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

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

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.

1.2 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.
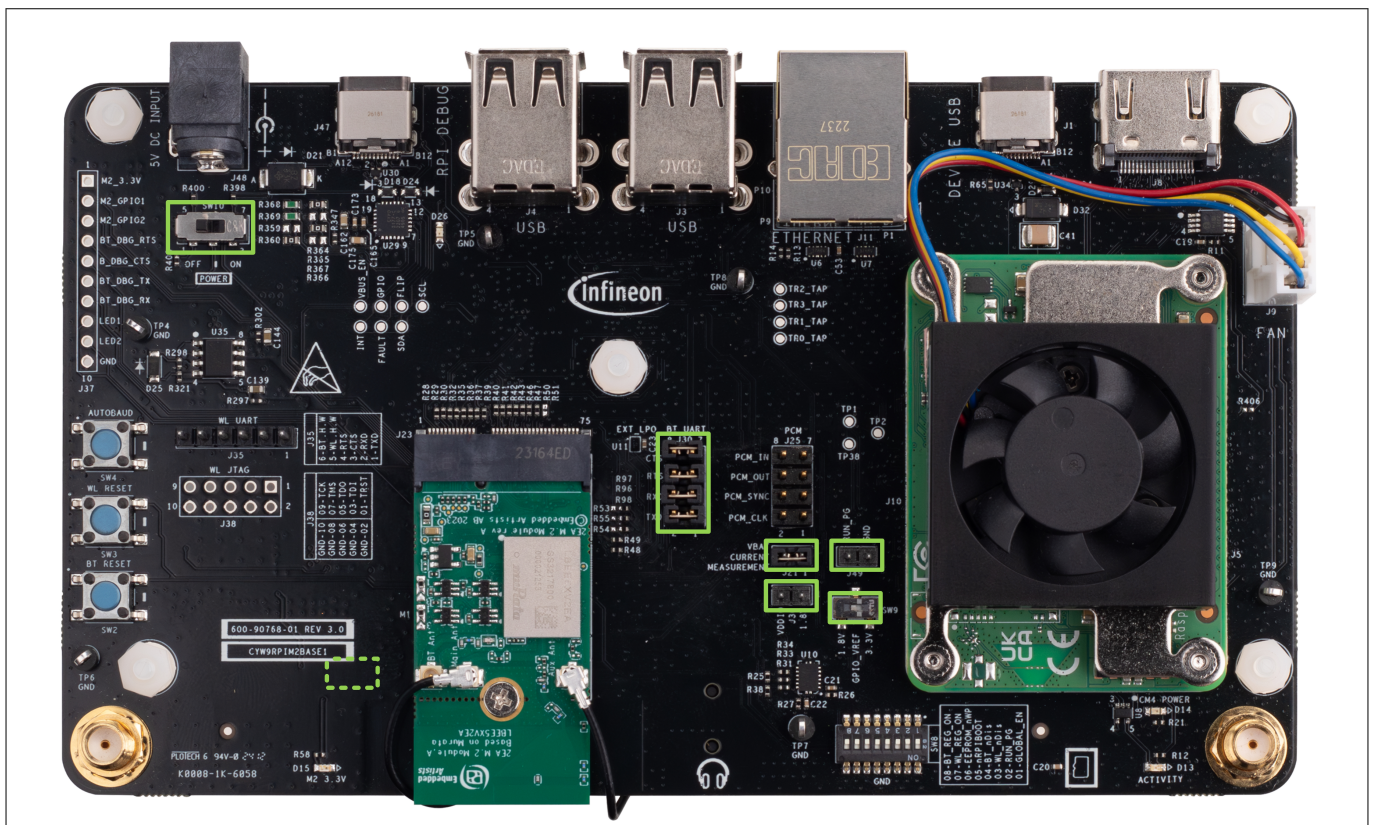

Figure 2   **CYW9RPIWIFIBT-EVK default jumper and switch setting**

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
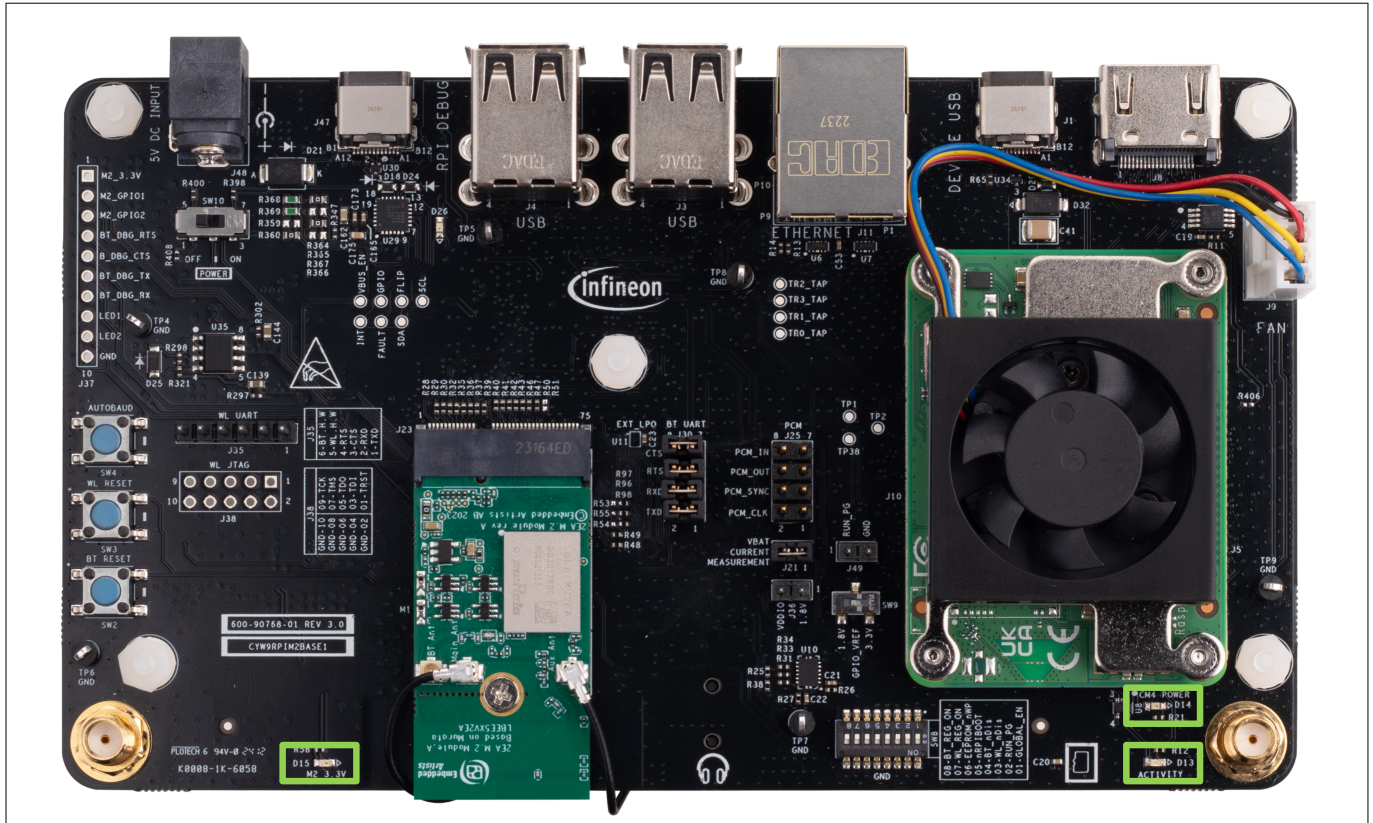
Figure 3   **CYW9RPIWIFIBT-EVK indication LEDs**

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
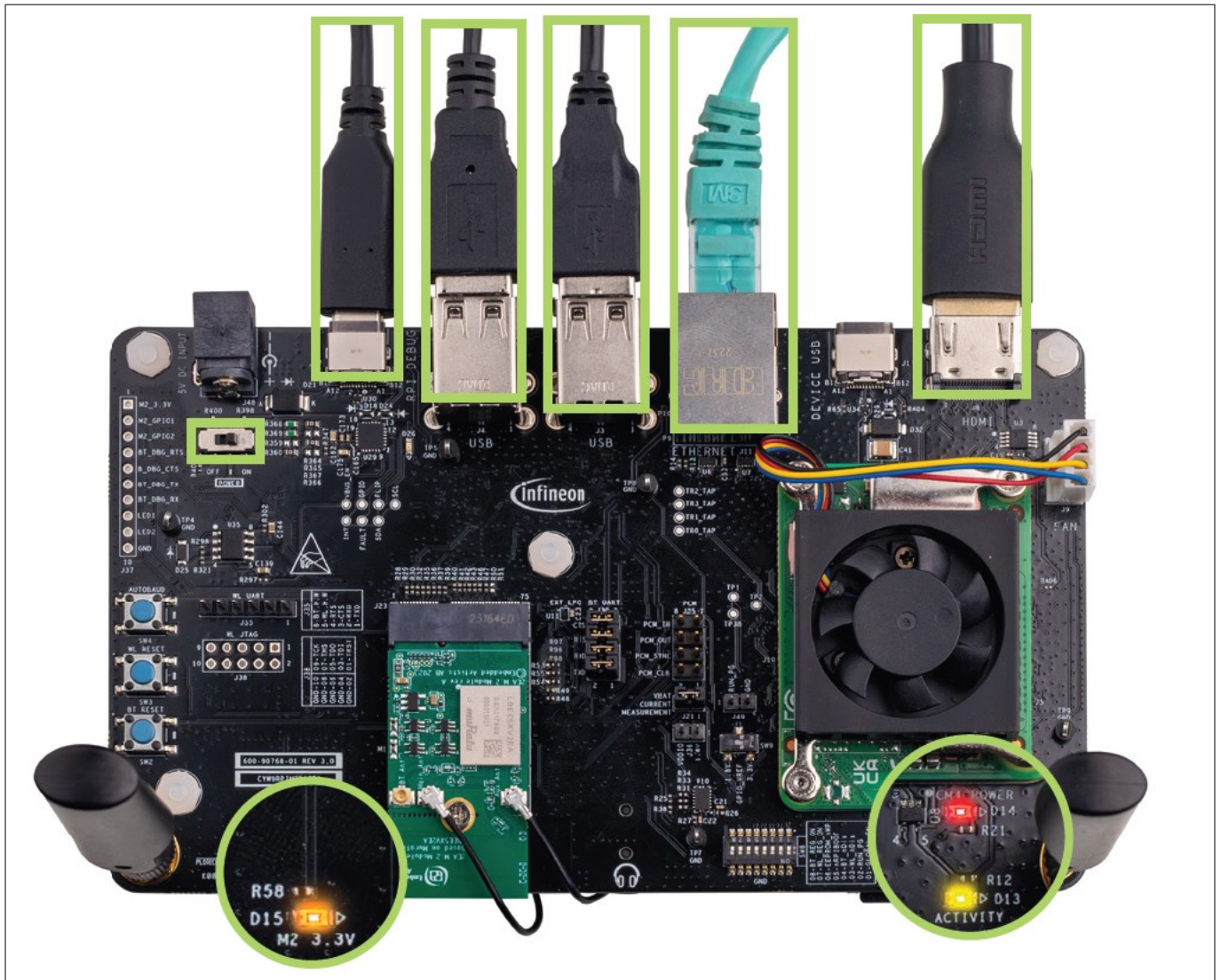
Figure 4 **Getting started with CYW9RPIWIFIBT-EVK**

