QuecPython EG91X-XX C1-P02 EVB

Specification and User Guide

LTE Standard Module Series

Version: 1.0.0

Date: 2024-02-20

Status: Preliminary

At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China
Tel: +86 21 5108 6236
Email: info@quectel.com

Or our local offices. For more information, please visit:
http://www.quectel.com/support/sales.htm.

For technical support, or to report documentation errors, please visit:
http://www.quectel.com/support/technical.htm.
Or email us at: support@quectel.com.

Legal Notices

We offer information as a service to you. The provided information is based on your requirements and we make every effort to ensure its quality. You agree that you are responsible for using independent analysis and evaluation in designing intended products, and we provide schematic designs for illustrative purposes only. Before using any hardware, software or service guided by this document, please read this notice carefully. Even though we employ commercially reasonable efforts to provide the best possible experience, you hereby acknowledge and agree that this document and related services hereunder are provided to you on an “as available” basis. We may revise or restate this document from time to time at our sole discretion without any prior notice to you.

Use and Disclosure Restrictions

License Agreements

Documents and information provided by us shall be kept confidential, unless specific permission is granted. They shall not be accessed or used for any purpose except as expressly provided herein.

Copyright

Our and third-party products hereunder may contain copyrighted material. Such copyrighted material shall not be copied, reproduced, distributed, merged, published, translated, or modified without prior written consent. We and the third party have exclusive rights over copyrighted material. No license shall be granted or conveyed under any patents, copyrights, trademarks, or service mark rights. To avoid ambiguities, purchasing in any form cannot be deemed as granting a license other than the normal non-exclusive, royalty-free license to use the material. We reserve the right to take legal action for noncompliance with abovementioned requirements, unauthorized use, or other illegal or malicious use of the material.

Trademarks

Except as otherwise set forth herein, nothing in this document shall be construed as conferring any rights to use any trademark, trade name or name, abbreviation, or counterfeit product thereof owned by Quectel or any third party in advertising, publicity, or other aspects.

Third-Party Rights

This document may refer to hardware, software and/or documentation owned by one or more third parties ("third-party materials"). Use of such third-party materials shall be governed by all restrictions and obligations applicable thereto.

We make no warranty or representation, either express or implied, regarding the third-party materials, including but not limited to any implied or statutory, warranties of merchantability or fitness for a particular purpose, quiet enjoyment, system integration, information accuracy, and non-infringement of any third-party intellectual property rights with regard to the licensed technology or use thereof. Nothing herein constitutes a representation or warranty by us to either develop, enhance, modify, distribute, market, sell, offer for sale, or otherwise maintain production of any our products or any other hardware, software, device, tool, information, or product. We moreover disclaim any and all warranties arising from the course of dealing or usage of trade.

Privacy Policy

To implement module functionality, certain device data are uploaded to Quectel's or third-party's servers, including carriers, chipset suppliers or customer-designated servers. Quectel, strictly abiding by the relevant laws and regulations, shall retain, use, disclose or otherwise process relevant data for the purpose of performing the service only or as permitted by applicable laws. Before data interaction with third parties, please be informed of their privacy and data security policy.

Disclaimer

a) We acknowledge no liability for any injury or damage arising from the reliance upon the information.
b) We shall bear no liability resulting from any inaccuracies or omissions, or from the use of the information contained herein.
c) While we have made every effort to ensure that the functions and features under development are free from errors, it is possible that they could contain errors, inaccuracies, and omissions. Unless otherwise provided by valid agreement, we make no warranties of any kind, either implied or express, and exclude all liability for any loss or damage suffered in connection with the use of features and functions under development, to the maximum extent permitted by law, regardless of whether such loss or damage may have been foreseeable.
d) We are not responsible for the accessibility, safety, accuracy, availability, legality, or completeness of information, advertising, commercial offers, products, services, and materials on third-party websites and third-party resources.

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
-	2024-02-20	Chavis CHEN	Creation of the document
1.0.0	2024-02-20	Chavis CHEN	Preliminary

Contents

Table Index

Figure Index

1 Introduction

This EVB is applicable to EG915U series module.

EG915U series is an 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 modules (EG91 series, EG95 series, BG95 series and BG96 series) in package, which has realized the seamless switching between 2G network and 4G network to meet the application requirements of products in different industries.

EG915U series consists of four models: EG915U-CN, EG915U-EU, EG915U-EC and EG915U-LA, which meet the frequency bands of different countries and regions.

EG915U series has rich built-in network protocols, integrates multiple industry standard interfaces, and supports 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 the applications in the fields of M2M.

2 Product Overview

2.1. Top and Bottom Views

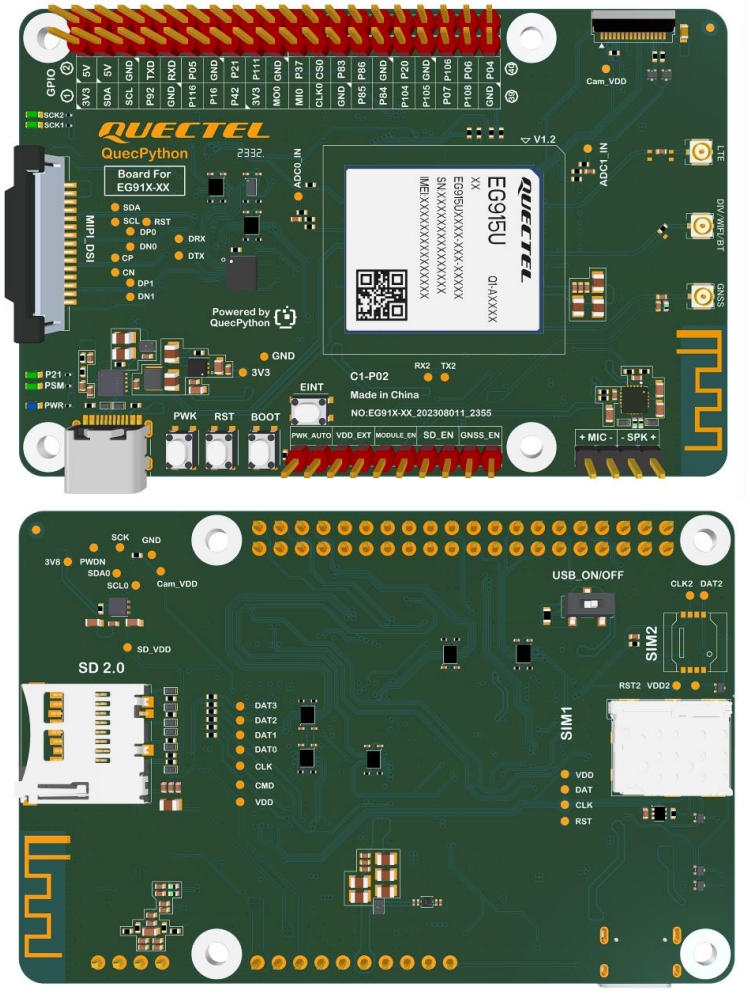


Figure 1: Top and Bottom Views

NOTE

The figure above is for reference only. Refer to the actual appearance.

