# QuecPython EC200U/A-XX C4-P01 EVB Specification and User Guide

**LTE Standard Module Series**

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# Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any terminal or mobile incorporating the module. Manufacturers of the terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals of the product. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.

| | |
|---|---|
|  | Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving. |
|  | Switch off the terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft. |
|  | Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities. |
|  | Terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances. |
|  | The terminal or mobile contains a transceiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment. |
|  | In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other terminals. Areas with explosive or potentially explosive atmospheres include fueling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders. |

# About the Document

## Revision History

| Version | Date | Author | Description |
|---------|------|--------|-------------|
| - | 2024-02-19 | Chavis CHEN | Creation of the document |
| 1.0.0 | 2024-02-19 | Chavis CHEN | Preliminary |

# Contents

## Table Index

## Figure Index

# 1 Introduction

This EVB is applicable to EC200U series and EC200A series modules.

EC200U series is the latest LTE Cat 1 wireless communication module designed by Quectel. It supports the maximum downlink rate of 10 Mbps and the maximum uplink rate of 5 Mbps with ultra-high cost performance. Meanwhile, it is compatible with Quectel multi-network LTE Standard modules (EC20-CE, EC20-CN, EC200S series, EC21 series, EG21-G, EC25 series and EG25-G), which has realized the seamless switching between 3G network and 4G network.

EC200U series consists of three models: EC200U-AU, EC200U-CN and EC200U-EU, which meet the frequency bands of different countries and regions.

EC200A series is an LTE Cat 4 wireless communication modules designed for M2M and IoT applications by Quectel. Adopting 3GPP Rel-9 LTE technology, it supports the maximum downlink rate of 150 Mbps and the maximum uplink rate of 50 Mbps Meanwhile, it is compatible with Quectel multi-network LTE Standard modules (EC25 series, EC21 series, EC20-CE, EG25-G, EC200D series, EC200U series, EC200N-CN) and UMTS/HSPA+ module (UC200A-GL) in the package, which have realized the seamless switching between 3G network and 4G network.

EC200A series consists of four models: EC200A-CN, EC200A-EU, EC200A-AU and EC200A-EL, which meet the frequency bands of different countries and regions. It is backward compatible with existing GSM/GPRS/EDGE networks, ensuring that it can work normally in remote areas where 3G and 4G networks cannot be accessed.

EC200U and EC200A series have rich built-in network protocols, integrate multiple industry standard interfaces, and support a variety of drivers and software functions (such as USB serial drivers for Windows 8/8.1/10/11, Linux, Android and other operating systems), which greatly expands its application in the fields of M2M.

