

# MC60-OpenCPU

## Reference Design

**GSM/GPRS/GNSS Module Series**

Rev. A

Date: 2016-07-27



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## About the Document

### History

Revision	Date	Author	Description
A	2016-07-27	Tiger CHENG	Initial

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# 1 Introduction

## 1.1. Introduction

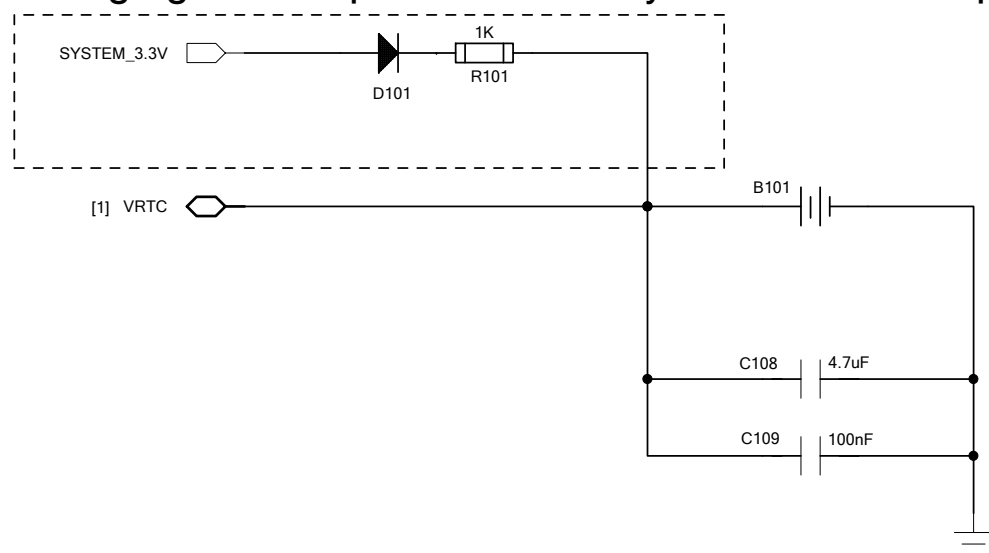
This document is a reference design for MC60-OpenCPU module.

## 1.2. Schematics

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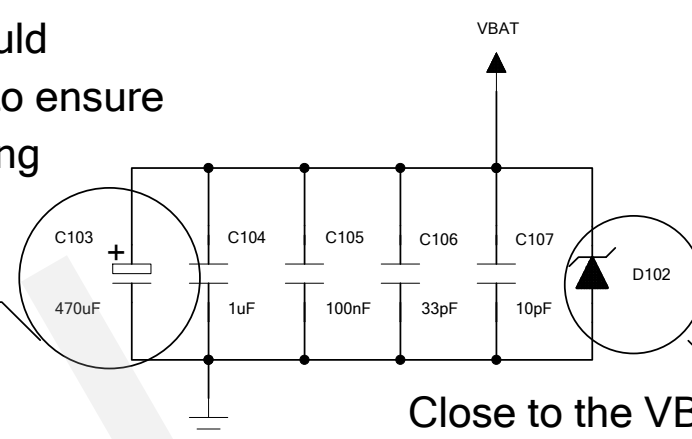
# Module Design

Charge golden capacitor or battery when VBAT is applied.

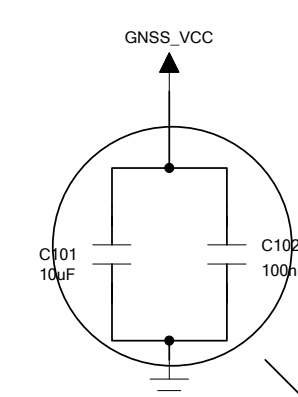


1. VRTC is designed to supply power for GNSS part of MC60-OpenCPU when VBAT is powered off.
2. Recommend to keep SYSTEM\_3.3V powered for the longest time in all system power supplies.

Capacitance of C101 should be chosen by debugging to ensure the max voltage drop during the burst transmission does not exceed 400mV.



Close to the VBAT pin  
A 5.1V/1W zener diode  
is recommended here.



Close to the GNSS\_VCC pin.

1. VBAT ranges from 3.3V to 4.6V.
2. Module drains the maximum current around 1.6A in burst time (577us).
3. The width of VBAT trace is recommended to be more than 2mm.
4. These capacitances are arranged in ascending order, with the smallest one closing to the VBAT pins and all capacitances as close to the VBAT pins as possible.

