# Smart 5G EVB

# User Guide

**Smart Module Series**

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**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

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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 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 |
|---|---|---|---|
| - | 2022-01-26 | Jian WU/ Chris ZHANG | Creation of the document |
| 1.0 | 2022-02-18 | Jian WU/ Chris ZHANG | First official release |
| 1.1 | 2022-06-18 | Jian WU/ Chris ZHANG | 1. Added a note about the single/dual screen configuration (Chapter 1).<br>2. Upgraded the top view for the component placement (Figure 3). |

# Contents

# Table Index

# Figure Index

# 1 Introduction

This user guide describes the application details of the Smart 5G EVB (evaluation board), which is an assistant tool for you to develop applications and test basic functionalities of the Smart 5G module SG560D series.

**NOTE**

Single-screen is the default configuration of Smart 5G EVB. If you need a dual-screen configuration, please contact Quectel Technical Support.

# 2 Product Overview

## 2.1. Top and Bottom Views

The size of Smart 5G EVB is 190 mm × 265 mm, and the top and bottom views are as shown below:

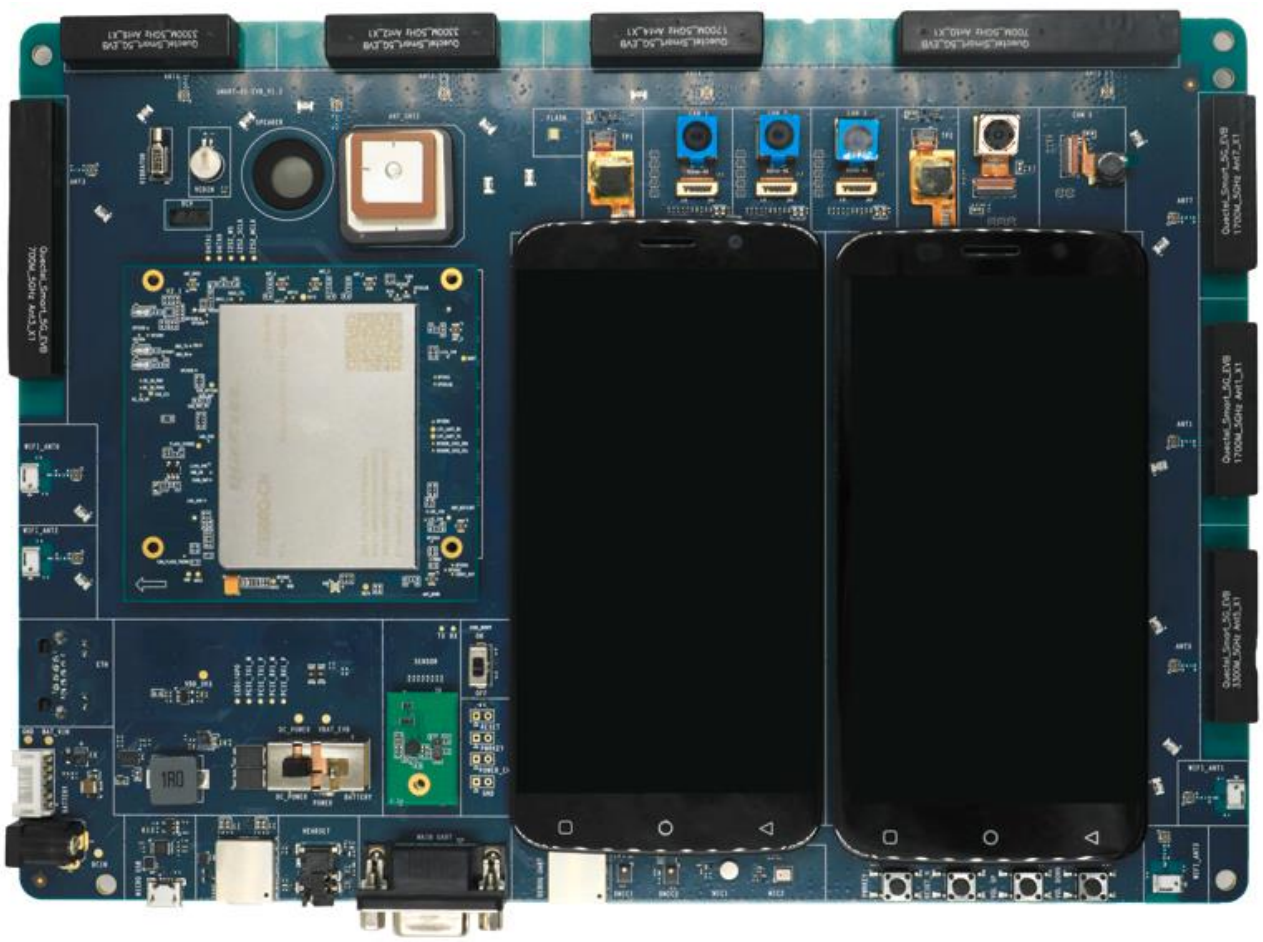


**Figure 1: Top View**

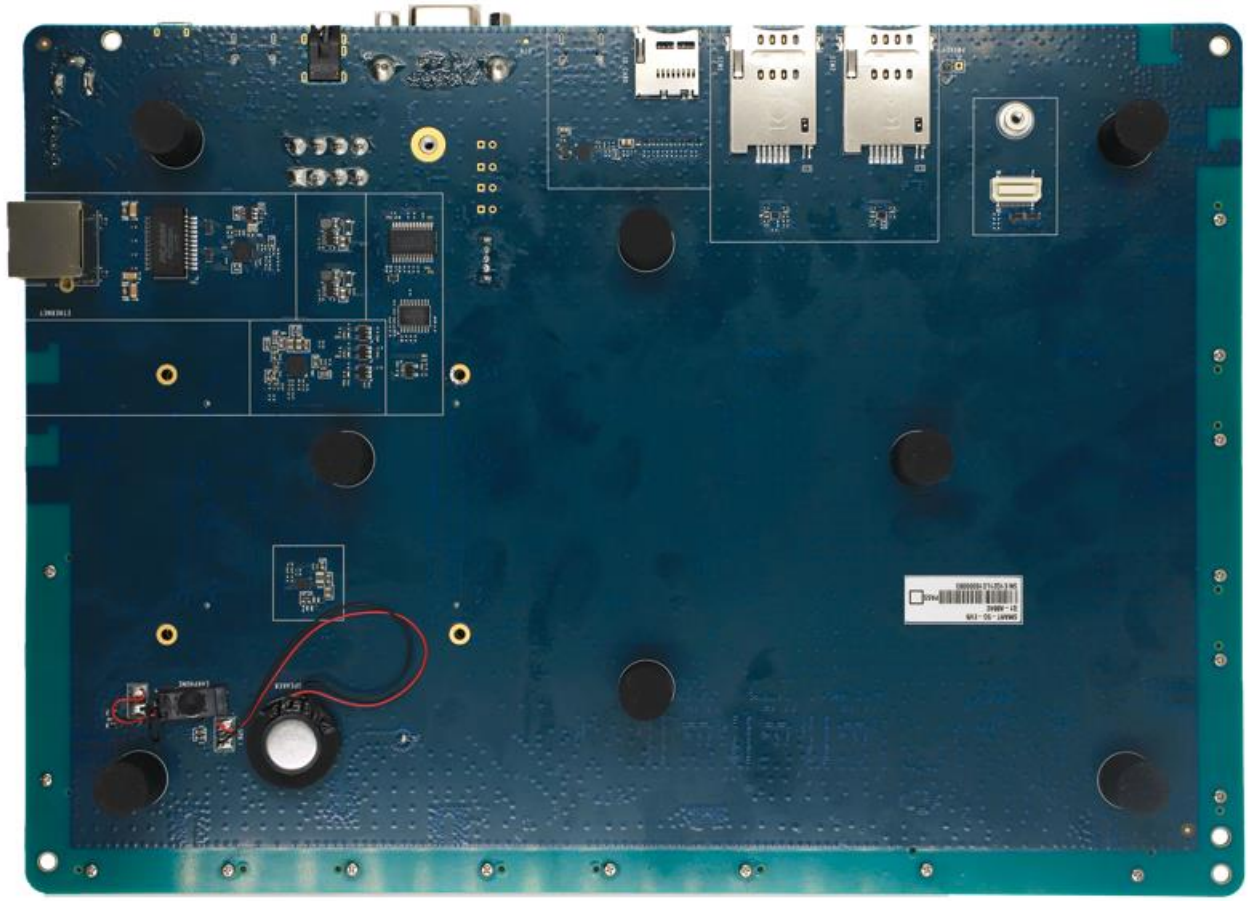


Figure 2: Bottom View

## 2.2. Component Placement

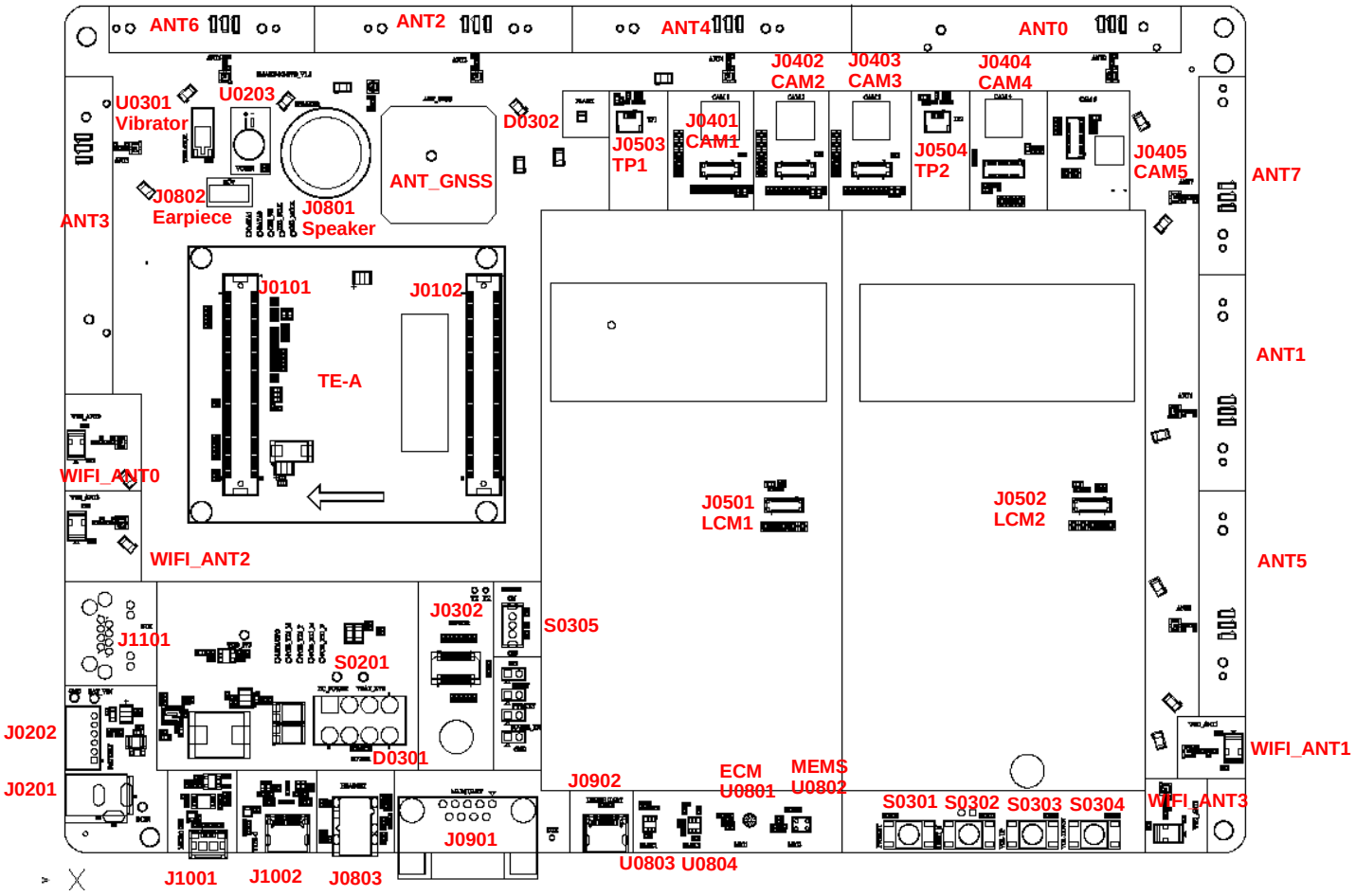



Figure 3: Top View for Component Placement

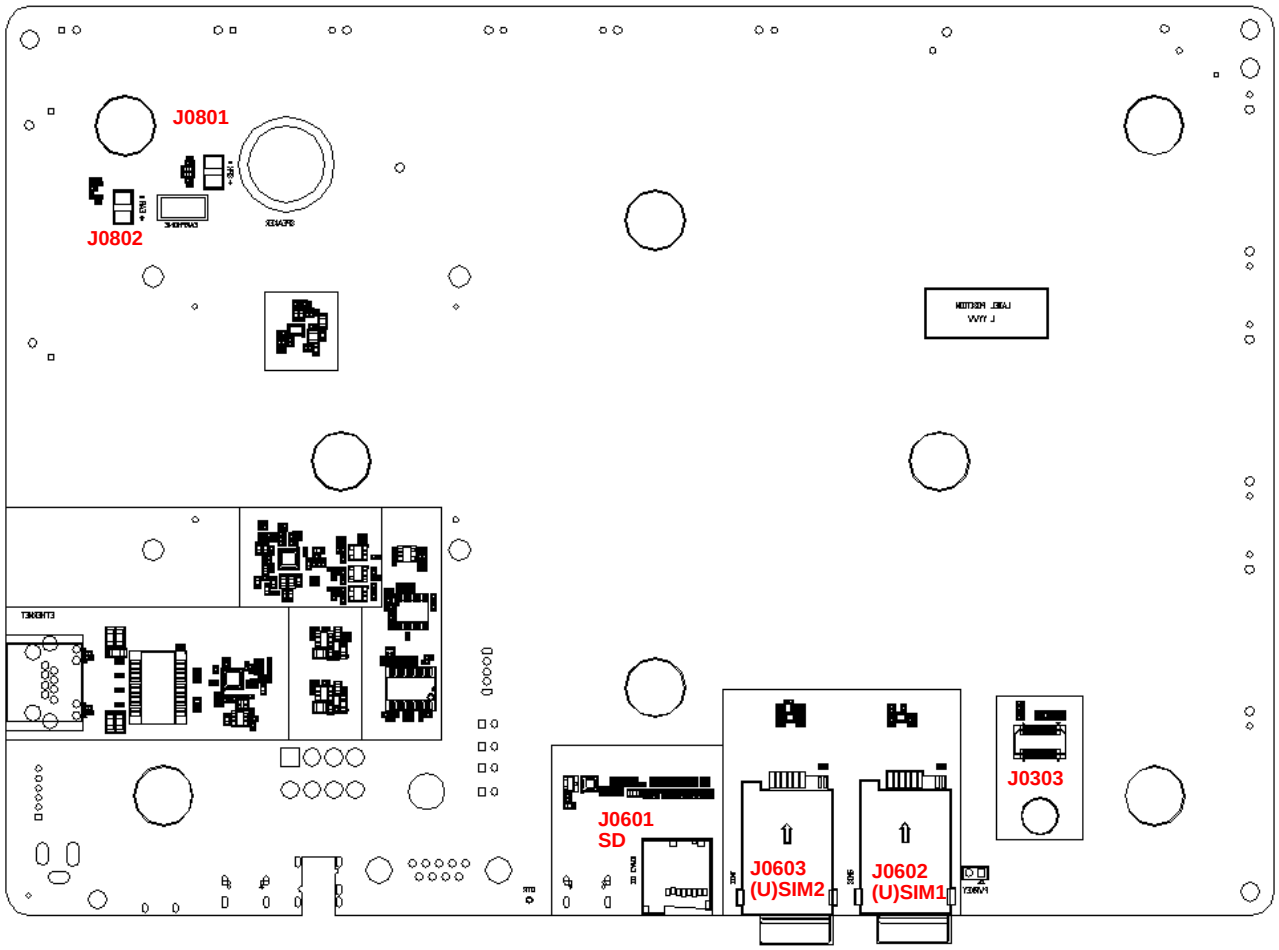



**Figure 4: Bottom View for Component Placement**

**Table 1: Components & Functions**

| Components | RefDes. | Description |
|---|---|---|
| Power Supply | J0201 | DC power jack on the EVB<br>Typical power supply: 12 V |
| | J0202 | Li-polymer battery connector<br>Typical power supply: 4.0 V |
| Power Switch | S0201 | Used to select DC or battery as the power supply, or to switch off the power supply |
| PWRKEY | S0301 | Turn on/off the module |
| RESET_N | S0302 | Reserved |
| VOL_UP | S0303 | Turn up the volume |
| VOL_DOWN | S0304 | Turn down the volume |

