SC200E&SC206E Series

Reference Design

Smart Module Series

Version: 1.2

Date: 2023-08-14

Status: Released

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About the Document

Revision History

Version	Date	Author	Description
-	2021-08-26	Dorian MENG	Creation of the document
1.0	2022-01-20	Dorian MENG	First official release
1.1	2022-09-23	Dorian MENG/ Vasile WANG	1. Added SC206E series. 2. Added a filter capacitor design to pins 38, 115, 124, 127, 133 and 137, respectively; and added notes about adding the capacitors (Sheet 3).
1.2	2023-08-14	Dorian MENG/ Downey YANG	1. Updated the GNSS antenna design and added a note about GNSS antenna (Sheet 4). 2. Added coupling capacitor design for SS signal of USB Type-C interface (Sheet 9).

Contents

1 Reference Design

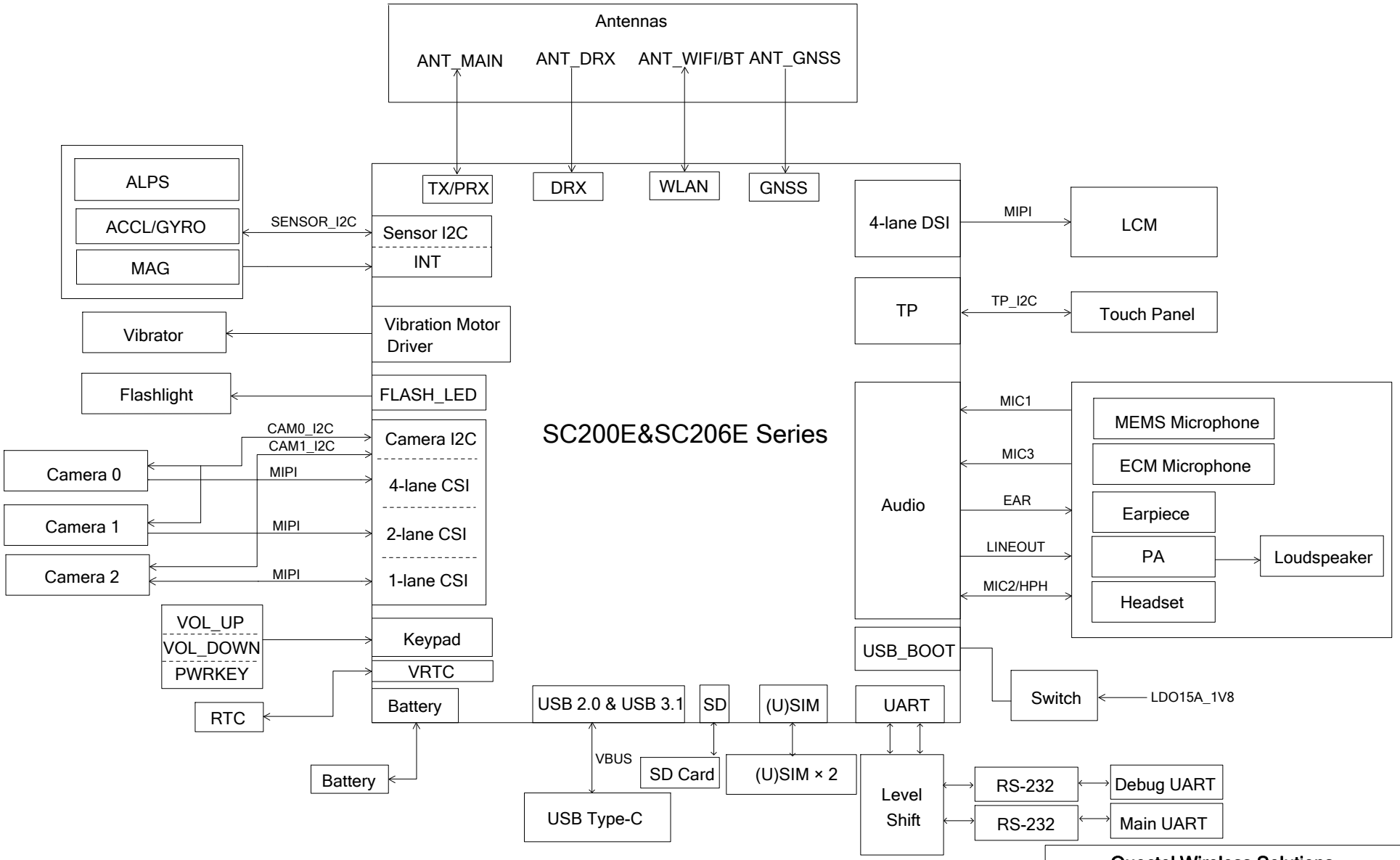
1.1. Introduction

This document provides the reference design for Quectel SC200E and SC206E series modules. It includes block diagrams, power supply, module interfaces, antenna interfaces, sensor interfaces, camera interfaces, LCM and TP interfaces, SD card and (U)SIM interfaces, UART and USB interfaces, audio interfaces and other designs, etc.

1.2. Schematics

The schematics illustrated in the following pages are provided for your reference only.

