

CYW9RPIWIFIBT-EVK Evaluation Kit user guide

About this document

Scope and purpose

Infineon's Wi-Fi - Bluetooth® Evaluation Kit with Raspberry Pi CM4 host (CYW9RPIWIFIBT-EVK) enables the evaluation, prototyping, and development of a wide array of Internet of Things (IoT) and audio applications using Infineon's AIROC™ Wi-Fi and combos portfolio, which integrates IEEE 802.11a/b/g/n/ac/ax Wi-Fi and Bluetooth® 5.4 in a single-chip solution to enable small form factor (SFF) IoT designs. This kit uses the Raspberry Pi Compute Module 4 (CM4) lite as the host, which helps users evaluate and develop Infineon's Wi-Fi combo chipsets over the Linux platform.

Intended audience

This evaluation board is designed for technical specialists who are familiar with connectivity and are interested in WiFi and Bluetooth® development on Linux platforms. It is intended to be used under laboratory conditions.

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Safety precautions

Safety precautions

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

Table 1 Safety precautions



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.

Table of contents

Table of contents

About this document 1

Important notice 2

Safety precautions 3

Table of contents 4

1 Introduction 6

1.1 Kit contents 6

1.2 Kit details 7

1.3 Getting started 8

1.4 Getting started with serial console access 9

1.5 IoT resources and technical support 10

2 Kit operation 11

2.1 Theory of operation 11

2.2 Buttons and switches 15

2.3 Jumpers 16

2.4 Connectors 17

2.5 USB serial interface chip 18

2.6 Kit power supply 18

3 Hardware 19

3.1 Raspberry Pi Compute Module 4 lite 19

3.2 2EA M.2 module 19

3.3 CYW9RPIM2BASE1 baseboard 19

3.4 Power supply system 19

3.5 USB Type-A ports and RPi device USB Type-C connector with hub controller 22

3.6 HDMI connector 23

3.7 1G Ethernet connector 23

3.8 microSD card connector 24

3.9 Fan controller and connector 25

3.10 Audio out jack 26

3.11 USB-UART bridge 26

3.12 M.2 E-Key radio card interface 28

3.13 RPi CM4 lite connectors 30

4 Kit rework 40

4.1 Rework to connect M.2 radio USB interface to USB hub 40

4.2 Rework for M.2 radio BT_HOST_WAKE and BT_DBG_TX 40

4.3 Rework for M.2 radio WL_UART and BT_DBG_RX 41

Revision history 43



Table of contents

Disclaimer 44

1 Introduction

1 Introduction

Infineon's WiFi - Bluetooth® Evaluation Kit with Raspberry Pi CM4 host (CYW9RPIWIFIBT-EVK) is an excellent tool that allows developers to evaluate, prototype, and develop various IoT and audio applications using Infineon's WiFi - Bluetooth® combo chipsets on the Linux platform. The kit is built around the Raspberry Pi Compute Module 4 lite, which helps users evaluate the performance of Infineon's combo chipsets and develop applications that leverage its capabilities.

The CYW9RPIWIFIBT-EVK Evaluation Kit supports peripheral component interconnect express (PCIe) and secure digital input output (SDIO) interfaces for Wi-Fi and HCI UART for Bluetooth® that allows the user to interface different combo chipsets to the host via the M.2 E-Key standard interface connector on the baseboard. The Raspberry Pi CM4 host sits on the baseboard. A HDMI port, 4xUSB Type-A connectors, a 1G Ethernet port, and an audio out jack are also provided on the baseboard for user accessibility.

The kit, by default, comes with a 2EA M.2 module with CYW55573 chipset (dual-band Wi-Fi 6E, 802.11 a/b/g/n/ac/ax 2x2 MIMO, and Bluetooth® 5.2). The user can replace the 2EA module with any other M.2 radio module with Infineon's combo chipset for evaluation and development.

1.1 Kit contents

This evaluation kit box includes the following components as shown in [Figure 1](#).

1. CYW9RPIWIFIBT-EVK Evaluation Board (with Raspberry-Pi CM4 host module and CYW955573 radio M.2 card)
2. Two tri-band dipole antennas
3. USB Type-C to Type-C cable
4. Quick start guide



Figure 1 CYW9RPIWIFIBT-EVK Evaluation Kit

Inspect the kit contents. If you find any part missing, contact your nearest Infineon sales office or [Infineon Support](#) for assistance.

1 Introduction

1.2 Kit details

The CYW9RPIWIFIBT-EVK Evaluation Kit consists of the following key features:

- Raspberry Pi CM4 module as the host
- M.2 E-Key radio module interface (2EA module connected by default)
- USB Type-C connector for power and debug logs
- 4x USB Type-A ports to connect peripherals
- 1GB Ethernet port
- HDMI port to connect display
- Raspberry Pi device USB Type-C port
- microSD card connector
- One audio out jack
- Two tri-band dipole antennas

Before connecting the kit to the PC, ensure that all jumpers and switches on the baseboard are in their default configuration as shown in [Figure 2](#) and specified in [Table 4](#) to [Table 8](#).

See the [Getting started](#) section for instructions on using the kit for development.

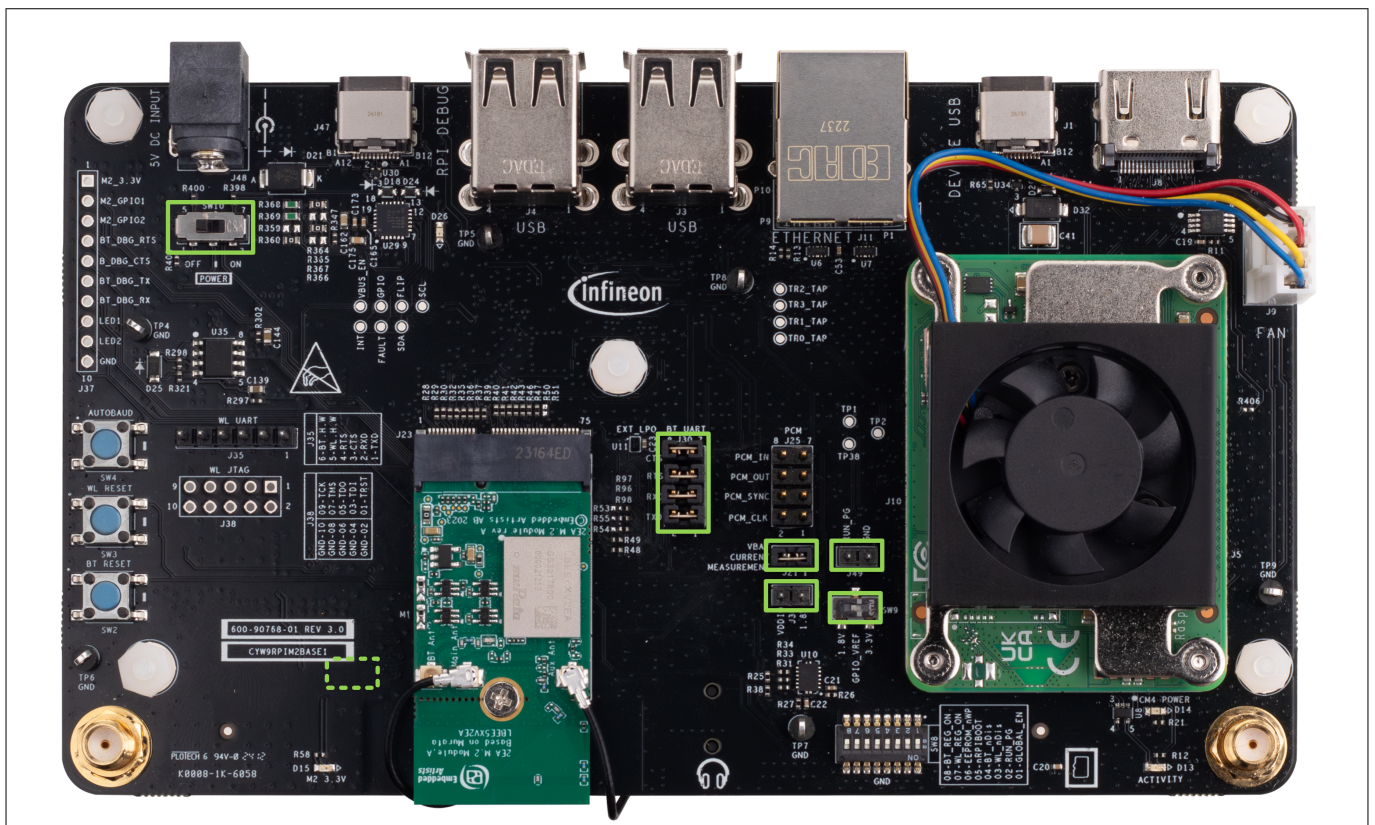


Figure 2 CYW9RPIWIFIBT-EVK default jumper and switch setting

[Figure 3](#) highlights the indication LEDs provided on the CYW9RPIWIFIBT-EVK board.

- D14 (Red) indicates that CM4 power supply 5 V is up
- D15 (Green) indicates the CM4 activity
- D13 (Orange) indicates the M.2 radio module power supply 3.3 V is up

1 Introduction

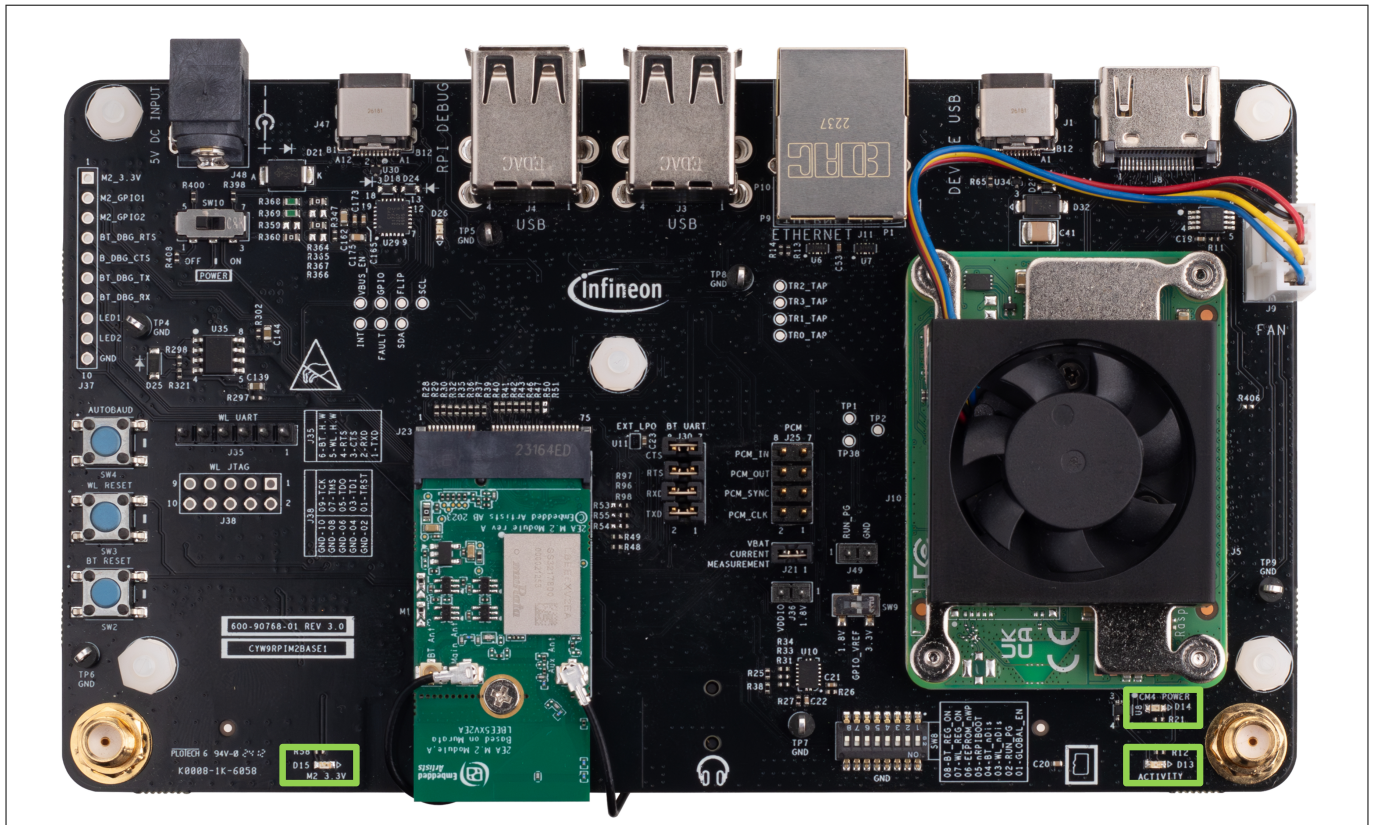


Figure 3 CYW9RPIWIFIBT-EVK indication LEDs

1.3 Getting started

This user guide provides details about the CYW955513EVK-01 Evaluation Kit and the instructions on its usage.

- The [Kit operation](#) section describes the operation and usage of various features of the kit
- The [Hardware](#) section describes the design details of the CYW9RPIWIFIBT-EVK hardware blocks

Perform the following steps to get started with the Out of Box experience of the CYW9RPIWIFIBT-EVK Kit.

1. Before you start, ensure that you have the following components:
 - PC with Type-C USB port
 - USB compatible mouse and keyboard
 - Monitor with HDMI interface
 - Pre-flashed SD card present in the SD card slot (J17)
2. Connect the dipole antenna to the SMA connectors on the baseboard and connect the antenna cable assembly to the UFL connectors (main and aux) on the M.2 radio card
3. Ensure that the jumper and switch settings on the board are configured as shown in [Figure 2](#) and specified in [Table 3](#) to [Table 8](#)
4. Connect the USB-compatible mouse and keyboard to the USB port (J3/J4)
5. Connect the HDMI compatible monitor to the HDMI port (J8) and Ethernet cable (optional) to the RJ45 connector (J11)
6. Connect the kit to the PC through the USB Type-C port (J47) using the USB cable provided
7. Switch on the power switch (SW10) and check for the CM4 power LED (D14), M.2 VBAT LED (D15) to glow and activity LED (D13) to blink
8. Observe the booting logs on the monitor and check for instructions on the screen to proceed

1 Introduction

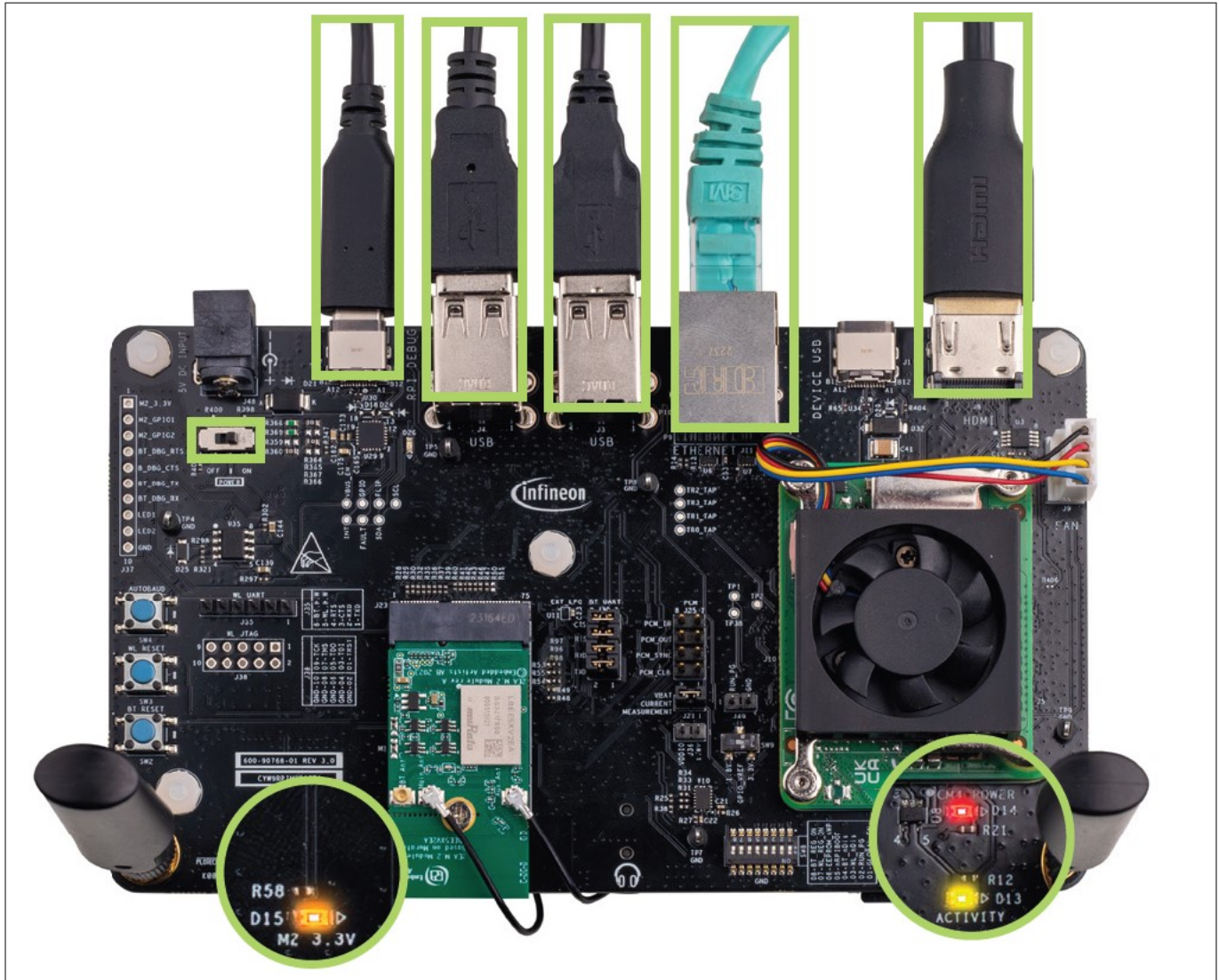


Figure 4 Getting started with CYW9RPIWIFIBT-EVK

1.4 Getting started with serial console access

Perform the following steps to get access to the serial debug console of the CYW9RPIWIFIBT-EVK Kit.