| | | |
|---|---|---|
| USB_BOOT | S0305 | Emergency download switch |
| USB Interfaces | J1001 | Micro USB connector |
| | J1002 | USB Type-C connector |
| Audio Interfaces | J0801 | ● Loudspeaker<br>● Rated resistance: 8 Ω<br>● Rated power: 1.5 W |
| | J0802 | ● Earpiece<br>● Rated resistance: 32 Ω<br>● Rated power: 30 mW |
| | J0803 | Audio jack for headset |
| | U0801 | ECM-type microphone |
| | U0802 | MEMS-type microphone |
| | U0803 & U0804 | Digital microphones |
| (U)SIM Card Interfaces | J0602 | (U)SIM1 card connector |
| | J0603 | (U)SIM2 card connector |
| UART Interface | J0901 | Main UART |
| Debug Interface | J0902 | Debug Interface (Type-C connector) |
| SD Card Interface | J0601 | SD card connector |
| VBAT Status Indicator | D0301 | Indicates VBAT on/off of the module |
| TE-A Interfaces | J0101 | Two B2B connectors for connection with Smart 5G module TE-A |
| | J0102 | |
| Camera Interfaces | J0401 | Camera1 connector, supports 16 MP CMOS sensor |
| | J0402 | Camera2 connector, supports 16 MP CMOS sensor |
| | J0403 | Camera3 connector, supports 16 MP CMOS sensor |
| | J0404 | Camera4 connector, supports 8 MP CMOS sensor |
| | J0405 | Camera5 connector, supports 2 MP CMOS sensor |
| Flashlight | D0302 | LED flashlight |
| LCM and Touch Panel Interfaces | J0501 | Connector for main LCM |
| | J0503 | ZIF connector for main touch panel |

| | | |
|---|---|---|
| | J0502 | Connector for secondary LCM |
| | J0504 | ZIF connector for secondary touch panel |
| Sensors | J0302 | Accelerometer and gyroscope sensor |
| | | Ambient light and proximity sensor |
| Vibrator | U0301 | ERM-type vibrator |
| Coin Cell Battery | U0203 | Coin cell battery for RTC backup power supply |
| NFC + SPI/I2S Interfaces | J0303 | Reserved |
| Ethernet Interface | J1101 | Ethernet interface |

## 2.3. Key Features

The following table describes the key features of Smart 5G EVB.

**Table 2: Key Features**

| Features | Description |
|---|---|
| Power Supply | ● DC power supply: 3.6–18 V (typical: 12 V)<br>● Battery power supply: 3.55–4.4 V (typical: 4.0 V) |
| LCM Interfaces | ● Two 5-inch 1280 × 720 HD LCDs<br>● 4-lane MIPI DSI for each LCD |
| Touch Panel Interfaces | 2 capacitive touch panels |
| Camera Interfaces | 5 cameras:<br>● Camera1 supports 16 MP with 4-lane CSI<br>● Camera2 supports 16 MP with 4-lane CSI<br>● Camera3 supports 16 MP with 4-lane CSI<br>● Camera4 supports 8 MP with 2-lane CSI<br>● Camera5 supports 2 MP with 1-lane CSI |
| USB Interfaces | 2 USB interfaces:<br>● One USB Type-C interface compliant with USB 3.1 (Gen 1) and USB 2.0 specifications, with transmission rate up to 5 Gbps on USB 3.1 (Gen 1) and 480 Mbps on USB 2.0<br>● One Micro USB interface compliant with USB 2.0 specifications, with transmission rate up to 480 Mbps |
| Audio Interfaces | **Analog Outputs:** |

| | |
|---|---|
| | 3 analog audio outputs:<br>● One mono loudspeaker differential amplifier output<br>● One mono earpiece differential output<br>● One stereo headphone output for headset<br>**Analog Inputs:**<br>3 analog microphone inputs:<br>● One single-ended microphone input for headset<br>● One differential microphone input for ECM-type microphone<br>● One differential microphone input for MEMS-type microphone<br>**Digital Inputs:**<br>2 digital microphone inputs |
| (U)SIM Card Interfaces | ● Supports USIM/SIM cards: 1.8 V and 2.95 V<br>● Supports dual SIM dual standby |
| UART Interface | Main UART for data transmission and AT command communication |
| Debug Interface | Debug interface for debugging (Type-C connector) |
| SD Card Interface | Supports 4-bit SD card with hot-swap detection |
| NFC + SPI/I2S Interfaces | Reserved |
| Flashlight | 1 LED flashlight for testing the module's flashlight interface |
| Sensors | Sensor TE-A:<br>● ALS/PS sensor<br>● Accelerometer/gyroscope sensor |
| Vibrator | 1 vibrator for testing the module's motor drive interface |
| Ethernet | 1 Ethernet interface |
| Switches and Buttons | 2 switches:<br>● Power switch<br>● Emergency download switch (USB_BOOT)<br>4 buttons:<br>● PWRKEY<br>● RESET_N (reserved)<br>● VOL_UP<br>● VOL_DOWN |
| VBAT Status Indicator | 1 LED indicator for VBAT on/off indication |

# 3 Kit Accessories & Assembly

## 3.1. Accessories Assembly

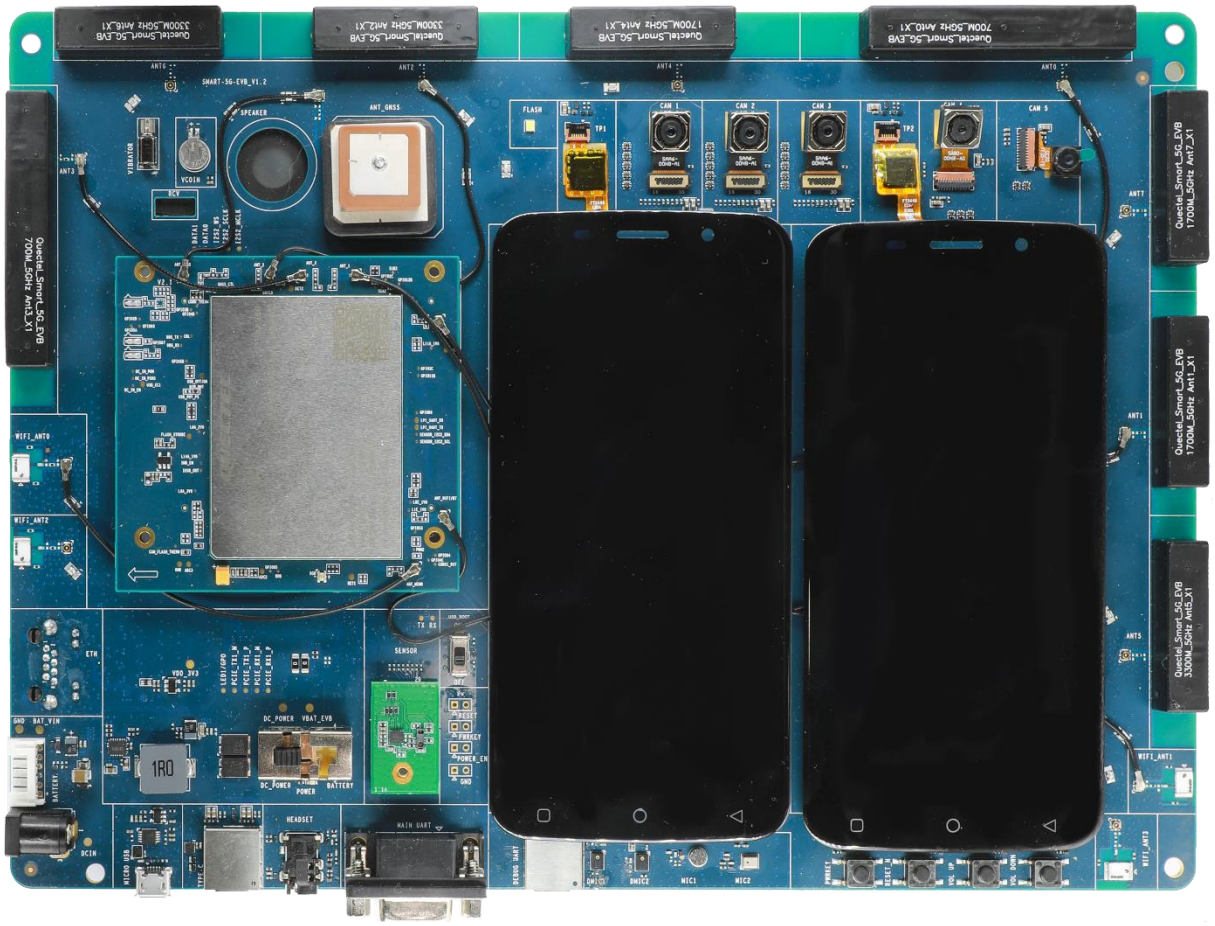


Figure 5: Smart 5G EVB and Accessory Assembly

## 3.2. Accessories List

All accessories of the Smart 5G EVB kit are listed as below. Please contact the supplier if there is something missing.


**Figure 6: Smart 5G EVB Kit Accessories**

**Table 3: Accessory List**

| Items | Description | Quantity (pcs) |
|---|---|---|
| Cables | USB to RS-232 converter cable | 1 |
| | USB Type-C cable | 1 |
| | RF cables | 14 |
| | DC power cable | 1 |

| | | |
|---|---|---|
| Antenna | GNSS antenna (passive) | 1 |
| Audio | Earpiece | 1 |
| Battery | Li-polymer battery | 1 |
| Power Adapter | 12 V DC power supply | 1 |

# 4 Application Interfaces

This chapter describes the hardware interfaces or components of Smart 5G EVB, listed as below:

- Power supply
- TE-A interface
- LCM interfaces
- Touch panel interfaces
- Camera interfaces
- USB interfaces
- Audio interfaces
- (U)SIM card interfaces
- UART interfaces
- SD card interface
- Flashlight
- Sensors
- Ethernet interface
- Emergency download interface
- Vibrator
- Buttons
- VBAT status indicator
- RF antennas

## 4.1. Power Supply

**Table 4: Power Supply**

| RefDes. | Description |
|---|---|
| J0201 | • DC power jack on the EVB<br>• Typical power supply: 12 V |
| J0202 | • Li-polymer battery connector<br>• Typical power supply: 4.0 V |
| S0201 | Used to select DC or battery as the power supply, or to switch off the power supply |

The following figure shows the simplified power supply block diagram of Smart 5G EVB.

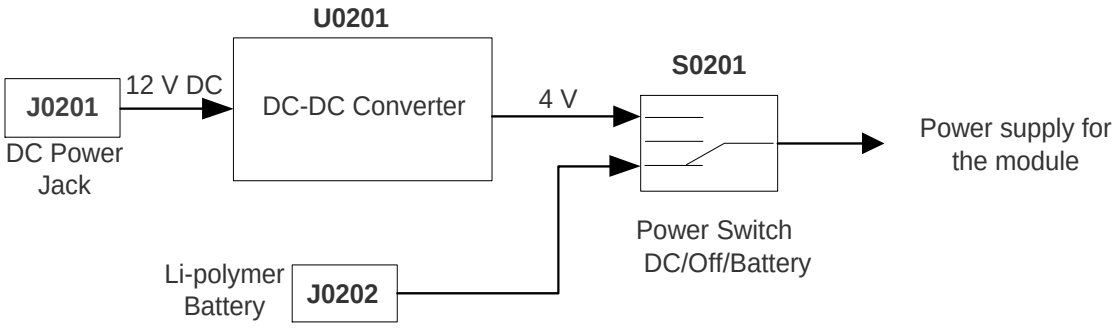



**Figure 7: Simplified Power Supply Block Diagram of Smart 5G EVB**

### 4.1.1. DC Power

The Smart 5G EVB can be powered by an external 12 V DC power adapter through the power jack (J0201) on the board. The power jack is internally connected to the step-down converter (DC-DC converter) to convert the 12 V DC power supply voltage to 4 V for powering up the module. The following figure shows the DC power jack of the Smart 5G EVB.

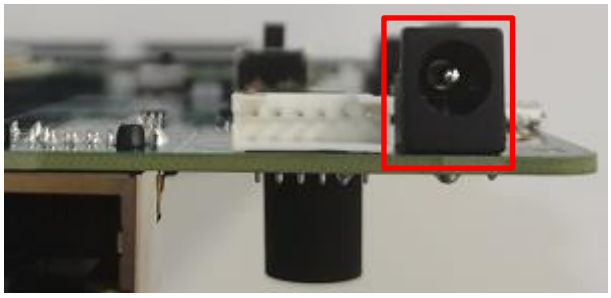


**Figure 8: DC Power Jack**

The EVB kit provides a 12 V DC power adapter to supply power for the Smart 5G EVB. The power plug design of the adapter is as shown below.

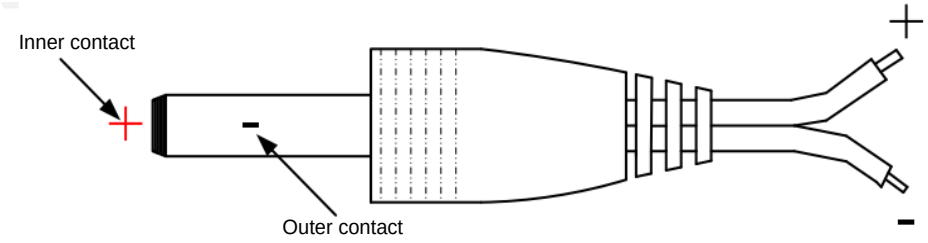



**Figure 9: Power Plug Design**

### 4.1.2. Battery Power

The Smart 5G EVB can also be powered by a Li-polymer battery through the battery connector (J0202) on the board. The following figure shows a schematic design for battery connection.

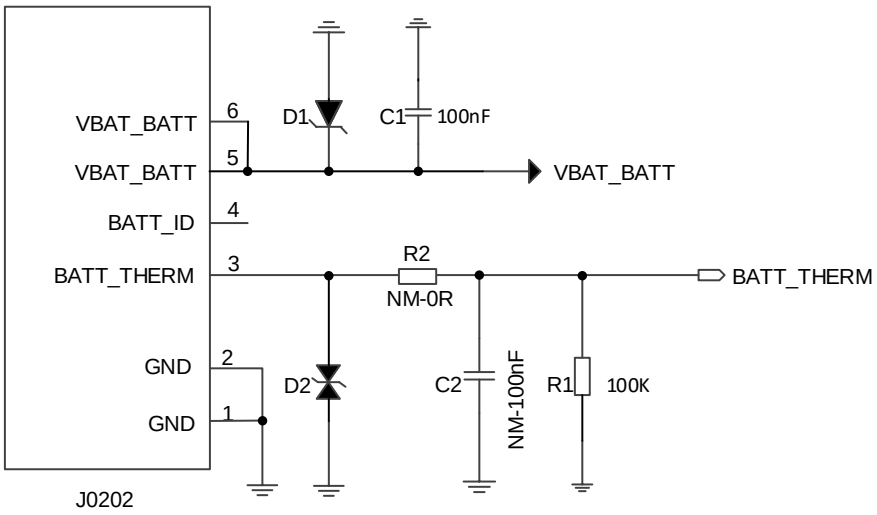



**Figure 10: Schematic Design for Battery Connection**

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

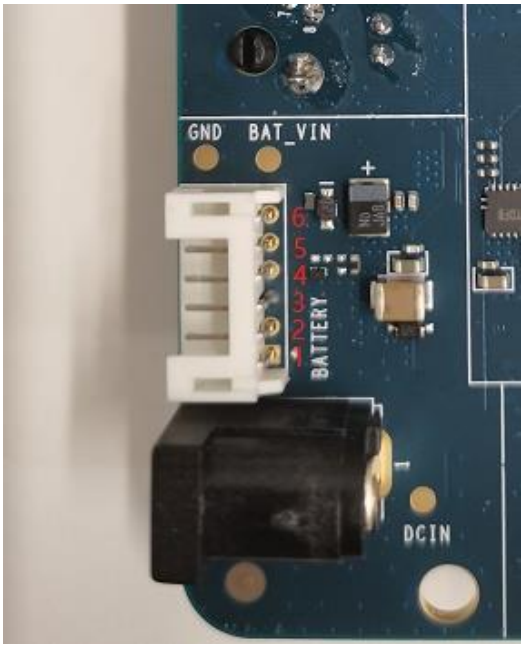



**Figure 11: Pin Assignment of Battery Connector**

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

| Pin No. | Pin Name | Description |
|---|---|---|
| 1, 2 | GND | ● Ground pins<br>● Connected to the negative pole of the battery |
| 3 | BATT_THERM | ● Used for battery temperature detection<br>● A 100 kΩ NTC thermistor is used for the battery protection circuit |
| 4 | BATT_ID | Reserved |
| 5, 6 | VBAT_BATT | ● Power input pins<br>● Connected to the positive pole of the battery |

**Figure 12: Battery Assembly**

### 4.1.3. Power Switch

Power switch (S0201) is used to select DC or battery as the power supply, or to switch off the power supply.