Block Diagram



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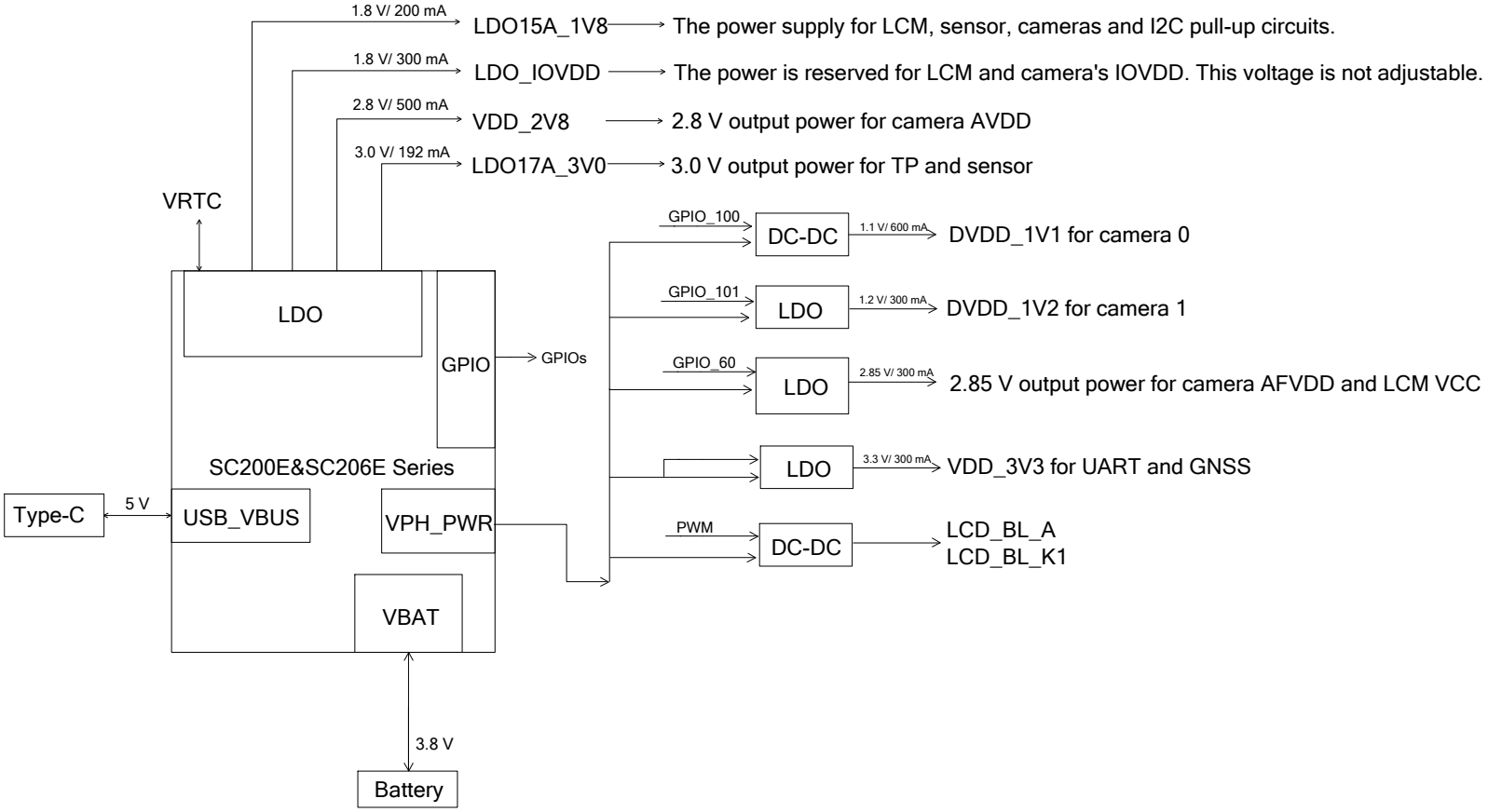
Power System Block Diagram



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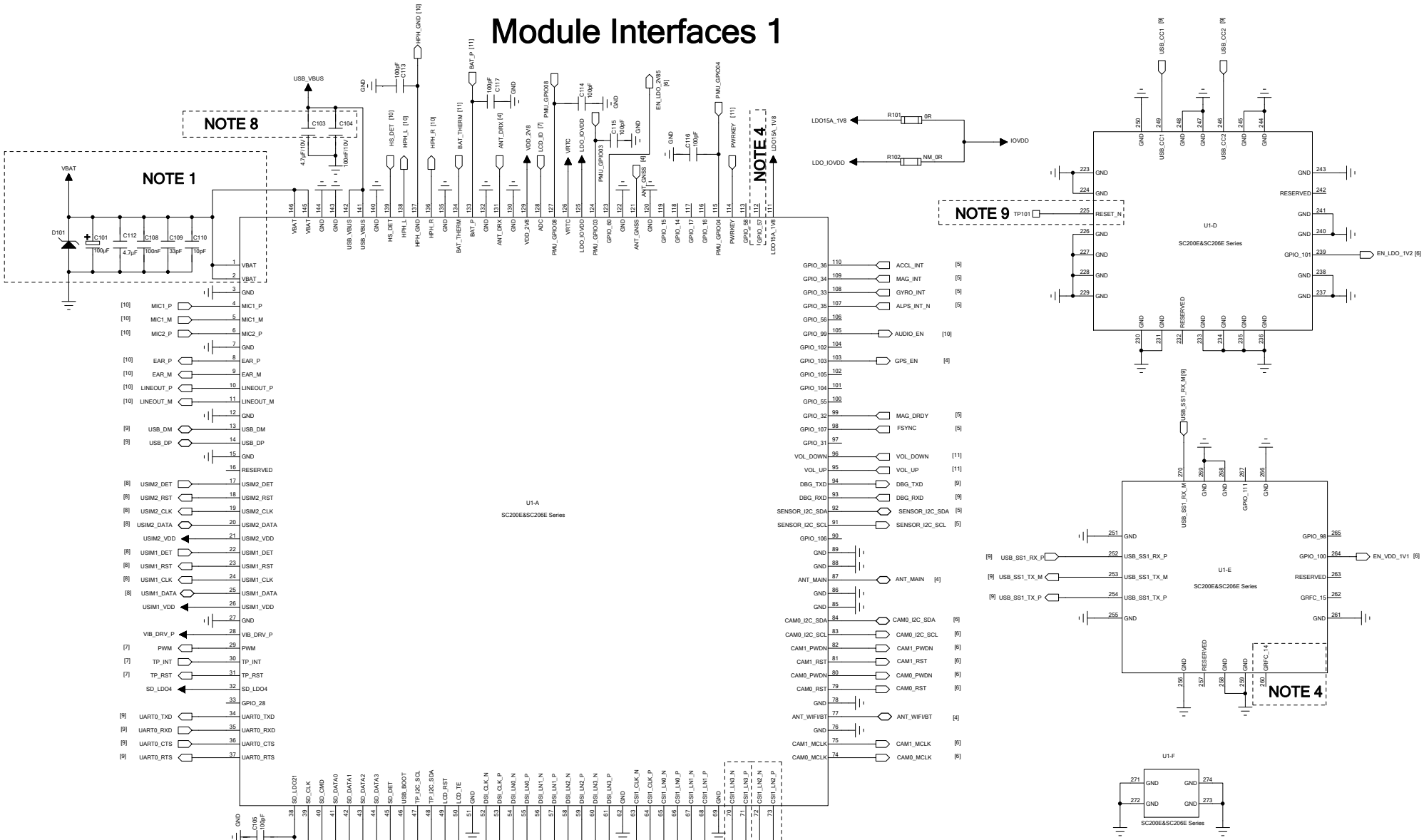
Module Interfaces 1



