

# MC60

# Reference Design

**GSM/GPRS/GNSS Module Series**

Rev. B

Date: 2016-08-01



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## About the Document

### History

Revision	Date	Author	Description
B	2016-08-01	Tiger CHENG	Initial

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# 1 Introduction

## 1.1. Introduction

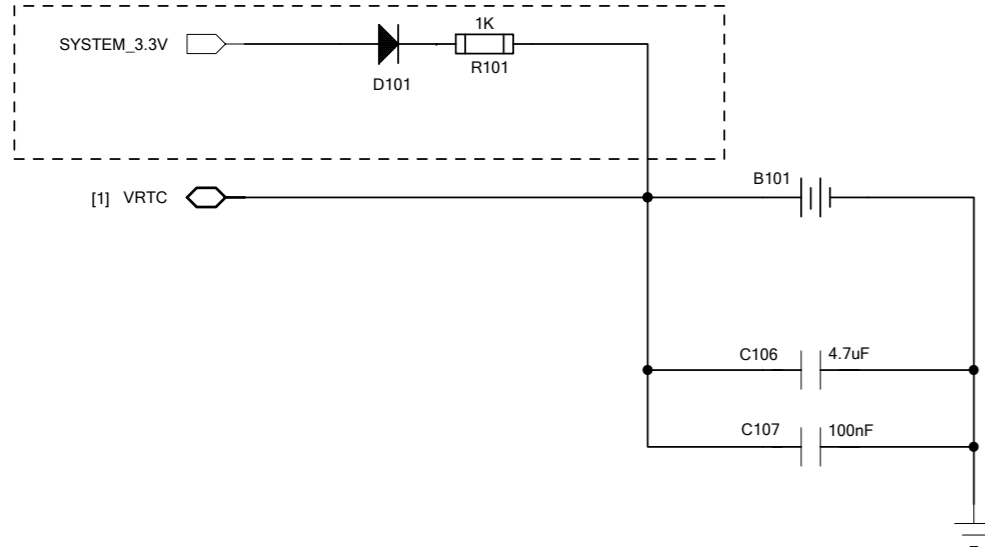
This document is a reference design for MC60 module.

## 1.2. Schematics

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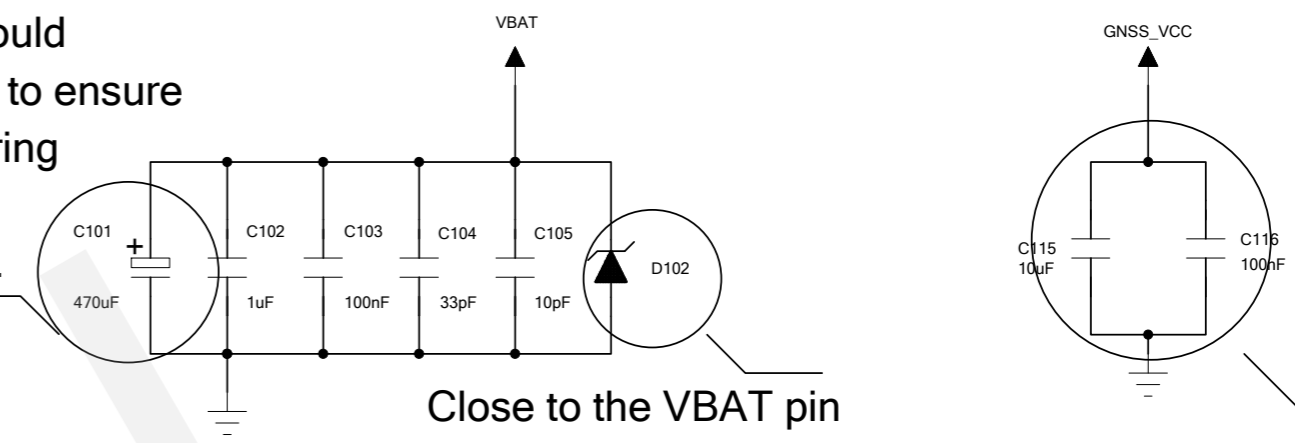
# Module Design

Charge golden capacitor or battery when VBAT is applied.



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

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



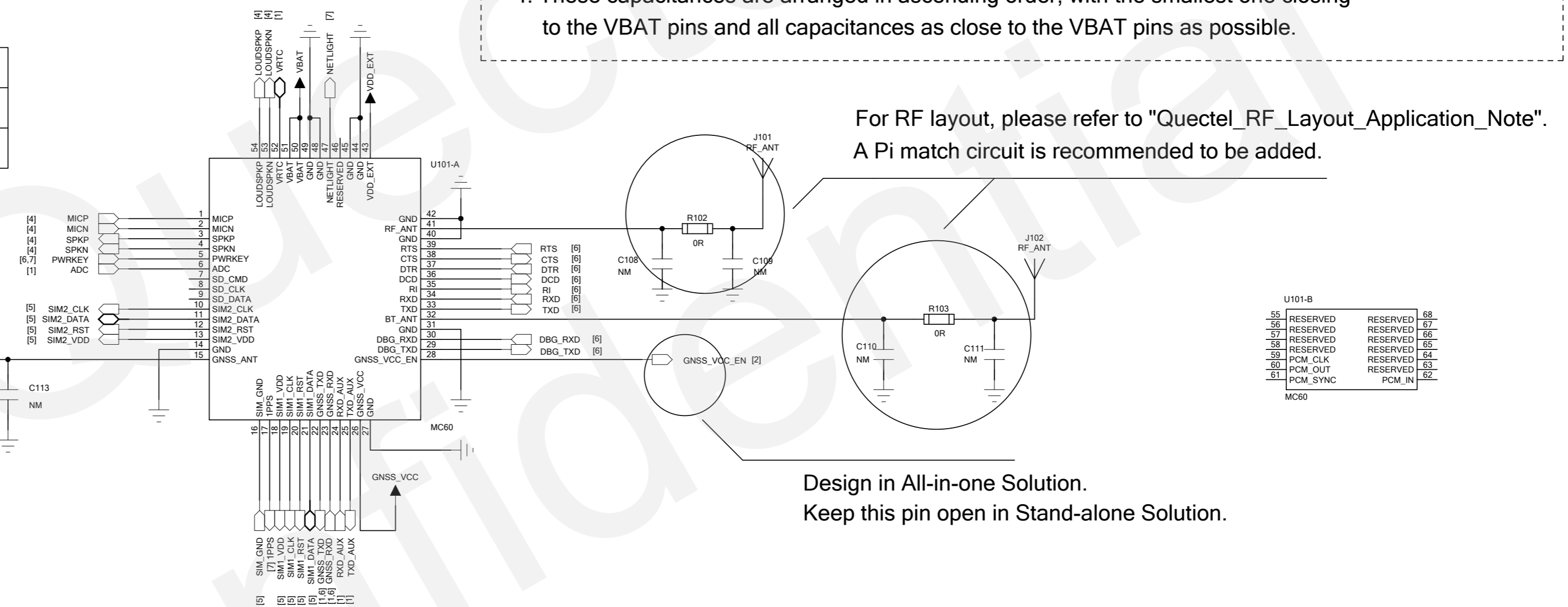
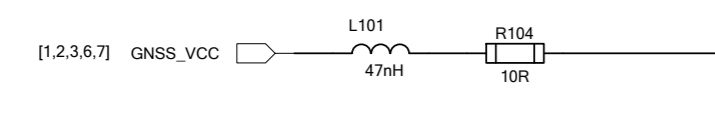
1. VBAT ranges from 3.3V to 4.6V.
2. Module drains the maximum current around 1.6A in burst time (577us).
3. The width of VBAT trace is recommended to be more than 2mm.
4. These capacitances are arranged in ascending order, with the smallest one closing to the VBAT pins and all capacitances as close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

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

Close to the GNSS\_VCC pin.

