BC66-OpenCPU

Reference Design

LPWA Module Series

Rev. BC66-OpenCPU_Reference_Design_V1.1

Date: 2019-02-26

Status: Released

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About the Document

History

Revision	Date	Author	Description
1.0	2018-08-27	Speed SUN	Initial
1.1	2019-02-26	Speed SUN	1. Updated the power supply block diagram (Figure 1). 2. Optimized the notes of “Battery Application” section in Sheet 2. 3. Added USB interface designs in Sheet 5. 4. Added auto startup circuit design (voltage detector solution) in “PWRKEY Reference Design” section in Sheet 6.

Contents

1 Reference Design

1.1. Introduction

This document provides the reference design for Quectel BC66-OpenCPU module.

1.2. Schematics

1.2.1. Power Supply Block Diagram

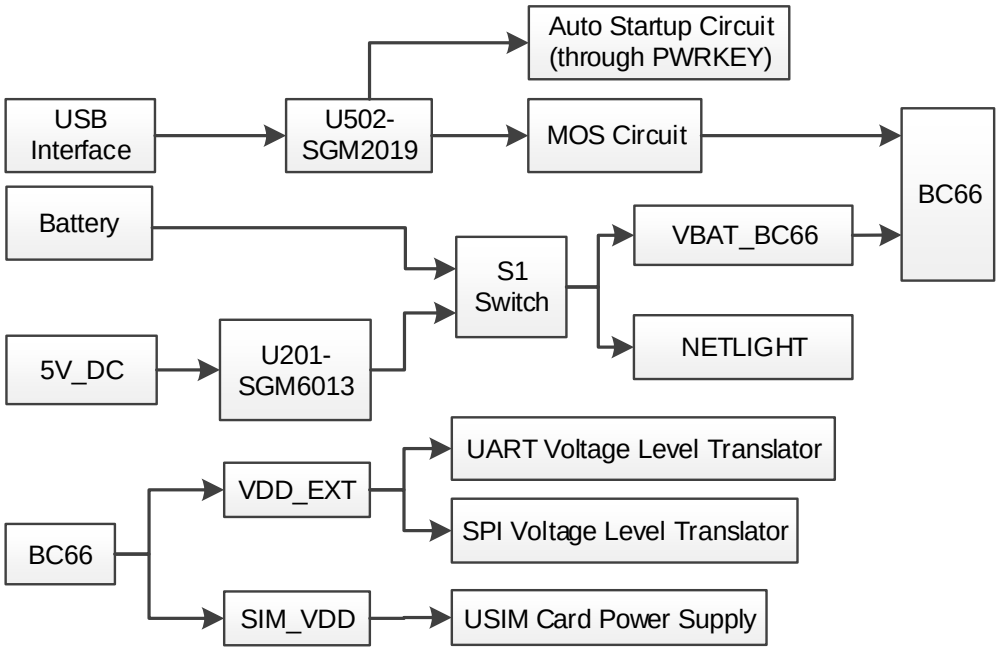
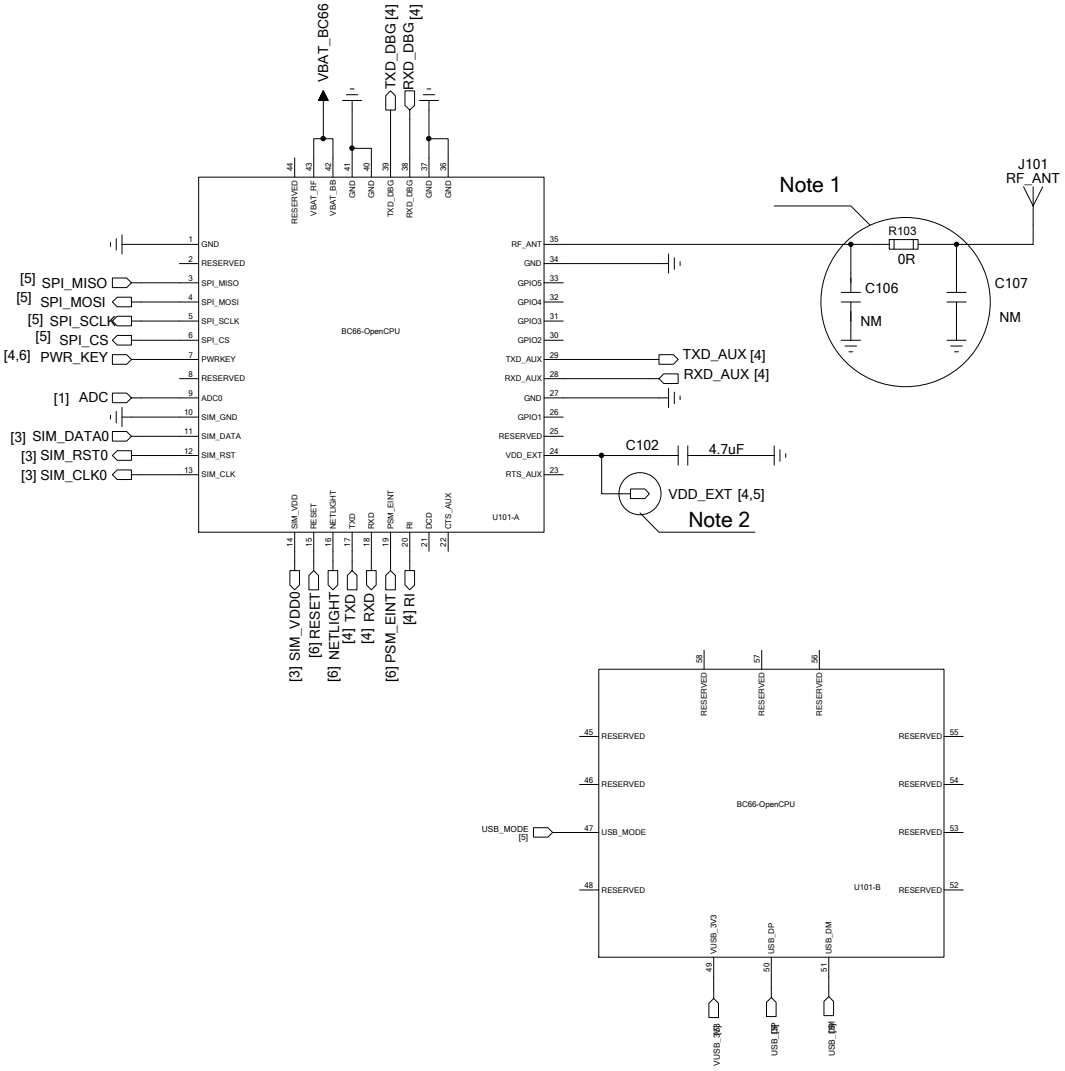