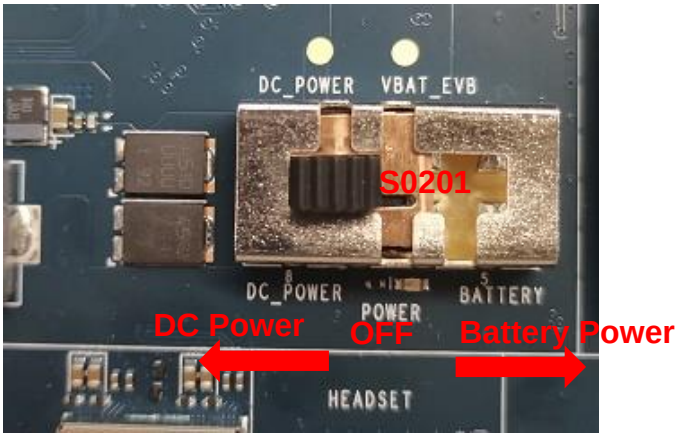



**Figure 13: Power Switch**

## 4.2. TE-A Interface

The TE-A interface includes two B2B connectors for connection with Smart 5G module TE-A.

**Table 6: TE-A B2B Connectors**

| RefDes. | Description |
|---|---|
| J0101 | Two B2B connectors for connection with Smart 5G module TE-A |
| J0102 | |

The following two figures show the two B2B connectors and the sketch map of Smart 5G module TE-A.

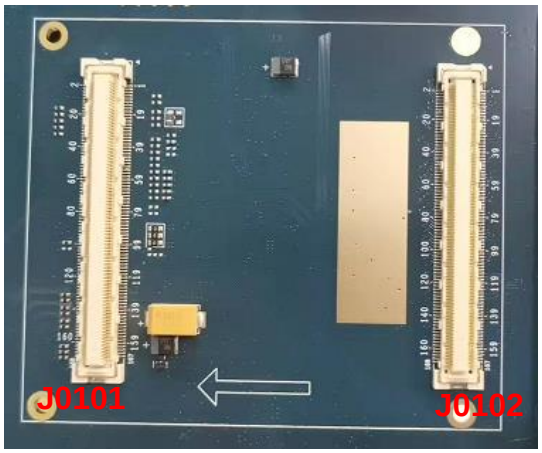



**Figure 14: TE-A B2B Connectors**

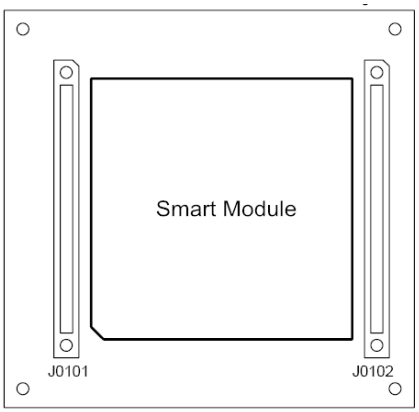



**Figure 15: Sketch Map of Smart 5G Module TE-A (Top View)**

The following table describes the pin definition of the two B2B connectors.

**NOTE**

Different modules have different pin definition, please refer the schematic of the TE-A.

**Table 7: Pin Definition of B2B Connectors**

| Pin No. (J0101) | Pin Name (J0101) | Pin No. (J0102) | Pin Name (J0102) |
|---|---|---|---|
| 1 | UART1_CTS | 1 | USIM1_VDD |
| 2 | GYRO_INT | 2 | GND |
| 3 | UART1_RXD | 3 | USIM1_DET |
| 4 | ACCEL_INT | 4 | DSI0_LN3_P |
| 5 | UART1_RTS | 5 | USIM1_CLK |
| 6 | SENSOR_I2C_SDA | 6 | DSI0_LN3_N |
| 7 | UART1_TXD | 7 | USIM1_RST |
| 8 | SENSOR_I2C_SCL | 8 | GND |
| 9 | UART2_RXD | 9 | USIM1_DATA |
| 10 | ALPS_INT | 10 | DSI0_LN2_P |
| 11 | UART2_TXD | 11 | USIM2_VDD |
| 12 | MAG_INT | 12 | DSI0_LN2_N |
| 13 | GND | 13 | USIM2_DET |
| 14 | AUDIO_I2C_SCL | 14 | GND |
| 15 | USB1_DP | 15 | USIM2_CLK |
| 16 | AUDIO_I2C_SDA | 16 | DSI0_LN1_P |
| 17 | USB1_DM | 17 | USIM2_RST |
| 18 | GND | 18 | DSI0_LN1_N |
| 19 | GND | 19 | USIM2_DATA |
| 20 | LPI_MI2S2_MCLK | 20 | GND |
| 21 | LDO6A_3V0 | 21 | GND |

| | | | |
|---|---|---|---|
| 22 | GND | 22 | DSI0_LN0_P |
| 23 | LDO6A_3V0 | 23 | CSI0_LN3_P |
| 24 | LPI_MI2S2_SCLK | 24 | DSI0_LN0_N |
| 25 | LDO8A_2V8 | 25 | CSI0_LN3_N |
| 26 | LPI_MI2S2_WS | 26 | GND |
| 27 | LDO11A_1V8 | 27 | GND |
| 28 | LPI_MI2S2_DATA0 | 28 | DSI0_CLK_P |
| 29 | LDO14A_1V8 | 29 | CSI0_LN2_P |
| 30 | LPI_MI2S2_DATA1 | 30 | DSI0_CLK_N |
| 31 | LDO14A_1V8 | 31 | CSI0_LN2_N |
| 32 | GND | 32 | GND |
| 33 | LDO1E_1V8 | 33 | GND |
| 34 | LPI_DMIC1_CLK | 34 | LCD0_TE |
| 35 | LDO8E_1V8 | 35 | CSI0_LN1_P |
| 36 | LPI_DMIC1_DATA | 36 | LCD0_RST |
| 37 | GND | 37 | CSI0_LN1_N |
| 38 | LPI_DMIC2_CLK | 38 | TP0_I2C_SCL |
| 39 | VREG_L3P_2P8 | 39 | GND |
| 40 | LPI_DMIC2_DATA | 40 | TP0_I2C_SDA |
| 41 | VREG_L4P_2P9 | 41 | CSI0_LN0_P |
| 42 | GND | 42 | TP0_RST |
| 43 | VREG_L7P_2P8 | 43 | CSI0_LN0_N |
| 44 | USB2_DM | 44 | TP0_INT |
| 45 | GND | 45 | GND |
| 46 | USB2_DP | 46 | GND |
| 47 | VREG_L1P_1P2 | 47 | CSI0_CLK_P |
| 48 | GND | 48 | DSI1_LN3_P |
| 49 | VREG_L1P_1P2 | 49 | CSI0_CLK_N |

| | | | |
|---|---|---|---|
| 50 | USB_SS1_TX_M | 50 | DSI1_LN3_N |
| 51 | VREG_L1P_1P2 | 51 | GND |
| 52 | USB_SS1_TX_P | 52 | GND |
| 53 | VREG_L2P_1P1 | 53 | CSI3_LN3_P |
| 54 | GND | 54 | DSI1_LN2_P |
| 55 | VREG_L2P_1P1 | 55 | CSI3_LN3_N |
| 56 | USB_SS1_RX_M | 56 | DSI1_LN2_N |
| 57 | VREG_L2P_1P1 | 57 | GND |
| 58 | USB_SS1_RX_P | 58 | GND |
| 59 | VREG_L5P_2P8 | 59 | CSI3_LN2_P |
| 60 | GND | 60 | DSI1_LN1_P |
| 61 | VREG_L6P_1P8 | 61 | CSI3_LN2_N |
| 62 | USB_SS2_TX_M | 62 | DSI1_LN1_N |
| 63 | GND | 63 | GND |
| 64 | USB_SS2_TX_P | 64 | GND |
| 65 | VRTC | 65 | CSI3_LN1_P |
| 66 | GND | 66 | DSI1_LN0_P |
| 67 | GPIO02_EN | 67 | CSI3_LN1_N |
| 68 | USB_SS2_RX_M | 68 | DSI1_LN0_N |
| 69 | GPIO03_EN | 69 | GND |
| 70 | USB_SS2_RX_P | 70 | GND |
| 71 | MIC_EN | 71 | CSI3_LN0_P |
| 72 | GND | 72 | DSI1_CLK_P |
| 73 | RESERVE1 | 73 | CSI3_LN0_N |
| 74 | USB_CC1_ID | 74 | DSI1_CLK_N |
| 75 | RESERVE2 | 75 | GND |
| 76 | USB_CC2 | 76 | GND |
| 77 | LCD1_BL_A | 77 | CSI3_CLK_P |

| | | | |
|---|---|---|---|
| 78 | USB_DP_AUX_M | 78 | LCD1_TE |
| 79 | LCD1_BL_K1 | 79 | CSI3_CLK_N |
| 80 | USB_DP_AUX_P | 80 | LCD1_RST |
| 81 | LCD1_BL_K2 | 81 | GND |
| 82 | NFC_INT | 82 | TP1_I2C_SCL |
| 83 | LCD1_BL_K3 | 83 | CSI1_LN3_P |
| 84 | NFC_CLK | 84 | TP1_I2C_SDA |
| 85 | LCD1_BL_K4 | 85 | CSI1_LN3_N |
| 86 | NFC_EN | 86 | TP1_RST |
| 87 | USB_VBUS2 | 87 | GND |
| 88 | NFC_CLK_REQ | 88 | TP1_INT |
| 89 | USB_VBUS2 | 89 | CSI1_LN2_P |
| 90 | NFC_DWL_REQ | 90 | ETH_3V3_EN |
| 91 | USB_VBUS2 | 91 | CSI1_LN2_N |
| 92 | NFC_I2C_SDA | 92 | CSI0_PWDN |
| 93 | USB_VBUS1 | 93 | GND |
| 94 | NFC_I2C_SCL | 94 | CSI3_PWDN |
| 95 | VPH_PWR | 95 | CSI1_LN1_P |
| 96 | NFC_WKUP | 96 | MCAM_PWDN |
| 97 | VPH_PWR | 97 | CSI1_LN1_N |
| 98 | MIC2_DET | 98 | SCAM_PWDN |
| 99 | GND | 99 | GND |
| 100 | GND | 100 | DCAM_PWDN |
| 101 | BAT_THERM | 101 | CSI1_LN0_P |
| 102 | PWM1 | 102 | CSI0_RST |
| 103 | BAT_ID | 103 | CSI1_LN0_N |
| 104 | PWM2 | 104 | CSI3_RST |
| 105 | GND | 105 | GND |

| | | | |
|---|---|---|---|
| 106 | GPIO11_EN | 106 | MCAM_RST |
| 107 | BAT_ISNS_P | 107 | CSI1_CLK_P |
| 108 | FORCE_USB_BOOT | 108 | SCAM_RST |
| 109 | BAT_ISNS_M | 109 | CSI1_CLK_N |
| 110 | GPIO12_EN | 110 | DCAM_RST |
| 111 | GND | 111 | GND |
| 112 | VIB_DRV | 112 | GND |
| 113 | VBAT_VSNS_P | 113 | CSI2_LN1_P |
| 114 | GND | 114 | CSI0_MCLK |
| 115 | VBAT_VSNS_M | 115 | CSI2_LN1_N |
| 116 | MI2S2_SCLK | 116 | GND |
| 117 | GND | 117 | GND |
| 118 | MI2S2_WS | 118 | CSI3_MCLK |
| 119 | GND | 119 | CSI2_LN0_P |
| 120 | MI2S2_DATA0 | 120 | GND |
| 121 | GND | 121 | CSI2_LN0_N |
| 122 | MI2S2_DATA1 | 122 | MCAM_MCLK |
| 123 | GND | 123 | GND |
| 124 | MI2S2_DATA2 | 124 | GND |
| 125 | GND | 125 | CSI2_CLK_P |
| 126 | MI2S2_DATA3 | 126 | SCAM_MCLK |
| 127 | GND | 127 | CSI2_CLK_N |
| 128 | GND | 128 | GND |
| 129 | GND | 129 | GND |
| 130 | MI2S2_MCLK | 130 | DCAM_MCLK |
| 131 | GND | 131 | CSI2_LN3_P |
| 132 | GND | 132 | GND |
| 133 | GND | 133 | CSI2_LN3_N |

| | | | |
|---|---|---|---|
| 134 | PCIE_REFCLK_M | 134 | HS_DET |
| 135 | VBAT | 135 | GND |
| 136 | PCIE_REFCLK_P | 136 | CAM_I2C_SDA0 |
| 137 | VBAT | 137 | CSI2_LN2_P |
| 138 | GND | 138 | CAM_I2C_SCL0 |
| 139 | VBAT | 139 | CSI2_LN2_N |
| 140 | PCIE_TX0_M | 140 | CAM_I2C_SDA1 |
| 141 | VBAT | 141 | GND |
| 142 | PCIE_TX0_P | 142 | CAM_I2C_SCL1 |
| 143 | VBAT | 143 | SD_CMD |
| 144 | GND | 144 | CAM_I2C_SDA2 |
| 145 | VBAT | 145 | SD_DET |
| 146 | PCIE_RX0_M | 146 | CAM_I2C_SCL2 |
| 147 | VBAT | 147 | SD_CLK |
| 148 | PCIE_RX0_P | 148 | SPI_CLK |
| 149 | VBAT | 149 | SD_DATA0 |
| 150 | GND | 150 | SPI_MISO |
| 151 | VBAT | 151 | SD_DATA1 |
| 152 | PCIE_TX1_M | 152 | SPI_MOSI |
| 153 | VBAT | 153 | SD_DATA2 |
| 154 | PCIE_TX1_P | 154 | SPI_CS |
| 155 | VBAT | 155 | SD_DATA3 |
| 156 | GND | 156 | FLASH_LED1 |
| 157 | VBAT | 157 | GND |
| 158 | PCIE_RX1_M | 158 | FLASH_LED1 |
| 159 | VBAT | 159 | SD_LDO9E |
| 160 | PCIE_RX1_P | 160 | GND |
| 161 | VBAT | 161 | SD_LDO9E |

| | | | |
|---|---|---|---|
| 162 | GND | 162 | PWRKEY |
| 163 | VBAT | 163 | SD_LDO6E |
| 164 | PCIE_RST_N | 164 | RESET_N |
| 165 | VBAT | 165 | SBU_SW_SEL |
| 166 | PCIE_WAKE_N | 166 | KEY_VOL_DOWN |
| 167 | VBAT | 167 | SBU_SW_OE |
| 168 | PCIE_CLK_REQ | 168 | KEY_VOL_UP |
| 169 | GND | 169 | GND |
| 170 | GND | 170 | GND |
| 171 | NC | 171 | NC |
| 172 | NC | 172 | NC |

## 4.3. LCM Interfaces

### 4.3.1. Main/Secondary LCM Interfaces

The Smart 5G EVB provides two LCM interfaces and can be equipped with two LCDs for dual display function. Currently the Smart 5G EVB provides two 5-inch 1280 × 720 HD LCDs (4-lane MIPI DSI for each LCD) for testing purpose.