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

Active Antenna Power Supply Circuit

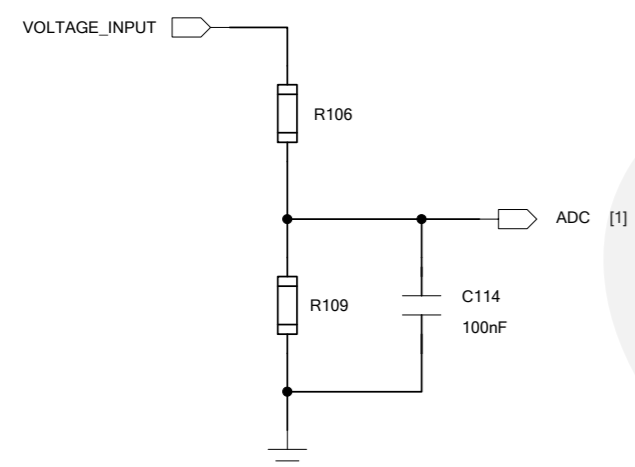


For RF layout, please refer to "Quectel\_RF\_Layout\_Application\_Note".  
A Pi match circuit is recommended to be added.

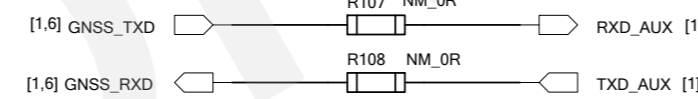
Design in All-in-one Solution.  
Keep this pin open in Stand-alone Solution.

U101-B	
55	RESERVED
56	RESERVED
57	RESERVED
58	RESERVED
59	RESERVED
60	PCM_CLK
61	PCM_OUT
62	PCM_SYNC
63	RESERVED
64	RESERVED
65	RESERVED
66	RESERVED
67	RESERVED
68	RESERVED

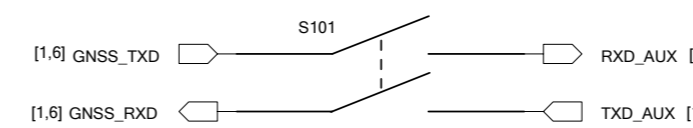
Reference Circuit of ADC



The voltage range of ADC input channel is from 0 to 2.8V.  
Please select a high-precision divider resistance.



Design in All-in-one Solution.



Design in Stand-alone Solution.

1. In Stand-alone Solution, keep the switch S101 closed during firmware upgrade, otherwise keep it disconnected.
2. For more details, please refer to the "Quectel\_MC60\_Hardware\_Design".

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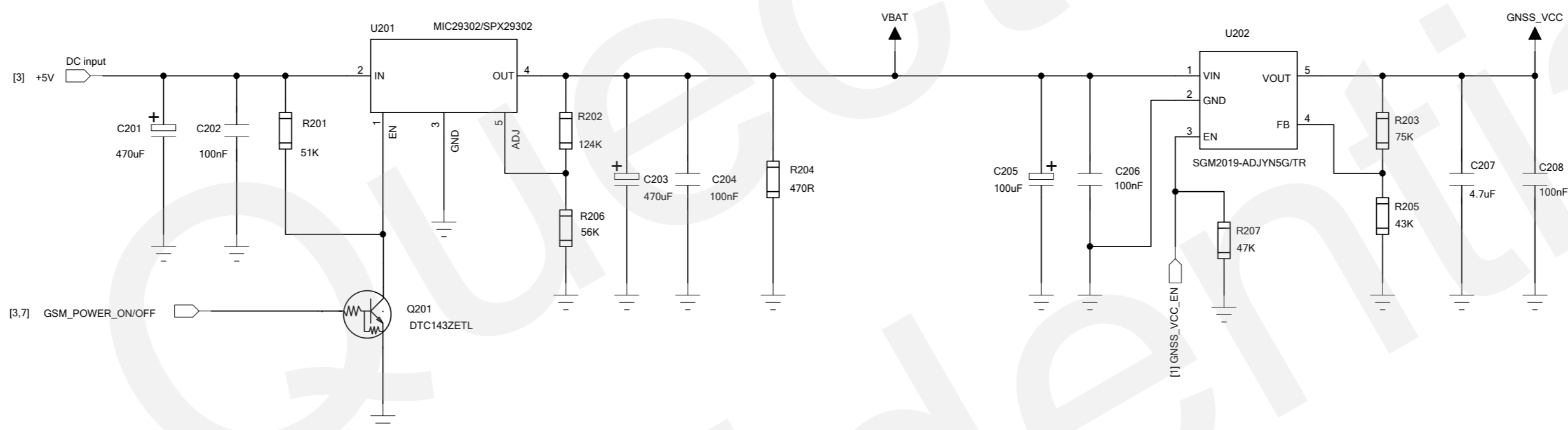
# Power Supply in All-in-one Solution

## NOTES

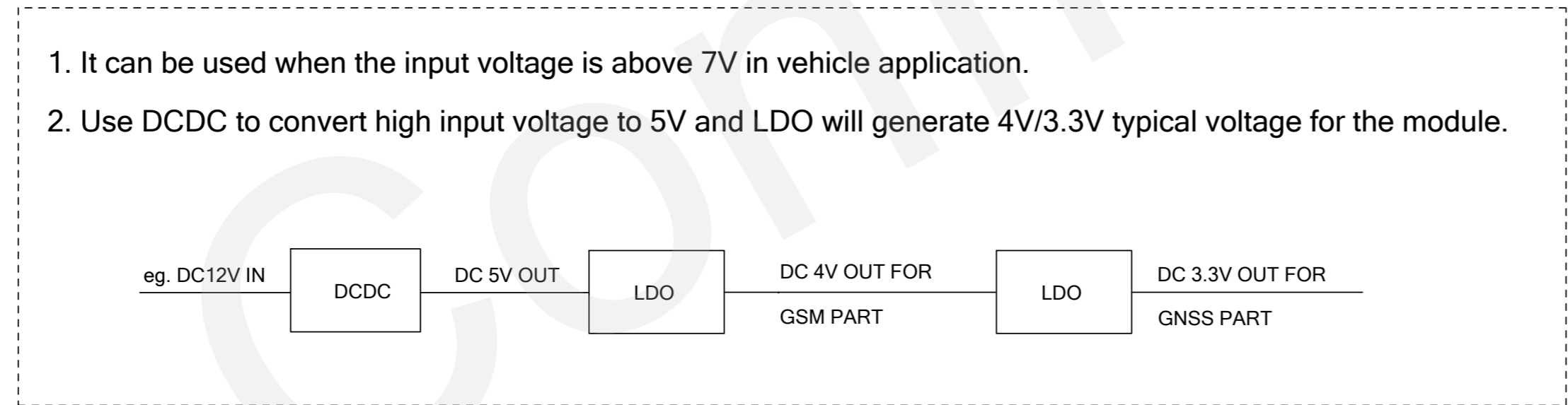
- 1. All reference circuits in this sheet apply only to All-in-one Solution.
- 2. The voltage converter should provide a minimum current of 2.0A.