NOTE:

1. Place the capacitors close to VBAT pins.
2. Keep all RESERVED and unused pins unconnected.
3. Connect all GND pins to ground.
4. GPIO_57 and GRFC_14 cannot be pulled up when the module is turning on.
5. Pin 70 and pin 71 are used as MIPI clock signals of camera 2.
6. Pin 72 and pin 73 are used as MIPI data signals of camera 2.
7. It is recommended to reserve a 100 pF parallel capacitor close to pins 38, 115, 124, 127, 133 and 137 respectively.
8. The recommended parallel capacitors (C103 and C104) for pins 141 and 142 should be placed as close to the pins as possible.
9. A test point is recommended to be reserved if RESET_N is unused.

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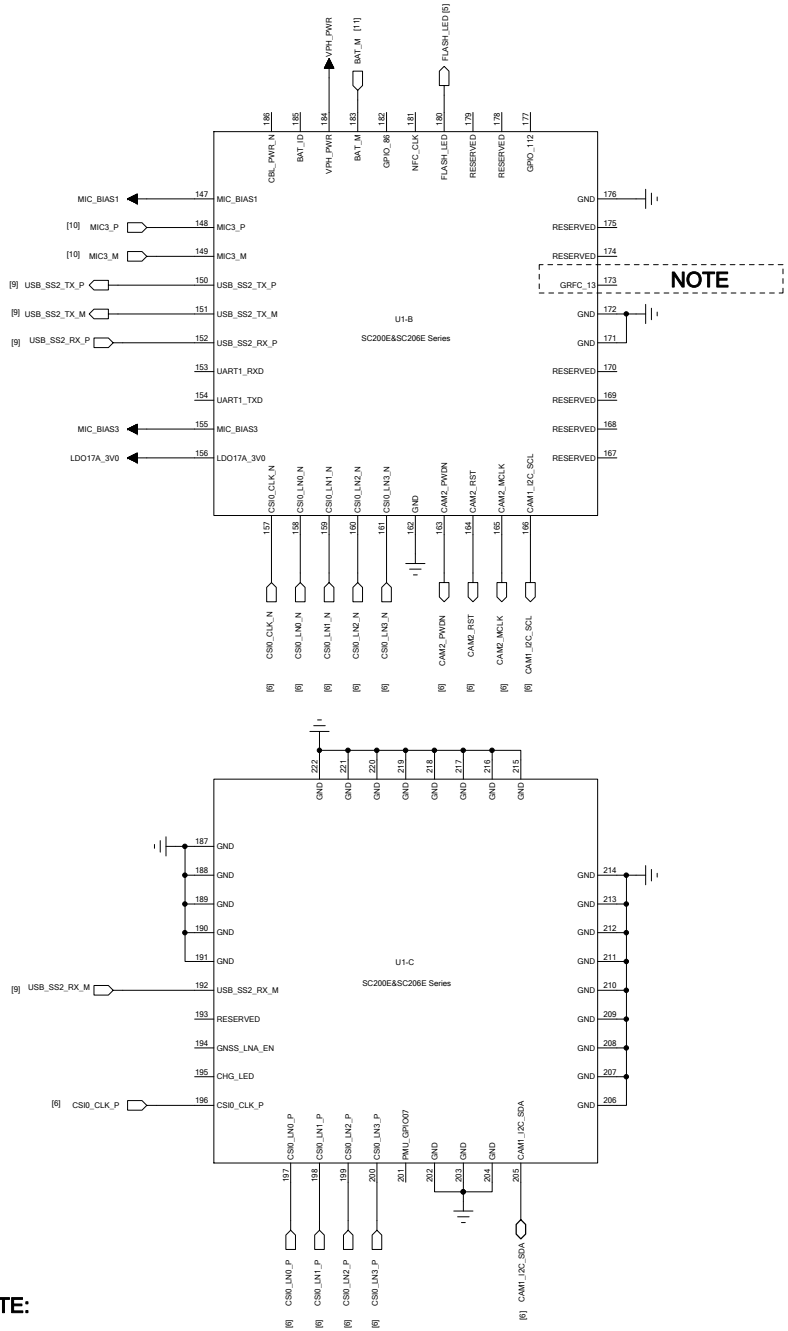
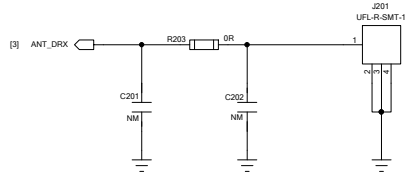
Module Interfaces 2 and Antenna Interfaces



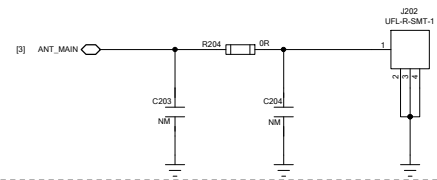
NOTE:

GRFC_13 cannot be pulled up when the module is turning on.

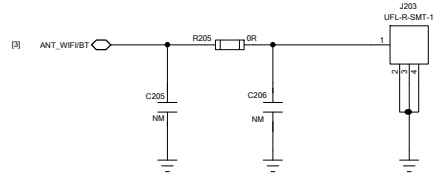
Rx-diversity Antenna



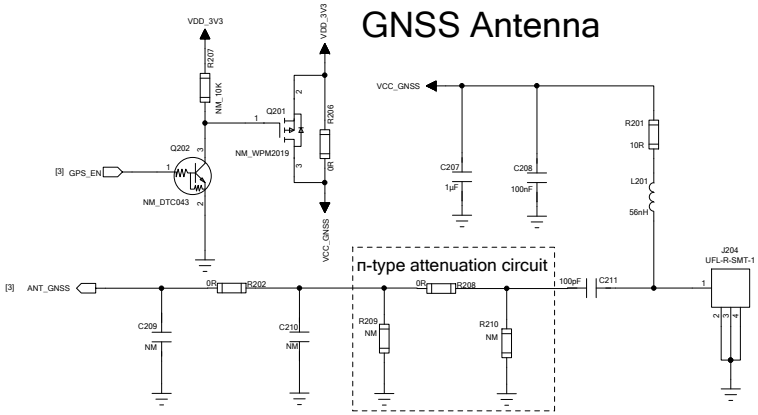
Main Antenna



Wi-Fi/Bluetooth Antenna



GNSS Antenna



NOTE:

1. In any case, it is recommended to use a passive GNSS antenna. If you use a passive antenna, the π-type attenuation circuit and R201 should be removed, but if you use an active antenna, it is strongly recommended to reserve the π-type attenuation circuit.