2.2. Component Placement

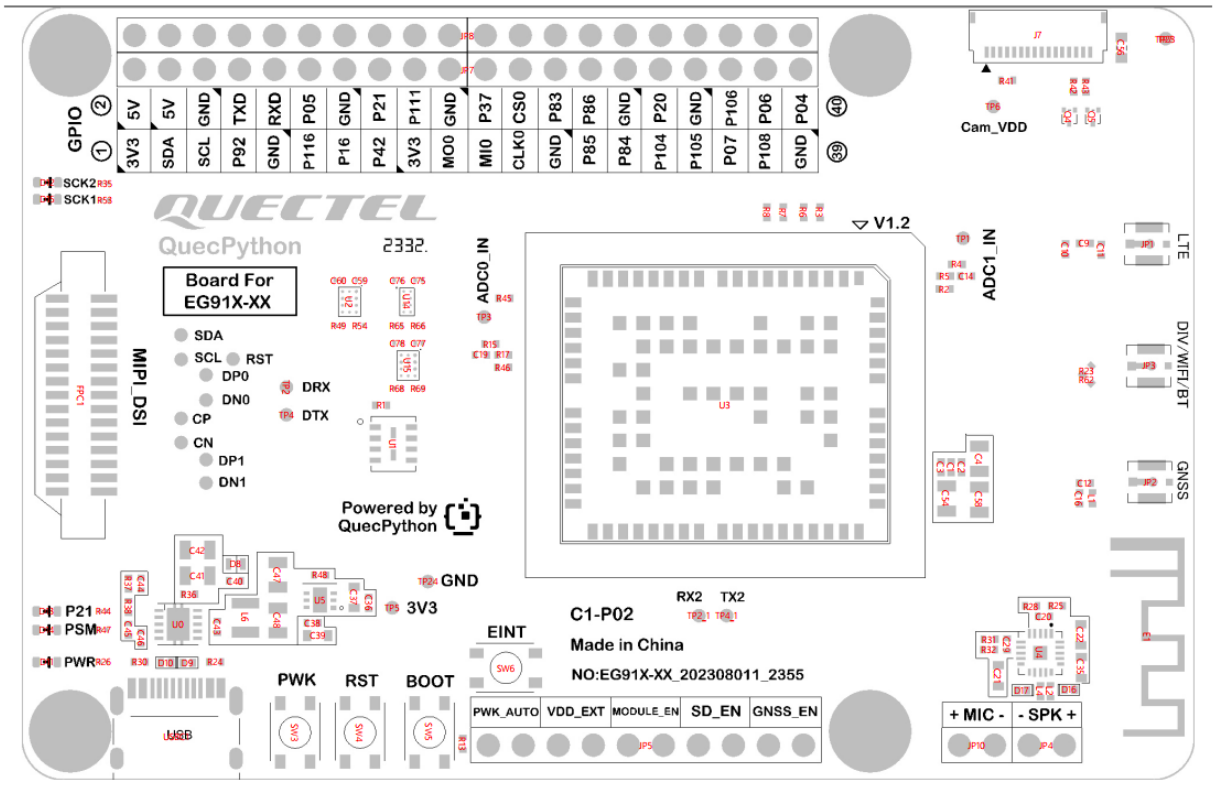


Figure 2: Top View for Component Placement

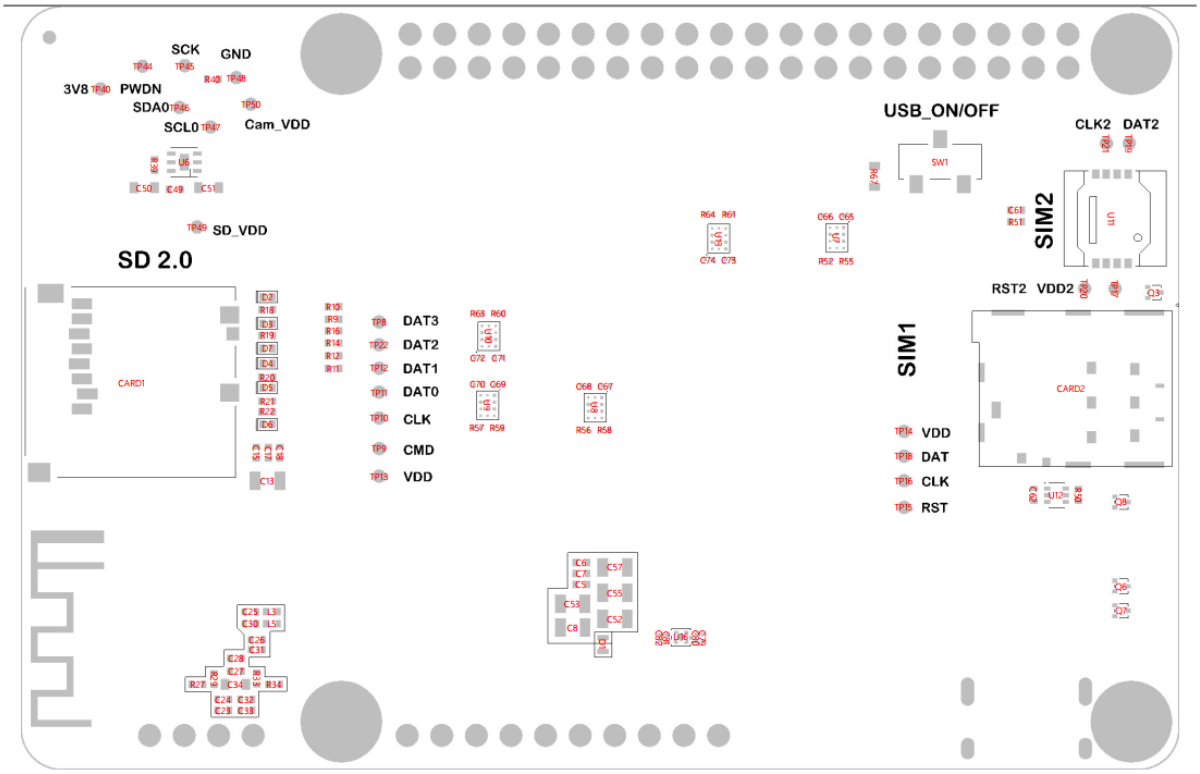


Figure 3: Bottom View for Component Placement

2.3. Major Components

Table 1: Major Components

Component	Module Type	RefDes.	Comment
Major module	EG915U-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, 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, PSM P21 SCK1, SCK2	
ADC	-	ADC1_IN	
USB power consumption detection switch	-	USB ON/OFF	

2.4. Electrical Characteristics

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

NOTE

1. When USB and the external supply power 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