Figure 1: Block Diagram of BC66-OpenCPU Power Supply

1.2.2. Reference Designs

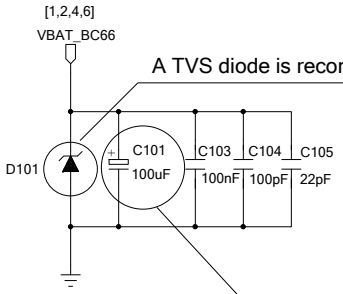
The schematics illustrated in the following pages are provided for your reference only.

Module Interfaces



Notes:

1. A PI type matching circuit is recommended here. For more details about RF layout, please refer to *Quectel_RF_Layout_Application_Note.*
2. VDD_EXT is a 1.8V output power supply and has no voltage output in PSM. It is intended to supply power for the module's pull-up circuits, and is thus not recommended to be used as the power supply for external circuits.

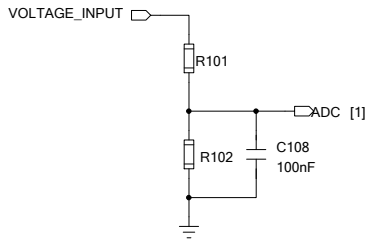


Capacitance of C101 should be selected by debugging to ensure that the input voltage after maximum voltage drop during the burst transmission is within the normal range.

Notes:

1. The input voltage of VBAT ranges from 2.1V to 3.63V.
2. The width of VBAT trace is recommended to be greater than 0.5mm, and the longer the trace is, the wider it should be.
3. The capacitors should be placed in ascending order of the capacitance value, and the one with the minimum capacitance should be placed nearest the VBAT pins. Additionally, all these capacitors should be placed as close to the VBAT pins as possible.

ADC Reference Circuit



The maximum input voltage of 10-bit ADC is 1.4V.