2. For the models that support GNSS L1 + L5, the frequency range supported by the antenna should be considered.

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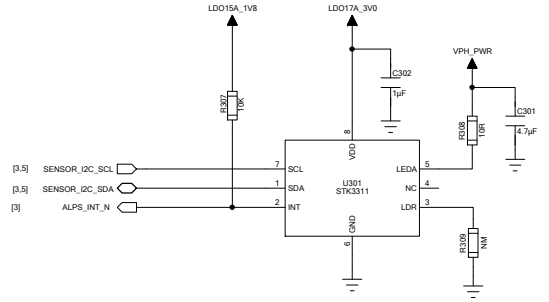
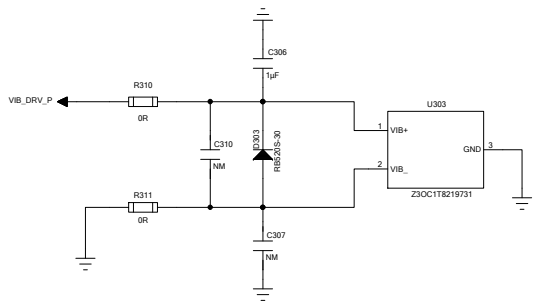
Sensor Interfaces, Flashlight and Vibrator

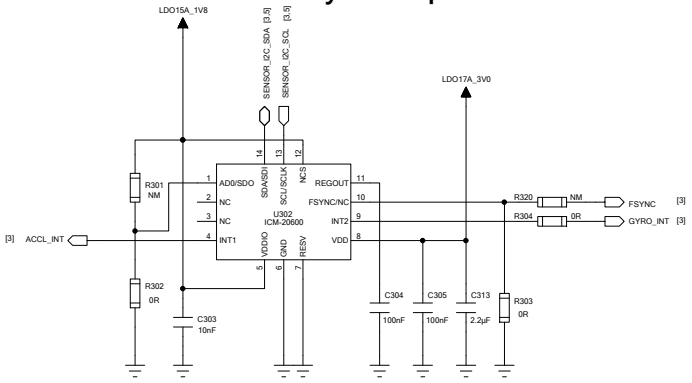
Ambient Light/Proximity Sensor



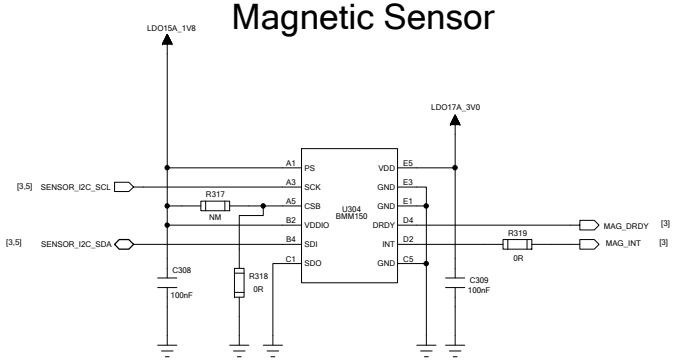
Vibrator



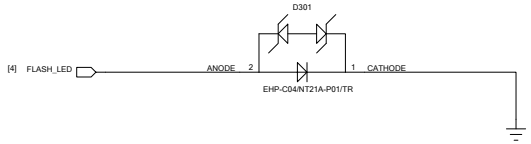
Acceleration/Gyroscopic Sensor



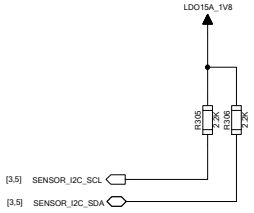
Magnetic Sensor



Flashlight



Sensor I2C



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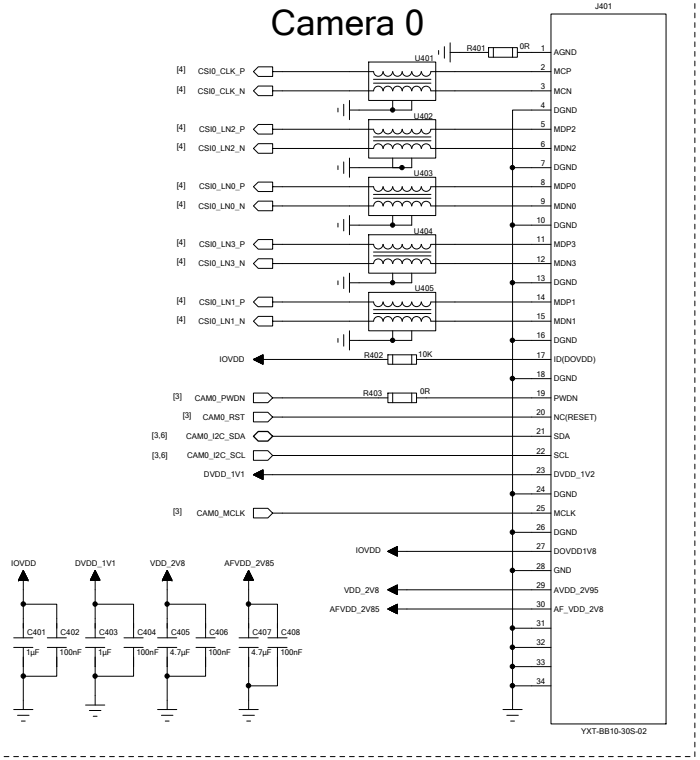
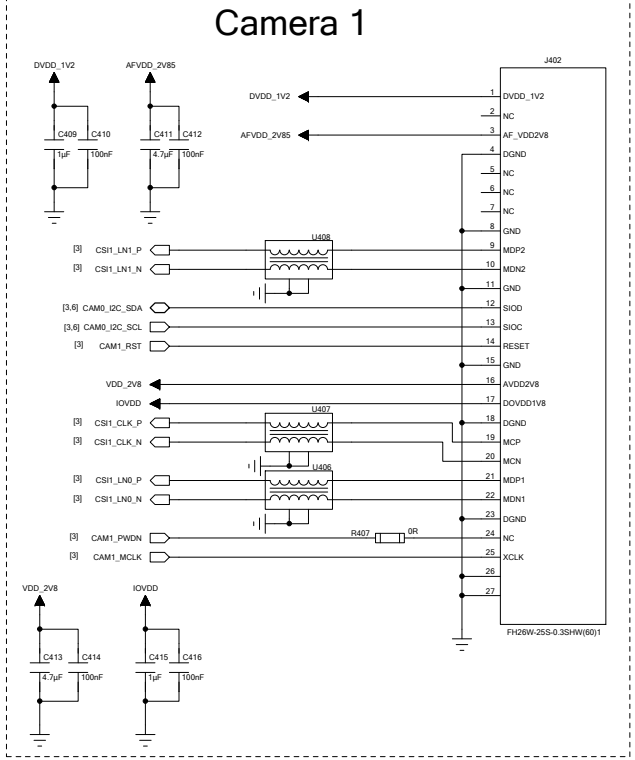
Camera Interfaces