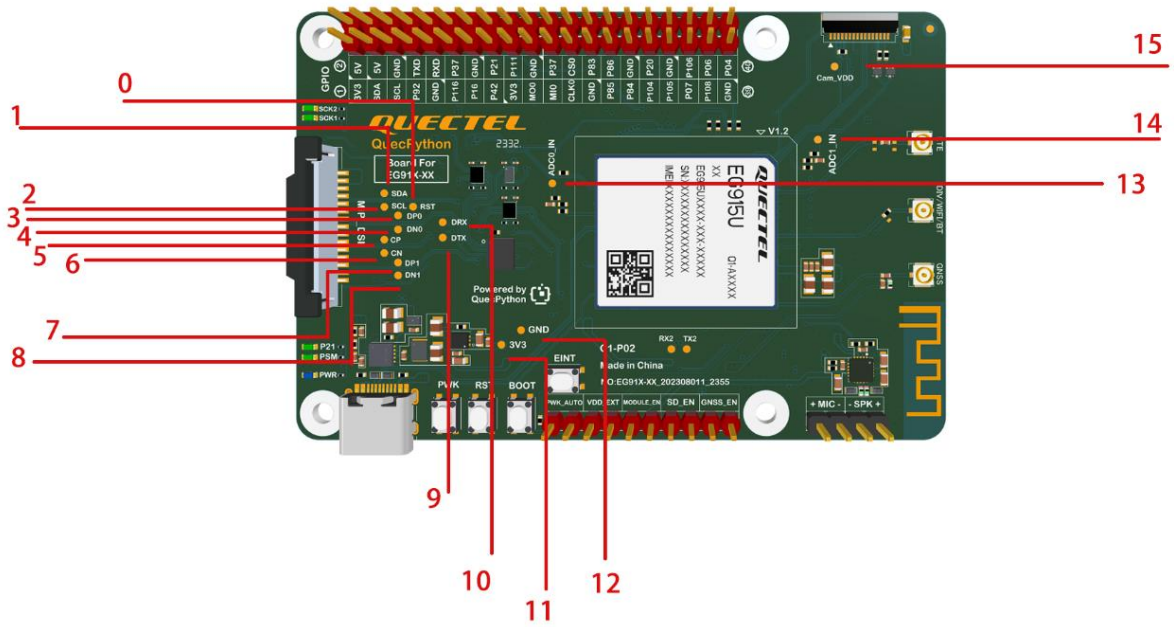


Figure 4: Pin Distribution of Test Points 1

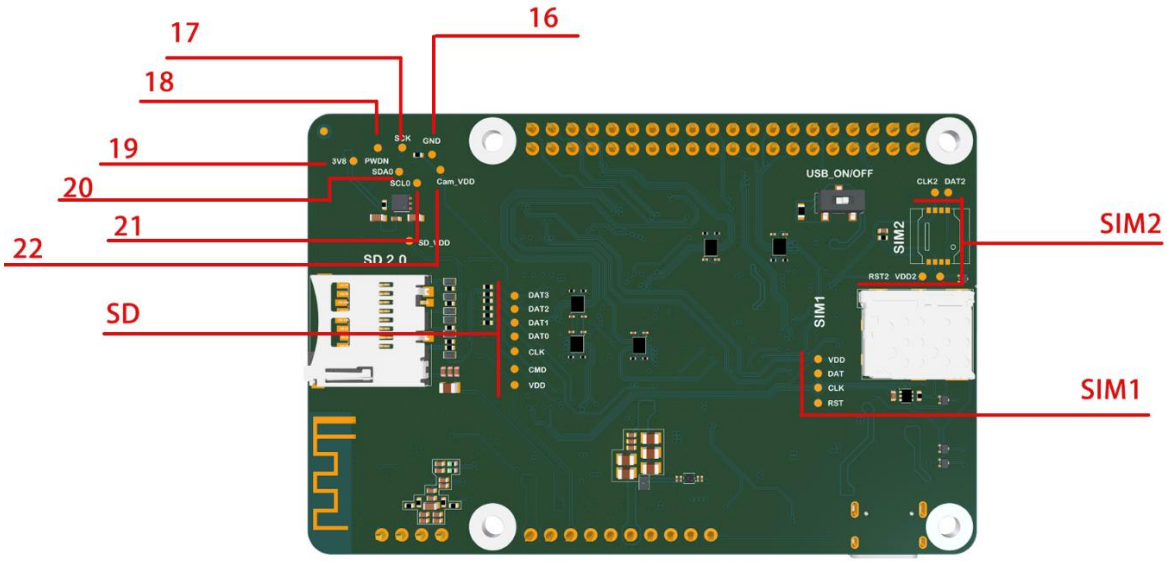


Figure 5: Pin Distribution of Test Points 2

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 of the module with 1.8 V level-shifting
10	DRX	DBG_RXD of 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 for CAM
20	SDA0	CAM_IIC_SDA0
21	SCL0	CAM_IIC_SCL0
22	CAM_VDD	2.8 V voltage of CAM_VDD

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

-	SD	SDIO
-	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.
- P21: pin 21 of the module. Indicator for NET_STATUS by default.
- PSM: pin 1 of the module. Indicator for PSM.
- 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.

