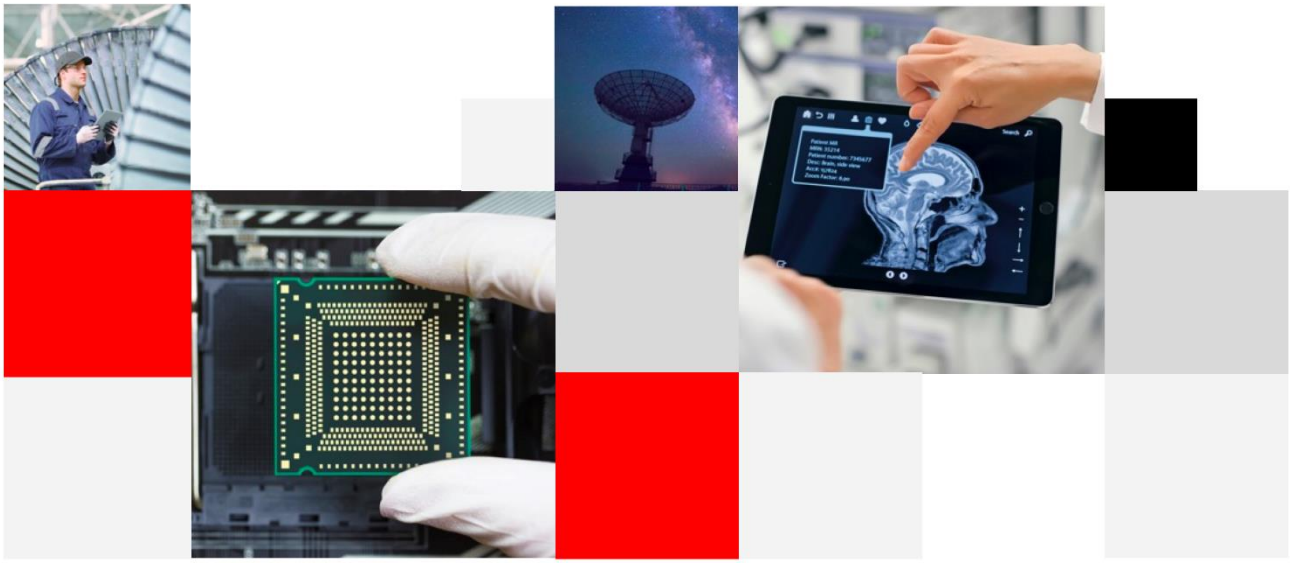
SA800U-WF
Reference Design

Smart Module Series

Version: 1.0

Date: 2021-03-31

Status: Released



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

The information contained here is proprietary technical information of Quectel wireless solutions co., ltd. Transmitting, reproducing, disseminating and editing this document as well as using the content without permission are forbidden. Offenders will be held liable for payment of damages. All rights are reserved in the event of a patent grant or registration of a utility model or design.

Copyright © Quectel Wireless Solutions Co., Ltd. 2021. All rights reserved.

About the Document

Revision History

Version	Date	Author	Description
-	2021-03-26	Light WANG	Creation of the document
1.0	2021-03-31	Light WANG	First official release

Contents

About the Document **3**
Contents **4**

1 Reference Design **5**
1.1. Introduction 5
1.2. Schematics 5

1 Reference Design

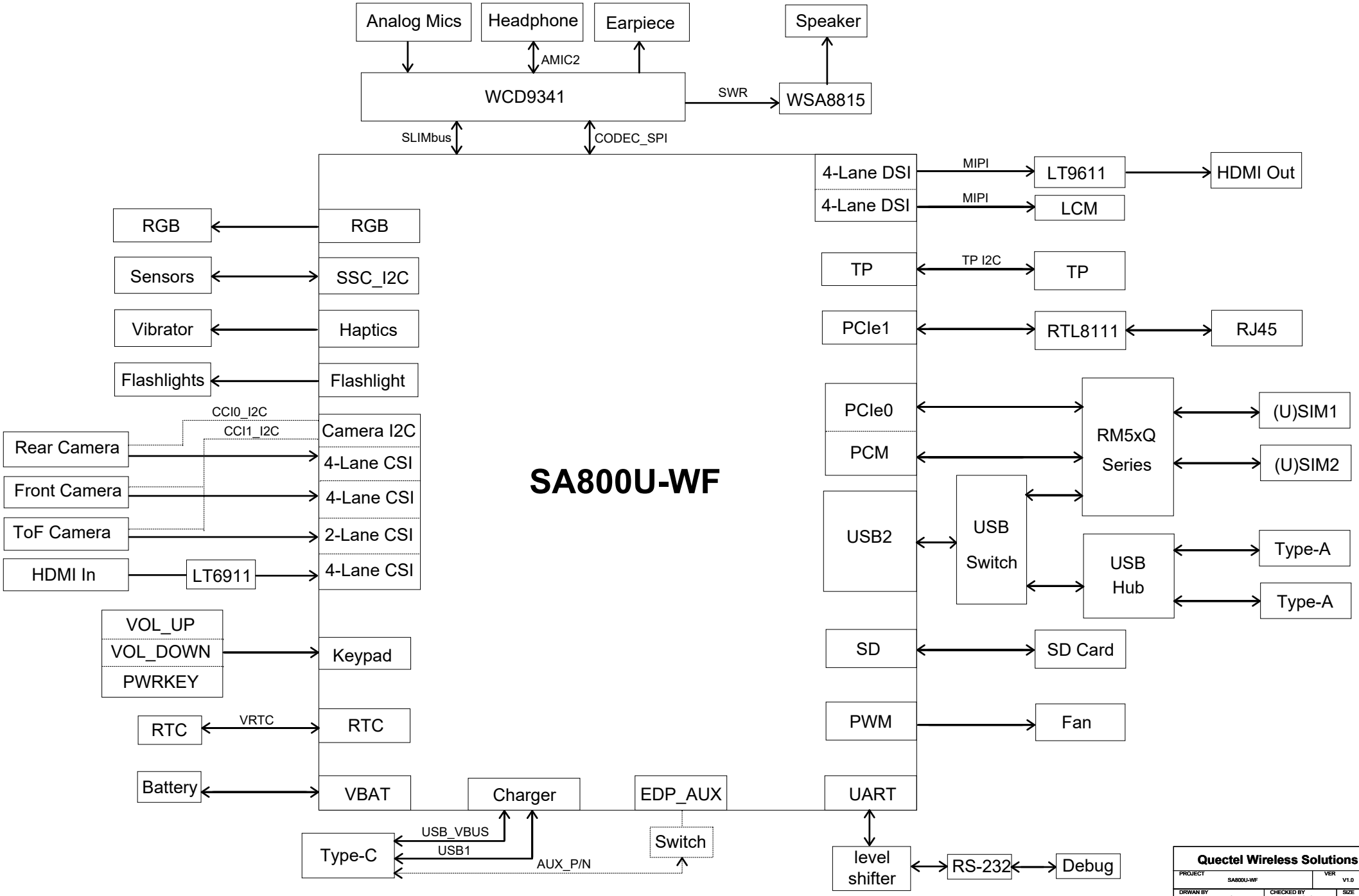
1.1. Introduction

This document provides a reference design for Quectel SA800U-WF module, including the design of power supply, audio, camera, HDMI In, HDMI Out, LCM, TP, Ethernet, USB, sensor interfaces, etc., as well as the interface design for the use of SA800U-WF in conjunction with Quectel 5G module - RM50xQ series.

1.2. Schematics

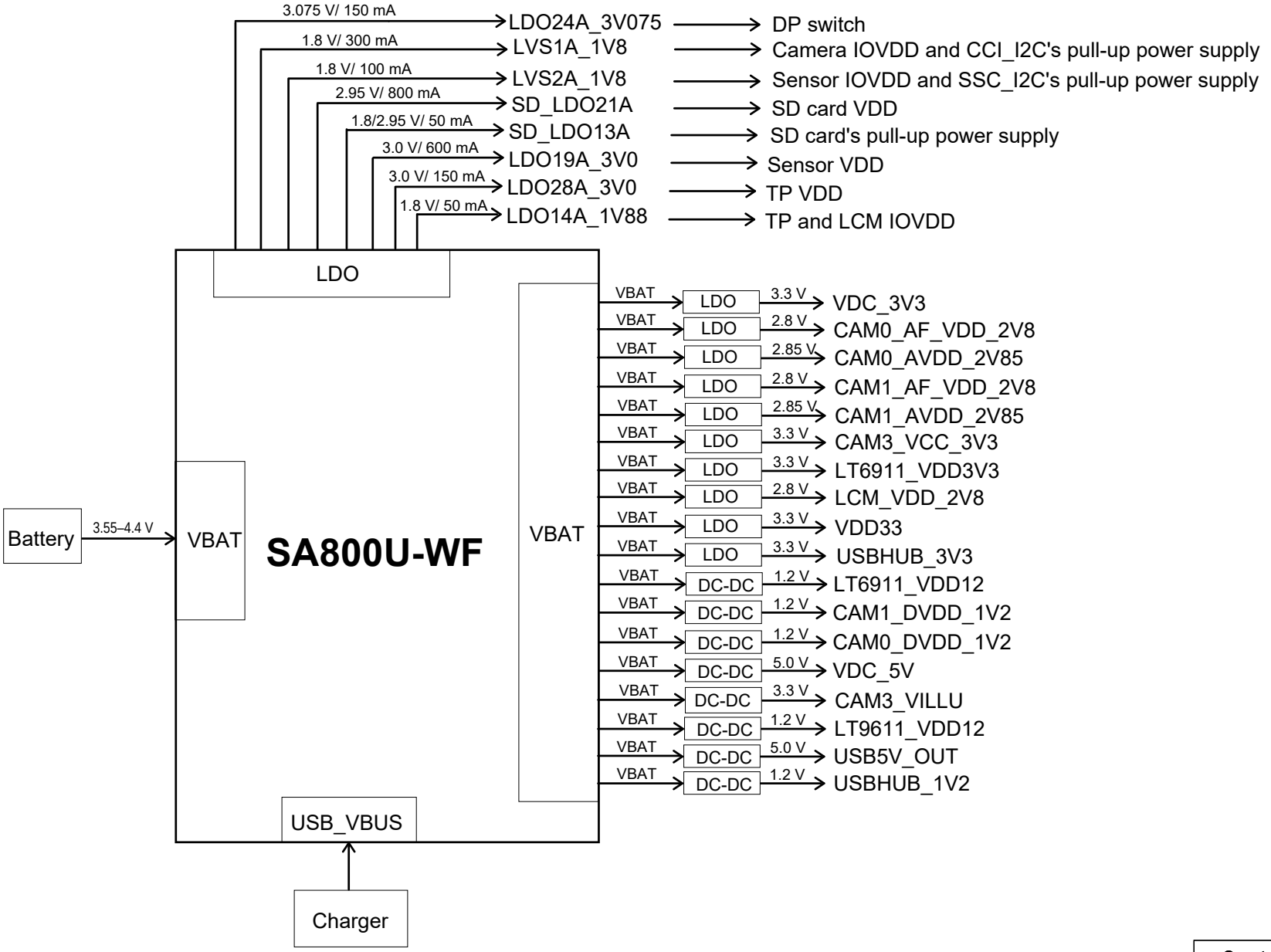
The schematics illustrated in the following pages are provided for reference only.