Antenna Type	Active Antenna Power Supply Circuit
Active	Need
Passive	No need

Active Antenna Power Supply Circuit

[1,2,5] GNSS\_VCC

L101

47nH

R104

10R

J103

GNSS\_ANT

C114

NM

C115

NM

R105

0R

C116

100nF

R106

10R

C117

100nF

R107

0R

C118

100nF

R108

0R

C119

100nF

R109

0R

C120

100nF

R110

0R

C121

100nF

R111

0R

C122

100nF

R112

0R

C123

100nF

R113

0R

C124

100nF

R114

0R

C125

100nF

R115

0R

C126

100nF

R116

0R

C127

100nF

R117

0R

C128

100nF

R118

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C129

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R119

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C130

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R120

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C131

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R121

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C147

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C148

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R138

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C149

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R139

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C150

100nF

R140

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C151

100nF

R141

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C152

100nF

R142

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C153

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R143

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C154

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R144

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C155

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C162

100nF

R152

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C163

100nF

R153

0R

C164

100nF

R154

0R

C165

100nF

R155

0R

C166

100nF

R156

0R

C167

100nF

R157

0R

C168

100nF

R158

0R

C169

100nF

R159

0R

C170

100nF

R160

0R

C171

100nF

R161

0R

C172

100nF

R162

0R

C173

100nF

R163

0R

C174

100nF

R164

0R

C175

100nF

R165

0R

C176

100nF

R166

0R

C177

100nF

R167

0R

C178

100nF

R168

0R

C179

100nF

R169

0R

C180

100nF

R170

0R

C181

100nF

R171

0R

C182

100nF

R172

0R

C183

100nF

R173

0R

C184

100nF

R174

0R

C185

100nF

R175

0R

C186

100nF

R176

0R

C187

100nF

R177

0R

C188

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0R

C190

100nF

R180

0R

C191

100nF

R181

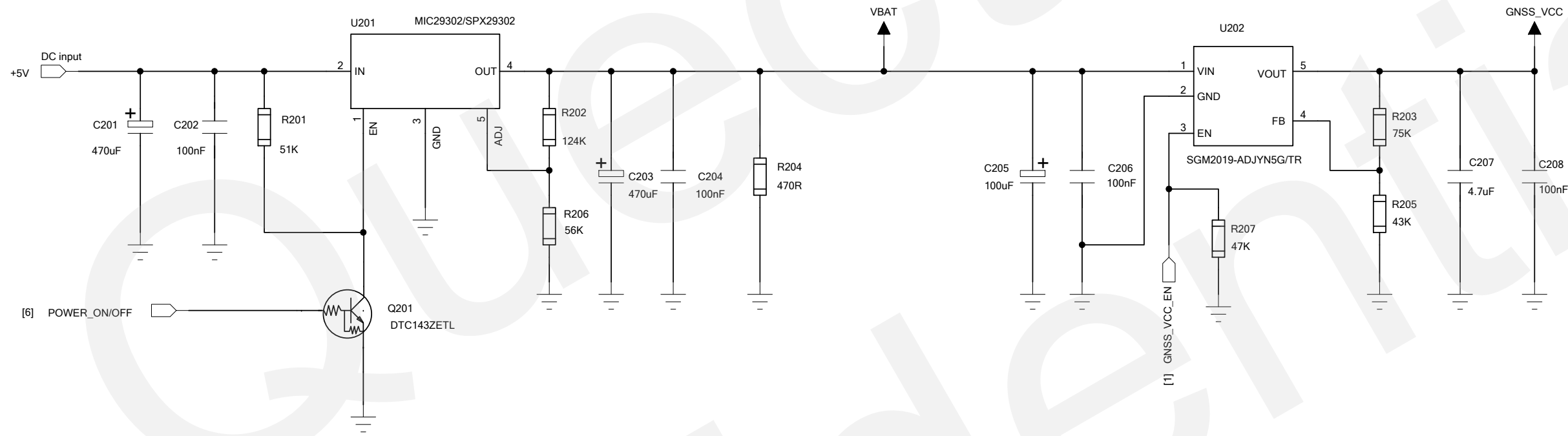
# Power Supply

## NOTE

The voltage converter should provide a minimum current of 2.0A.

