

# **EM06** Reference Design

**LTE-A Module Series**

Rev. EM06\_Reference\_Design\_ Rev.A

Date: 2018-08-02

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# About the Document

## History

Revision	Date	Author	Description
A	2018-08-02	Oscar LIU	Initial

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# 1 Reference Design

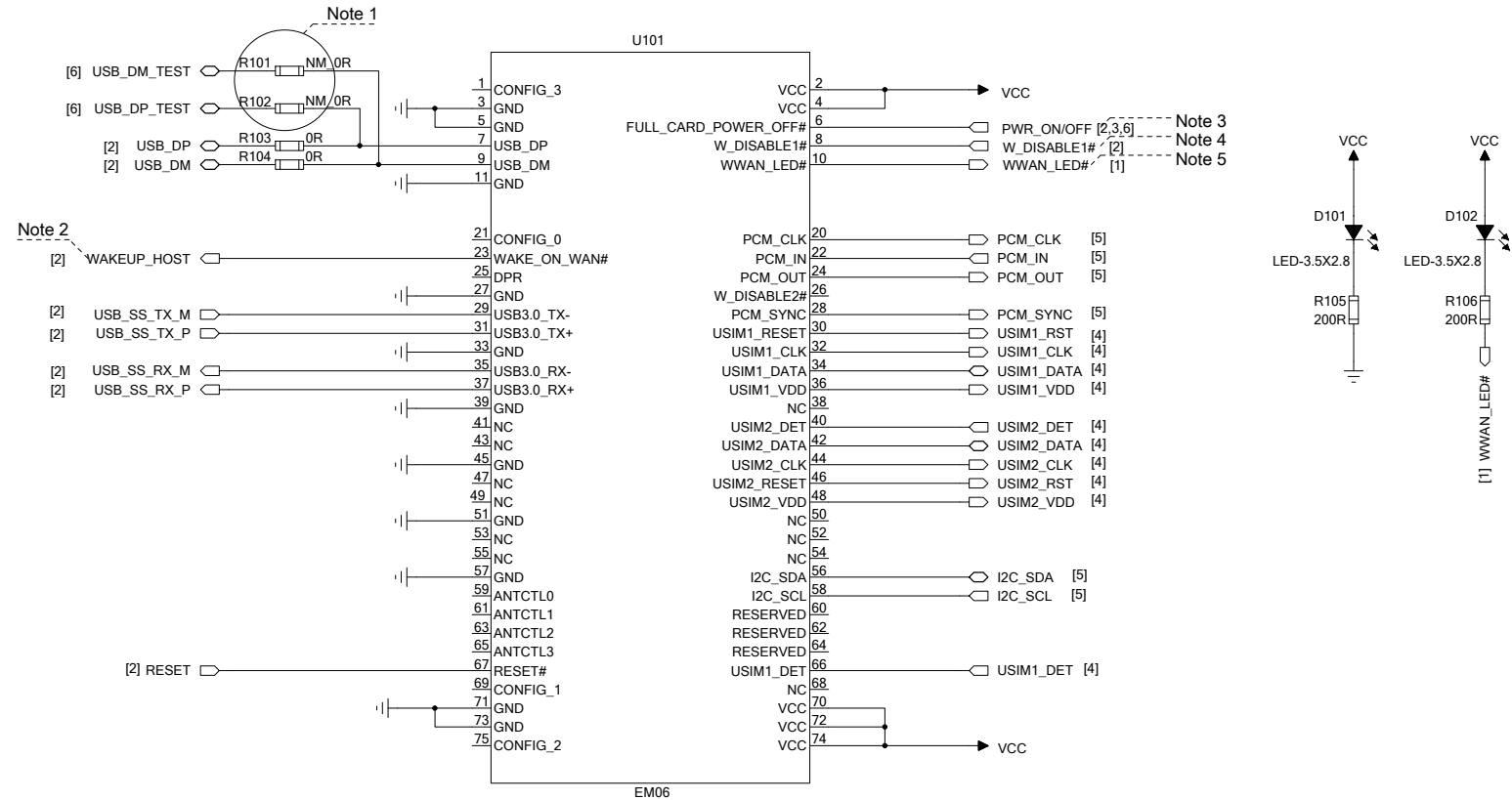
## 1.1. Introduction

This document provides the reference design for Quectel EM06 module.