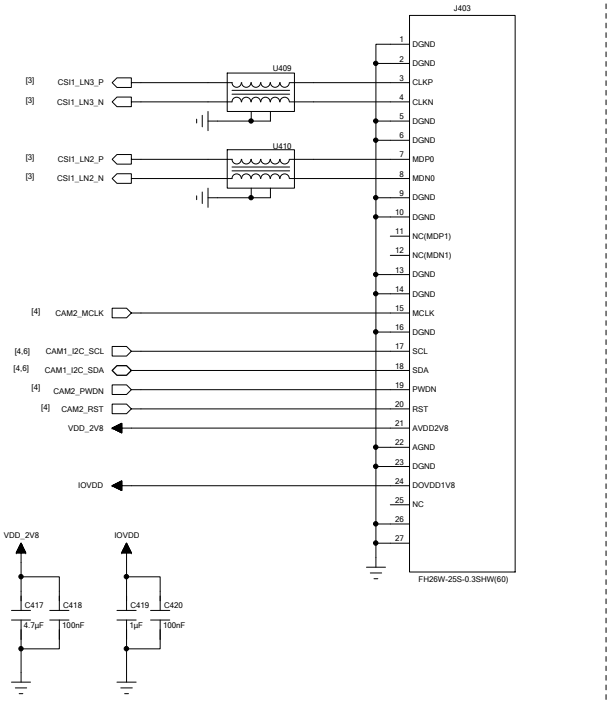
Camera 0

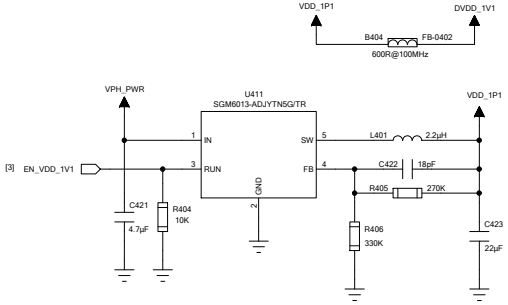


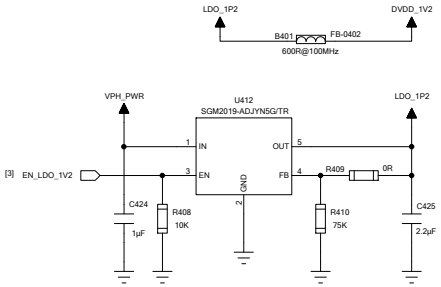
Camera 1

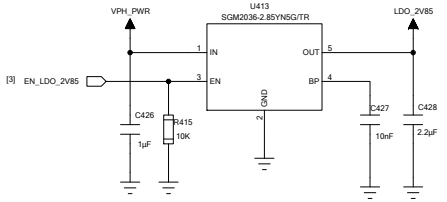


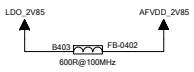
Camera 2

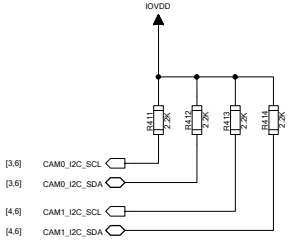












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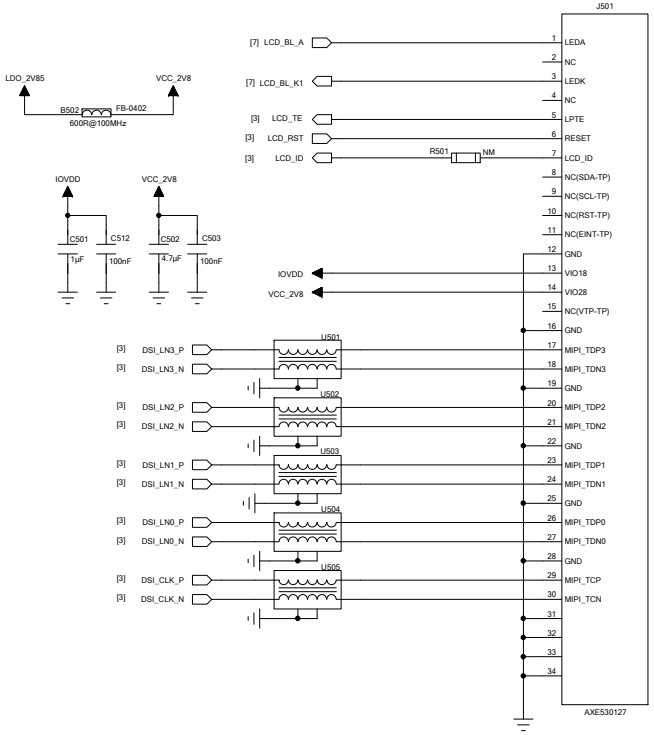
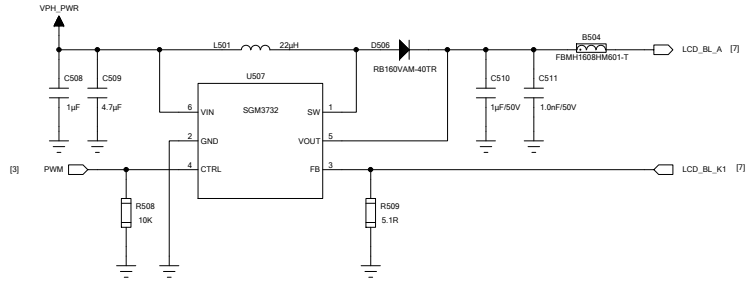
LCM and TP Interfaces