# 2 Product Overview

## 2.1. Top and Bottom Views



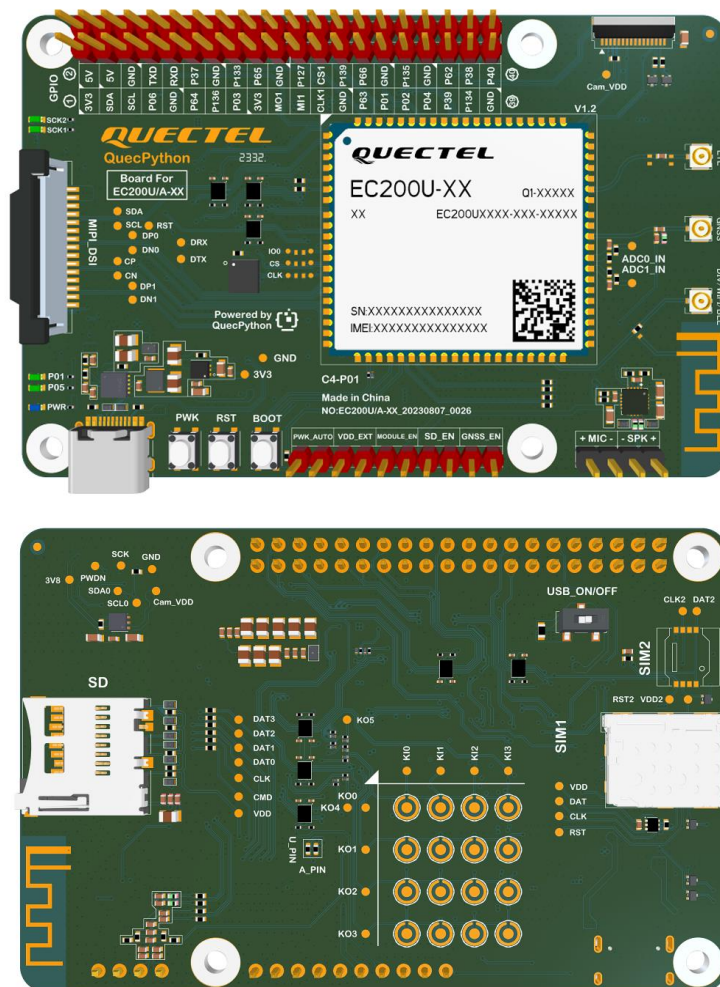**Figure 1: Top and Bottom Views**

> **NOTE**
>
> The figure above is for reference only. Refer to the actual appearance.
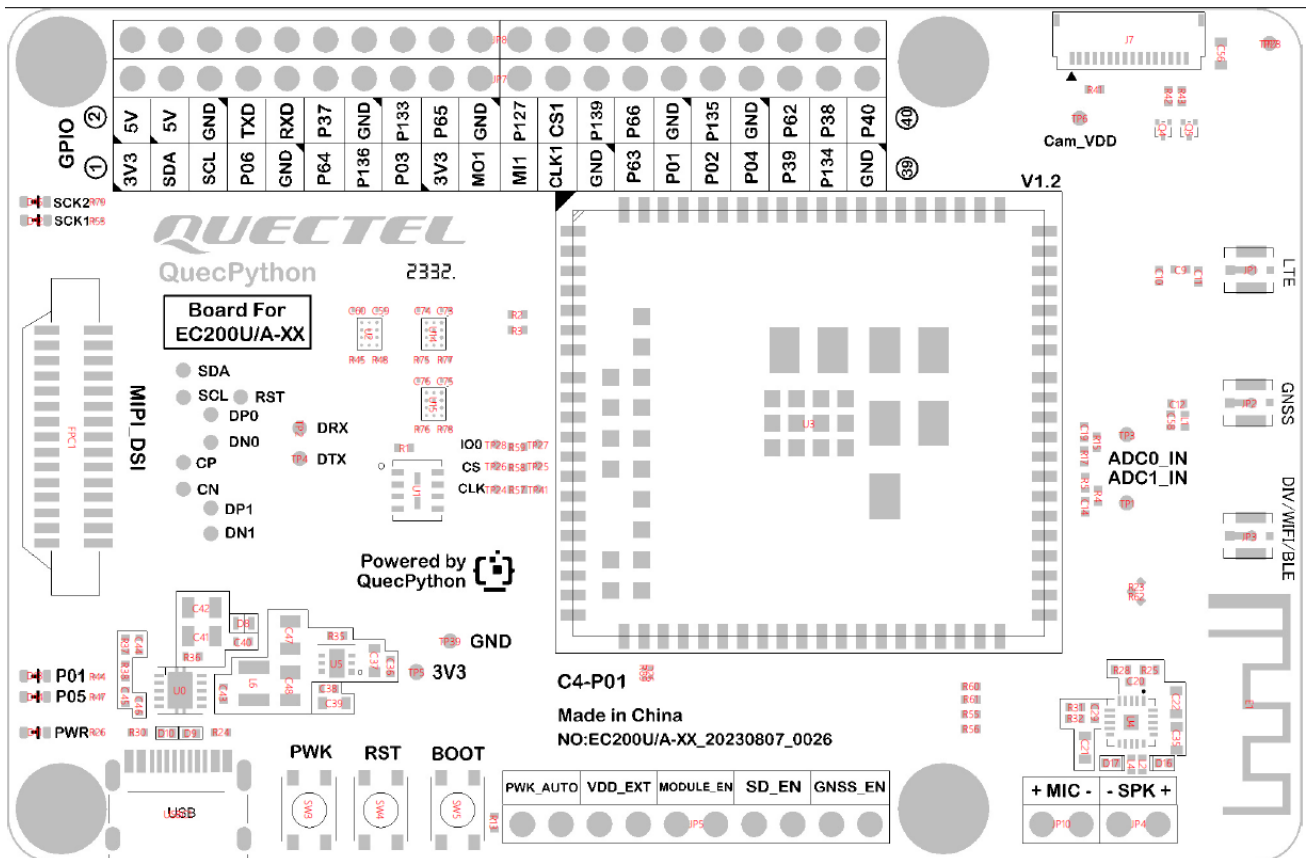
## 2.2. Component Placement
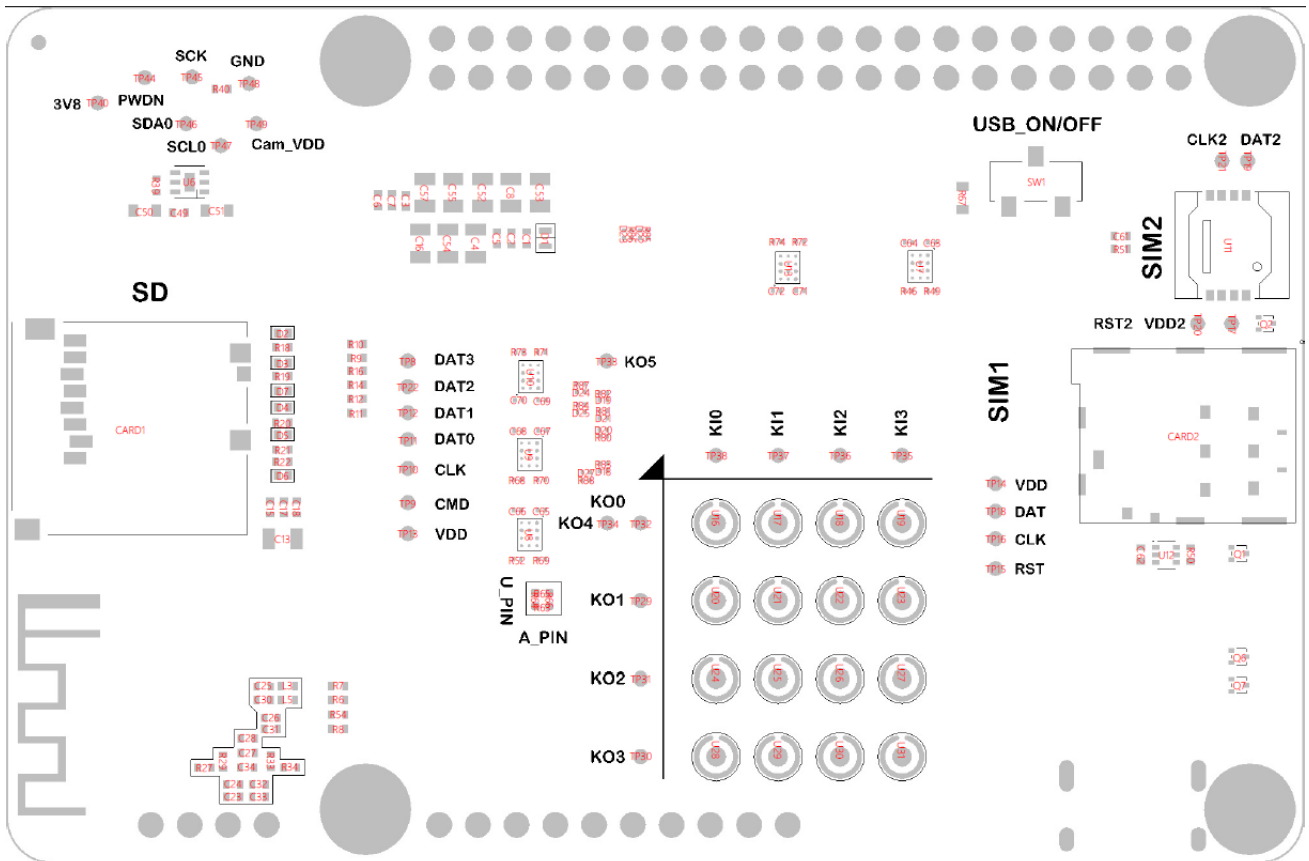


**Figure 2: Top View for Component Placement**

**Figure 3: Bottom View for Component Placement**

## 2.3. Major Components

**Table 1: Major Components**

| Component | Module Type | RefDes. | Comment |
|---|---|---|---|
| Major module | EC200U-XX/EC200A-XX | U3 | |
| Flash | W25Q32JWPIQ | U1 | |
| DCDC | TPS54428DRCR | U0 | |
| LDO1 | TLV73328PQDRVRQ1 | U6 | |
| LDO2 | XC6220B331ER-G | U5 | |
| PA | AW8733ATQR | U4 | |
| Level-shifting | TXS0104EYZTR | U2, U7, U8, U9, U10, U13, U14, U15 | |
| SIM card slot 1 | SMN-315-ARP7 | CARD2 | Nano-SIM |
| SIM card slot 2 | MUP-C7809-1 | U11 | E-SIM |
| SD card slot | TF-101A-P3 | CARD1 | |
| LED indicators | - | PWR, P01 P05、SCK1、SCK2 | |
| ADC | - | ADC0_IN, ADC1_IN | |
| USB power consumption detection switch | - | USB ON/OFF | |

## 2.4. Electrical Characteristics

- Normal operating voltage range of USB power supply: 5 V/ 2 A–5.1 V/ 3 A.
- External power supply voltage range: 5–6 V.