**Table 8: LCM Interfaces**

| RefDes. | Description |
|---|---|
| J0501 | Connector for main LCM |
| J0502 | Connector for secondary LCM |

The following figure shows a schematic design for main LCM interface of the Smart 5G EVB.

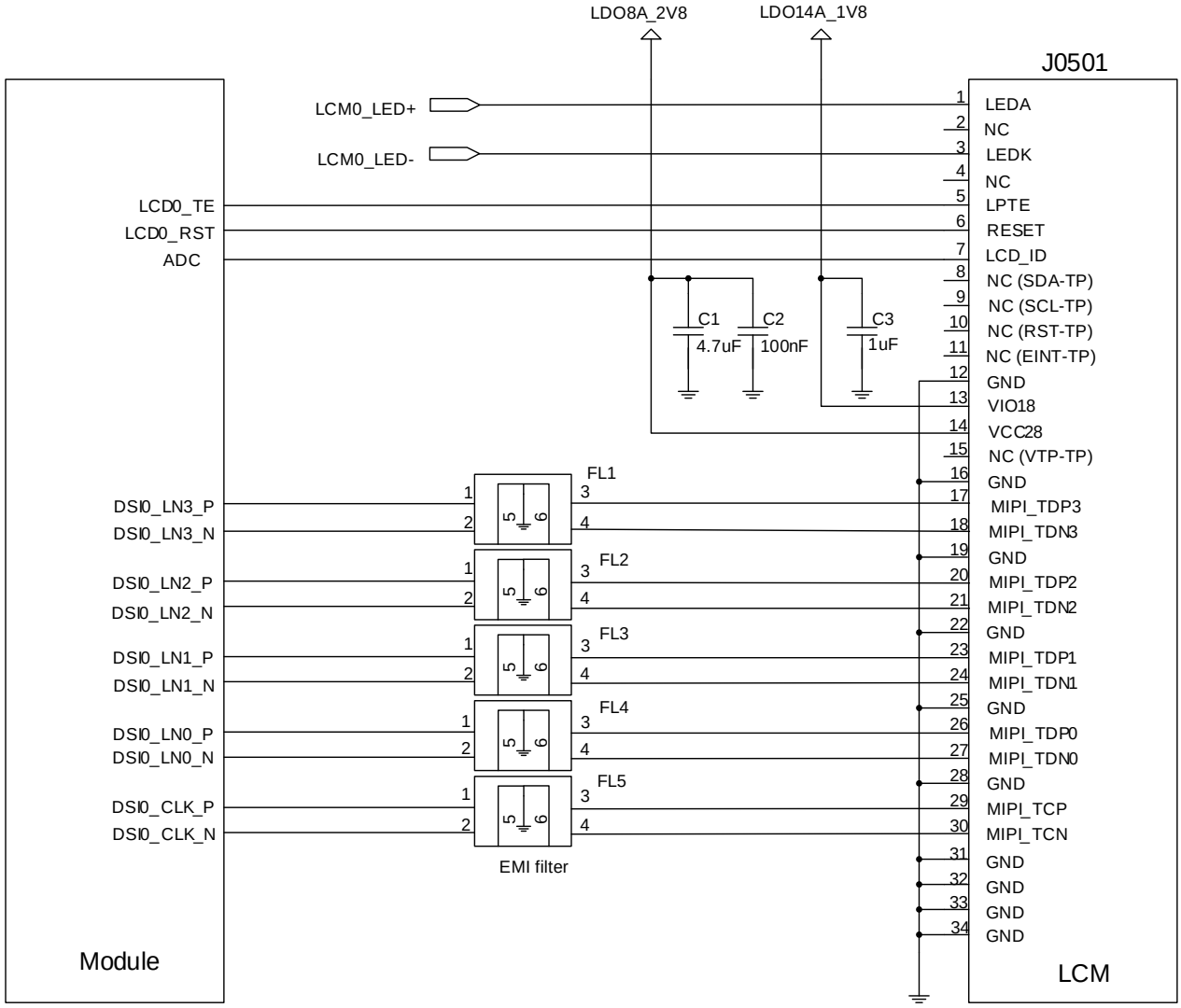



**Figure 16: Schematic Design for Main LCM Interface**

The following figure shows a schematic design for secondary LCM interface of the Smart 5G EVB.

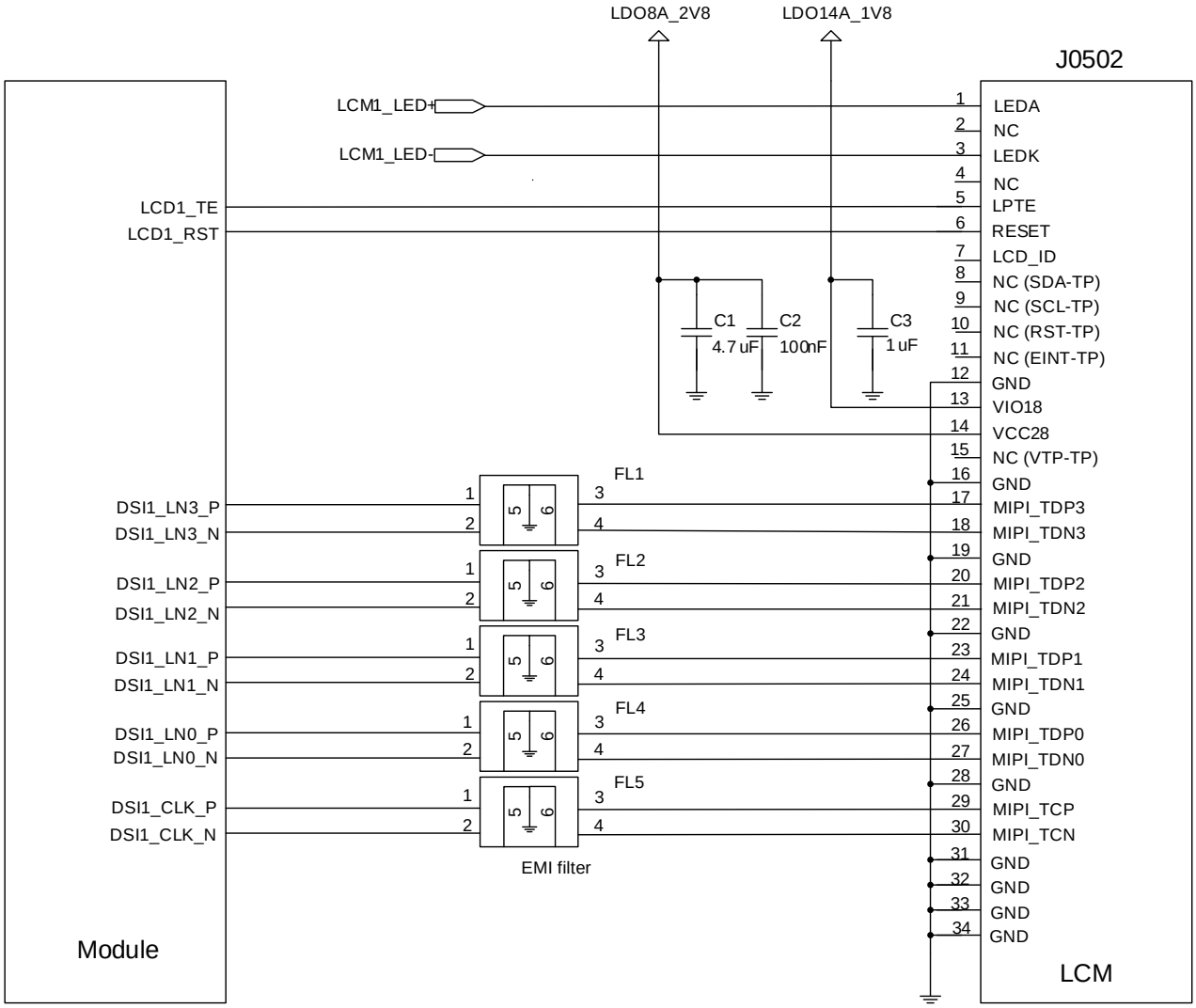



**Figure 17: Schematic Design for Secondary LCM Interface**

The following figure shows the pin assignment of LCM connector.

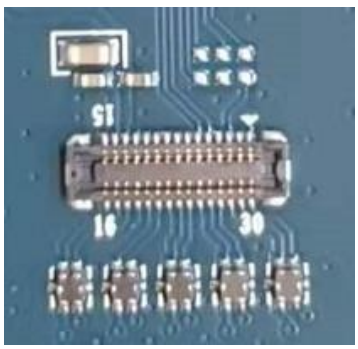


**Figure 18: Pin Assignment of LCM Connector**

### 4.3.2. Backlight Driver for LCM Interfaces

The Smart 5G EVB uses a PWM dimming step-up LED driver for the WLED backlighting of LCM interfaces.

The following figure shows a schematic design for the backlight driver.

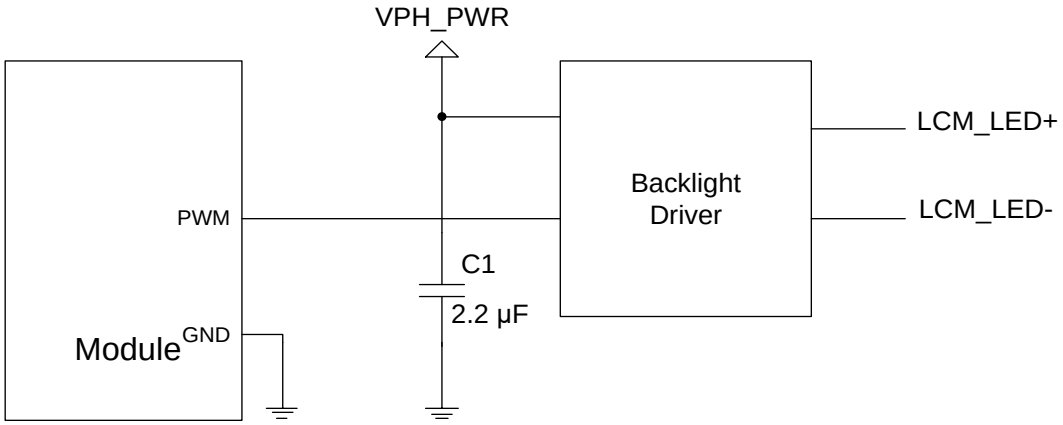



**Figure 19: Schematic Design for Backlight Driver**

## 4.4. Touch Panel Interfaces

The Smart 5G EVB provides two touch panel interfaces:

**Table 9: Touch Panel Interfaces**

| RefDes. | Description |
|---|---|
| J0503 | ● ZIF connector for main touch panel<br>● Used for the connection between touch panel interfaces of main LCM and EVB |
| J0504 | ● ZIF connector for secondary touch panel<br>● Used for the connection between touch panel interfaces of secondary LCM and EVB |

The following figure shows a schematic design for touch panel interfaces.

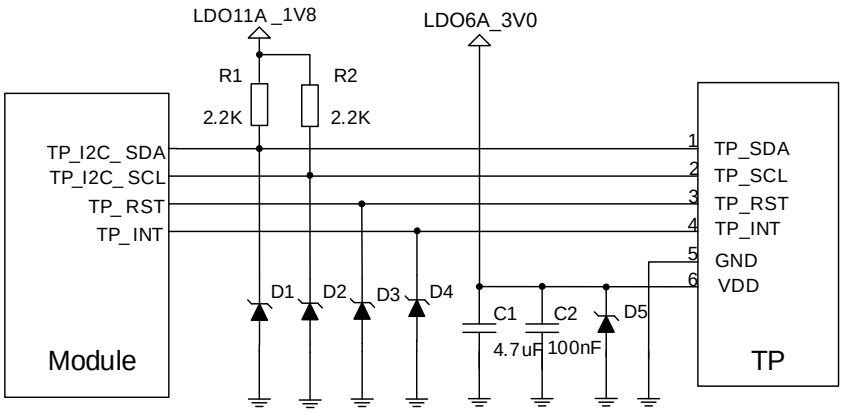



**Figure 20: Schematic Design for Touch Panel Interfaces**

The following figure shows the pin assignment of touch panel connectors, and the following table shows the pin definition of touch panel connectors.

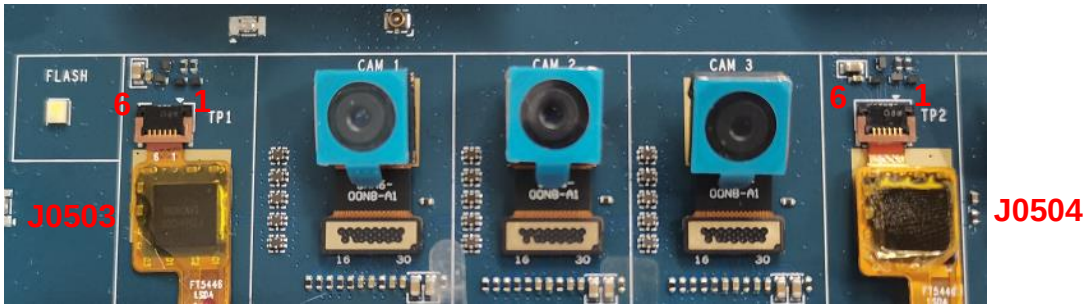



**Figure 21: Pin Assignment of Touch Panel Connectors**

**Table 10: Pin Definition of Touch Panel Connectors**

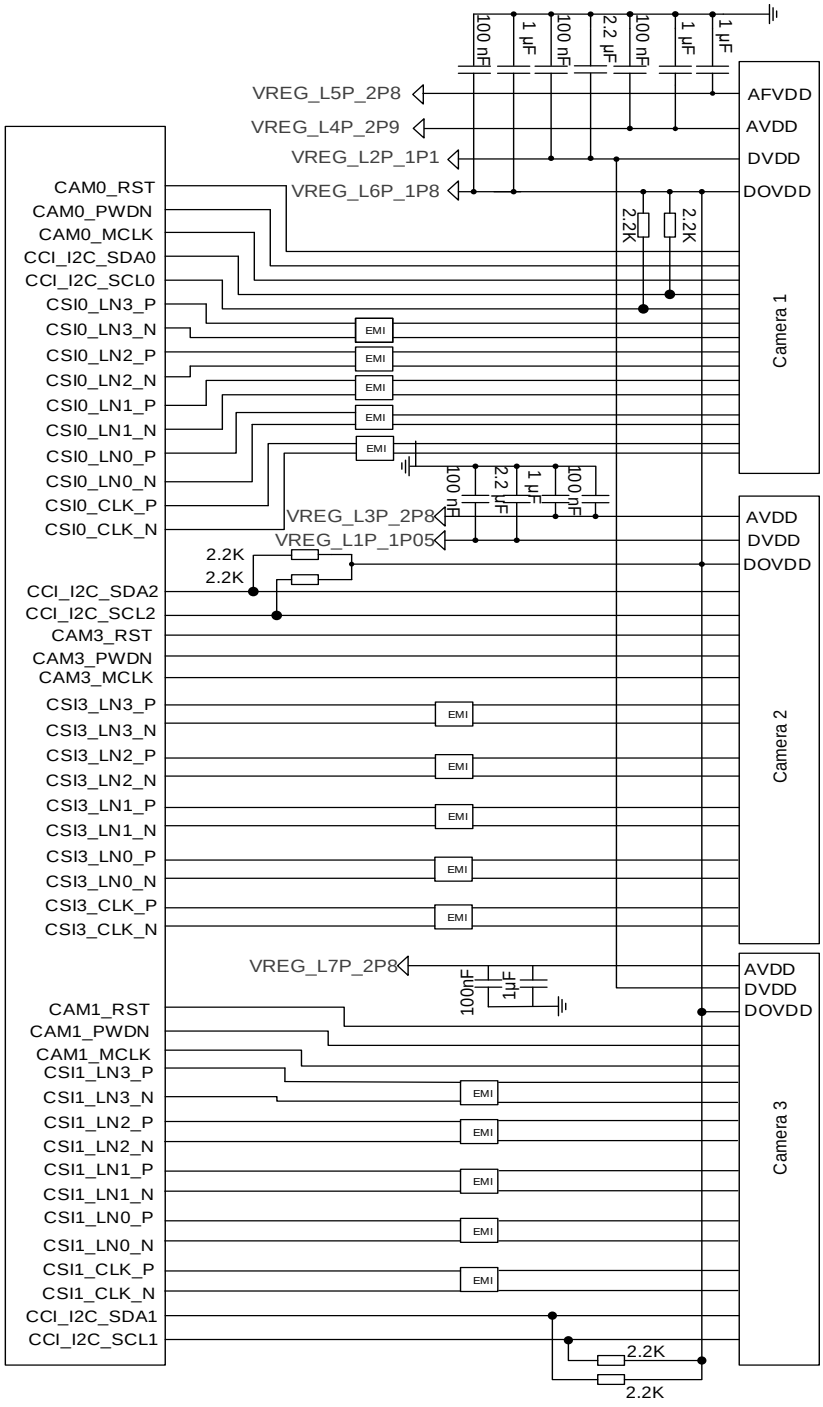
| Pin No. | Pin Name | Description | Comment |
|---|---|---|---|
| 1 | TP_SDA | I2C data signal of touch panel | |
| 2 | TP_SCL | I2C clock signal of touch panel | |
| 3 | TP_RST | Reset signal of touch panel | Active low |
| 4 | TP_INT | Interrupt signal of touch panel | |
| 5 | GND | Ground | |
| 6 | VDD | power supply for touch panel VDD power | |

## 4.5. Camera Interfaces

Smart 5G EVB provides five camera interfaces (4-lane + 4-lane + 4-lane + 2-lane + 1-lane).