2.8. ADC

ADC0_IN/ADC1_IN are led as test points by default. Their input voltage cannot exceed the VBAT input 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

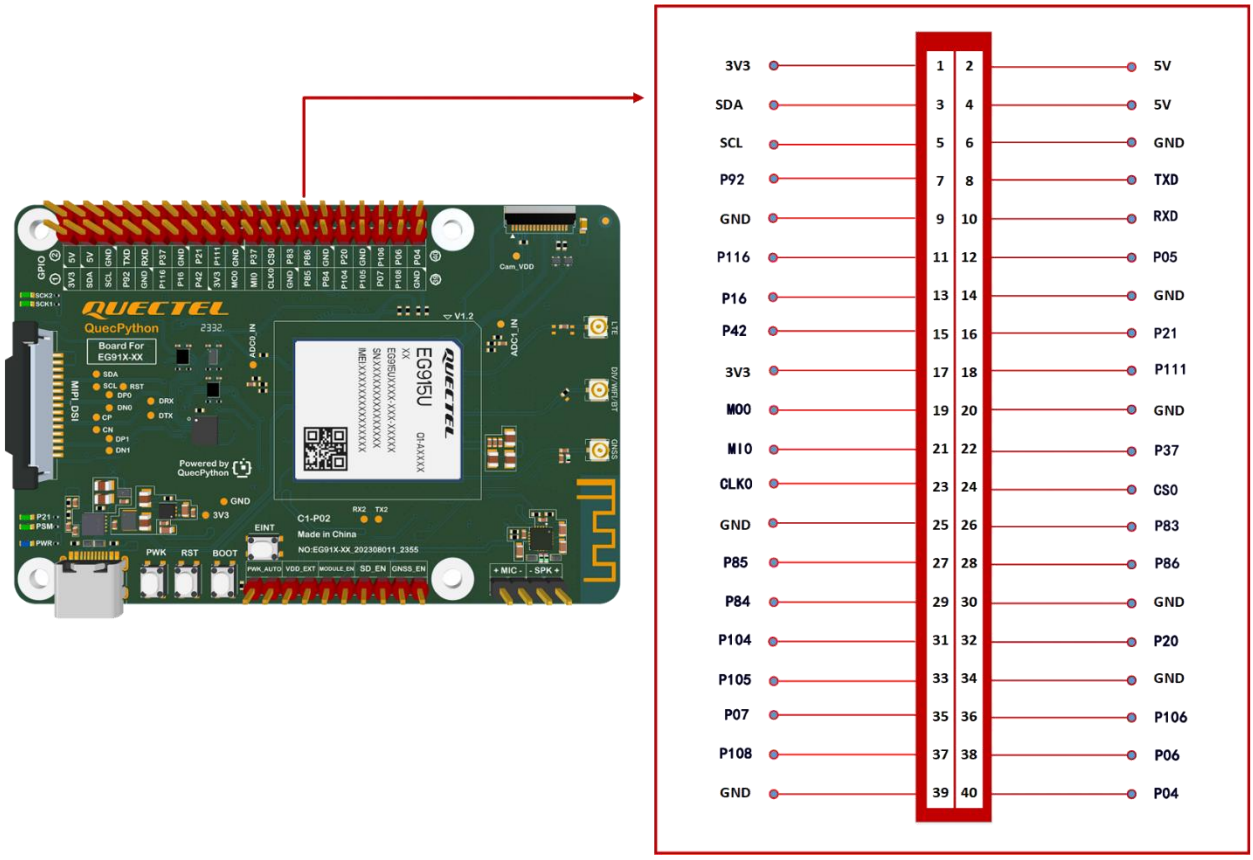


Figure 6: Pin Distribution of 40-Pin Headers

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	5V	-	-	5 V output
3	SDA	I2C1_SDA	GPIO14	I2C1 serial data/ General-purpose input/output	4	5V	-	-	5 V output
5	SCL	I2C1_SCL	GPIO13	I2C1 serial clock/ General-purpose input/output	6	GND	-	-	Ground
7	P92	GOIO30	-	General-purpose input/output	8	TXD	UART1_TXD	GPIO11	UART1 transmit/ General-purpose input/output
9	GND	-	-	Ground	10	RXD	UART1_RXD	GPIO12	UART1 receive/ General-purpose input/output
11	P116	GPIO41	-	General-purpose input/output	12	P05	GPIO2	SPI1_CS	General-purpose input/output/ SPI1 chip select
13	P16	GPIO24	-	General-purpose input/output	14	GND	-	-	Ground
15	P42	GPIO26	-	General-purpose input/output	16	P21	GPIO17	-	General-purpose input/output
17	3V3	-	-	3.3 V output	18	P111	GPIO38	-	General-purpose input/output

19	MO0	SPI0_MOSI	GPIO15	SPI0 master-out slave-in/ General-purpose input/output	20	GND	-	-	Ground
21	MI0	SPI0_MISO	GPIO21	SPI0 master-in slave-out/ General-purpose input/output	22	P37	GPIO23	-	General-purpose input/output
23	CLK0	SPI0_CLK	GPIO10	SPI0 clock/ General-purpose input/output	24	CS0	SPI0_CS	GPIO9	SPI0 chip select/ General-purpose input/output
25	GND	-	-	Ground	26	P83	GPIO28	-	General-purpose input/output
27	P85	GPIO18	-	General-purpose input/output	28	P86	GPIO19	-	General-purpose input/output
29	P84	GPIO29	-	General-purpose input/output	30	GND	-	-	Ground
31	P104	GPIO34	-	General-purpose input/output	32	P20	GPIO16	PWM0	General-purpose input/output/ PWM0 output
33	P105	GPIO35	-	General-purpose input/output	34	GND	-	-	Ground
35	P07	GPIO4	SPI1_MISO	General-purpose input/output/ SPI1 master-in slave-out	36	P106	GPIO36	-	General-purpose input/output