System Diagram



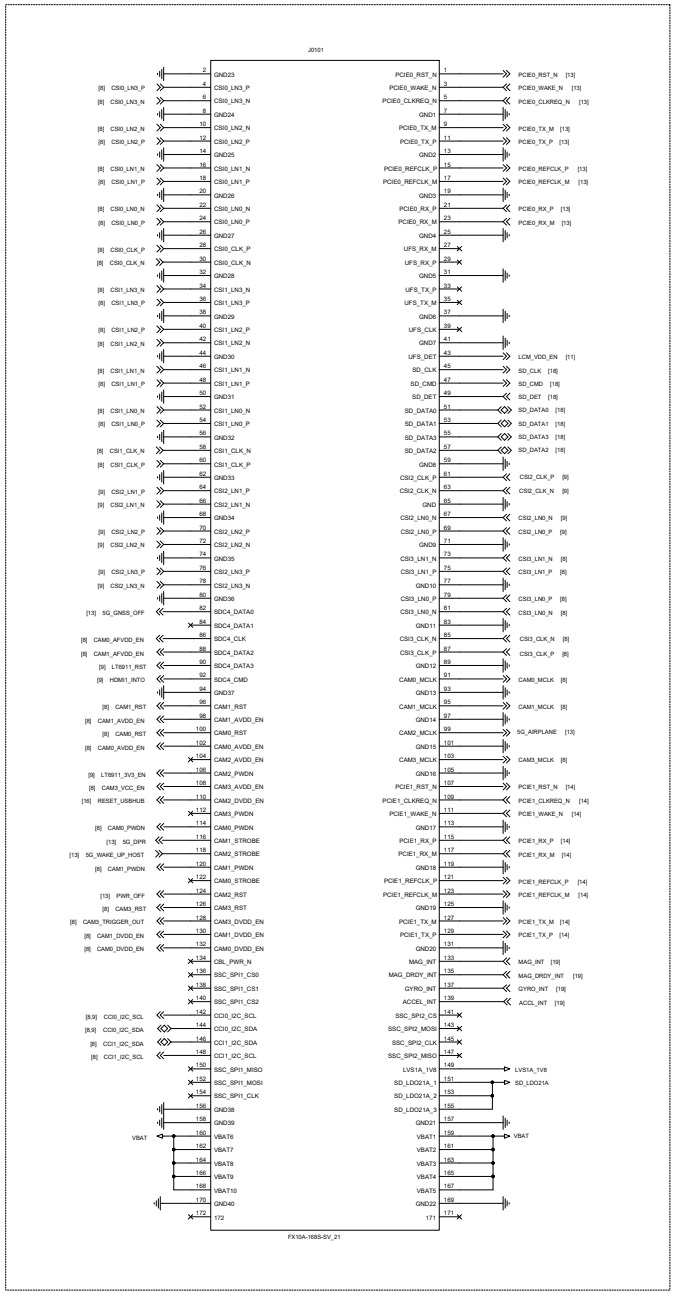
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 1 OF 19	

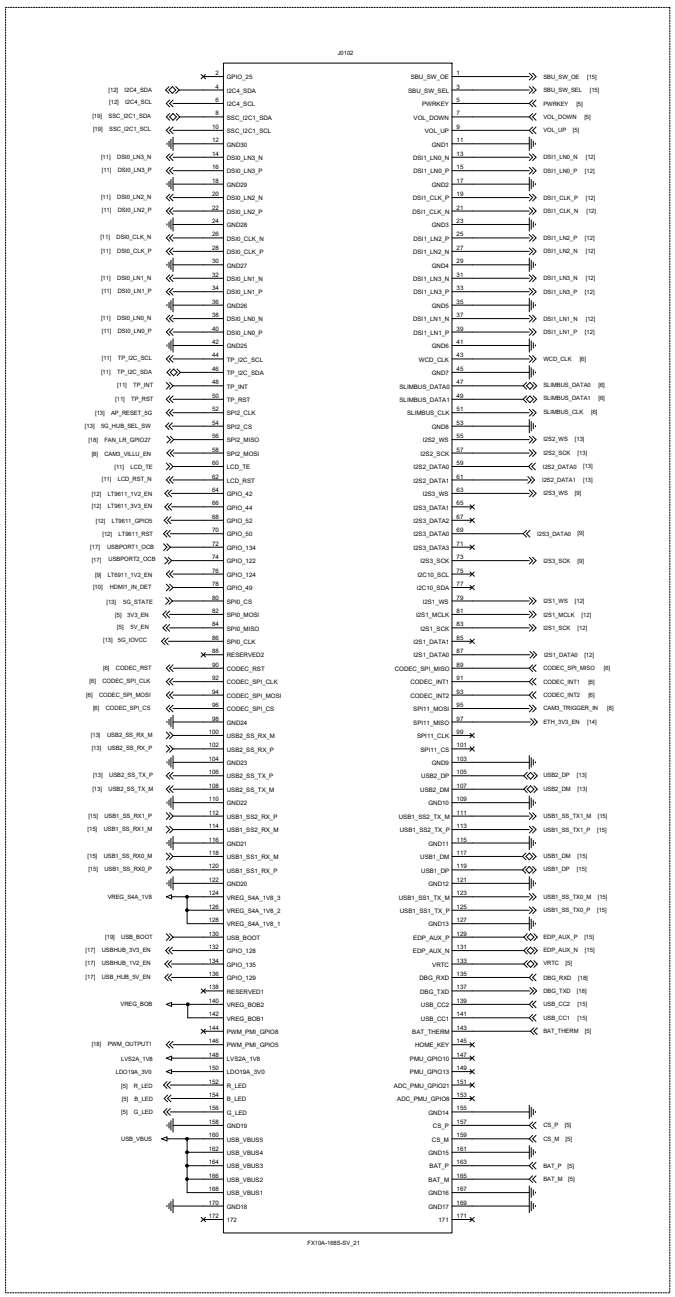
Power Diagram



Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 2 OF 19	

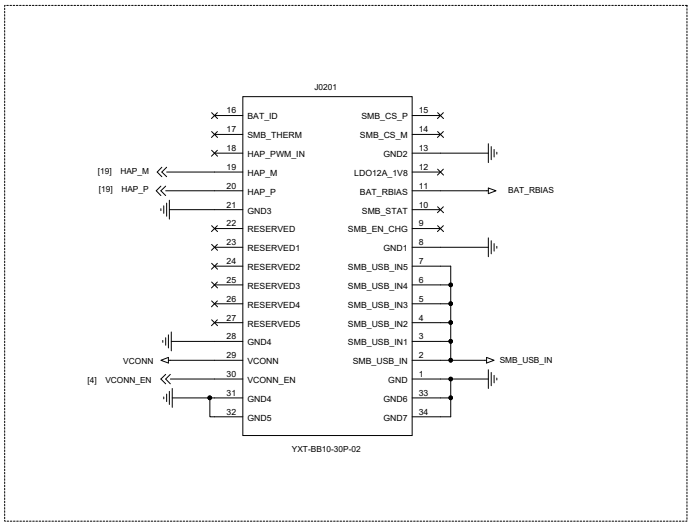
Module Interfaces

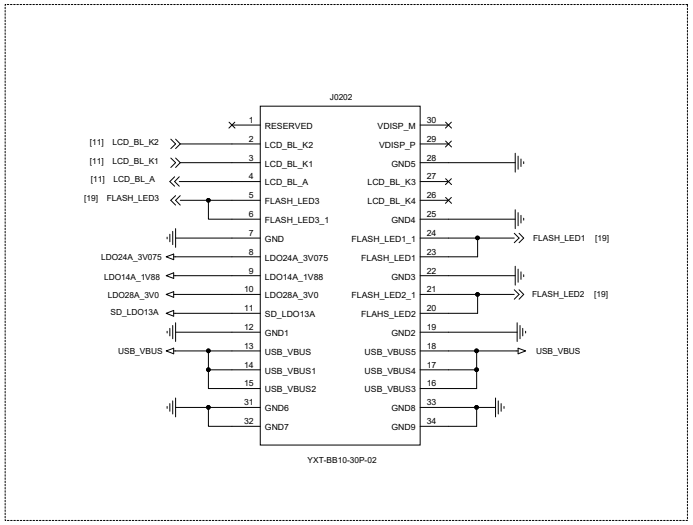




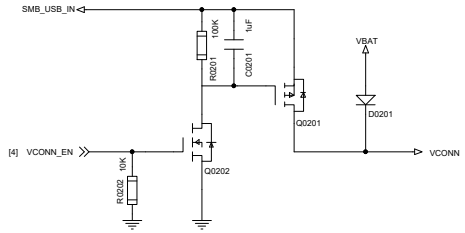
Quectel Wireless Solutions			
PROJECT: SA800U-WF			VER: V1.0
DRWAN BY: Light WANG		CHECKED BY: Tony GAO	SIZE: A1
DATE: Wednesday, March 31, 2021		SHEET: 3 OF 19	

FPC Connectors





VCONN Circuit



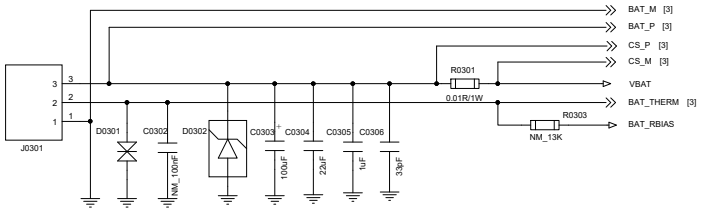
Note:

If functional pins in FPC connectors are not used, keep them unconnected.

Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 4 OF 19	

Power Supply

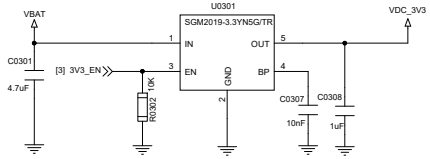
Battery Application



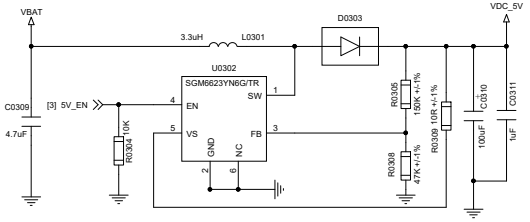
Notes:

1. If battery NTC = 47 kΩ, R0303 = NM.
2. If battery NTC = 10 kΩ, R0303 = 13 kΩ.

3.3 V Power Supply

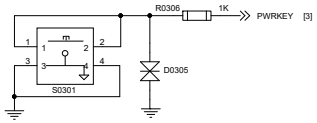


5.0 V Power Supply

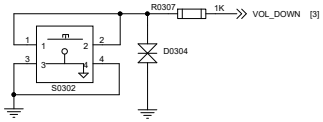


Keypad

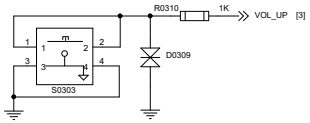
PWRKEY



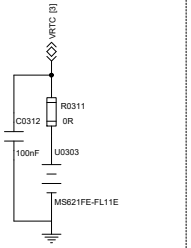
VOL_DOWN



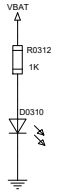
VOL_UP



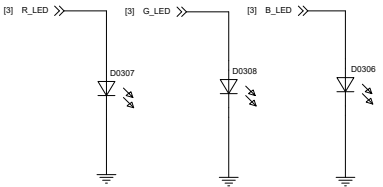
Backup Battery



Indicator

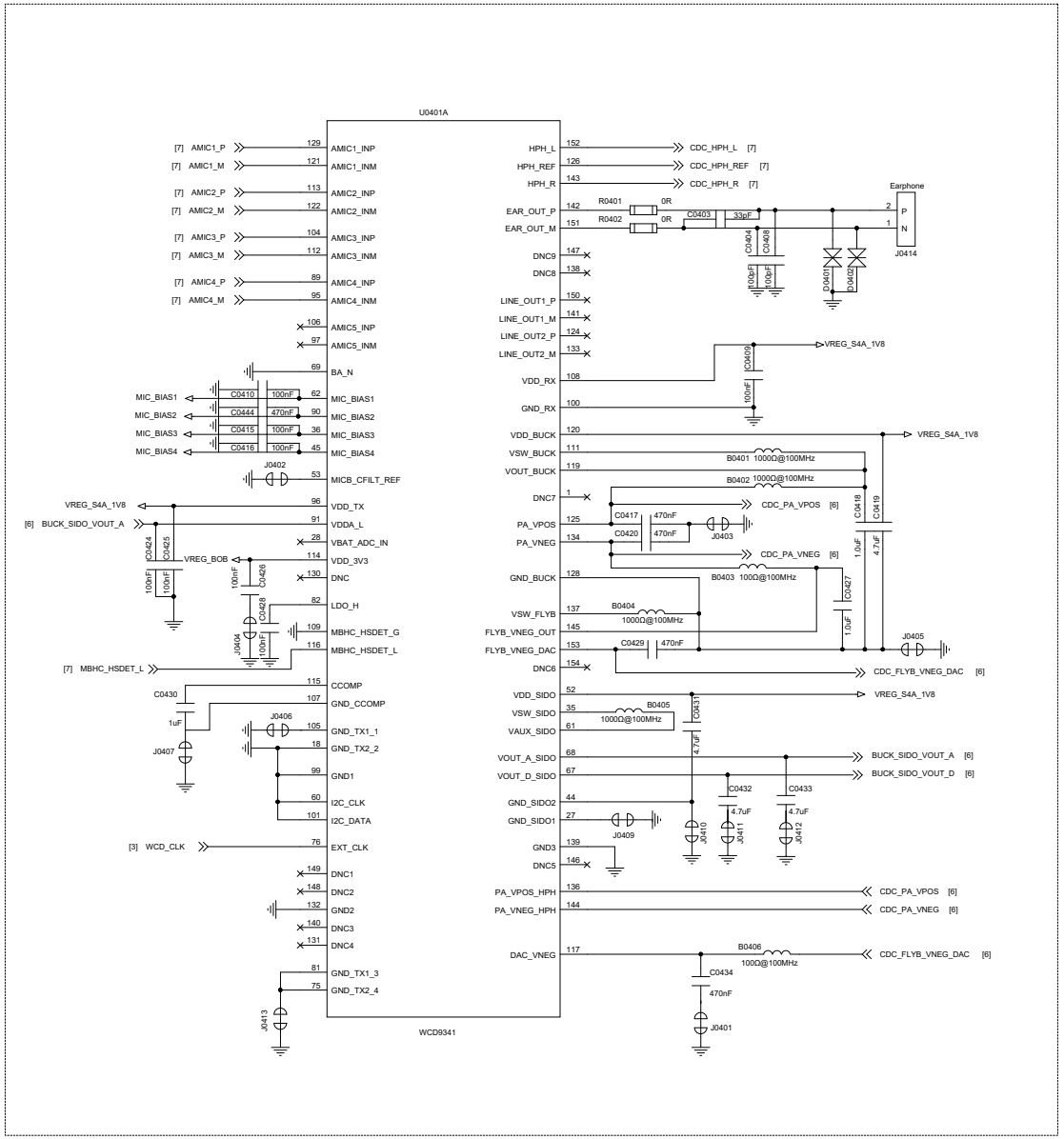


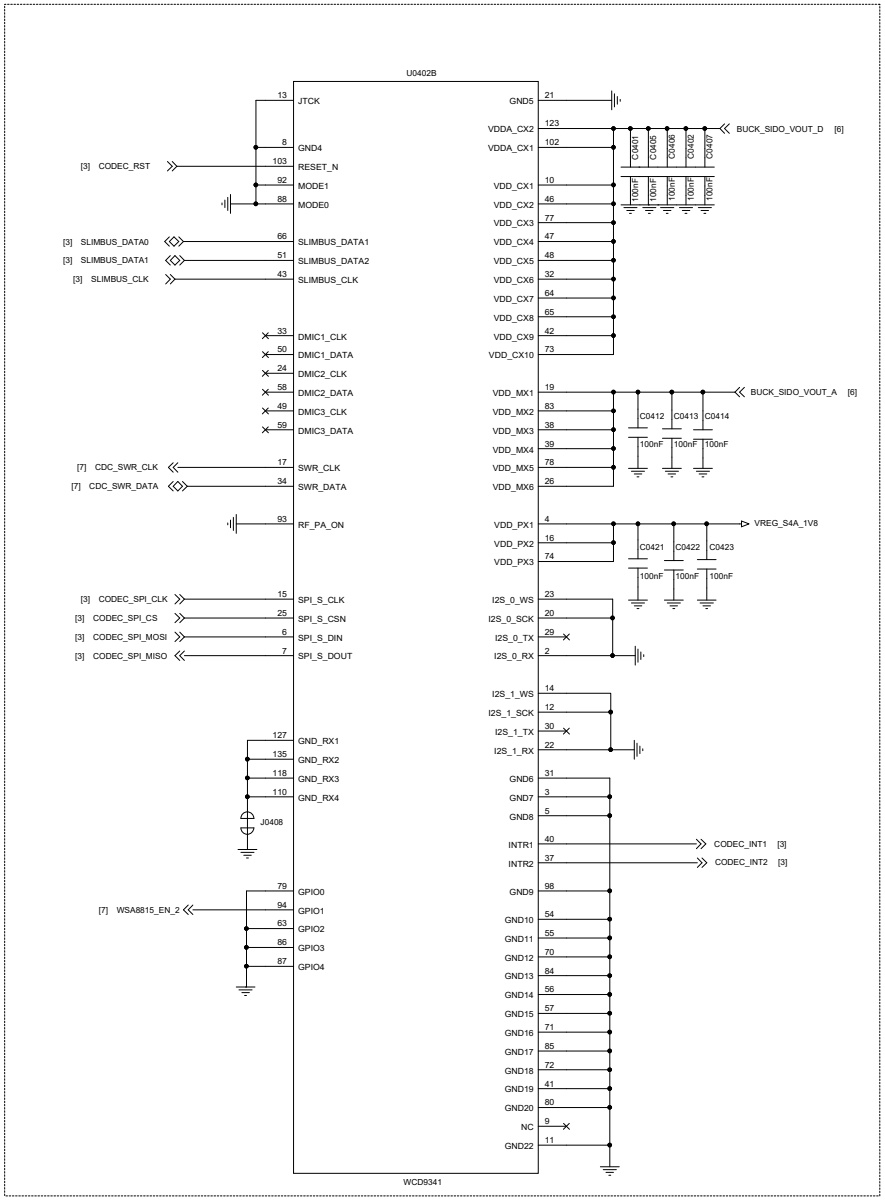
RGB LED



Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 5 OF 19	

Codec Interfaces





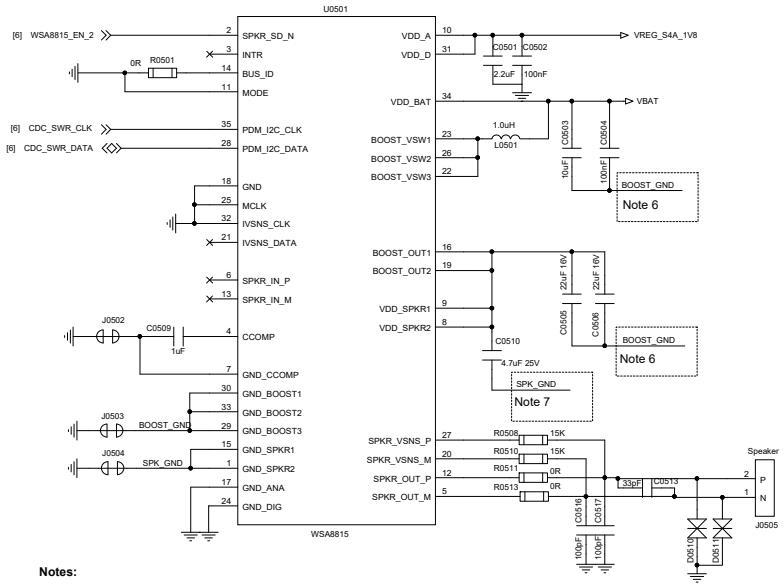
Note:

J0401~J0413 should be connected directly to the main GND plane.

Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 6 OF 19	

Audio Interfaces

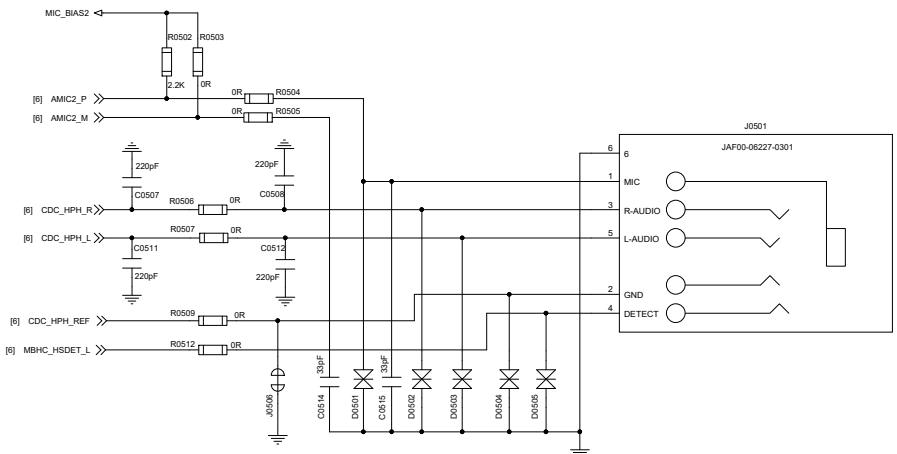
Audio PA



Notes:

1. Pin BUS_ID should be pulled high for one WSA8815 and low for another WSA8815.
2. Pin MODE should be pulled to GND for SoundWire mode and pulled to 1.8 V for analog mode.
3. Leave pin INTR unconnected for PDM mode.
4. J0502–J0504 should be connected directly to the main GND plane.
5. Pin SPKR_VSNS_P and pin SPKR_VSNS_M should be placed close to the speaker transducer for optimum feedback and speaker protection.
6. C0503–C0506 should be connected to pin 29, 30, 33 of WSA8815, and then directly to the main GND plane.
7. C0510 should be connected to pin 1 and 15 of WSA8815, and then directly to the main GND plane.

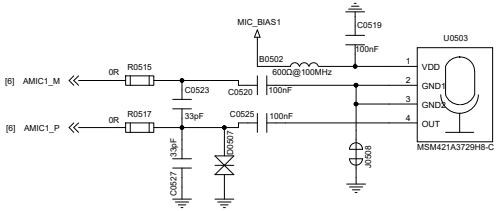
Headphone

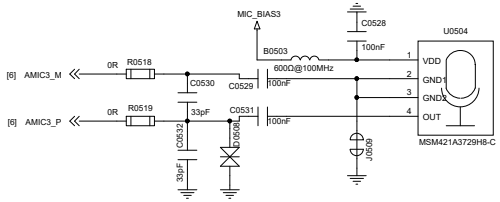


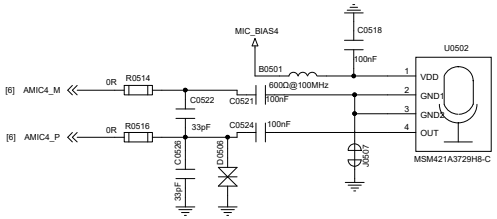
Note:

J0506 should be connected directly to the main GND plane.