1. Before you power the kit, ensure that you have the following:
 - PC with USB Type-C port
 - UART terminal software such as Tera Term or Minicom
2. Ensure that the jumper and switch settings on the board are configured as shown in [Figure 2](#) and specified in [Table 3](#) to [Table 8](#)
3. Connect the kit to the PC through the USB Type-C port (J47) using the USB cable provided
4. Switch on the power switch (SW10) and check for the CM4 power LED (D14), M.2 VBAT LED (D15) to glow and activity LED (D13) to blink

1 Introduction

- 5. Open the UART terminal software and connect to the kit’s USB-to-UART COM port using the following parameters:
 - Baud rate: 115200, Data: 8 bit, Parity: None, Stop bit: 1 bit, Flow control: None
- 6. Power cycle the board and check for the boot logs on the terminal. After boot, enter the following credentials to access the console:
 - Username: ifx
 - Password : ifx

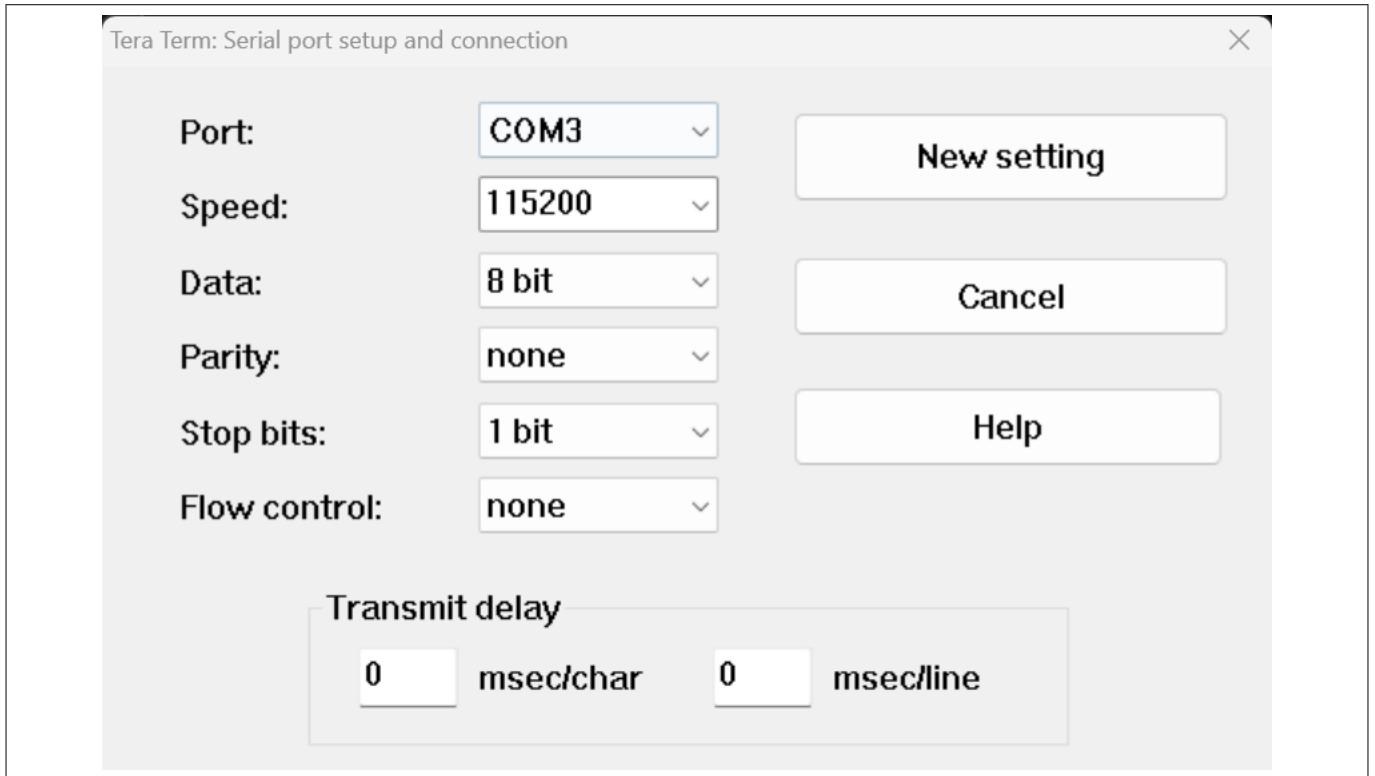


Figure 5 USB-UART COM port setup

1.5 IoT resources and technical support

Infineon provides a wealth of product documentation at the [Wireless Connectivity](#) webpage to help you select the right IoT device for your design. Additionally, [Infineon Developer Community](#) offers a platform for developers to access the latest software and tools, solving common evaluation and integration problems while directly interacting with both Infineon engineers and experienced peers.

2 Kit operation

2 Kit operation

This section provides detailed instructions required to setup the CYW9RPIWIFIBT-EVK Kit for Wi-Fi and Bluetooth® LE combo applications on the Linux platform. It also introduces the CYW9RPIWIFIBT-EVK Kit and discusses its features, including Wi-Fi and Bluetooth® connectivity, audio capabilities, programming or debugging, and other user interfaces for communicating with the EVK.

2.1 Theory of operation

CYW9RPIWIFIBT-EVK is built around the Raspberry Pi Compute Module 4. The kit features a Raspberry Pi CM4 module as the host and uses a M.2 E-Key standard connector to connect the WiFi - Bluetooth® radio modules. It also features four USB Type-A ports to connect the peripherals, one HDMI port to connect the monitor, one 1Gb Ethernet port, an audio output jack and a USB Type-C port for powering and debug. The kit also consists of a Type-C USB port for device USB access and one optional 5 V DC jack to provide more power when required. The block diagram of the kit is shown in Figure 6.

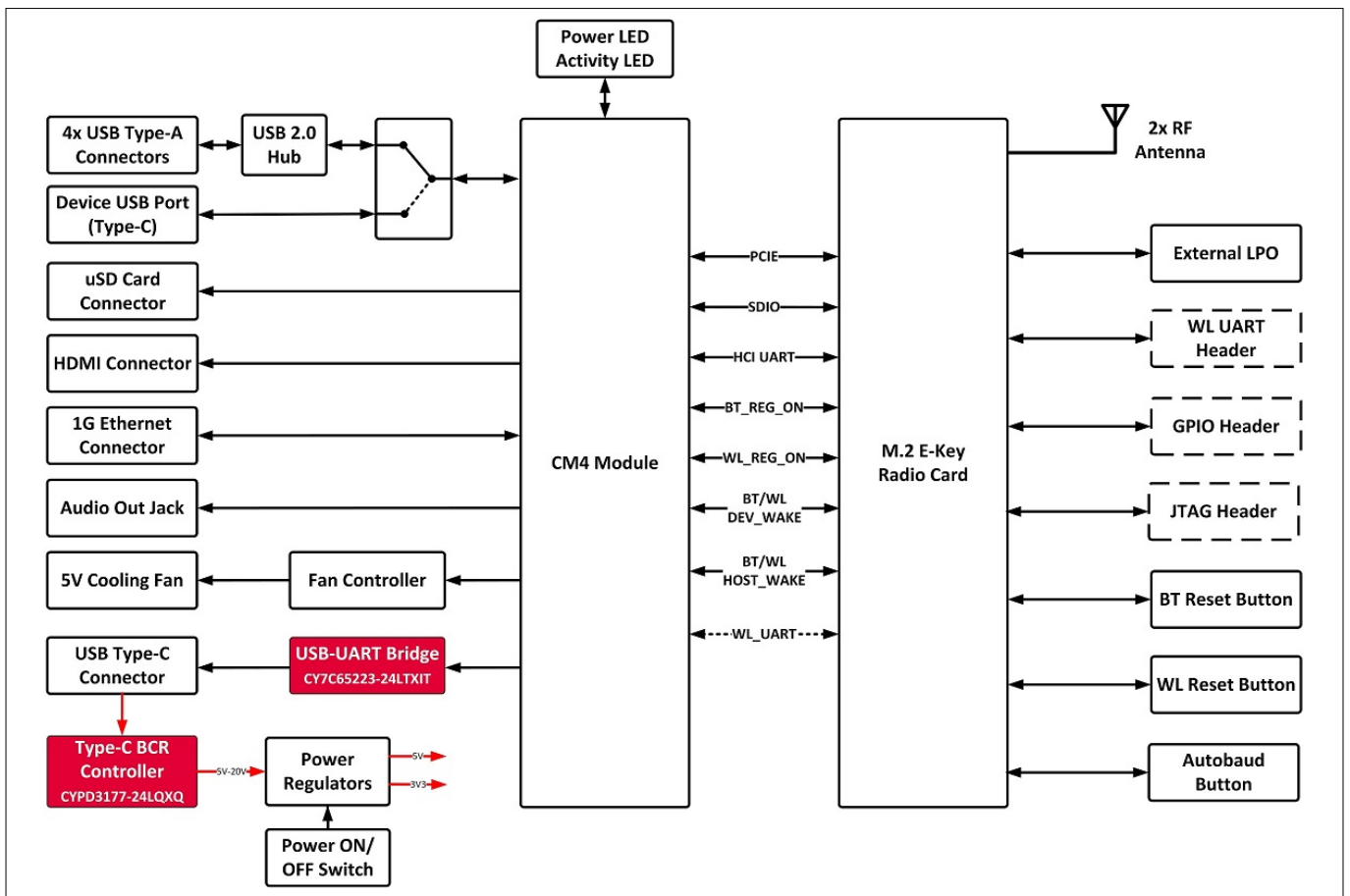


Figure 6 CYW9RPIWIFIBT-EVK block diagram

Figure 7 and Figure 8 shows the markup of each part on the kit, followed by a subsequent description.