37	P108	GPIO37	-	General-purpose input/output	38	P06	GPIO3	SPI1_MOSI	General-purpose input/output/ SPI1 master-out slave-in
39	GND	-	-	Ground	40	P04	GPIO1	SPI1_CLK	General-purpose input/output/ SPI1 clock

3.2. Pin Definition of 10-Pin Headers

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

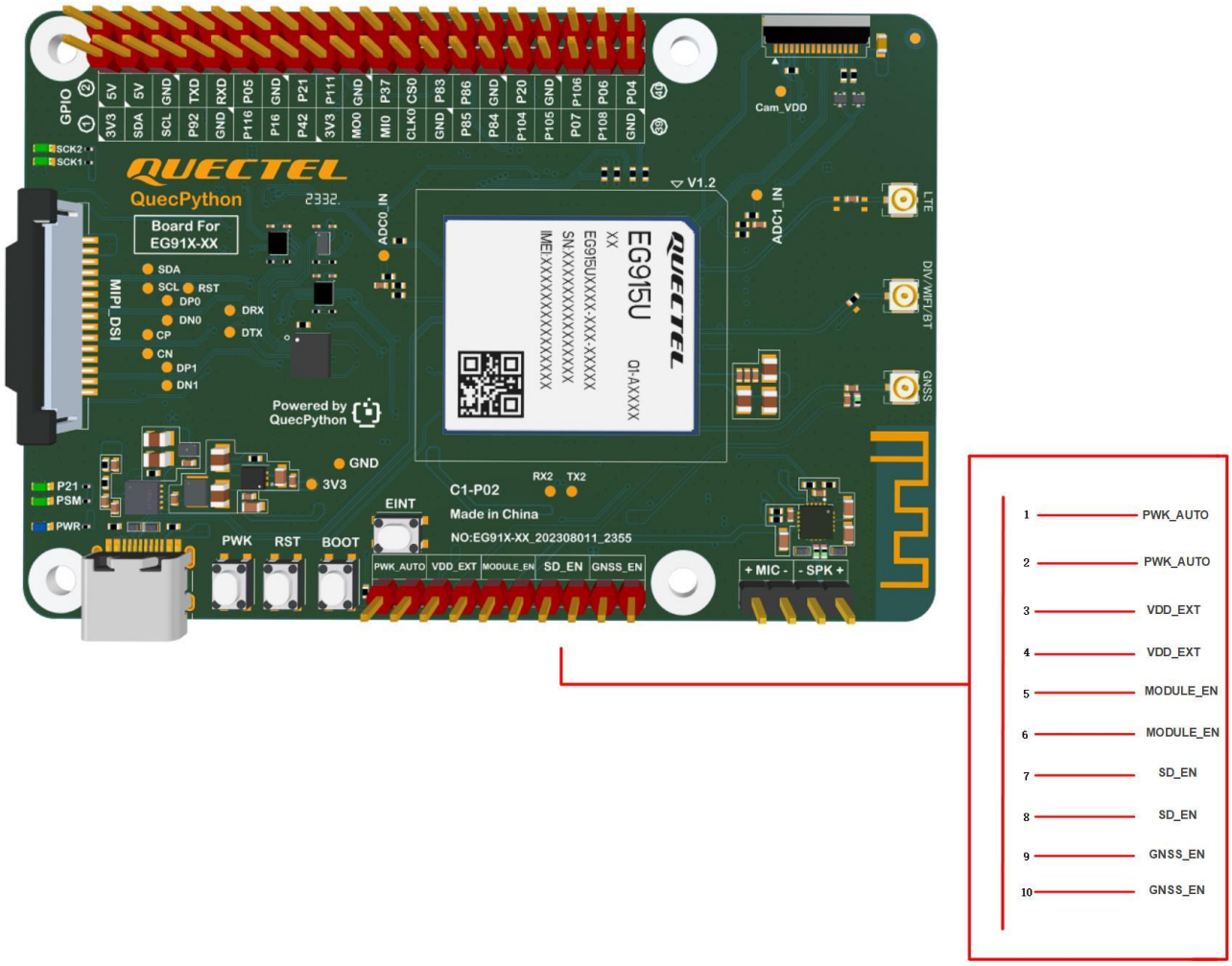


Figure 7: Pin Distribution of 10-Pin Headers

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.

