# SA800U-WF EVB

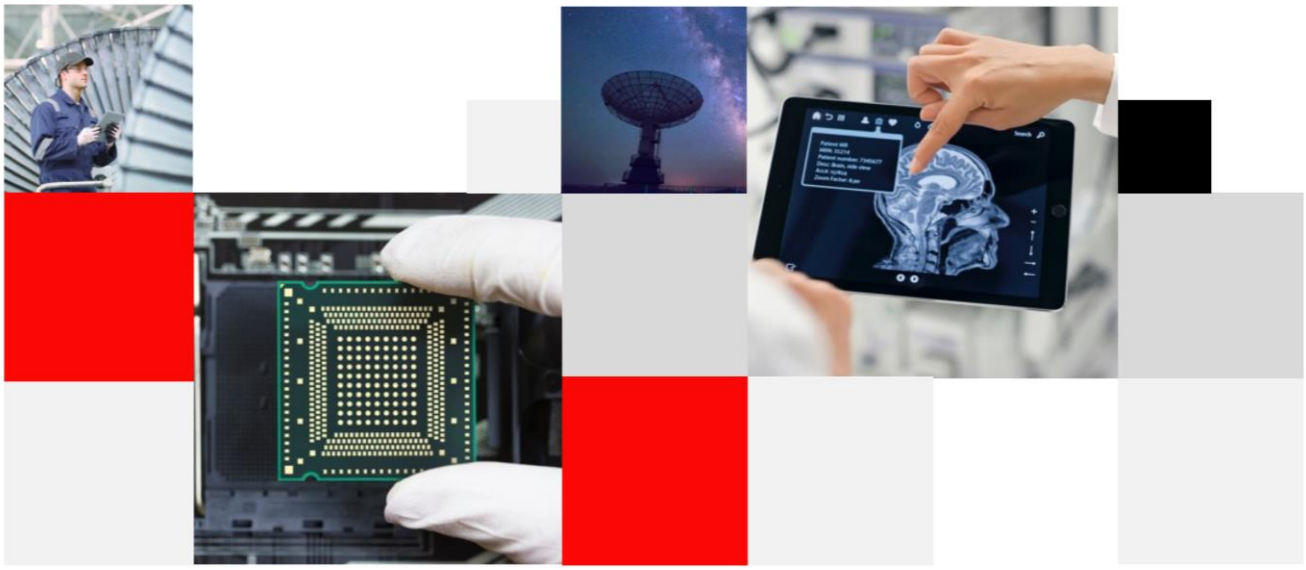
# User Guide

**Smart Module Series**

Version: 1.0.0

Date: 2021-03-25

Status: Preliminary



Build a Smarter World

**Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our company 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 office. 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 to support@quectel.com.

## General Notes

Quectel offers the information as a service to its customers. The information provided is based upon customers' requirements. Quectel makes every effort to ensure the quality of the information it makes available. Quectel does not make any warranty as to the information contained herein, and does not accept any liability for any injury, loss or damage of any kind incurred by use of or reliance upon the information. All information supplied herein is subject to change without prior notice.

## Disclaimer

While Quectel has made efforts to ensure that the functions and features under development are free from errors, it is possible that these functions and features could contain errors, inaccuracies and omissions. Unless otherwise provided by valid agreement, Quectel makes no warranties of any kind, implied or express, with respect to the use of features and functions under development. To the maximum extent permitted by law, Quectel excludes all liability for any loss or damage suffered in connection with the use of the functions and features under development, regardless of whether such loss or damage may have been foreseeable.

## Duty of Confidentiality

The Receiving Party shall keep confidential all documentation and information provided by Quectel, except when the specific permission has been granted by Quectel. The Receiving Party shall not access or use Quectel's documentation and information for any purpose except as expressly provided herein. Furthermore, the Receiving Party shall not disclose any of the Quectel's documentation and information to any third party without the prior written consent by Quectel. For any noncompliance to the above requirements, unauthorized use, or other illegal or malicious use of the documentation and information, Quectel will reserve the right to take legal action.

## Copyright

# Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any cellular terminal or mobile incorporating the module. Manufacturers of the cellular 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 cellular 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. |
|  | Cellular 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 cellular 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 cellular 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 cellular terminals. Areas with explosive or potentially explosive atmospheres include fuelling 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 |
|---|---|---|---|
| - | 2021-03-24 | Mary SHEN | Initial |
| 1.0.0 | 2021-03-25 | Mary SHEN | Preliminary |

# Contents

# Table Index

# Figure Index

# 1 Introduction

This document describes in detail the basic information and use instructions of SA800U-WF EVB. The smart evaluation board is an assistant tool to develop and test Quectel SA800U-WF module.

## 1.1. Special Mark

**Table 1: Special Mark**

| Mark | Definition |
|---|---|
| * | Unless otherwise specified, when an asterisk (*) is used after a function, feature, interface, pin name, AT command, or argument, it indicates that the function, feature, interface, pin, AT command, or argument is under development and currently not supported; and the asterisk (*) after a model indicates that the sample of such model is currently unavailable. |

# 2 Product Overview

Quectel supplies SA800U-WF EVB for designers to develop applications based on Quectel SA800U-WF module. This EVB can test basic functionalities of the module.

## 2.1. Key Features

The following table describes the detailed features of SA800U-WF EVB.

**Table 2: Key Features**

| Features | Implementation |
|---|---|
| Power Supply | DC power supply: 9.0 – 15.97 V (typical: 12.0 V)<br>Battery supply: 3.55 – 4.4 V (typical: 3.8 V) |
| LCM Interface | For LCD display, the resolution is 1280 × 720 |
| Touch Panel Interface | For capacitive touch panel |
| Camera Interfaces | **3 CSI interfaces:**<br>● CSI0: 4-lane camera interface, support 16 MP<br>● CSI1: 4-lane camera interface, support 16 MP<br>● CSI3: 2-lane TOF* camera interface, support only RAW data flow |
| HDMI Interfaces | **2 HDMI interfaces:**<br>● HDMI IN: consists of 4-lane CSI2 interface and QUA_MI2S interface<br>● HDMI OUT: consists of 4-lane DSI1 interface and SEC_MI2S interface, maximum resolution support 4K |
| USB Interfaces | **Type-C interface:**<br>● Support USB Type-C mode, DisplayPort mode and USB OTG<br>● Used for AT command communication, data transmission, software debugging and firmware upgrade<br>**Type-A interfaces:**<br>● three Type-A interfaces, only support host mode |
| PCIe interfaces | **2 PCIe interfaces:**<br>● PCIe0: Gen 2.0 1-lane interface, support 5G module<br>● PCIe1: Gen 3.0 1-lane interface, support Ethernet |

| | |
|---|---|
| Audio Interfaces | **Analog audio interfaces:**<br>● Used headset, earphone, microphone, loudspeaker<br>**Digital audio interfaces:**<br>● Used to connect digital MIC board, support 3 PDM interfaces |
| (U)SIM Interfaces | Support (U)SIM1 and (U)SIM2 cards: 1.8 V and 2.95 V |
| UART Interface | Used for debugging |
| SD Card Interface | Support 4-bit SD card with hot-plug detection |
| Flashlights | Support 3 flashlight LEDs |
| SPI Interfaces | SPI interfaces only support master mode<br>● SPI0 interfaces used for transferring CAN interface<br>● SPI1 and SPI2 is reserved the interfaces<br>● SPI8 interfaces used for Audio module |
| Sensors | Support three sensors including ALS/PS, accelerometer/gyroscope and compass |
| Vibrator | EMR vibrator |
| Switches and Buttons | **6 switches:**<br>● 2 power supply switches<br>● USB BOOT switch<br>● FCT switch<br>● 5G PWRKEY switch<br>● HDMI OUT Resolution switch<br>**3 buttons:**<br>● PWRKEY button<br>● VOL_UP button<br>● VOL_DOWN button |
| Status Indication LEDs | 6 LEDs are available for signal indication |
| Reserved | PWM/ADC Interfaces |
| Physical Characteristics | Size: 28.8 cm × 17.0 cm |

## 2.2. Interface Overview

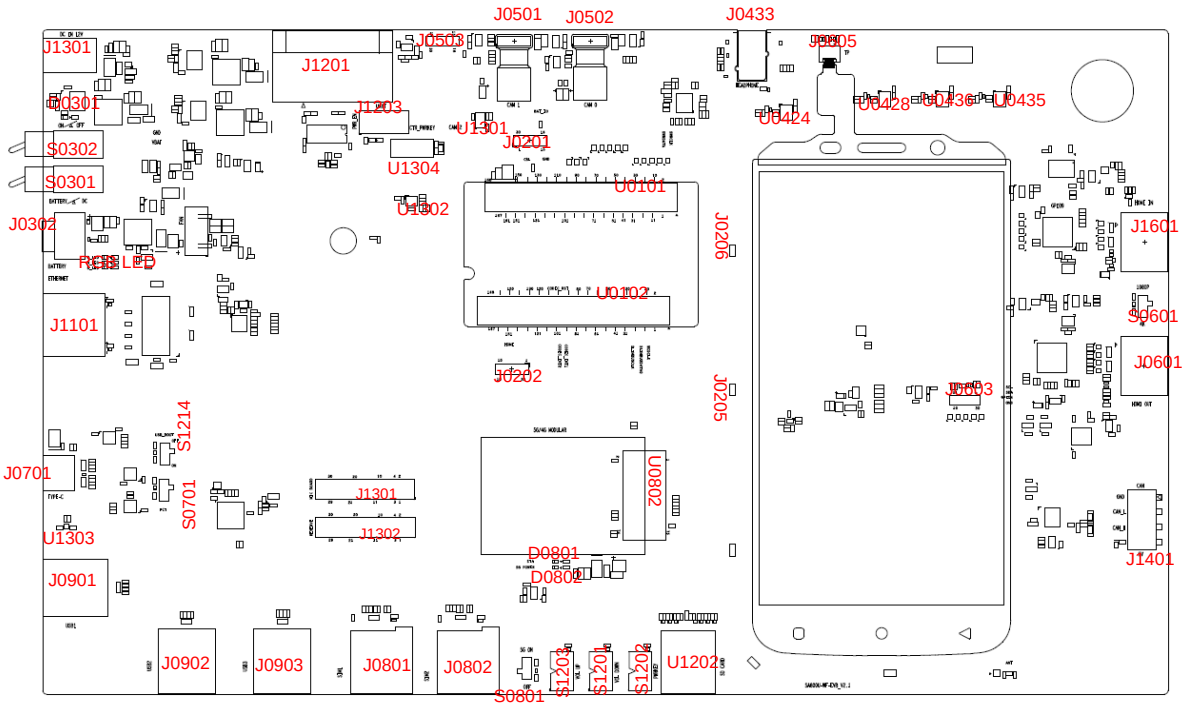



**Figure 1: SA800U-WF EVB Interface Overview (Top)**

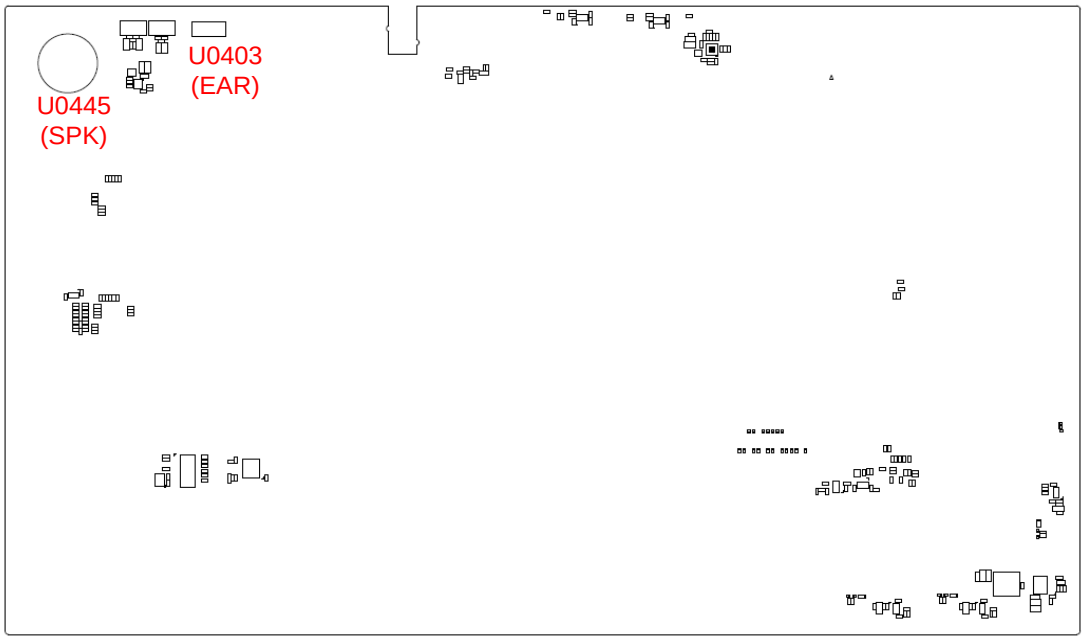



**Figure 2: SA800U-WF EVB Interface Overview (Bottom)**

**Table 3: Interfaces of SA800U-WF EVB**

| Interface | Reference Number | Description |
|---|---|---|
| DC Power Supply | J0301 | The power jack on the EVB. Typical power supply: +12.0 V |
| Battery Supply | J0302 | Li-polymer battery connector, Typical power supply: +3.8 V |
| Power Supply Switches | S0301 | Used to select DC power supply or battery power supply |
| | S0302 | Used to power on/off the module |
| PWRKEY | S1202 | Used to turn on/off the module |
| Resolution Switch | S0601 | Resolution selector switch, support 1080P and 4K |
| FCT Switch | S0701 | For factory functional testing only |
| 5G PWRKEY | S0801 | Used to turn on/off the 5G module |
| USB_BOOT | S1214 | Force the module into emergency download mode |
| VOL_UP | S1203 | Used to turn the volume up |
| VOL_DOWN | S1201 | Used to turn the volume down |
| USB | J0901, J0902, J0903 | TYPE-A connectors |
| | J0701 | TYPE-C connector |
| Ethernet | J1101 | RJ45 connector |
| M.2 | U0802 | 5G module interface |
| Audio | U0445 | Used for loudspeaker<br>● Rated resistance: 8 Ω<br>● Rated power: 1.5 W |
| | U0403 | Used for earphone<br>● Rated resistance: 32 Ω<br>● Rated power: 30 mW |
| | U0424, U0428, U0435, U0436 | Used for MEMS-type microphones |
| | J0433 | Audio Jack for headset |
| (U)SIM | J0801 | (U)SIM1 card connector |
| | J0802 | (U)SIM2 card connector |