## LDO Application

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



## DC-DC Application



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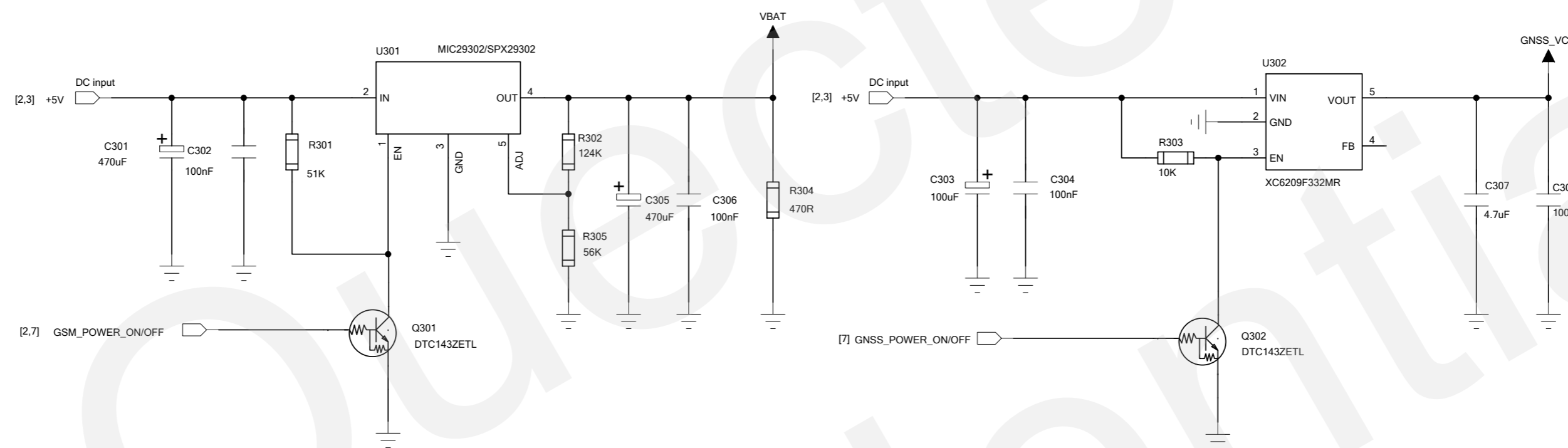
# Power Supply in Stand-alone Solution

## NOTES

- 1. All reference circuits in this sheet apply only to Stand-alone Solution.
- 2. The voltage converter should provide a minimum current of 2.0A.