- Camera1–3 use 16 MP digital CMOS sensors.
- Camera4 uses 8 MP CMOS sensor.
- Camera5 uses 2 MP CMOS sensor.

The following figure shows a schematic design for camera interfaces.



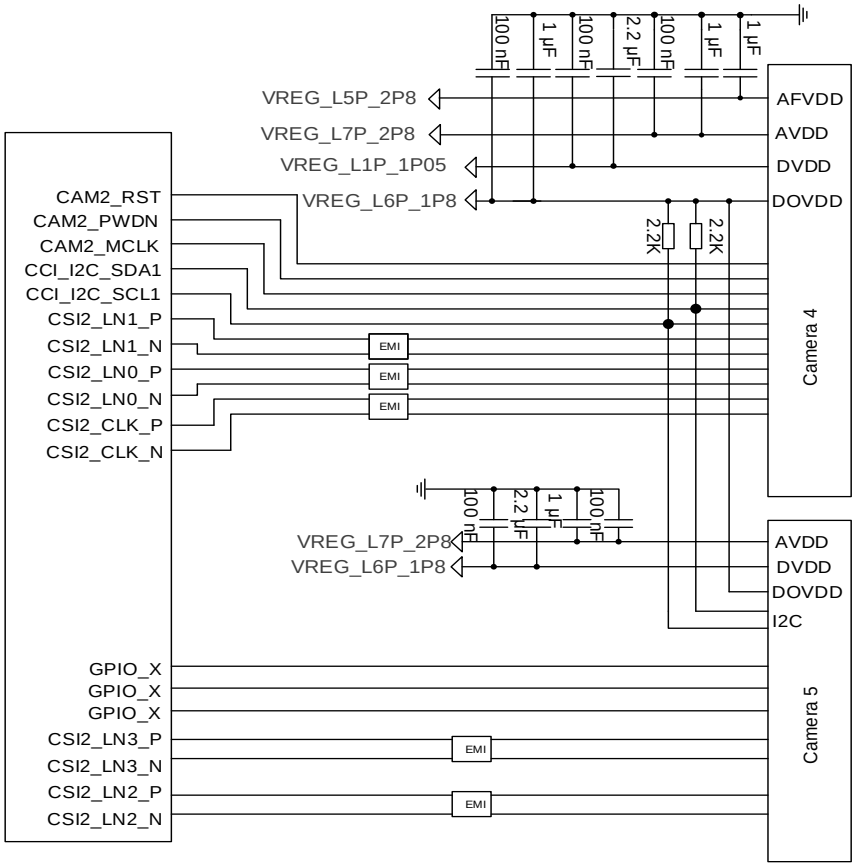



**Figure 22: Schematic Design for Camera1–5 Interfaces**

The following figure shows the camera interfaces with cameras assembled.

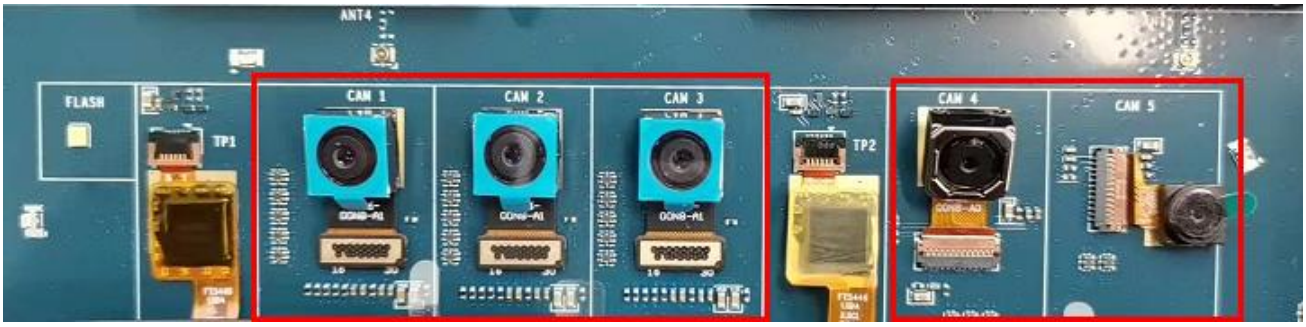



**Figure 23: Camera Interfaces with Cameras Assembled**

## 4.6. USB Interfaces

The Smart 5G EVB provides two USB interfaces: Micro USB interface and Type-C interface.

- Used for AT command communication, data transmission, software debugging and firmware upgrade.
- The Type-C interface complies with USB 3.1 (Gen 1)/2.0 specifications and supports super speed (5 Gbps) on USB 3.1 (Gen 1), high speed (480 Mbps) and full speed (12 Mbps) modes on USB 2.0.
- The Micro USB interface complies with USB 2.0 specifications and supports high speed (480 Mbps) and full speed (12 Mbps) modes.

**Table 11: USB Interfaces**

| RefDes. | Description |
|---|---|
| J1001 | Micro USB connector |
| J1002 | USB Type-C connector |

The following figures show schematic designs for USB interfaces.

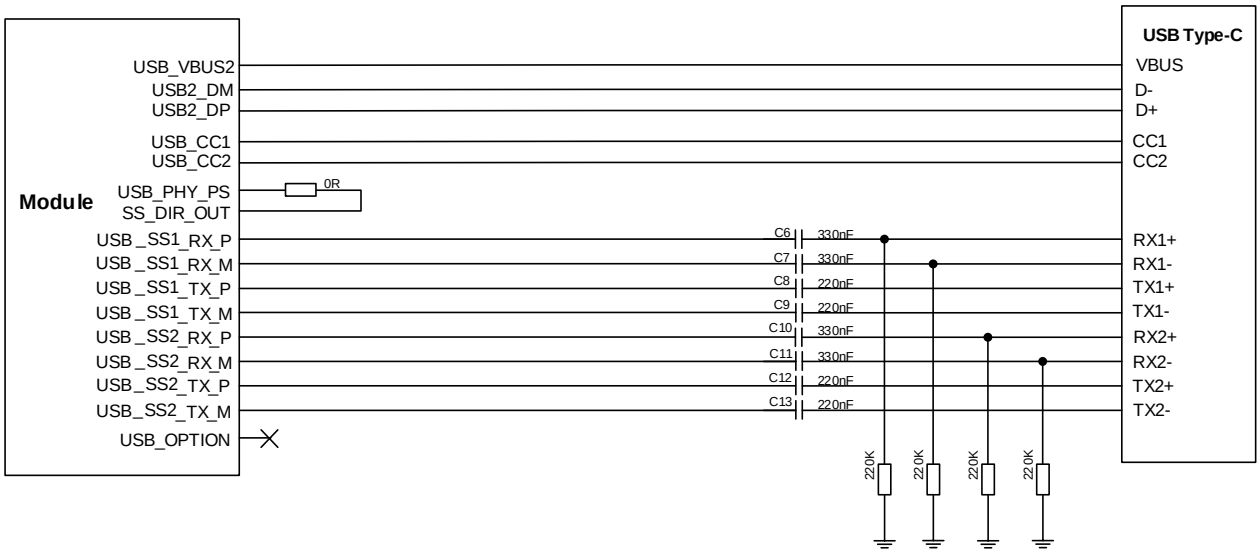



**Figure 24: Schematic Design for USB Type-C Interface**

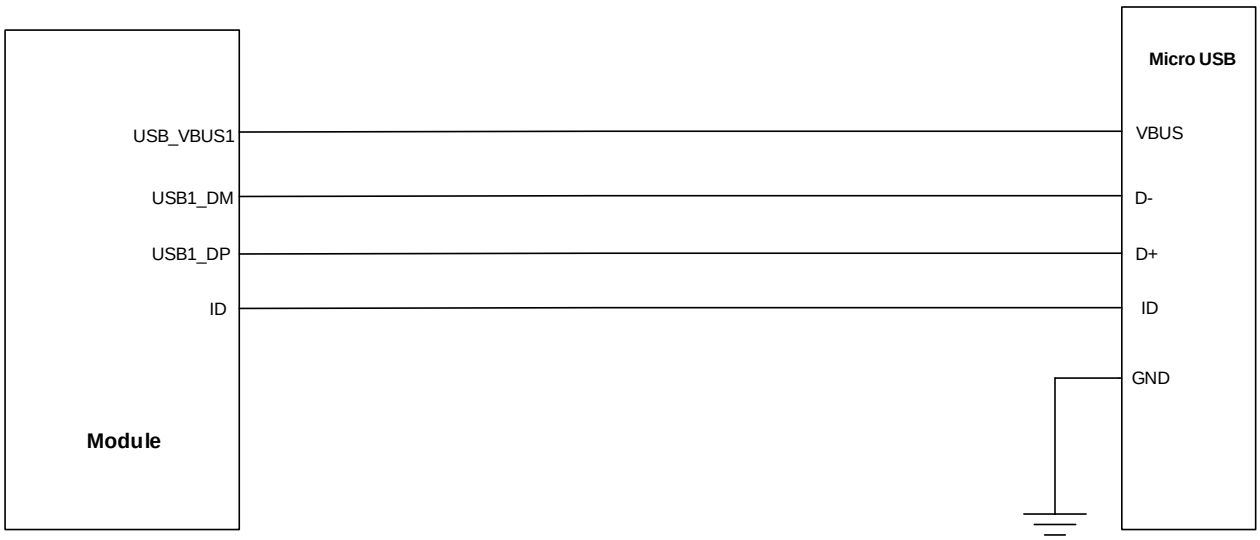



**Figure 25: Schematic Design for Micro USB Interface**

**NOTE**

The Micro USB connector on Smart 5G EVB is only used for modules supporting second USB interface.

## 4.7. Audio Interfaces

Smart 5G EVB provides three analog audio outputs including one mono loudspeaker differential amplifier output, one mono earpiece differential output, and one stereo headphone output for headset. It also provides three analog audio inputs including one single-ended microphone input for headset and two differential microphone inputs for microphones. Additionally, two DMIC interfaces are provided for digital microphones.

### 4.7.1. Loudspeaker Interface

Smart 5G EVB provides one loudspeaker interface and the loudspeaker is soldered onto the Smart 5G EVB via test point J0801. The following figure shows a schematic design for loudspeaker interface.

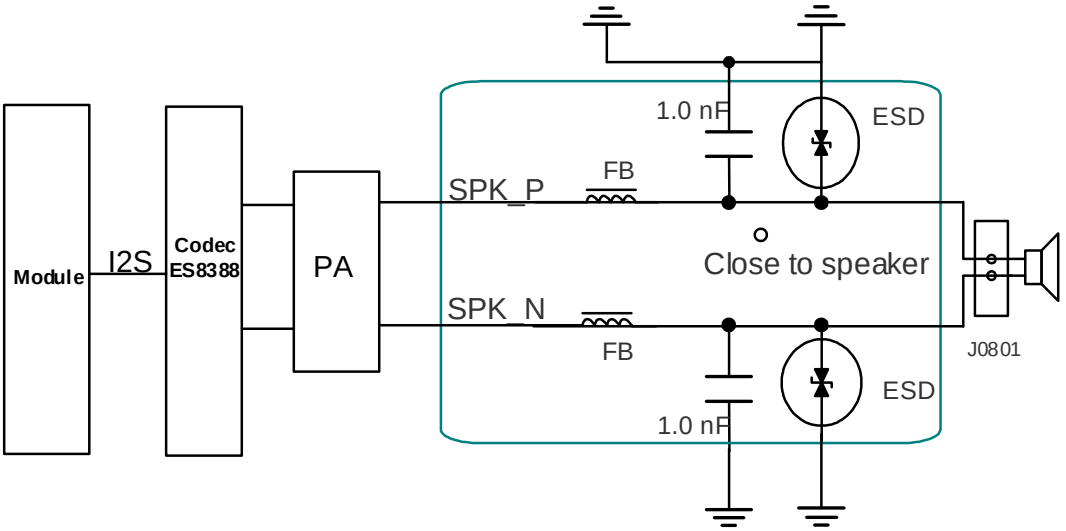



**Figure 26: Schematic Design for Loudspeaker Interface**

### 4.7.2. Earpiece Interface

Smart 5G EVB provides one earpiece interface and the earpiece is soldered onto the Smart 5G EVB via test point J0802. The following figure shows a schematic design for earpiece interface.

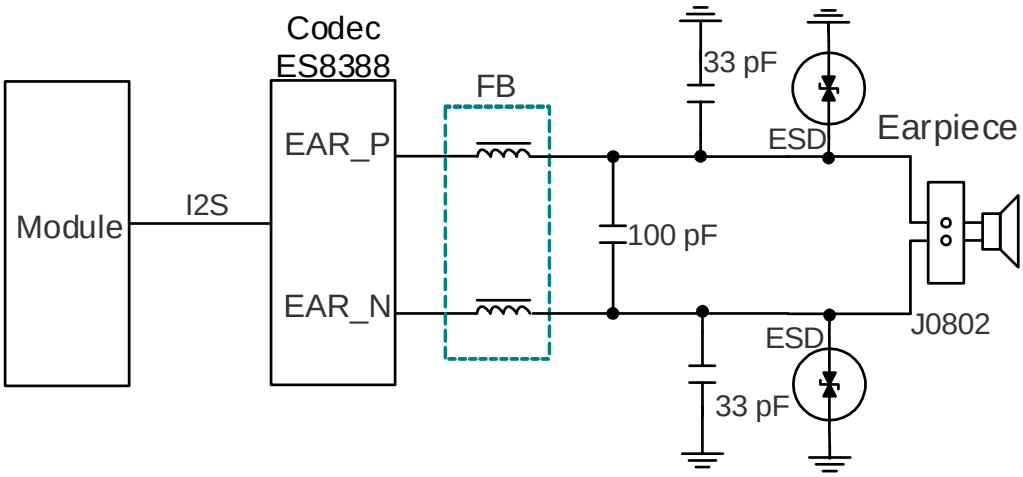



**Figure 27: Schematic Design for Earpiece Interface**

### 4.7.3. Headset Interface

The following figure shows a schematic design for headset interface.

