

BC92 Reference Design

NB-IoT Module Series

Version: 1.2

Date: 2024-11-12

Status: Released



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

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

Tel: +86 21 5108 6236

Email: info@quectel.com

Or our local offices. For more information, please visit:

<http://www.quectel.com/support/sales.htm>.

For technical support, or to report documentation errors, please visit:

<http://www.quectel.com/support/technical.htm>.

Or email us at: support@quectel.com.

Legal Notices

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

Use and Disclosure Restrictions

License Agreements

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

Copyright

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

Trademarks

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

Third-Party Rights

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

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

Privacy Policy

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

Disclaimer

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

Copyright © Quectel Wireless Solutions Co., Ltd. 2024. All rights reserved.

About the Document

Revision History

Version	Date	Author	Description
1.0	2020-02-27	Glenn GE	First official release
1.1	2020-04-29	Clifton HE	Changed pins of audio interface to RESERVED.
1.2	2024-11-12	Forest LIN/ King HUANG	- Updated the power system block diagram (Sheet 2). - Updated reference circuit for RF antenna interface and added relevant notes (Sheet 3). - Updated the note on capacitor C105 (Sheet 3). - Deleted DC-DC application reference design (Sheet 4). - Changed LDO application reference design to DC power supply reference design (Sheet 4). - Added power supply switch reference design (Sheet 4). - Added a note about adding a 10 kΩ pull-up resistor in (U)SIM interfaces design (Sheet 5). - Updated MCU connection to UART interfaces design (Sheet 6).

Contents

About the Document.....3

Contents4

1 Reference Design.....5

1.1. Introduction5

1.2. Schematics5

1 Reference Design

1.1. Introduction

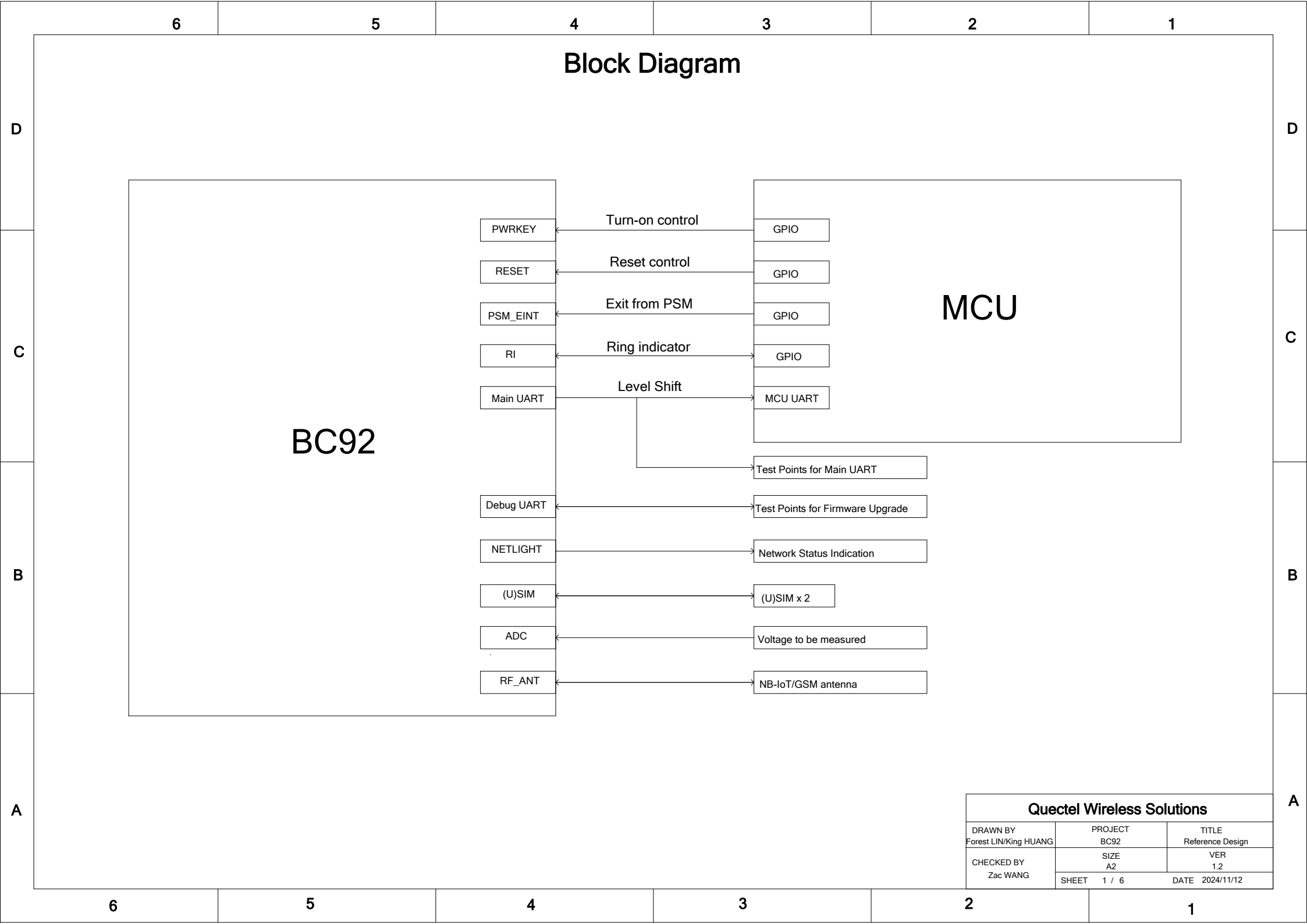
This document provides the reference design for Quectel BC92 module, including block diagram, power system block diagram, module interfaces, power supply design, (U)SIM interfaces and UART interfaces.