4 Onboard Resource

4.1. MIPI

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

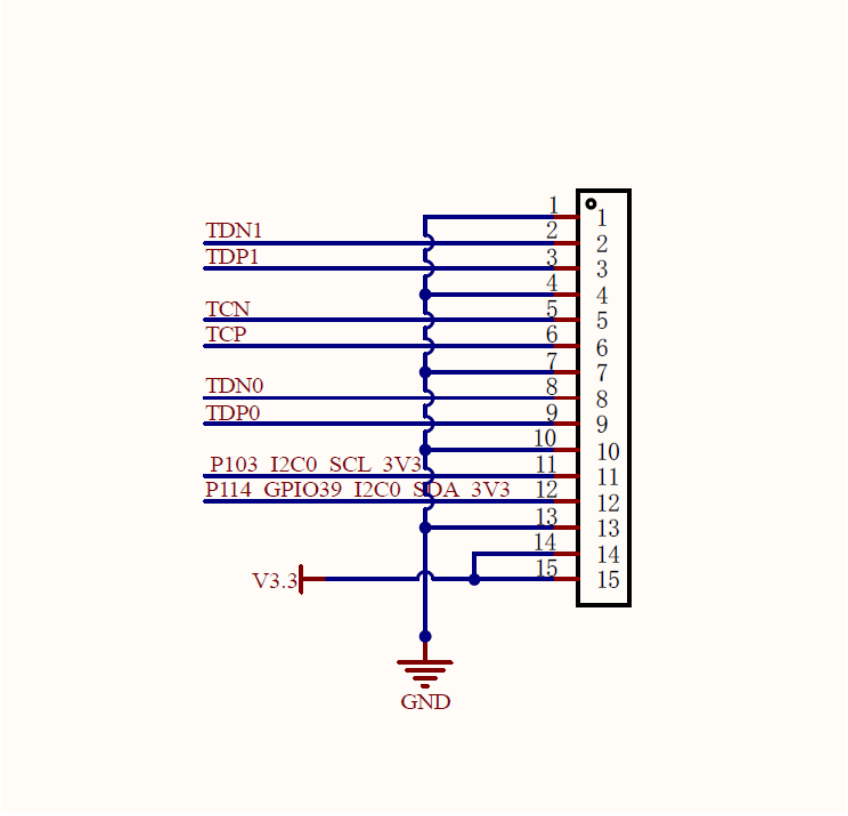


Figure 8: Reference Circuit for MIPI Screen Interface

4.2. Camera

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

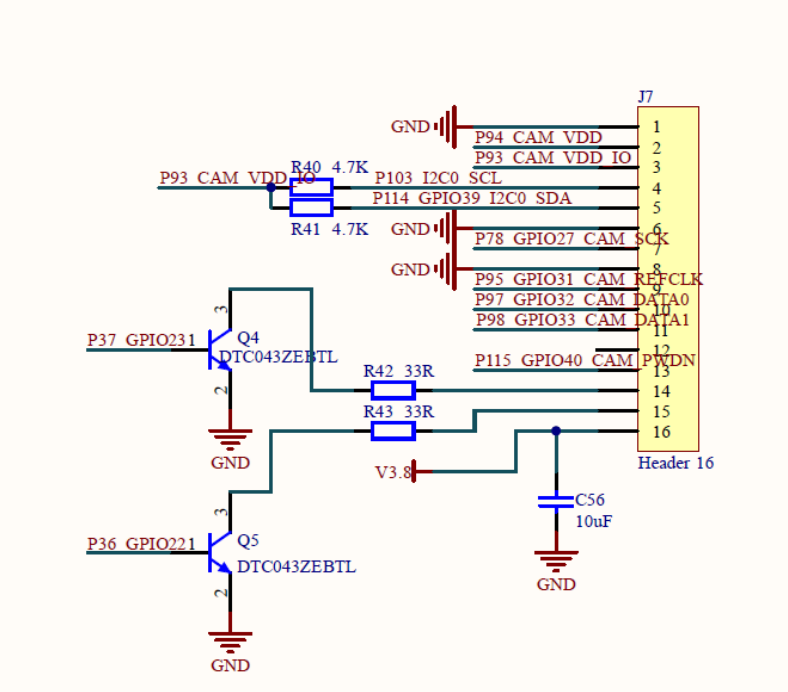


Figure 9: Reference Circuit for Camera FPC Interface

4.3. SD Card

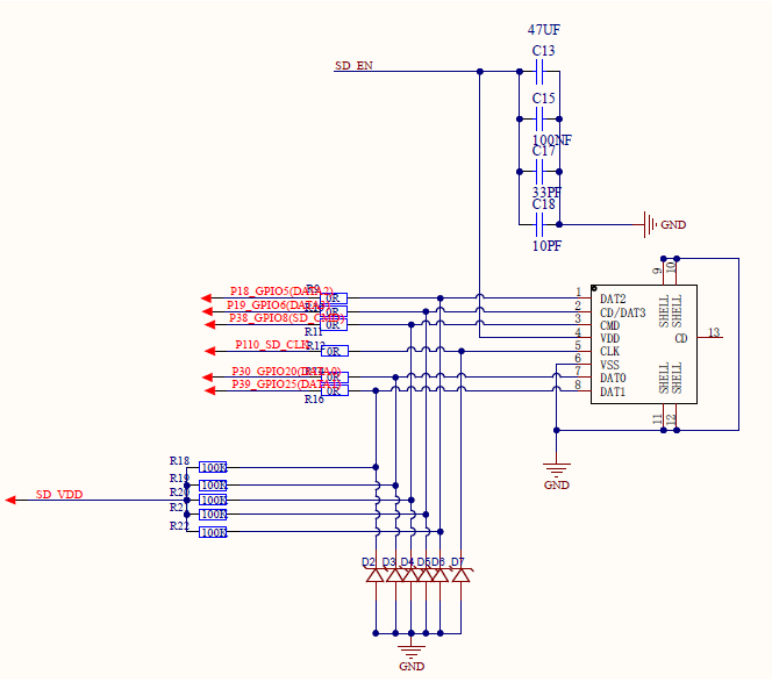


Figure 10: Reference Circuit for SD Card Interface

Before using SD card, enable SD card in the 10 functional pin headers to supply power to the SD card.

4.4. 6-wire Nor Flash

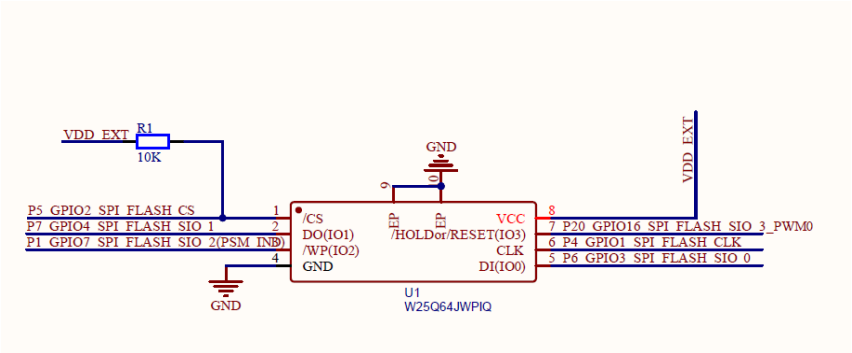


Figure 11: Reference Circuit for W25Q64JWPIQ Flash Interface

The external 6-wire Nor Flash only supports EG915U 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.