2 Kit operation

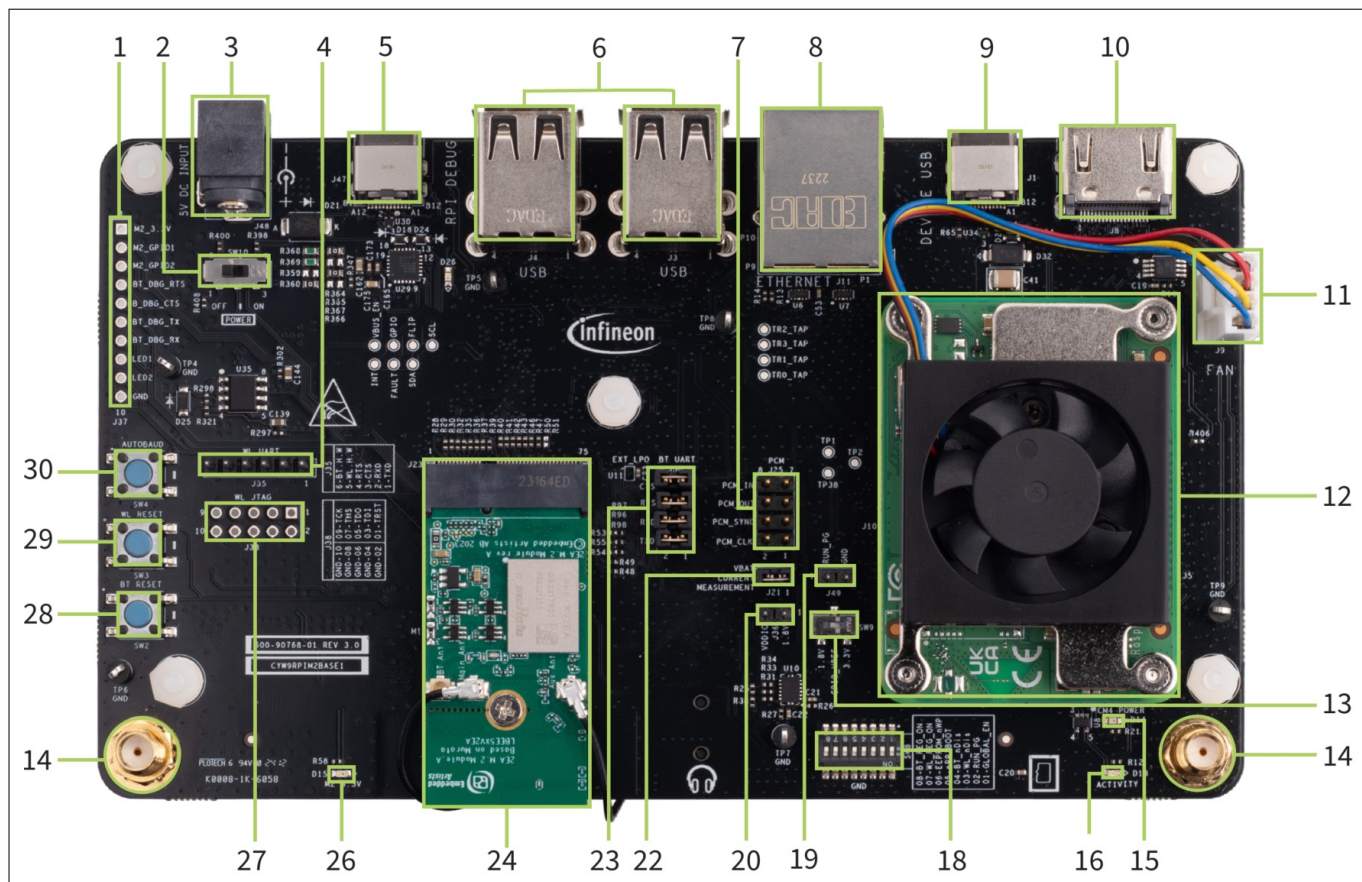


Figure 7 CYW9RPIWIFIBT-EVK top side

2 Kit operation

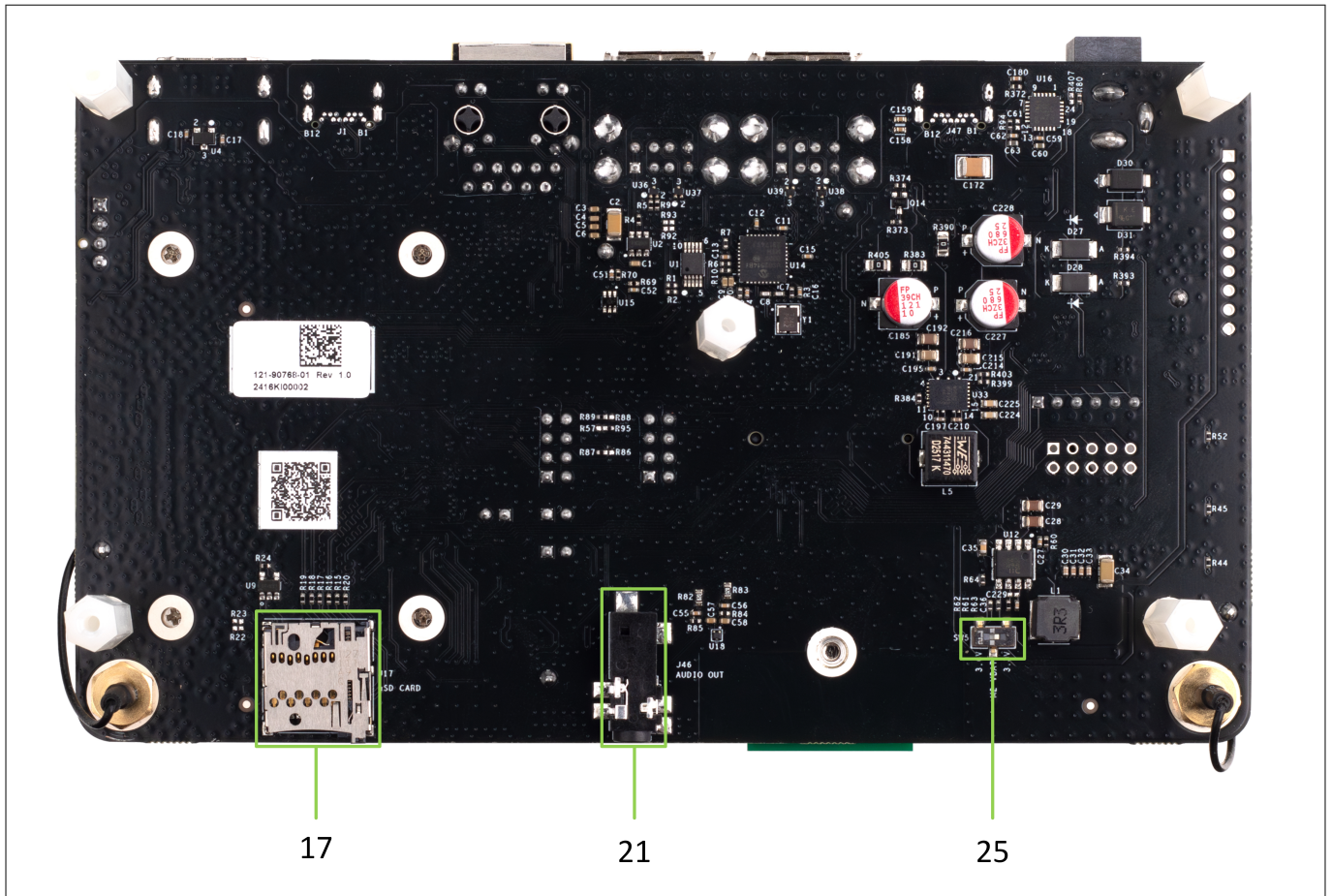


Figure 8 CYW9RPIWIFIBT-EVK bottom side

1. **M.2 GPIO header (J37):** The 10-pin header provides access to the GPIOs from the M.2 radio module. This connector is not mounted by default on the kit. General-purpose I/Os from the M.2 radio module are mapped to this connector, and users can access them by mounting a male/female header. For details on pin mapping of the connector, see the [Connectors](#) section
2. **Power ON/OFF switch (SW10):** After connecting the USB cable to the J47 Type-C USB connector of the kit from the PC, switch ON the SW10 switch to power on the kit
3. **5 V DC jack (J48):** This optional 5 V DC input jack is used to supply additional power to the 5 V rail on the kit when power-hungry peripherals are connected to the USB Type-A ports and the Type-C port is unable to provide sufficient power
4. **WL UART connector (J35):** The 6-pin male header is used to access the WLAN UART interface of the M.2 radio module inserted to the M.2 E-Key connector. The Bluetooth® and WLAN host wake pins are also mapped to the connector for user access. For details on pin mapping of the connector, see the [Connectors](#) section
5. **Raspberry-Pi debug USB Type-C connector (J47):** This is the major power supply to the kit and is connected to the PC using the Type-C to Type-C cable provided with the kit to power the kit. This USB Type-C port features the USB-UART bridge for the Raspberry Pi CM4 module to access the console
6. **4 x USB Type-A connectors (J3, J4):** Four USB Type-A ports with two stacked connectors are provided to connect the peripherals such as the mouse, keyboard, storage device, etc
7. **PCM connector (J25):** The 8-pin male header is used to access the PCM interface from the M.2 radio module externally. By mounting jumpers on the four rows of the connector, the PCM interface of the radio module can be interfaced to the CM4 module, helping in Bluetooth® audio development
8. **1G Ethernet connector (J11):** The 1G Ethernet port provided on the baseboard of the kit enables LAN connection to the kit

2 Kit operation

9. **Device USB Type-C connector (J1):** This Type-C port on the kit enables the user to access the Raspberry Pi CM4 as a USB device. During booting, if the nRPI_Boot pin of the CM4 module is LOW, booting from the SD card is stopped and transferred to the RPi boot via this USB connector
10. **HDMI connector (J8):** The HDMI Type-A standard connector on the baseboard allows the user to connect the display monitor to the kit
11. **Fan connector (J9):** A 4-pin keyed connector is used to power and control the 5 V cooling fan of the CM4 module
12. **Raspberry Pi CM4 lite module:** [Raspberry Pi CM4 lite module](#) is the central unit of the kit, interfaced to the baseboard via two 100-pin board-to-board connectors with a pitch of 0.4 mm. Compute Module 4 (CM4) lite is a system-on-module containing a processor, memory, and supporting power circuitry, enabling designers to use the Raspberry Pi hardware and software stack in their custom systems. Additional IO interfaces are provided to help designers explore other features. All major interfaces from the module are routed to the baseboard and are made accessible to the user on this kit
13. **CM4 GPIO voltage select switch (SW9):** The CM4 lite module supports GPIO voltage levels of 1.8 V and 3.3 V. The IO voltage level of the radio module can be changed using the SW9 switch. By default, it is set to 1.8 V
14. **Antenna connectors:** Two SMA to UFL cable assemblies are provided to connect the tri-band dipole antennas provided with the kit. The UFL connector end is connected to the radio module to support both WLAN and Bluetooth® functions
15. **CM4 power LED (D14):** The Red color LED glows to indicate power-up of the CM4 module
16. **CM4 activity LED (D13):** The Green color LED blinks to indicate activity on the CM4 lite module
17. **Micro SD card connector (J17):** A pre-flashed microSD card is inserted to this socket to boot the CM4 lite module. The socket is a push-push socket. To release the microSD card, gently push the card
18. **DIP control switches (SW8):** The 8 in 1 DIP SPST switch allows the user to access control pins of the Raspberry Pi CM4 lite module. Control signals like, GLOBAL_EN, RUN_PG, WL_nDISABLE, BT_nDISABLE, nRPIBOOT, and EEPROM_nWP can be accessed via this DIP switch. For more details, see the [Buttons and switches](#) section
19. **CM4 reset jumper (J49):** The 2-pin male header is used to reset the Raspberry Pi CM4 lite externally. A jumper can be mounted to connect the *RUN_PG* pin to the ground to reset the module
20. **M.2 external VDDIO isolation jumper (J36):** This jumper is used to isolate the external VDDIO supply to the radio module. To measure the current supplied to the carrier module, an ammeter can be connected to the two pins
21. **Audio out jack (J46):** This 3.5 mm headphone jack supports the audio out from the CM4 lite module via the PWM interface. This allows the user to explore Bluetooth® audio development
22. **M.2 VBAT isolation jumper (J21):** This jumper is used to power (3.3 V/3.6 V) the M.2 radio module. To measure the current supplied to the radio module, remove this jumper and connect an ammeter to the two pins
23. **Bluetooth® UART connector (J30):** The 8-pin male header is used to interface the Bluetooth® HCI UART to the CM4 lite module. By default, the jumpers are mounted on the header to connect the HCI UART from the radio module to the CM4 module. The HCI interface from the M.2 radio module can be accessed externally by removing the jumpers
24. **2EA M.2 radio module:** The kit is mounted with the [2EA M.2 radio module](#) featuring the Infineon CYW955573 chipset. Users can replace the M.2 card with any other standard M.2 module to explore different chipsets
25. **M.2 VBAT voltage select switch (SW5):** This switch can be used to change the VBAT voltage level to the radio module between 3.3 V and 3.6 V as per the module requirement
26. **M.2 VBAT power LED (D15):** The Orange color LED glows to indicate power-up of the M.2 radio module
27. **WL JTAG connector (J38):** The 10-pin header is used to access the WLAN JTAG interface of the M.2 radio module for test and debug. This header is not mounted by default

2 Kit operation

- 28. Bluetooth® reset button (SW2):** This button resets the Bluetooth® subsystem of the radio module. When pressed, this button connects the *BT_REG_ON* pin to the ground and resets the Bluetooth® section of the radio device
- 29. WLAN reset button (SW3):** This button resets the WLAN subsystem of the radio module. When pressed, this button connects the *WL_REG_ON* pin to the ground and resets the WLAN section of the radio device
- 30. Autobaud button (SW4):** This button forces the combo chip into autobaud mode. When pressed, it connects the *BT_UART_CTS* pin to the ground, causing the radio device to enter autobaud mode

2.2 Buttons and switches

Buttons

The buttons available on the CYW9RPIWIFIBT-EVK Kit and their functionality is listed in the following table:

Table 2 CYW9RPIWIFIBT-EVK buttons and functionality

| Button | Pressed state | Connection on the radio module | Description |
|--------|---------------|--------------------------------|--------------------------------------|
| SW2 | Ground | BT_REG_ON | Bluetooth® Reset button (Active LOW) |
| SW3 | Ground | WL_REG_ON | WLAN Reset button (Active LOW) |
| SW4 | Ground | BT_UART_CTS | Autobaud button (Active LOW) |

Switches

Table 3 lists the slide or DIP switches available on the kit and their functionality.

Table 3 CYW9RPIWIFIBT-EVK switches and functionality

| Switch | Connection on the CM4 lite module or radio module | State of pin | | Description |
|--------|---|---------------------------|---------------------------|--|
| | | OFF (default) | ON | |
| SW10 | Power enable | Pull-down | Pull-up | Power ON/OFF slide switch |
| SW5 | NA | Connect to 3.3 V feedback | Connect to 3.6 V feedback | VBAT voltage select DIP switch |
| SW9 | GPIO_VREF | Connect to 1.8 V | Connect to 3.3 V | CM4 lite GPIO voltage select DIP switch |
| SW8.1 | GLOBAL_EN | Pull-up | Pull-down | CM4 lite Power down DIP switch |
| SW8.2 | RUN_PG | Pull-up | Pull-down | CM4 lite Reset DIP switch |
| SW8.3 | WL_nDISABLE | Pull-up | Pull-down | CM4 lite WLAN interface disable DIP switch |
| SW8.4 | BT_nDISABLE | Pull-up | Pull-down | CM4 lite Bluetooth® interface disable DIP switch |
| SW8.5 | nRPI_BOOT | Pull-up | Pull-down | CM4 lite USB boot mode enable DIP switch |
| SW8.6 | EEPROM_nWP | Pull-up | Pull-down | CM4 lite EEPROM write protect enable DIP switch |
| SW8.7 | WL_REG_ON | Pull-up | Pull-down | Radio module WLAN interface disable DIP switch |
| SW8.8 | BT_REG_ON | Pull-up | Pull-down | Radio module Bluetooth® interface disable DIP switch |

2 Kit operation

2.3 Jumpers

Table 4 to Table 8 lists the jumpers on the CYW9RPIWIFIBT-EVK Kit, their default settings, and usage.

Table 4 Jumper J21 pin configuration

| Jumper J21 (VBAT current measurement) | Default state | Description |
|---------------------------------------|---------------|--|
| 1 and 2 | Shorted | Short this jumper to supply power to the VBAT pin of the M.2 radio module. In addition, use this jumper to measure the current consumption of the VBAT domain. |

Table 5 Jumper J36 pin configuration

| Jumper J36 (VDDIO current measurement) | Default state | Description |
|--|---------------|---|
| 1 and 2 | Open | Short this jumper to supply power to the VDDIO pin of the M.2 radio module externally (by default it is generated on radio module). In addition, use this jumper to measure the current consumption of the VDDIO domain, when externally powered. |

Table 6 Jumper J49 pin configuration

| Jumper J49 (CM4 lite reset) | Default state | Description |
|-----------------------------|---------------|--|
| 1 and 2 | Open | Short and open this jumper to reset the CM4 lite module. This header can be used to reset the kit remotely using a relay connected to this header. |

Table 7 Jumper J30 pin configuration

| Jumper J30 (Bluetooth® UART Interface) | Default state | Description |
|--|---------------|--|
| 1 and 2 | Shorted | Short these pins to connect the Bluetooth® HCI UART interface of the radio module to the CM4 lite host. Open the jumpers to isolate the connection and access the UART lines externally. |
| 3 and 4 | Shorted | |
| 5 and 6 | Shorted | |
| 7 and 8 | Shorted | |

Table 8 Jumper J25 pin configuration

| Jumper J25 (PCM interface) | Default state | Description |
|----------------------------|---------------|---|
| 1 and 2 | Open | Short these pins to connect the PCM audio interface of the radio module to the CM4 lite host. Open the jumpers to isolate the connection and access the PCM lines externally. |
| 3 and 4 | Open | |
| 5 and 6 | Open | |
| 7 and 8 | Open | |

2 Kit operation

2.4 Connectors

This section lists out the different connectors available on the CYW9RPIWIFIBT-EVK Kit and pinouts of the same.

Table 9 WL UART connector (J35)

| Pin number | Pin name | Description |
|------------|---------------------|---|
| 1 | <i>WL_UART_TXD</i> | WLAN debug UART transmitter |
| 2 | <i>WL_UART_RXD</i> | WLAN debug UART receiver |
| 3 | <i>WL_UART_CTS</i> | WLAN debug UART clear to send |
| 4 | <i>WL_UART_RTS</i> | WLAN debug UART request to send |
| 5 | <i>WL_HOST_WAKE</i> | WLAN host wake signal from radio module |
| 6 | <i>BT_HOST_WAKE</i> | Bluetooth® host wake signal from radio module |

Table 10 WL JTAG connector (J38)

| Pin number | Pin name | Description |
|------------|---------------------|----------------------------|
| 1 | <i>WL_JTAG_TRST</i> | WLAN JTAG reset |
| 2 | <i>GND</i> | Ground |
| 3 | <i>WL_JTAG_TDI</i> | WLAN JTAG test data input |
| 4 | <i>GND</i> | Ground |
| 5 | <i>WL_JTAG_TDO</i> | WLAN JTAG test data output |
| 6 | <i>GND</i> | Ground |
| 7 | <i>WL_JTAG_TMS</i> | WLAN JTAG test mode select |
| 8 | <i>GND</i> | Ground |
| 9 | <i>WL_JTAG_TCK</i> | WLAN JTAG test clock |
| 10 | <i>GND</i> | Ground |

Table 11 M.2 GPIO header (J37)

| Pin number | Pin name | Description |
|------------|-------------------|---------------------------------------|
| 1 | <i>M2_VBAT</i> | 3.3 V supply |
| 2 | <i>M2_GPIO1</i> | M.2 GPIO pin1 |
| 3 | <i>M2_GPIO2</i> | M.2 GPIO pin2 |
| 4 | <i>BT_DBG_RTS</i> | Bluetooth® debug UART request to send |
| 5 | <i>BT_DBG_CTS</i> | Bluetooth® debug UART clear to send |
| 6 | <i>BT_DBG_TX</i> | Bluetooth® debug UART transmitter |
| 7 | <i>BT_DBG_RX</i> | Bluetooth® debug UART receiver |
| 8 | <i>LED1</i> | M.2 LED pin1 |
| 9 | <i>LED2</i> | M.2 LED pin2 |
| 10 | <i>GND</i> | Ground |

2 Kit operation

2.5 USB serial interface chip

A CY7C65223-24LTXIT chip (U16) is used as the USB-serial bridge for the CM4 lite module to access the console on the PC. With the USB Type-C cable connected between the CYW9RPIWIFIBT-EVK Kit and the PC, the console of the CM4 lite module can be accessed using a serial terminal application. For more details, see the [Hardware](#) section.