1.2. Schematics

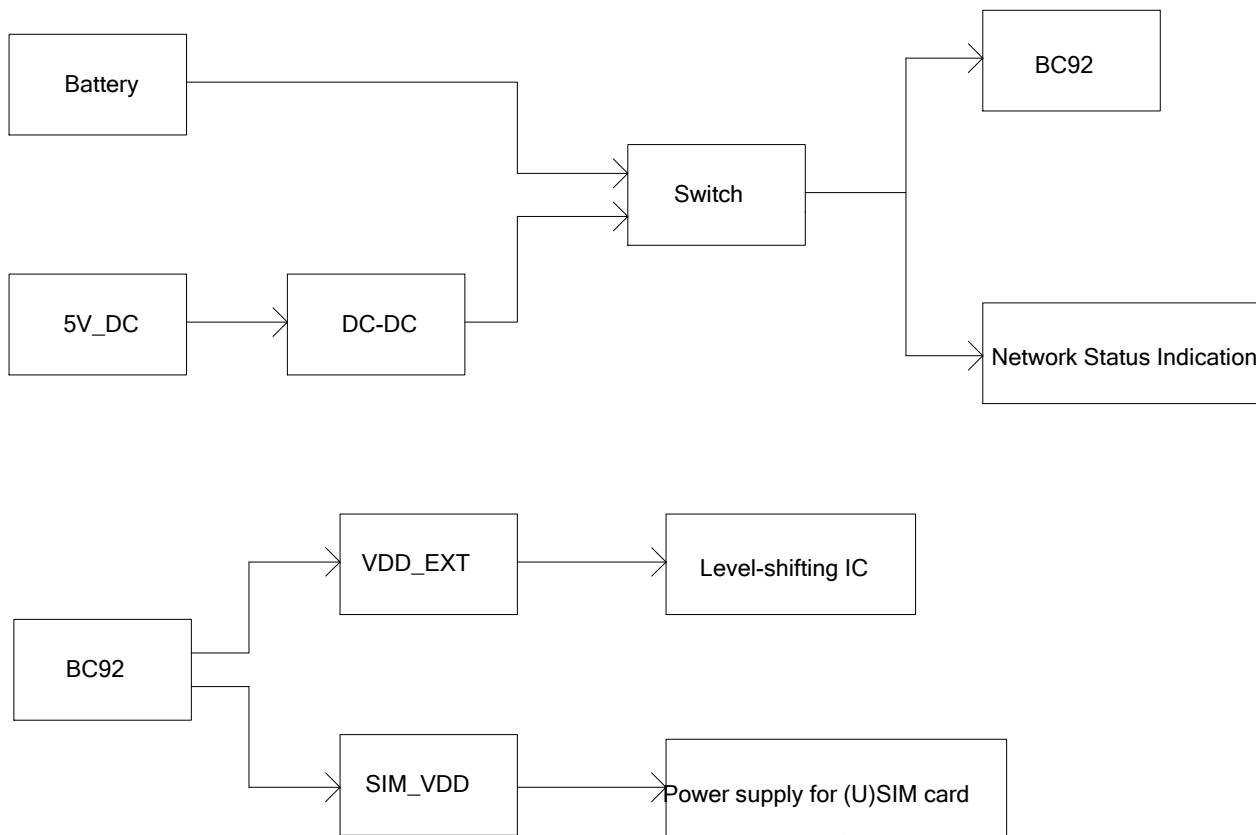
The schematics illustrated in the following pages are provided for your reference only.