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

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
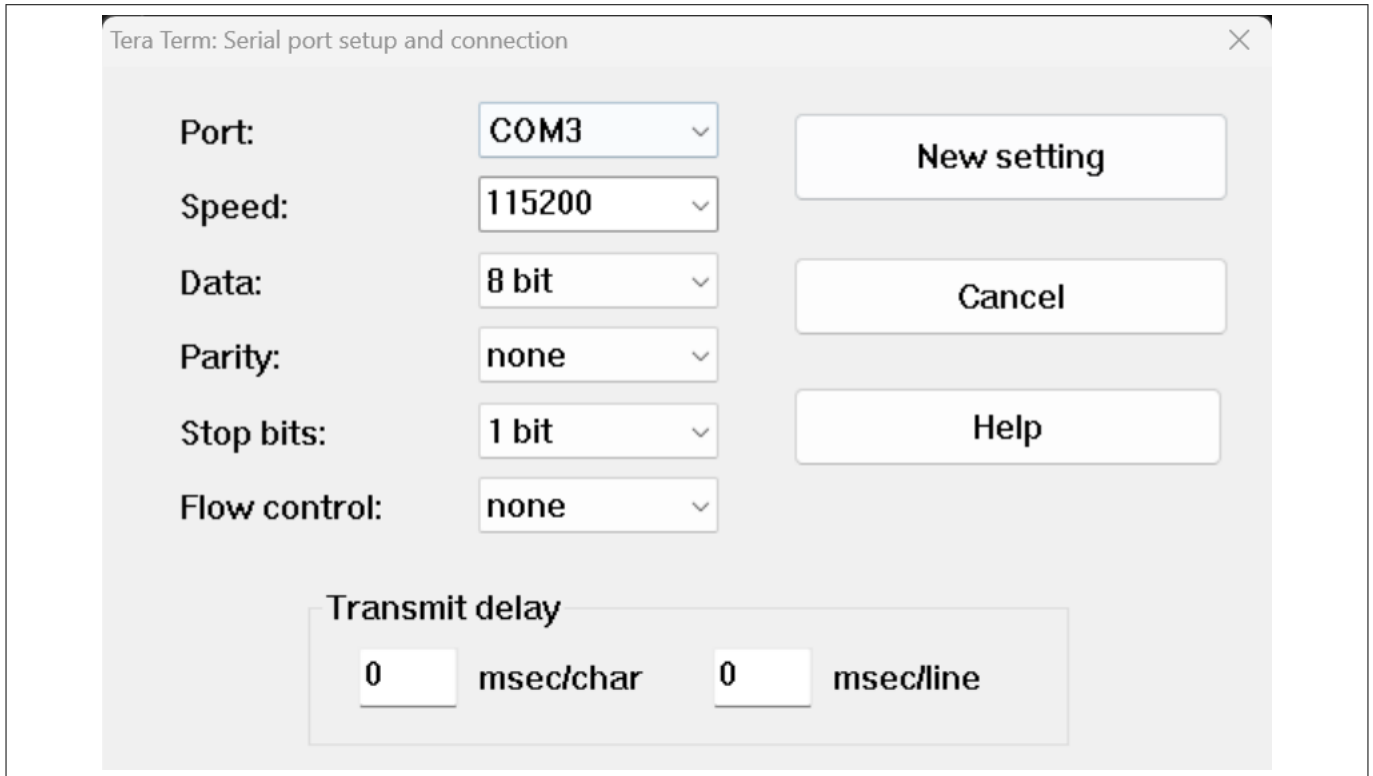
Figure 5   **USB-UART COM port setup**

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

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.
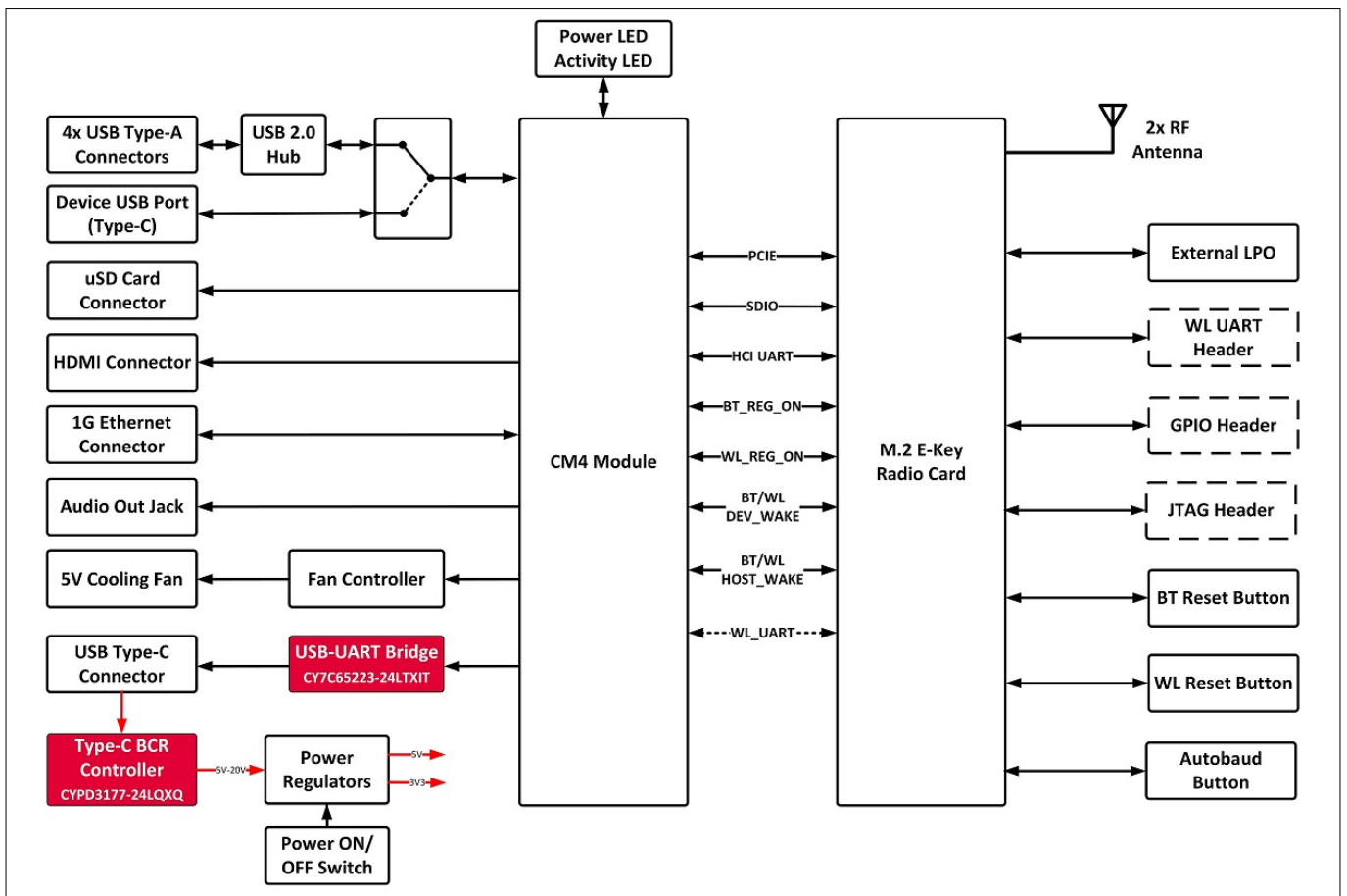