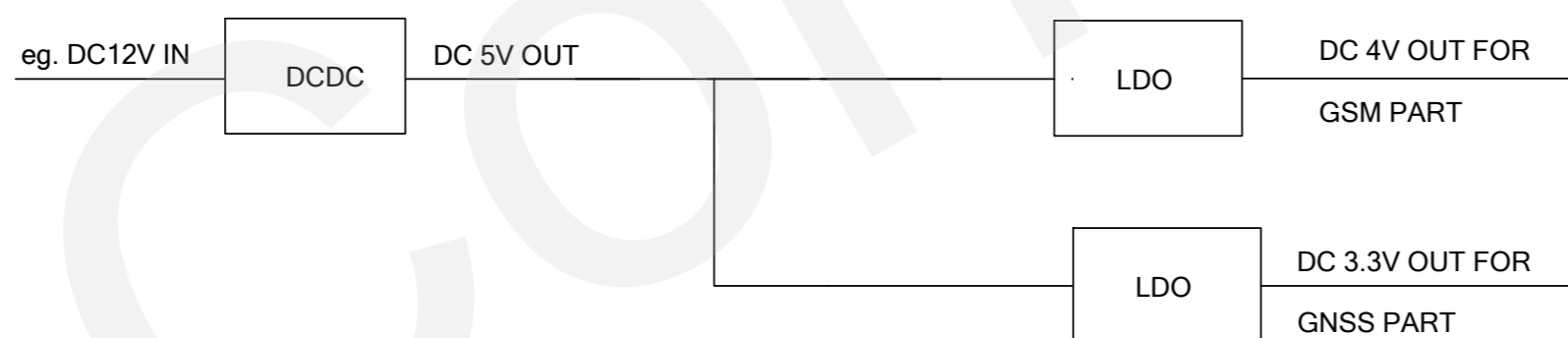
## LDO Application

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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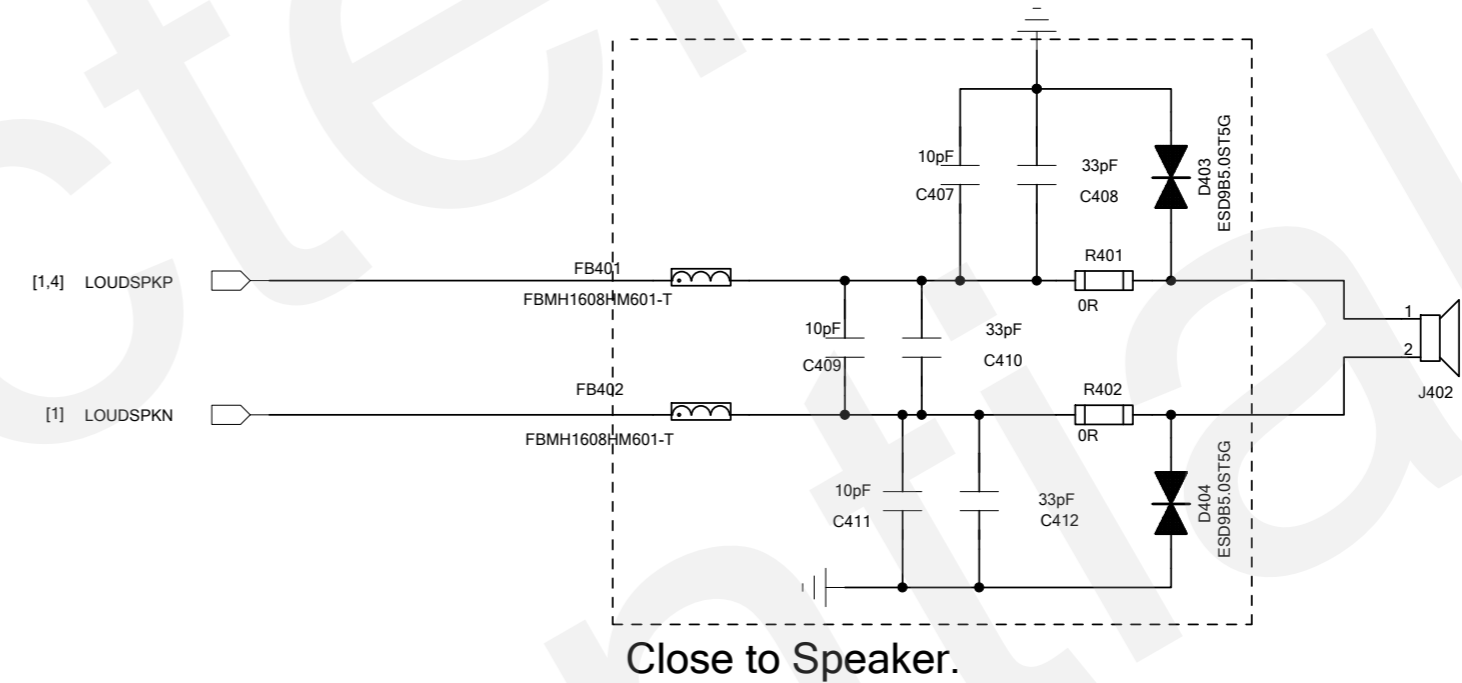
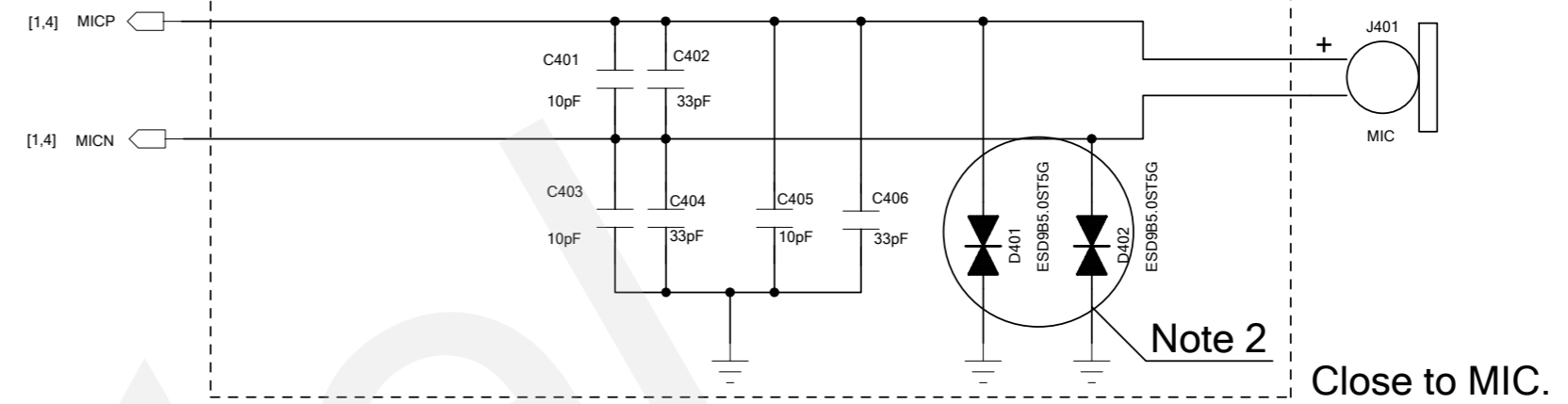


# Audio Design

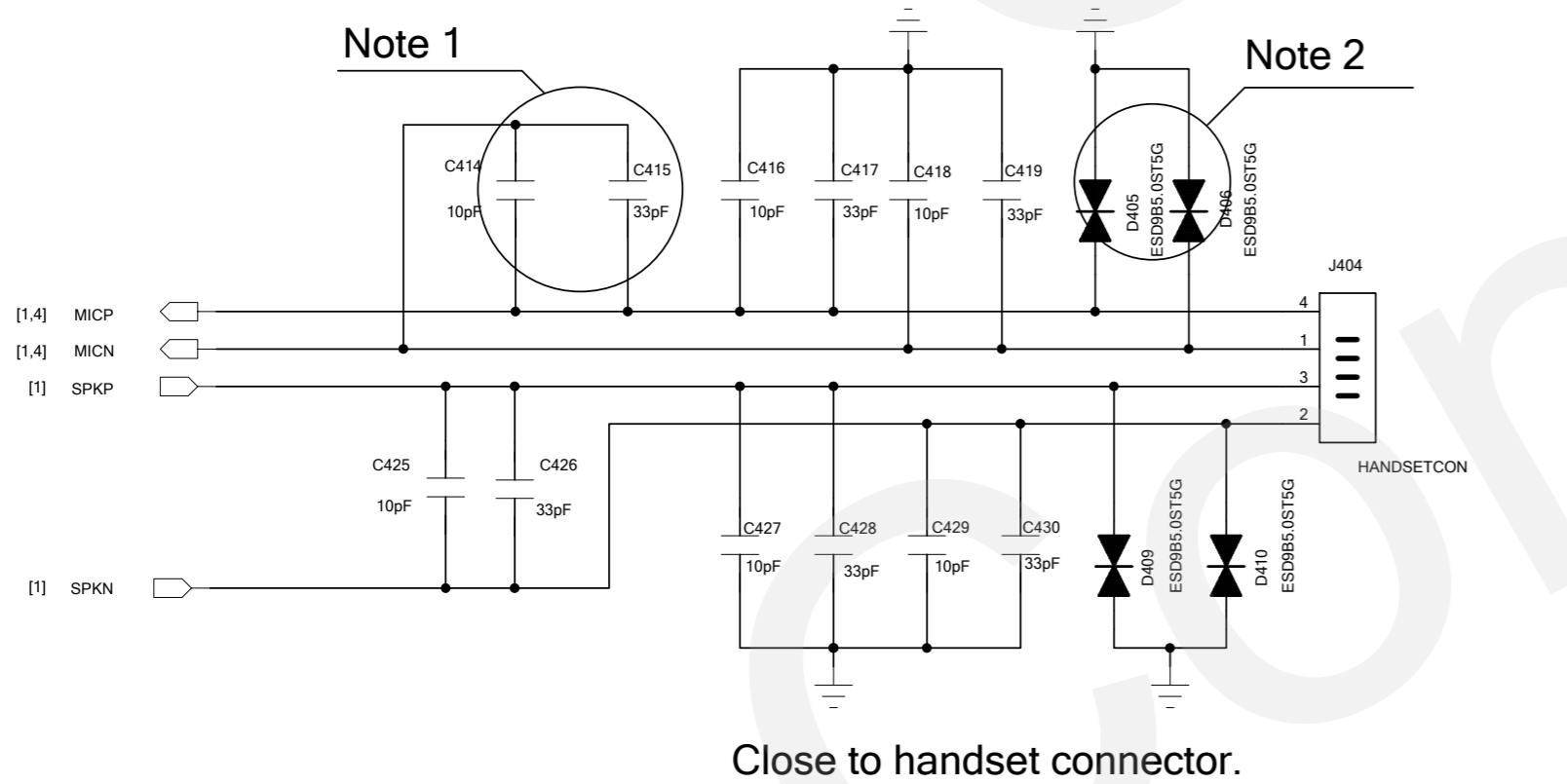
## NOTES

1. 10p & 33p capacitors are used for filtering TDD noise.
2. These components are used to enhance the ESD protection performance of MIC lines, and thus it is strongly recommended to reserve them.
3. AIN has bias voltage of microphone.
4. AOUT1 is capable of driving 32ohm load.
5. AOUT2 is capable of driving 8ohm load and Earphone.
6. It is recommended that customer connect AGND and MAIN GROUND together if a single-ended earphone is used.