Microphones







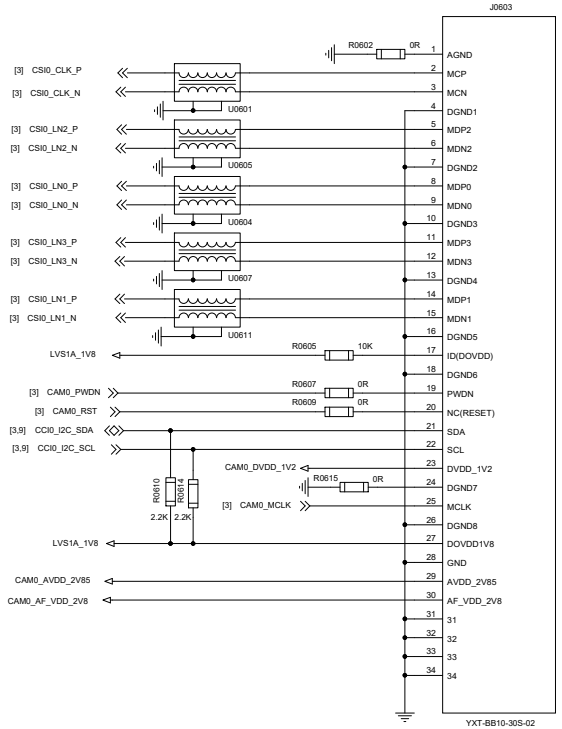
Note:

J0507–J0509 should be connected directly to the main GND plane.

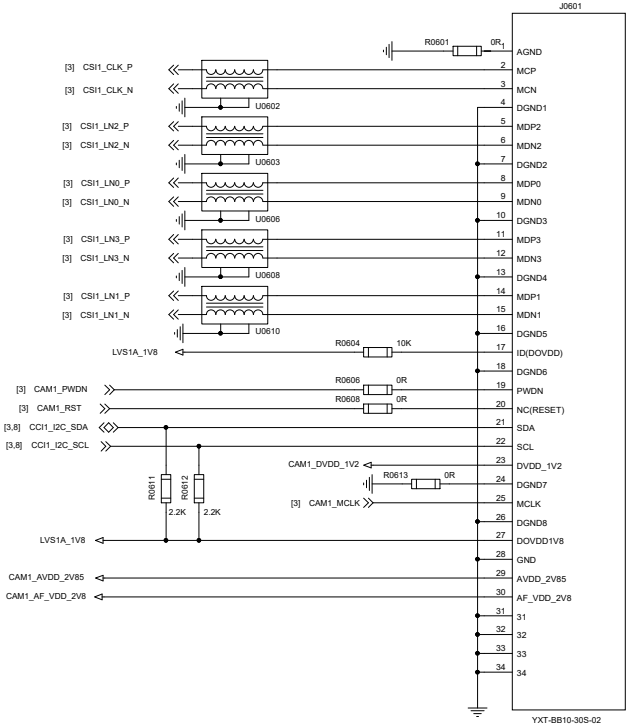
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 7 OF 19	

Camera Interfaces

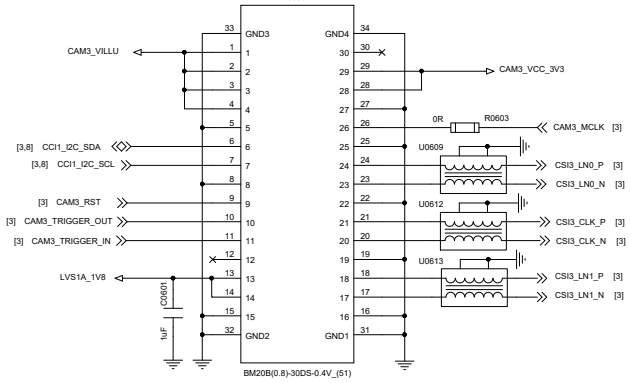
Rear Camera



Front Camera



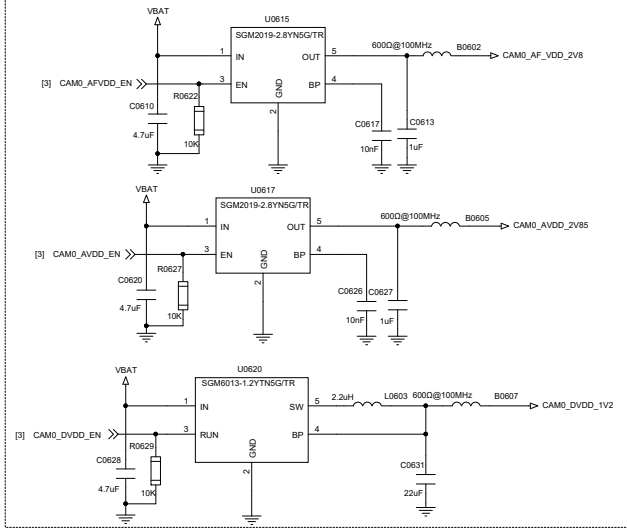
ToF Camera



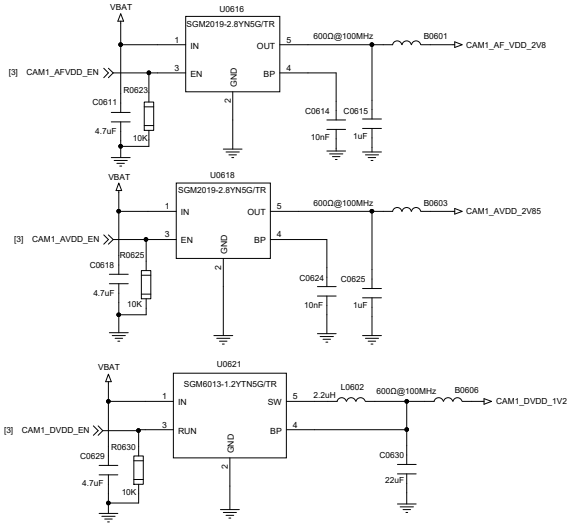
Note:

CSI3 only gets data of RAW format and can not be used for display.

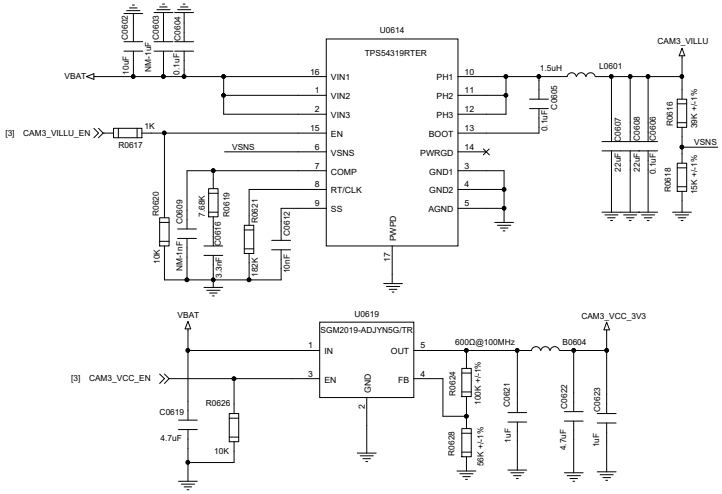
Rear Camera Power



Front Camera Power



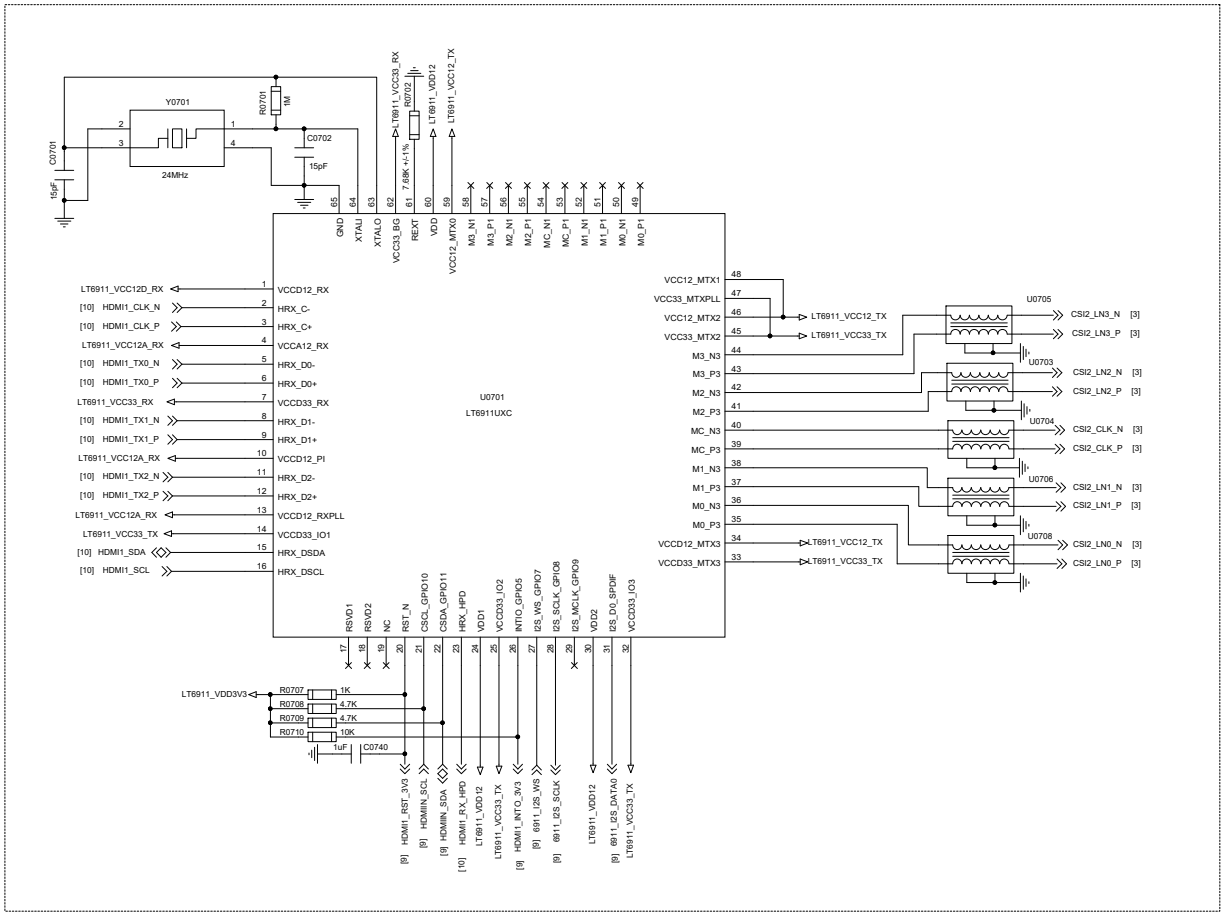
ToF Camera Power



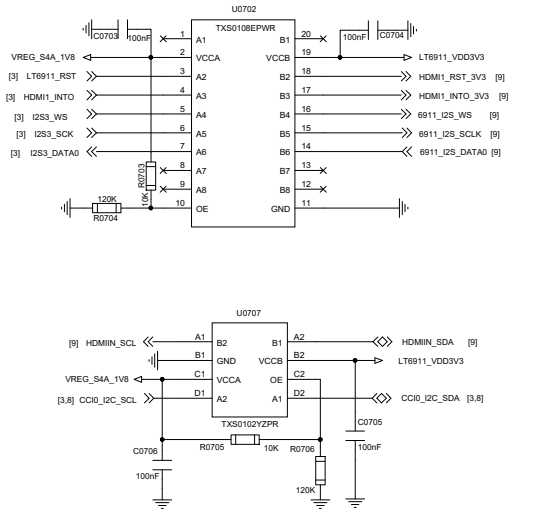
Quectel Wireless Solutions

PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 8 OF 19	

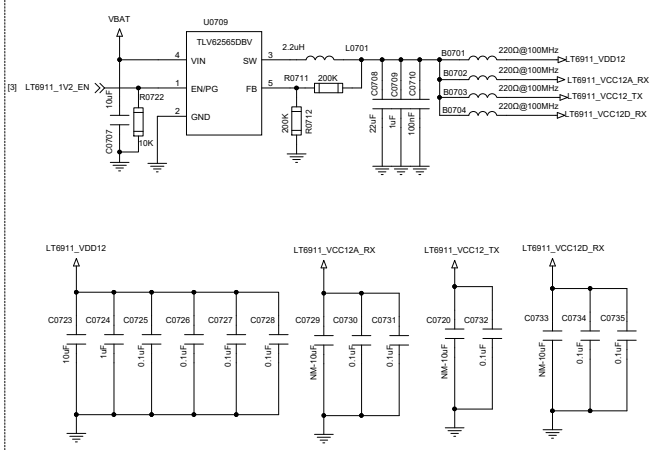
HDMI In Interface (Part 1)