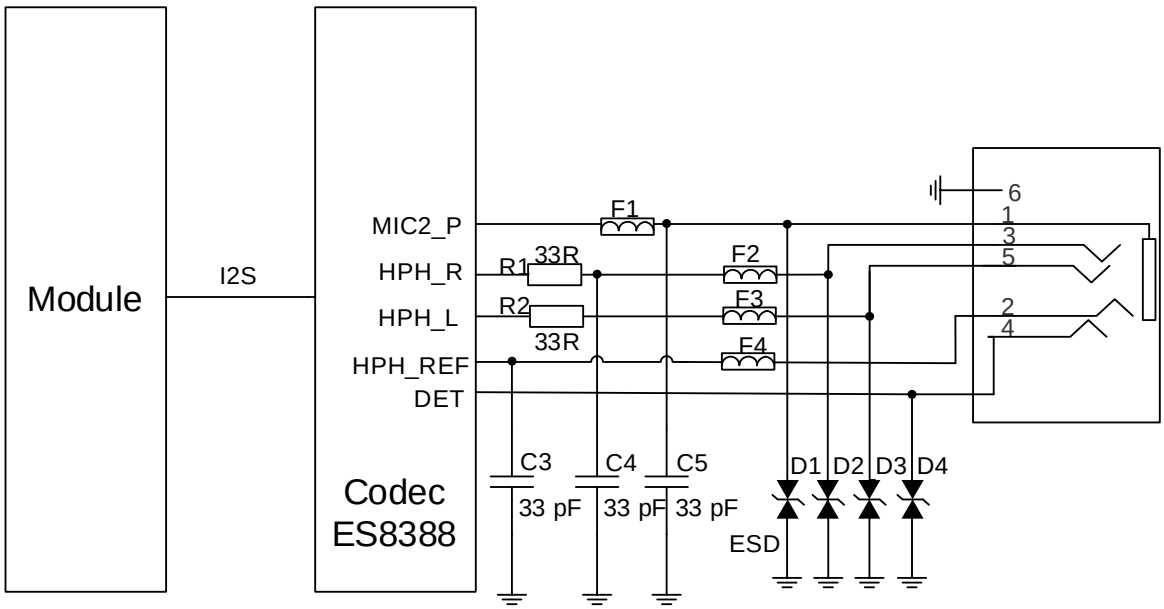



**Figure 28: Schematic Design for Headset Interface**

The following figure shows the pin assignment of headset audio jack.

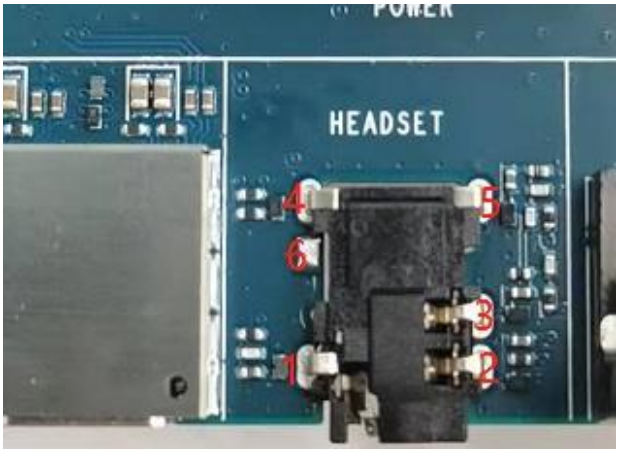



**Figure 29: Pin Assignment of Headset Audio Jack**

The following table shows the pin definition of headset audio jack.

**Table 12: Pin Definition of Headset Audio Jack**

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | MIC | Microphone input (+) |
| 2 | GND | Dedicated GND for headset |
| 3 | R-AUDIO | Headphone right channel |
| 4 | DETECT | Headset detection |
| 5 | L-AUDIO | Headphone left channel |
| 6 | GND | Ground |

The following figure shows the sketch design of audio plug for the audio jack on Smart 5G EVB.

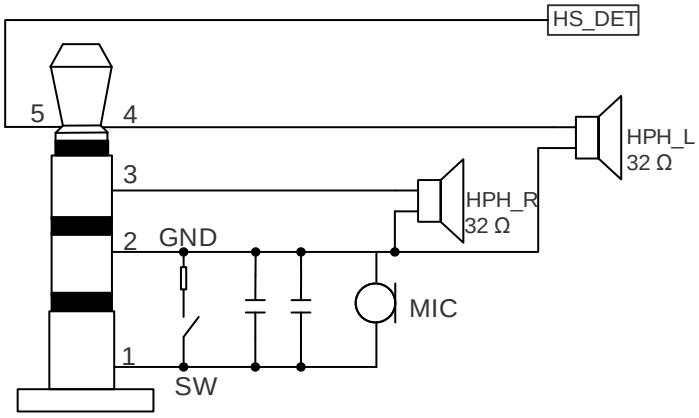



**Figure 30: Sketch Design of Audio Plug**

### 4.7.4. Microphone Interfaces

Smart 5G EVB provides two analog differential microphone inputs for ECM-type microphone and MEMS-type microphone respectively. The following figures show a schematic design for analog microphone interfaces, as well as the ECM-type and MEMS-type microphones on the board.

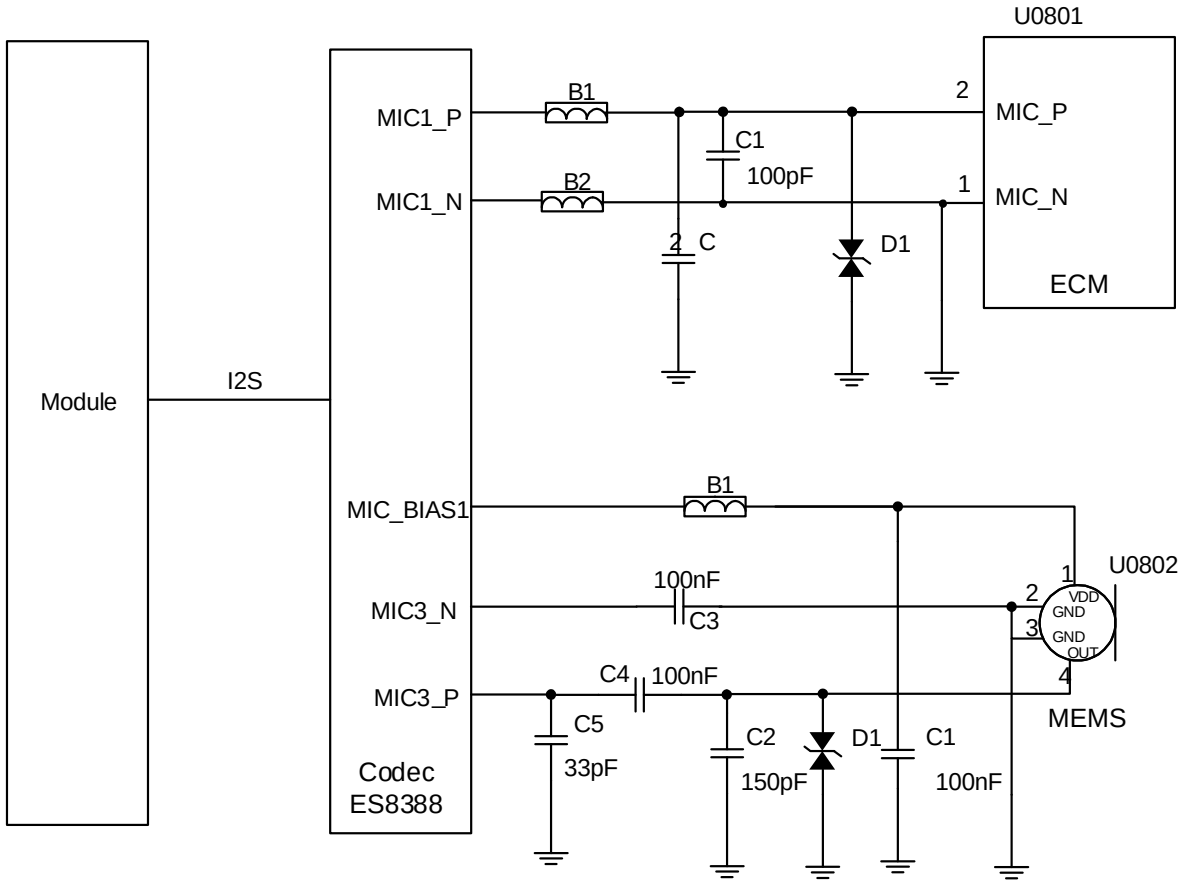



**Figure 31: Schematic Design for Analog Microphone Interfaces**


**Figure 32: ECM-Type and MEMS-Type Microphones**

Smart 5G EVB also provides two DMIC interfaces for digital microphones.

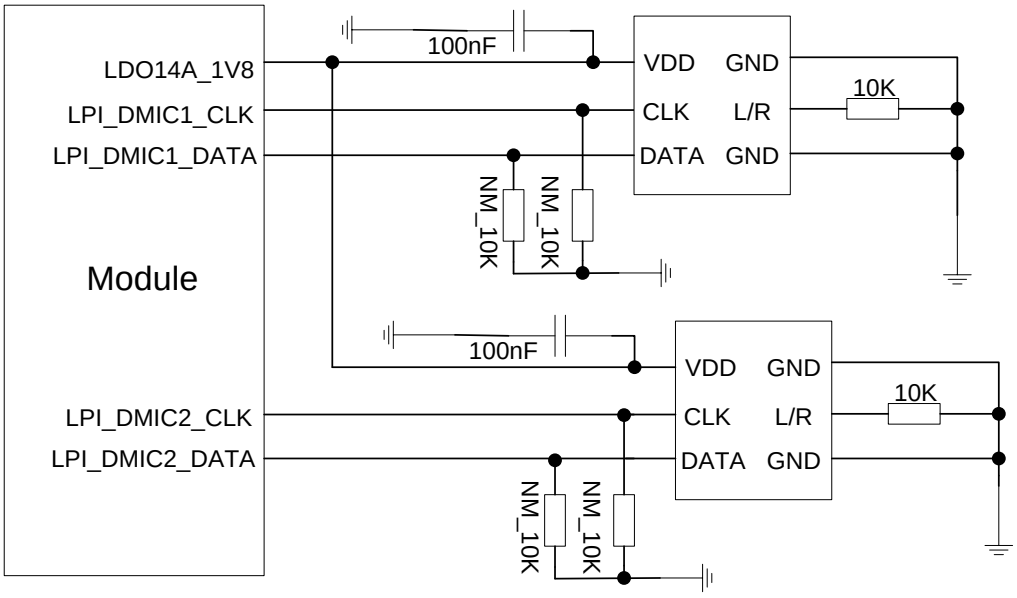



**Figure 33: Schematic Design for DMIC Interfaces**

## 4.8. (U)SIM Card Interfaces

The Smart 5G EVB provides two push-push type (U)SIM card (1.8/2.95 V) connectors: (U)SIM1 card connector and (U)SIM2 card connector.

**Table 13: (U)SIM Card Interfaces**

| RefDes. | Description |
|---|---|
| J0602 | (U)SIM1 card connector |
| J0603 | (U)SIM2 card connector |

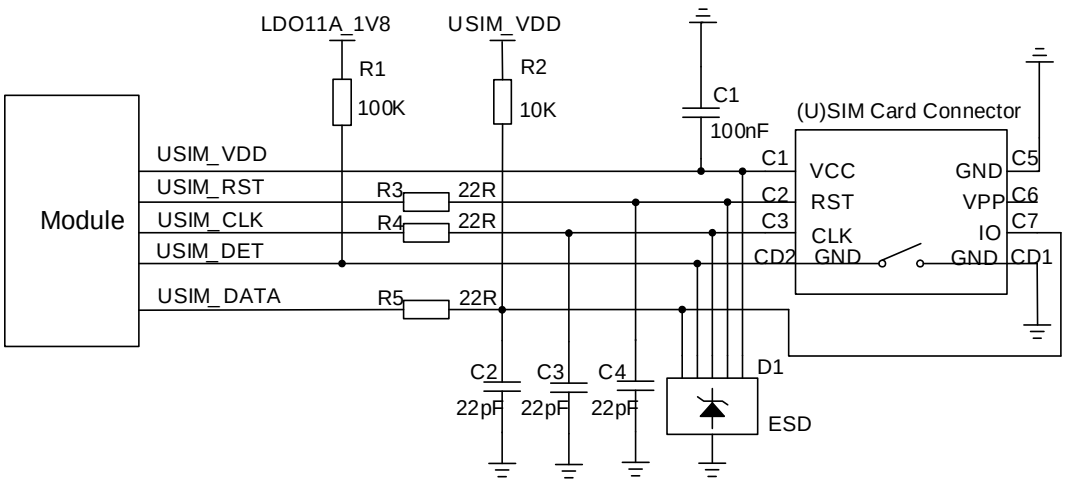



**Figure 34: Schematic Design for (U)SIM Card Interfaces**

The following figure shows the pin assignment of (U)SIM card connectors (J0602/J0603):

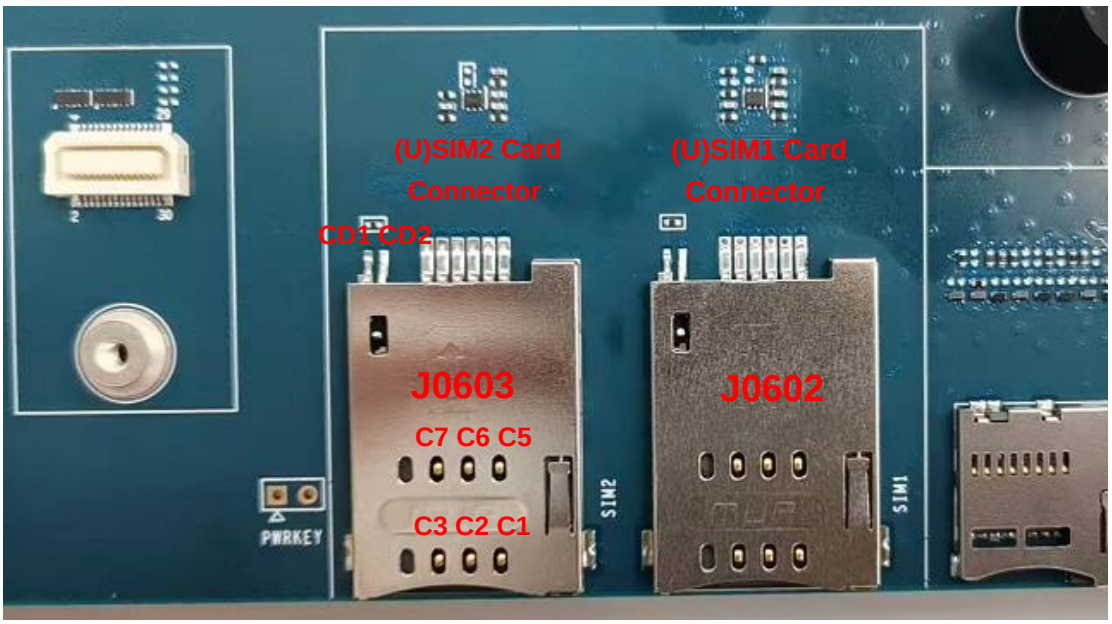



**Figure 35: Pin Assignment of (U)SIM Card Connectors**

**Table 14: Pin Definition of (U)SIM Card Connectors**

| Pin No. | Pin Name | I/O (from Module's Direction) | Function |
|---|---|---|---|
| C1 | VCC | PO | (U)SIM card power supply |
| C2 | RST | DO | (U)SIM card reset signal |

| | | | |
|---|---|---|---|
| C3 | CLK | DO | (U)SIM card clock signal |
| C5 | GND | - | Ground |
| C6 | VPP | - | Not connected |
| C7 | IO | DIO | (U)SIM card data signal |
| CD1 | GND | - | (U)SIM card detection |
| CD2 | USIM_PRESENCE | DI | (U)SIM card detection |

## 4.9. UART & Debug Interfaces

Smart 5G EVB provides a UART interface and a debug interface. The main UART can be used for data transmission and AT command communication and the debug interface is used for debugging.

**Table 15: UART Interfaces**

| RefDes. | Description |
|---|---|
| J0901 | Main UART |
| J0902 | Debug Interface (Type-C connector) |

The following figure shows the circuit design of debug interface on Smart 5G EVB.

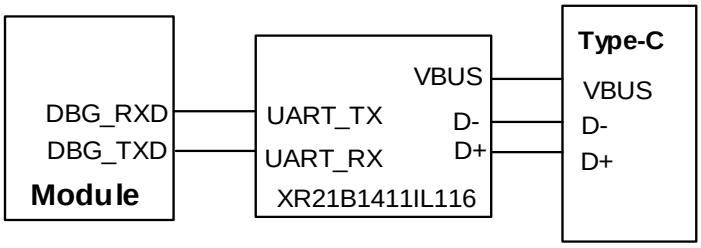



**Figure 36: Debug Interface Circuit**

The following figure shows the RS-232 level match circuit of main UART on Smart 5G EVB.