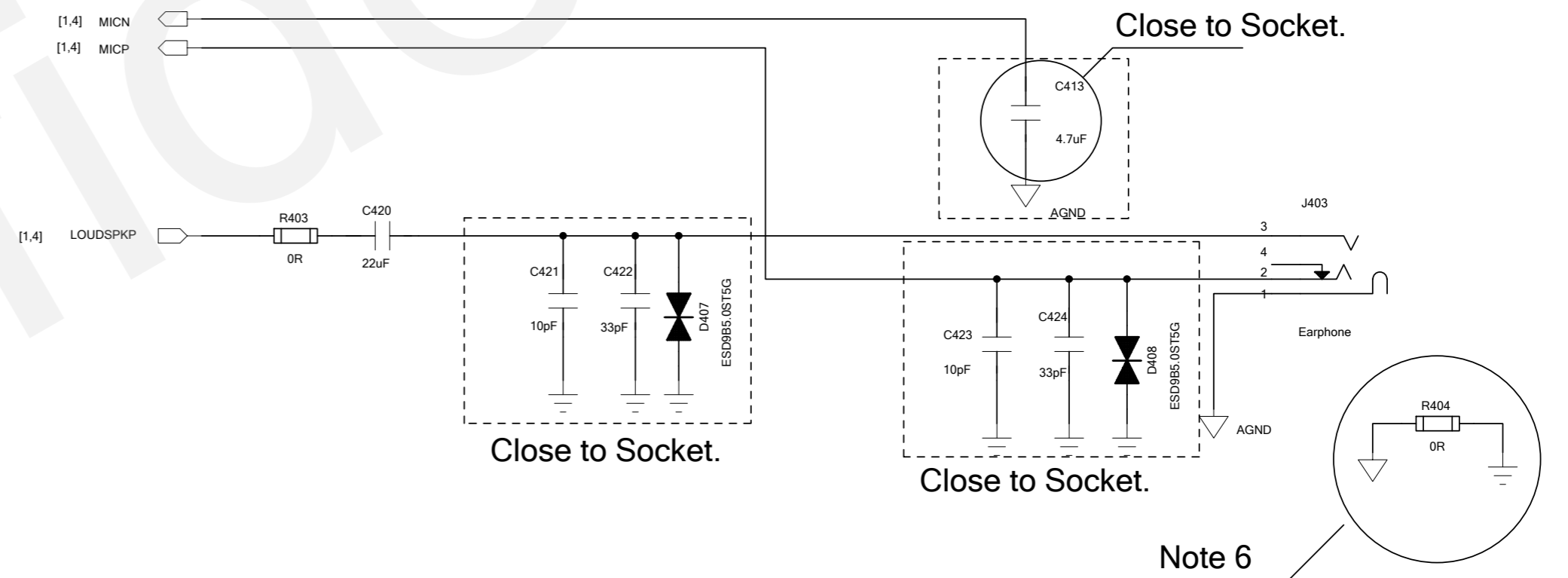
### Handsfree Application of AIN/AOUT2



### Handsets Application of AIN/AOUT1



### Earphone Application of AIN/AOUT2

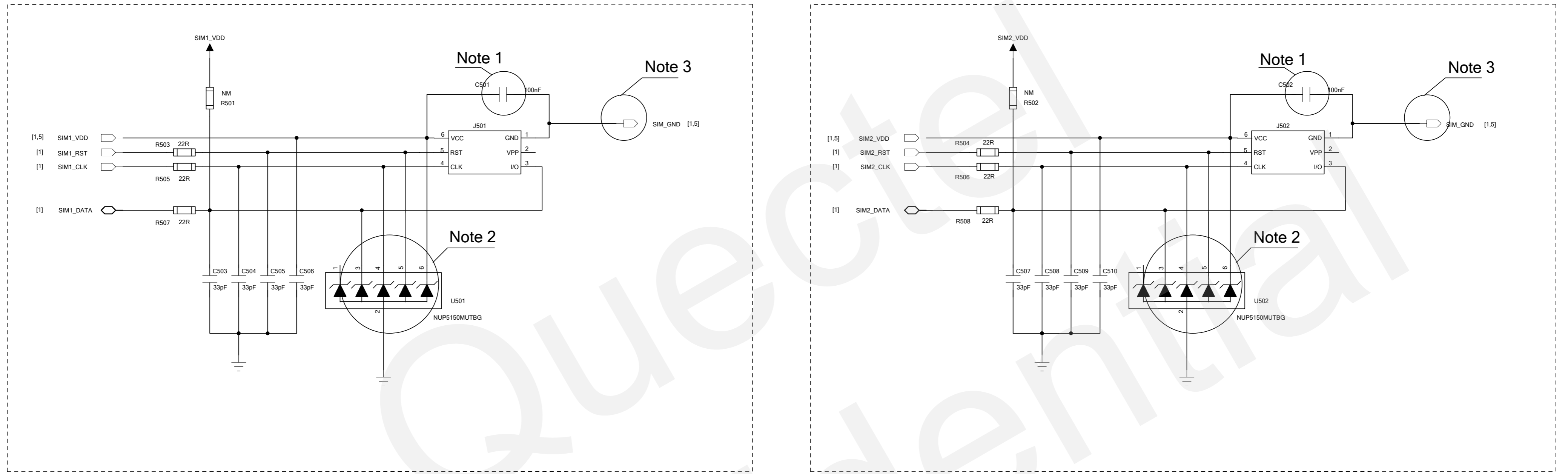


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# SIM Card

## SIM Card Interface



### NOTES

1. The value of C501/C502 should be less than 1uF.
2. U501/U502 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 module, ground of SIM card is recommended to be routed to the Pin 16 ("SIM\_GND") of the module separately.