**NOTE**

1.  When USB and the external power supply simultaneously, the voltage of the two must be the same. If the difference is large, the related circuits may be burned out.
2.  When the external power supply voltage is 5 V, the current should be 2 A at least.
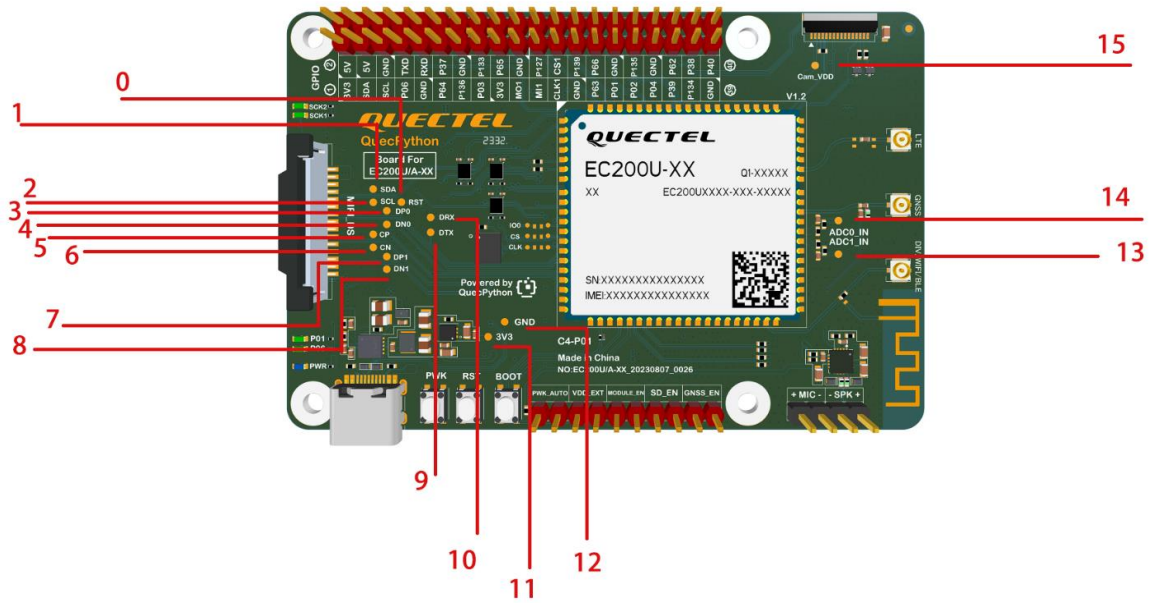
## 2.5. Test Points



**Figure 4: Test Point Pin Distribution 1**
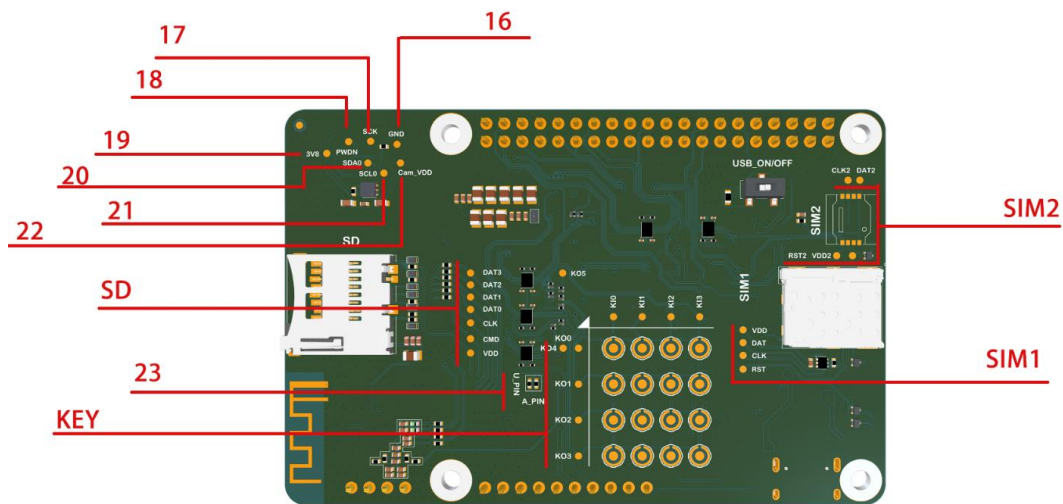


**Figure 5: Test Point Pin Distribution 2**

**Table 2: Pin Definition of Test Points**

| No. | Silkscreen Name | Comment |
| --- | --- | --- |
| 0 | RST | MIPI_RST |
| 1 | SDA | EC200U, IIC_SDA1, 3.3 V level-shifting |
| 2 | SCL | EC200U, IIC_SCL1, 3.3 V level-shifting |
| 3 | DP0 | MIPI_DP0 |
| 4 | DN0 | MIPI_DN1 |
| 5 | CP | MIPI_CP |
| 6 | CN | MIPI_CN |
| 7 | DP1 | MIPI_DP1 |
| 8 | DN1 | MIPI_DN1 |
| 9 | DTX | DBG_TXD for the module with 1.8 V level-shifting |
| 10 | DRX | DBG_RXD for the module with 1.8 V level-shifting |
| 11 | 3V3 | 3.3 V test point |
| 12 | GND | Ground |
| 13 | ADC0_IN | The measured external input voltage of ADC0, which cannot exceed that of VBAT [1]. |
| 14 | ADC1_IN | The measured external input voltage of ADC1, which cannot exceed that of VBAT [1]. |
| 15 | CAM_VDD | 2.8 V voltage of CAM_VDD |
| 16 | GND | Ground |
| 17 | SCK | CAM_SCK |
| 18 | PWDN | CAM_PWDN |
| 19 | 3V8 | 3.8 V input voltage of CAM |
| 20 | SDA0 | CAM_IIC_SDA0 |
| 21 | SCL0 | CAM_IIC_SCL0 |
| 22 | CAM_VDD | 2.8 V voltage of CAM_VDD |

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[1] See *Chapter 2.8* for voltage measurement value of ADC.

| 23 | U/A_PIN | EC200U-XX/EC200A-XX SPI selective resistors |
|----|---------|---------------------------------------------|
| -  | SD      | SDIO                                        |
| -  | KEY     | Matrix keypad                               |
| -  | SIM1    | (U)SIM1                                      |
| -  | SIM2    | (U)SIM2                                      |

## 2.6. Power Consumption Measurement Control Switch

The EVB contains a single pole double throw switch. When the switch is in the closed state, USB can be connected normally; When the USB switch is off, Type-C only supplies power to the EVB without USB interaction function, and it can be used to measure power consumption of the module.

## 2.7. Indicators

There are five functional indicators on the EVB:

● PWR: power supply indicator.
● P01: Pin 1 of the module. Indicator for EC200A-XX PWM0 by default.
● P05: Pin 5 of the module. Indicator for NET_MODE.
● SCK1: Detection indicator for SIM1. It is on when SIM1 card is inserted.
● SCK2: Detection indicator for SIM2. It is on when SIM2 card is inserted. It is connected to Pin 128 by default. EC200A-XX does not have SIM2, which can be ignored.

## 2.8. ADC

ADC0_IN/ADC1_IN are led as test points by default. The input voltage cannot exceed the VBAT voltage. The ADC0 input voltage is one-fourth of the ADC0_IN input voltage. The ADC1 input voltage is one-fourth of the ADC1_IN input voltage.