| | | |
|---|---|---|
| UART | J1201 | UART connector |
| CAN | J1401 | CAN connector |
| SD | U1202 | SD card connector |
| LEDs | D0301<br>D0801<br>D0802<br>D1201<br>D1202<br>D1203 | D0301 indicates the power supply of the module<br>D0801 indicate the operation status of 5G module<br>D0802 indicate the power supply status of 5G module<br>D1201 is red LED<br>D1202 is green LED<br>D1203 is blue LED |
| B2B | U0101, U0102 | Connectors for connecting SA800U-WF with SA800U-WF EVB |
| FPC | J0201, J0202 | Connectors for connecting SA800U-WF with SA800U-WF EVB |
| HDMI | J0601 | HDMI OUT connector |
| | J1601 | HDMI IN connector |
| Cameras | J0501 | Camera connectors |
| | J0502 | |
| | J0503 | TOF* camera connector |
| Flashlights | D1301 | Flashlights |
| | D1302 | |
| | D1303 | |
| LCM | J0603 | LCM connector |
| TP | J0605 | Touch panel connector |
| Sensors | U1302 | Accelerometer and gyroscope sensor |
| | U1303 | Compass sensor |
| | U1301 | Ambient light sensor and proximity sensor |
| Fan | J1202* | Fan connector |
| MIC Board | J1301* | MIC board connector |
| Coin Cell | U0311 | Coin cell battery for RTC power supply |

| | | |
|---|---|---|
| Reserved | J1302 | Reserved interfaces connector |

## 2.3. Top and Bottom Views of SA800U-WF EVB

**Figure 3: SA800U-WF EVB Top View**

**Figure 4: SA800U-WF EVB Bottom View**

## 2.4. SA800U-WF EVB Kit Accessories

All accessories of the SA800U-WF EVB kit are listed as below:

**Table 4: Accessories List**

| Items | Description | Quantity (pcs) |
|---|---|---|
| Cables | Wi-Fi/Bluetooth Antenna | 2 |
| | RF Cables | 3 |
| | Type-C to DP20 Cable | 1 |
| | HDMI Cable | 1 |
| | USB-RS232 Cable | 1 |
| | USB Type-C Converter Cable | 1 |
| | One Gigabit Ethernet Cable | 1 |
| Audio | Earphone | 1 |
| USB Flash Drive | Includes module related documentation, tools and drivers, etc | 1 |
| Adapter | 12.0 V DC power supply | 1 |
| Others | FPC flat cable | 2 |
| | Bolts and coupling nuts | 6 for each |

# 3 Interface Applications

This chapter describes the hardware interfaces of SA800U-WF EVB, shown as follows:

- Power supply interfaces
- B2B and FPC interfaces
- LCM interface
- Touch panel interface
- Camera interfaces
- HDMI interfaces
- USB interfaces
- Audio interfaces
- (U)SIM interfaces
- UART interface
- CAN interface
- PCIe interfaces
- SD card interface
- Emergency download interface

It also provides information about flashlights, sensors, vibrator, buttons and switches, status indication LEDs to help customers use the SA800U-WF EVB.

## 3.1. Power Supply Interfaces

The SA800U-WF EVB can be powered by an external 12.0 V DC power adapter. Connect the DC power adapter to the power jack (J0301) and then through the DC-DC conversion circuit, the 12.0 V power supply is converted into the working voltage of the module 4.2 V.

The SA800U-WF EVB can also be powered by a Li-polymer battery through the battery connector (J0302) on the board.

The following figure shows the simplified power supply block diagram of SA800U-WF EVB.

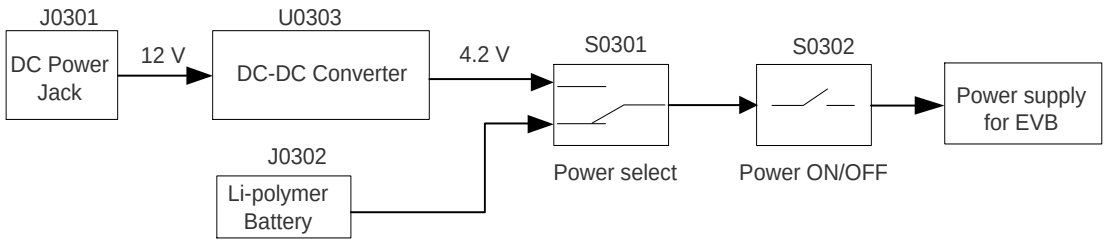



**Figure 5: Simplified Power Supply Block Diagram of SA800U-WF EVB**

### 3.1.1. Adapter Interface

The following figure shows the DC power jack (J0301) of the SA800U-WF EVB.


**Figure 6: SA800U-WF EVB Adapter Interface**

Before connecting the power supply, customers have to select a proper +12 V DC power adapter to supply power for the SA800U-WF EVB, and the power plug design of the adapter is shown as below.

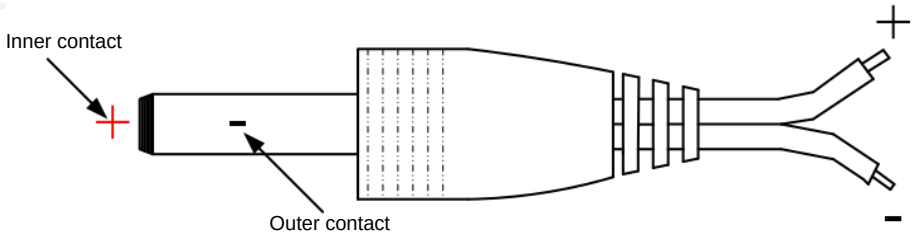



**Figure 7: Power Plug Design**

### 3.1.2. Battery Interface

The following figure shows a reference circuit design for battery interface (J0302).

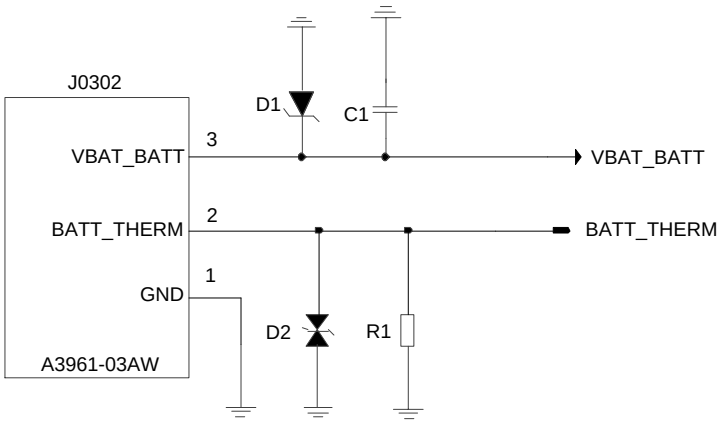



**Figure 8: Reference Design for Battery Interface**

The following figure shows the pin assignment of battery interface, and the following table shows the pin definition of battery connector.

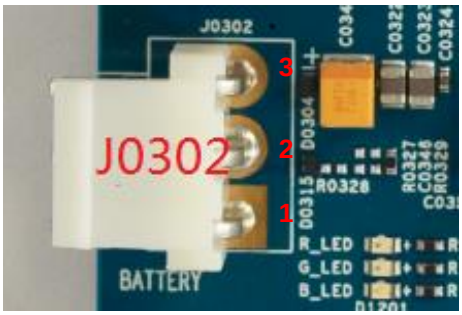



**Figure 9: Pin Assignment of Battery Interface**

**Table 5: Pin Definition of Battery Interface**

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | BATT_THERM | Battery temperature detection.<br>A 47K thermistor is used for the battery protection circuit. |
| 3 | VBAT_BATT | Power input |

## 3.2. B2B and FPC Interfaces

SA800U-WF EVB is a function board specially designed for the SA800U-WF module. The SA800U-WF module is connected via two B2B connectors U0101 and U0102, and two FPC connectors J0201 and J0202.

The following two figures show the B2B and FPC connectors and the sketch map of the SA800U-WF.