Figure 6 CYW9RPIWIFIBT-EVK block diagram

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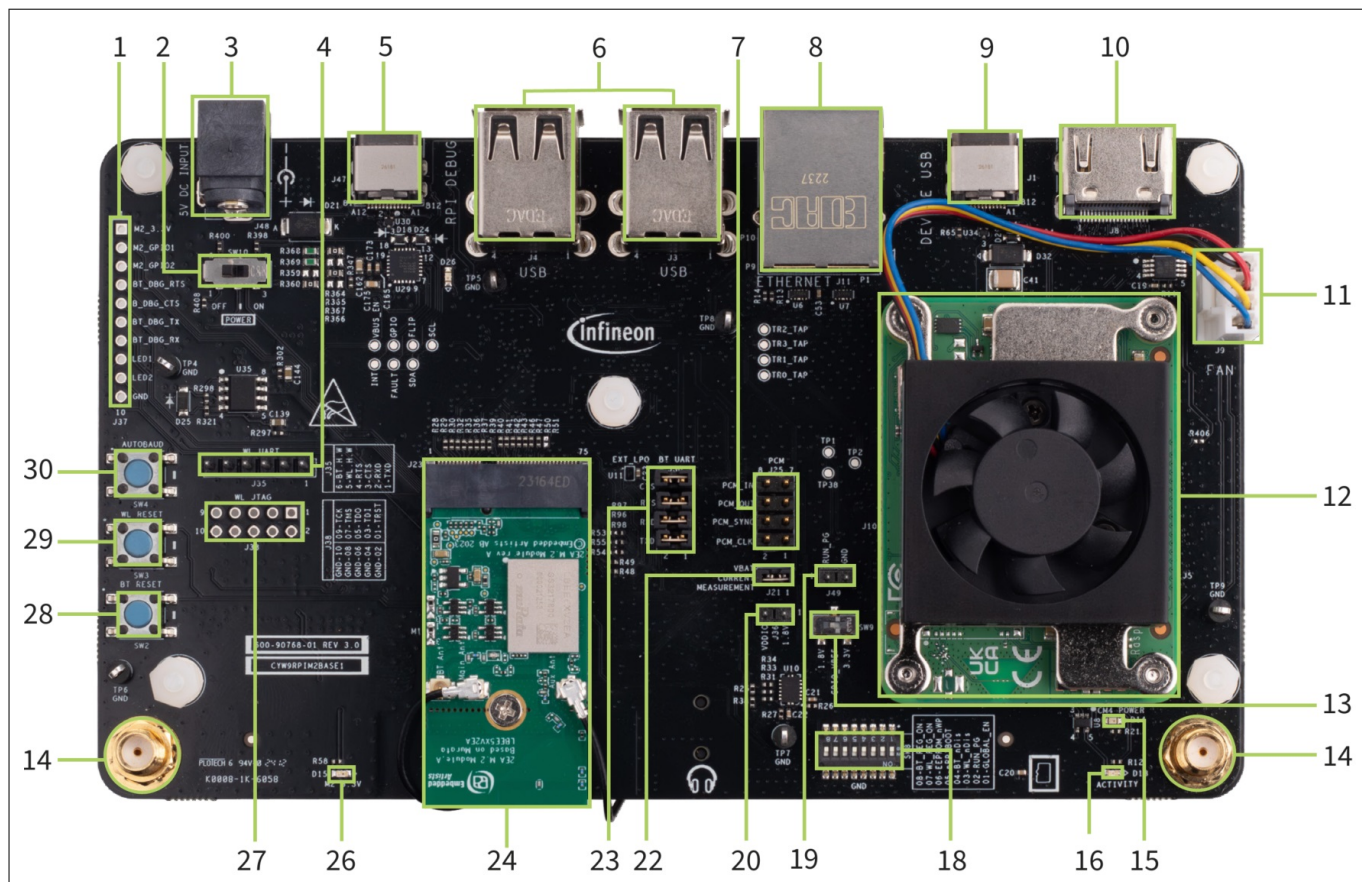
2 Kit operation

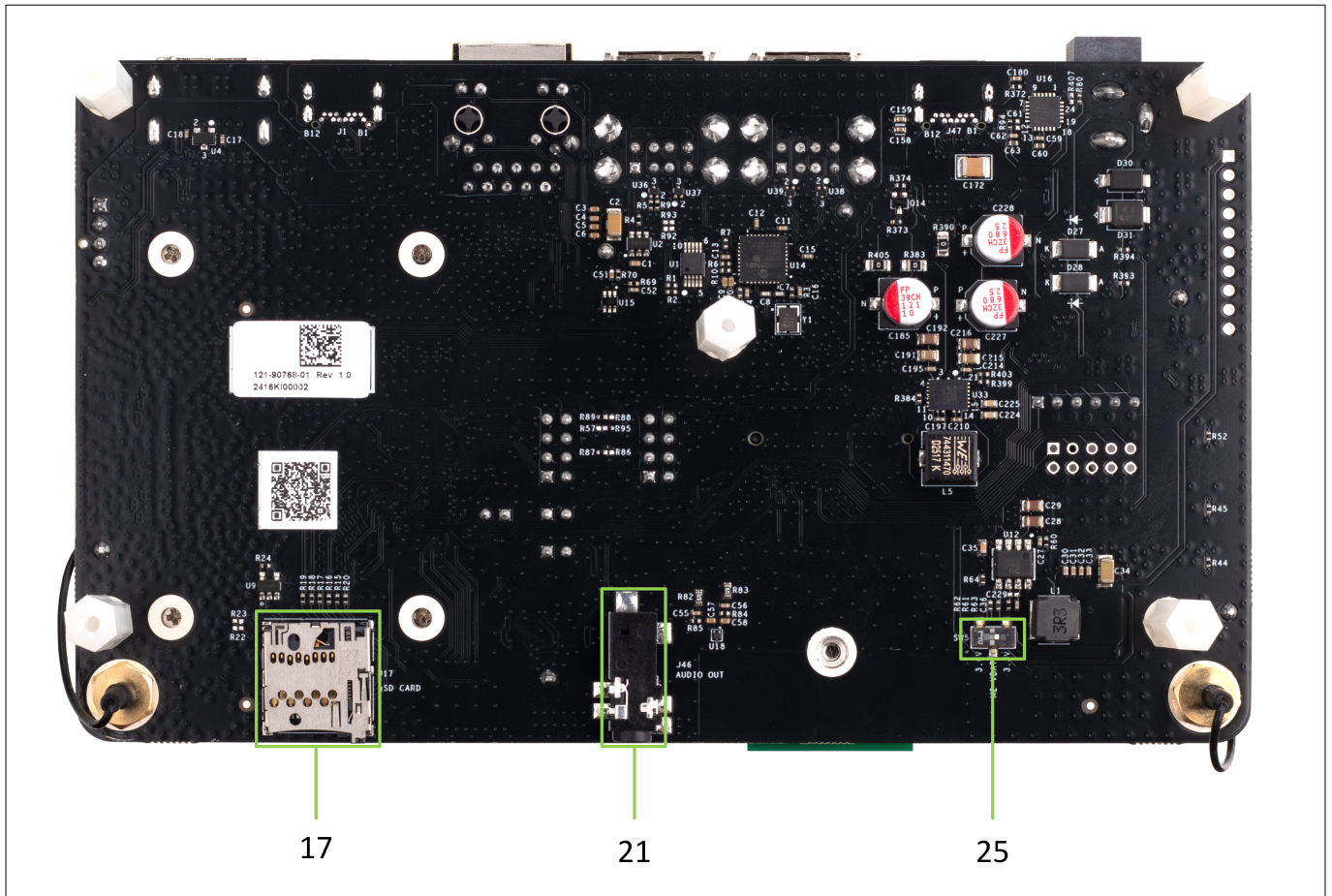**Figure 7**   CYW9RPIWIFIBT-EVK top side

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

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

2.3 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	

2.4 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	WL_UART_TXD	WLAN debug UART transmitter
2	WL_UART_RXD	WLAN debug UART receiver
3	WL_UART_CTS	WLAN debug UART clear to send
4	WL_UART_RTS	WLAN debug UART request to send
5	WL_HOST_WAKE	WLAN host wake signal from radio module
6	BT_HOST_WAKE	Bluetooth® host wake signal from radio module

Table 10   **WL JTAG connector (J38)**

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

Table 11   **M.2 GPIO header (J37)**

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

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

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

CYW9PIM2BASE1 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.
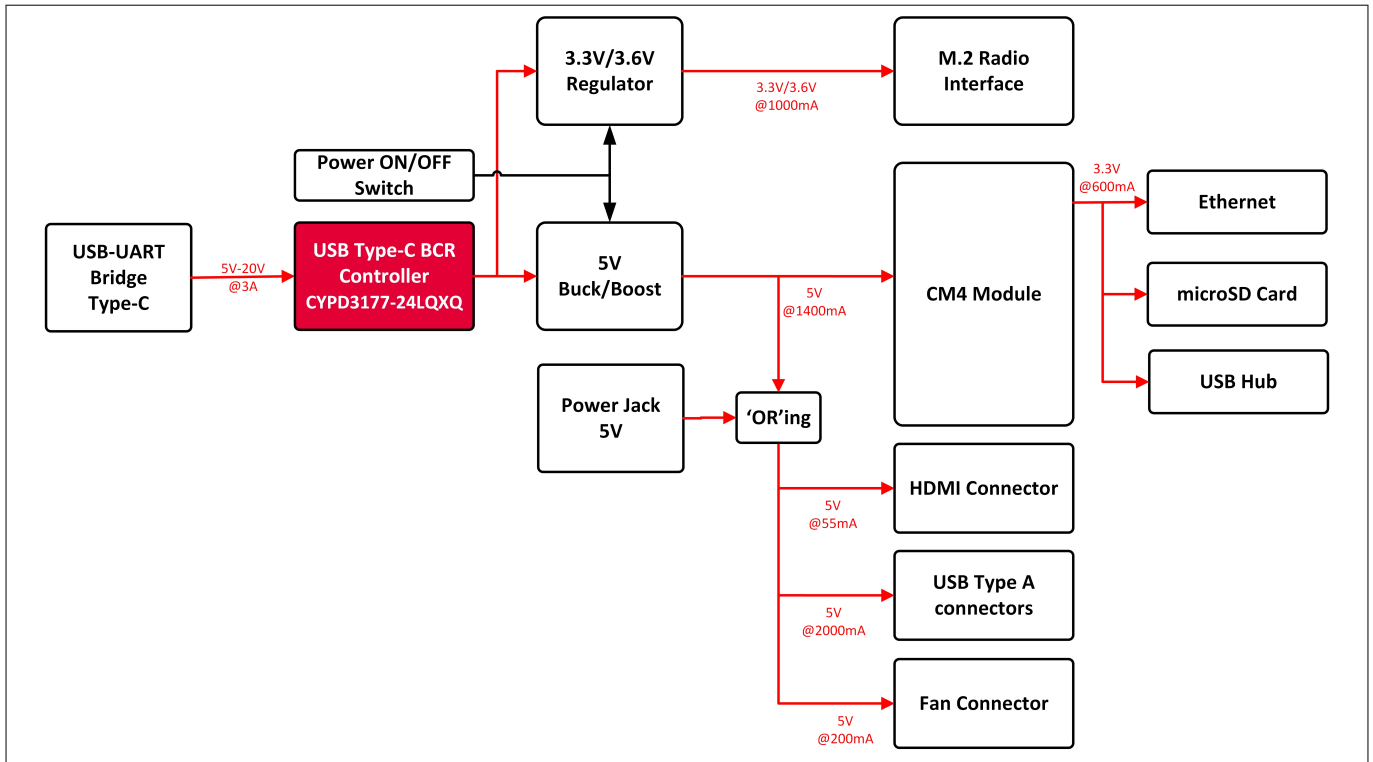
3 Hardware