2.6 Kit power supply

Input power supply to the CYW9RPIWIFIBT-EVK Kit is provided by the USB Type-C connector (J47), and it can be powered from a USB Type-C port of a laptop. The kit supports an input power of 5 V to 20 V at a maximum of 3 A with the help of the BCR controller on the kit.

A buck-boost regulator generates the 5 V supply to the CM4 lite module, while a 3.3 V and 1.8 V supply are generated on the CM4 lite internally to power the peripherals. Additionally, another buck regulator generates the VBAT supply (3.3 V or 3.6 V) from the input supply to power the M.2 radio module.

An optional 5 V DC jack is also provided on the kit to supply more power to the 5 V rail, providing support for increased power requirements by the peripherals when necessary.

For more details on the power supply of the kit, see the [Hardware](#) section.

3 Hardware

3 Hardware

This section describes the CYW9RPIWIFIBT-EVK Kit hardware, power supply, interfaces, and peripherals. This kit mainly consists of three boards: the Raspberry Pi Compute Module 4 Lite, 2EA M.2 module, and the baseboard (CYW9RPIM2BASE1) on which the module is mounted. The baseboard also has all the required user interfaces that allow the user to communicate to the CM4 module and radio module.

See the [CYW9RPIWIFIBT-EVK Kit webpage](#) for the schematics and design files of the baseboard.

3.1 Raspberry Pi Compute Module 4 lite

The Raspberry Pi CM4 lite module is the central part of the kit and is a system-on-module containing a processor, memory, and a power circuitry. CYW9RPIWIFIBT-EVK leverages the Raspberry Pi CM4 hardware and software stack for evaluation and development of Infineon's Wi-Fi - Bluetooth® combo chipsets. It is mounted on the baseboard via two 100-pin board-to-board connectors with a 0.4 mm pitch.

For more details, see the [Raspberry Pi CM4 webpage](#).

3.2 2EA M.2 module

CYW9RPIWIFIBT-EVK comes with the 2EA M.2 radio module mounted by default. The 2EA M.2 module is built around the CYW55573 chipset from Infineon that enables Wi-Fi, Bluetooth® and Bluetooth® Low Energy (LE) communication. It also supports, dual-band Wi-Fi 6E with 802.11 a/b/g/n/ac/ax standard 2x2 MIMO and Bluetooth® 5.2 standard. The 2EA M.2 module is mounted on a M.2 standard E-Key connector on the baseboard.

For more details, see [2EA M.2 module](#).

Users can replace the 2EA M.2 module with any other M.2 radio module with Infineon's [Wi-Fi + Bluetooth® combo chipset](#) for validation and development of the same on the CYW9RPIWIFIBT-EVK baseboard.

3.3 CYW9RPIM2BASE1 baseboard

CYW9RPIM2BASE1 baseboard is the carrier board, on which the CM4 lite module and 2EA M.2 module are mounted. It has the power supply section that powers the CM4 module and the M.2 module. All user interfaces such as user buttons or switches, LEDs, and peripheral connectors are present on the CYW9RPIM2BASE1 baseboard, which allows the user to communicate to the kit easily. The hardware of different blocks of the CYW9RPIM2BASE1 baseboard is explained in the sections below:

3.4 Power supply system

The following block diagram shows the power supply system of the CYW9RPIWIFIBT-EVK Kit.

3 Hardware

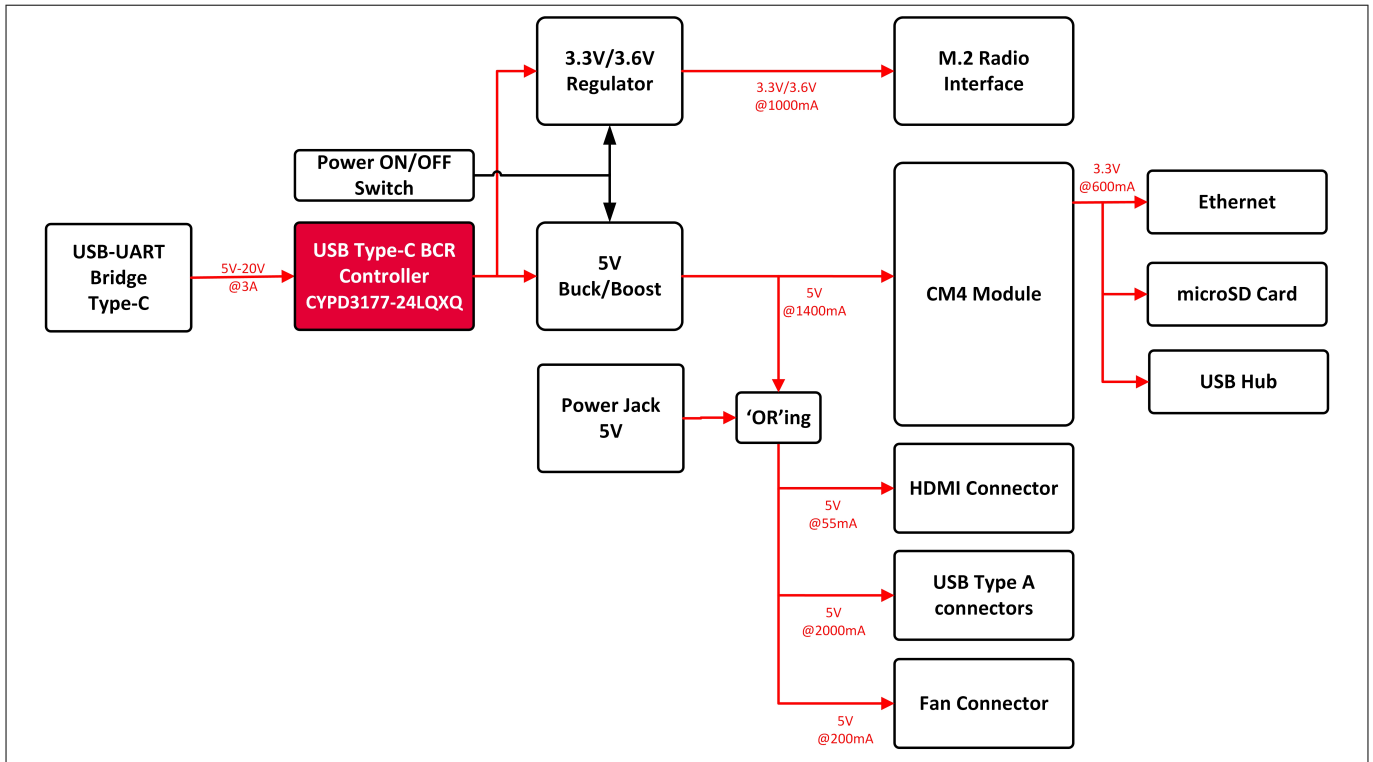


Figure 9 CYW9RPIWIFIBT-EVK power supply system

The major source of power supply to the kit is provided by the USB Type-C debug connector (J47) with the BCR controller circuit. The BCR controller enables the Type-C debug connector to provide 5 V-20 V/3 A power to the kit.

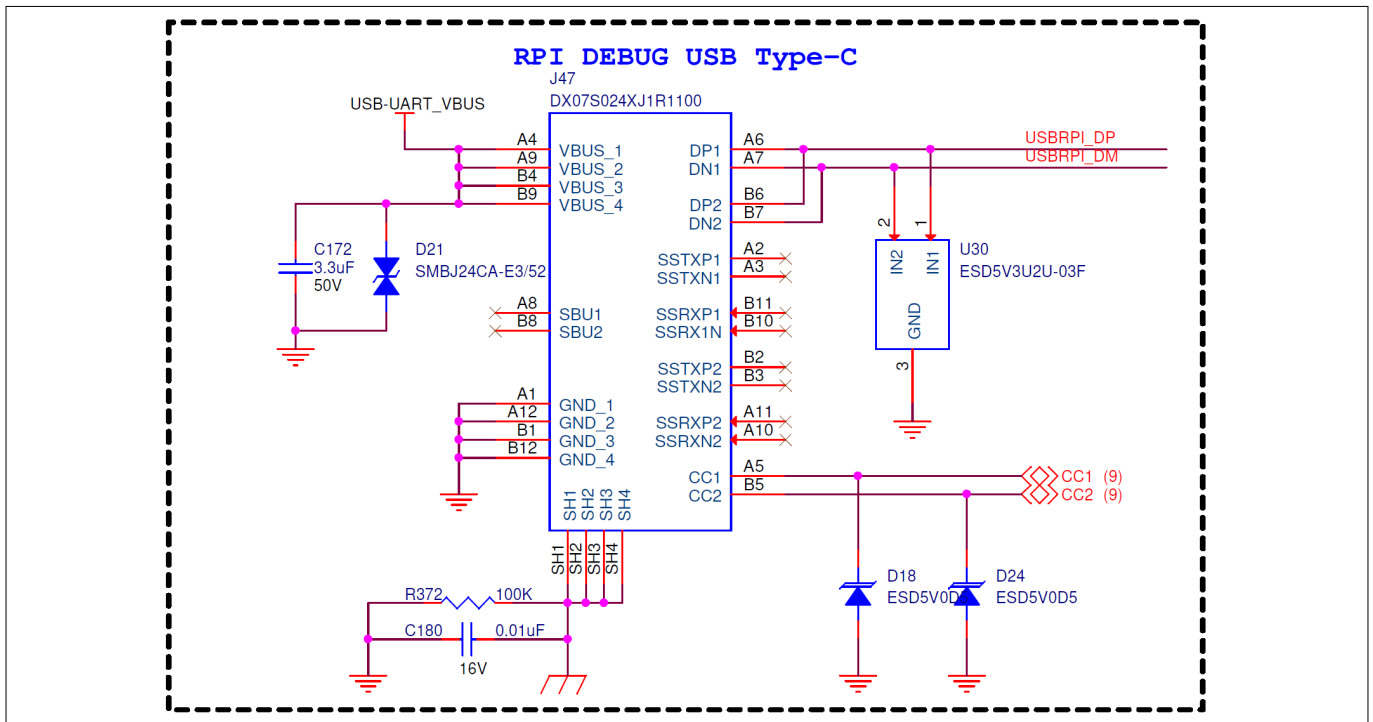


Figure 10 Power input USB Type-C connector

The power supply system on the kit is designed to generate a 5 V supply to power the CM4 lite module, and a 3.3 V/3.6 V supply to power the M.2 radio module. A buck-boost regulator generates 5 V(VDD_5V) to power the

3 Hardware

CM4 lite module while 3.3 V and 1.8 V supplies are generated internally by the CM4 lite module to power the peripherals like the SD card connector, USB hub, and USB-UART bridge. Additionally, another buck regulator generates the VBAT power (3.3 V/3.6 V) for the M.2 module. Voltage levels can be selected between 3.3 V and 3.6 V using the DIP switch (SW5).

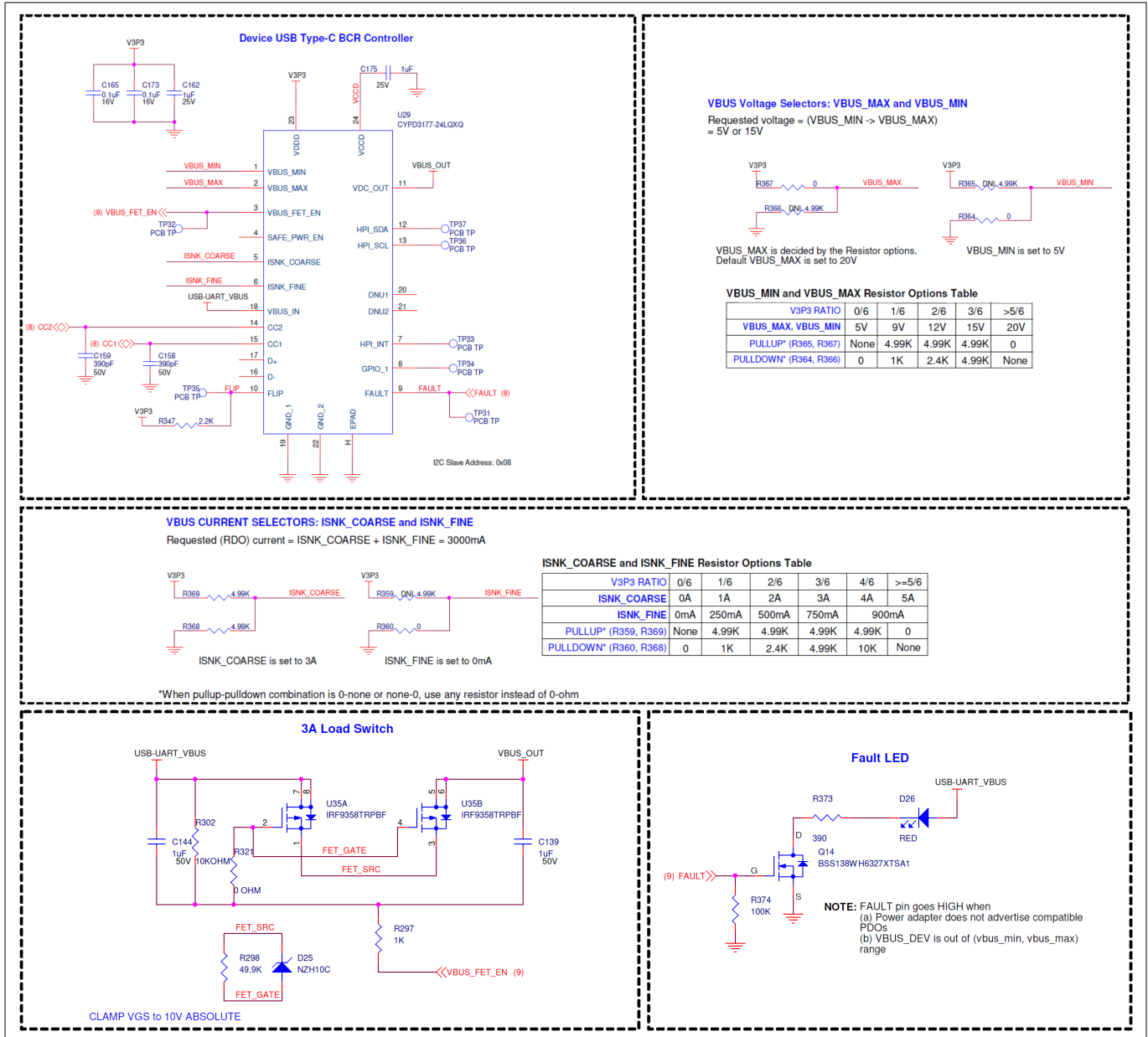


Figure 11 BCR controller circuitry

A power ON/OFF switch (SW10) is provided on the kit to enable voltage regulators. LED D14 indicates whether the CM4 lite module power supply is up or not and LED D13 indicates whether the VBAT voltage is up or not. An optional 5 V DC jack input option is provided to supply additional power to the peripheral 5 V (PERI_5V) rail, which powers the HDMI, USB, and fan connector whenever required. An ORing diode (D27, D28) circuit helps to switch the power source to the PERI_5V.