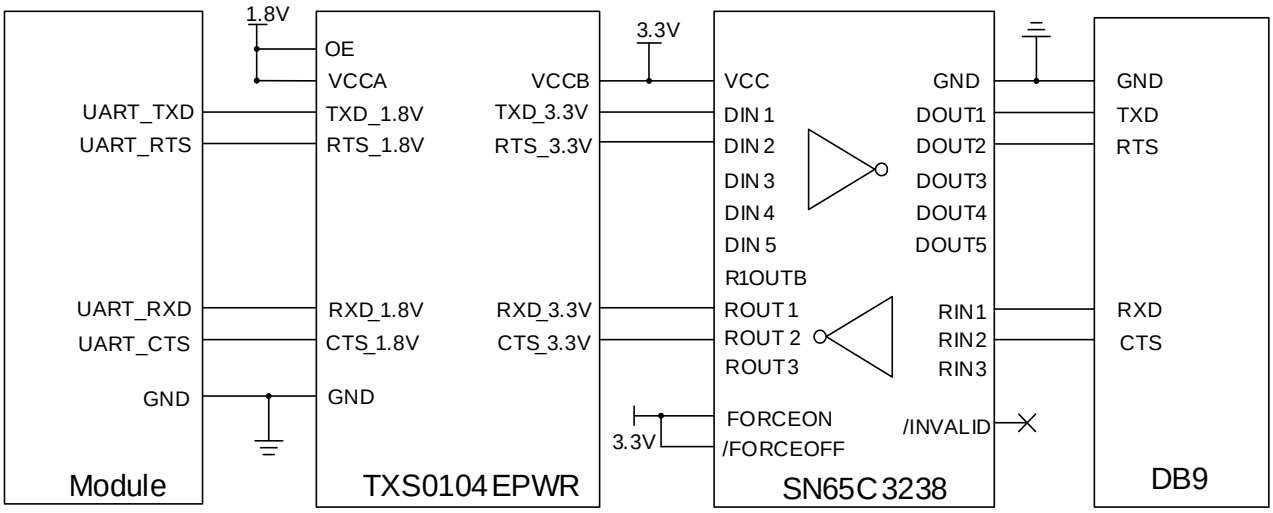



**Figure 37: RS-232 Level Match Circuit**

The following figure shows the pin assignment of main UART DB9 connector (J0901):

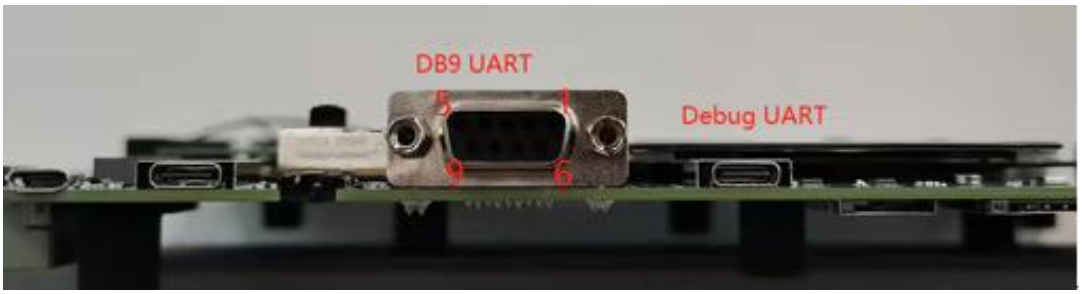



**Figure 38: Pin Assignment of Main UART Connector**

**Table 16: Pin Definition of Main UART Connector**

| Pin No. | Pin Name | I/O | Description |
|---|---|---|---|
| 2 | RS232_TXD | DO | Transmit data |
| 3 | RS232_RXD | DI | Receive data |
| 5 | RS232_GND | - | Ground |
| 7 | RS232_CTS | DI | Clear to send |
| 8 | RS232_RTS | DO | Request to send |

## 4.10. SD Card Interface

Smart 5G EVB provides an SD card interface J0601 for you to test the module's SD card interface. The following figure shows the schematic design for SD card interface on Smart 5G EVB.

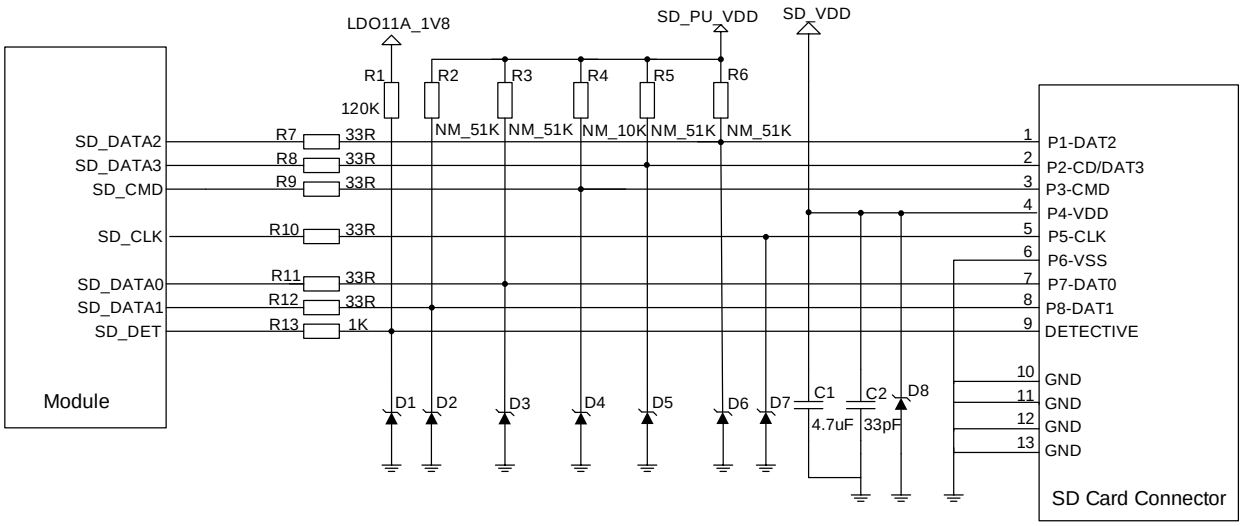



**Figure 39: Schematic Design for SD Card Interface**

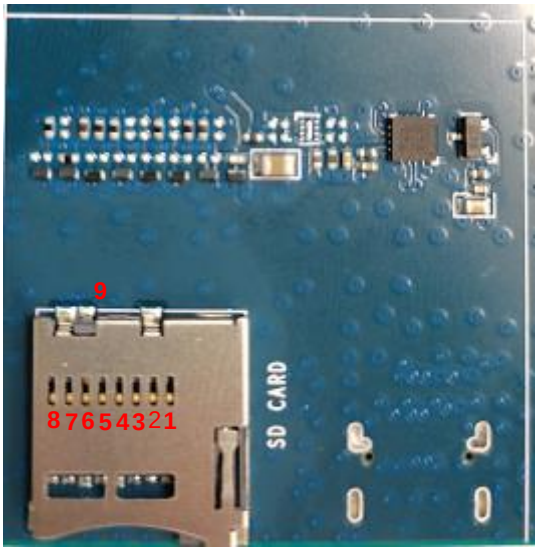



**Figure 40: Pin Assignment of SD Card Connector**

## 4.11. Flashlight

Smart 5G EVB provides one LED flashlight D0302 for testing the module's flashlight interface which supports flash mode and torch mode. The following figures show a schematic design for flashlight and its location on the board.

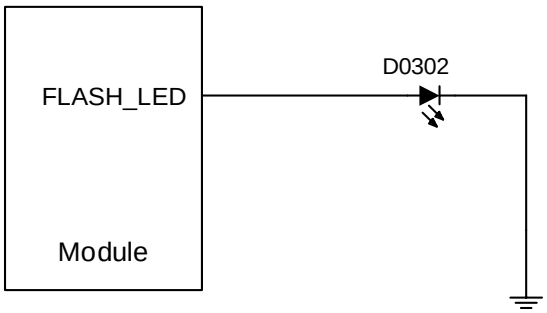



**Figure 41: Schematic Design for Flashlight Interface**


**Figure 42: Flashlight**

## 4.12. Sensors

Smart 5G EVB provides sensors TE-A for testing purpose, as shown in the figure below.


**Figure 43: Sensors**

## 4.13. Ethernet Interface

Smart 5G EVB provides an Ethernet interface which supports LAN.

**Table 17: Ethernet Interface**

| RefDes. | Description |
|---|---|
| J1101 | RJ45 connector, connected to PC with LAN cable |

The following figure shows the schematic design for Ethernet interface:

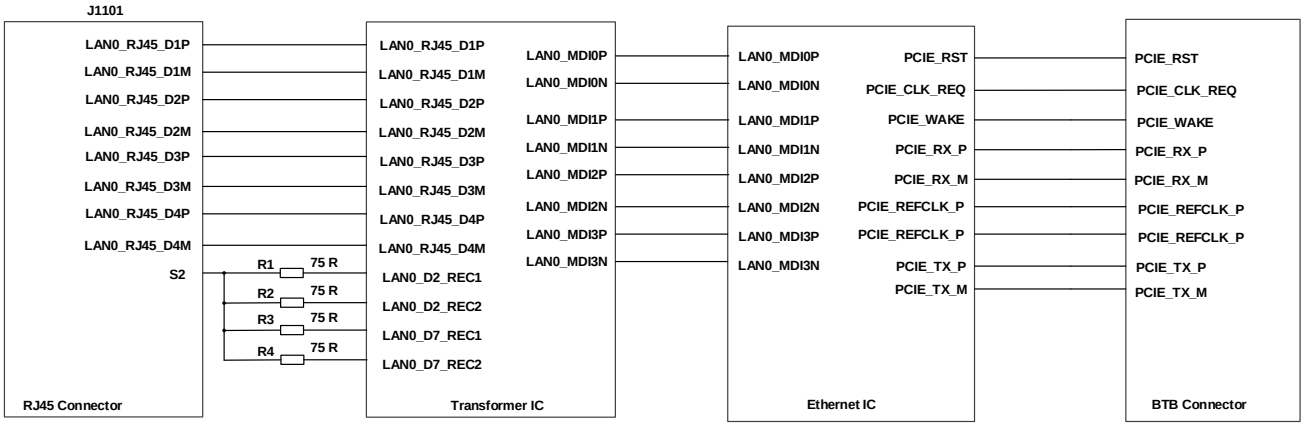



**Figure 44: Schematic Design for Ethernet Interface**

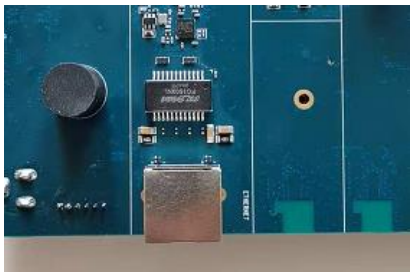


**Figure 45: Ethernet Interface**

## 4.14. Emergency Download Interface

Smart 5G EVB provides one emergency download switch USB_BOOT to force the module into download mode by pulling up USB_BOOT to 1.8 V before powering on the module. The following figures show a schematic design for the emergency download interface and its switch on the board.

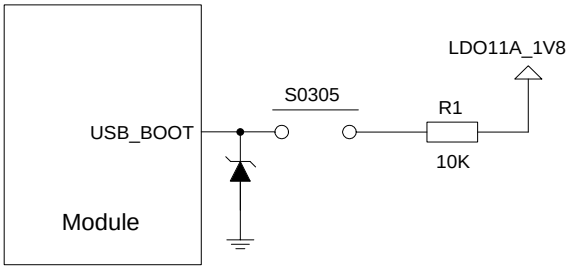



**Figure 46: Schematic Design for Emergency Download Interface**


**Figure 47: Emergency Download Switch**

## 4.15. Vibrator

Smart 5G EVB provides an ERM-type vibrator for you to test the motor driver interface of the module. The following figures show a schematic design and the vibrator on the board.

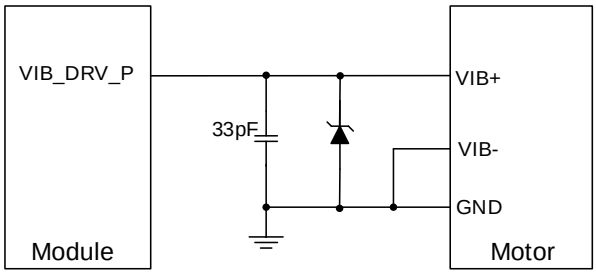



**Figure 48: Schematic Design for Vibrator**

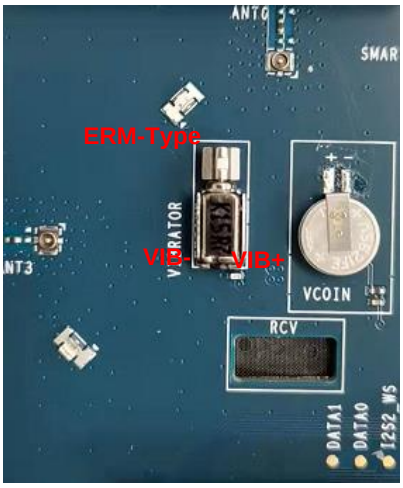



**Figure 49: ERM-Type Vibrator**

## 4.16. Buttons

Smart 5G EVB provides four buttons (S0301, S0302, S0303 and S0304) including PWRKEY, RESET_N (reserved), VOL_UP and VOL_DOWN, as shown in the following figure.


**Figure 50: Buttons**

**Table 18: Buttons**

| RefDes. | Items | Description |
|---|---|---|
| S0301 | PWRKEY | Turn on/off the module |
| S0302 | RESET_N | Reserved |
| S0303 | VOL_UP | Turn up the volume |
| S0304 | VOL_DOWN | Turn down the volume |

## 4.17. VBAT Status Indicator

There is one LED indicator (D0301) for VBAT on/off indication on Smart 5G EVB, as shown below.

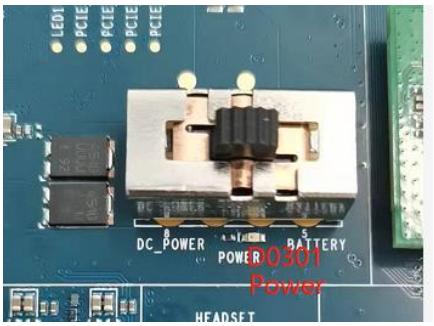



**Figure 51: VBAT Status Indicator**

**Table 19: VBAT Status Indicator**

| RefDes. | Item | Description |
|---|---|---|
| D0301 | VBAT Status Indicator | Indicates VBAT on/off of the module |

## 4.18. RF Antennas

There are 13 antennas, including 8 cellular antennas, 4 Wi-Fi/Bluetooth antennas and 1 GNSS ceramic antenna.

### 4.18.1. Antenna Distribution and Definition

See the following figure for antenna distribution.