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.
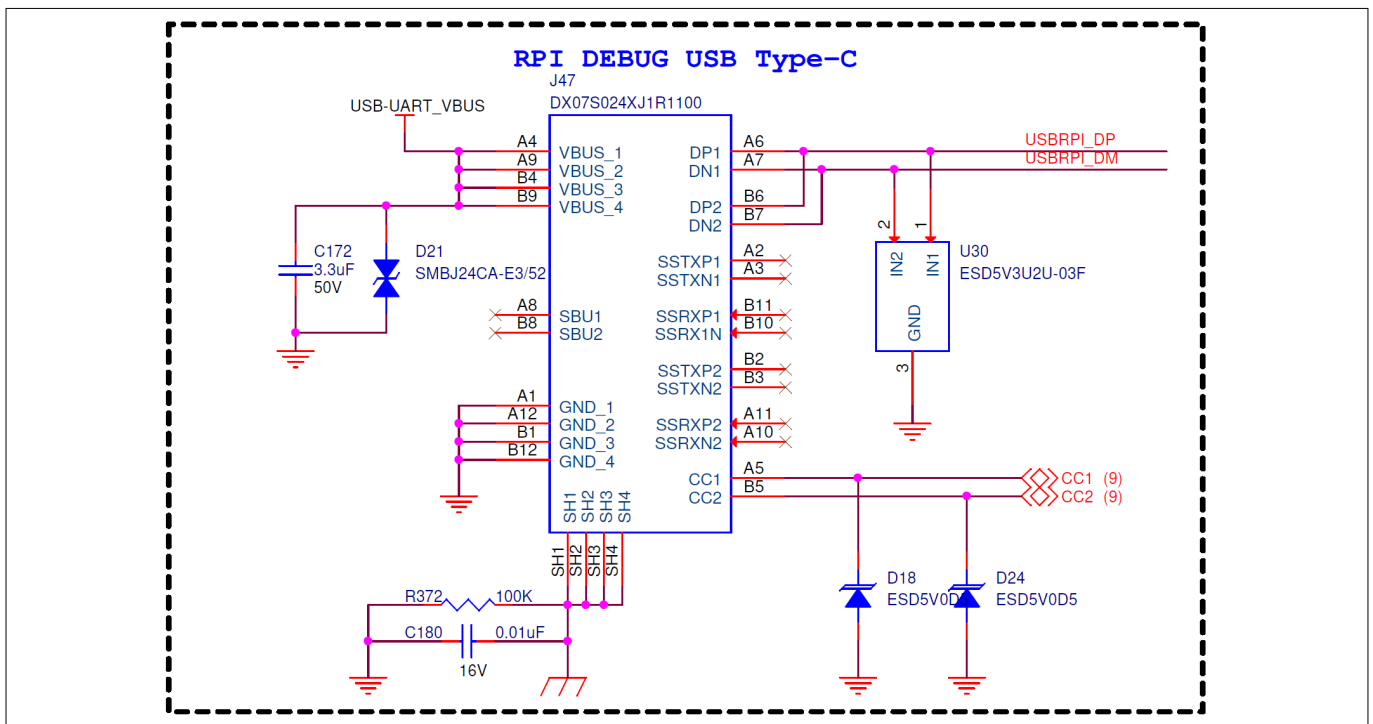

Figure 10   **Power input USB Type-C connector**

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).
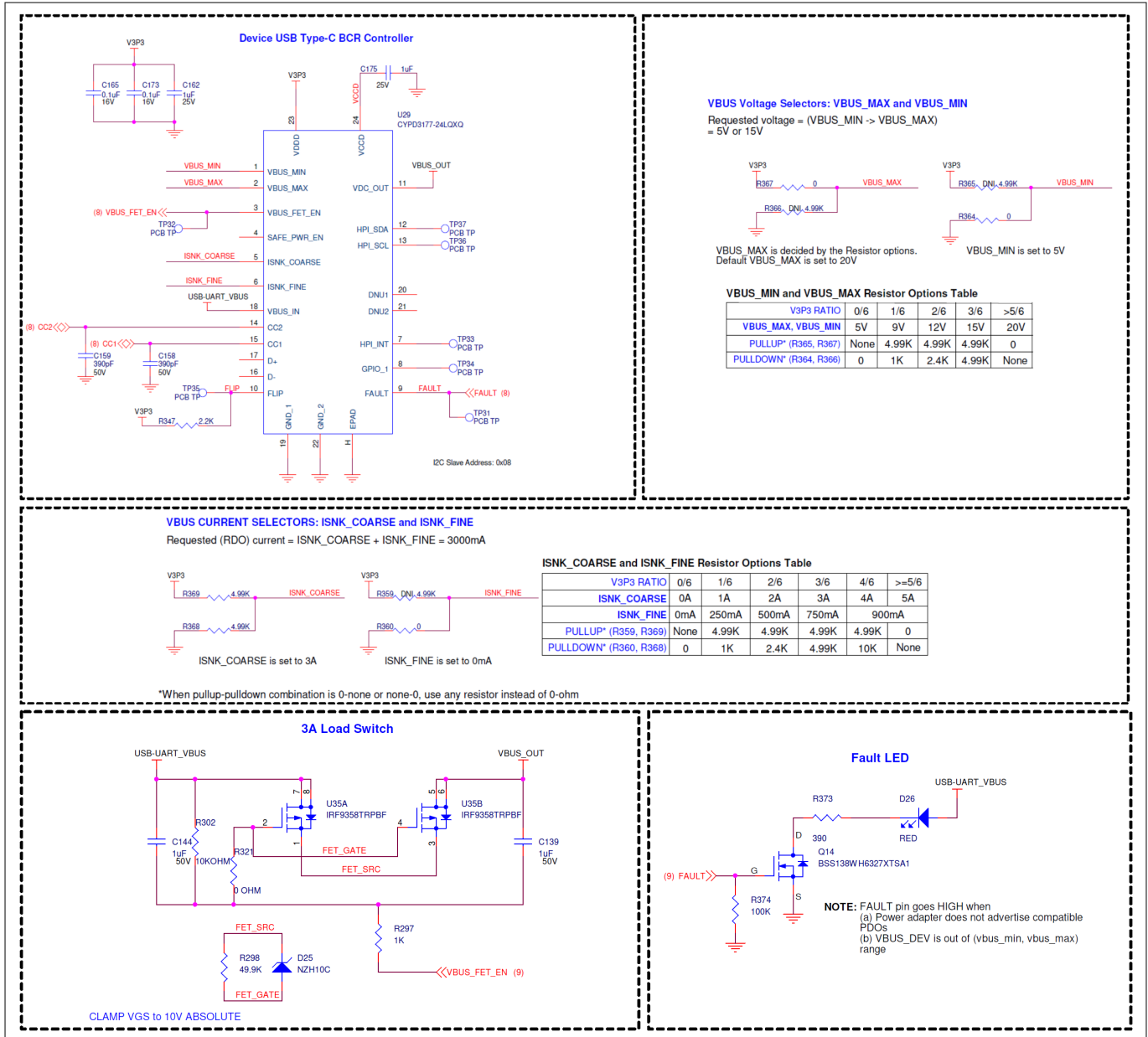

Figure 11   BCR controller circuitry

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.
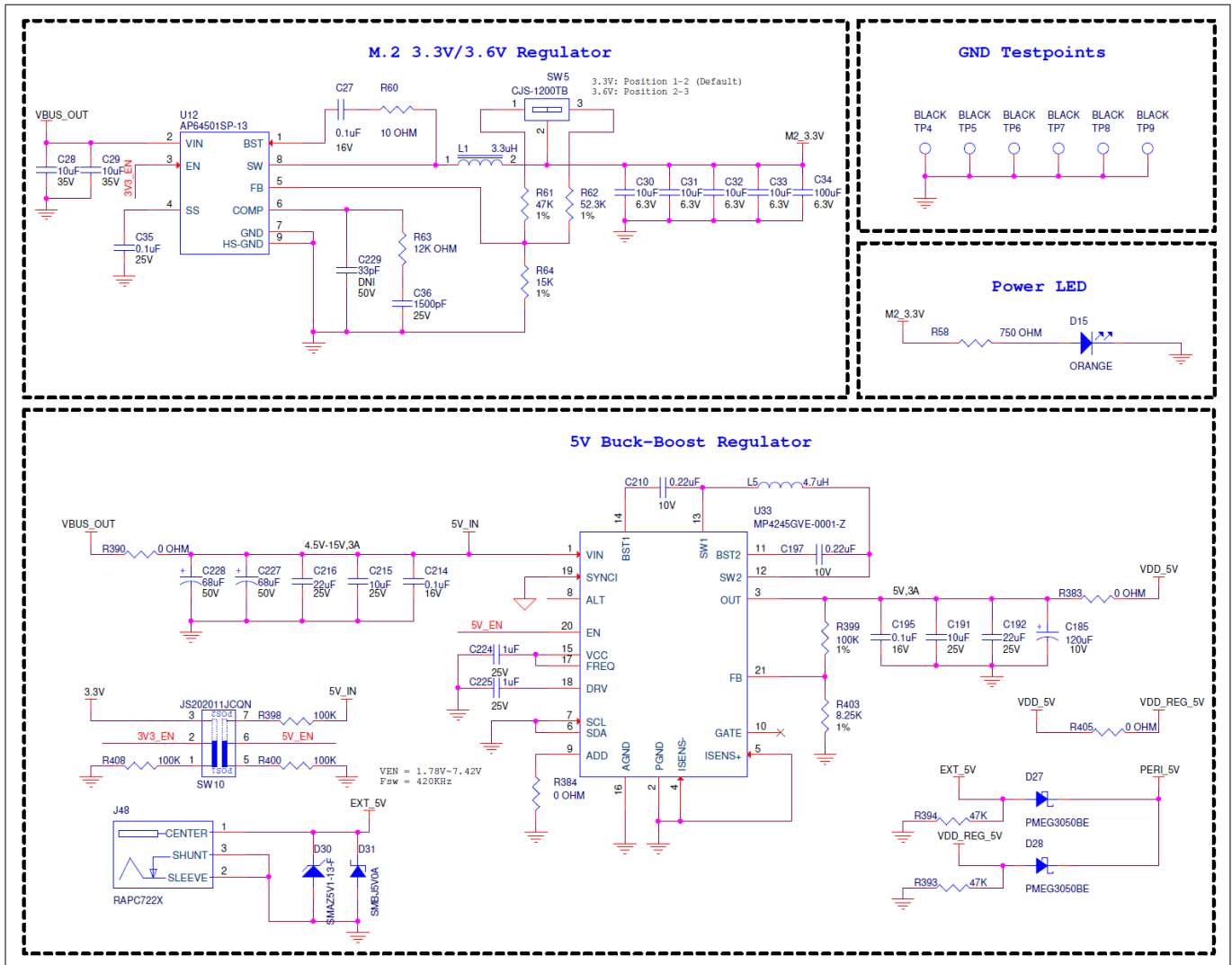
Figure 12   **Voltage regulators and optional 5 V DC jack input**

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 USB peripheral ports are powered from the PERI_5V rail via a current limit switch.