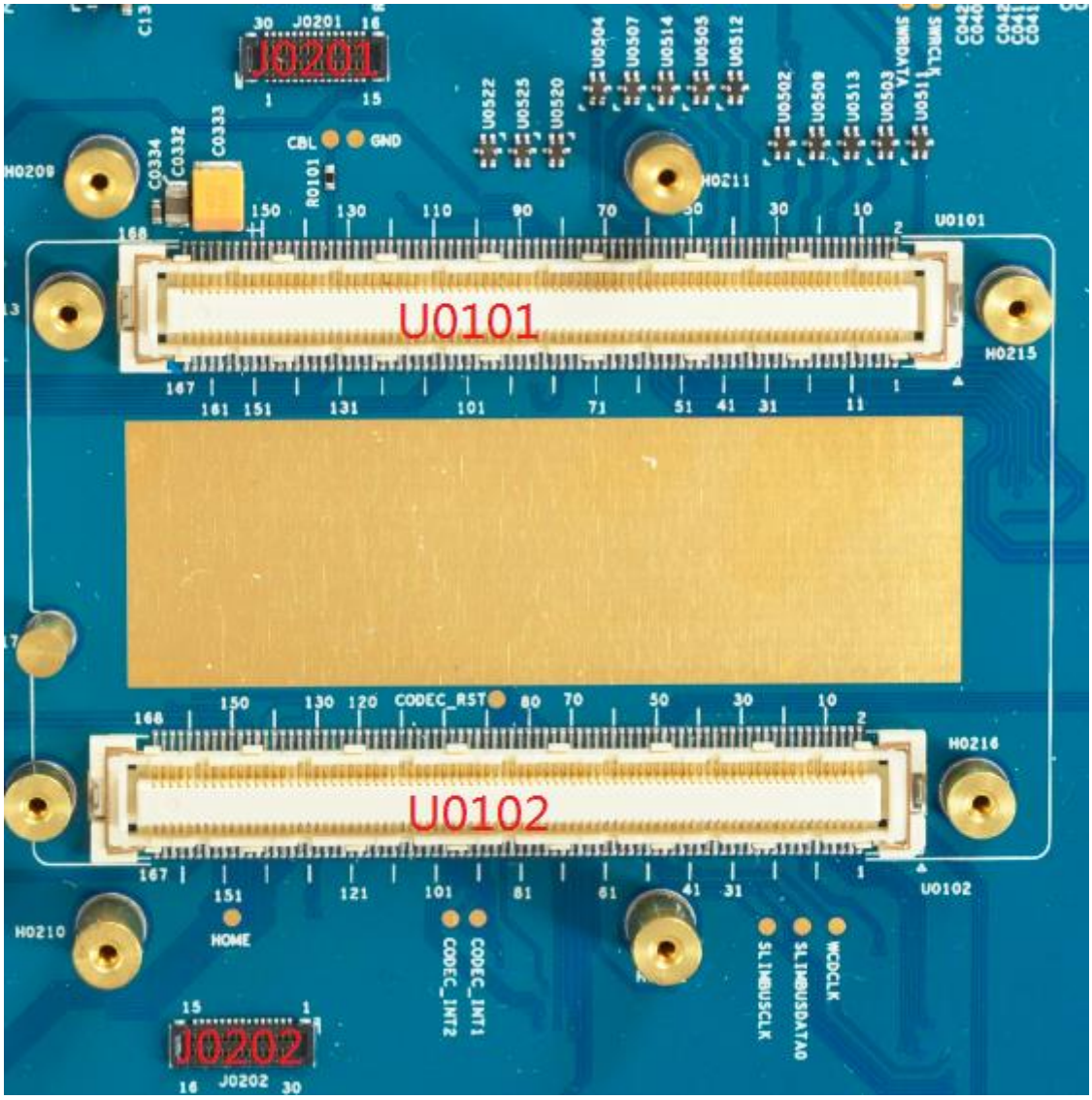



**Figure 10: B2B and FPC Connectors**

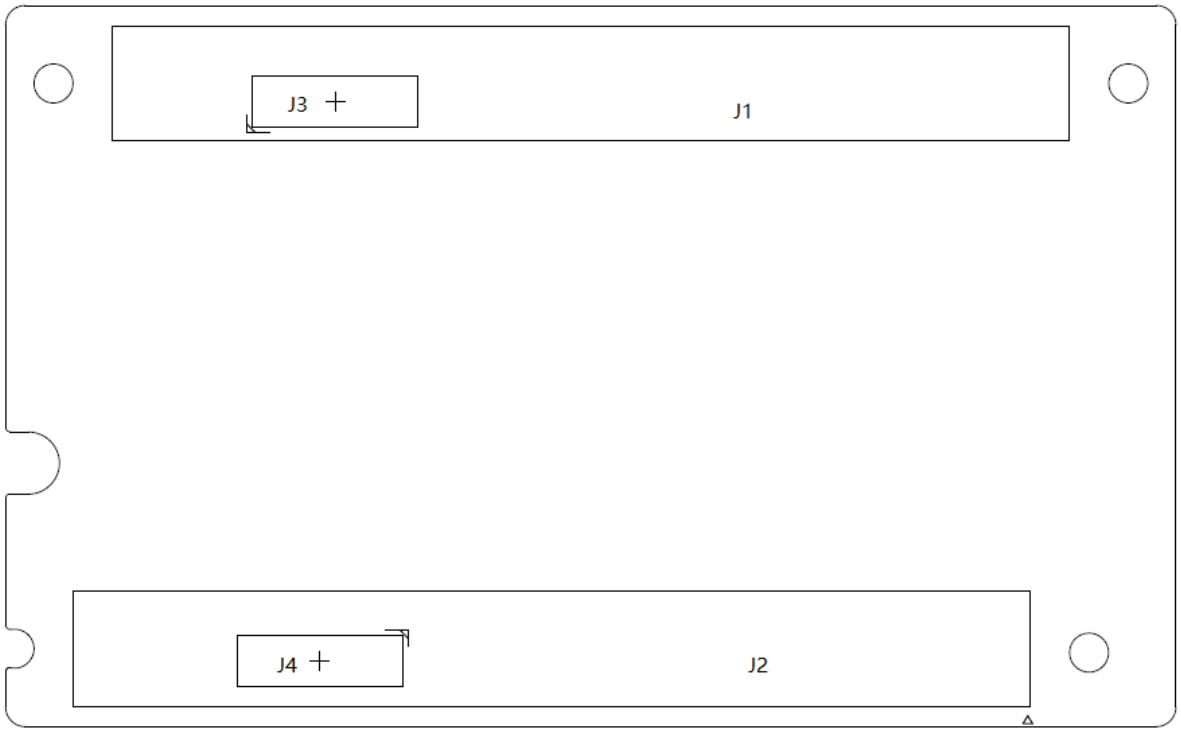



**Figure 11: Sketch Map of SA800U-WF (Top View)**

See ***document [1]*** for detailed information about pin definition of B2B and FPC connectors.

## 3.3. LCM Interface

SA800U-WF EVB display interface (J0603) is based on MIPI_DSI0 standard, supporting 4 groups of high-speed differential data transmission, resolution of 1280 × 720, supporting high-definition display.

The following figure shows a reference circuit design for LCM interface of the SA800U-WF EVB.

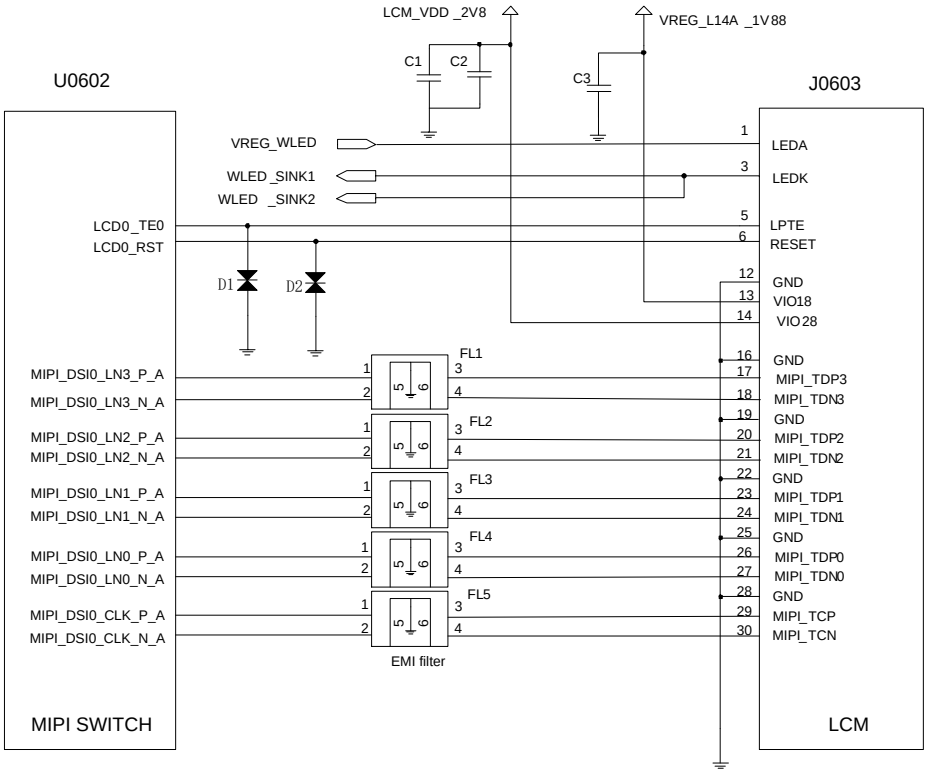



**Figure 12: Reference Design for LCM Interface**

Pin definitions are shown in the following table:

**Table 6: Pin Definitions for the LCM Interface**

| Pin No | Pin Name | Describe |
|---|---|---|
| 1 | LEDA | Anode pin of backlight |
| 3 | LEDK | Cathode pin of backlight |
| 5 | LPTE | Tearing effect output |
| 6 | RESET | Reset |
| 13 | VIO18 | 1.8 V |

| | | |
|---|---|---|
| 14 | VIO28 | 2.8 V |
| 17 | MIPI_TDP3 | MIPI Data 3(+) |
| 18 | MIPI_TDN3 | MIPI Data 3(-) |
| 20 | MIPI_TDP2 | MIPI Data 2(+) |
| 21 | MIPI_TDN2 | MIPI Data 2(-) |
| 23 | MIPI_TDP1 | MIPI Data 1(+) |
| 24 | MIPI_TDN1 | MIPI Data 1(-) |
| 26 | MIPI_TDP0 | MIPI Data 0(+) |
| 27 | MIPI_TDN0 | MIPI Data 0(-) |
| 29 | MIPI_TCP | MIPI Clock (+) |
| 30 | MIPI_TCN | MIPI Clock (-) |
| 12, 16, 19, 22, 25, 28 | GND | GND |

The following figure shows the pin assignments of LCM interface.

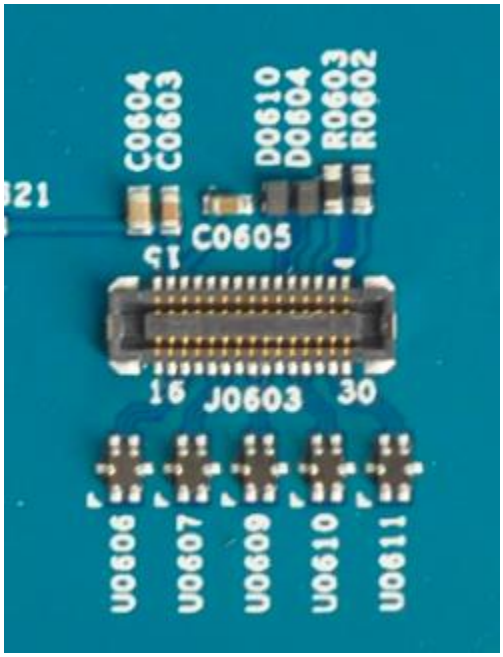



**Figure 13: Pin Assignments of LCM Interface**

## 3.4. Touch Panel Interface

SA800U-WF EVB touch panel interface (J0605) is used to realize the touch function of LCD screen. The following figure shows a reference design for touch panel interface.

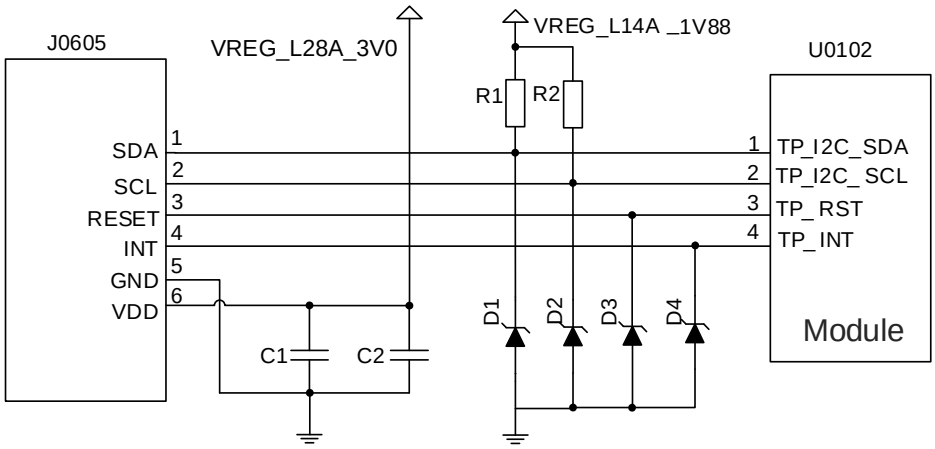



**Figure 14: Reference Design for Touch Panel Interface**

The following table shows the pin definition of touch panel interface:

**Table 7: Pin Definition of Touch Panel Interface**

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | TP_I2C_SDA | TP I2C data |
| 2 | TP_I2C_SCL | TP I2C clock |
| 3 | TP_RST | TP reset |
| 4 | TP_INT | TP interrupt |
| 5 | GND | Ground |
| 6 | VDD | 3.0 V power supply for touch panel VDD power |

The following figure shows the pin assignments of touch panel interface:

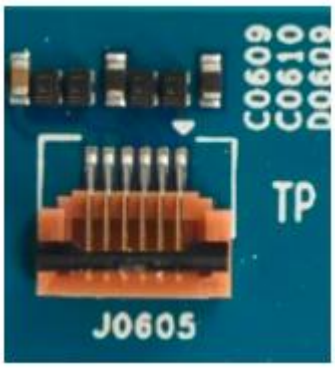



**Figure 15: Pin Assignments of Touch Panel Interface**

## 3.5. Camera Interfaces

The SA800U-WF EVB is based on the MIPI CSI standard and supports 2 regular cameras and a TOF* camera. The camera interface J0501 supports 4-lane MIPI_CSI1, and the camera interface J0502 supports 4-lane MIPI_CSI0. The pixels of the two cameras are both 16 MP. The TOF* camera interface J0503 supports 2-lane MIPI_CSI3, only supports RAW format and does not support preview. The video and photo quality are determined by various factors such as camera sensor, camera lens quality, etc.

The following figure shows a reference design for camera interface.