3 Hardware

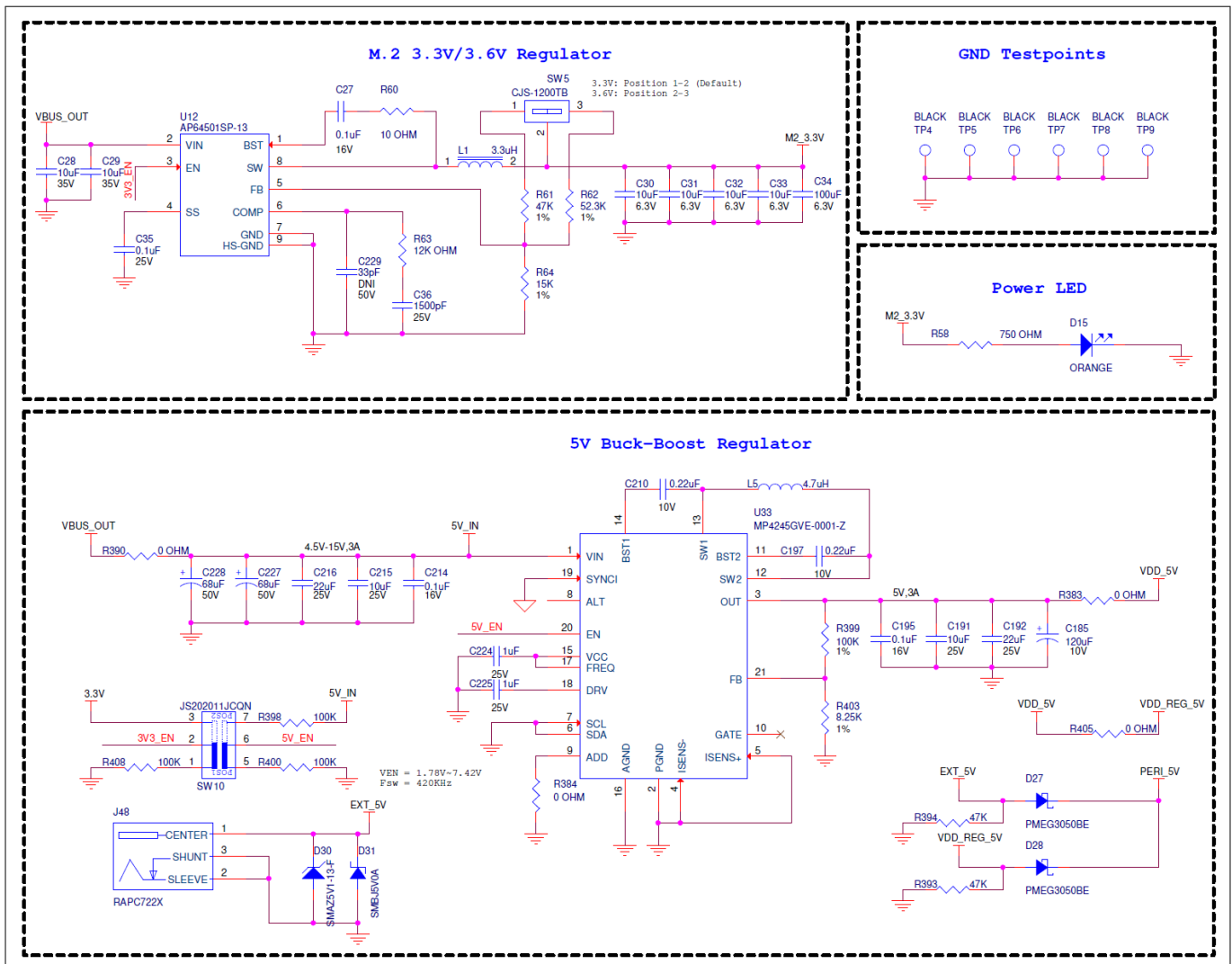


Figure 12 Voltage regulators and optional 5 V DC jack input

3.5 USB Type-A ports and RPi device USB Type-C connector with hub controller

The baseboard features four USB Type-A ports to connect peripherals such as the mouse, keyboard, etc., to the kit, and an additional USB Type-C connector is provided to access the Raspberry Pi CM4 as a USB device and enables USB boot. All Type-A USB peripheral ports and device USB ports are connected to the Raspberry Pi CM4 via a USB 2.0 hub controller (U14) and a USB double-pole, double throw (DPDT) switch (U1).

The USB hub is powered from the 3.3 V rail generated from the CM4 lite module and the VDD USB peripheral ports are powered from the PERI_5V rail via a current limit switch.

3 Hardware

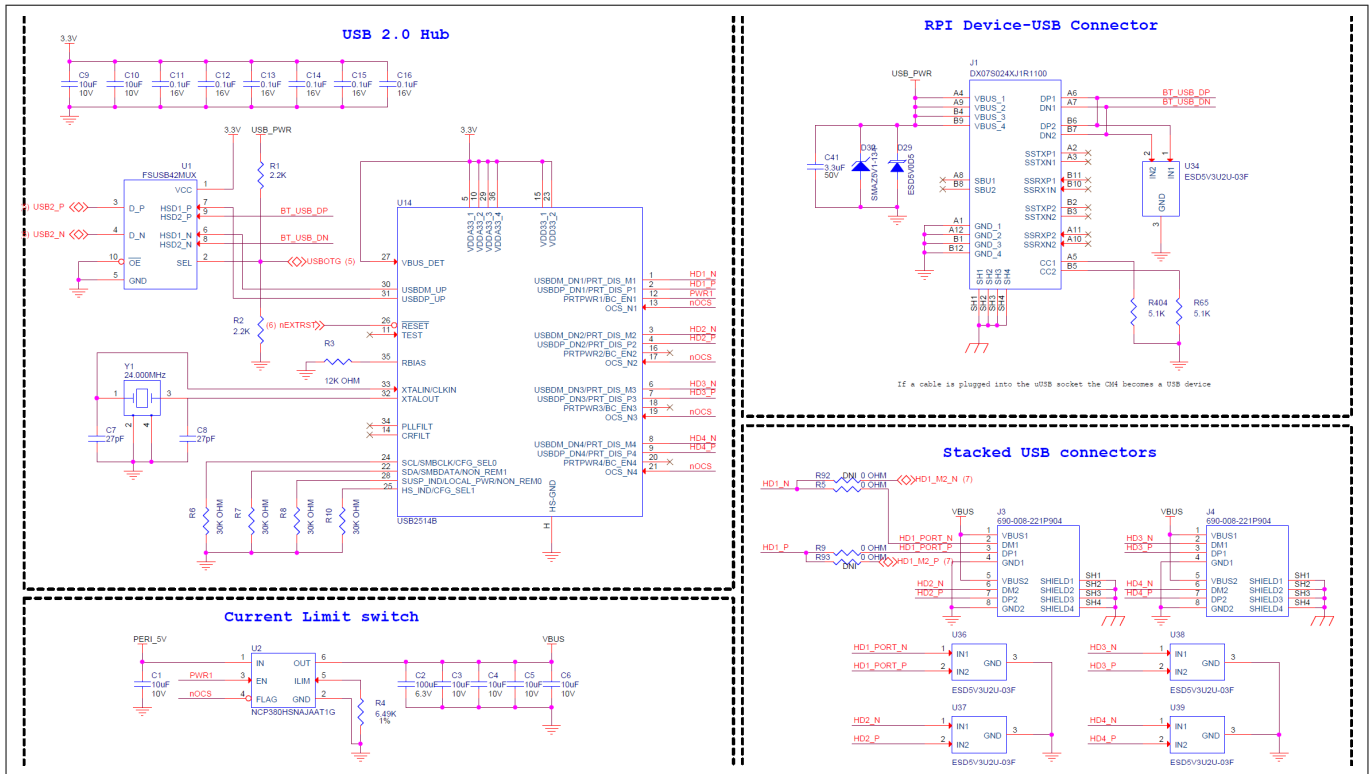


Figure 13 USB ports with hub controller

3.6 HDMI connector

A HDMI Type-A standard connector is available on the baseboard that interfaces to one of the HDMI 2.0 ports of the CM4 lite module and allows the user to connect the HDMI compatible display monitor to the kit. The HDMI port is powered from the PERI_5V rail via a current limit switch.

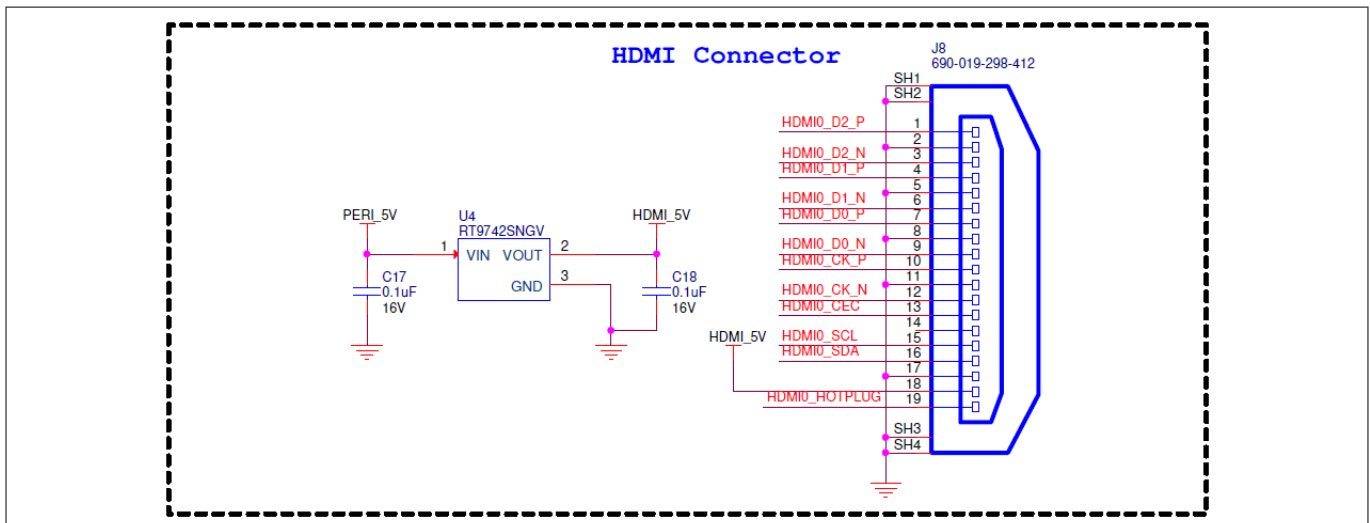


Figure 14 HDMI connector

3.7 1G Ethernet connector

The baseboard has an RJ45 connector with magnetics, which enables the user to connect the LAN network to the kit. This Ethernet connector is interfaced to the Gigabit Ethernet PHY interface of the CM4 lite module via

3 Hardware

the board-to-board connector. The RJ45 connector also has links and activity LEDs that indicate whether the network is up.

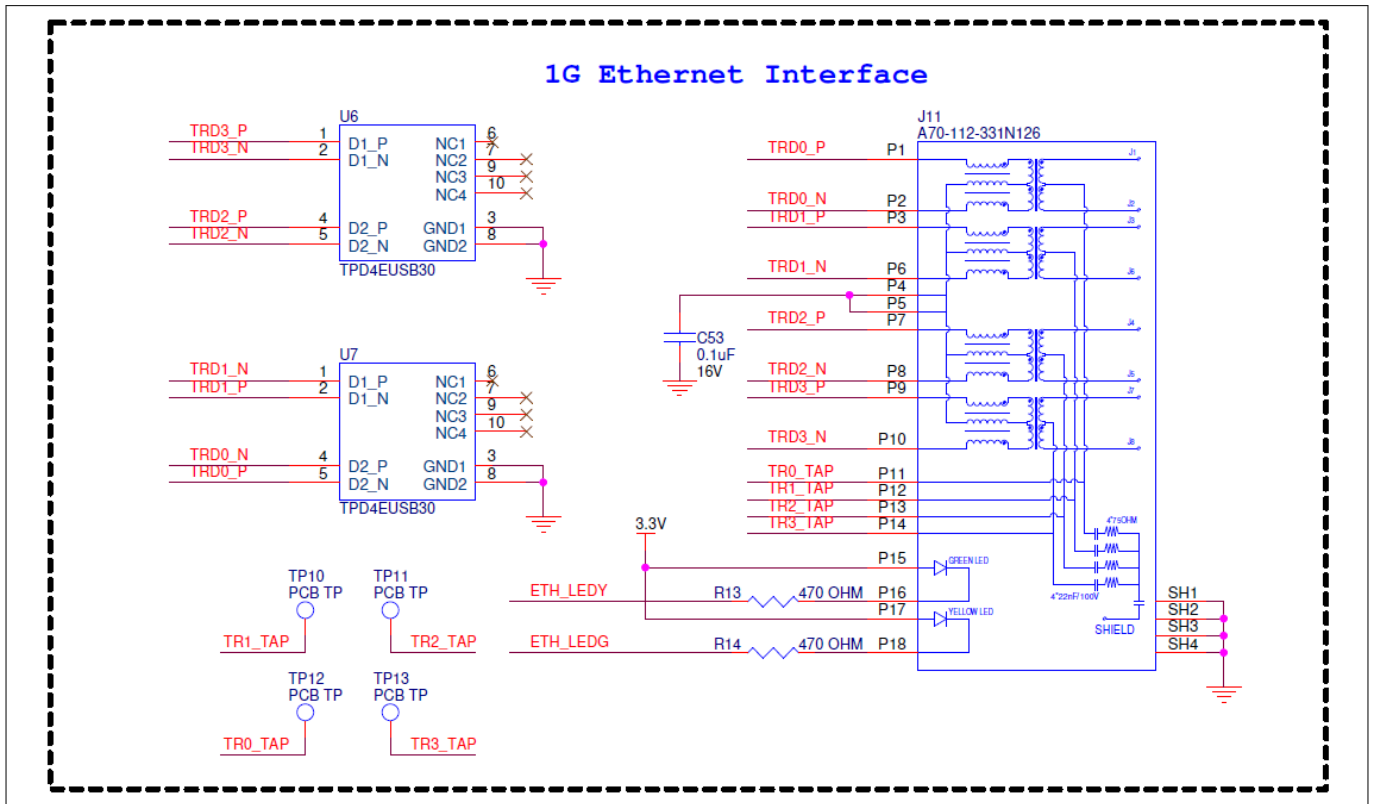


Figure 15 1G Ethernet connector

3.8 microSD card connector

A microSD card connector is provided on the baseboard to insert the pre-flashed microSD card to boot the CM4 lite module. The socket is a push-push socket. To release the microSD card, a gentle push on the card will enable it to be removed. The SD card connector is interfaced to the 2.0 SDIO port of the CM4 lite module and the module boot from the SD card image. The SD card is powered by the 3.3 V rail generated from the CM4 lite module.