# 3 Function Description of Pin Headers

The EVB provides 40 compatible pin headers for peripherals, and 10 function enabling and controling pins. The definition of EVB pin headers is described as follows:
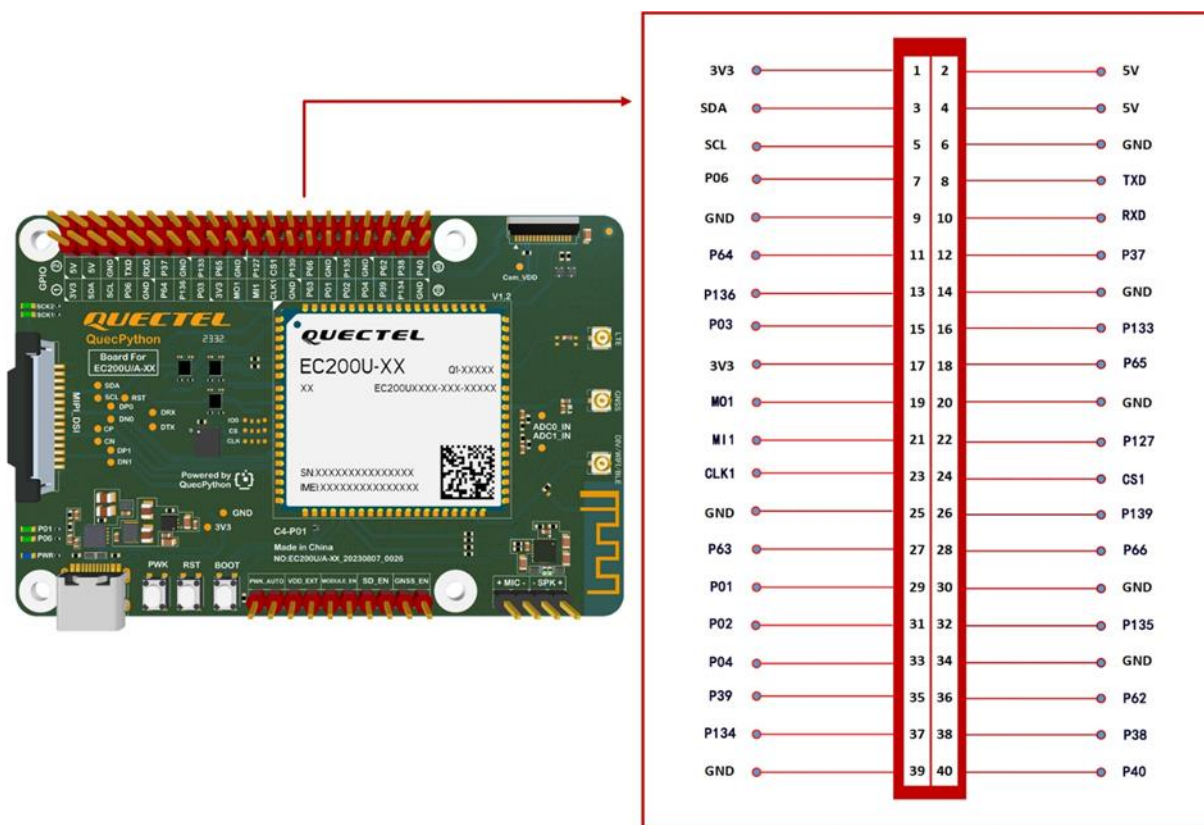
## 3.1  Pin Definition of 40-Pin Headers



**Figure 6: Pin Distribution of 40-Pin Headers**

**Table 3: Pin Definition of 40-Pin Headers**

| No. | Silk screen | Default Function | Multiplexing Function | Function Description | No. | Silk screen | Default Function | Multiplexing Function | Function Description |
|-----|-------------|------------------|----------------------|---------------------|-----|-------------|------------------|----------------------|---------------------|
| 1 | 3V3 | - | - | 3.3 V output | 2 | 5 V | - | - | 5 V output |
| 3 | SDA | I2C0_SDA | GPIO35 | I2C0 serial data/ General-purpose input/output | 4 | 5 V | - | - | 5 V output |
| 5 | SCL | I2C0_SCL | - | I2C0 serial clock | 6 | GND | - | - | Ground |
| 7 | P06 | GOIO46 | A_PWM2 | General-purpose input/output/ PWM2 output | 8 | TXD | UART2_TXD | - | UART2 transmit |
| 9 | GND | - | - | Ground | 10 | RXD | UART2_RXD | - | UART2 receive |
| 11 | P64 | GPIO19 | - | General-purpose input/output | 12 | P37 | GPIO11 | A_SPI0_CS | General-purpose input/output/ SPI0 chip select |
| 13 | P136 | GPIO7 | - | General-purpose input/output | 14 | GND | - | - | Ground |
| 15 | P03 | GPIO9 | - | General-purpose input/output | 16 | P133 | GPIO8 | - | General-purpose input/output |
| 17 | 3V3 | - | - | 3.3 V output | 18 | P65 | GPIO18 | - | General-purpose input/output |
| 19 | MO1 | SPI1_MOSI | GPIO3 | SPI1 master-out slave-in/ General-purpose | 20 | GND | - | - | Ground |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | input/output | | | | | |
| 21 | MI1 | SPI1_MISO | GPIO4 | SPI1 master-in slave-out/ General-purpose input/output | 22 | P127 | GPIO22 | - | General-purpose input/output |
| 23 | CLK1 | SPI1_CLK | GPIO1 | SPI1 clock/ General-purpose input/output | 24 | CS1 | SPI1_CS | GPIO2 | SPI1 chip select/ General-purpose input/output |
| 25 | GND | - | - | Ground | 26 | P139 | GPIO20 | - | General-purpose input/output |
| 27 | P63 | GPIO44 | A_UART1_TXD | General-purpose input/output/ UART1 transmit | 28 | P66 | GPIO45 | A_UART1_RXD | General-purpose input/output/ UART1 receive |
| 29 | P01 | GPIO28 | A_PWM0 | General-purpose input/output/ PWM0 output | 30 | GND | - | - | Ground |
| 31 | P02 | GPIO29 | - | General-purpose input/output | 32 | P135 | GPIO6 | U_PWM0 | General-purpose input/output/ PWM0 output |
| 33 | P04 | GPIO30 | A_PWM1 | General-purpose input/output/ PWM1 output | 34 | GND | - | - | Ground |
| 35 | P39 | GPIO13 | A_SPI0_MISO | General-purpose input/output/ SPI0 master-in slave-out | 36 | P62 | GPIO43 | - | General-purpose input/output |

| 37 | P134 | GPIO37 | - | General-purpose input/output | 38 | P38 | GPIO12 | A_SPI0_MOSI | General-purpose input/output/ SPI0 master-out slave-in |
|----|------|--------|---|------------------------------|----|-----|--------|-------------|------------------------------------------------------------|
| 39 | GND | - | - | Ground | 40 | P40 | GPIO10 | A_SPI0_CLK | General-purpose input/output/ SPI0 clock |

**NOTE**

"U" represents EC200U series module; "A" represents EC200A series module.