LCM



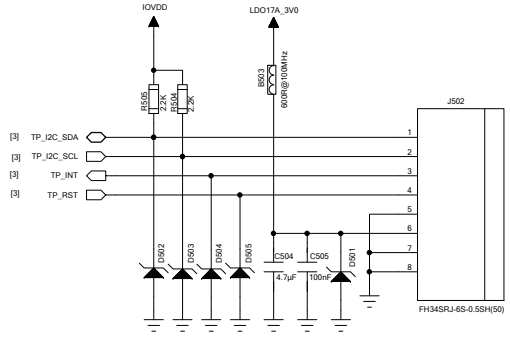
LCM Backlight Control



NOTE:

The resistance value of feedback resistor R509 should be determined according to the backlight IC datasheet.

Touch Panel



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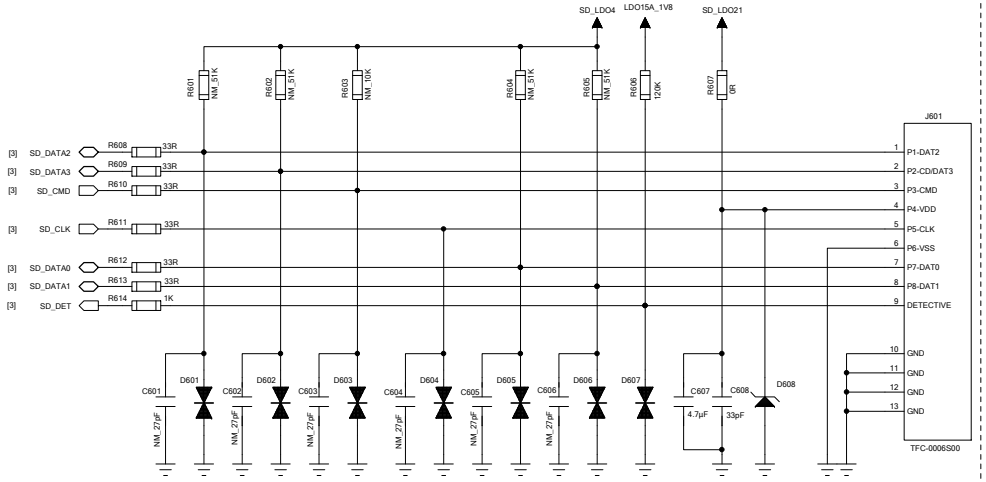
SD Card and (U)SIM Interfaces

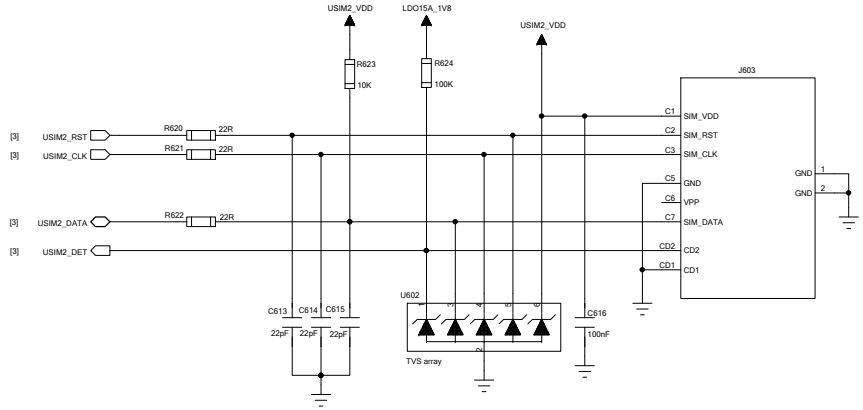
SD Card



NOTE:

R608-R613 are used to suppress EMI and improve ESD protection.

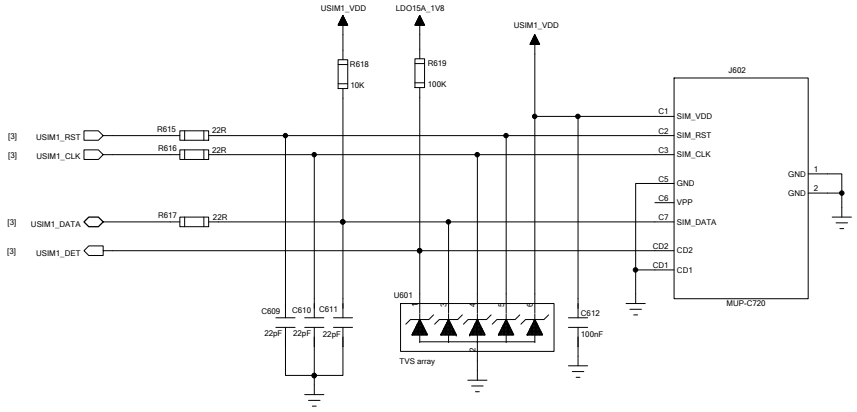
(U)SIM2



NOTE:

R620-R622 are used to suppress EMI and improve ESD protection.

(U)SIM1



NOTE:

R615-R617 are used to suppress EMI and improve ESD protection.