3 Hardware

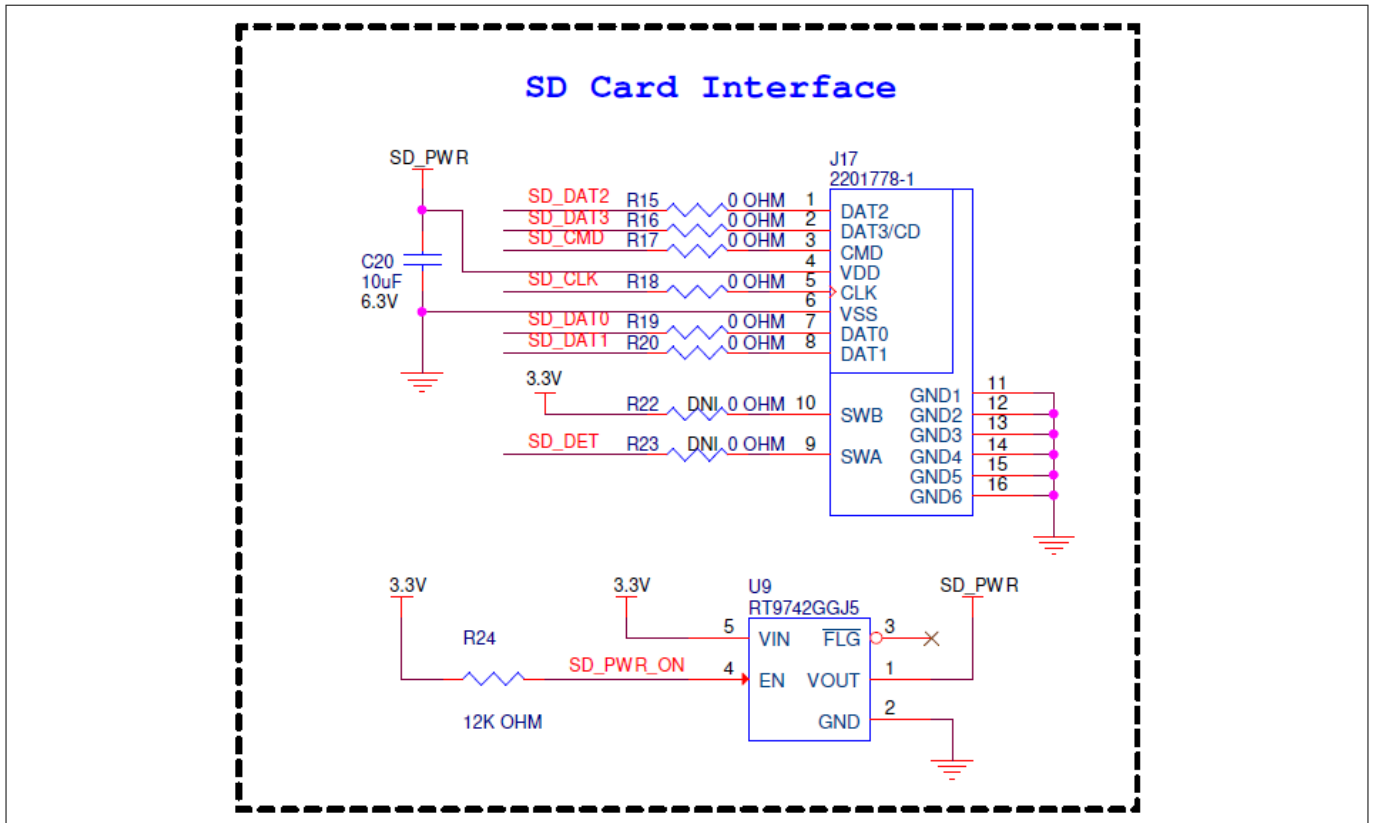


Figure 16 microSD card connector

3.9 Fan controller and connector

The cooling fan of the CM4 lite module is powered from the baseboard by the 4-pin fan connector via an I2C fan controller. The fan is powered from the peripheral 5 V rail and the fan controller chip is powered from the 3.3 V rail on the CM4 lite module.

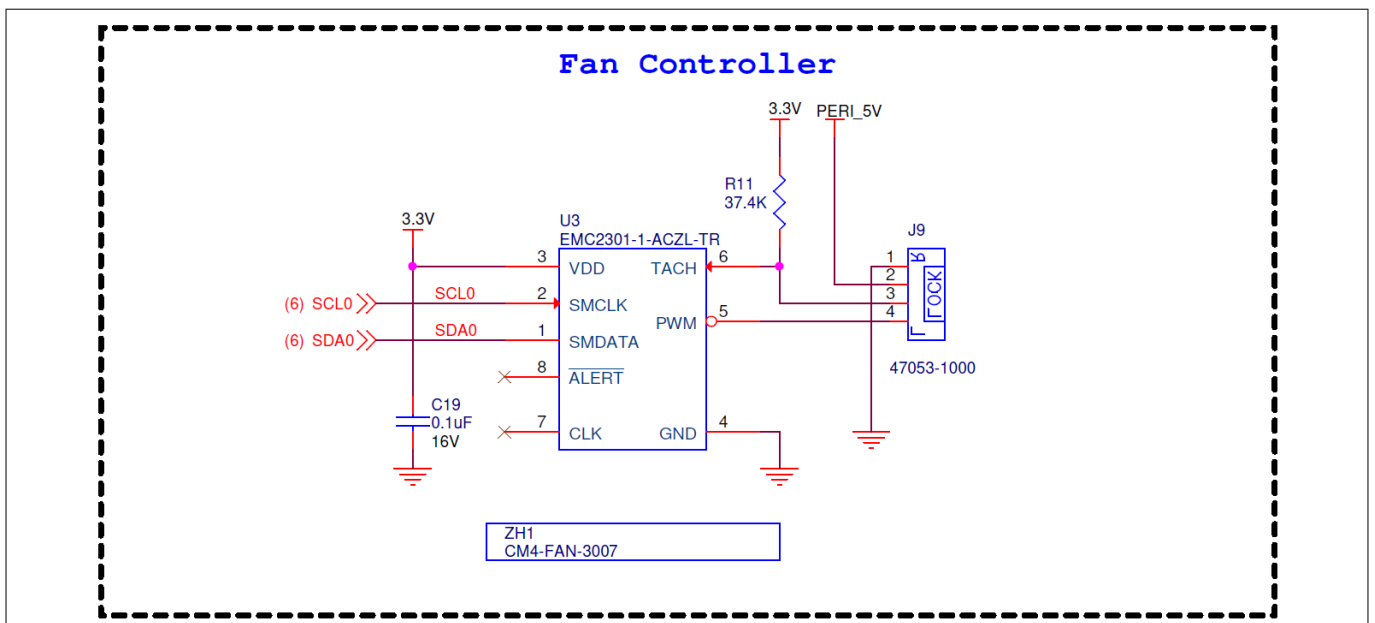


Figure 17 Fan controller and connector

3 Hardware

3.10 Audio out jack

A 3.5 mm headphone jack is provided on the baseboard to support the audio out function from the CM4 lite module via the PWM interface. This allows the user to explore the Bluetooth® audio development feature. PWM lines connected from the audio jack to the CM4 lite module are protected by the ESD diodes.

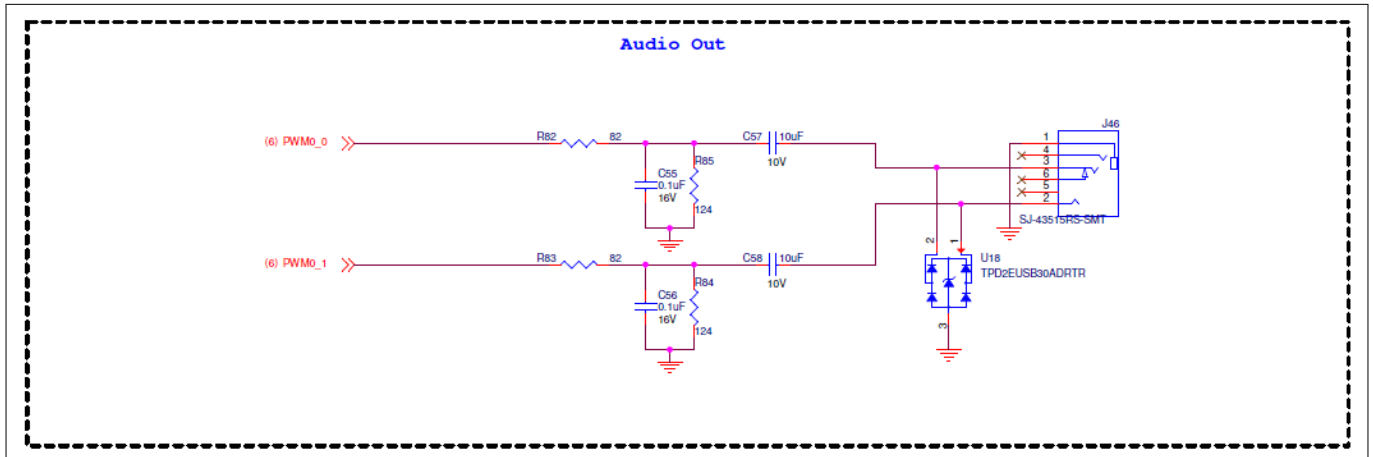


Figure 18 Audio out jack

3.11 USB-UART bridge

A single-channel USB to UART bridge controller is available on the baseboard to access the UART console of the CM4 lite module. Users can access the CM4 lite module console through the Type-C USB port (J47) via this USB-UART bridge.

3 Hardware

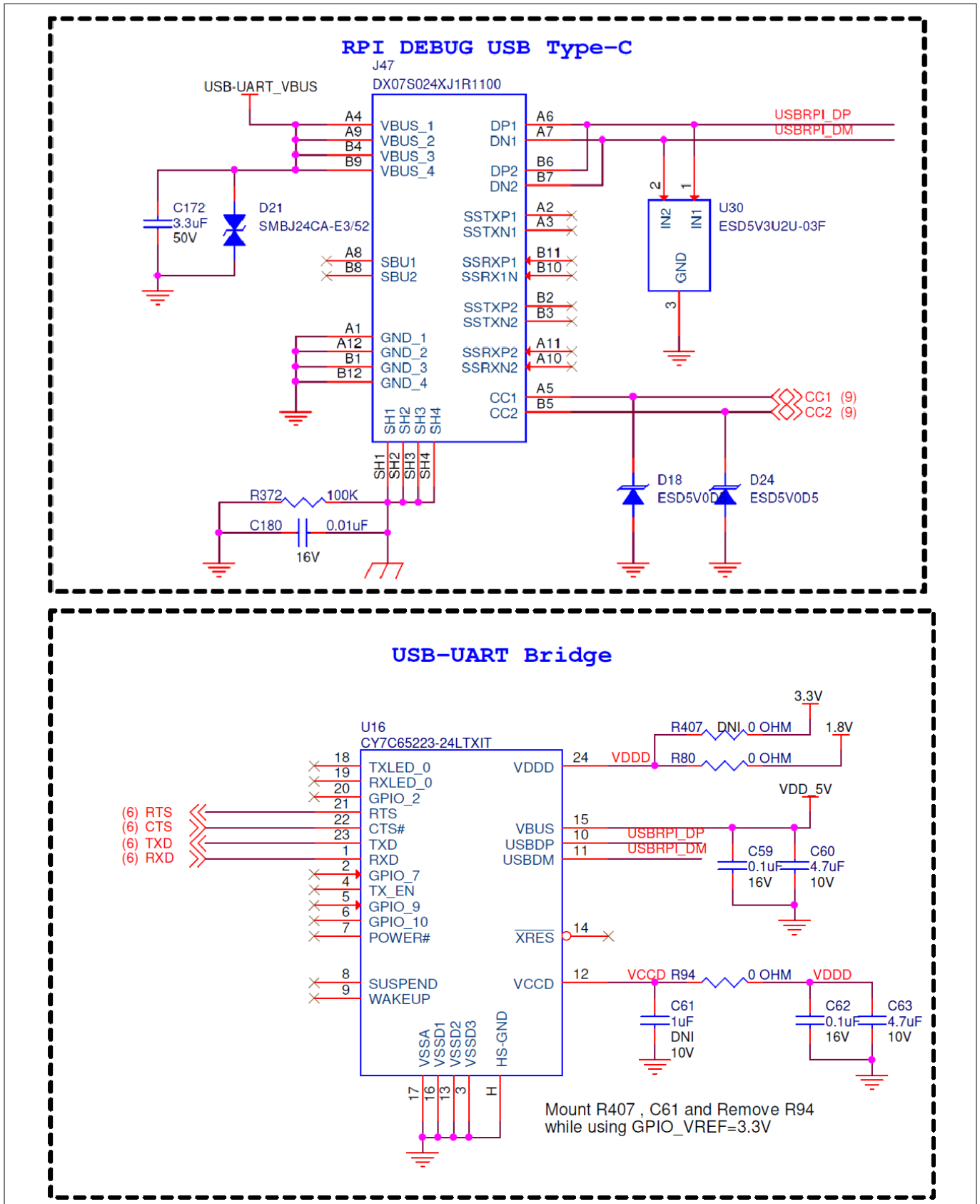


Figure 19 USB-UART bridge

3 Hardware

3.12 M.2 E-Key radio card interface

The M.2 radio card (2EA module by default) is mounted on the 75-pin E-key standard M.2 connector on the baseboard. VBAT 3.3 V/3.6 V power generated on the baseboard and other major interfaces like the PCIe, SDIO, HCI UART, and PCM audio interface are routed from the CM4 lite to radio module via this connector. Other GPIOs from the CM4 lite module to the radio module are routed via the M.2 connector.

Three user buttons are provided to reset Bluetooth® and WLAN sections and force the radio module into autobaud mode. An external LPO present on the baseboard is used to provide a 32.768 kHz clock to the radio module.

The HCI UART interface and PCM interface from the M.2 connector are routed to the CM4 lite module connector via isolation headers for external access. WL UART pins are terminated to a 6-pin male header (J35). WL_JTAG pins from the radio module can be accessed on a 10-pin dual row header (J38) and major GPIOs are terminated on a single row 10-pin connector (J37). Both of these pins, by default, are not populated on the kit.

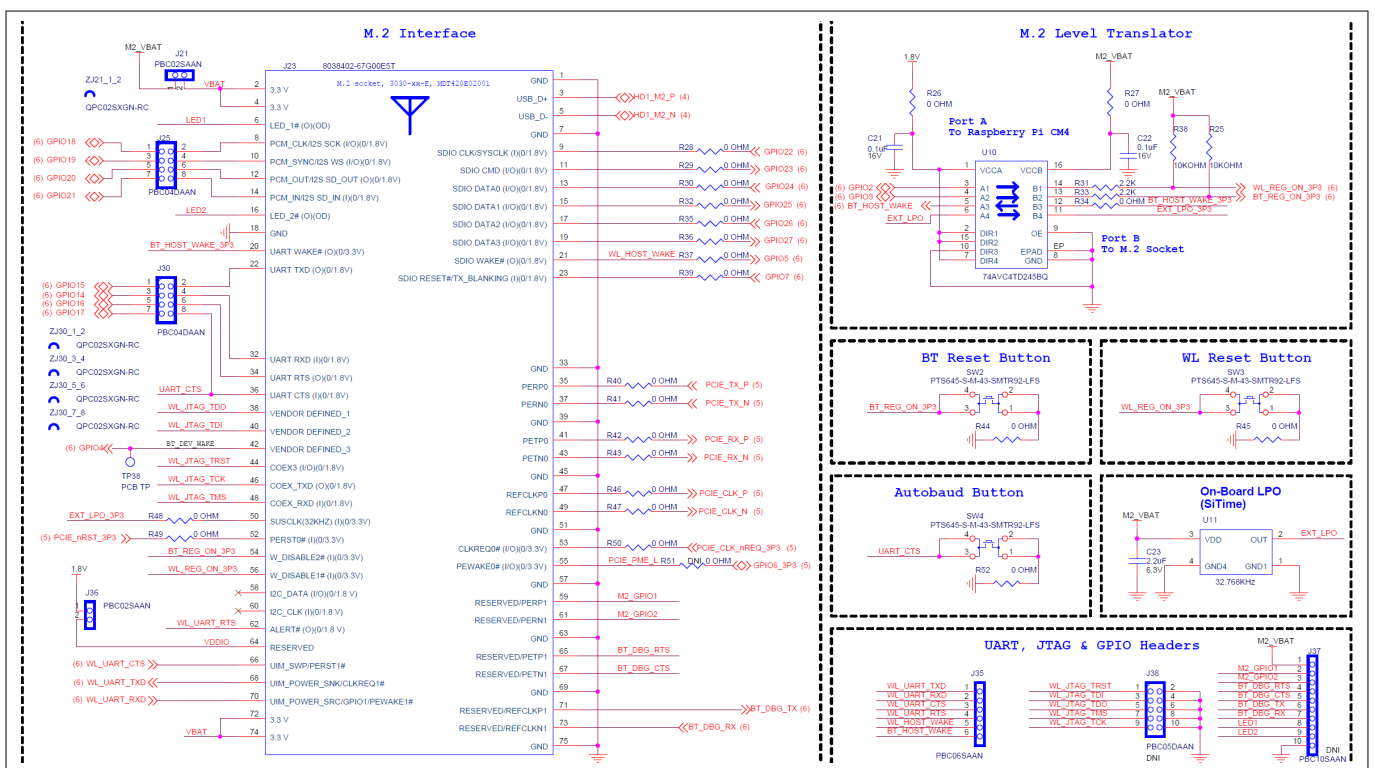


Figure 20 M.2 radio card interface

The following table provides the pin mapping details of the M.2 E-Key connector on the baseboard to the CM4 lite GPIOs and other connectors.