NOTE

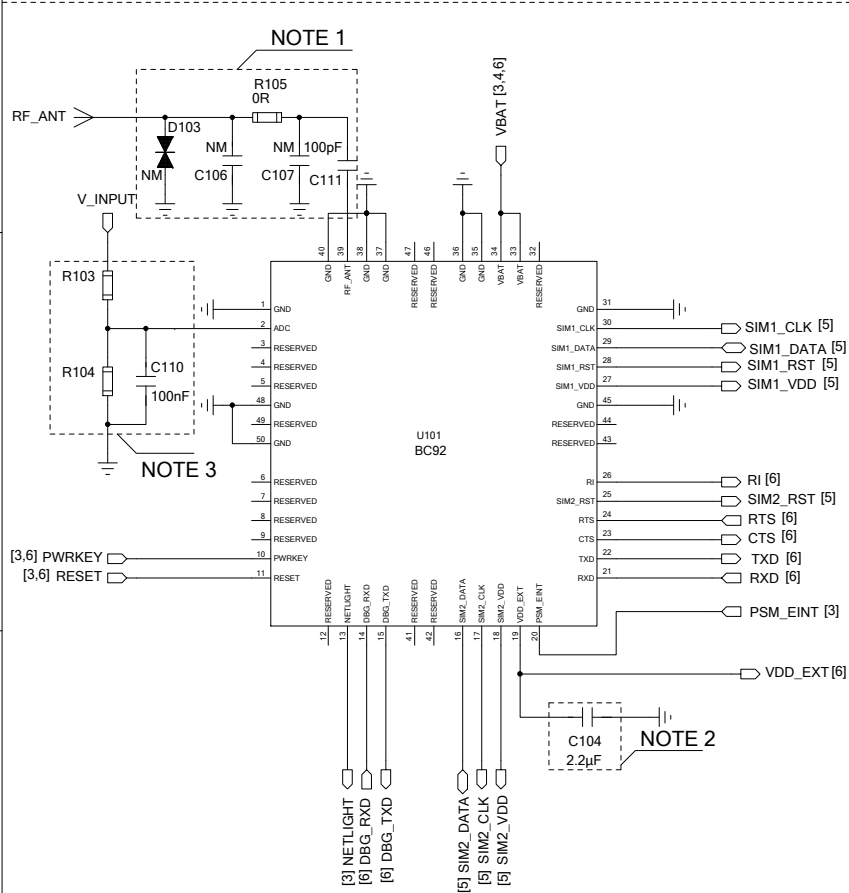
It is required to confirm the applicability and price from the supplier about the IC involved in the reference design.