## 3.2 Pin Definition of 10-Pin Headers

The 10-pins are the enabling and controling pins of the EVB function. Refer to the following table to achieve the corresponding function.
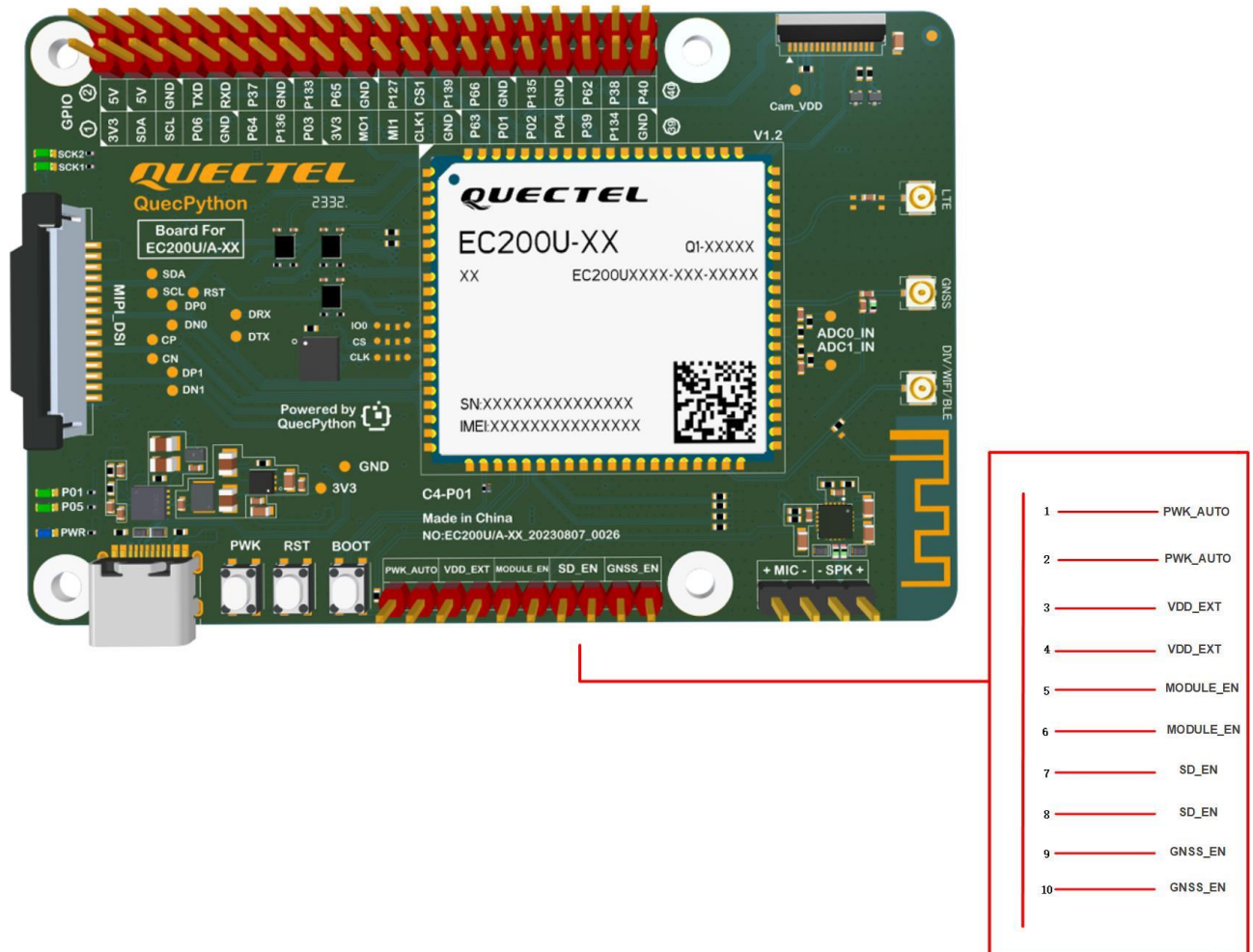


**Figure 7: Pin Distribution of 10-Pin Headers**

**Table 4: Pin Definition of 10-Pin Headers**

| Pin No. | Function | Silkscreen |
|---------|----------|------------|
| 1 | POWERKEY | PWK_AUTO |
| 2 | GND | |
| 3 | 1.8 V | VDD_EXT |
| 4 | VDD_EXT | |
| 5 | VBAT | MODULE_EN |
| 6 | 3.8 V | |
| 7 | SD_EN | SD_EN |
| 8 | 3.3 V | |
| 9 | 3.3 V | GNSS_EN |
| 10 | GNSS_EN | |

- Pin 1 and pin 2: turn on automatically.
- Pin 3 and pin 4: pin 3 and pin 4 are used to supply power to the peripheral circuits after being connected; To measure the power consumption of the module, disconnect pin 3 and pin 4 [2].
- Pin 5 and pin 6: when pin 5 and pin 6 are connected, the USB power supply supplies power to the module through DCDC. Disconnect pin 5 and pin 6, and an external power supply can be connected to pin 5 to supply power to the module and measure power consumption.
- Pin 7 and pin 8: enable SD active power supply.
- Pin 9 and pin 10: enable GNSS active power supply.

---

[2] Turn off the USB detection switch.

## 3.3  Pin Difference of SPI

The SPI function between EC200U series and EC200A series is slightly different.

**Table 5: Difference Introduction of SPI**

| Module | MOSI Pin No. | MISO Pin No. |
| --- | --- | --- |
| EC200U series | 24 | 25 |
| EC200A series | 25 | 24 |

In this case, the EVB will select and mount the 0 Ω resistor at the test point U/A_PIN to keep the function consistent. Note that the default GPIO number will change accordingly.

# 4 Onboard Resource

## 4.1. MIPI

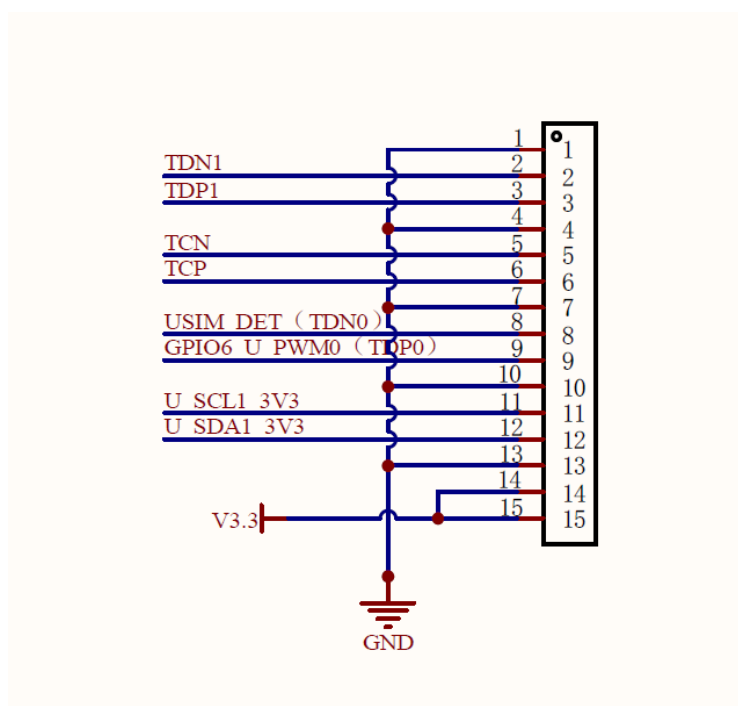The EVB supports MIPI screen and is fully compatible with Raspberry PI peripherals.