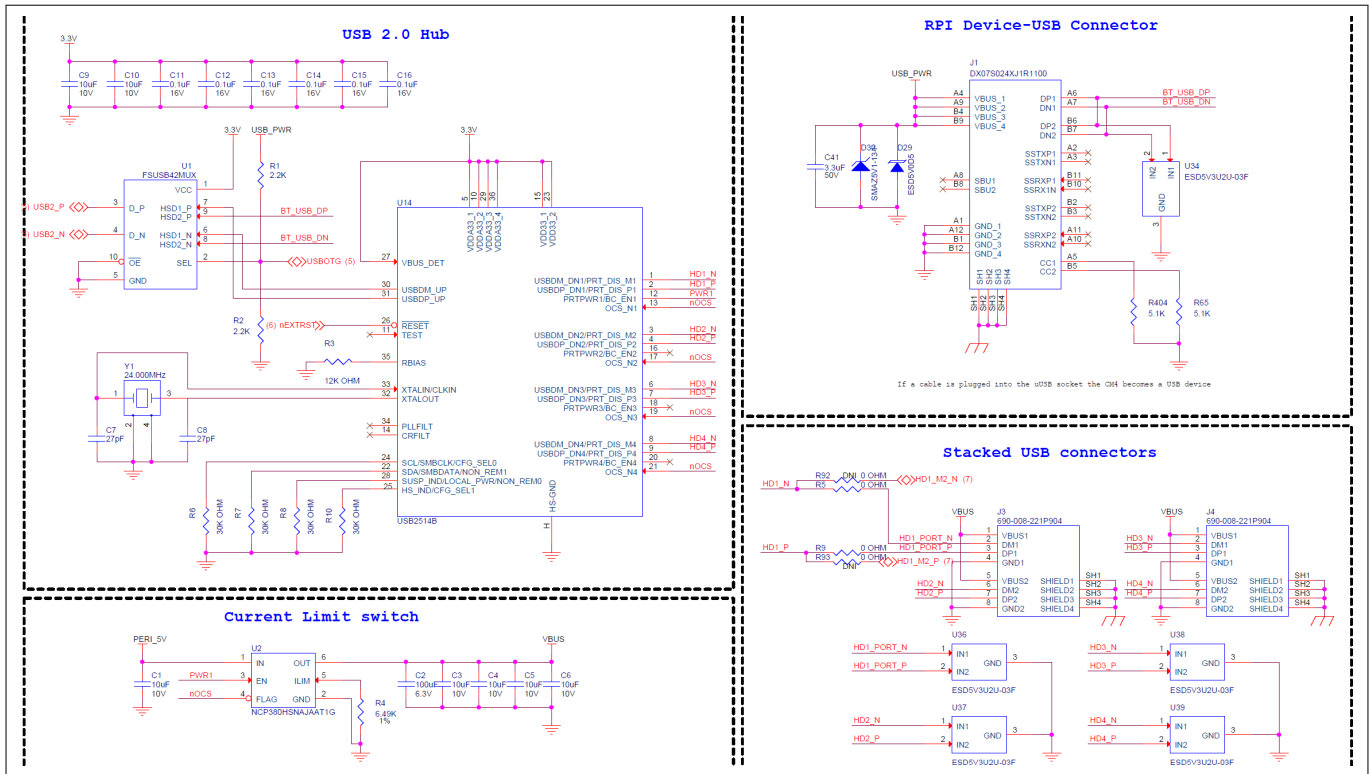**Figure 13**   **USB ports with hub controller**

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.
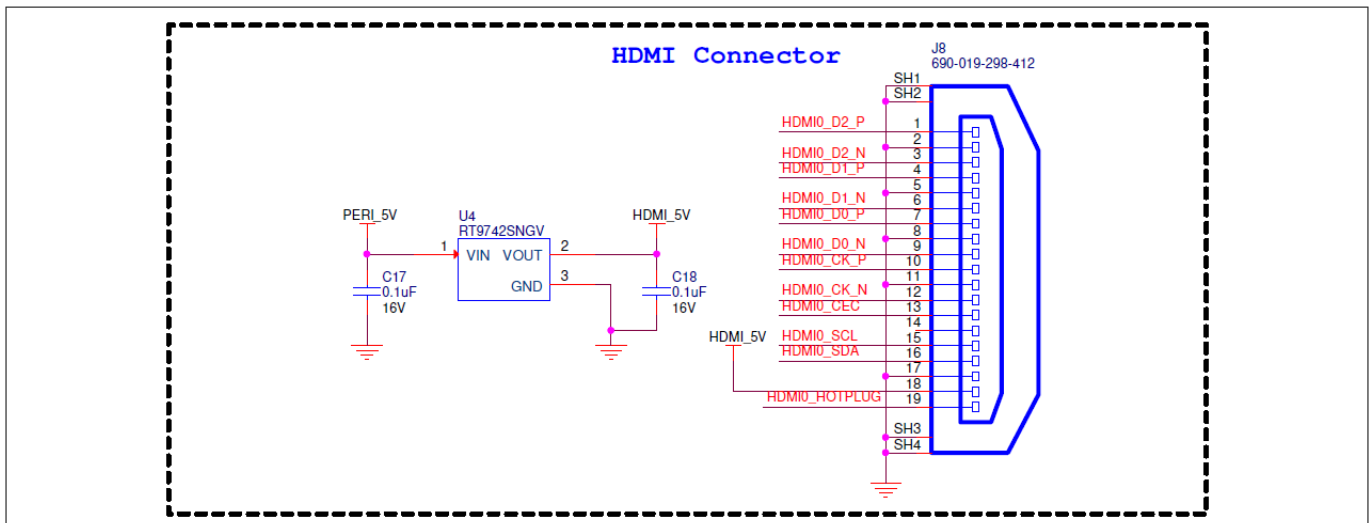

Figure 14   **HDMI connector**

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

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

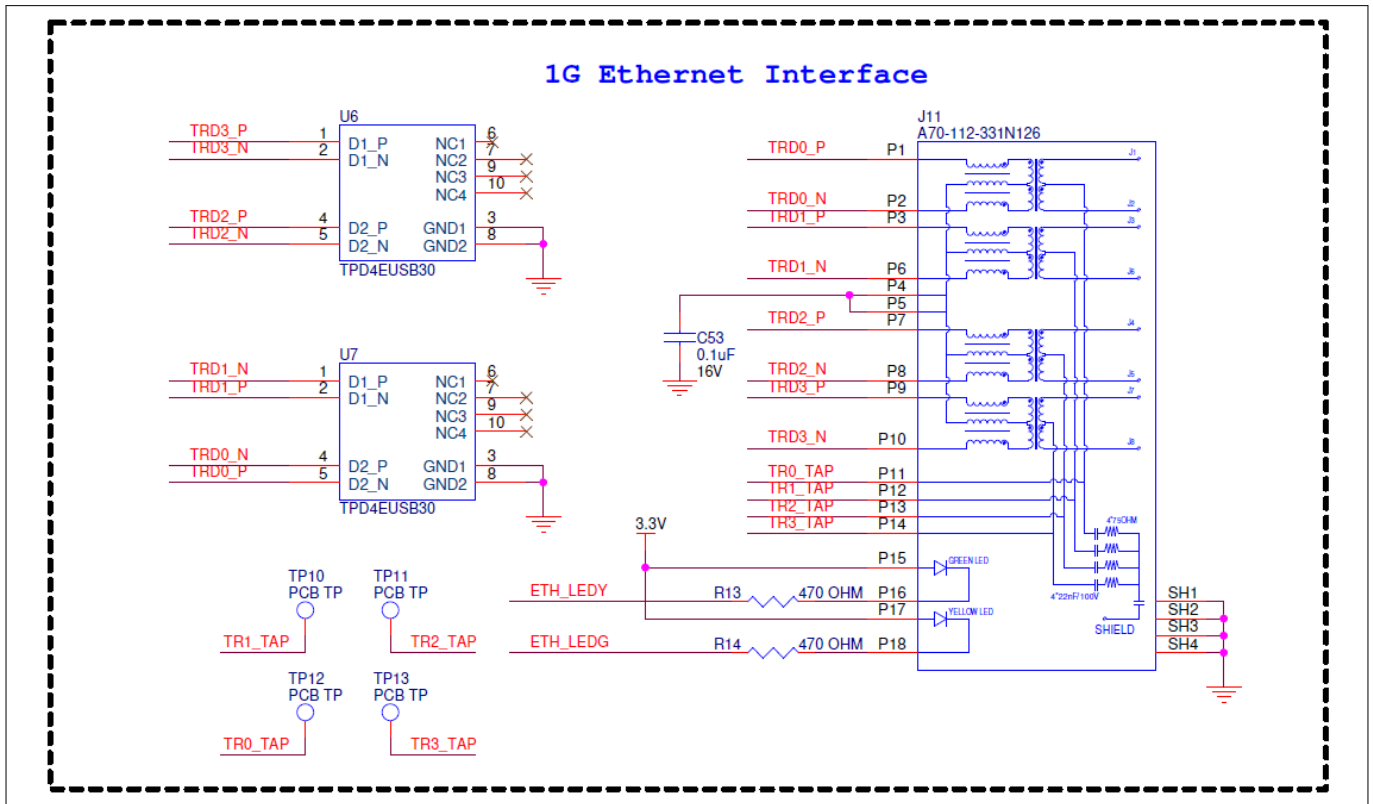**Figure 15**   **1G Ethernet connector**

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.