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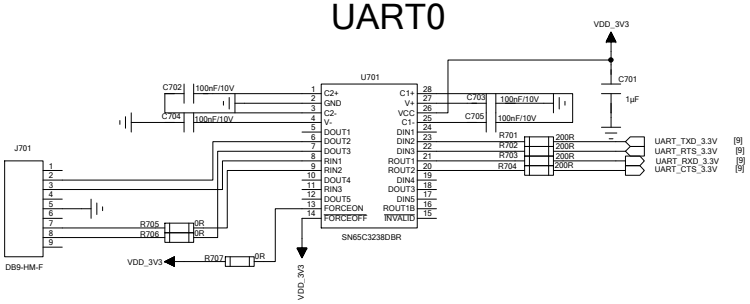
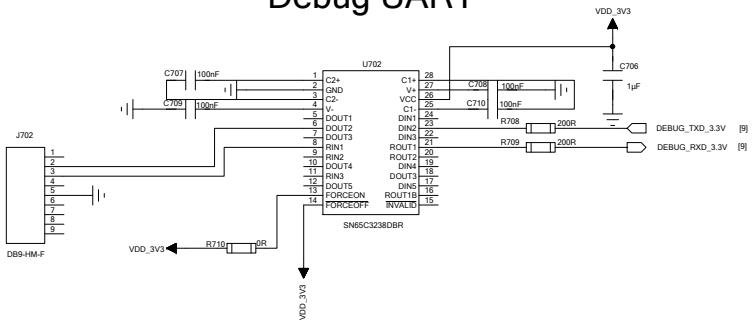
UART and USB Interfaces

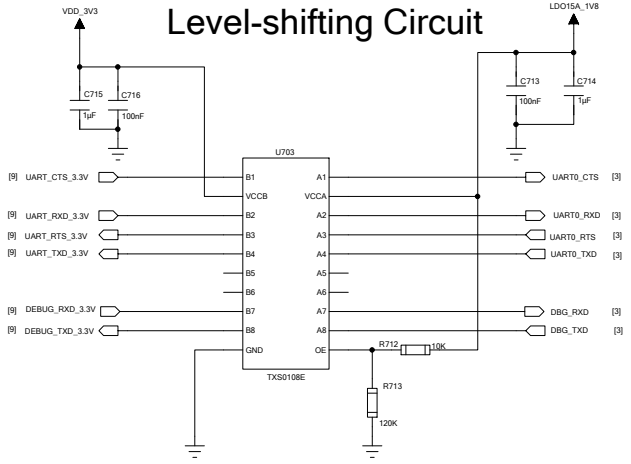
UART0



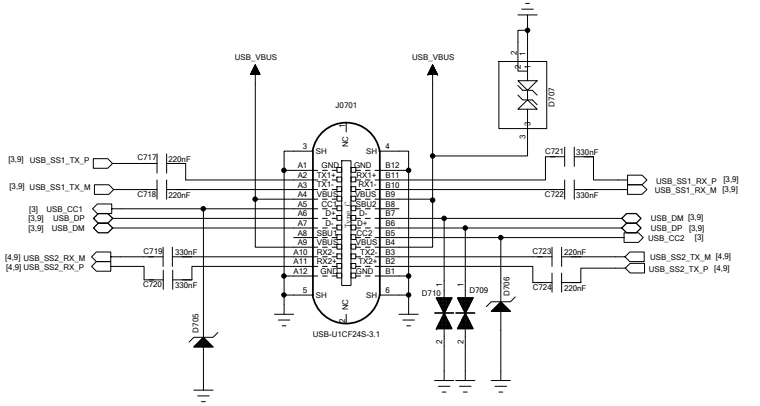
Debug UART

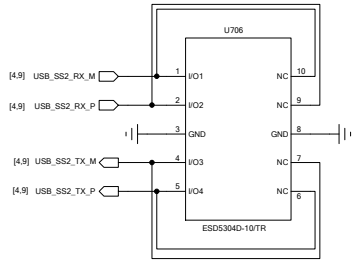


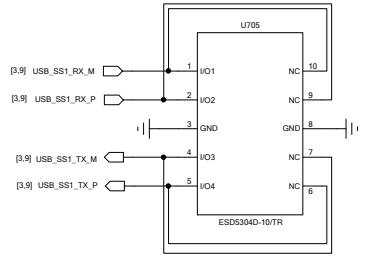
Level-shifting Circuit



USB Type-C







NOTE:

1. It is recommended to add a TVS array close to the USB connector.
2. The junction capacitance value of TVS on USB_DP/DM should be less than 2 pF.
3. The junction capacitance value of TVS on USB_SS_TX/RX should be less than 0.5 pF.
4. The spacing between USB signals and all other signals should be at least 4 times the trace width while that between RX and TX should be at least 3 times the trace width.
5. For USB 3.1, it is suggested to do simulation after the design is completed. If the cable is too long or there are too many vias, a redriver can be added to ensure the quality of signal transmission if necessary.

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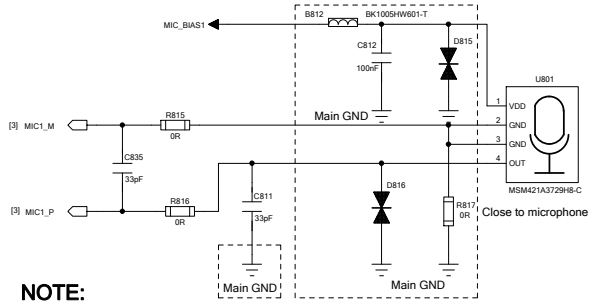
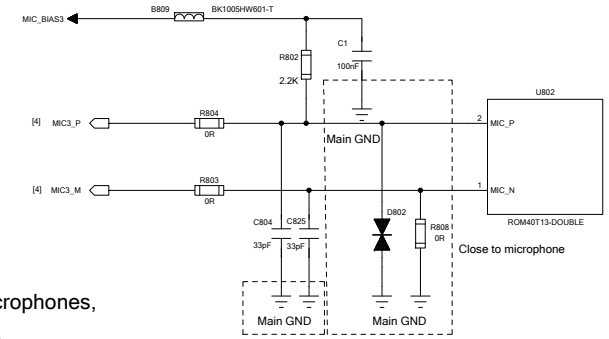
Audio Interfaces