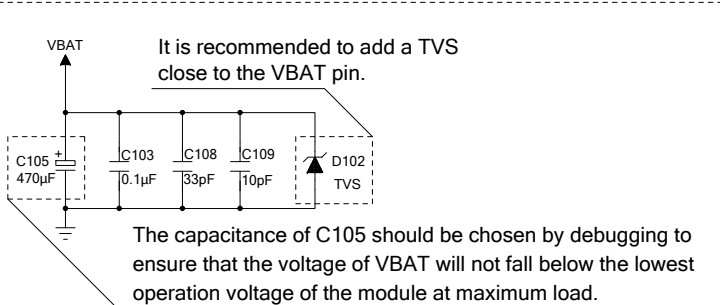
Power System Block Diagram



Module Interfaces

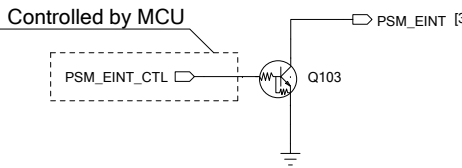


- NOTE:**
- It is recommended to reserve a dual L-type circuit for all the antenna interfaces for better RF performance and for the ease of debugging.
It is recommended to reserve an ESD protection component for the cellular antenna interface and the junction capacitance should not exceed 0.05 pF.
If there is DC power at the antenna ports, C111 must be used for DC-blocking to prevent short circuit to ground. The capacitance value is recommended to be 100 pF, which can be adjusted according to the actual requirements.
If there is no DC power in the peripheral design, C111 should not be reserved.
For more details, please refer to the RF routing guidelines.
 - It is recommended to use VDD_EXT as the external pull-up power supply for I/O and add a 2.2 μ F bypass capacitor in parallel.
 - The voltage of ADC input channel ranges from 0 V to 1.8 V, so please select a high-precision voltage divider resistor.

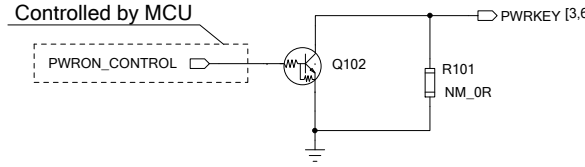


- NOTE:**
- The input voltage of VBAT ranges from 3.4 V to 4.2 V.
 - The module drains a maximum current of approx. 1.6 A during GSM burst, so the minimum width of VBAT trace should be 2 mm.
 - These capacitors are arranged with capacitances in descending order. Capacitors with the lowest capacitance should be placed near to the VBAT pin and all other capacitors should be placed as close to the VBAT pin as possible.

PSM_EINT Reference Circuit



PWRKEY Reference Circuit

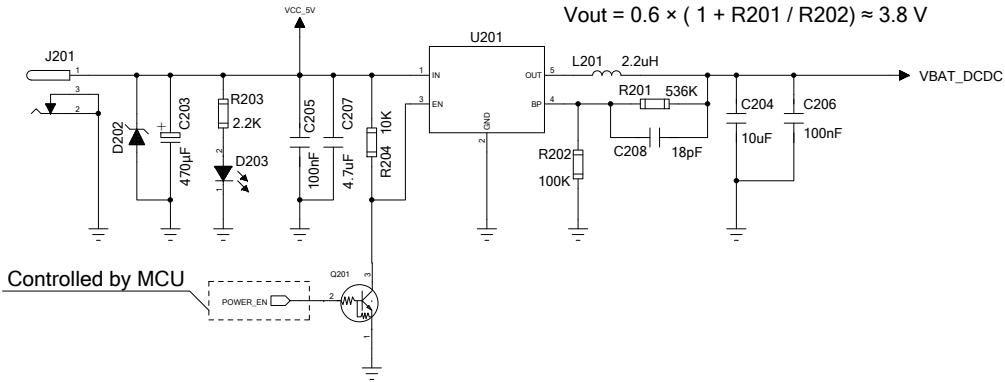


Quectel Wireless Solutions

DRAWN BY Forest LIN/King HUANG	PROJECT BC92	TITLE Reference Design
CHECKED BY Zac WANG	SIZE A2	VER 1.2
SHEET 3 / 6	DATE 2024/11/12	