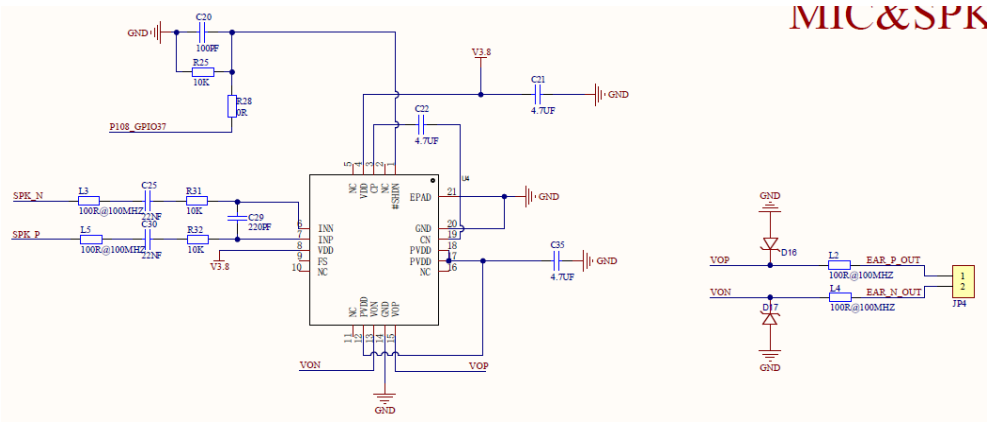


Figure 12: Reference Circuit for Microphone & Loudspeaker

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 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.

5 Mechanical Information

This chapter describes the mechanical dimensions of the EG915U series EVB.

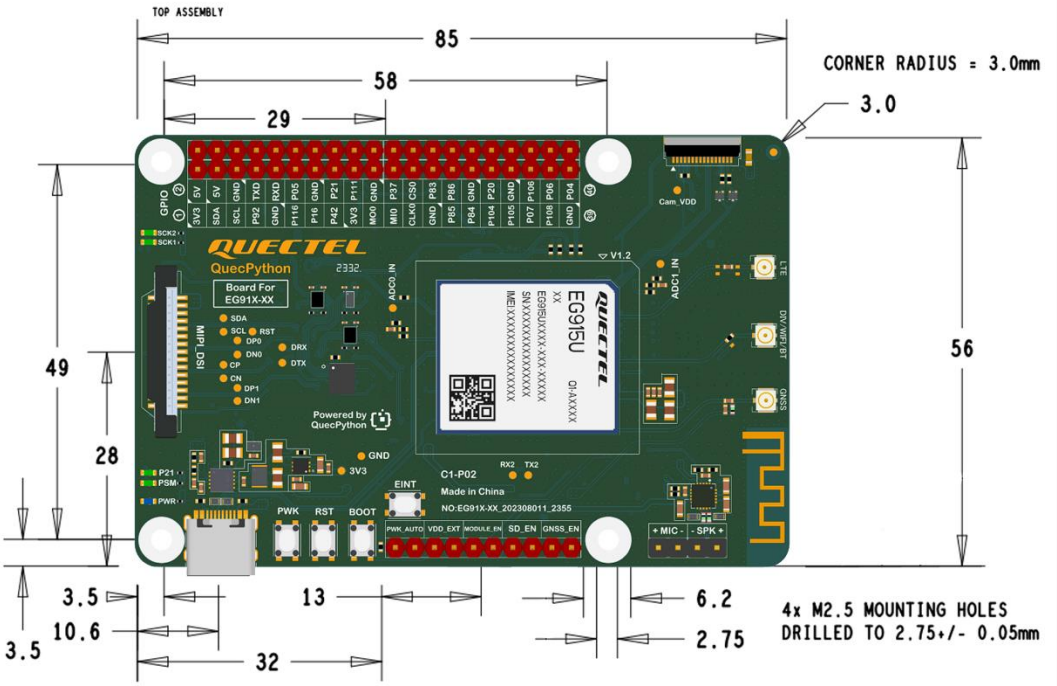


Figure 13: EVB Dimensions

6 RF Connector Recommendation

The EVB is equipped with an RF connector (socket) for easy antenna connection. Dimensions of antenna connectors are shown in the following figure.

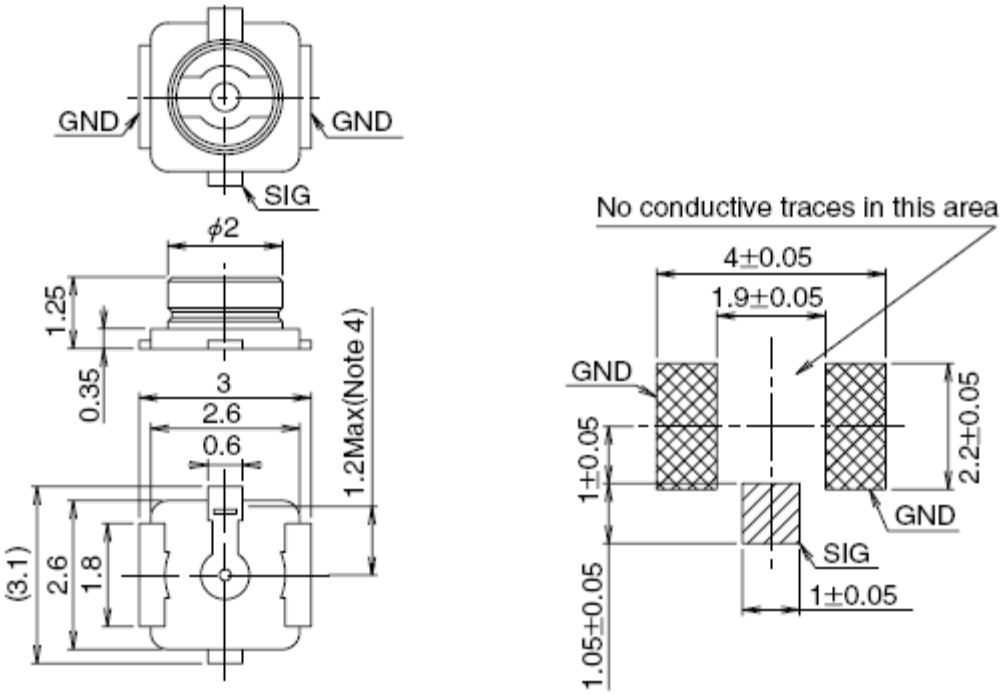


Figure 14: Dimensions of the Receptacle (Unit: mm)

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

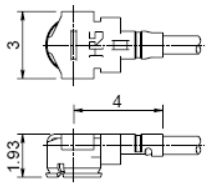
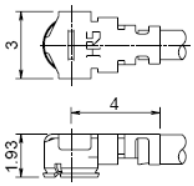
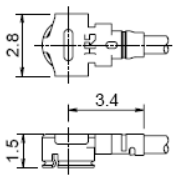
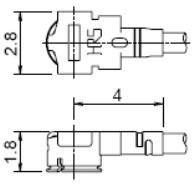
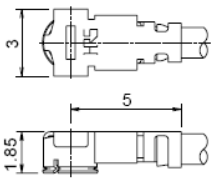
Part No.	U.FL-LP-040	U.FL-LP-066	U.FL-LP(V)-040	U.FL-LP-062	U.FL-LP-088
					
Mated Height	2.5mm Max. (2.4mm Nom.)	2.5mm Max. (2.4mm Nom.)	2.0mm Max. (1.9mm Nom.)	2.4mm Max. (2.3mm Nom.)	2.4mm Max. (2.3mm Nom.)
Applicable cable	Dia. 0.81mm Coaxial cable	Dia. 1.13mm and Dia. 1.32mm Coaxial cable	Dia. 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 15: Specifications of Mated Plugs (Unit: mm)

The following figure describes the space factor of mated connectors.