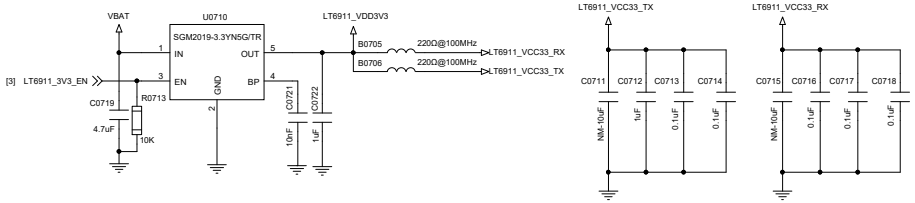
Level Shift Circuit



1.2 V Power Supply



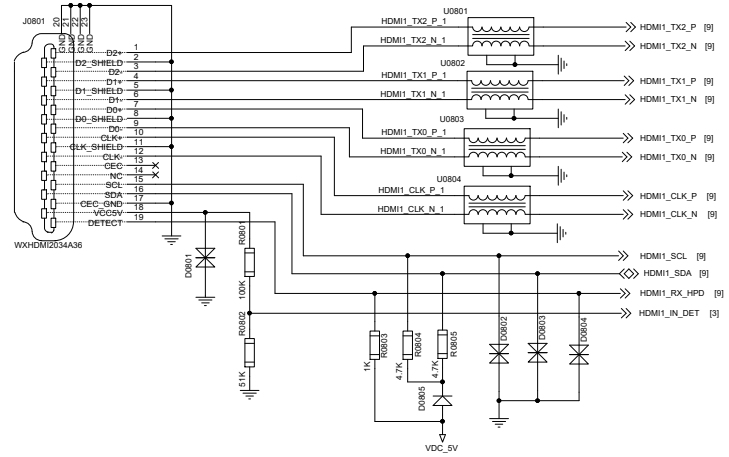
3.3 V Power Supply

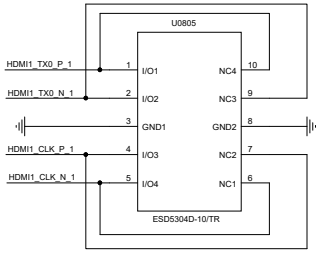


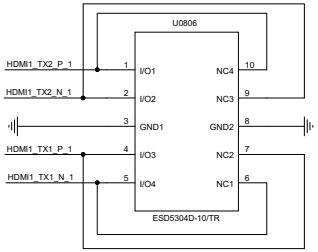
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Wednesday, March 31, 2021	SHEET: 9 OF 19	

HDMI In Interface (Part 2)

HDMI In Connector







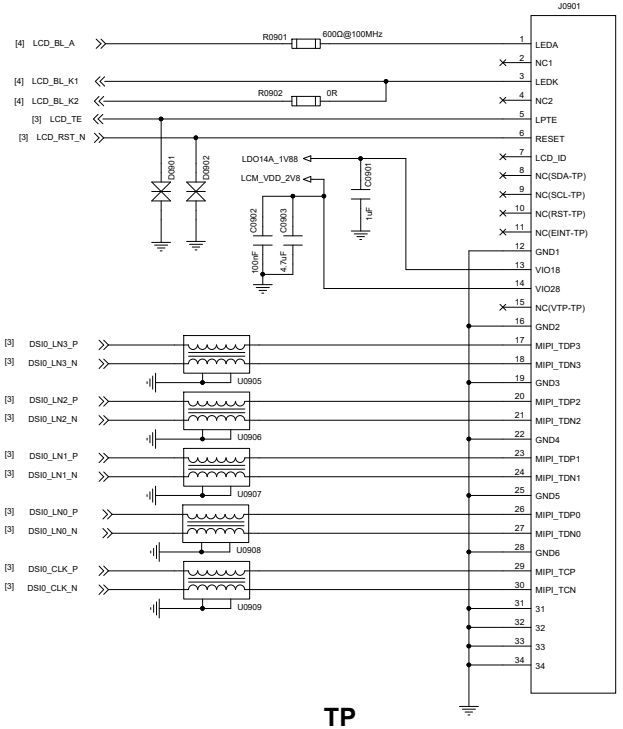
Note:

The junction capacitance of TVS on HDMI_TX/CLK should be no more than 0.5 pF.

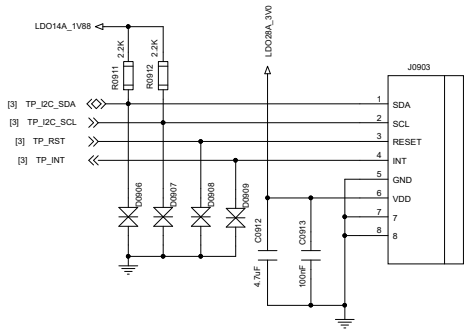
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 10OF 19	

Display Interfaces

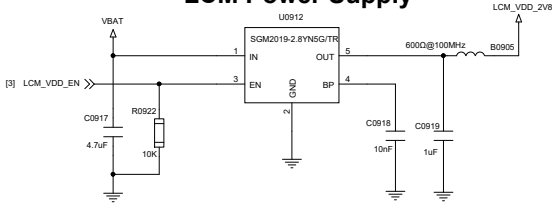
LCM



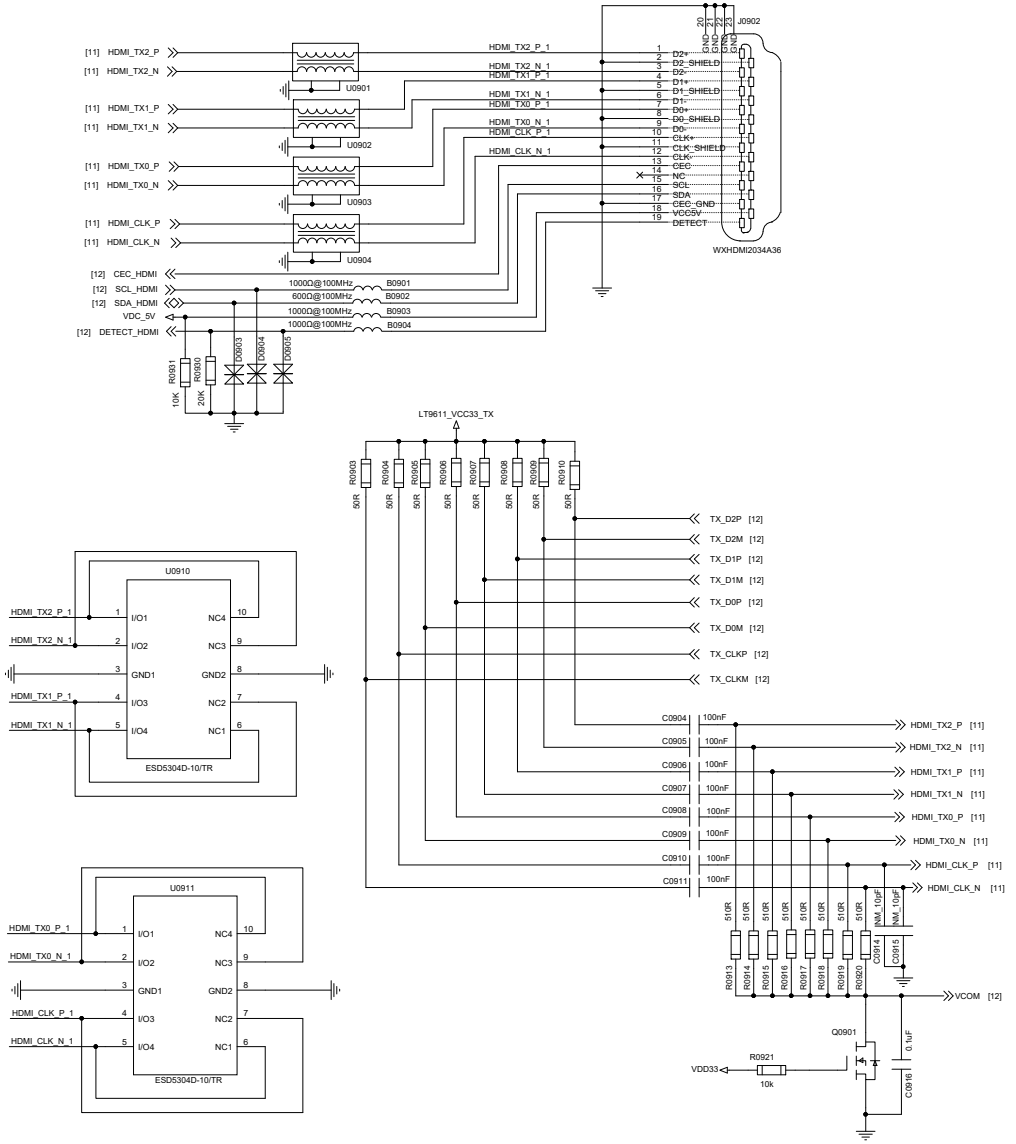
TP



LCM Power Supply



HDMI Out Connector

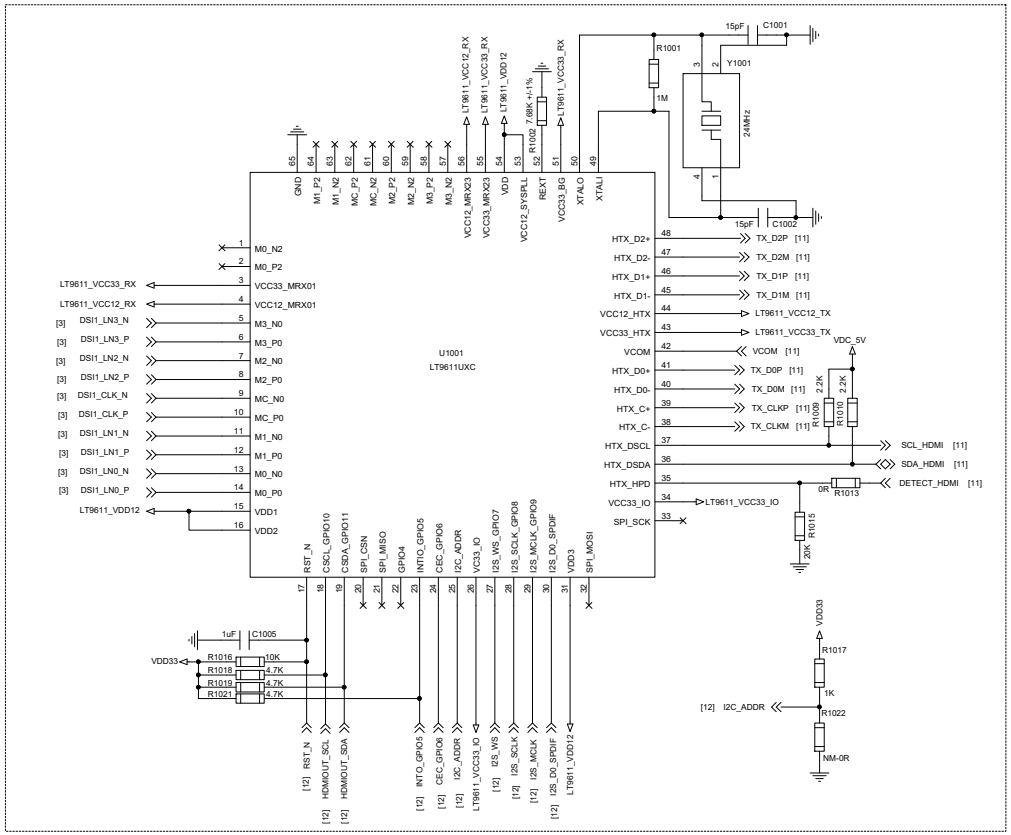


Note:

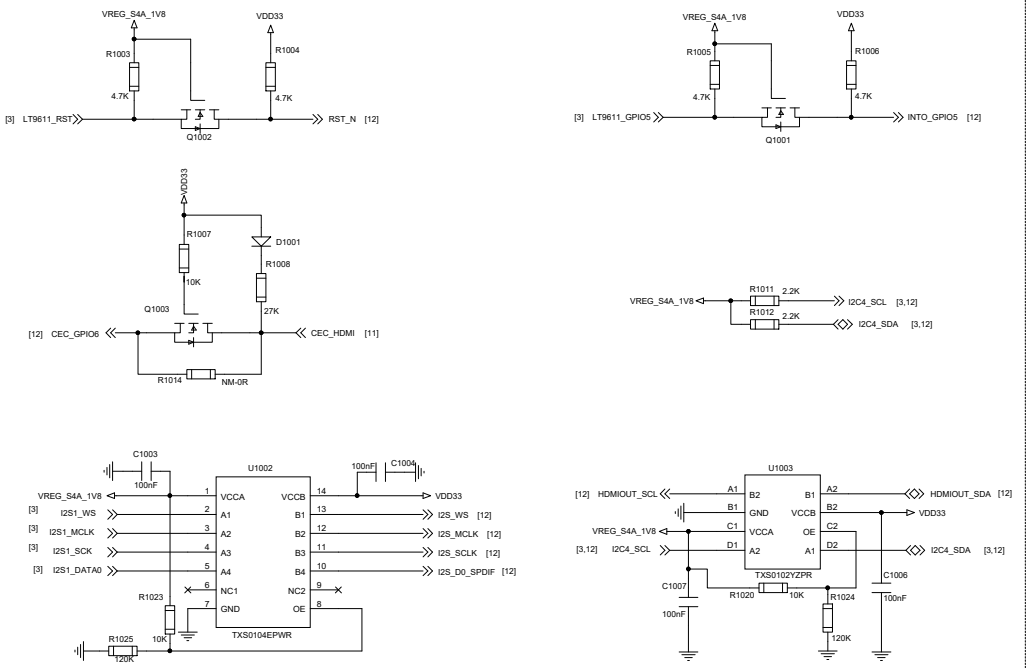
The junction capacitance of TVS on HDMI_TX/CLK shpuld be no more than than 0.5 pF.

Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 11OF 19	

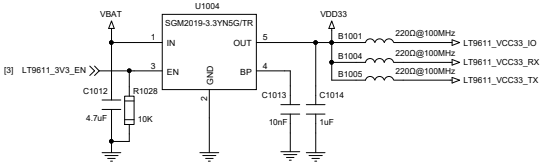
HDMI Out Interface

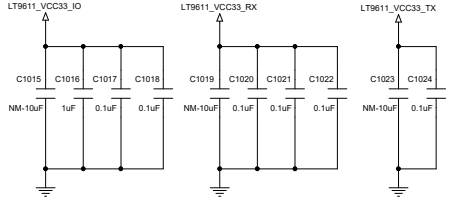


Level Shift Circuit

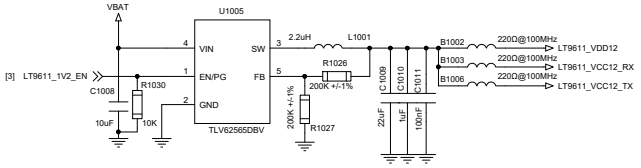


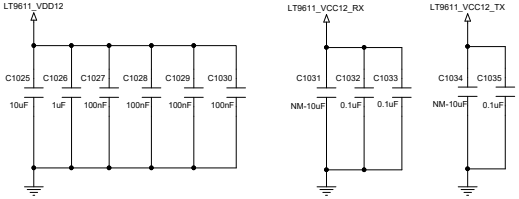
3.3 V Power Supply





1.2 V Power Supply

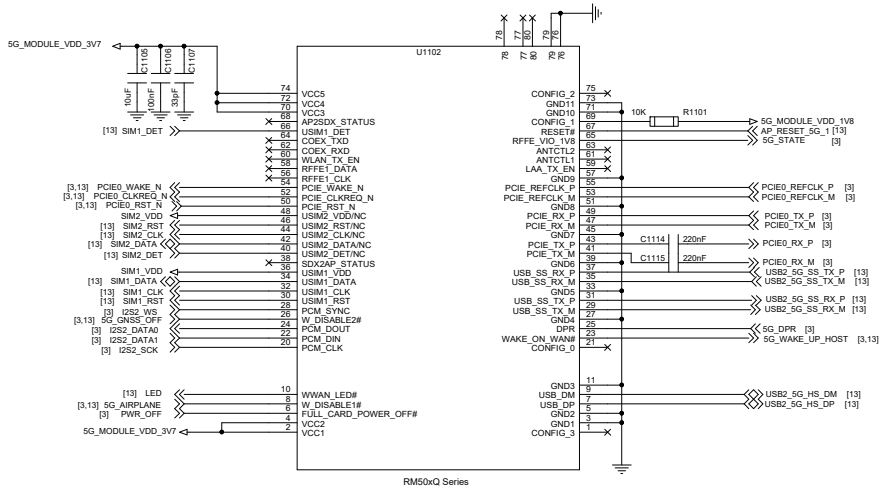




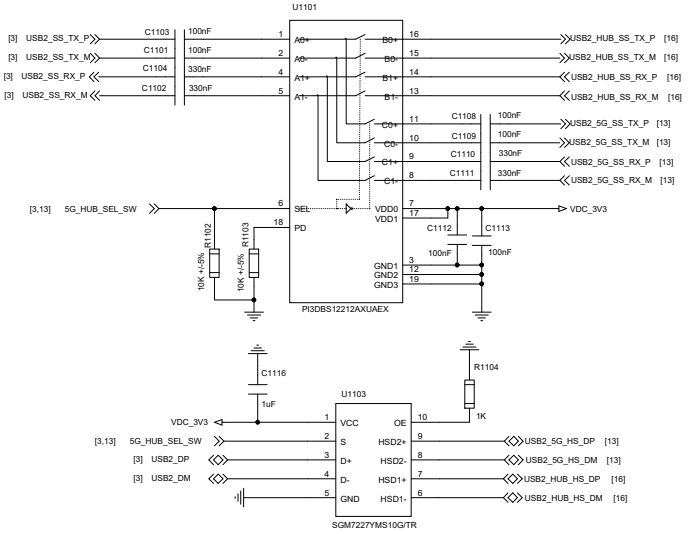
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Wednesday, March 31, 2021	SHEET: 12OF 19	

5G Module Interfaces

RM50xQ Series Interfaces



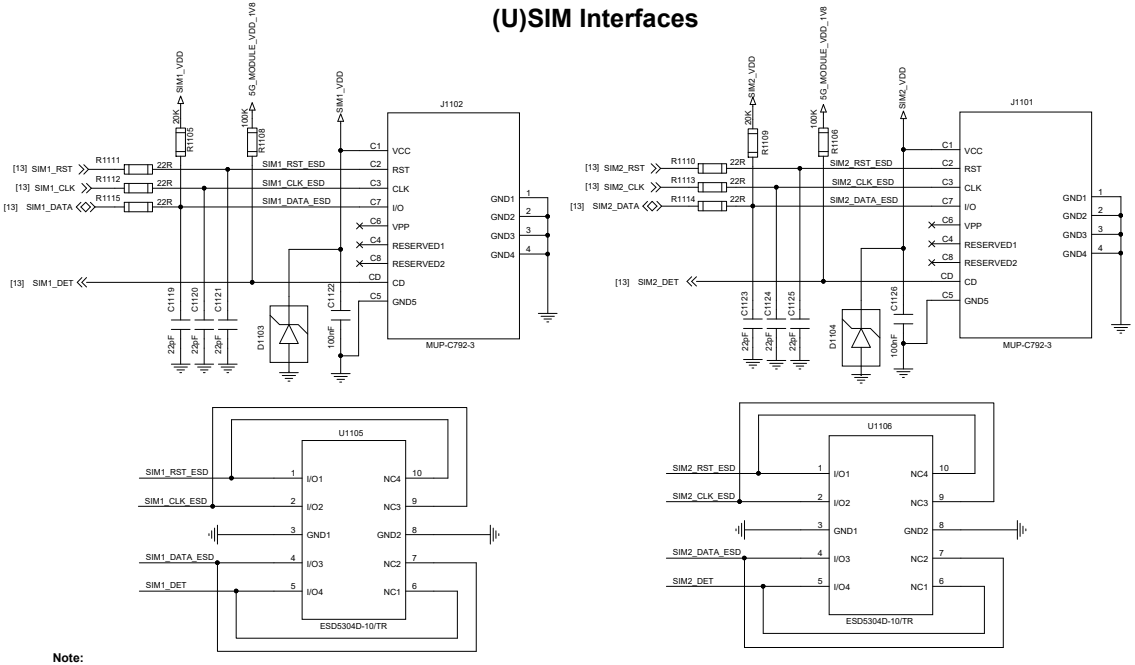
USB2 Interface



Note:

USB2 should be connected to hub by default.

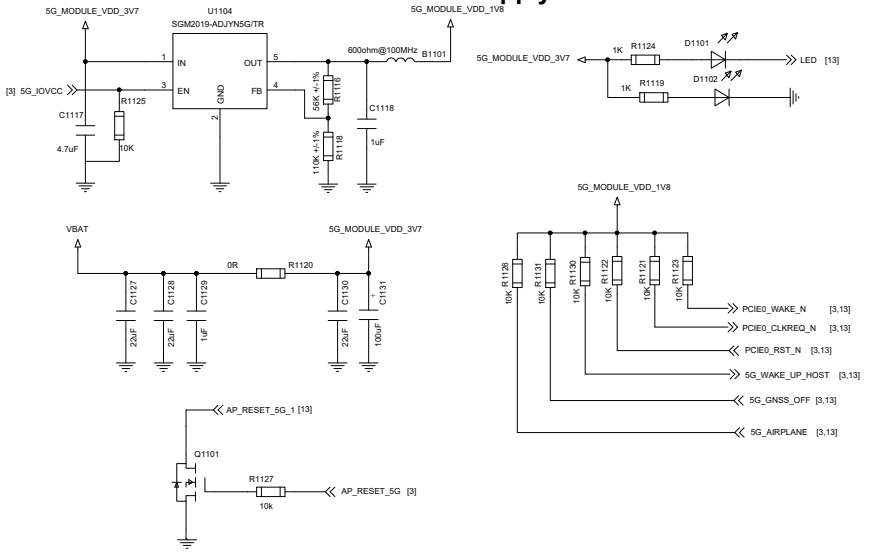
(U)SIM Interfaces



Note:

R1110–R1115 are applied to suppress EMI and enhance ESD protection.