Table 12 M.2 radio module connector pin mapping

| Pin number | Pin name | Connection to the CM4 lite/other connectors |
|------------|------------------------------|---|
| PIN_1 | GND | GND |
| PIN_3 | USB_D+ | HD1_M2_P |
| PIN_5 | USB_D- | HD1_M2_N |
| PIN_7 | GND | GND |
| PIN_9 | SDIO CLK/SYSCLK (I)(0/1.8 V) | GPIO22 |

(table continues...)

3 Hardware

Table 12 (continued) M.2 radio module connector pin mapping

| Pin number | Pin name | Connection to the CM4 lite/other connectors |
|------------|--------------------------------------|---|
| PIN_11 | SDIO CMD (I/O)(0/1.8 V) | GPIO23 |
| PIN_13 | SDIO DATA0 (I/O)(0/1.8 V) | GPIO24 |
| PIN_15 | SDIO DATA1 (I/O)(0/1.8 V) | GPIO25 |
| PIN_17 | SDIO DATA2 (I/O)(0/1.8 V) | GPIO26 |
| PIN_19 | SDIO DATA3 (I/O)(0/1.8 V) | GPIO27 |
| PIN_21 | SDIO WAKE# (O)(0/1.8 V) | GPIO5 |
| PIN_23 | SDIO RESET#/TX_BLANKING (I)(0/1.8 V) | GPIO7 |
| PIN_33 | GND | GND |
| PIN_35 | PERP0 | PCIE_TX_P |
| PIN_37 | PERN0 | PCIE_TX_N |
| PIN_39 | GND | GND |
| PIN_41 | PETP0 | PCIE_RX_P |
| PIN_43 | PETN0 | PCIE_RX_N |
| PIN_45 | GND | GND |
| PIN_47 | REFCLKP0 | PCIE_CLK_P |
| PIN_49 | REFCLKN0 | PCIE_CLK_N |
| PIN_51 | GND | GND |
| PIN_53 | CLKREQ0# (I/O)(0/3.3 V) | PCIE_CLK_nREQ_3P3 |
| PIN_55 | PEWAKE0# (I/O)(0/3.3 V) | PCIE_PME_L |
| PIN_57 | GND | GND |
| PIN_59 | RESERVED/PERP1 | M2_GPIO1 |
| PIN_61 | RESERVED/PERN1 | M2_GPIO2 |
| PIN_63 | GND | GND |
| PIN_65 | RESERVED/PETP1 | BT_DBG_RTS |
| PIN_67 | RESERVED/PETN1 | BT_DBG_CTS |
| PIN_69 | GND | GND |
| PIN_71 | RESERVED/REFCLKP1 | BT_DBG_TX |
| PIN_73 | RESERVED/REFCLKN1 | BT_DBG_RX |
| PIN_75 | GND | GND |
| PIN_2 | VBAT | VBAT |
| PIN_4 | VBAT | VBAT |
| PIN_6 | LED_1# (O)(OD) | LED1 |
| PIN_8 | PCM_CLK/I2S SCK (I/O)(0/1.8 V) | GPIO18 |

(table continues...)

3 Hardware

Table 12 (continued) M.2 radio module connector pin mapping

| Pin number | Pin name | Connection to the CM4 lite/other connectors |
|------------|---------------------------------|---|
| PIN_10 | PCM_SYNC/I2S WS (I/O)(0/1.8 V) | GPIO19 |
| PIN_12 | PCM_OUT/I2S SD_OUT (O)(0/1.8 V) | GPIO20 |
| PIN_14 | PCM_IN/I2S SD_IN (I)(0/1.8 V) | GPIO21 |
| PIN_16 | LED_2# (O)(OD) | LED2 |
| PIN_18 | GND | GND |
| PIN_20 | UART WAKE# (O)(0/3.3 V) | GPIO12 |
| PIN_22 | UART TXD (O)(0/1.8 V) | GPIO15 |
| PIN_32 | UART RXD (I)(0/1.8 V) | GPIO14 |
| PIN_34 | UART RTS (O)(0/1.8 V) | GPIO16 |
| PIN_36 | UART CTS (I)(0/1.8 V) | GPIO17 |
| PIN_38 | VENDOR DEFINED_1 | WL_JTAG_TDO |
| PIN_40 | VENDOR DEFINED_2 | WL_JTAG_TDI |
| PIN_42 | VENDOR DEFINED_3 | GPIO4 |
| PIN_44 | COEX3 (I/O)(0/1.8 V) | WL_JTAG_TRST |
| PIN_46 | COEX_TXD (O)(0/1.8V) | WL_JTAG_TCK |
| PIN_48 | COEX_RXD (I)(0/1.8 V) | WL_JTAG_TMS |
| PIN_50 | SUSCLK(32KHZ) (I)(0/3.3 V) | EXT_LPO_3P3 |
| PIN_52 | PERST0# (I)(0/3.3 V) | PCIE_nRST_3P3 |
| PIN_54 | W_DISABLE2# (I)(0/3.3 V) | GPIO3 |
| PIN_56 | W_DISABLE1# (I)(0/3.3 V) | GPIO2 |
| PIN_58 | I2C_DATA (I/O)(0/1.8 V) | NC |
| PIN_60 | I2C_CLK (I)(0/1.8 V) | NC |
| PIN_62 | ALERT# (O)(0/1.8 V) | WL_UART_RTS |
| PIN_64 | RESERVED | VDDIO |
| PIN_66 | UIM_SWP/PERST1# | WL_UART_CTS |
| PIN_68 | UIM_POWER_SNK/CLKREQ1# | WL_UART_TXD |
| PIN_70 | UIM_POWER_SRC/GPIO1/PEWAKE1# | WL_UART_RXD |
| PIN_72 | VBAT | VBAT |
| PIN_74 | VBAT | VBAT |

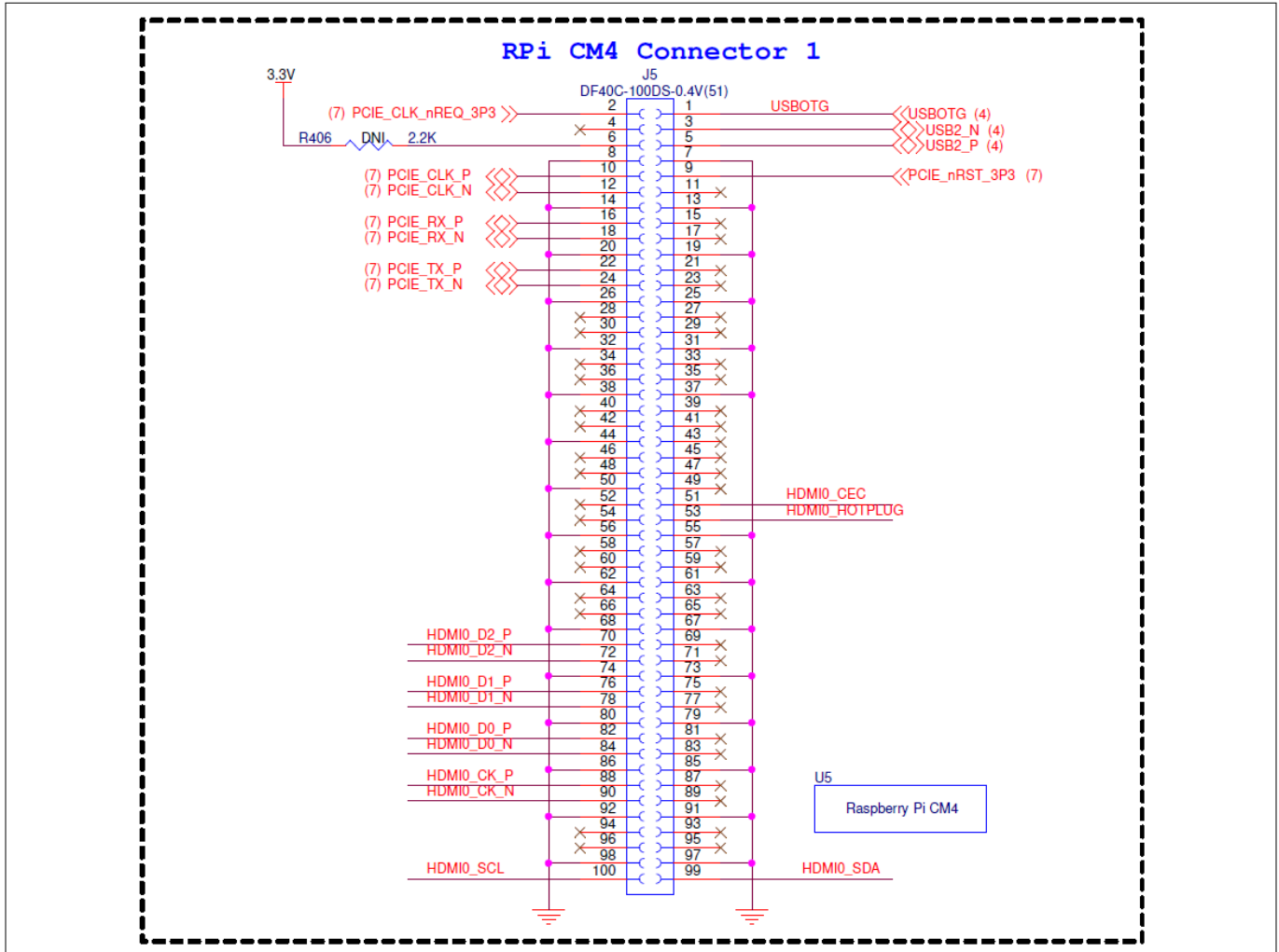
3.13 RPi CM4 lite connectors

On the baseboard, the CM4 lite module is mounted on two 100-pin board-to-board connectors, which bring out all the major interfaces and GPIOs from the CM4 lite module to the baseboard and provide 5 V power from the baseboard to the module.

3 Hardware

Major control pins from the CM4 lite module are routed to a 8x DIP switch (SW8) for user access. See the [Switches](#) section for more details. The CM4 power LED and activity LED on the baseboard are driven from the CM4 via this connector. CM4 GPIO voltage levels can be selected between 1.8 V and 3.3 V using a DIP switch (SW9).

3 Hardware



3 Hardware

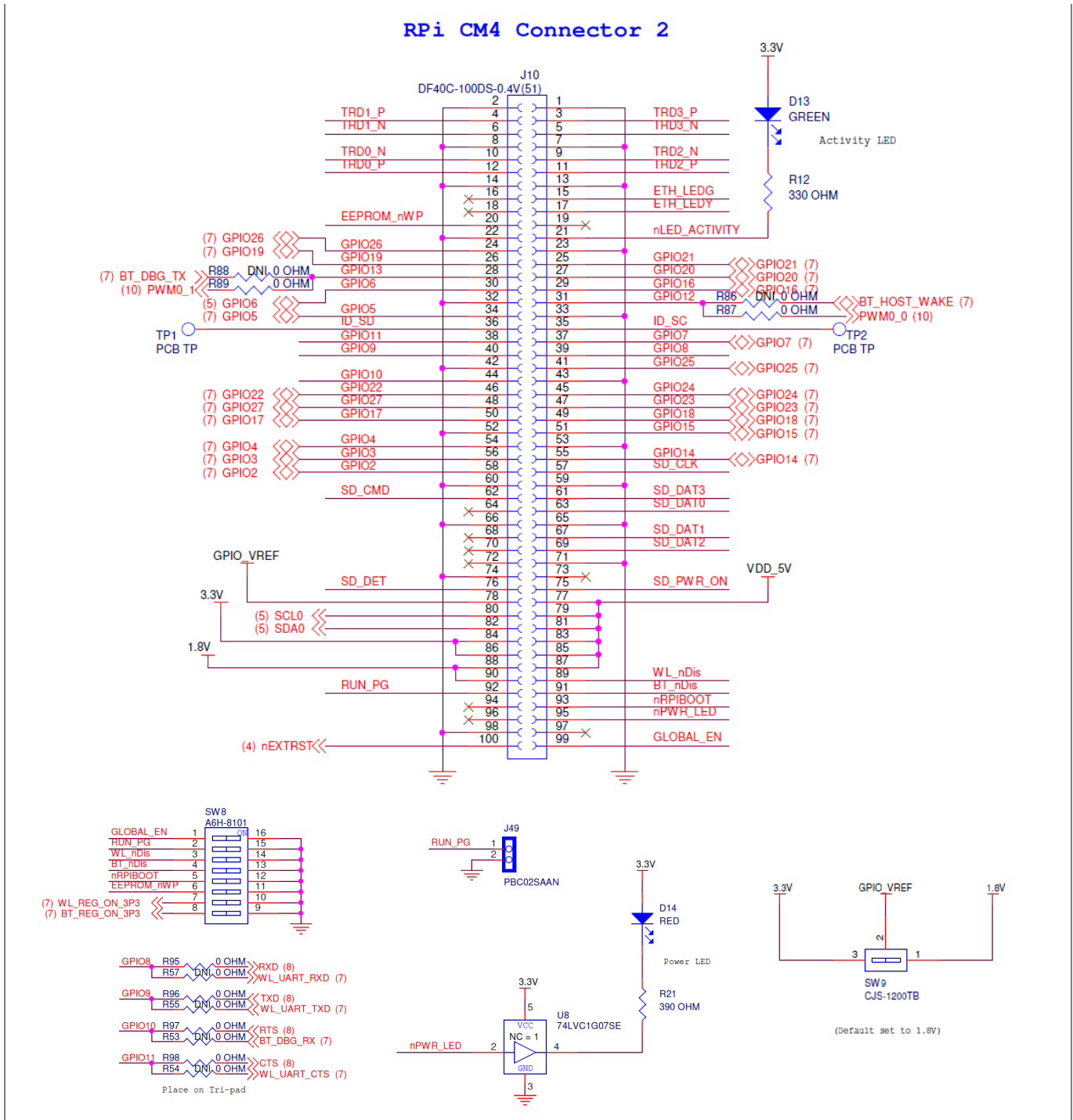


Figure 21 CM4 lite module connector interface

The following table provides the pin mapping details of the CM4 lite module board-to-board connectors.

Table 13 CM4 lite board-to-board connector pin mapping

| Pin number | Connection to CM4 lite module |
|------------|-------------------------------|
| PIN_J5.1 | USBOTG |
| PIN_J5.2 | PCIE_CLK_NREQ_3P3 |
| PIN_J5.3 | USB2_N |

(table continues...)

3 Hardware

Table 13 (continued) CM4 lite board-to-board connector pin mapping

| Pin number | Connection to CM4 lite module |
|------------|-------------------------------|
| PIN_J5.4 | NC |
| PIN_J5.5 | USB2_P |
| PIN_J5.6 | NC |
| PIN_J5.7 | GND |
| PIN_J5.8 | GND |
| PIN_J5.9 | PCIE_NRST_3P3 |
| PIN_J5.10 | PCIE_CLK_P |
| PIN_J5.11 | NC |
| PIN_J5.12 | PCIE_CLK_N |
| PIN_J5.13 | GND |
| PIN_J5.14 | GND |
| PIN_J5.15 | NC |
| PIN_J5.16 | PCIE_RX_P |
| PIN_J5.17 | NC |
| PIN_J5.18 | PCIE_RX_N |
| PIN_J5.19 | GND |
| PIN_J5.20 | GND |
| PIN_J5.21 | NC |
| PIN_J5.22 | PCIE_TX_P |
| PIN_J5.23 | NC |
| PIN_J5.24 | PCIE_TX_N |
| PIN_J5.25 | GND |
| PIN_J5.26 | GND |
| PIN_J5.27 | NC |
| PIN_J5.28 | NC |
| PIN_J5.29 | NC |
| PIN_J5.30 | NC |
| PIN_J5.31 | GND |
| PIN_J5.32 | GND |
| PIN_J5.33 | NC |
| PIN_J5.34 | NC |
| PIN_J5.35 | NC |
| PIN_J5.36 | NC |

(table continues...)