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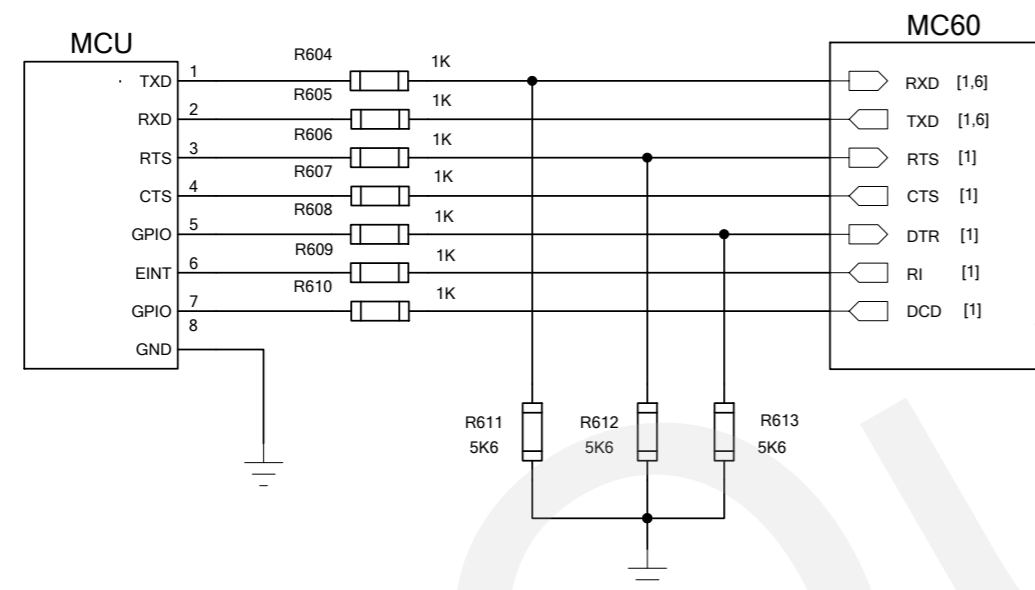
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# Serial Interface

Electrical characteristics of the module's input and output port:

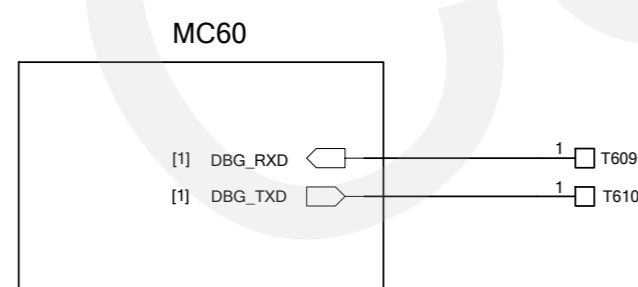
- $VOH_{min} = 0.85 * VDD\_EXT$
- $VOL_{max} = 0.15 * VDD\_EXT$
- $VIL_{max} = 0.25 * VDD\_EXT$
- $VIH_{min} = 0.75 * VDD\_EXT$
- $VIH_{max} = VDD\_EXT + 0.2V$
- $VDD\_EXT = 2.8V$  (typical value)

## Connection of Full-function UART Port for 3.3V System



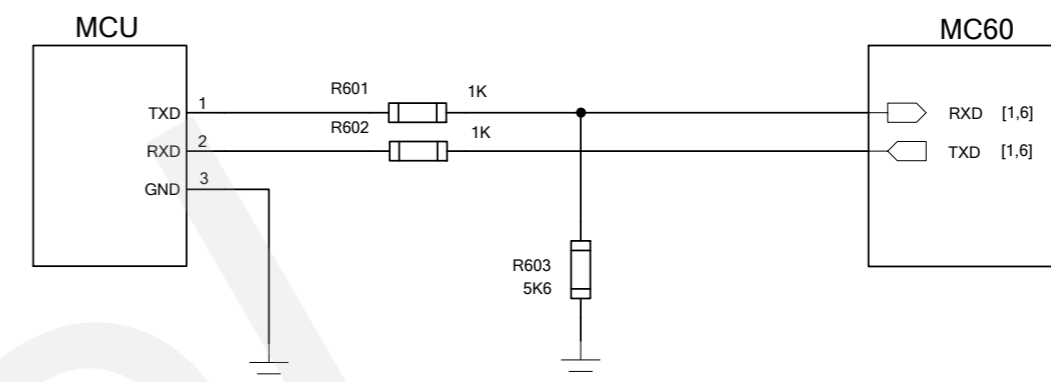
### NOTES

- CTS/RTS will be used for HW flow control when mass data has been sent.
- 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.
- RI will output an indication signal when activity such as voice call or SMS is coming.
- DCD is mainly applied in modem communication (PPP). The active status represents that the communication link has been set up.
- Please pay attention to the level match of UART in product application.



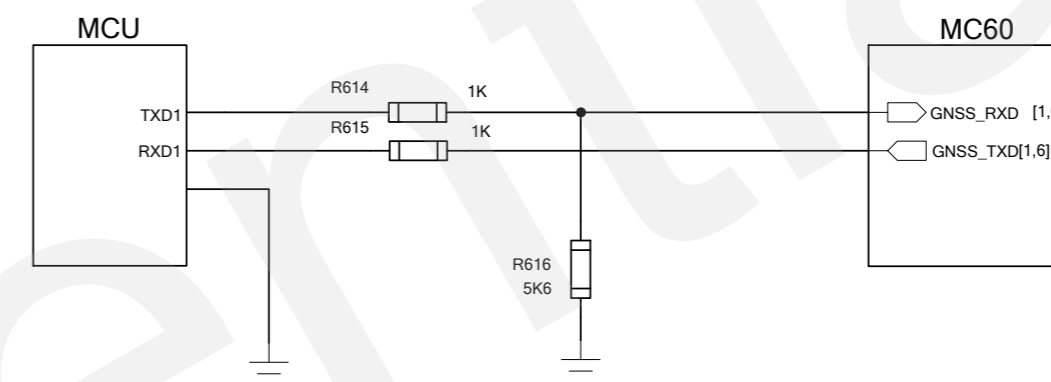
It is recommended to reserve the points for debug port.

## Connection of Three-line UART Port for 3.3V System



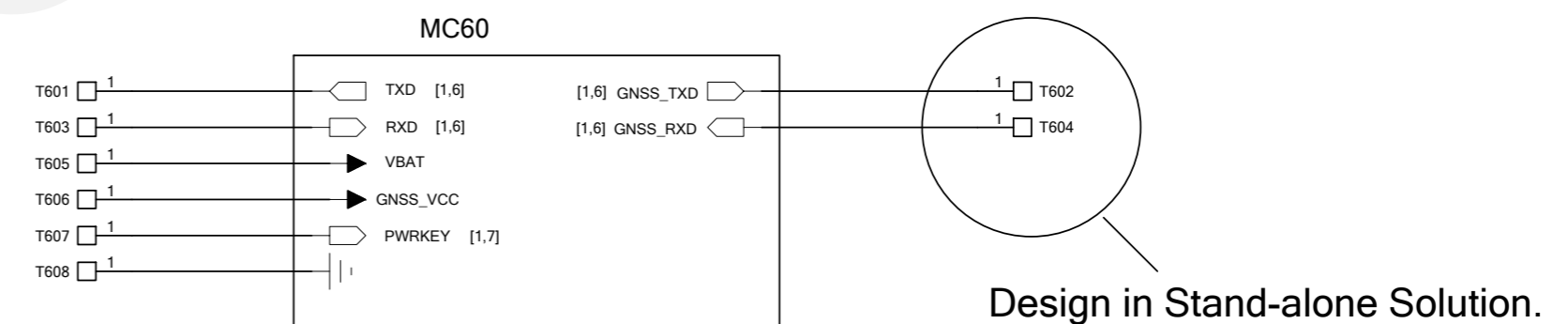
Please pay attention to the level match of UART in product application.