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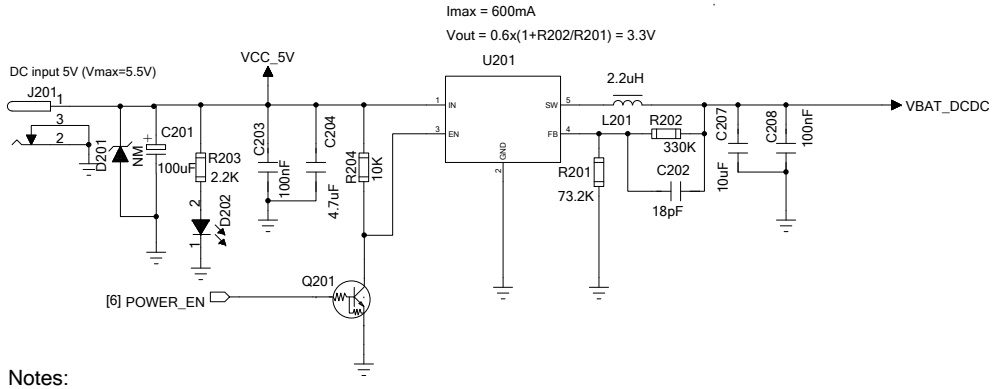
Power Supply

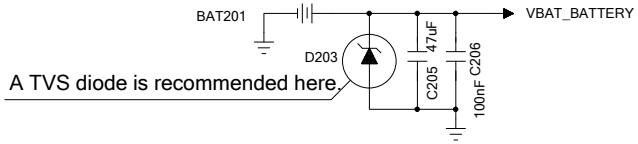
DC Power Supply



Notes:

1. The output current of power converter should be no less than 0.5A.
2. The recommended power management IC is SGM6013.

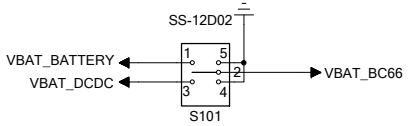
Battery Application



Notes:

1. The battery voltage shall range between 2.1V and 3.63V to meet the module's power supply requirements, and the battery's rated output current should be greater than the module's maximum current consumption. Additionally, it is recommended to do reverse battery protection to avoid damages to the module.
2. According to battery selection, the capacitance of C205 should be appropriately increased according to debugging results.

Power Supply Selection



Notes:

1. S101 is used to switch between an external 5V power supply and battery power supply.
2. VBAT_BC66 ranges from 2.1V to 3.63V, and the typical value is 3.3V.

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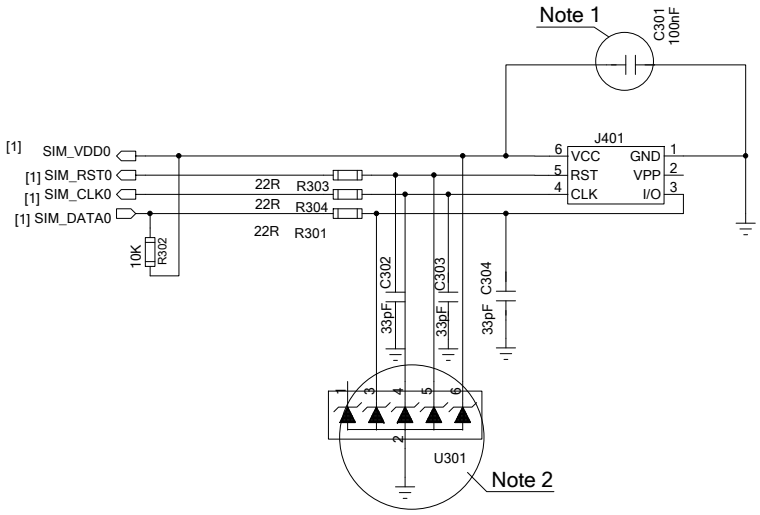
USIM Interface Design



Notes:

1. The value of C301 should be less than 1uF.
2. U301 is used for protecting USIM interface against ESD and the junction capacitance should be less than 50pF. It should be placed nearby USIM card connector.
3. For more design guidelines, please refer to *Chapter 3.10* of *Quectel_BC66-OpenCPU_Hardware_Design*.

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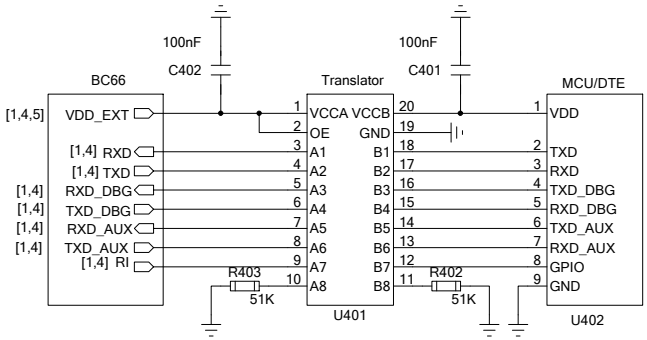
UART Interface Design