## 1.2. Schematics

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

# Module Interface



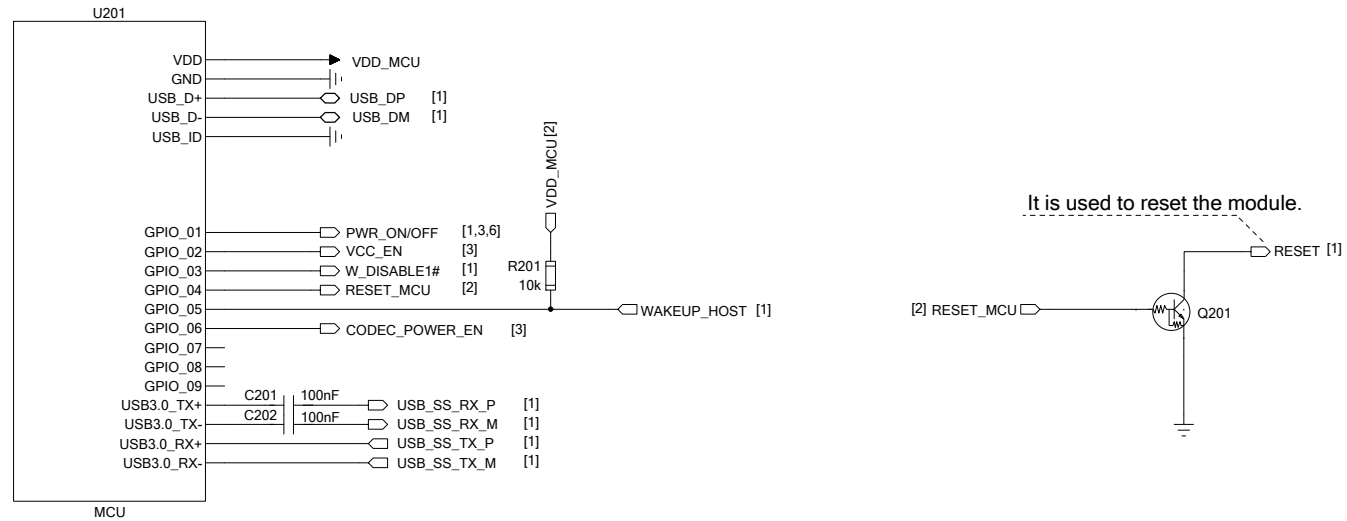
## Notes:

1. It is recommended to reserve the test points for upgrading the firmware over USB interface and minimizing the stub length of USB test signals.
2. The WAKE\_ON\_WAN# signal is an open drain signal, and requires a pull-up resistor on the host.
3. FULL\_CARD\_POWER\_OFF# is controlled by MCU. The signal is used to control power-on/-off of the module. When it is at low level, the module powers off. When it is at high level, the module powers on.
4. W\_DISABLE1# signal is used to enable or disable wireless communications through hardware operation. RF function is disabled when W\_DISABLE1# is at low level.
5. WWAN\_LED# is used to indicate RF status of the module, and its typical current consumption is up to 40mA. When WWAN\_LED# is at low level, it indicates the RF function is turned on. When the pin is at high level, it indicates the RF function is turned off.

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# MCU Interface



It is used to reset the module.

## Notes:

1. U201 represents customers' MCU.
2. EM06 provides one integrated USB interface which complies with the USB 3.0/2.0 specifications, and supports super speed on USB 3.0, high speed and full speed modes on USB 2.0.
3. Keep C201 and C202 to the MCU as close as possible.
4. The differential impedance of USB 2.0 and USB 3.0 signal lines needs to be controlled as 90 ohm.
5. If USB connector is used, please keep the ESD protection components to the USB connector as close as possible.

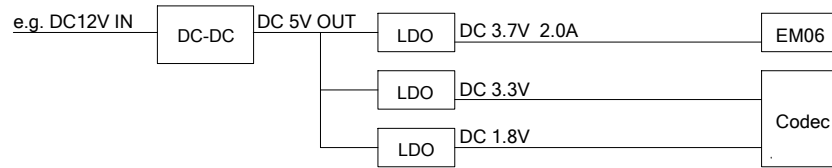
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# Power Supply Design

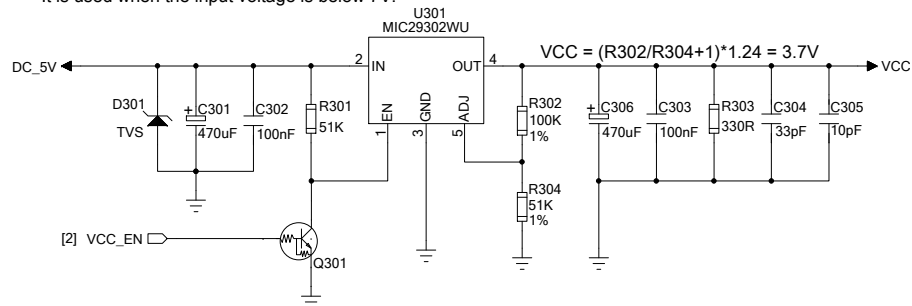
## DC-DC Application

When the input voltage is above 7V, a DC-DC converter should be used to convert the high input voltage to 5V output, and then the LDOs will generate 3.4V, 3.3V and 1.8V typical voltages.