**Figure 8: Reference Circuit for MIPI Screen Interface**

## 4.2. Camera

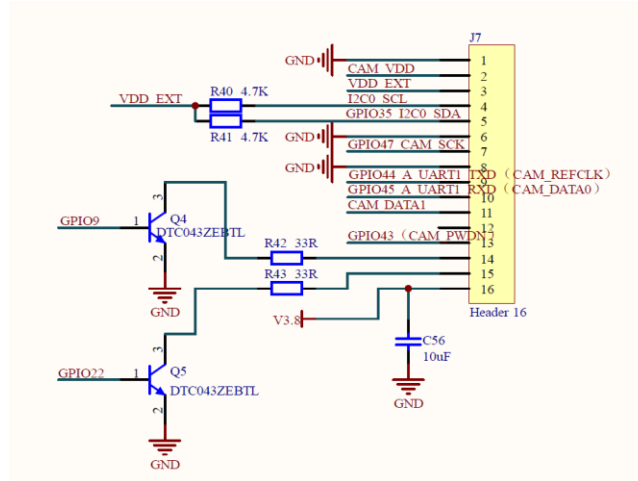The EVB supports customized SPI cameras with a maximum of 30 W pixels. The following is pin definition for the camera FPC.



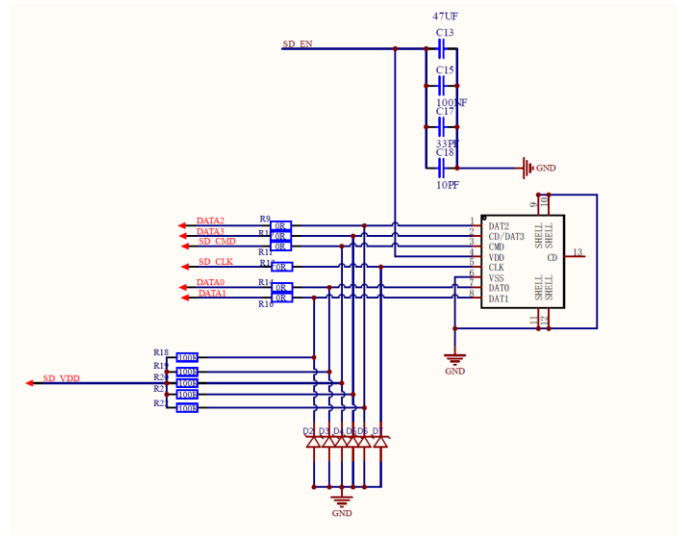**Figure 9: Reference Circuit for Camera FPC Interface**

## 4.3. SD Card



**Figure 10: Reference Circuit for SD Interface**

Before using SD card, enable SD card in the ten functional pin headers to supply power to the SD card.
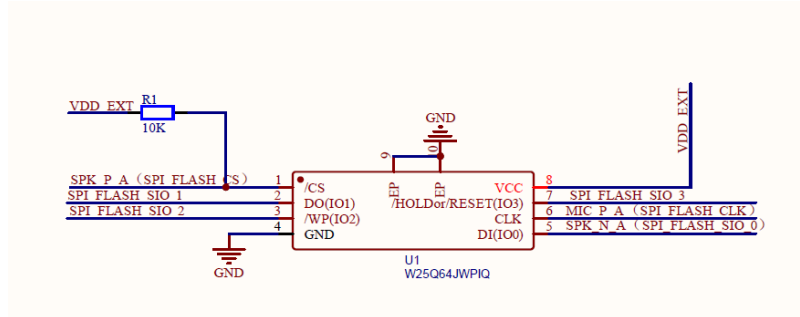
## 4.4. 6-wire Nor Flash



**Figure 11: Reference Circuit for W25Q64JWPIQ Nor Flash**

The external 6-wire Nor Flash only supports EC200U series. When measuring power consumption, disconnect the Flash 0 Ω resistor.

## 4.5. MIC & SPK

The EVB carries a PA (AW8733A) of AWINIC, and its gain is optional: 12 dB, 16 dB, 24 dB and 27.5 dB. It supports one line pulse control.
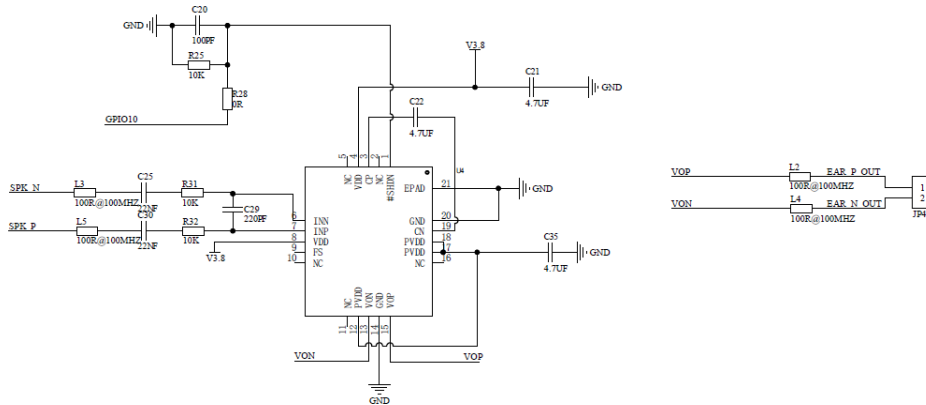


**Figure 12: Reference Circuit for Microphone & Loudspeaker**

GPIO10 of the module is used to control the first-line pulse mode to select the working mode. The number of rising edges of the first-line pulse signal determines the working mode of the chip. When the GPIO10 signal is directly pulled up, that is, a rising edge, the chip starts to work, Av = 4V/V; When GPIO10 is in the pulse signal order of "high → low → high", that is, two rising edges, the chip enters the anti-crack mode and the gain rises to Av = 6V/V; When GPIO10 sends three rising edges, Av = 16V/V, there is no

anti-crack sound; When GPIO10 sends four rising edges, Av = 24V/V , the anti-crack function is turned on. The one-line pulse is controlled in a cyclic way, if the GPIO10 sends five rising edges, it will enter the first working state; When GPIO10 sends six rising edges, it will enter the second working state, and so on.