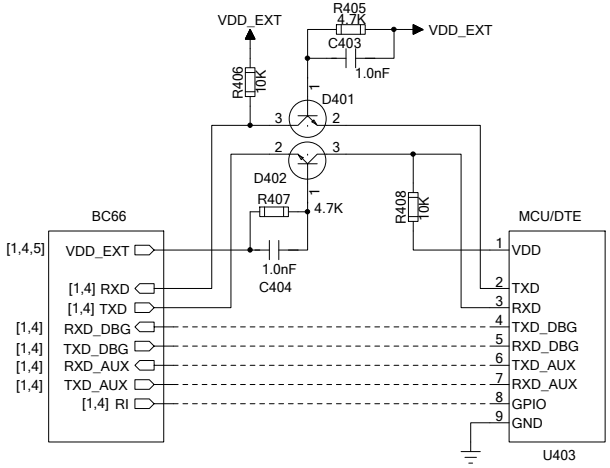
UART Level Translation - IC Solution



Notes:

1. When there is a SMS or URC output, the module will inform DTE with the RI pin.
2. Please pay attention to the level matching issue of UART ports during application.
3. Please note that the voltage level translator requires VCCA ≤ VCCB.

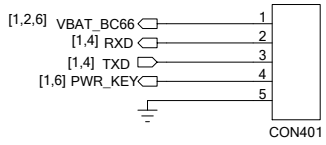
UART Level Translation - Transistor Solution



Notes:

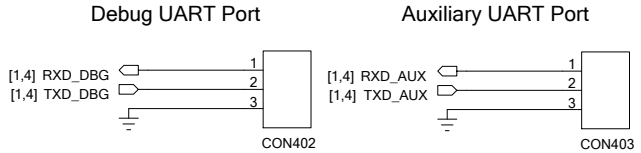
1. When there is a SMS or URC output, the module will inform DTE with the RI pin.
2. Please pay attention to the level matching issue of UART ports during application.
3. The circuit design of dotted line section can refer to the design of solid line section, but please pay attention to the direction of connection.

Recommended Test Points for Firmware Upgrade



Please pay attention to the level matching issue of the port during application.

Recommended Test Points for UART Ports



Please pay attention to the level matching issue of UART ports during application.

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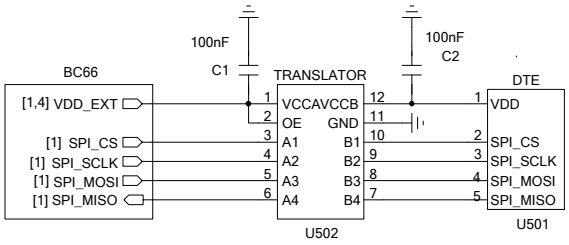
SPI & USB Interface Designs

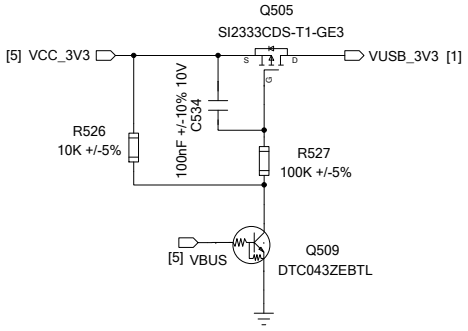
SPI Level Translation

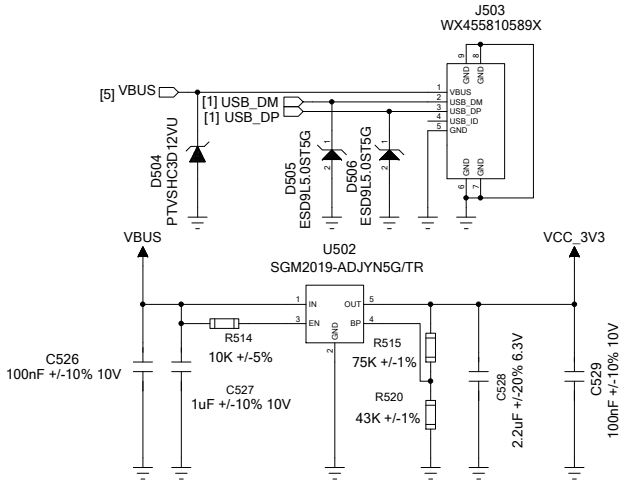


Notes:

1. Please pay attention to the level matching issue of SPI interface during application.
2. Please note that the voltage level translator requires VCCA ≤ VCCB.