Connection of GNSS UART Port for 3.3V System in Stand-alone Solution. In All-in-one Solution, the circuit design is not needed and thus can be ignored.



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

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



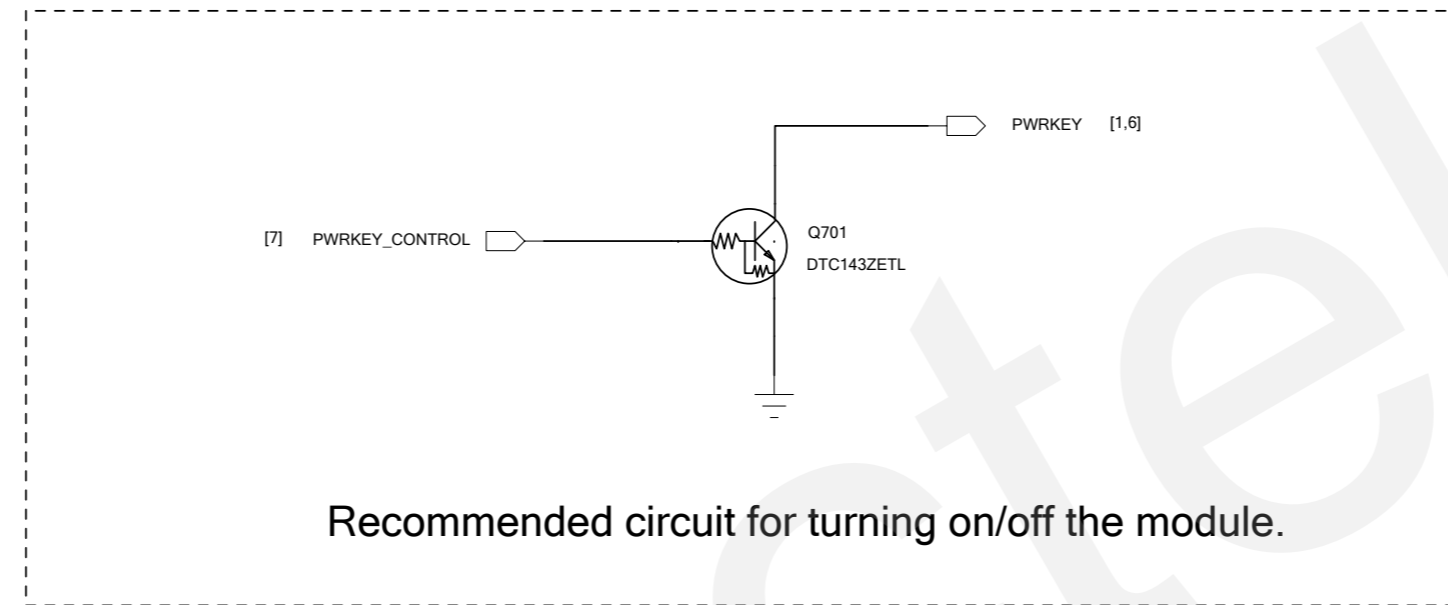
Please pay attention to the level match of UART in product application.

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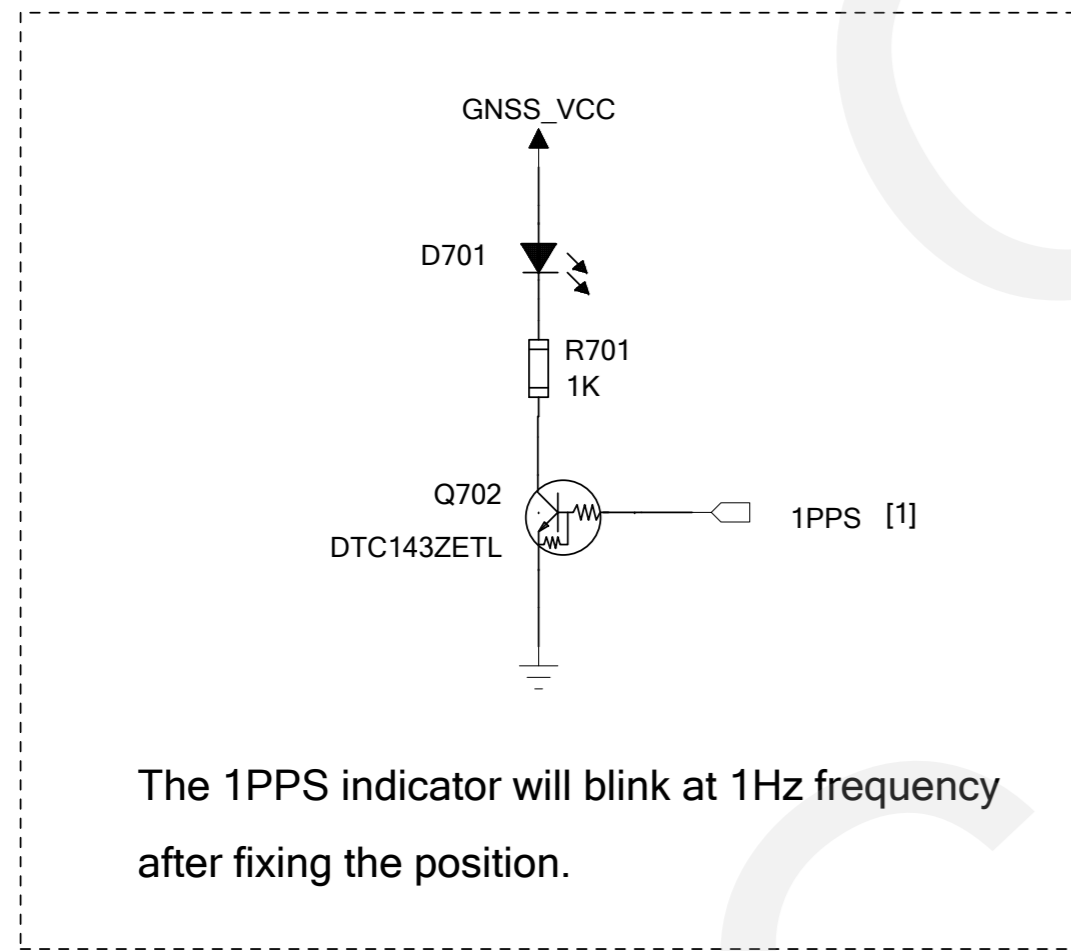
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# MCU Control and Driver