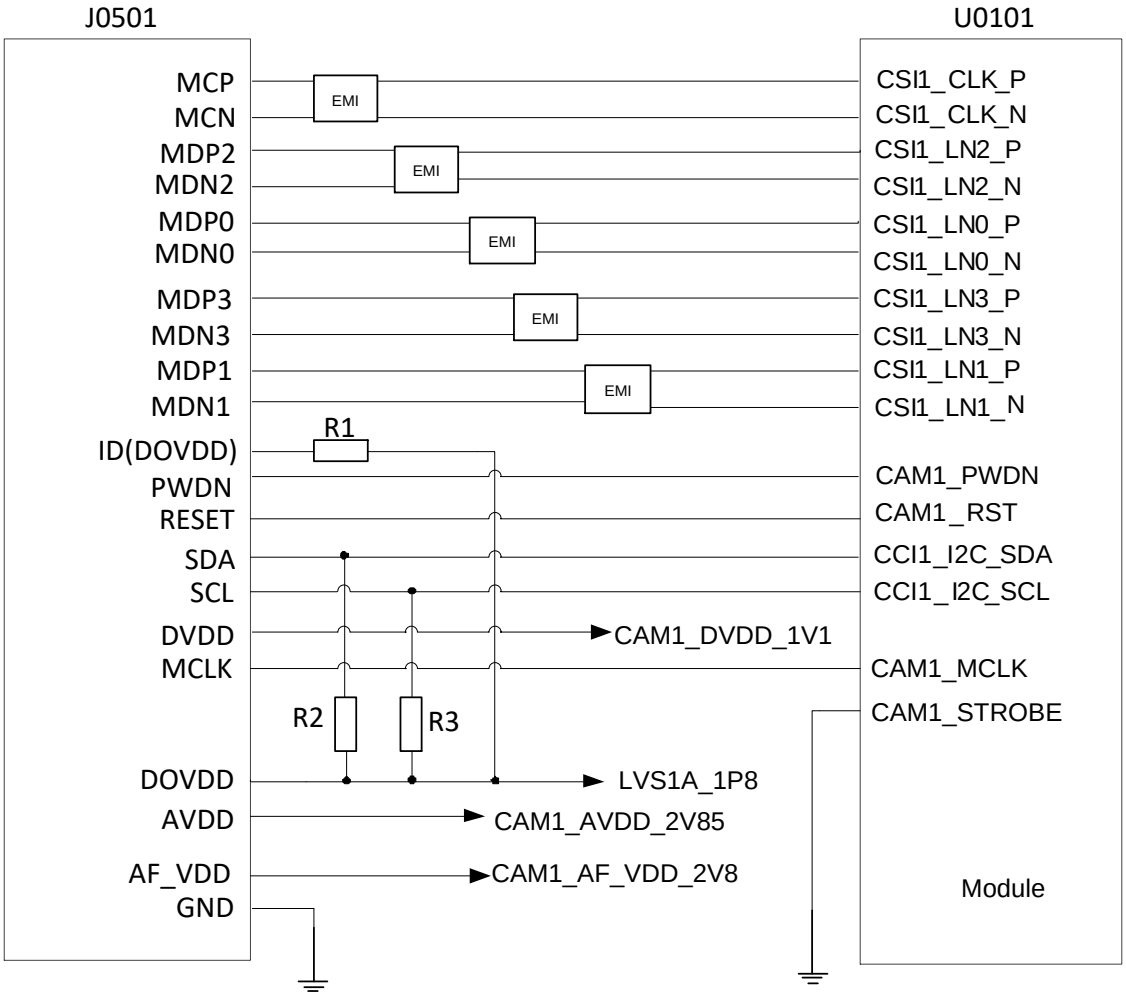



**Figure 16: Reference Design for Camera Interface J0501**

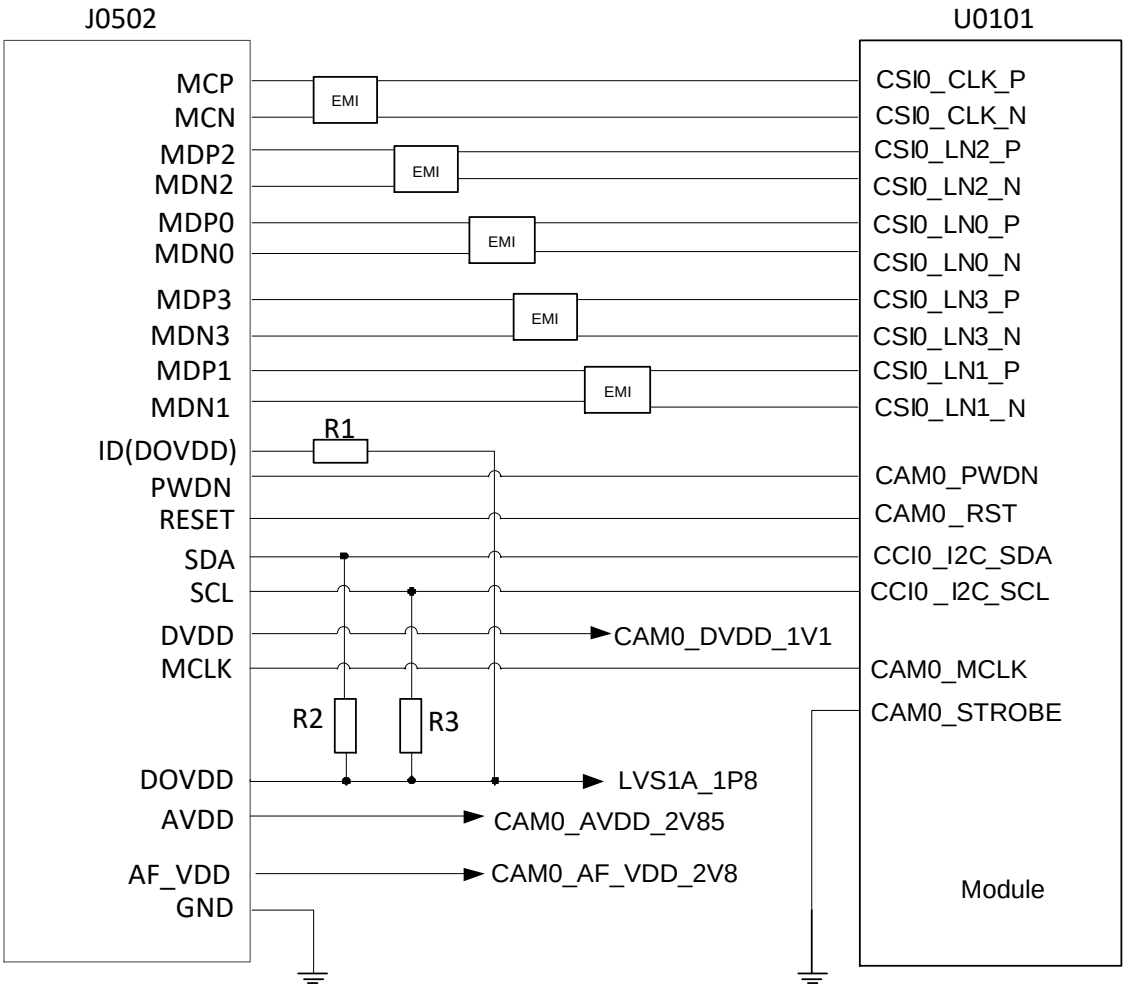



**Figure 17: Reference Design for Camera Interface J0502**

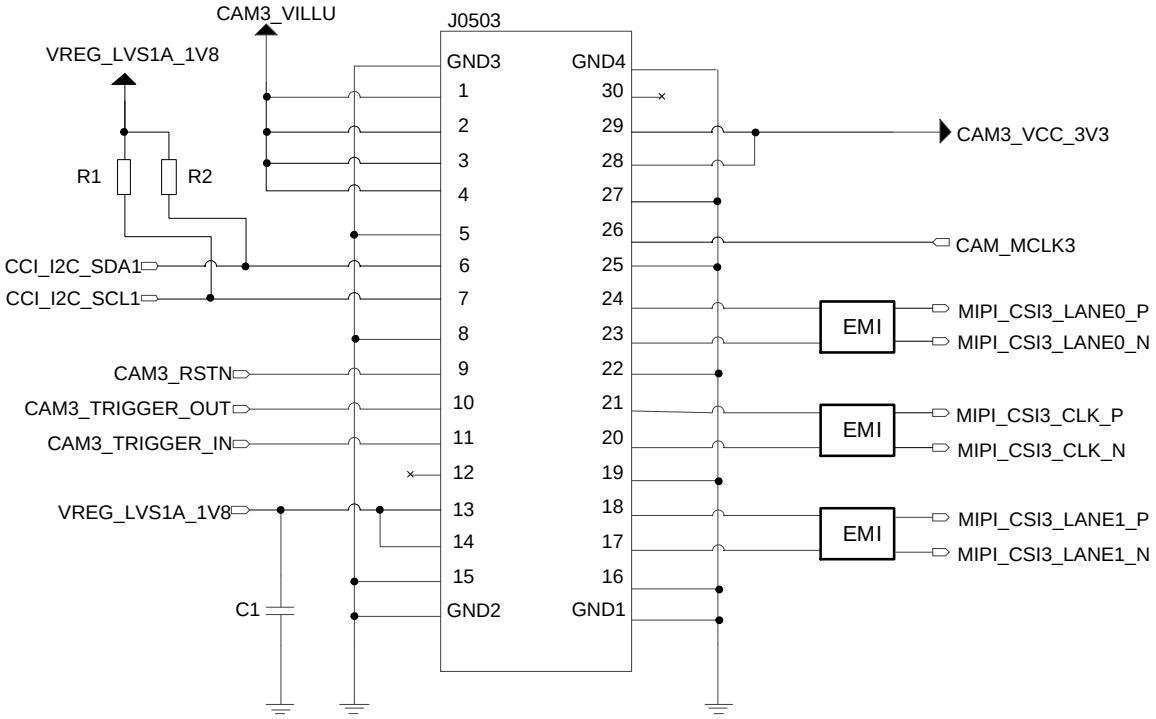



**Figure 18: Reference Design for TOF* Camera Interface**

The following figure shows the camera interfaces with cameras assembled.

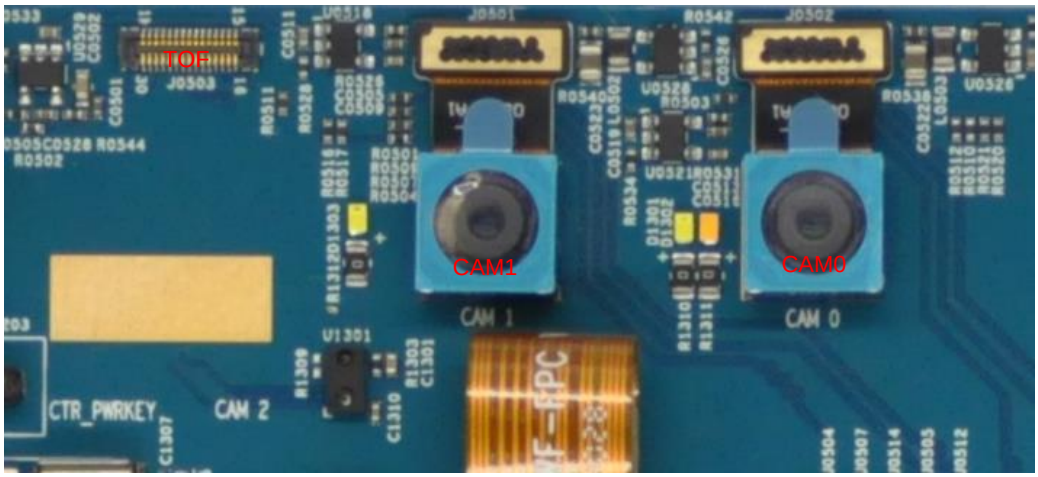



**Figure 19: Camera Interfaces with Cameras Assembled**

## 3.6. HDMI Interfaces

SA800U-WF EVB provides a HDMI IN and a HDMI OUT interfaces. The following figure shows a reference circuit design for HDMI IN interface (J1601).

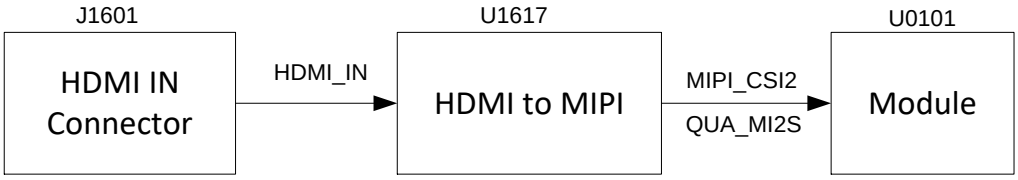



**Figure 20: Simplified Interface Schematic for HDMI IN**

The following figure shows a reference circuit design for HDMI OUT interface (J0601).

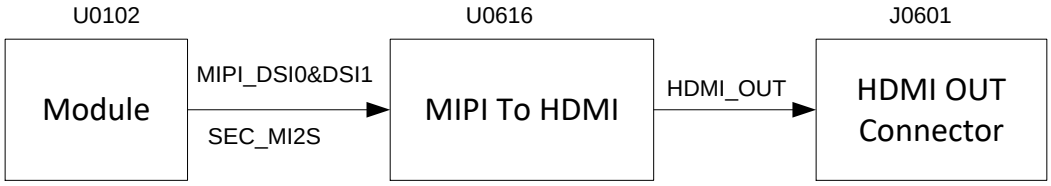



**Figure 21: Simplified Interface Schematic for HDMI OUT**

## 3.7. USB Interfaces

The SA800U-WF EVB provides a USB Type-C port and 3 USB Type-A ports, both of which comply with the USB 3.1/2.0 specification. In terms of data transmission rate, it supports ultra-high speed (5 Gbps) mode, high speed (480 Mbps) mode, and full speed (12 Mbps) mode. USB Type-C interface supports DisplayPort mode and OTG function, which can be used for AT instruction transmission, data transmission, software debugging and software upgrade. USB Type-A interface only supports Host mode.

### 3.7.1. Type-C Interface

USB Type-C interface (J0701) has a set of USB 2.0 compatible HS interfaces, namely USB_DP and USB_DM, and two sets of USB 3.1 compatible SS interfaces, namely USB_SS1 and USB_SS2.
When Type-C is plugged in right-side up, USB_CC1 will detect the external device, and the data will be

transmitted through USB_SS1; when it is plugged in upside down, USB_CC2 will detect the external device, and the data will be transmitted through USB_SS2. The following table shows the pin definition of USB Type-C interface.

The following figure shows a reference circuit design for USB 3.1 interface.