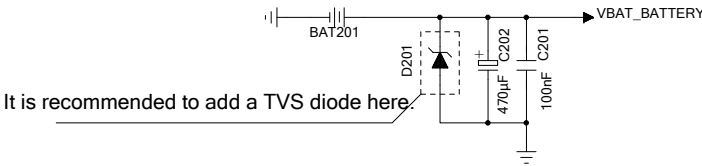
Power Supply

DC Power Supply



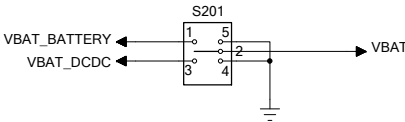
- NOTE:
- 1. The output current of power converter U201 should be at least 2 A.
 - 2. The VBAT_DCDC output voltage is 3.8 V.

Battery Application



- NOTE:
- 1. Please select an appropriate battery according to the supply voltage range of module.
 - 2. The battery should be able to provide an instantaneous current of 2 A.

Power Supply Switch



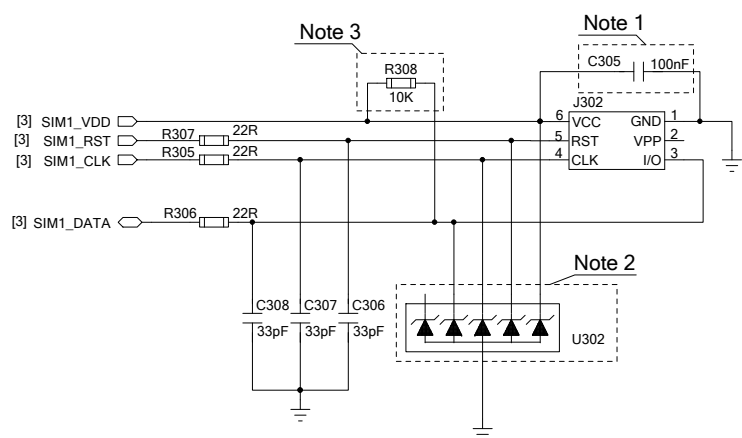
- NOTE:
- 1. S201 is used to switch between DC-DC power supply and battery power supply.
 - 2. VBAT voltage ranges from 3.4 V to 4.2 V, and the typical value is 3.8 V.

Quectel Wireless Solutions

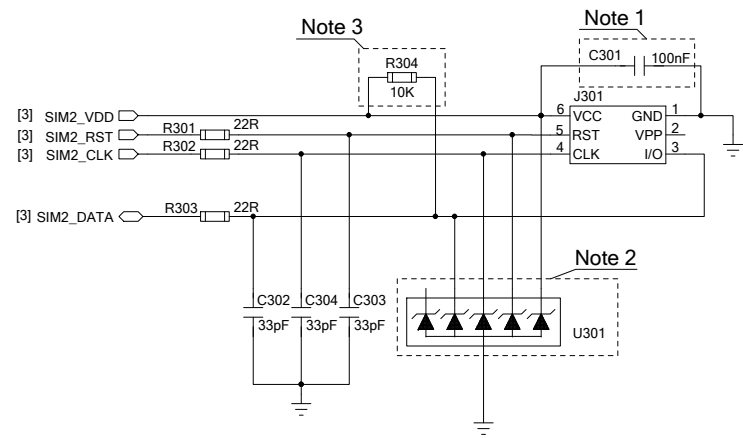
DRAWN BY Forest LIN/King HUANG	PROJECT BC92	TITLE Reference Design
CHECKED BY Zac WANG	SIZE A2	VER 1.2
SHEET 4 / 6	DATE 2024/11/12	