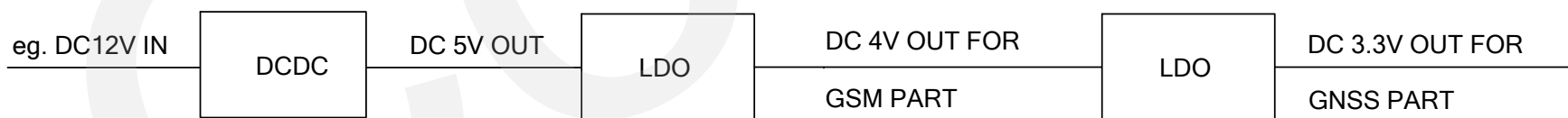
## LDO Application

It is used when the DC input voltage is below 7V.



## DC-DC Application

- 1. It can be used when the input voltage is above 7V in vehicle application.
- 2. Use DCDC to convert high input voltage to 5V and LDO will generate 4V/3.3V typical voltage for the module.

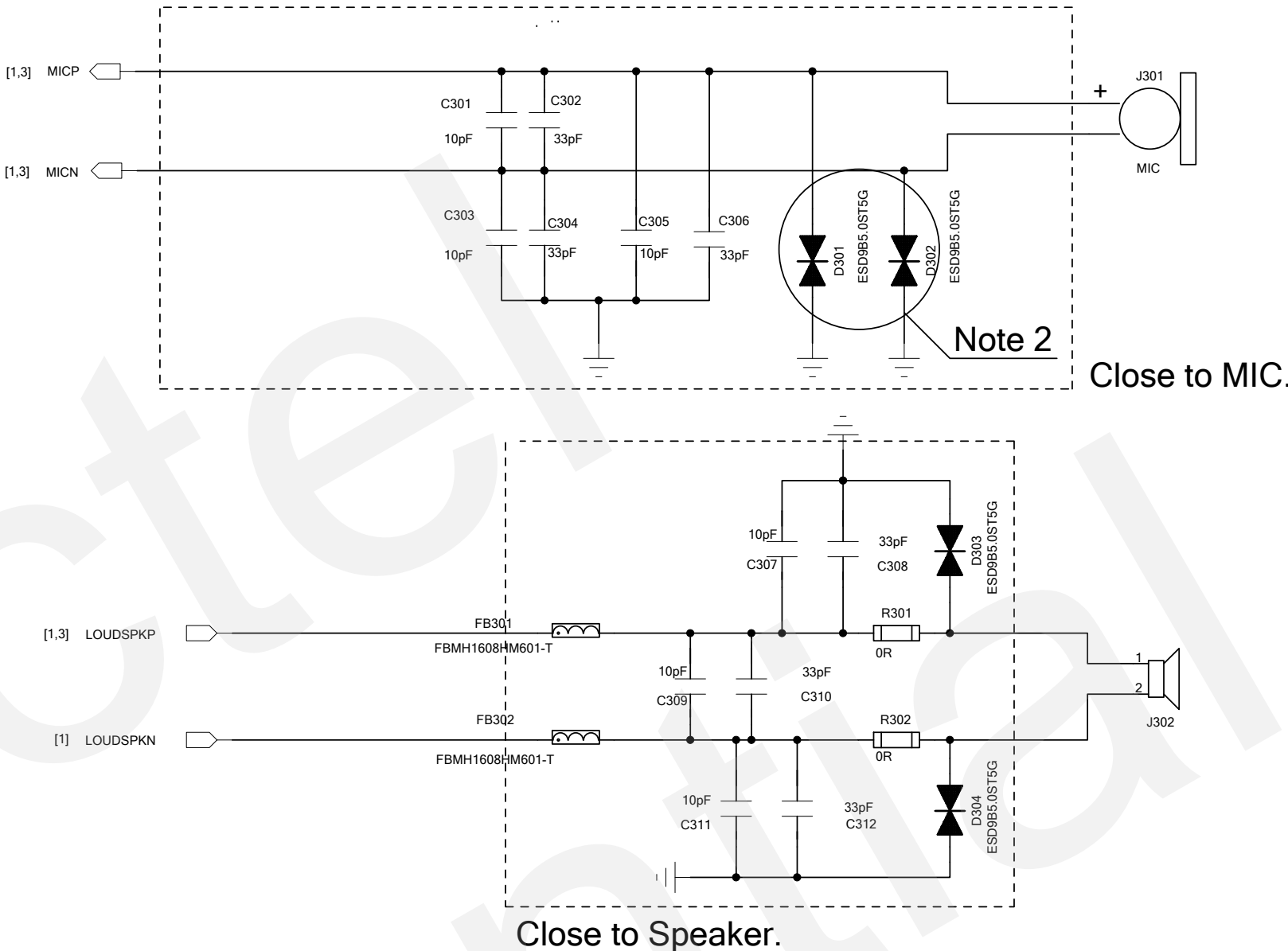


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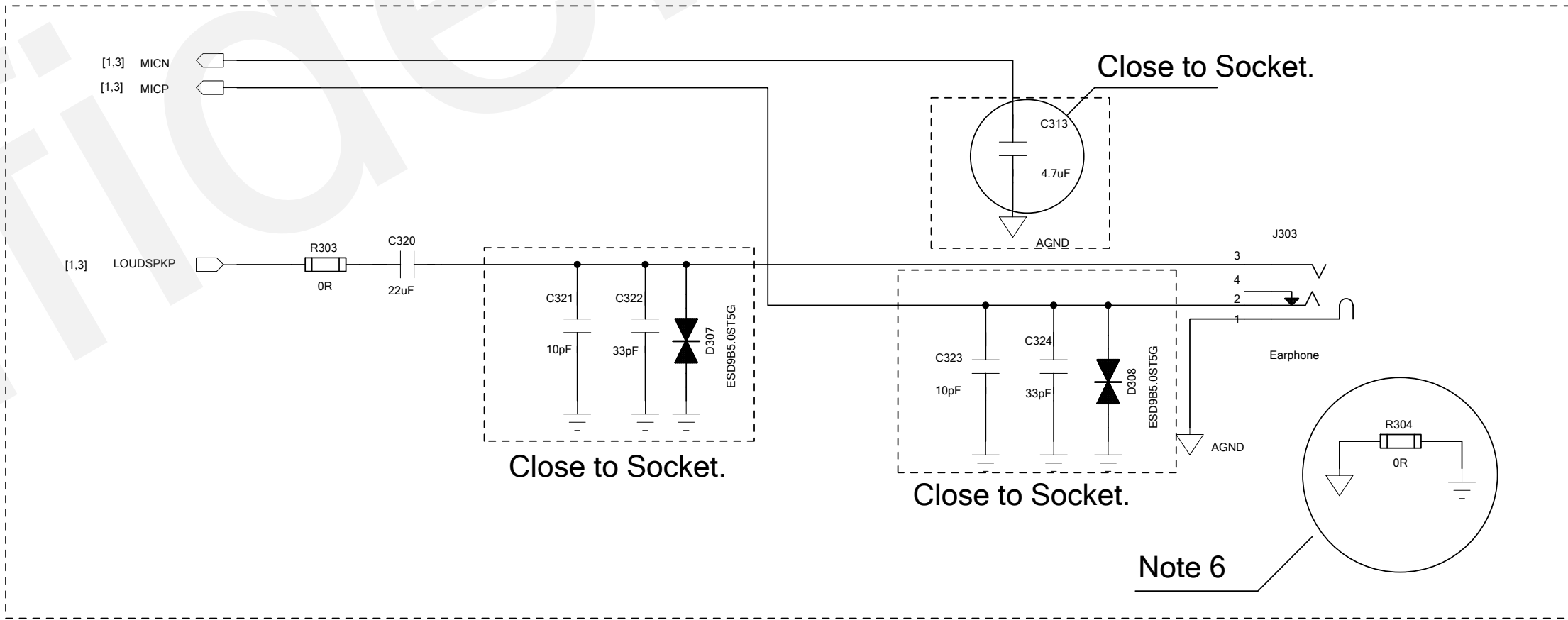
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# Audio Design