Figure 16   **microSD card connector**
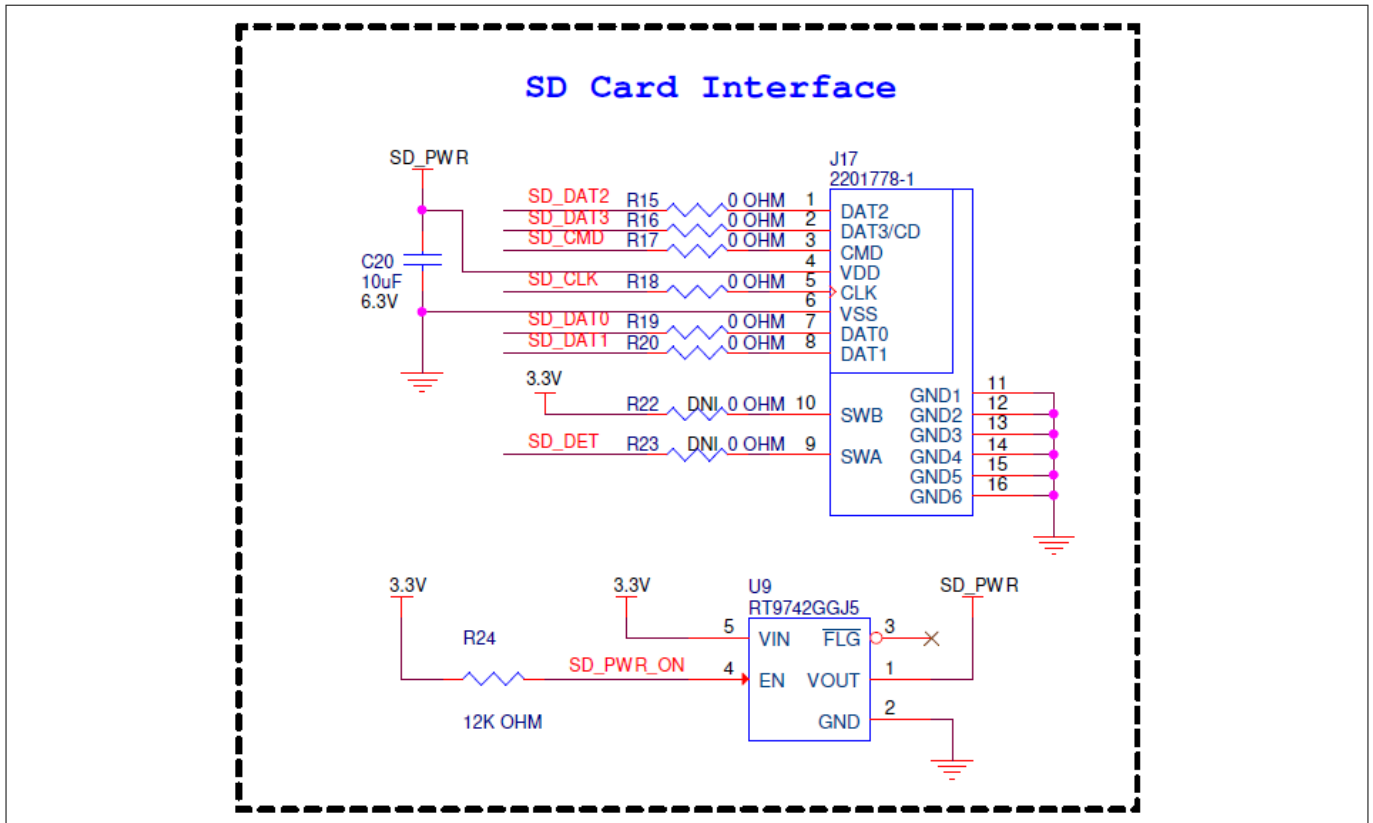
3.9   Fan controller and connector

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.
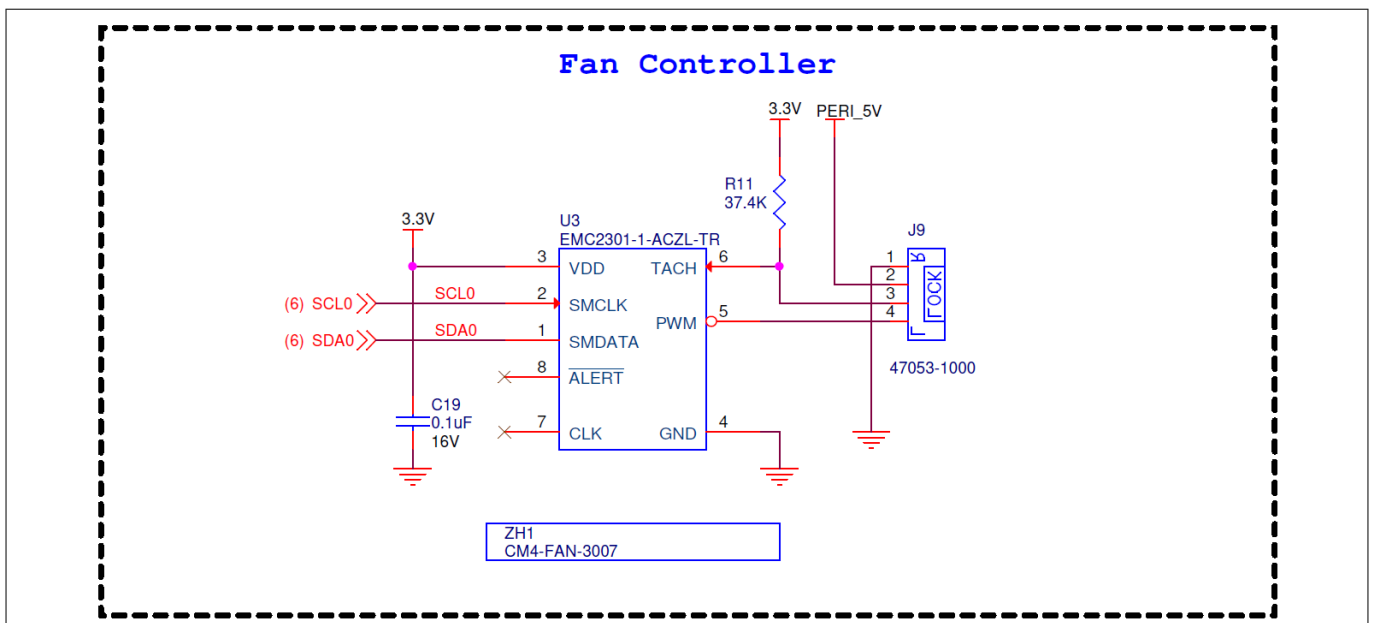

Figure 17   **Fan controller and connector**

3.10 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.
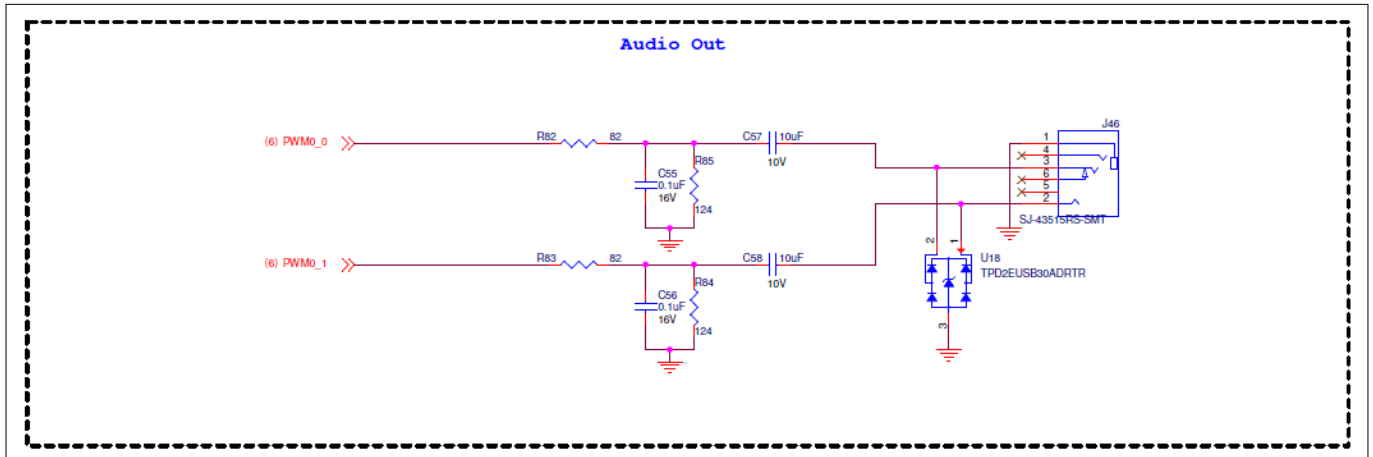

Figure 18   Audio out jack

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.
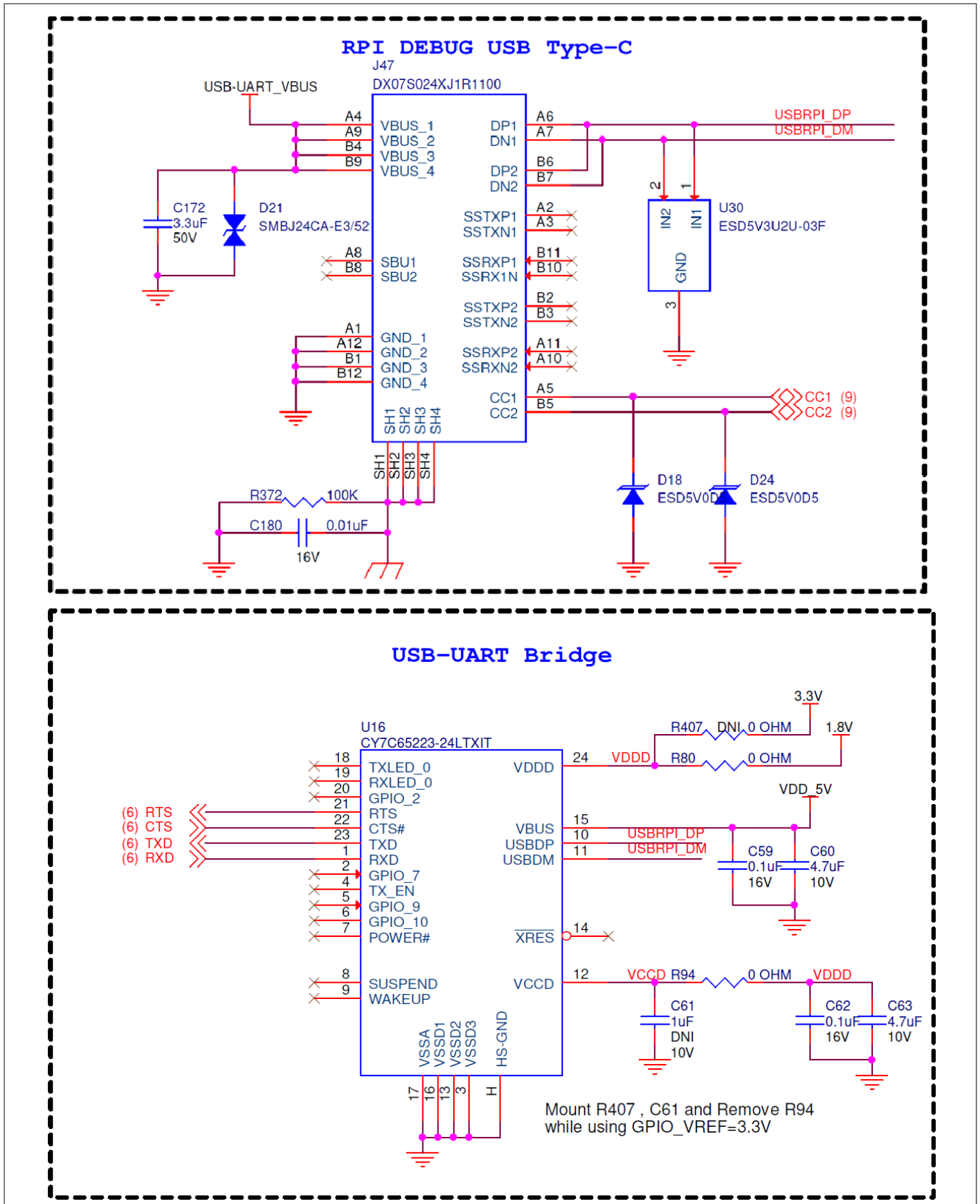
3 Hardware