(U)SIM Interfaces Design

(U)SIM1 Interface



(U)SIM2 Interface



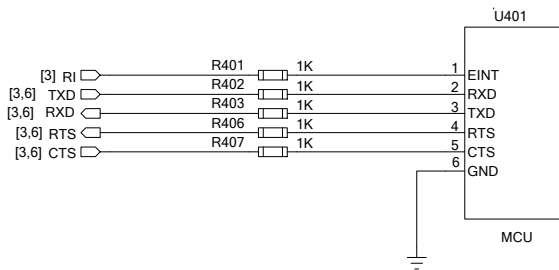
NOTE:

- 1. The value of C301/C305 should be less than 1 μ F.
- 2. U301/U302 is used to protect the (U)SIM card against ESD, and the parasitic capacitance should be less than 15 pF.
It should be placed near the (U)SIM card connector.
- 3. It is necessary to add a 10 k Ω pull-up resistor between SIM_DATA and SIM_VDD to improve anti-interference ability, and to ensure data signal quality.
- 4. (U)SIM1 interface supports both GSM and NB-IoT networks.
- 5. (U)SIM2 interface only supports GSM network and it is still under development.
If it is not used, please keep these pins unconnected.

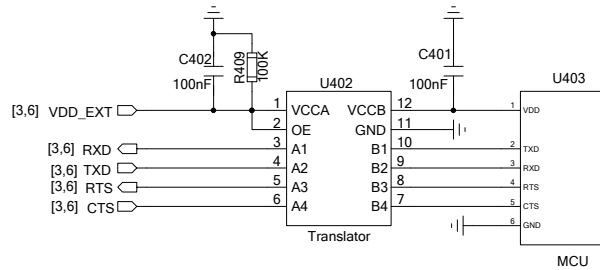
Quectel Wireless Solutions		
DRAWN BY Forest LIN/King HUANG	PROJECT BC92	TITLE Reference Design
CHECKED BY Zac WANG	SIZE A2	VER 1.2
SHEET 5 / 6		DATE 2024/11/12

UART Interfaces Design

UART Interface



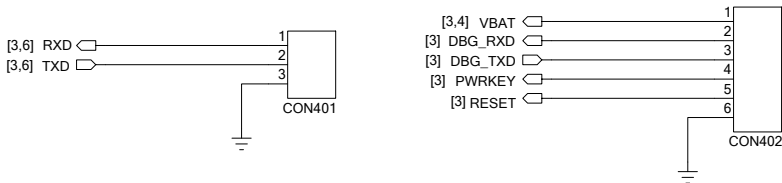
Level Shifting - IC Solution



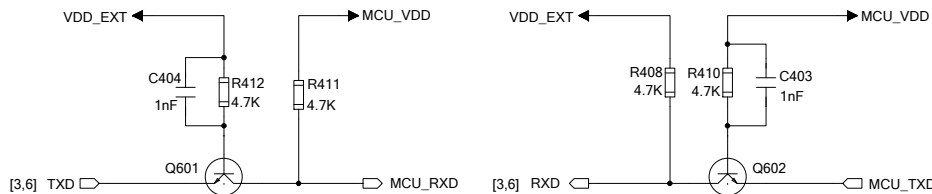
NOTE:

Please note that the voltage level translator generally requires $V_{CCA} \leq V_{CCB}$.

Recommended Test Points for Main UART and Firmware Upgrade



Level Shifting - Transistor Solution



NOTE:

1. The transistor circuit solution is not suitable for applications with high baud rates exceeding 460 kbps.
2. In the transistor solution, it is recommended to retain these two 1 nF capacitors (C403/C404) on the transistor circuit to improve communication speed.

Quectel Wireless Solutions			
DRAWN BY Forest LIN/King HUANG		PROJECT BC92	TITLE Reference Design
CHECKED BY Zac WANG		SIZE A2	VER 1.2
		SHEET 6 / 6	DATE 2024/11/12