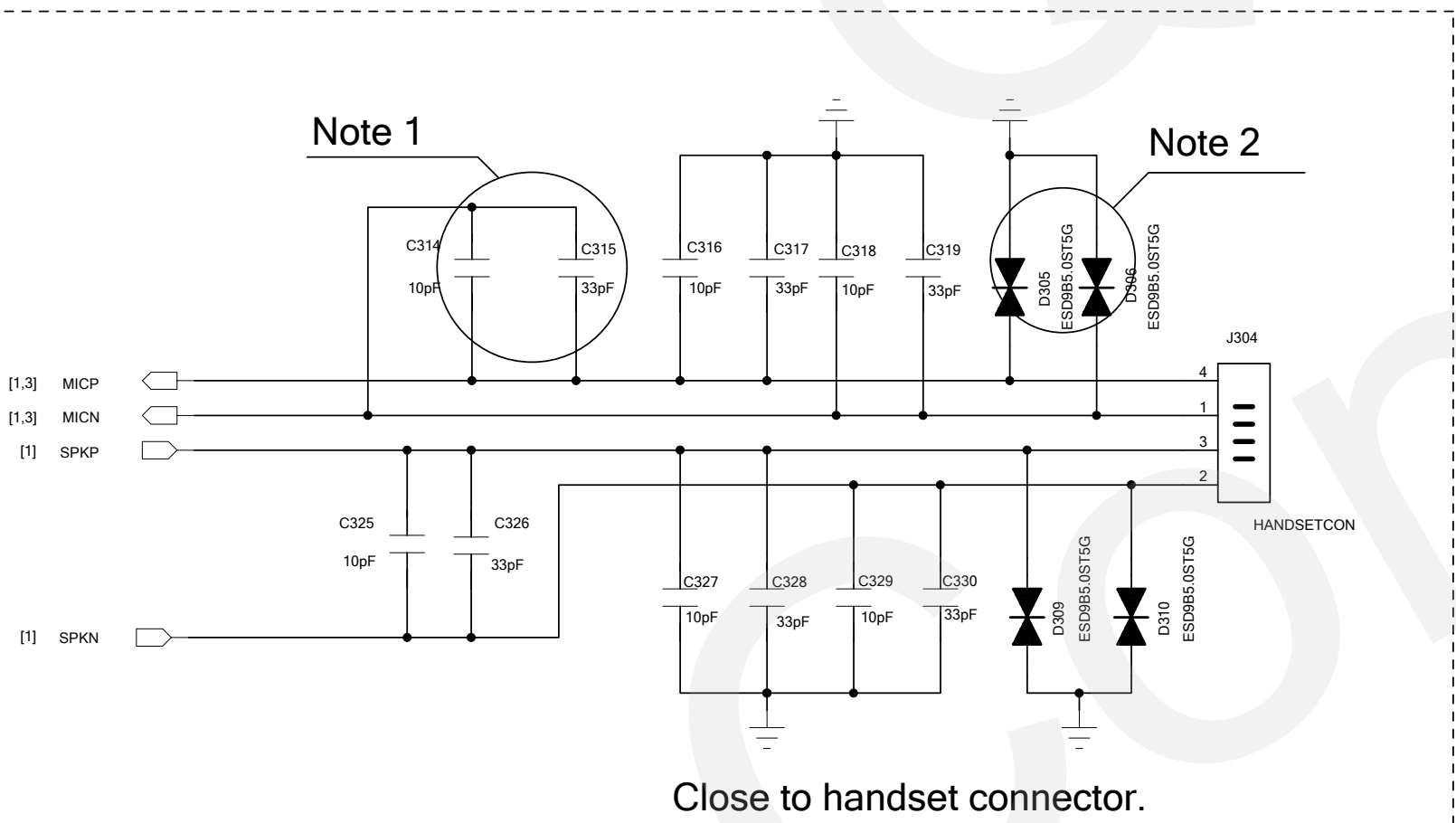
## Handsfree Application of AIN/AOUT2



## Earphone Application of AIN/AOUT2



## Handsets Application of AIN/AOUT1



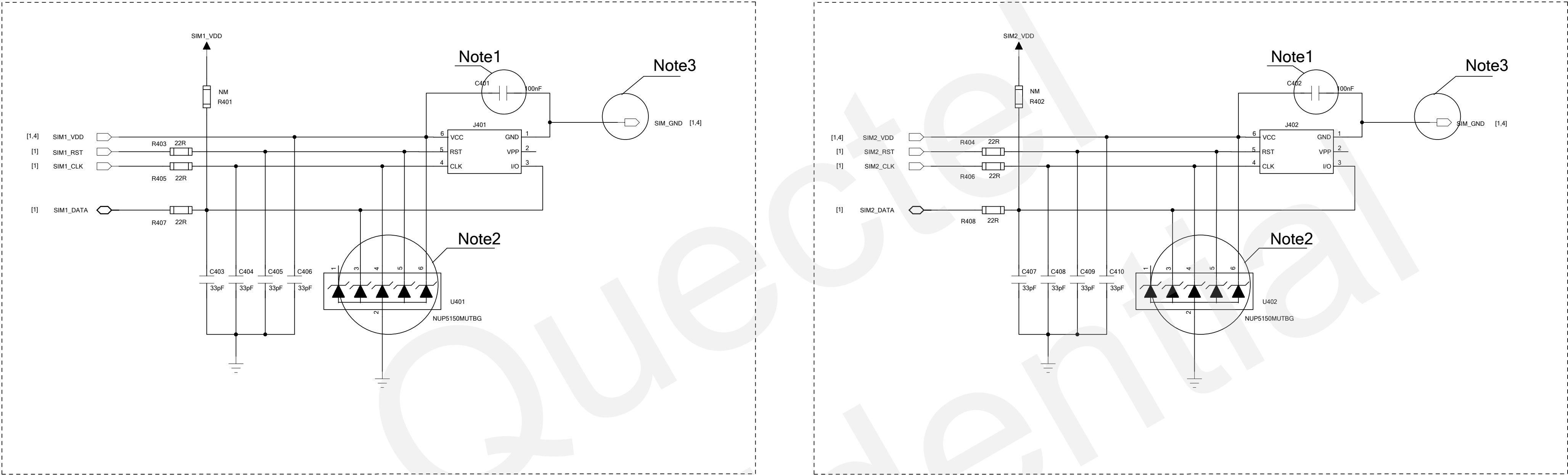
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SIM Card

SIM Card Interfaces



NOTES

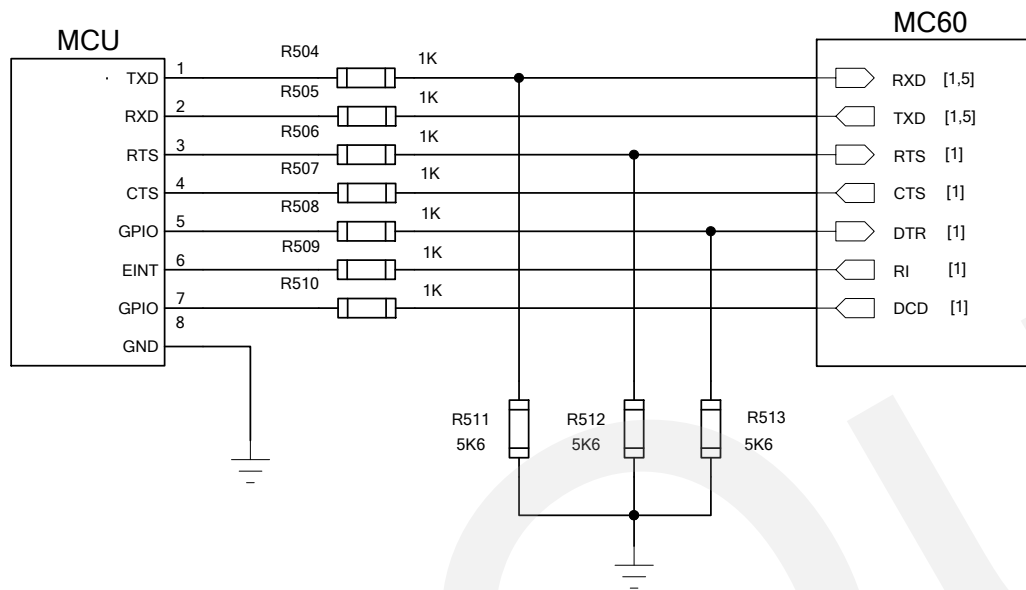
- 1. The value of C401/C402 should be less than 1uF.
- 2. U401/U402 is used for protecting SIM card against ESD, and the junction capacitance should be less than 50pF.  
It should be placed nearby SIM card holder.
- 3. For MC60-OpenCPU module, ground of SIM card is recommended to be routed to the Pin 16 ("SIM\_GND") of the module separately.