Figure 19 USB-UART bridge

3.12 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.
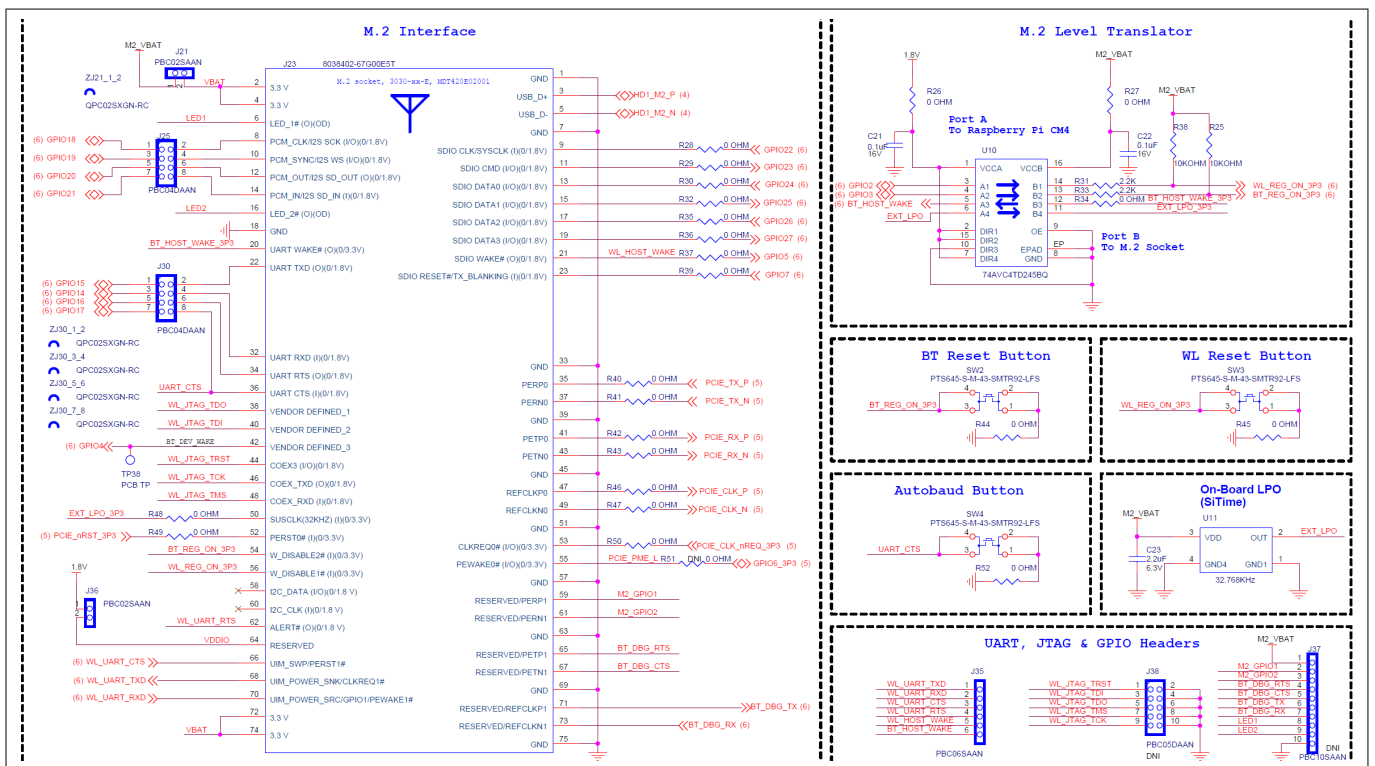
Figure 20   M.2 radio card interface

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...)

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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...)

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

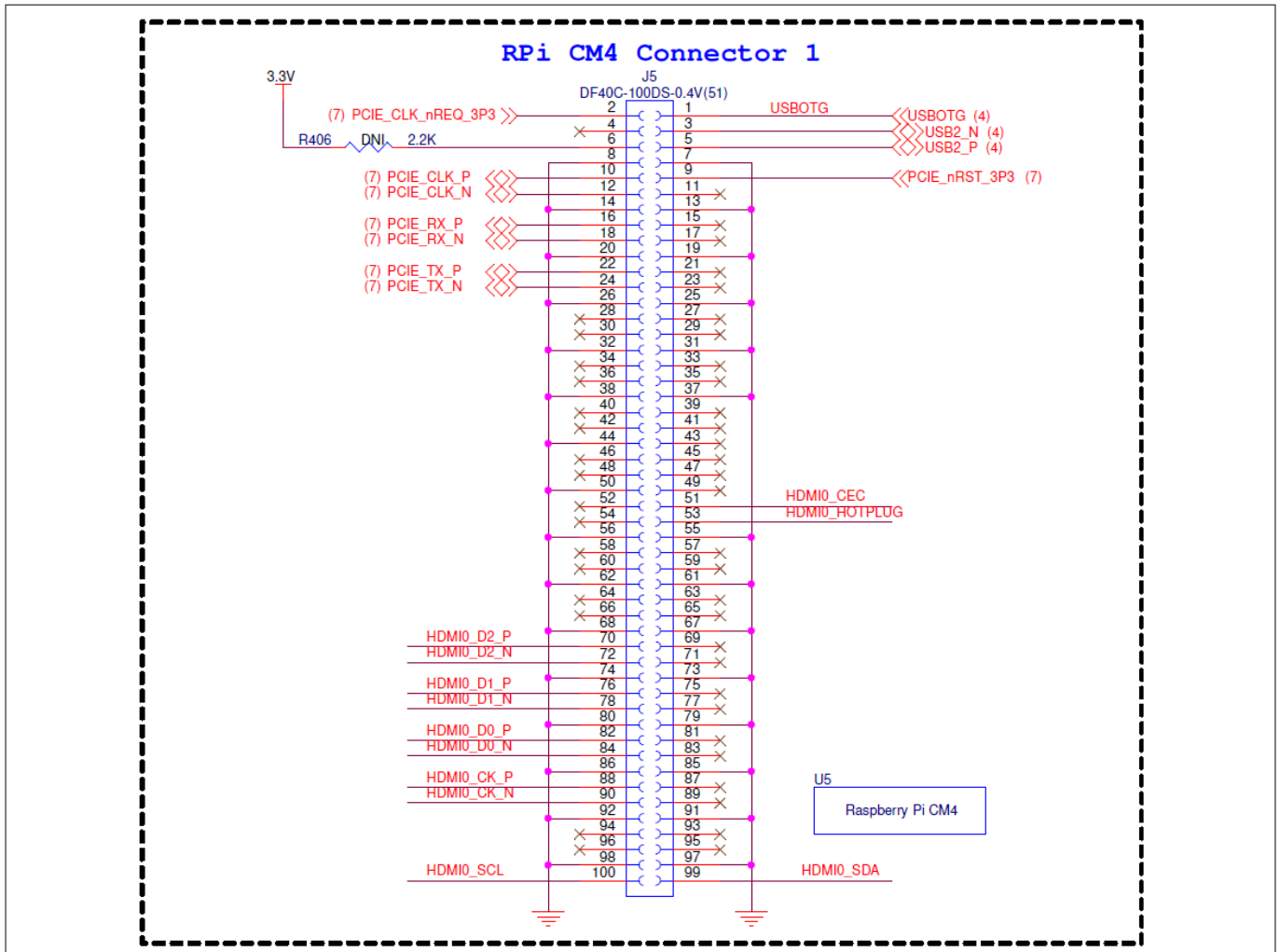| Pin number	Pin name	Connection to the CM4 lite/other connectors
PIN_10	PCM_SYNC/I2S WS (I/O)(0/1.8 V)	GPIO19
PIN_12	PCM_OUT/I2S SD_OUT (O)(0/1.8 V)	GPIO20
PIN_14	PCM_IN/I2S SD_IN (I)(0/1.8 V)	GPIO21
PIN_16	LED_2# (O)(OD)	LED2
PIN_18	GND	GND
PIN_20	UART WAKE# (O)(0/3.3 V)	GPIO12
PIN_22	UART TXD (O)(0/1.8 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.

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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).