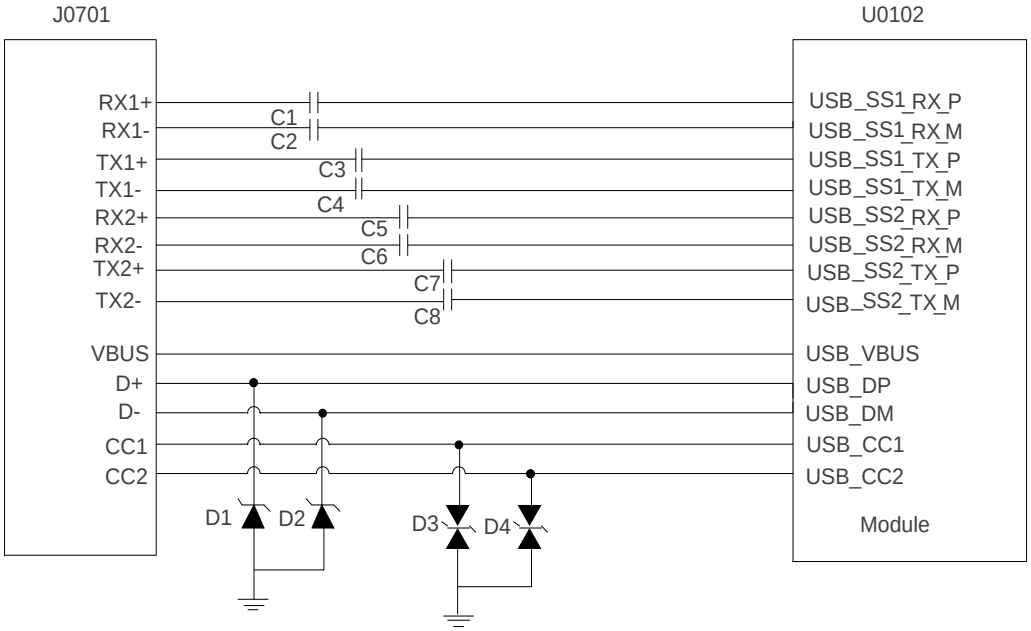



**Figure 22: The Simplifies Circuit for Type-C Interface**

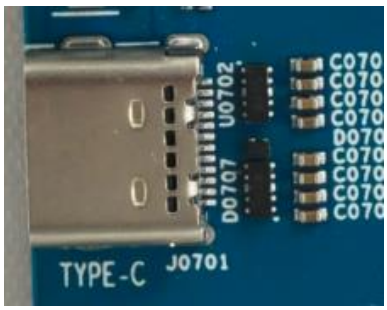



**Figure 23: Type-C Interface**

USB Type-C interface supports DisplayPort function, and the maximum resolution is 4K @ 60fps. The default software version does not support DP functionality. If you need DP function, please contact us to update the software. The pin descriptions in USB Type-C and DisplayPort mode are listed below:

**Table 8: Pin Descriptions in USB Type-C and DisplayPort Mode**

| Pin Name | USB Type-C Mode | DisplayPort Mode |
|---|---|---|
| USB1_SS2_RX_P/M | USB1_SS2_RX_P/M | DP_LANE0_P/M |
| USB1_SS2_TX_P/M | USB1_SS2_TX_P/M | DP_LANE1_P/M |
| USB1_SS1_RX_P/M | USB1_SS1_RX_P/M | DP_LANE3_P/M |
| USB1_SS1_TX_P/M | USB1_SS1_TX_P/M | DP_LANE2_P/M |
| EDP_AUX_P/N | SBU1/2 | DP_AUX_P/N |
| USB1_DP/DM | USB1_DP/DM | USB1_DP/DM |
| USB_CC1/CC2 | USB_CC1/CC2 | HOTPLUG_DET/VCONN |
| USB_VBUS | USB_VBUS | USB_VBUS |
| GND | GND | GND |

### 3.7.2. Type-A Interfaces

The SA800U-WF EVB provides 3 Type-A interfaces, which are extended from the module's USB2 interface through the HUB chip (U0901). The following figure is the block diagram and the actual diagram of Type-A interface design.

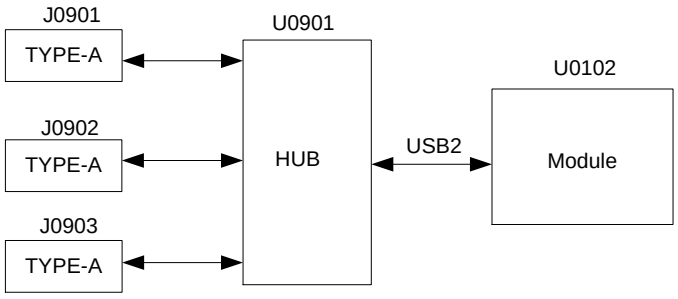



**Figure 24: Type-A Interfaces Block Diagram**

## 3.8. Audio Interfaces

SA800U-WF EVB supports analog audio signal and digital audio signal, in which the analog audio interface supports headset, earphone, microphones, loudspeaker and LINE_OUT differential signal. Digital audio interface is for external digital MIC board.

### 3.8.1. Headset Interface

SA800U-WF EVB provides a headset jack (J0433). The following figure shows a reference circuit design for headset interface.

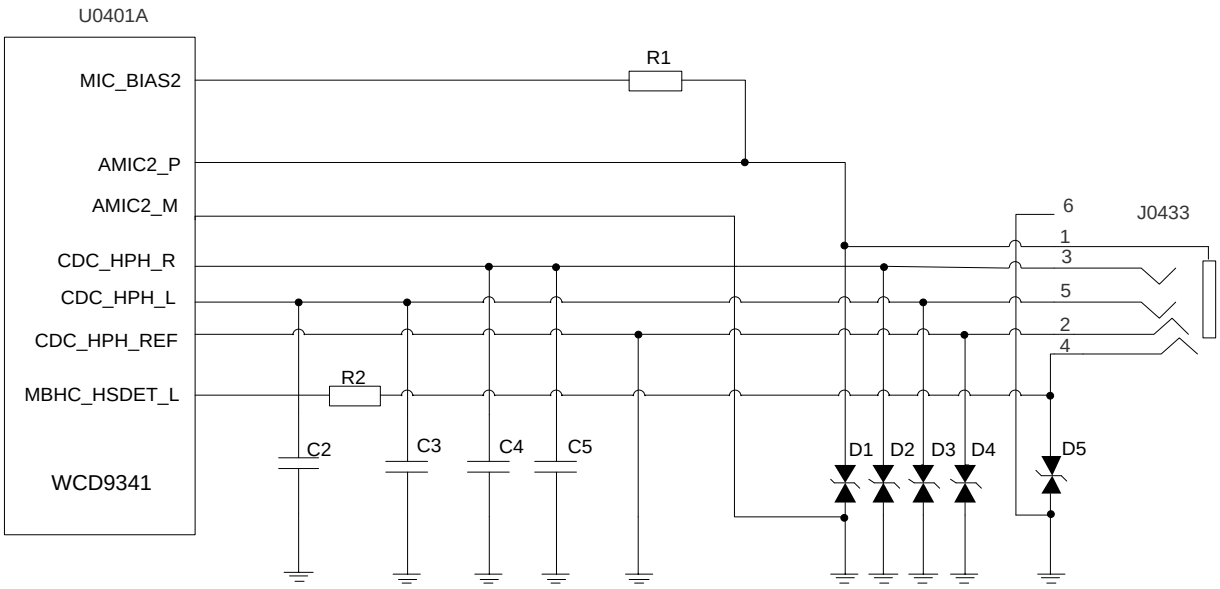



**Figure 25: Simplified Circuit for Headset Interface**

The following figure shows the pin assignment of headset interface.

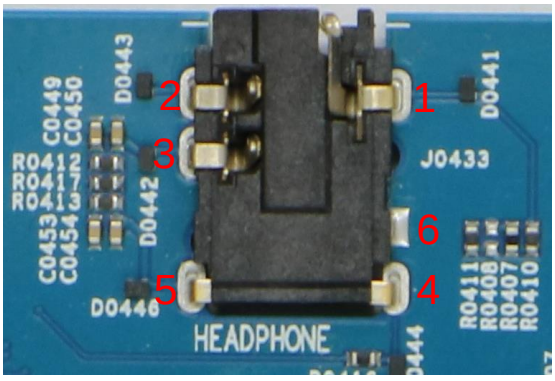



**Figure 26: Pin Assignment of Headset Interface**

The following table shows the pin definition of headset interface.

**Table 9: Pin Definition of Headset Interface**

| Pin No. | Pin Name | Function |
|---|---|---|
| 1 | MIC | Positive microphone input |
| 2 | GND | Dedicated GND for audio |
| 3 | R-AUDIO | Headset right channel |
| 4 | DETECT | Headset detection |
| 5 | L-AUDIO | Headset left channel |
| 6 | GND | Ground |

The following figure shows the sketch design of audio plug which suits for the audio jack on SA800U-WF EVB.

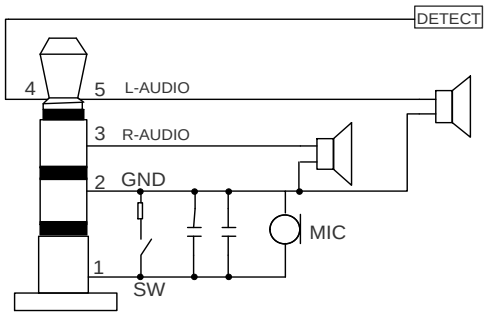



**Figure 27: Sketch of Audio Plug**

### 3.8.2. Microphone Interfaces

The SA800U-WF EVB provides 4 analog microphones, namely U0424, U0428, U0435 and U0436. The following figures show a reference circuit design for microphone interfaces.

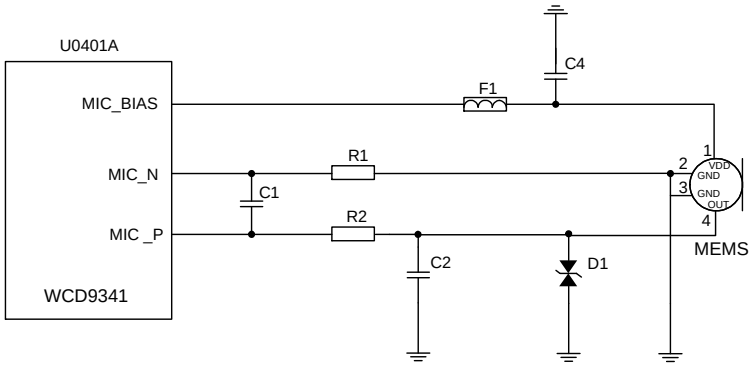



**Figure 28: Reference Design for Microphone Interfaces**

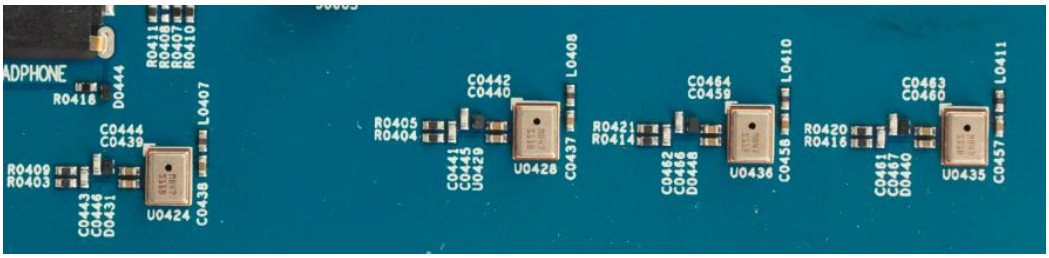


**Figure 29: MEMS-Type Microphones**

### 3.8.3. Earphone Interface

The SA800U-WF EVB provides an earphone interface (U0401), and the earphone is welded to the EVB via U0403 pads. The following figure shows a reference circuit design for earphone interface.

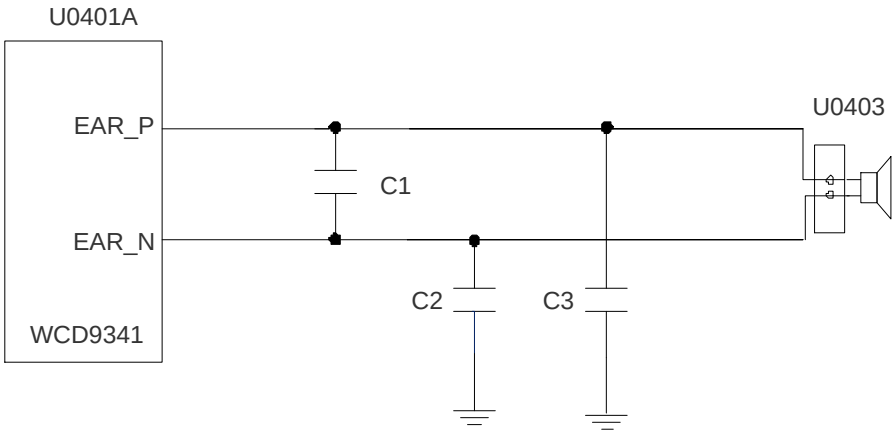



**Figure 30: Reference Design for Earphone Interface**

### 3.8.4. Loudspeaker Interface

The SA800U-WF EVB provides a speaker interface (U0427), and the loudspeaker is welded to the EVB via U0445 pads. The following figure shows a reference circuit design for loudspeaker interface.

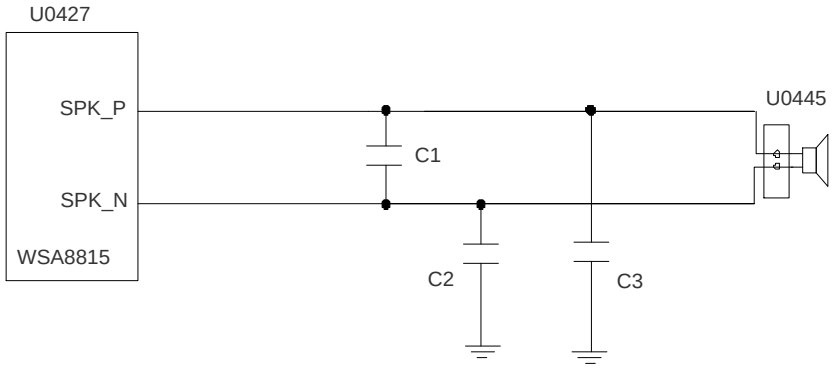



**Figure 31: Reference Design for Loudspeaker Interface**

## 3.9. (U)SIM Interfaces

The SA800U-WF EVB provides two 6-pin push-in (U)SIM card connectors, namely (U)SIM1 card connector (J0801) and (U)SIM2 card connector (J0802). The following figure shows the simplified interface schematic for J0801.