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Serial Interface

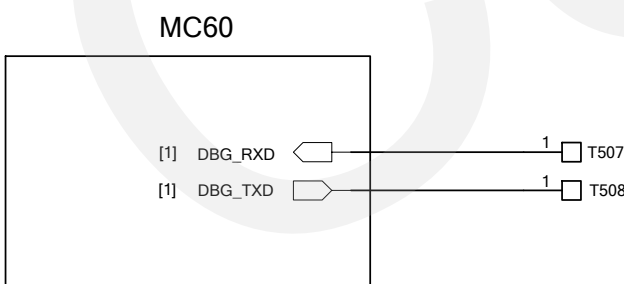
Electrical characteristics of the module's input and output port:  
VOHmin=0.85\*VDD\_EXT  
VOLmax=0.15\*VDD\_EXT  
VILmax=0.25\*VDD\_EXT  
VIHmin=0.75\*VDD\_EXT  
VIHmax=VDD\_EXT+0.2V  
VDD\_EXT=2.8V (typical value)

Connection of Full-function UART Port for 3.3V System



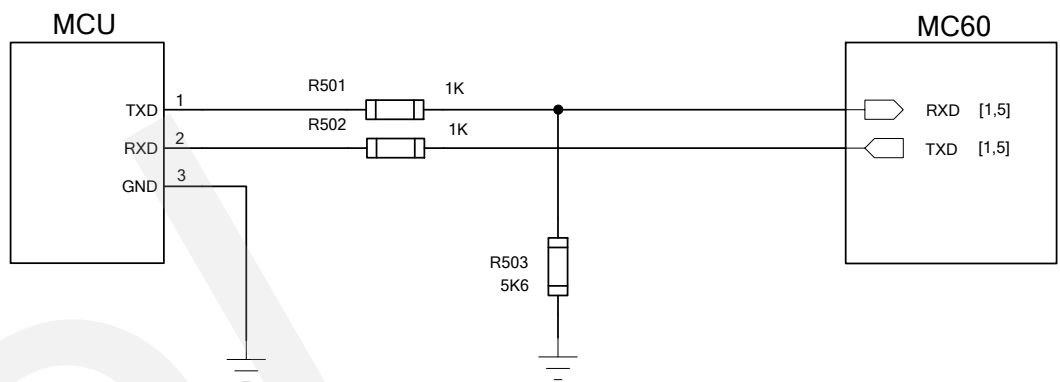
NOTES

1. CTS/RTS will be used for HW flow control when mass data has been sent.
2. When AT+QSClk=1 is set on the module, customer's application can control the module to enter into or exit from the sleep mode through the pin DTR. When DTR is set to high level, and there is no on-air or hardware interrupt, such as GPIO interrupt or data on serial port, the module will enter into sleep mode automatically.
3. RI will output an indication signal when activity such as voice call or SMS is coming.
4. DCD is mainly applied in modem communication (PPP). The active status represents that the communication link has been set up.
5. Please pay attention to the level match of UART in product application.



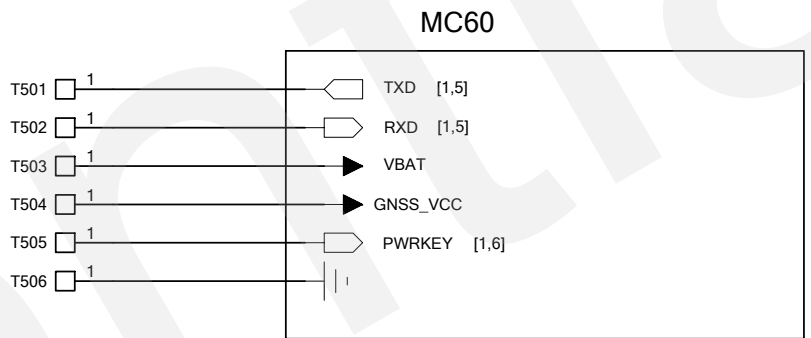
It is recommended to reserve the points for debug port.

Connection of Three-line UART Port for 3.3V System



Please pay attention to the level match of UART in product application.

It is recommended to reserve the points for upgrading the firmware.



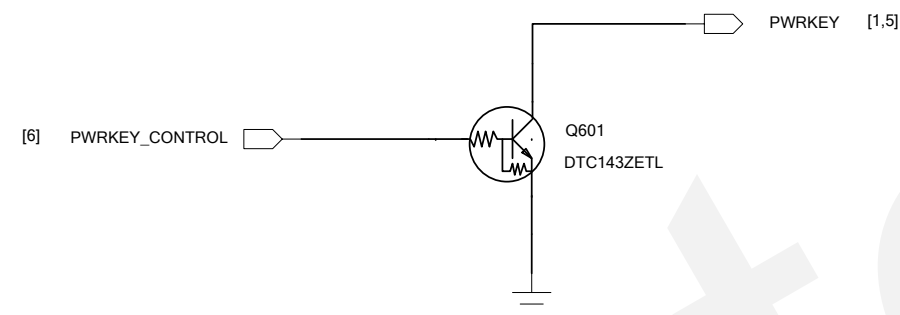
Please pay attention to the level match of UART in product application.