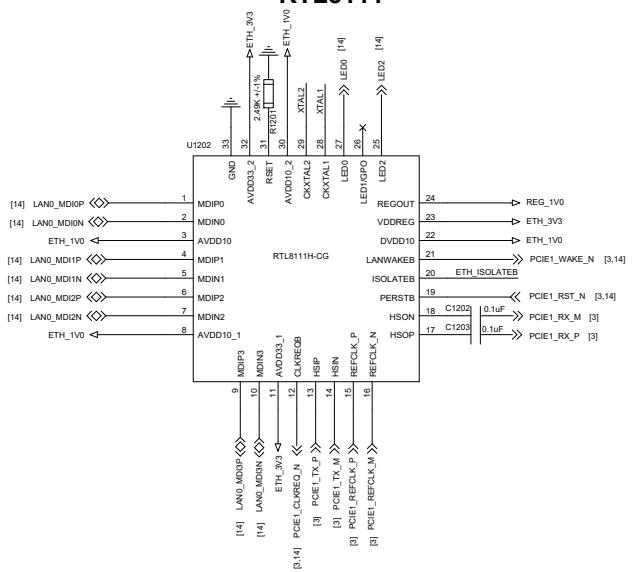
Power Supply



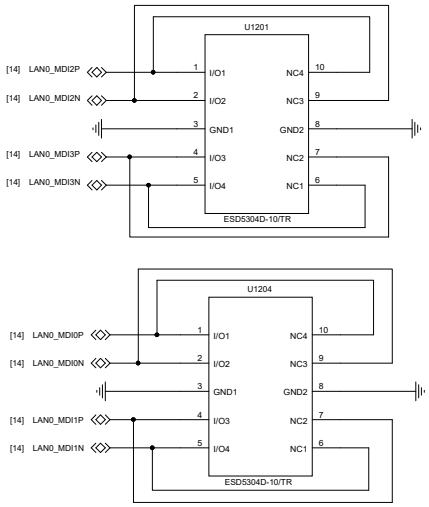
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 13OF 19	

Ethernet Interface

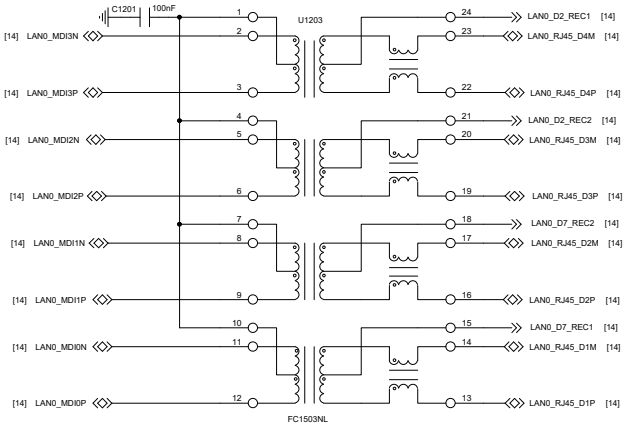
RTL8111



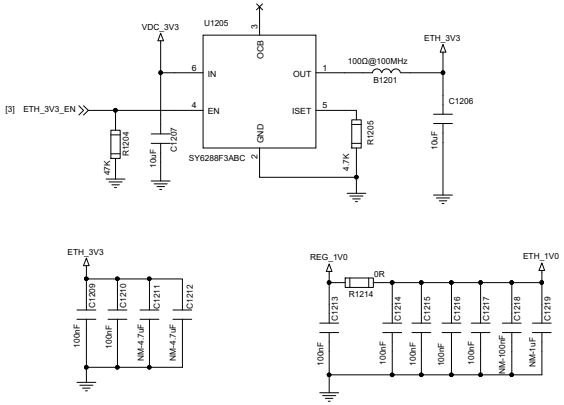
ESD

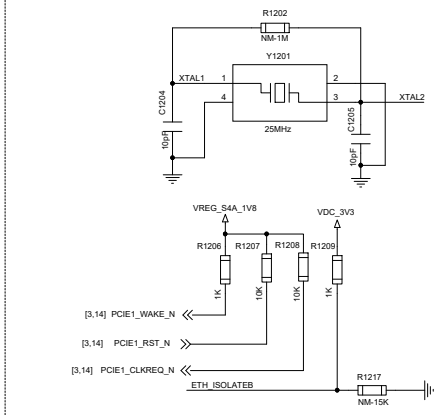


Transformer

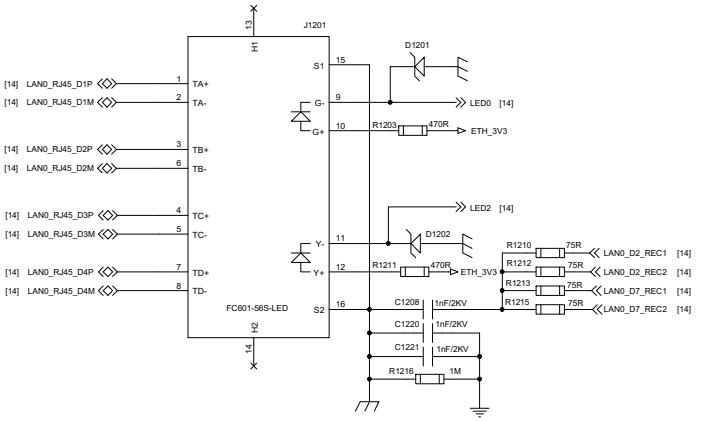


3.3 V Power Supply





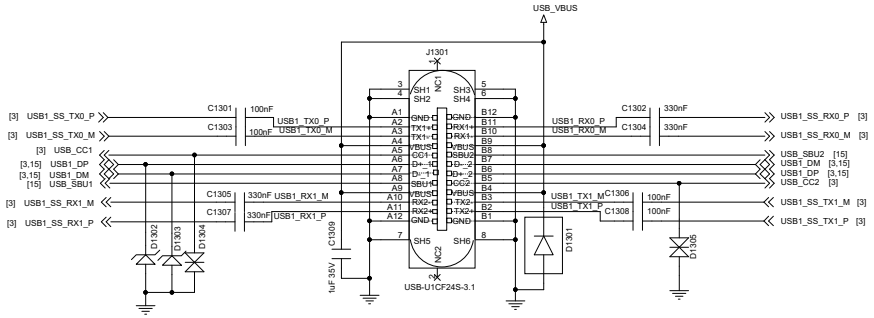
RJ45 Connector



Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 14OF 19	

Type-C Interface

Type-C



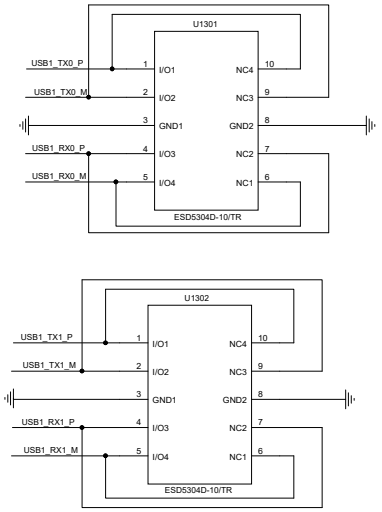
Note:

It is recommended to add TVS to USB1 interface:

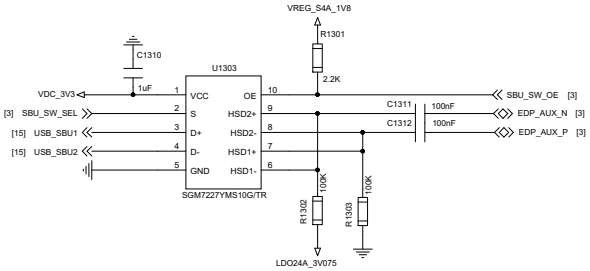
The junction capacitance of TVS on USB 2.0 traces should be no more than 2 pF;

The junction capacitance of TVS on USB 3.1 traces should be no more than 0.5 pF.

ESD



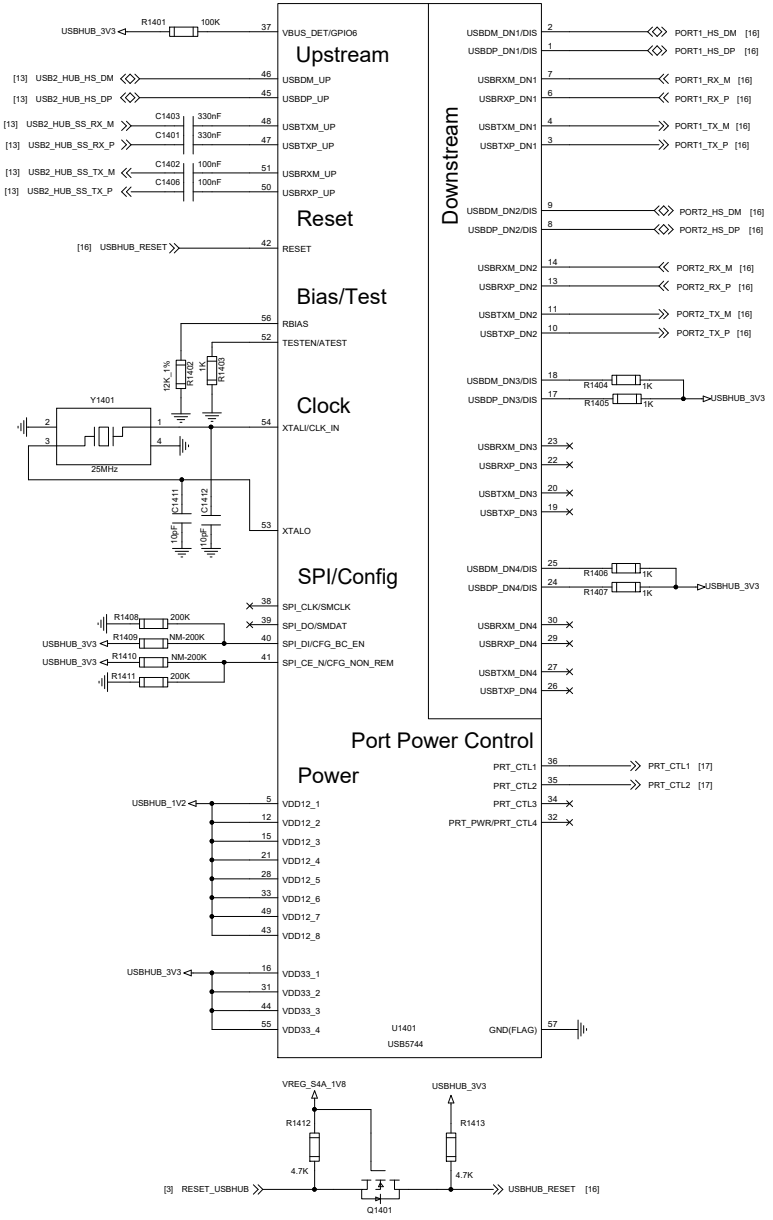
DisplayPort Switch



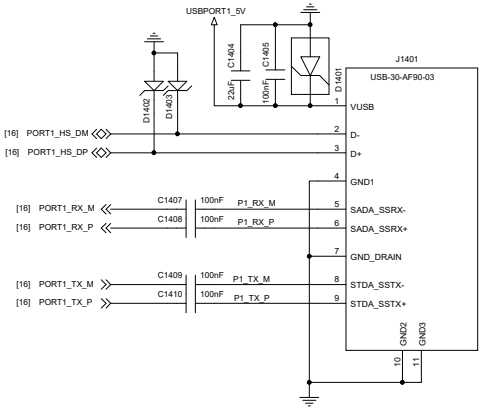
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 15OF 19	