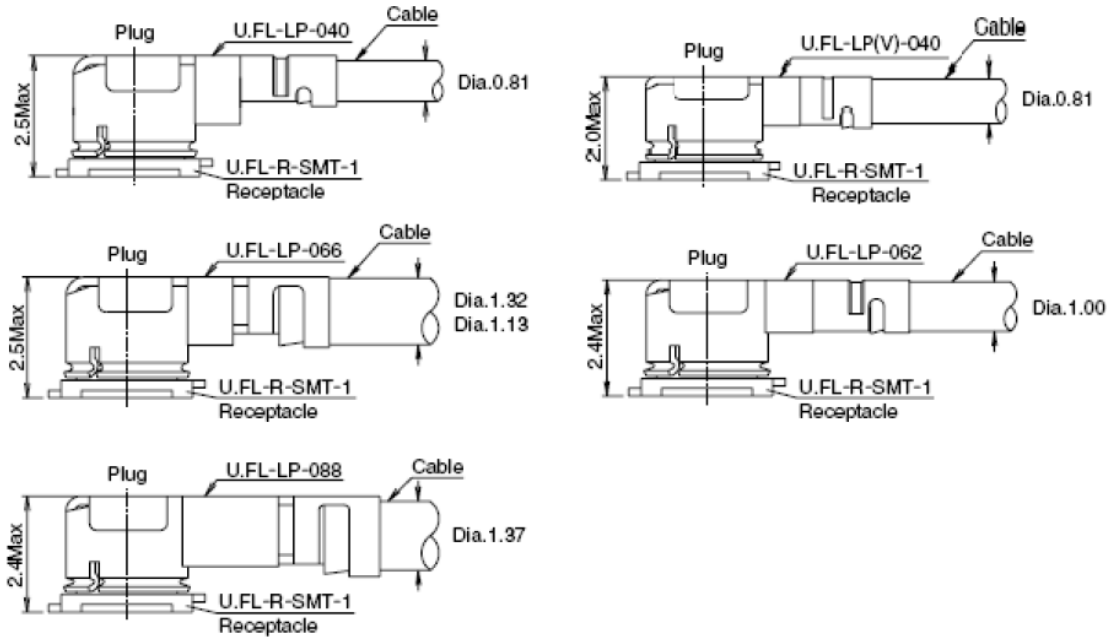


Figure 16: Space Factor of Mated Connectors (Unit: mm)

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 5: Input Power Supply Range

Parameter	Description	Min.	Typ.	Max.	Unit
V_I	USB power supply	5.0	5.0	5.1	V
V_I	External power supply	5.0	5.0	6.0	V

Table 6: I/O Requirements

Parameter	Description	Min.	Max.	Unit
V_{IH}	High-level input voltage	0.7 × VCC	VCC + 0.3	V
V_{IL}	Low-level input voltage	-0.3	0.3 × 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.

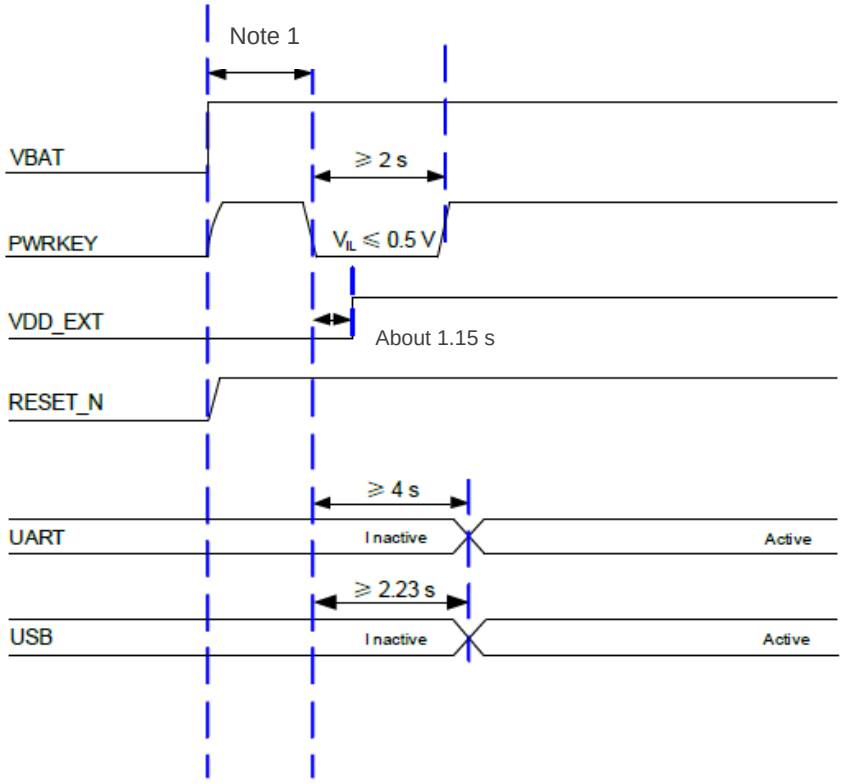


Figure 17: Timing of Turn-on with PWRKEY

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

9.1. EVB Schematics

Click the following link to download schematics of EVB:
(https://images.quectel.com/python/sites/2/2023/12/BG95_Board_Sch_0829.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/BG95_Board_SILK_SCREEN.pdf).