## 4.6. Matrix Keypad

On EC200U-XX/EC200A-XX C4-P01 EVB, matrix keypad pins are reserved, and you can solder or connect them by yourself. The EVB has keyboard keys by default.
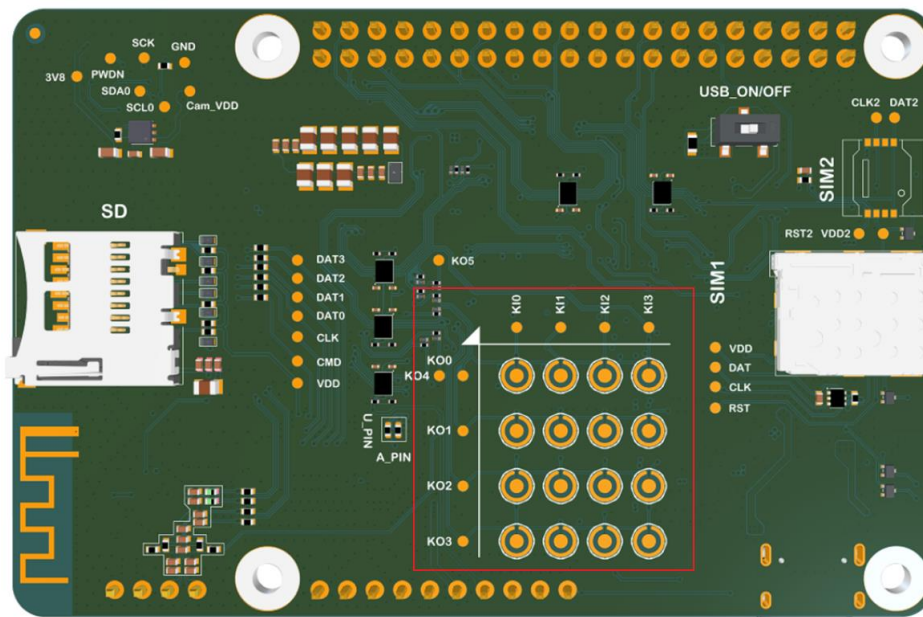


**Figure 13: Solder Diagram of Matrix Keypad**

# 5 Mechanical  Information

This chapter describes the mechanical dimensions of the EC200x series EVB.
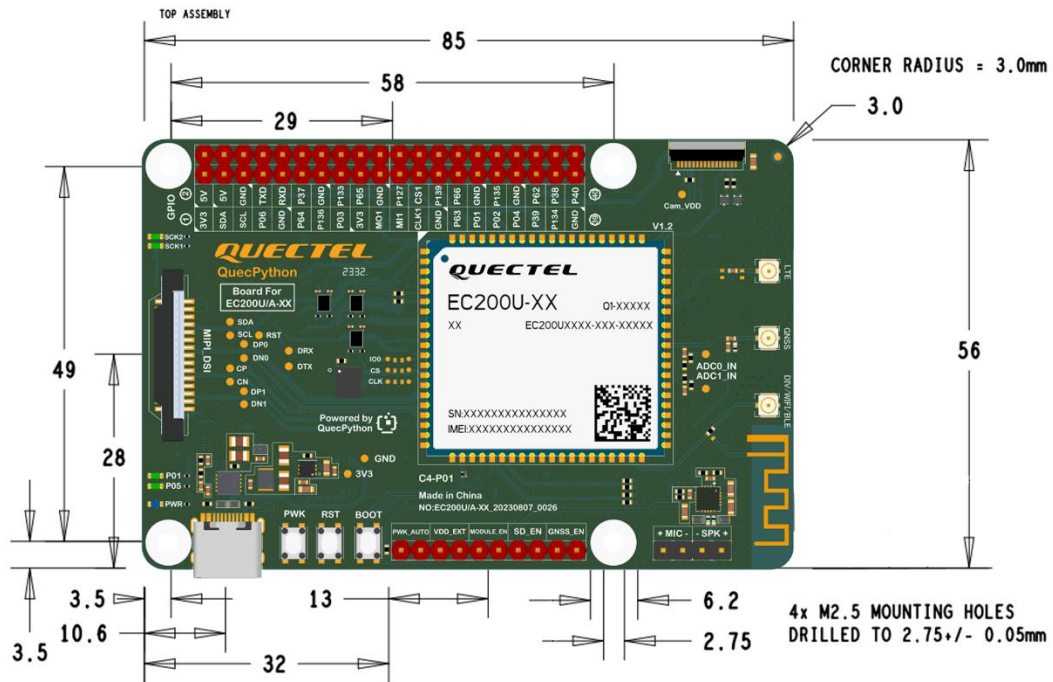


**Figure 14: EVB Dimensions**

# 6 RF Connector Recommendation

The EVB board is equipped with an RF connector (socket) for easy antenna connection. Dimensions of antenna connectors are shown in the following figure.
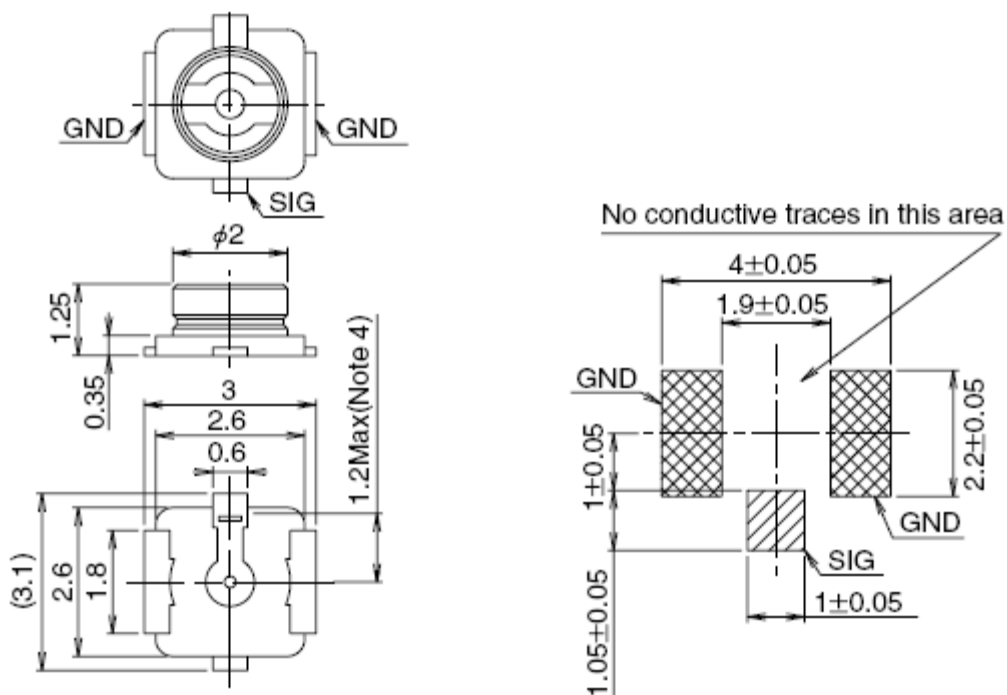
**Figure 15: Dimensions of the Receptacle (Unit: mm)**

U.FL-LP series mated plugs listed in the following figure can be used to match the U.FL-R-SMT connector.

| Part No. | U.FL-LP-040 | U.FL-LP-066 | U.FL-LP(V)-040 | U.FL-LP-062 | U.FL-LP-088 |
|---|---|---|---|---|---|
| Mated Height | 2.5mm Max. (2.4mm Nom.) | 2.5mm Max. (2.4mm Nom.) | 2.0mm Max. (1.9mm Nom.) | 2.4mm Max. (2.3mm Nom.) | 2.4mm Max. (2.3mm Nom.) |
| Applicable cable | Dia. 0.81mm Coaxial cable | Dia. 1.13mm and Dia. 1.32mm Coaxial cable | Dia. 0.81mm Coaxial cable | Dia. 1mm Coaxial cable | Dia. 1.37mm Coaxial cable |
| Weight (mg) | 53.7 | 59.1 | 34.8 | 45.5 | 71.7 |
| RoHS | YES | | | | |