MEMS Microphone



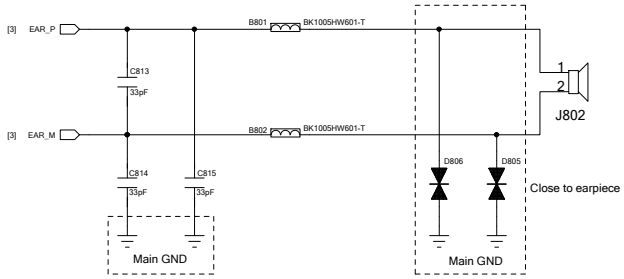
ECM Microphone



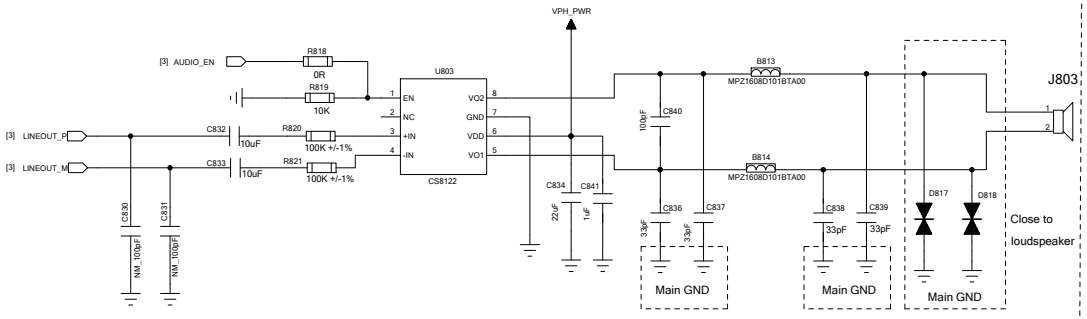
NOTE:

1. SC200E and SC206E series modules support ECM and MEMS microphones, and the latter one is recommended for better interference immunity.
2. MIC_BIAS3 is 1.8 V and is not adjustable.

Earpiece



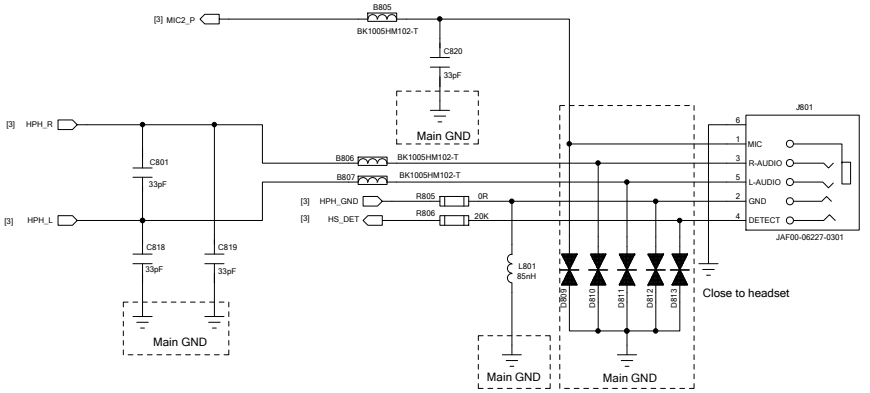
Loudspeaker



NOTE:

1. Output power supply of audio amplifier: VDD = 3.6 V, THD = 1 %, RL = 8 Ω, Po = 0.65 W.
2. PA gain = (2 × 150 kΩ) / R820.
3. LINEOUT_P and LINEOUT_M are routed as a differential pair.

Headset



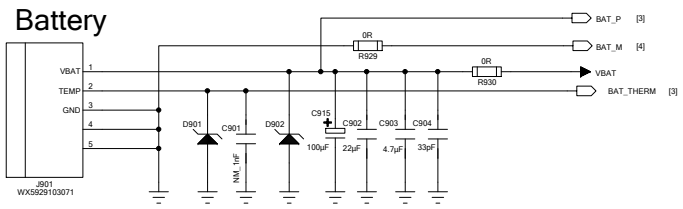
NOTE:

1. The clamping voltage of the TVS components for earpiece and loudspeaker shall be from 10 V to 12.5 V.
2. The clamping voltage of the TVS components for headset and microphone shall be from 5 V to 6 V.
3. Headset interface has negative swing and therefore requires bidirectional TVS.

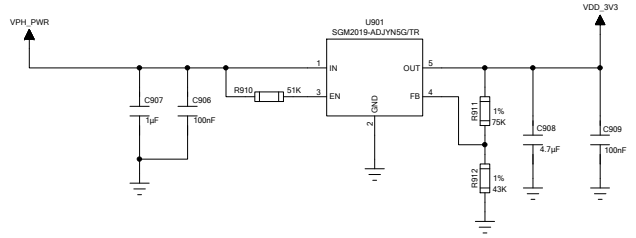
Quectel Wireless Solutions		
DRAWN BY Dorian MENG/Downey YANG	PROJECT SC200E&SC206E Series	TITLE Reference Design
CHECKED BY Tony GAO	SIZE A2	VER 1.2
	SHEET 10 / 11	DATE 2023/6/26

Power Supply

Battery Application

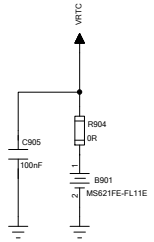


3.3 V Power Supply

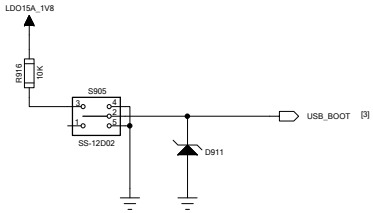


Vout = [(R911 + R912) / R912] × 1.207 ≈ 3.3 V

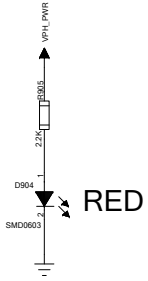
RTC Backup Battery



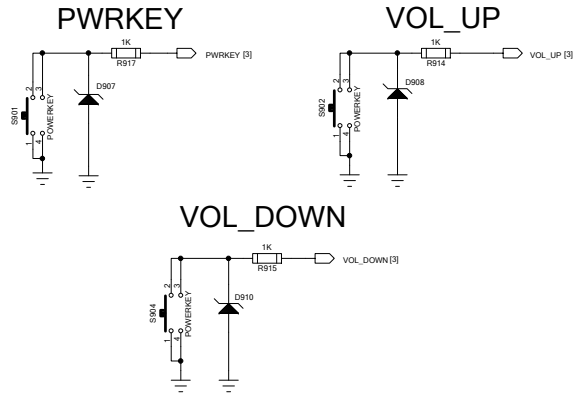
USB_BOOT



Indication Light



Keypad



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