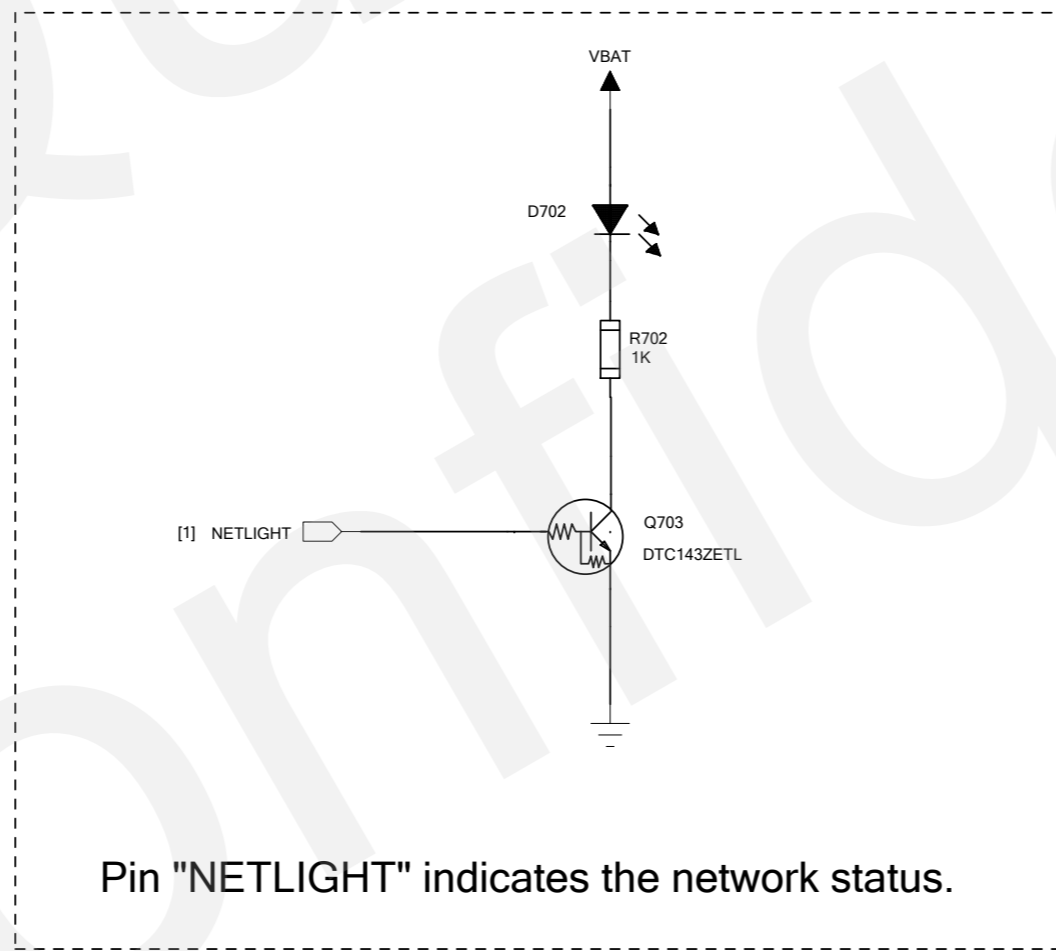
## GSM Turn on/off



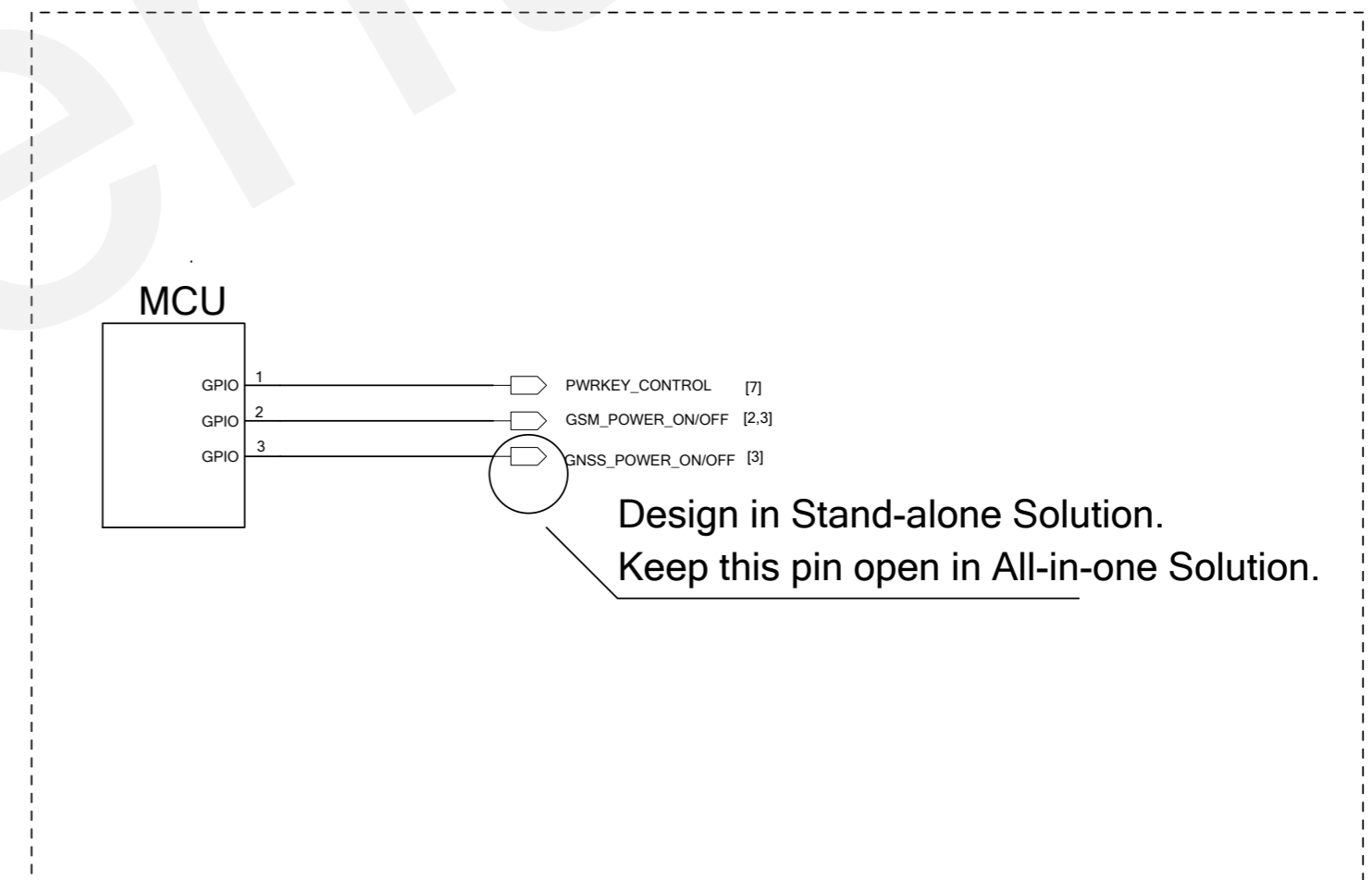
## 1PPS Indication



## NETWORK STATUS Indication



## MCU GPIO



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