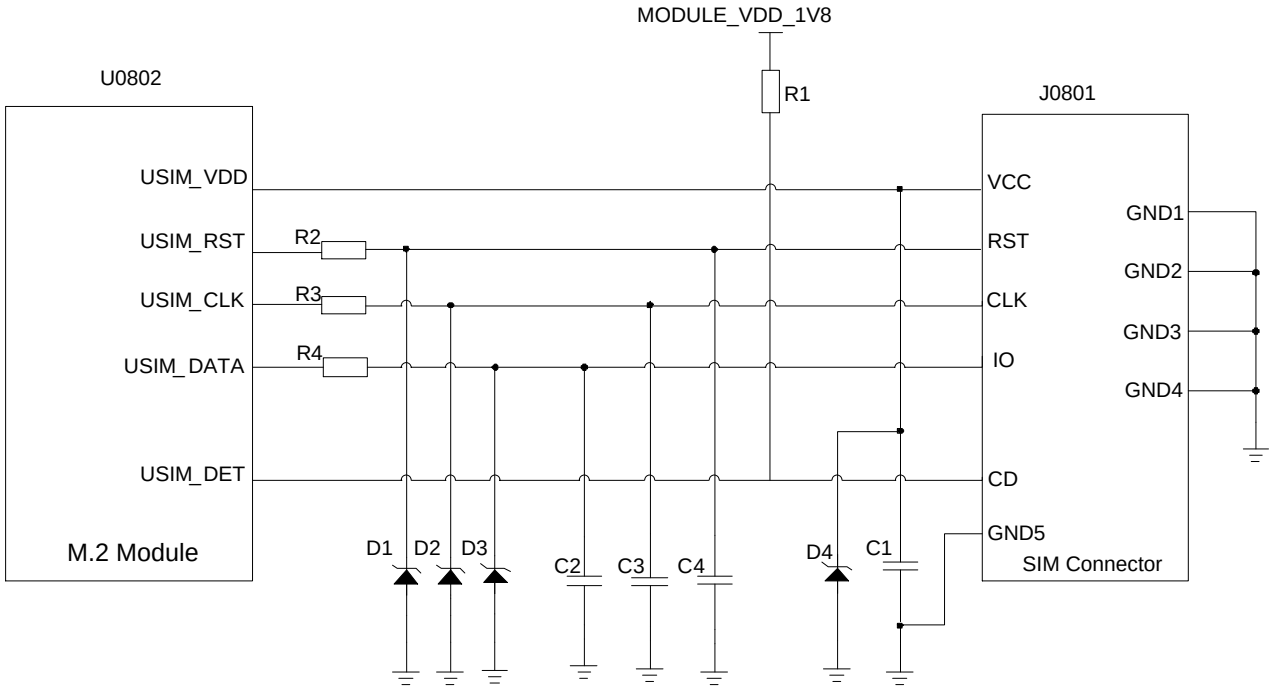



**Figure 32: Simplified Schematic for (U)SIM Card Connector J0801**

The following figure shows the (U)SIM card connectors (J0801, J0802).

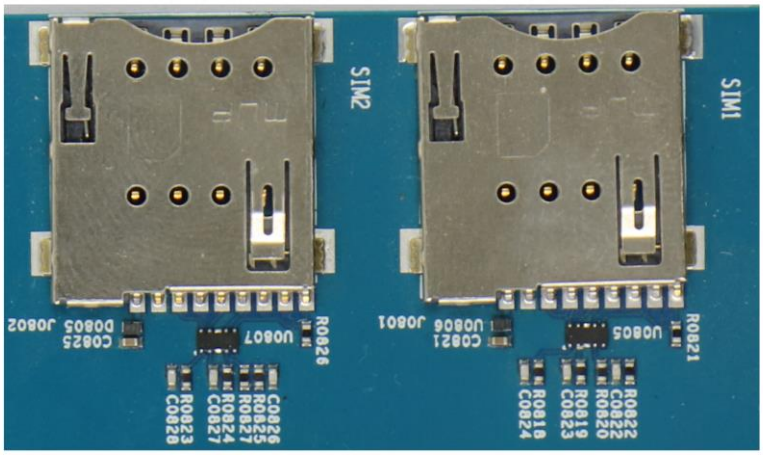



**Figure 33: (U)SIM Card Connectors**

## 3.10. UART Interface

SA800U-WF EVB provides a UART interface, support RS-232 interface standard, can be used for data transmission and AT instruction communication, to achieve debugging functions. The design principle is shown in the figure below:

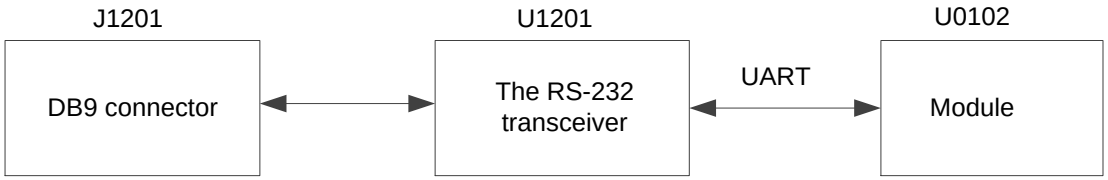



**Figure 34: UART Interface Design Block Diagram**

DB9 connector is a 9 pins interface, which is used to achieve RS-232 serial communication, as shown in the figure below.

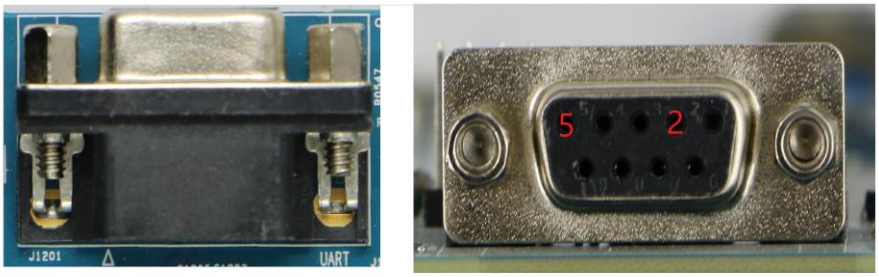



**Figure 35: Debug UART Interface**

The following table shows the pin definition of the Debug UART interface.

**Table 10: Pin Definition of UART Port**

| Pin No | Pin Name | Description |
|---|---|---|
| 5 | DBG_TXD | UART transmit data.<br>Used for debugging by default |
| 2 | DBG_RXD | UART receive data.<br>Used for debugging by default |

## 3.11. CAN Interface

SA800U-WF EVB provides a CAN interface converted by SPI0. The design block diagram of CAN interface (J1401) is as follows:

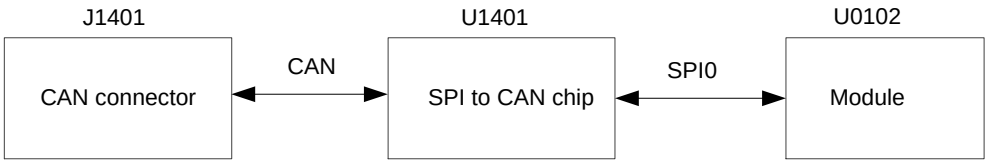



**Figure 36: CAN Interface Block Diagram**

## 3.12. PCIe Interfaces

The SA800U-WF EVB supports 2 PCIe interfaces. PCIE0 is a Gen 2 1-lanel interface with a rate of 5 Gbps per lane and supports 5G modules. PCIE1 is a GEN 3 1-lane interface with a rate of 8 Gbps per

lane and supports Ethernet. The following figure shows the simplified interface schematic for Ethernet Interface.

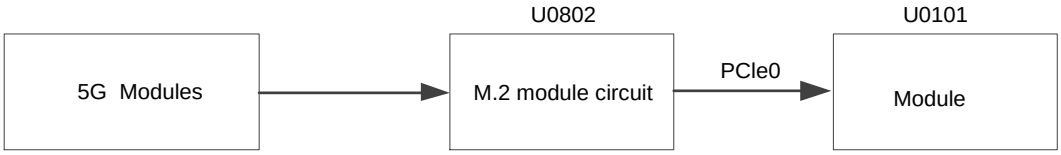



**Figure 37: Block Diagram of 5G Module Design**

The module M.2 is shown in the following figure:

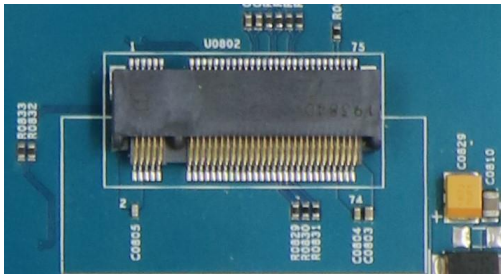


**Figure 38：M.2 Module**

Ethernet circuit design block diagram is shown as follows:

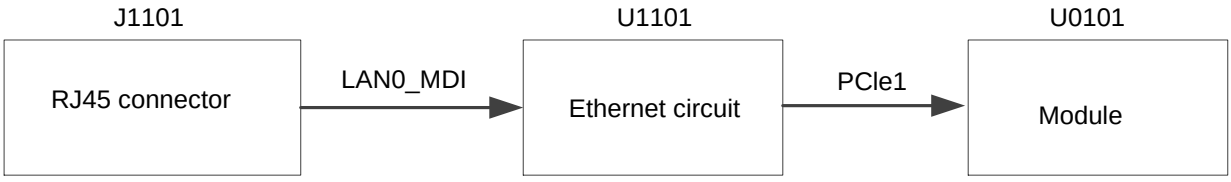



**Figure 39：Block Diagram of Ethernet Design**

Ethernet port RJ45 connector is shown in the figure below:

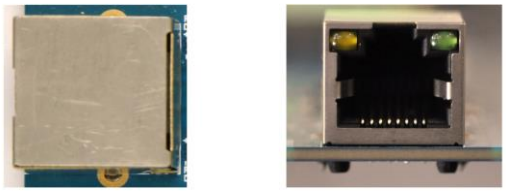


**Figure 40：RJ45 Connector**

## 3.13. SD Card Interface

SA800U-WF EVB supports SD card, has hot plug check function. The following figure is a simplified circuit of the SD card interface (U1202).

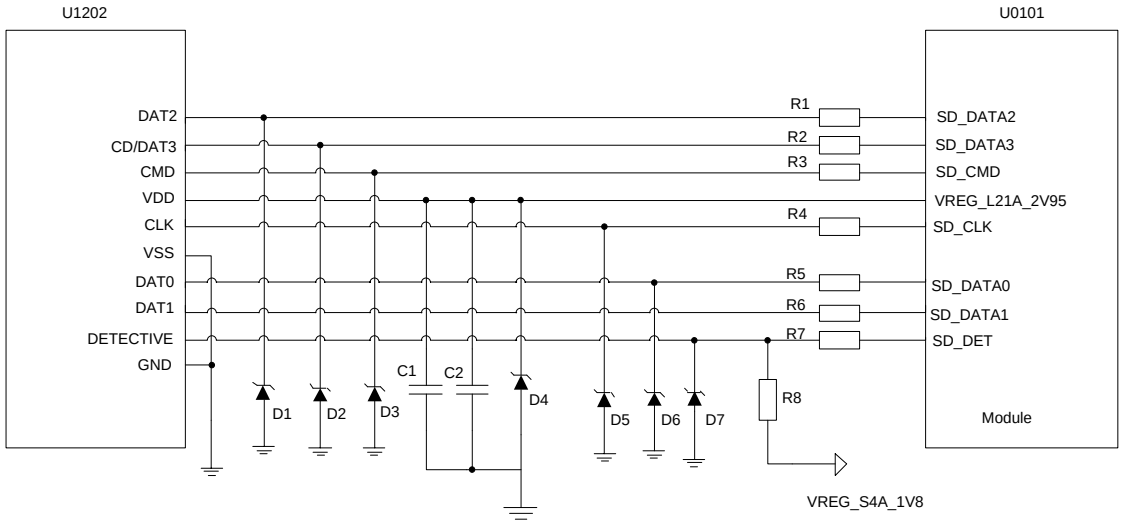



**Figure 41: Simplified Circuit for SD Card Interface**

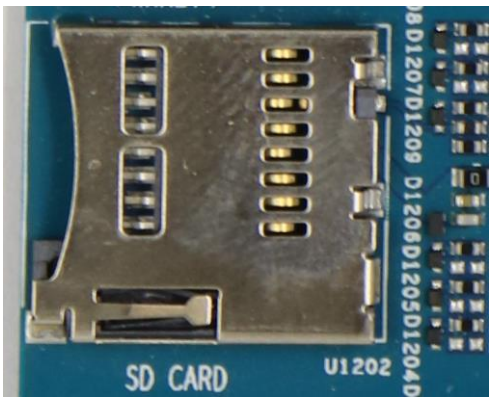



**Figure 42: SD Card Interface**

## 3.14. Emergency Download Interface

SA800U-WF EVB provides an emergency download switch USB_BOOT (U0102), which forces the module to enter download mode. It is used for the final treatment if the product fails to start properly due to a fault. To use this function, it is necessary to pull the USB_BOOT pin to 1.8 V before the module is powered on. The circuit design principle is as follows:

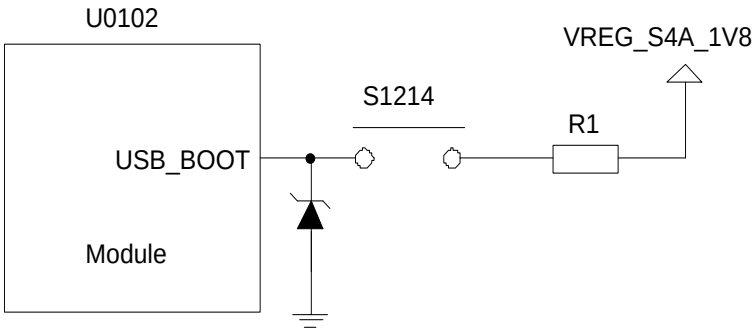



**Figure 43: Reference Design for Emergency Download Interface**

## 3.15. Flashlights

The SA800U-WF EVB provides 3 flash lights that support flashlight and flash modes. Below is the reference circuit design of the flashlights and their location distribution on the SA800U-WF EVB (yellow).