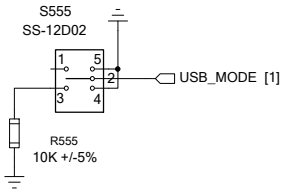
USB Interface Design





USB Download Circuit

Pin	USB Download Mode	Catch Log via USB
USB_MODE	Connect the pin to GND with a 10KΩ pull-down resistor	NC



Notes:

1. The USB interface and thereof signal traces should be kept away from power supply, RF interface and other sensitive signal traces.
2. The impedance of USB signal traces should be controlled as 90Ω.
3. It is recommended to select TVS diodes with parasitic capacitance less than 3pF for USB signal lines, and place the them close to the USB connector.

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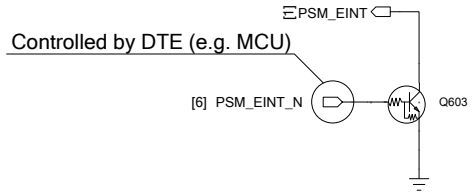
MCU Control and Drive Circuits

PSM_EINT Reference Circuit

PSM_EINT can be used to wake up the module from PSM.

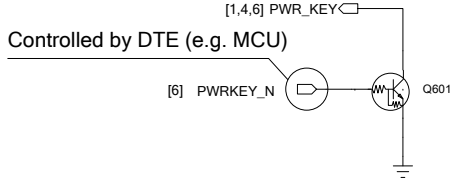


Notes:

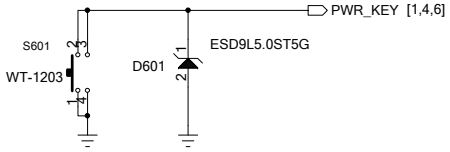
1. The voltage domain of PSM_EINT is VBAT.
2. PSM_EINT supports falling edge triggered interrupt, and thus supports connection to external sensors with interrupt function.

PWRKEY Reference Circuit

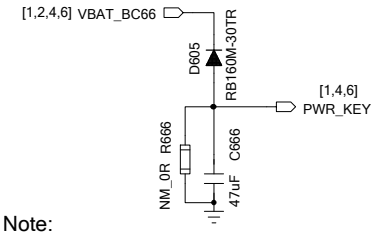
MCU Application



Keystroke Application



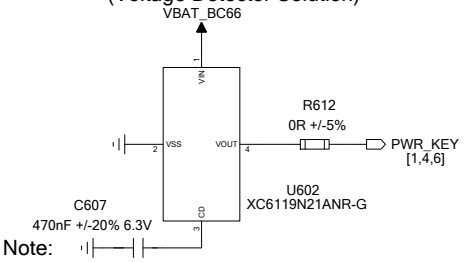
Auto Startup Circuit Design (Capacitor Solution)



Note:

When it is intended to reset the module through disconnecting the power supply, please disconnect VBAT_BC66 for 2s at least before re-apply the power supply.

Auto Startup Circuit Design (Voltage Detector Solution)

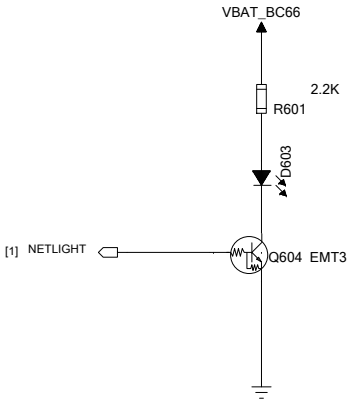


Note:

When it is intended to reset the module through disconnecting the power supply, please disconnect VBAT_BC66 for 200ms at least before re-apply the power supply.

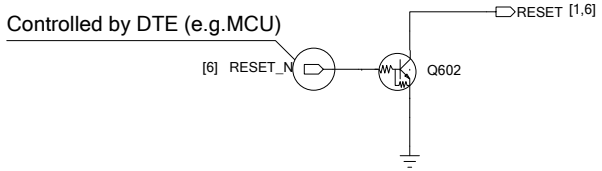
Network Status Indication

The NETLIGHT pin is used to indicate network status.

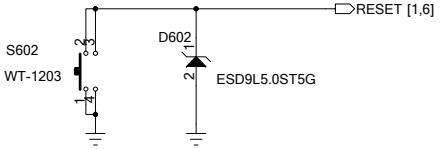


Reset Reference Circuit

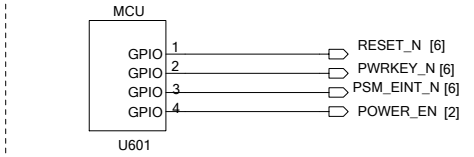
MCU Application



Keystroke Application



MCU GPIO



Note:

OpenCPU is a solution where the module acts as a main processor, eliminating the demand of an external MCU. This document also includes reference designs for applications with an external MCU so as to meet customers' varied demands.

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