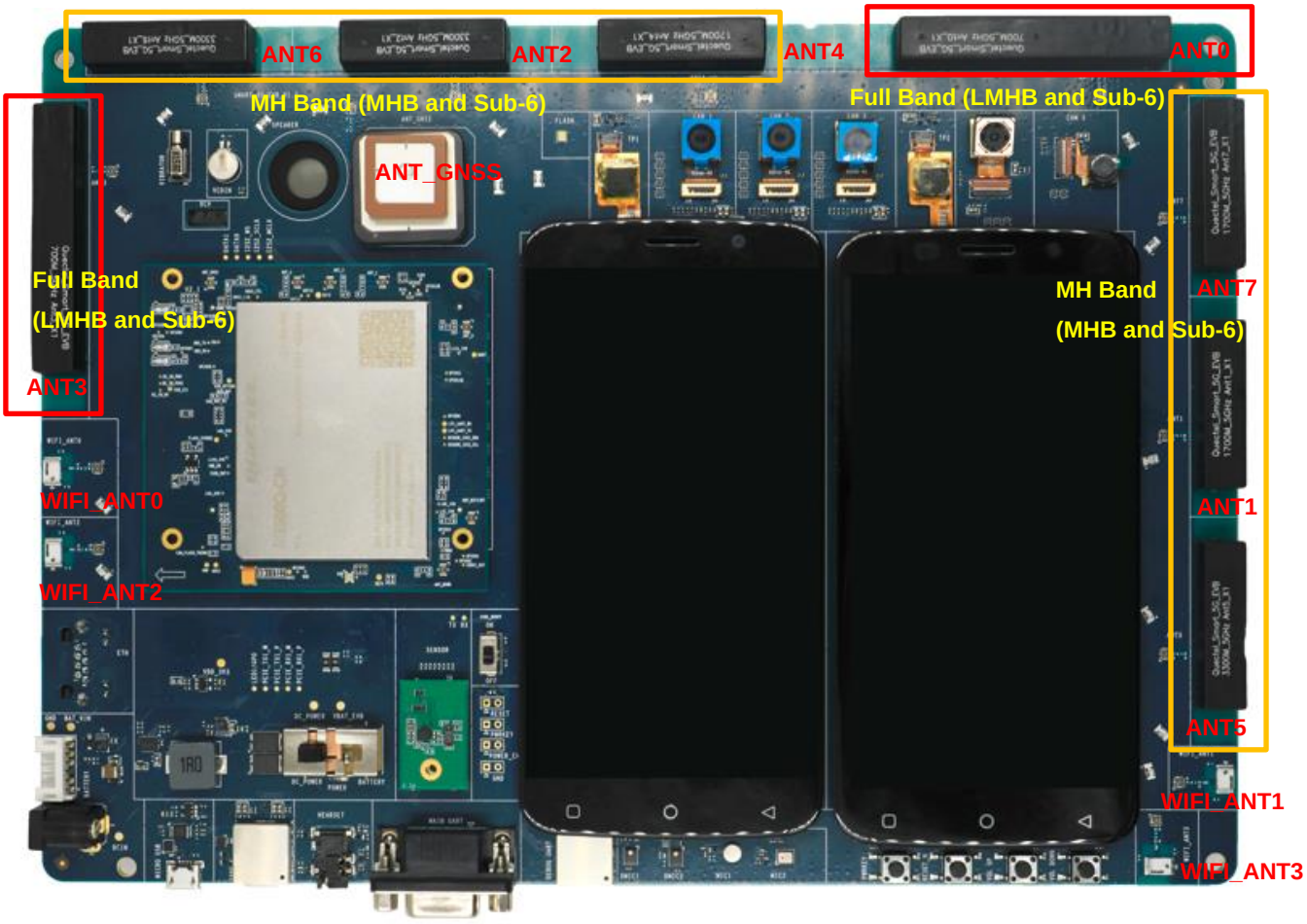



**Figure 52: Antenna Distribution**

**Table 20: Antennas**

| Antenna Name | Antenna Type | Band |
|---|---|---|
| ANT0, ANT3 | Cellular Antennas | Full Band (LMHB and Sub-6)：<br>699–960 MHz, 1710–2690 MHz, 3300–4200 MHz, 4400–5000 MHz |
| ANT1, ANT2, ANT4, ANT5, ANT6, ANT7 | Cellular Antennas | MH Band (MHB and Sub-6)：<br>1710–2690 MHz, 3300–4200 MHz, 4400–5000 MHz |
| WIFI_ANT0–3 | Wi-Fi/Bluetooth Antennas | 2.4/5 GHz |
| ANT_GNSS | GNSS Antenna | L1/L5 |

### 4.18.2. Antenna Connection

See the following figure for antenna connection. The RF connectors need to be matched one by one between TE-A and EVB.

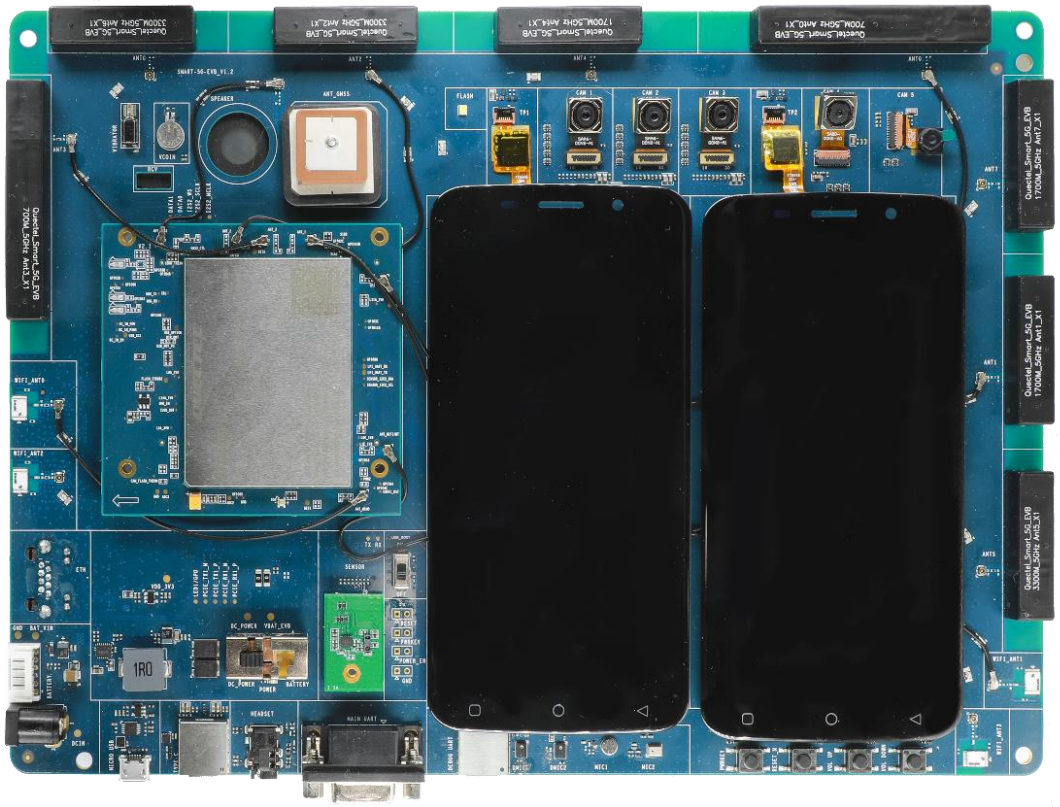


**Figure 53: Antenna Connection**

# 5 Operation Procedures

This chapter introduces the basic operation procedures with the Smart 5G EVB.

## 5.1. Turn On the Module

To turn on the module, follow the steps below:

1. Connect the module TE-A to the B2B connectors (J0101 and J0102) on Smart 5G EVB.

2. If battery power is to be selected, mount a Li-polymer battery to the battery connector (J0202) and then switch S0201 to "**BATTERY**" state. If 12 V DC power is to be selected, connect the 12 V power adapter to the power jack (J0201) and then switch S0201 to "**DC_POWER**" state. Then D0301 indicator will light up.

3. Press S0301 (PWRKEY) for at least 1.6 s to turn on the module. When the utilized LCD(s) displays as below, it means the booting has been completed successfully.

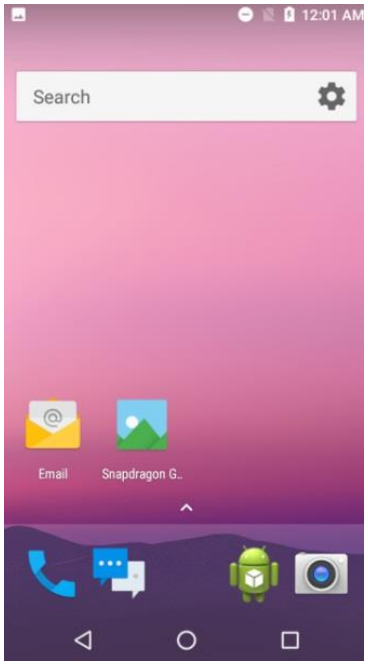



**Figure 54: LCD Display Indicating Module's Successful Power-on**

**NOTE**

After the module's VBAT power is provided, inserting USB into USB the interface can also turn on the module.

## 5.2. Turn Off/Reboot the Module

To turn off the module, follow the steps below:

1. Press S0301 (PWRKEY) for at least 3 s, and then the LCD will display a menu for selection:

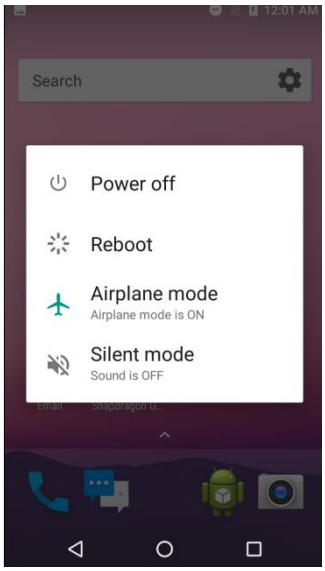



**Figure 55: Menu to Select Whether to Continue Turn-off Operation**

2. Choose "**Power off**" option and then the module will be powered off normally.

You can also press "**PWRKEY**" for at least 8 s to reboot the module.

## 5.3. Communication via USB Interface

1. Turn on the module according to the procedures mentioned in ***Chapter 5.1***.

2. Connect Smart 5G EVB to PC with USB cable through USB interface and then run the USB flash drive on PC to install the USB driver and ADB driver. The loaded USB ports can be viewed through the PC Device Manager, as shown below.

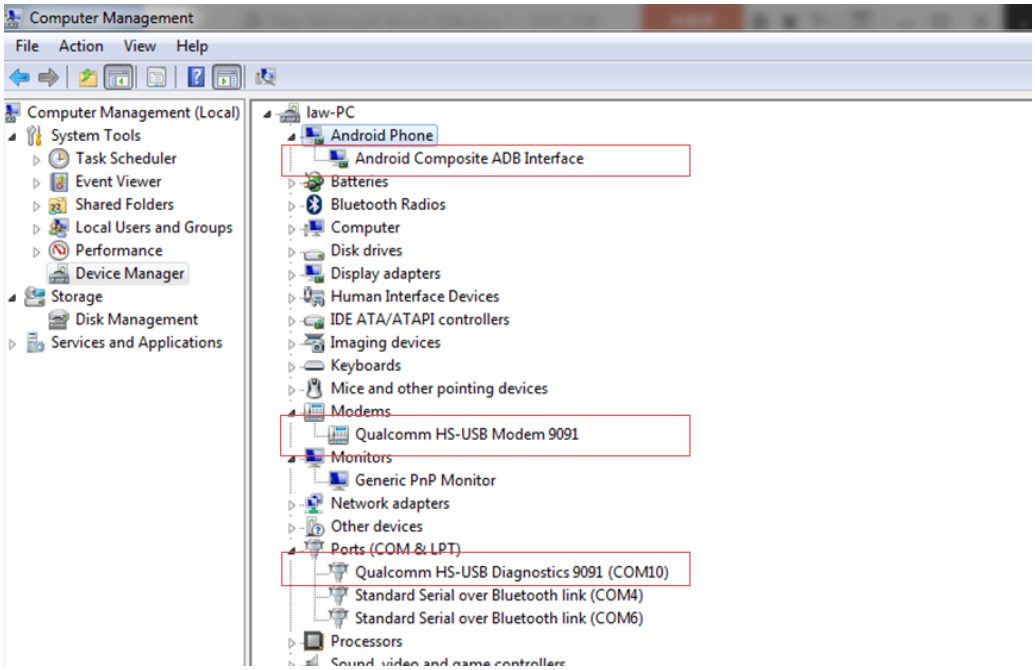



**Figure 56: Loaded USB Ports**

3. Open CMD tool: "**START**" → "**All Programs**" → "**Accessory**" → "**Command Prompt**".

4. Use the **adb shell** command to make the module enter ADB mode. Then you can use USB ADB interface for test.

```
C:\Users\Glenn>adb shell
```

**Figure 57: adb shell Command**

**NOTE**

1. If you want to use HyperTerminal for test, then Qualcomm HS-USB Modem 9091 (or 90DB) can be used.
2. Qualcomm HS-USB Diagnostics 9091 (or 90DB) can be used for firmware upgrade.

## 5.4. Communication via UART Interface

1. Connect the UART interface to the PC with USB to RS-232 converter cable or connect the debug interface (Type-C connector) to the PC with USB Type-C cable and then turn on the module according to the procedures mentioned in ***Chapter 5.1***. After that, the USB Serial Port number can be viewed through the PC Device Manager, as shown below.

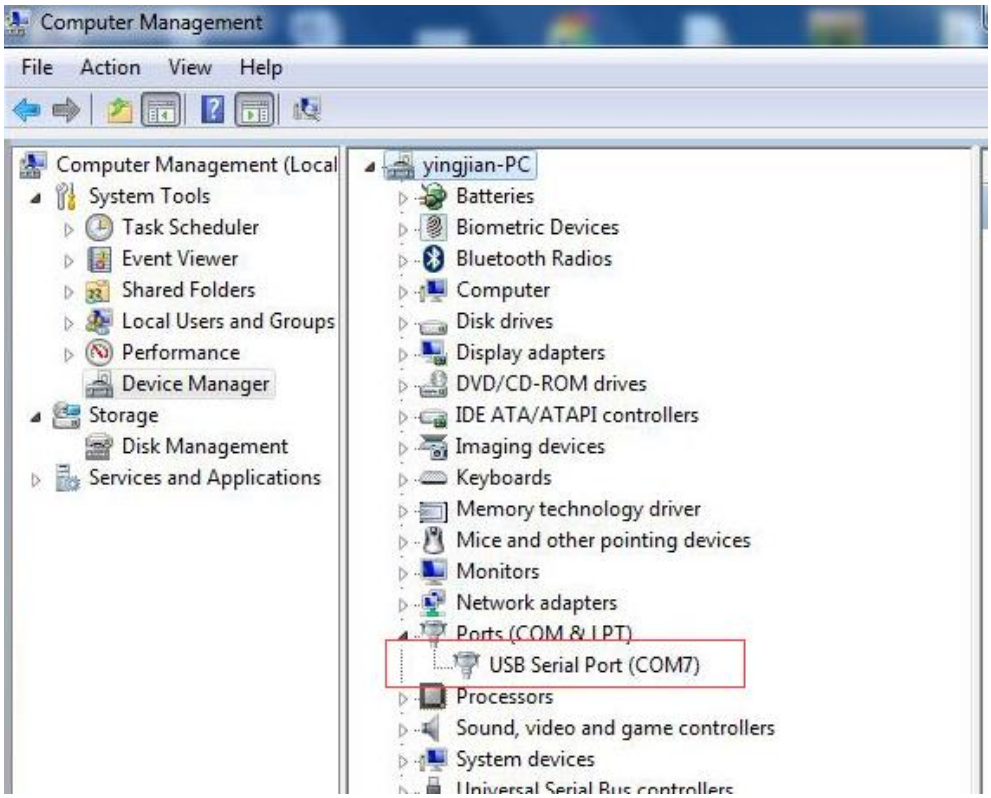



**Figure 58: USB Serial Port**

2. Use the QCOM tool provided by Quectel to realize communication between the module and the PC. The following figure shows the QCOM configuration: select the correct "**COM Port**" number corresponding to USB Serial Port and set the correct "**Baudrate**" (such as 115200 bps). For more details about QCOM tool usage and configuration, see ***document [1]***.

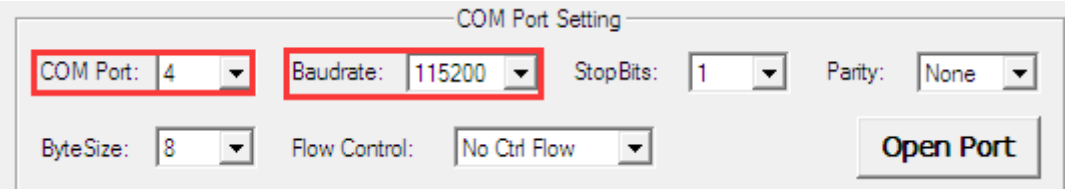



**Figure 59: QCOM Configuration**

# 6 Appendix References

**Table 21: Related Document**

| Document Name |
| --- |
| [1] Quectel_QCOM_User_Guide |

**Table 22: Terms and Abbreviations**

| Abbreviation | Description |
| --- | --- |
| ADB | Android Debug Bridge |
| ALS | Ambient Light Sensor |
| CMOS | Complementary Metal Oxide Semiconductor |
| CSI | Camera Serial Interface |
| DSI | Display Serial Interface |
| ECM | Electret Microphone |
| HD | High Definition |
| LCM | Liquid Crystal Display Module |
| LED | Light Emitting Diode |
| LMHB | Low/Middle/High Band |
| MEMS | Micro-Electro-Mechanical System |
| MHB | Middle/High Band |
| MIPI | Mobile Industry Processor Interface |
| OTG | On-The-Go |
| PC | Personal Computer |

| | |
|---|---|
| PS | Proximity Sensor |
| PWM | Pulse Width Modulation |
| UART | Universal Asynchronous Receiver & Transmitter |
| USB | Universal Serial Bus |
| (U)SIM | (Universal) Subscriber Identity Module |
| WLED | White LED |
| ZIF | Zero Insertion Force |