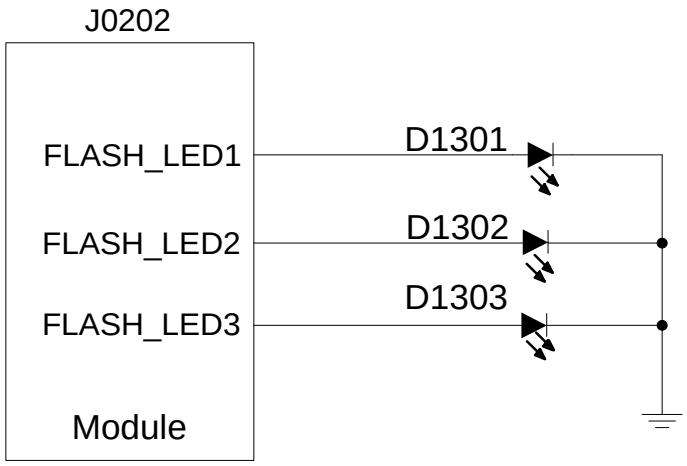



**Figure 44: Reference Circuit Design for Flashlights**

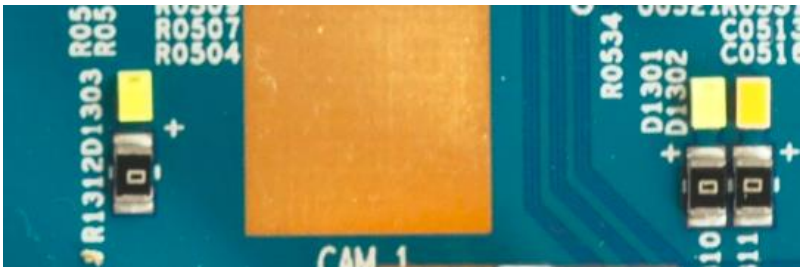



**Figure 45: Flashlights**

## 3.16. Sensors

SA800U-WF EVB provides 3 commonly used sensors, which are acceleration/gyroscope sensor (U1302), compass sensor (U1303), and ambient light/proximity sensor (U1301), as shown in the following picture:

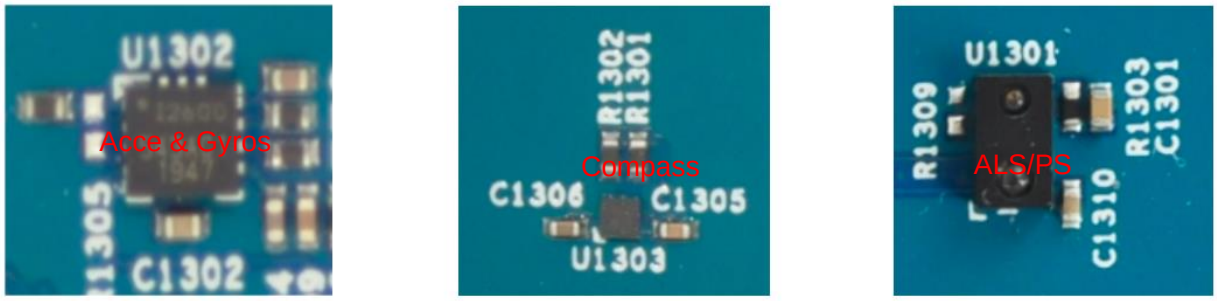



**Figure 46: Sensors**

## 3.17. Vibrator

The SA800U-WF EVB provides an ERM type vibrator (U1304), which is an eccentric vibration motor, for the customer to test the motor drive interface of the module. The following figure is the motor circuit design and the physical drawing:

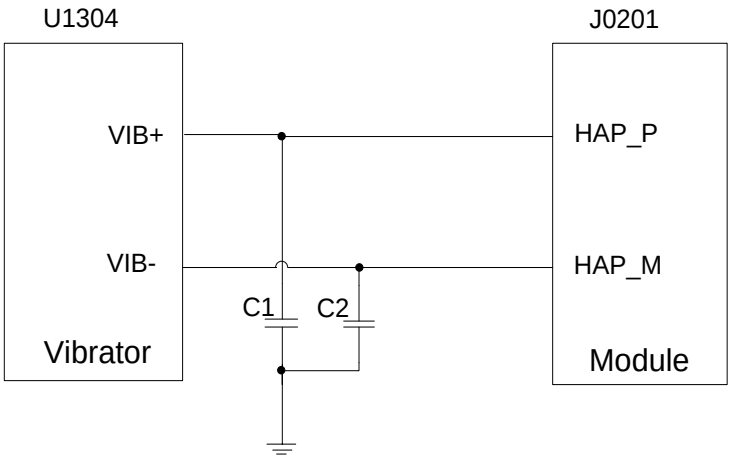



**Figure 47: Reference Design for Vibrator**

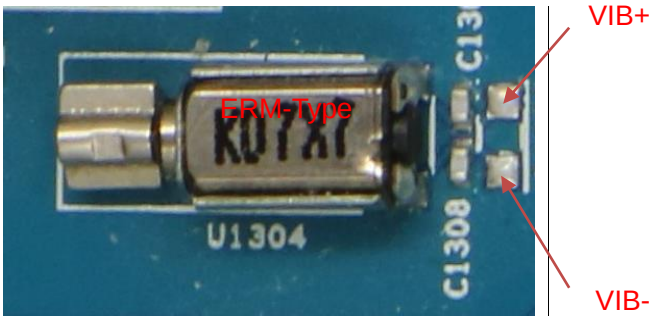



**Figure 48: ERM-Type Vibrator**

## 3.18. Buttons and Switches

SA800U-WF EVB provides three buttons (S1201, S1202, S1203) and four switches (S0701, S0601, S0801, S1214), including PWRKEY button, VOL_UP button, VOL_DOWN button, HDMI OUT Resolution switch, FCT switch, 5G PWRKEY, and USB_BOOT, which are shown in the following figure.

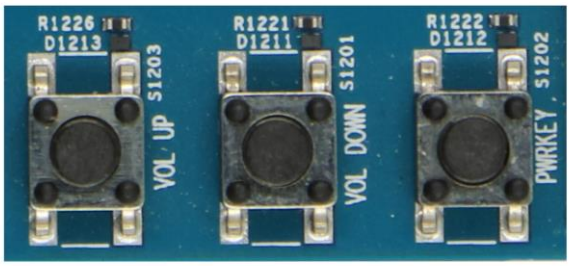



**Figure 49: Buttons**

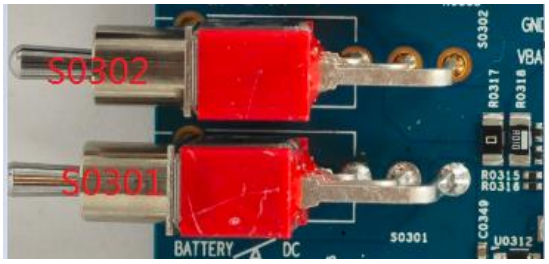



**Figure 50: Power Switches**

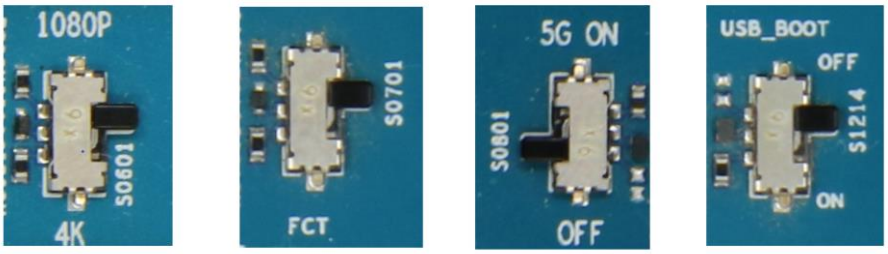



**Figure 51: Function Switches**

**Table 11: Description of Buttons**

| Reference No. | Items | Description |
|---|---|---|
| S1202 | PWRKEY | Power key (push button)<br>Used to turn on/off the module |
| S1203 | VOL_UP | Used to turn the volume up |
| S1201 | VOL_DOWN | Used to turn the volume down |

| | | |
|---|---|---|
| S0301 | DC/Battery | Used to select DC power supply or battery power supply |
| S0302 | ON/OFF | Used to power on/off the module |
| S0601 | Resolution Switch | Used to change the resolution of the HDMI OUT port |
| S0701 | FCT Switch | For factory functional testing only |
| S0801 | 5G PWRKEY | Power key<br>Used to turn on/off the 5G module |
| S1214 | USB_BOOT | Used to force the module enter into download mode |

## 3.19. Status Indication LEDs

SA800U-WF EVB has 3 status indicator lights (D0301, D0801, D0802, D1201, D1202 and D1203), which are power indicator, 5G module indicator and RGB indicator, as shown in the figure below.

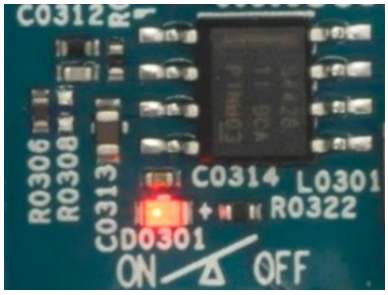



**Figure 52: Power Indication LED**

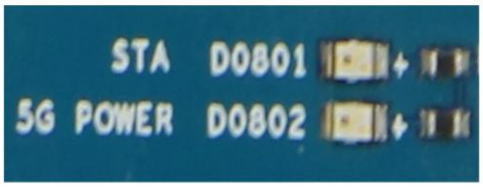



**Figure 53: 5G Module Indication LEDs**

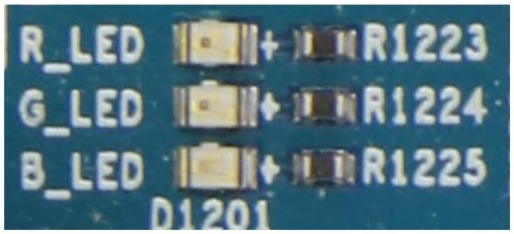



**Figure 54: Status Indication LEDs**

**Table 12: Description of Status Indication LEDs**

| Reference No. | Items | Description |
|---|---|---|
| D0301 | POWER | Indicate the power supply status of module |
| D0801 | STA | Indicate the operation status of 5G module |
| D0802 | 5G POWER | Indicate the power supply status of 5G module |
| D1201 | R_LED | Red LED |
| D1202 | G_LED | Green LED |
| D1203 | B_LED | Blue LED |

# 4 Operation Procedures

This chapter describes the basic operating instructions for testing and evaluating the SA800U-WF module using the SA800U-WF EVB.

## 4.1. Power ON

The following are the procedures for powering on the smart module.

1. Connect the SA800U-WF to the connectors (U0101, U0102, J0201, J0202) on SA800U-WF EVB.
2. If battery power supply mode is selected, install a Li-polymer battery on J0302 and then switch S0301 to '**BATTERY**' state. If 12.0 V DC power supply mode is selected, switch S0301 to **'DC POWER**' state.
3. Switch S0302 to '**ON**' state, and then D0301 will be lighted.
4. Press S1202 ('**PWRKEY**') for at least 2 s to turn on the module. When the following interface is displayed on the utilized LCD(s), it means the booting has been completed.

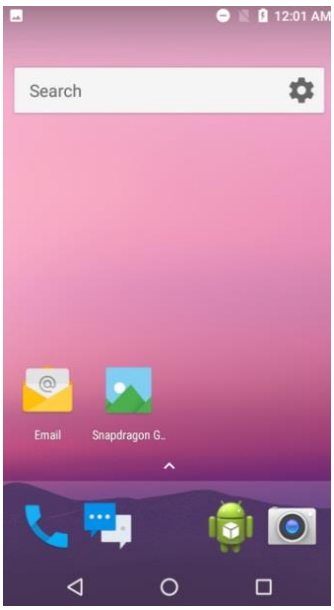



**Figure 55: LCD Display Indicating Module's Power-on**

**NOTE**

Inserting USB into Type-C interface after power supply is provided can also turn on the module.