**Figure 16: Specifications of Mated Plugs (Unit: mm)**

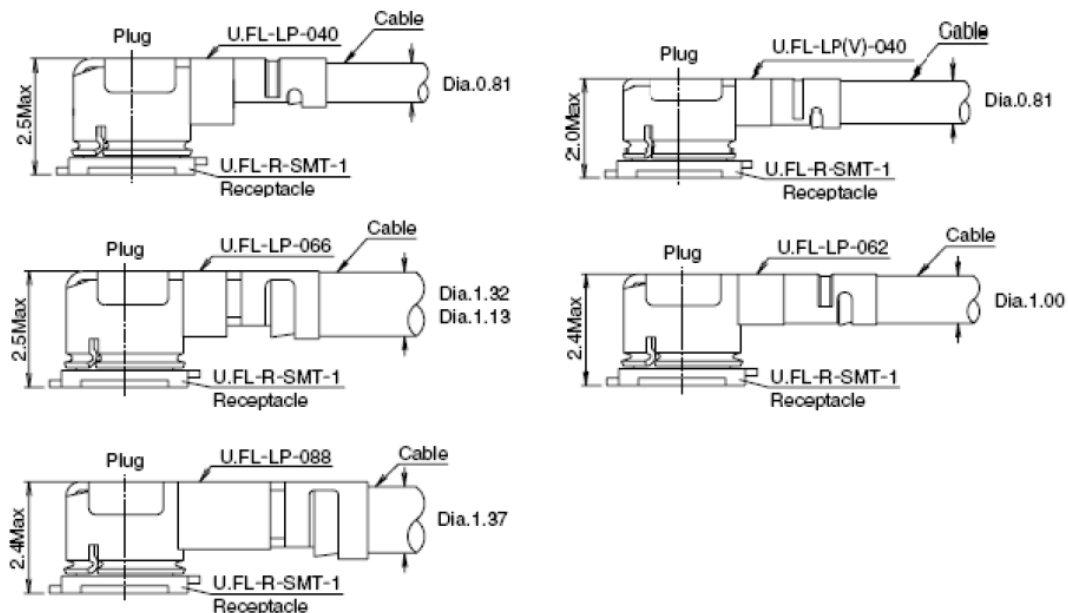The following figure describes the space factor of mated connectors.

**Figure 17: Dimensions of the Receptacle (Unit: mm)**

# 7 Reliability and Electrical Characteristics

This chapter mainly describes the electrical characteristics of EVB interfaces, including: power supply characteristics.

## 7.1. Power Supply Characteristics

The USB input voltage of the EVB is 5.0–5.1 V, and then it is converted by DCDC to 3.8 V power supply for the module. The power supply requirements are shown in the following tables:

**Table 6: Input Power Supply Range**

| Parameters | Description | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $V_I$ | Power supply of USB | 5.0 | 5.0 | 5.1 | V |
| $V_I$ | External power supply | 5.0 | 5.0 | 6.0 | V |

**Table 7: I/O Requirements**

| Parameters | Description | Min. | Max. | Unit |
|---|---|---|---|---|
| $V_{IH}$ | High-level input voltage | $0.7 \times VCC$ | $VCC + 0.3$ | V |
| $V_{IL}$ | Low-level input voltage | -0.3 | $0.3 \times VCC$ | V |
| $V_{OH}$ | High-level output voltage | VCC - 0.5 | VCC | V |
| $V_{OL}$ | Low-level output voltage | 0 | 0.4 | V |

**NOTE**

The typical value of VCC is 3.3 V.

# 8 Notification

## 8.1. Turn-on

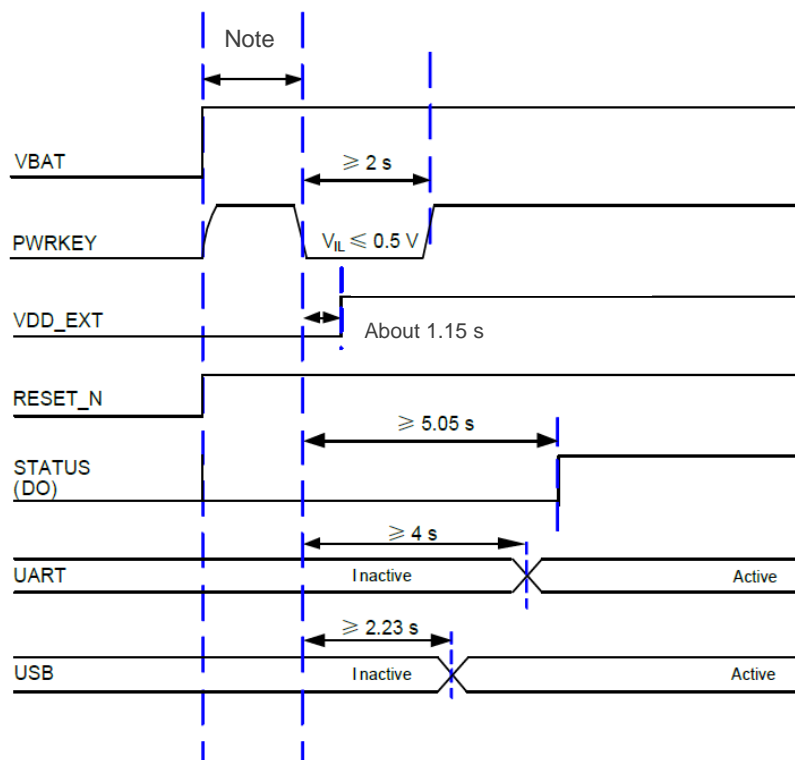The turn-on scenario is illustrated in the following figure.



**Figure 18: Timing of Turn-on with PWRKEY**

| NOTE |
| --- |

Make sure that VBAT is stable before pulling down PWRKEY pin. It is recommended that the time difference between powering up VBAT and pulling down PWRKEY pin is not less than 30 ms. If the module needs to turn on automatically but does not need turn-off function, short circuit the two pins corresponding to the PWK_AUTO silkscreen among the pin headers.

# 9 Appendix Schematics

## 9.1. EVB Schematics

Click the following link to download schematics of EVB:
([https://images.quectel.com/python/sites/2/2023/12/EC200UA_Board_Sch_0829-1.pdf](https://images.quectel.com/python/sites/2/2023/12/EC200UA_Board_Sch_0829-1.pdf)).

## 9.2. EVB Silkscreen

Click the following link to download the silkscreen figure of EVB:
([https://images.quectel.com/python/sites/2/2024/01/EC200U_EC200A_SILK_SCREEN.pdf](https://images.quectel.com/python/sites/2/2024/01/EC200U_EC200A_SILK_SCREEN.pdf)).