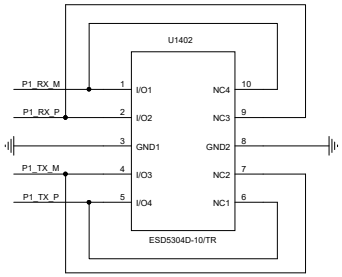
USB Hub (Part 1)

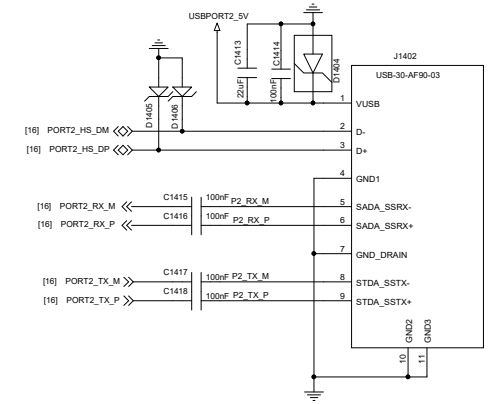
USB Hub

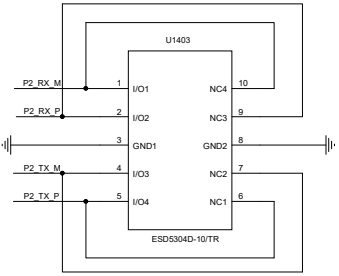


USB Interfaces









Note:

It is recommended to add TVS to USB2 interface:

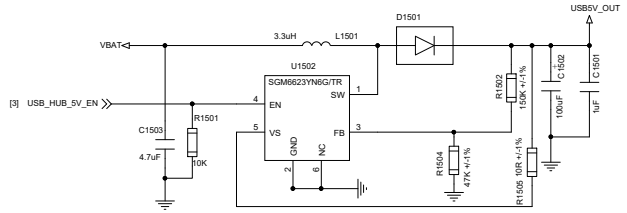
The junction capacitance of TVS on USB 2.0 traces should be no more than 2 pF;

The junction capacitance of TVS on USB 3.1 traces should be no more than 0.5 pF.

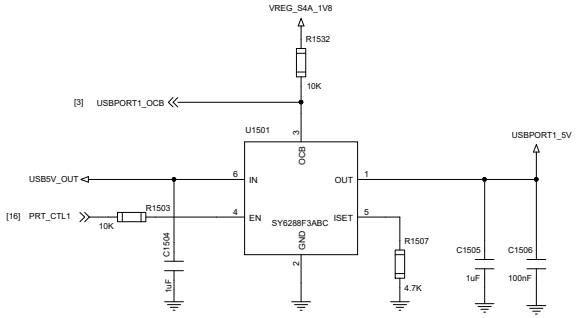
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 16OF 19	

USB Hub (Part 2)

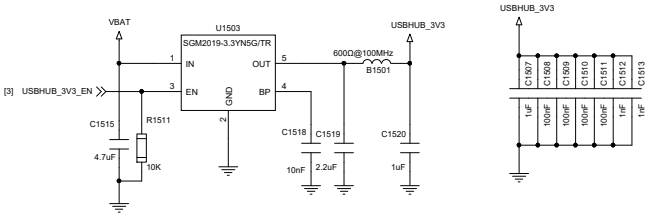
5.0 V Power Supply



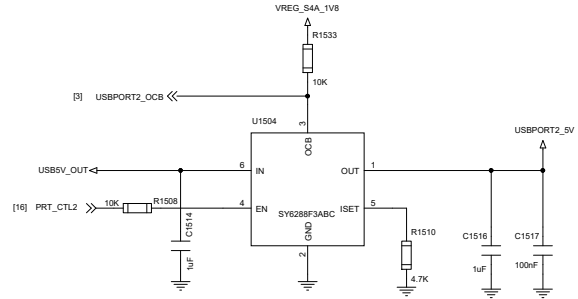
Overcurrent Protection



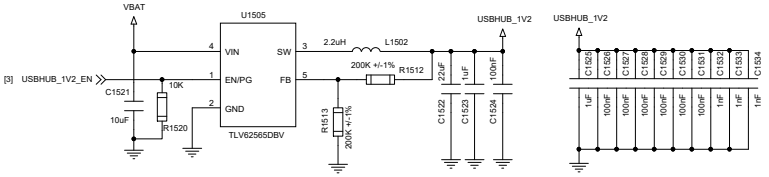
3.3 V Power Supply



Overcurrent Protection



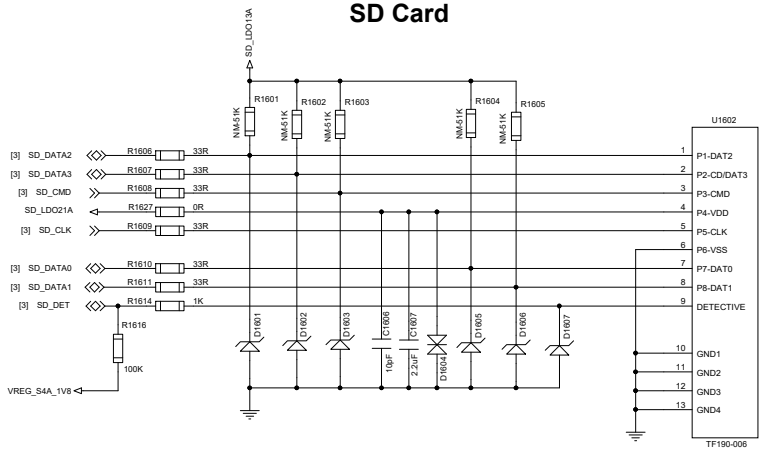
1.2 V Power Supply



Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Wednesday, March 31, 2021	SHEET: 17OF 19	

Other Interfaces

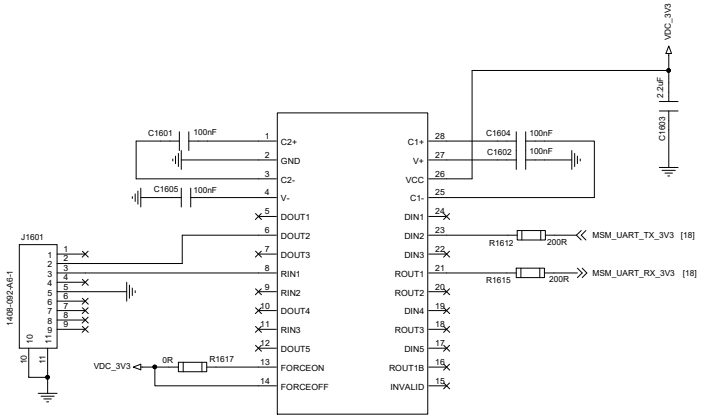
SD Card



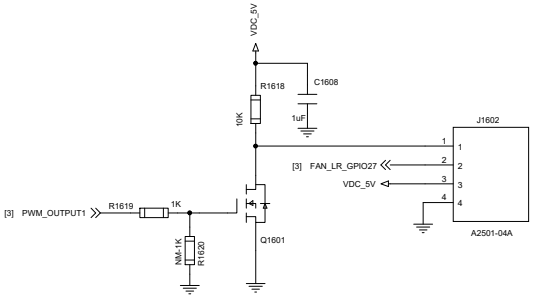
Note:

R1606–R1611 are applied to suppress EMI and enhance ESD protection.

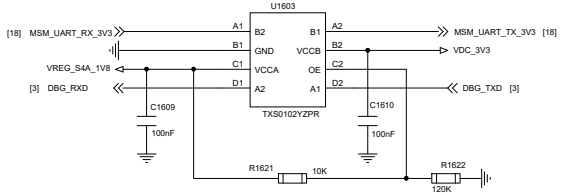
Debug UART



Fan Interface



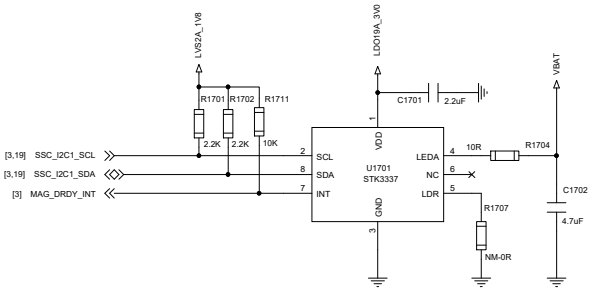
Level Shift Circuit



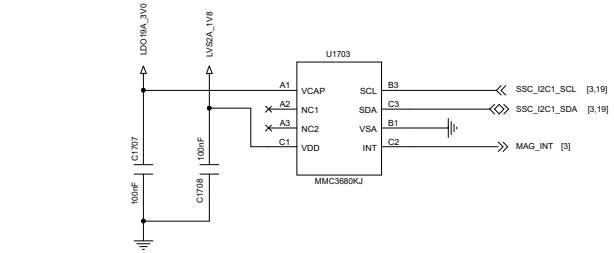
Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 18OF 19	

Sensor Interfaces

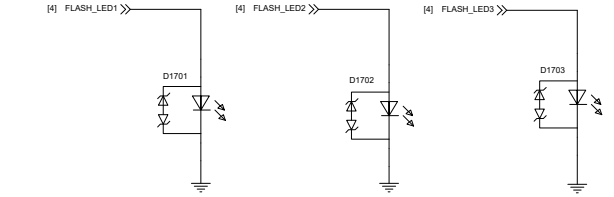
ALS/PS



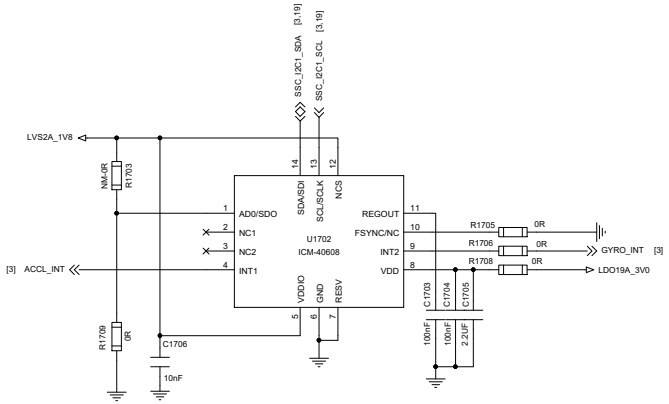
Magnetic Sensor



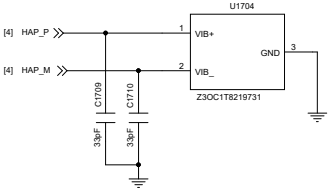
Flashlight



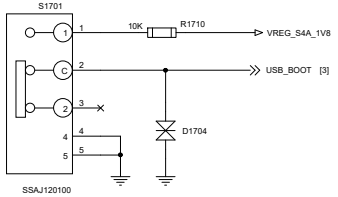
Accelerometer & Gyroscope



Vibrator



Forced USB Boot



Quectel Wireless Solutions		
PROJECT: SA800U-WF		VER: V1.0
DRWAN BY: Light WANG	CHECKED BY: Tony GAO	SIZE: A2
DATE: Tuesday, March 30, 2021	SHEET: 19OF 19	