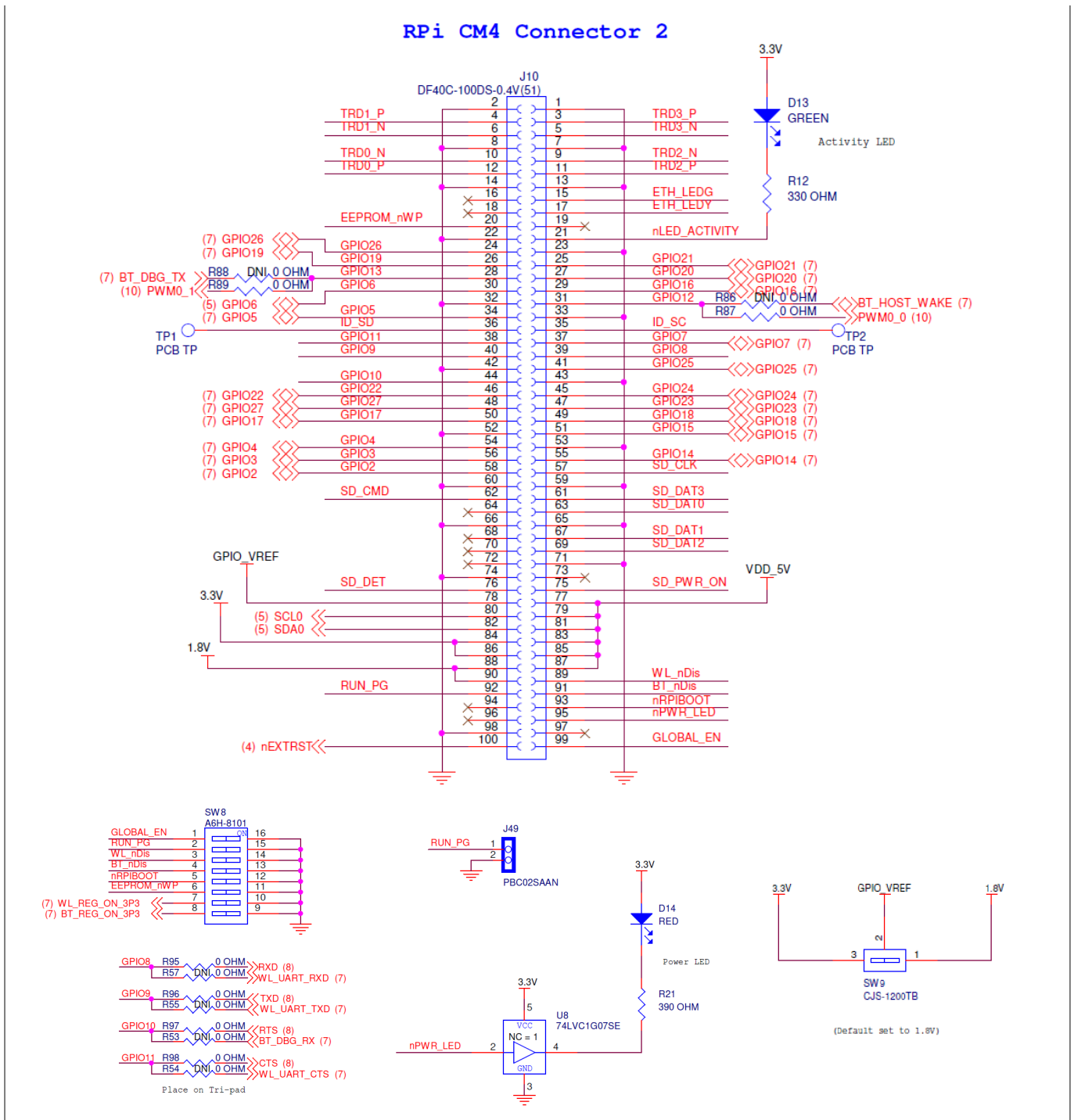### 3 Hardware

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...)

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...)

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…)

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...)

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...)

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

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
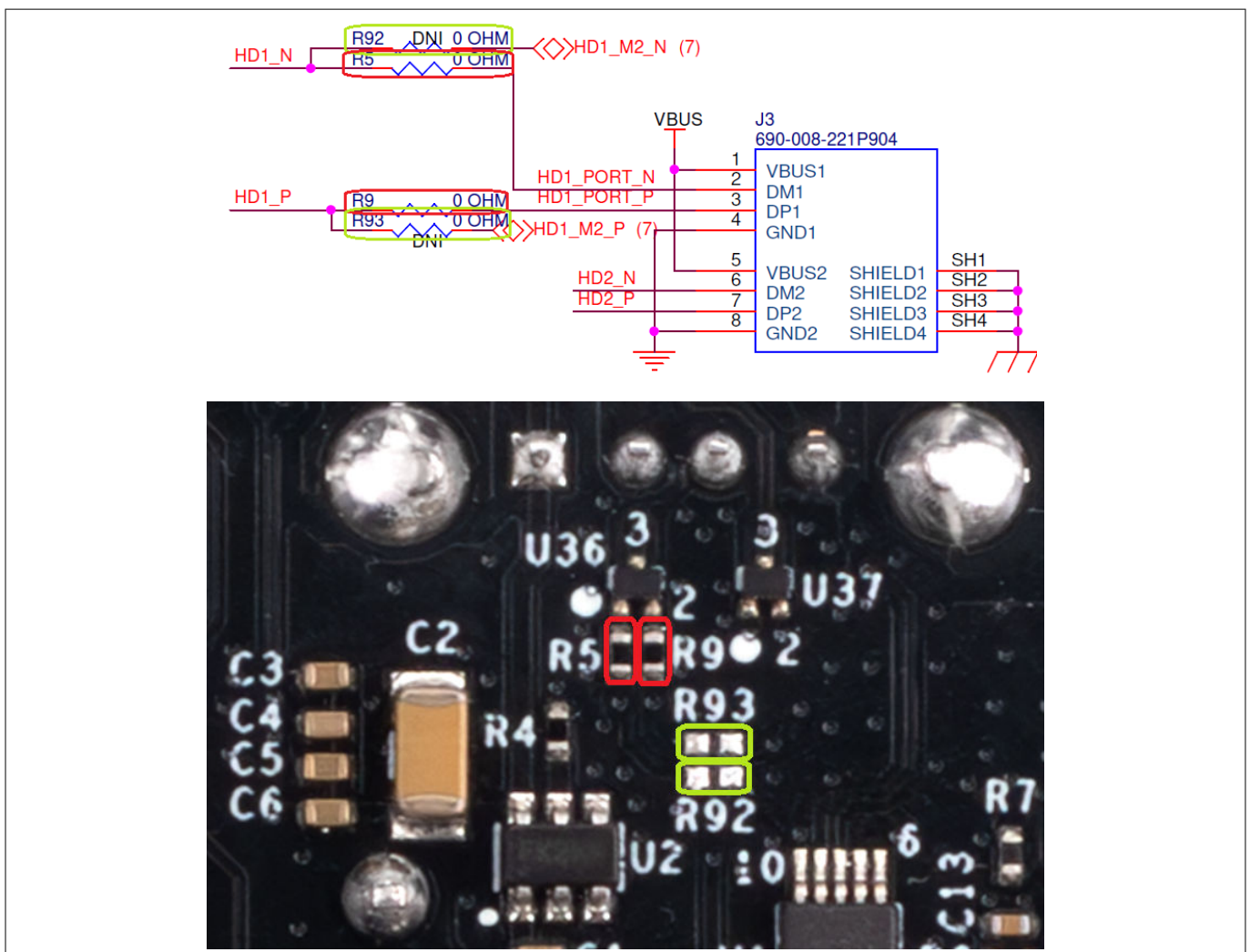
Figure 22 **M.2 radio USB rework**

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:

- Remove R87 and R89
- Mount R86 and R88

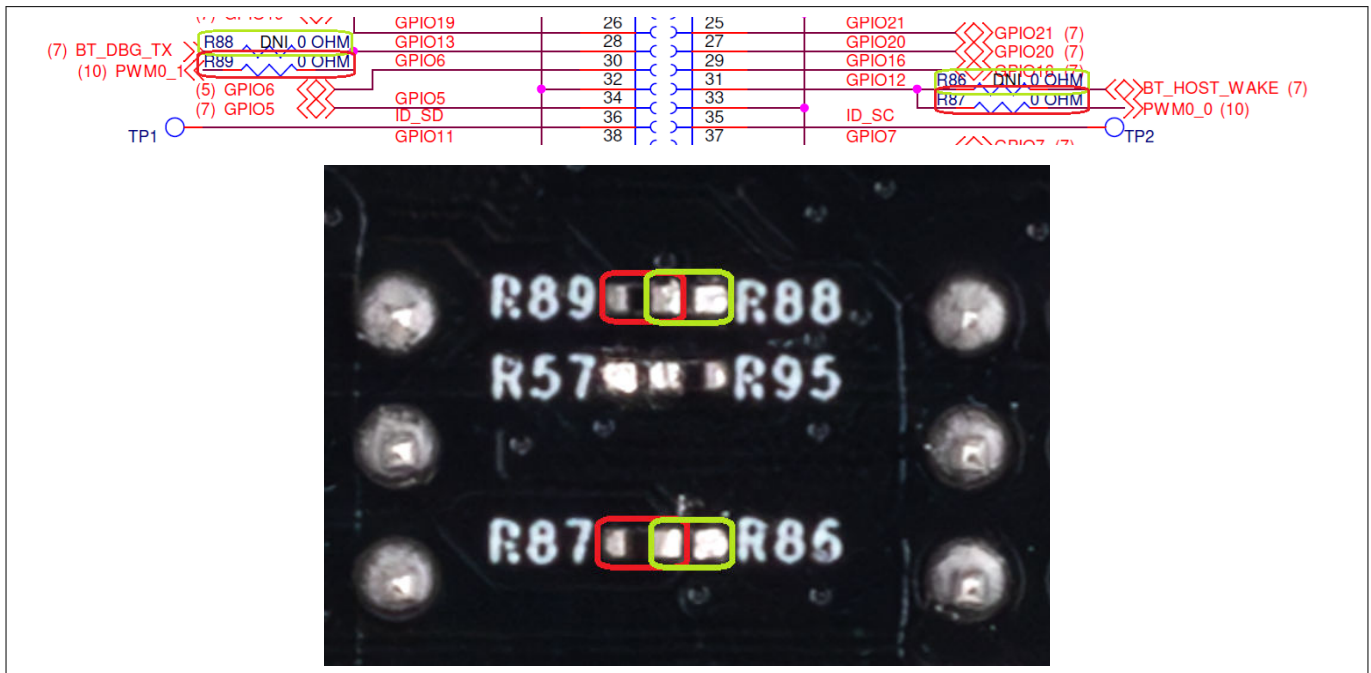**Figure 23**　　　　**BT_HOST_WAKE and BT_DBG_TX rework**

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

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

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