3 Hardware

Table 13 (continued) CM4 lite board-to-board connector pin mapping

| Pin number | Connection to CM4 lite module |
|------------|-------------------------------|
| PIN_J5.37 | GND |
| PIN_J5.38 | GND |
| PIN_J5.39 | NC |
| PIN_J5.40 | NC |
| PIN_J5.41 | NC |
| PIN_J5.42 | NC |
| PIN_J5.43 | NC |
| PIN_J5.44 | GND |
| PIN_J5.45 | NC |
| PIN_J5.46 | NC |
| PIN_J5.47 | NC |
| PIN_J5.48 | NC |
| PIN_J5.49 | NC |
| PIN_J5.50 | GND |
| PIN_J5.51 | HDMI0_CEC |
| PIN_J5.52 | NC |
| PIN_J5.53 | HDMI0_HOTPLUG |
| PIN_J5.54 | NC |
| PIN_J5.55 | GND |
| PIN_J5.56 | GND |
| PIN_J5.57 | NC |
| PIN_J5.58 | NC |
| PIN_J5.59 | NC |
| PIN_J5.60 | NC |
| PIN_J5.61 | GND |
| PIN_J5.62 | GND |
| PIN_J5.63 | NC |
| PIN_J5.64 | NC |
| PIN_J5.65 | NC |
| PIN_J5.66 | NC |
| PIN_J5.67 | GND |
| PIN_J5.68 | GND |
| PIN_J5.69 | NC |

(table continues...)

3 Hardware

Table 13 (continued) CM4 lite board-to-board connector pin mapping

| Pin number | Connection to CM4 lite module |
|------------|-------------------------------|
| PIN_J5.70 | HDMI0_D2_P |
| PIN_J5.71 | NC |
| PIN_J5.72 | HDMI0_D2_N |
| PIN_J5.73 | GND |
| PIN_J5.74 | GND |
| PIN_J5.75 | NC |
| PIN_J5.76 | HDMI0_D1_P |
| PIN_J5.77 | NC |
| PIN_J5.78 | HDMI0_D1_N |
| PIN_J5.79 | GND |
| PIN_J5.80 | GND |
| PIN_J5.81 | NC |
| PIN_J5.82 | HDMI0_D0_P |
| PIN_J5.83 | NC |
| PIN_J5.84 | HDMI0_D0_N |
| PIN_J5.85 | GND |
| PIN_J5.86 | GND |
| PIN_J5.87 | NC |
| PIN_J5.88 | HDMI0_CK_P |
| PIN_J5.89 | NC |
| PIN_J5.90 | HDMI0_CK_N |
| PIN_J5.91 | GND |
| PIN_J5.92 | GND |
| PIN_J5.93 | NC |
| PIN_J5.94 | NC |
| PIN_J5.95 | NC |
| PIN_J5.96 | NC |
| PIN_J5.97 | GND |
| PIN_J5.98 | GND |
| PIN_J5.99 | HDMI0_SDA |
| PIN_J5.100 | HDMI0_SCL |
| PIN_J10.1 | GND |
| PIN_J10.2 | GND |

(table continues...)

3 Hardware

Table 13 (continued) CM4 lite board-to-board connector pin mapping

| Pin number | Connection to CM4 lite module |
|------------|-------------------------------|
| PIN_J10.3 | TRD3_P |
| PIN_J10.4 | TRD1_P |
| PIN_J10.5 | TRD3_N |
| PIN_J10.6 | TRD1_N |
| PIN_J10.7 | GND |
| PIN_J10.8 | GND |
| PIN_J10.9 | TRD2_N |
| PIN_J10.10 | TRD0_N |
| PIN_J10.11 | TRD2_P |
| PIN_J10.12 | TRD0_P |
| PIN_J10.13 | GND |
| PIN_J10.14 | GND |
| PIN_J10.15 | ETH_LEDG |
| PIN_J10.16 | NC |
| PIN_J10.17 | ETH_LEDY |
| PIN_J10.18 | NC |
| PIN_J10.19 | NC |
| PIN_J10.20 | EEPROM_NWP |
| PIN_J10.21 | NLED_ACTIVITY |
| PIN_J10.22 | GND |
| PIN_J10.23 | GND |
| PIN_J10.24 | GPIO26 |
| PIN_J10.25 | GPIO21 |
| PIN_J10.26 | GPIO19 |
| PIN_J10.27 | GPIO20 |
| PIN_J10.28 | GPIO13 |
| PIN_J10.29 | GPIO16 |
| PIN_J10.30 | GPIO6 |
| PIN_J10.31 | GPIO12 |
| PIN_J10.32 | GND |
| PIN_J10.33 | GND |
| PIN_J10.34 | GPIO5 |
| PIN_J10.35 | ID_SC |

(table continues...)

3 Hardware

Table 13 (continued) CM4 lite board-to-board connector pin mapping

| Pin number | Connection to CM4 lite module |
|------------|-------------------------------|
| PIN_J10.36 | ID_SD |
| PIN_J10.37 | GPIO7 |
| PIN_J10.38 | GPIO11 |
| PIN_J10.39 | GPIO8 |
| PIN_J10.40 | GPIO9 |
| PIN_J10.41 | GPIO25 |
| PIN_J10.42 | GND |
| PIN_J10.43 | GND |
| PIN_J10.44 | GPIO10 |
| PIN_J10.45 | GPIO24 |
| PIN_J10.46 | GPIO22 |
| PIN_J10.47 | GPIO23 |
| PIN_J10.48 | GPIO27 |
| PIN_J10.49 | GPIO18 |
| PIN_J10.50 | GPIO17 |
| PIN_J10.51 | GPIO15 |
| PIN_J10.52 | GND |
| PIN_J10.53 | GND |
| PIN_J10.54 | GPIO4 |
| PIN_J10.55 | GPIO14 |
| PIN_J10.56 | GPIO3 |
| PIN_J10.57 | SD_CLK |
| PIN_J10.58 | GPIO2 |
| PIN_J10.59 | GND |
| PIN_J10.60 | GND |
| PIN_J10.61 | SD_DAT3 |
| PIN_J10.62 | SD_CMD |
| PIN_J10.63 | SD_DAT0 |
| PIN_J10.64 | NC |
| PIN_J10.65 | GND |
| PIN_J10.66 | GND |
| PIN_J10.67 | SD_DAT1 |
| PIN_J10.68 | NC |

(table continues...)

3 Hardware

Table 13 (continued) CM4 lite board-to-board connector pin mapping

| Pin number | Connection to CM4 lite module |
|-------------|-------------------------------|
| PIN_J10.69 | SD_DAT2 |
| PIN_J10.70 | NC |
| PIN_J10.71 | GND |
| PIN_J10.72 | NC |
| PIN_J10.73 | NC |
| PIN_J10.74 | GND |
| PIN_J10.75 | SD_PWR_ON |
| PIN_J10.76 | SD_DET |
| PIN_J10.77 | VDD_5V |
| PIN_J10.78 | GPIO_VREF |
| PIN_J10.79 | VDD_5V |
| PIN_J10.80 | SCL0 |
| PIN_J10.81 | VDD_5V |
| PIN_J10.82 | SDA0 |
| PIN_J10.83 | VDD_5V |
| PIN_J10.84 | 3.3 V |
| PIN_J10.85 | VDD_5V |
| PIN_J10.86 | 3.3 V |
| PIN_J10.87 | VDD_5V |
| PIN_J10.88 | 1.8 V |
| PIN_J10.89 | WL_NDIS |
| PIN_J10.90 | 1.8 V |
| PIN_J10.91 | BT_NDIS |
| PIN_J10.92 | RUN_PG |
| PIN_J10.93 | NRPIBOOT |
| PIN_J10.94 | NC |
| PIN_J10.95 | NPWR_LED |
| PIN_J10.96 | NC |
| PIN_J10.97 | NC |
| PIN_J10.98 | GND |
| PIN_J10.99 | GLOBAL_EN |
| PIN_J10.100 | NEXTRST |

4 Kit rework

4 Kit rework

This section provides rework instructions for enabling features that are not available by default in the CYW9RPIWIFIBT-EVK Kit. Note that all the rework instructions are made considering the kit at its default hardware setting. These instructions may not be valid for an already reworked kit.

4.1 Rework to connect M.2 radio USB interface to USB hub

On the CYW9RPIWIFIBT-EVK Kit, the USB interface of the M.2 radio module is not connected to the CM4 lite module. This connection can be enabled by following the rework instructions mentioned below and can be connected to the CM4 lite module via the USB hub, instead of one USB Type-A peripheral port.

- Remove R5 and R9
- Mount R92 and R93

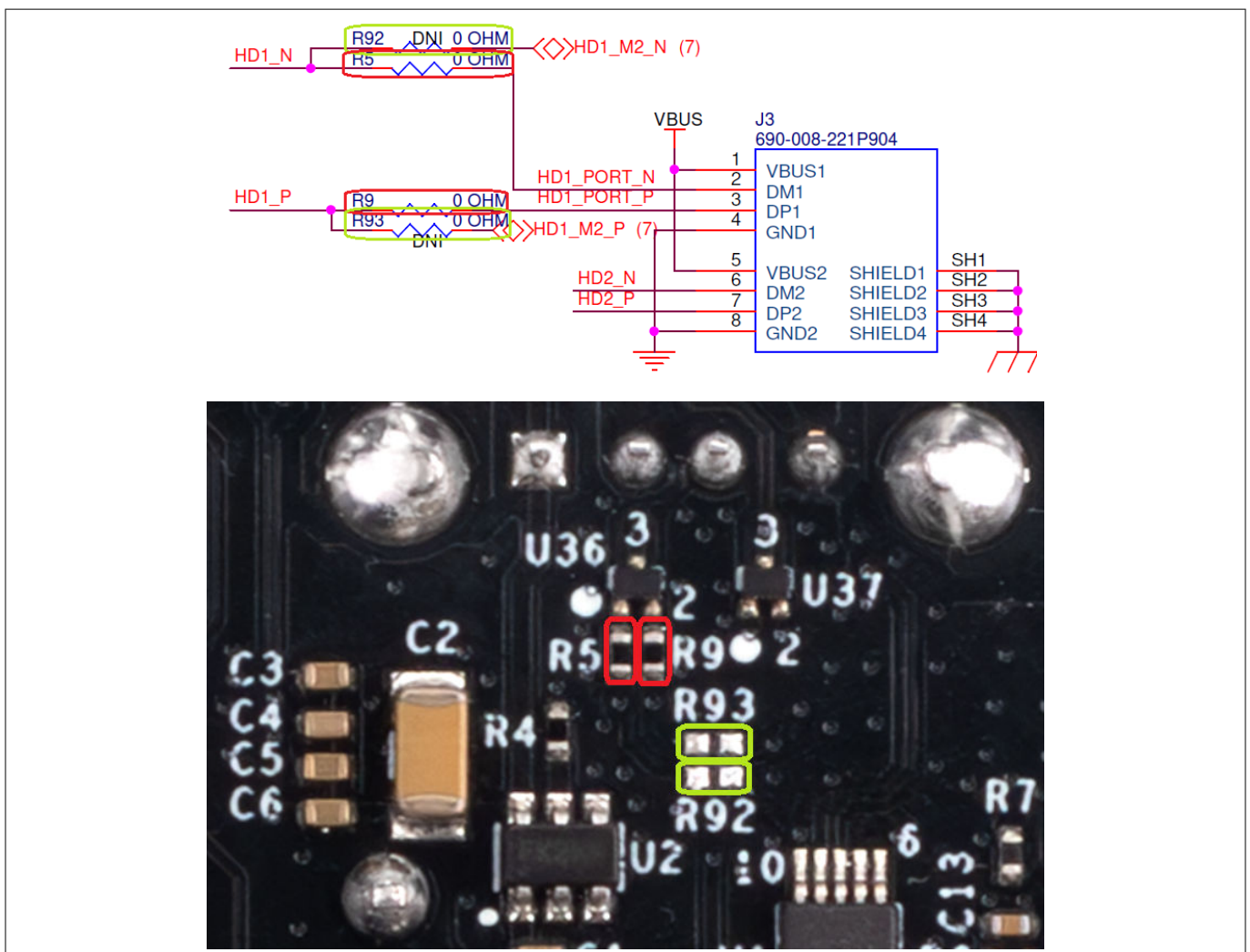


Figure 22 M.2 radio USB rework

4.2 Rework for M.2 radio BT_HOST_WAKE and BT_DBG_TX

By default, GPIO12 and GPIO13 on the baseboard, from the CM4 lite module are used for the PWM audio out operation. To use these pins as BT_HOST_WAKE and BT_DBG_TX to the M.2 radio module, the following rework instructions should be implemented on the baseboard:

4 Kit rework

- Remove R87 and R89
- Mount R86 and R88

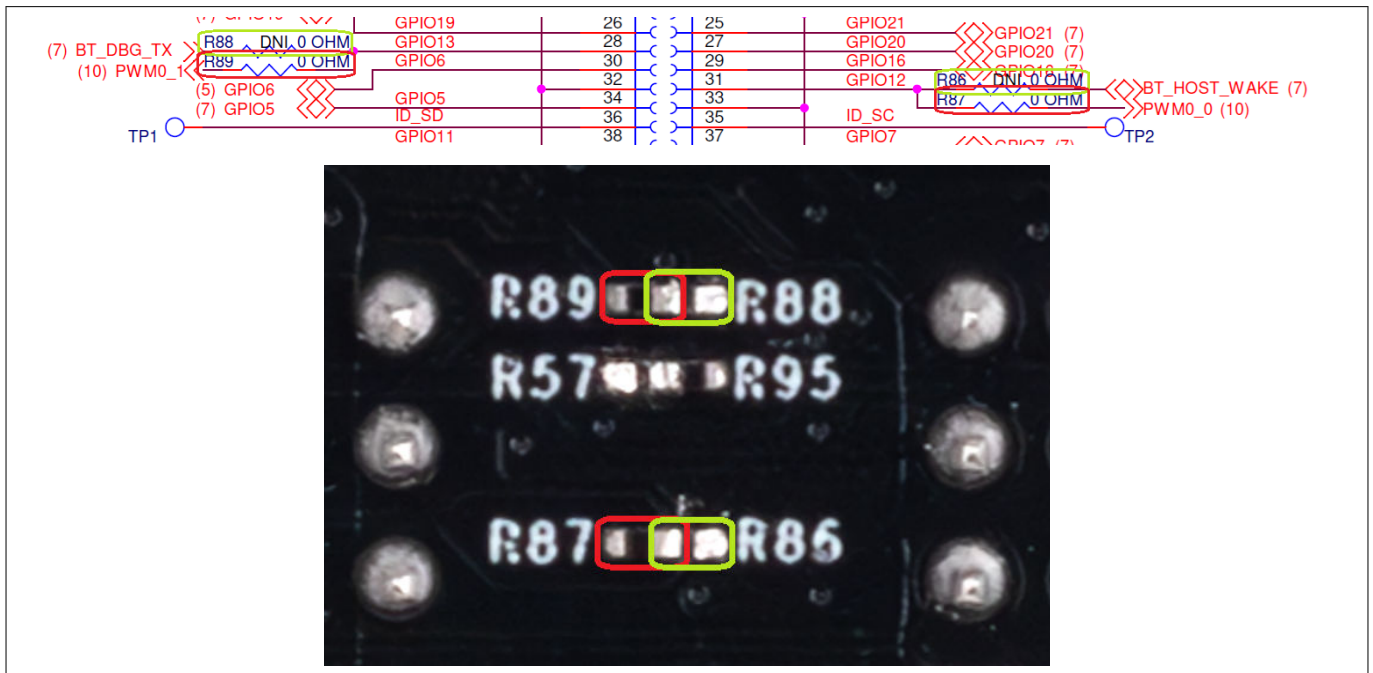


Figure 23 BT_HOST_WAKE and BT_DBG_TX rework

4.3 Rework for M.2 radio WL_UART and BT_DBG_RX

WL UART pins from the M.2 radio module are not connected to the CM4 lite module by default, as those GPIOs are used for the serial console. To establish this connection, the following rework should be implemented on the baseboard:

- Remove R95, R96, R97, and R98
- Mount R53, R54, R55, and R57

4 Kit rework



Figure 24 WL UART interface rework

Revision history

Revision history

| Document version | Date of release | Description of changes |
|------------------|-----------------|------------------------|
| ** | 2024-06-14 | Initial release |

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