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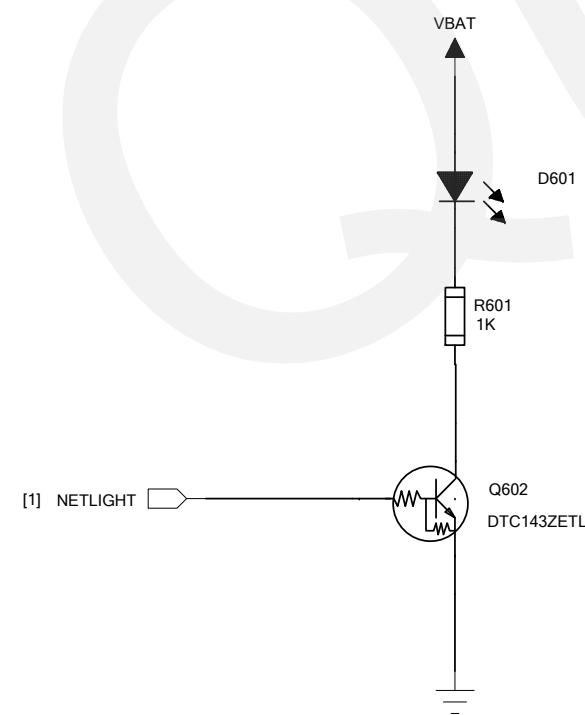
# MCU Control and Driver

## Turn on/off



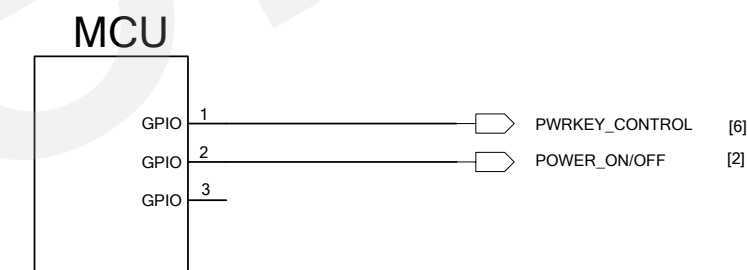
Recommended circuit for turning on/off the module.

## LED Indication



Pin "NETLIGHT" indicates the network status.

## MCU GPIO



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6		5		4		3		2		1					
Multiplexed Functions															
MC60-OpenCPU GPIO Function Configuration Table															
PIN NO.		PIN NAME		MODE1		MODE2		MODE3		MODE4		RESET		DRIVING (mA)	
7		SD_CMD		SD_CMD		GPIO						I/PD		4	
8		SD_CLK		SD_CLK		GPIO						I/PD		4	
9		SD_DATA		SD_DATA		GPIO						I/PD		4	
35		RI		RI		GPIO		I2C_SCL				I/PD		4	
36		DCD		DCD		GPIO		I2C_SDA				I/PD		4	
37		DTR		DTR		GPIO		EINT		SIM_PRESENCE		I/PD		4	
38		CTS		CTS		GPIO		EINT				I/PU		4	
39		RTS		RTS		GPIO						I/PU		4	
47		NETLIGHT		NETLIGHT		GPIO		PWM_OUT		EINT		I/PD		4	
59		PCM_CLK		PCM_CLK		GPIO		SPI_CS				HO/-		4	
60		PCM_OUT		PCM_OUT		GPIO		SPI_MOSI				I/PD		4	
61		PCM_SYNC		PCM_SYNC		GPIO		SPI_MISO				I/PD		4	
62		PCM_IN		PCM_IN		GPIO		SPI_CLK				I/PU		4	
NOTE															
1. O:output; I:input; PU:pull up; PD:pull down; HO:high output.															
2. All the pins in the table above belong to the voltage domain of VDD_EXT.															
3. Any pin in the table above should be kept floating if it is not used.															
4. The typical value for PD & PU is 75Kohm.															
5. Electrical characteristics of module's input or output port:															
VOHmax=VDD_EXT															
VOHmin=2.0V															
VILmax=0.67V															
VIHmin=1.7V															
VIHmax=VDD_EXT+0.3V															
VDD_EXT=2.8V typical value															
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6		5		4		3		2		1					