## 4.2. Communication Via USB Interface

1. Power on the module according to the procedures mentioned in ***Chapter 4.1***.

2. Connect the USB Type-C interface (J0701) of EVB to PC with USB Type-C converter cable, and then install the USB driver and ADB driver on PC and run them. The USB port number can be viewed through PC Device Manager, as shown in the figure below:

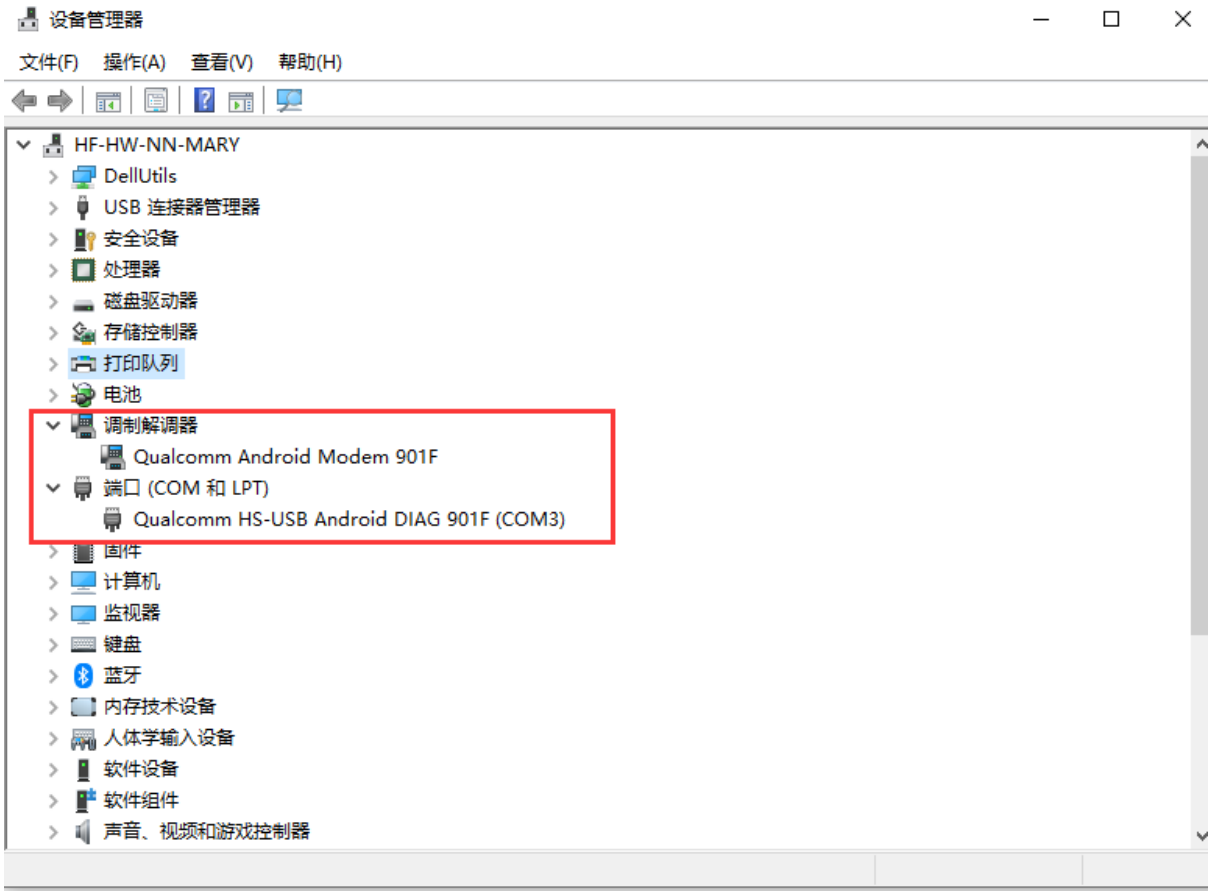



**Figure 56: USB COM Port**

3. Open CMD command window.

4. Execute the command “adb shell” to make the module enter ADB mode. Then customers can use USB ADB interface for testing.

```
C:\Users\lenovo>adb shell
sdm845:/ $
```

**Figure 57: "adb shell" Command**

**NOTE**

Please note that the USB port numbers may be different among different modules.

## 4.3. Communication via UART Interface

1. Run the driver disk on PC to install the USB-to-RS232 driver.

2. Connect the UART interface to the PC with USB-to-RS232 converter cable and then power on the module according to the procedures mentioned in ***Chapter 4.1***. After that, the USB serial port number can be viewed through the PC Device Manager, shown as the following figure.

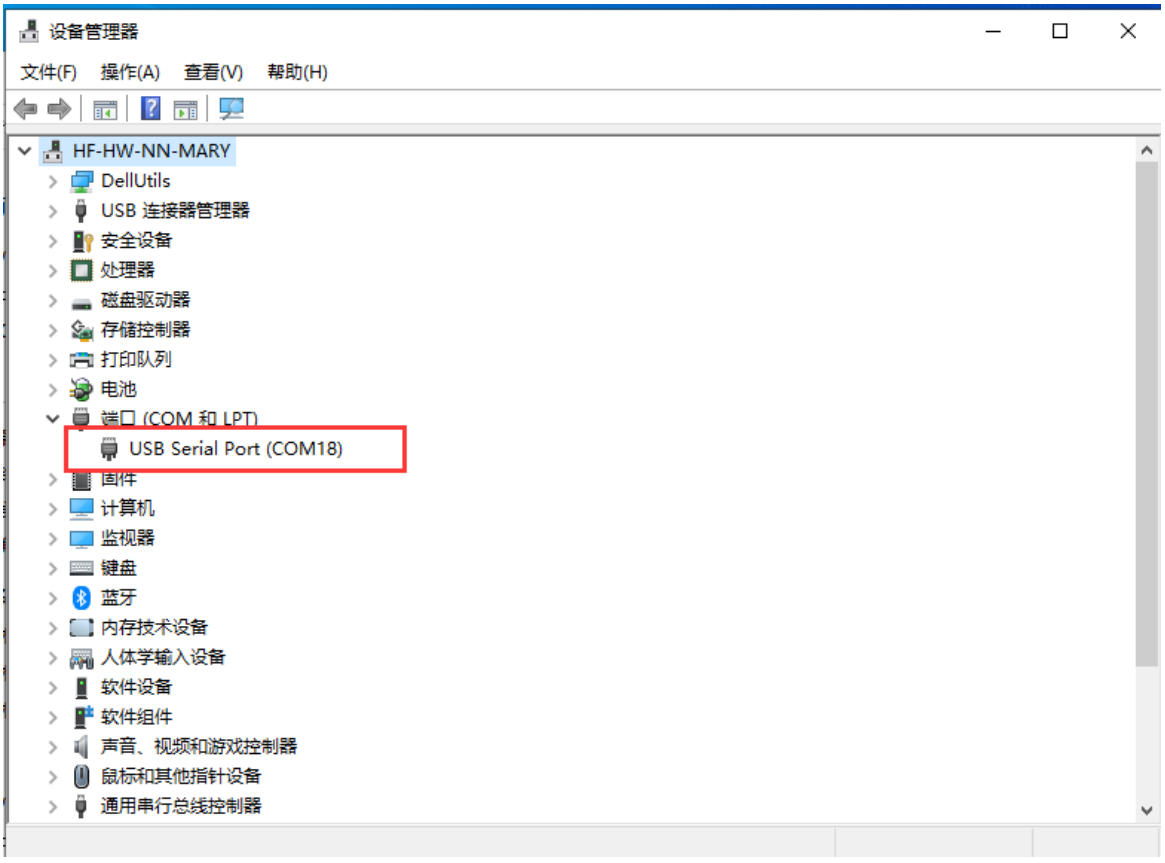



**Figure 58: USB Serial Port**

3. Install and then use the QCOM tool provided by Quectel to realize the communication between the smart module and the PC. The following figure shows the QCOM configuration: select correct "**COM port**" (USB Serial Port) and set correct "**Baudrate**" (such as 115200 bps). For more details about QCOM tool usage and configuration, see ***document [2]***.

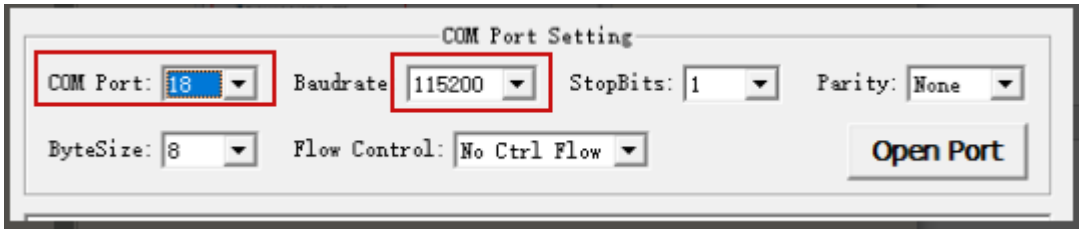



**Figure 59: QCOM Interface Parameter Configuration**

## 4.4. Firmware Upgrade

Quectel Smart module upgrade firmware via USB port by default. Please follow the procedures below to upgrade firmware.

1. Install and open the firmware upgrade tool QFIL on PC and then power on the smart module according to the procedures mentioned in ***Chapter 4.1***.
2. Click the "**SelectPort**" and select the USB port "**Qualcomm HS-USB Android DIAG 901F (COM3)**".
3. Select "**Flat Build**" in "**Select Build Type**" option.
4. Click "**Browse**" to select the firmware which needs to be upgraded in "**Select Programmer**" option.
5. Click "**Load XML**" to select the XML which needs to be upgraded in "**Select Build**" option.
6. Click "**Download**" to upgrade the firmware.
7. Storage Type select "**UFS**".

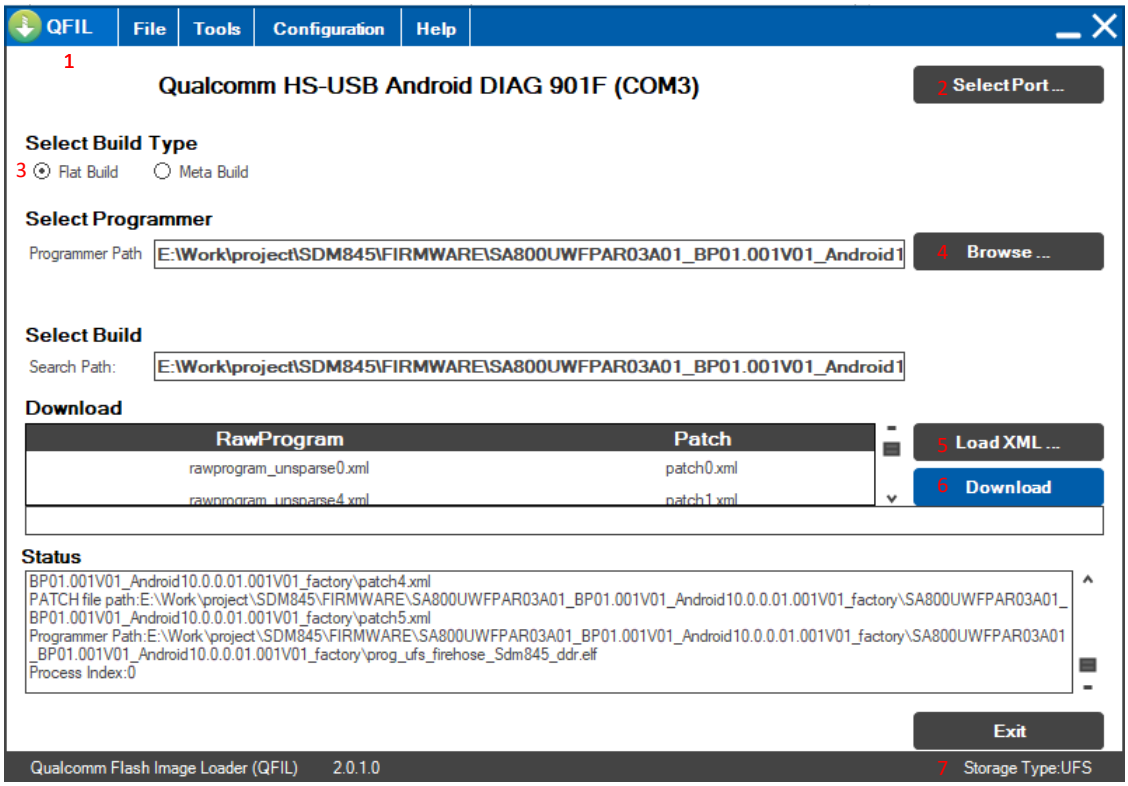



**Figure 60: Firmware Upgrade Steps**

## 4.5. Power OFF

The module shutdown steps are as follows:

1. Press S1202 (‘**PWRKEY**’) for at least 1 s under the power-on state, and then LCD will display a menu for selection shown as the following figure:


**Figure 61: LCD Menu Display for Powering off Module**

2. Choose “**Power off**” option.

3. The module will be powered off.

# 5 Appendix References

**Table 13: Related Documents**

| SN | Document name | Remark |
|---|---|---|
| [1] | Quectel_SA800U-WF_Hardware_Design | Hardware Design for SA800U-WF |
| [2] | Quectel_QCOM_User_Guide | User guide for QCOM tool |

**Table 14: Terms and Abbreviations**

| Abbreviation | Description |
|---|---|
| ALS | Ambient Light Sensor |
| B2B | Board to Board |
| CAN | Controller Area Network |
| EVB | Evaluation Board |
| FCT | Function Test |
| FPC | Flexible Printed Circuit |
| HDMI | High Definition Multimedia Interface |
| LCM | LCD Module |
| LED | Light Emitting Diode |
| MIPI | Mobile Industry Processor Interface |
| PC | Personal Computer |
| PCIe | Peripheral Component Interconnect Express |
| PS | Proximity Sensor |
| PWM | Pulse Width Modulation |

| | |
|---|---|
| SD | Secure Digital Memory Card |
| TOF* | Time of Flight |
| TP | Touch Panel |
| UART | Universal Asynchronous Receiver & Transmitter |
| UFS | Universal Flash Storage |
| USB | Universal Serial Bus |
| (U)SIM | (Universal) Subscriber Identity Module |