## LDO Application

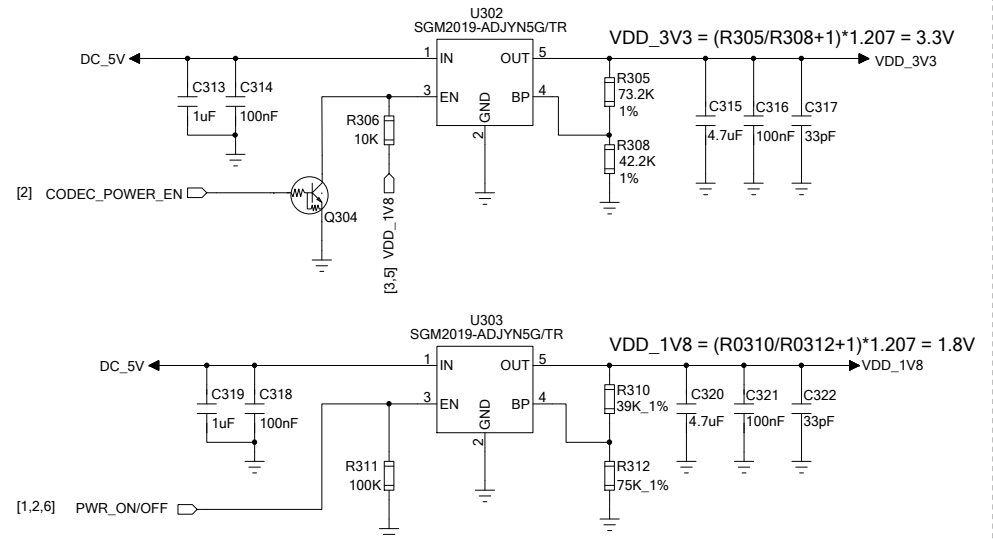
It is used when the input voltage is below 7V.



### Notes:

1. The load current of MIC29302WU is recommended to be greater than 10mA.
2. The power supply must be able to provide sufficient current up to 2A or more.
3. The recommended operating voltage of VCC is 3.135V~4.4V.

## Supply Power for PCM Codec



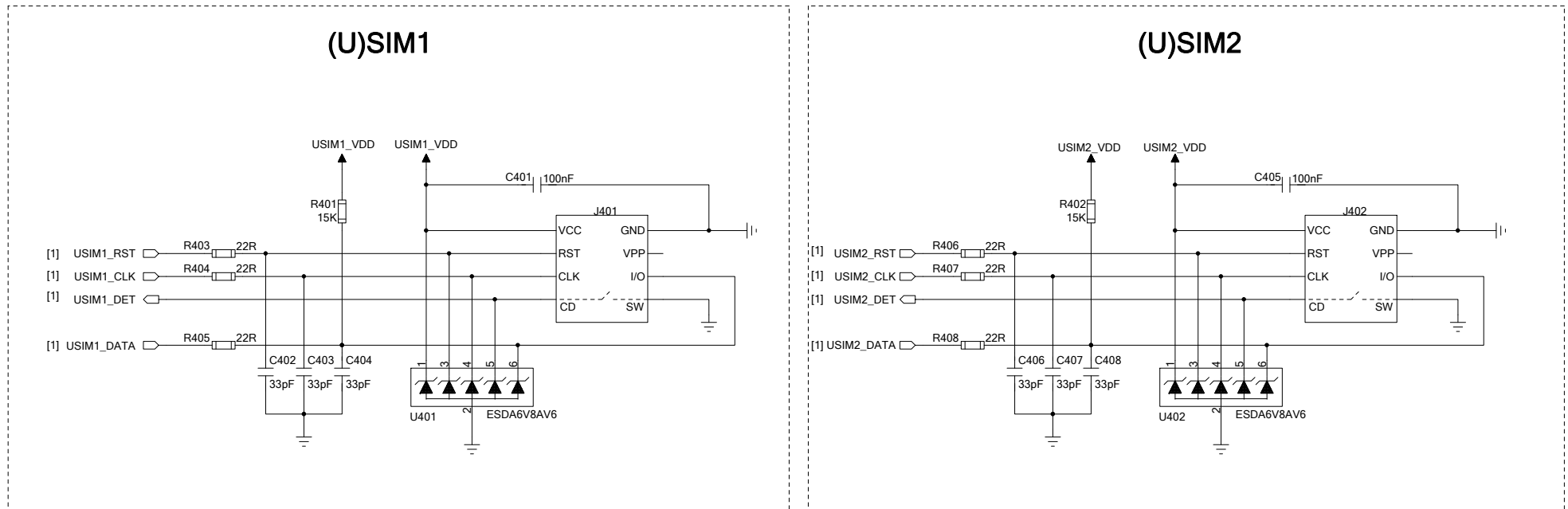
Note:  
CODEC\_POWER\_EN must be at low level in order to ensure output voltage of VDD\_3V3 normally.  
When it is at high level, VDD\_3V3 will be cut off.

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# (U)SIM Interface Design

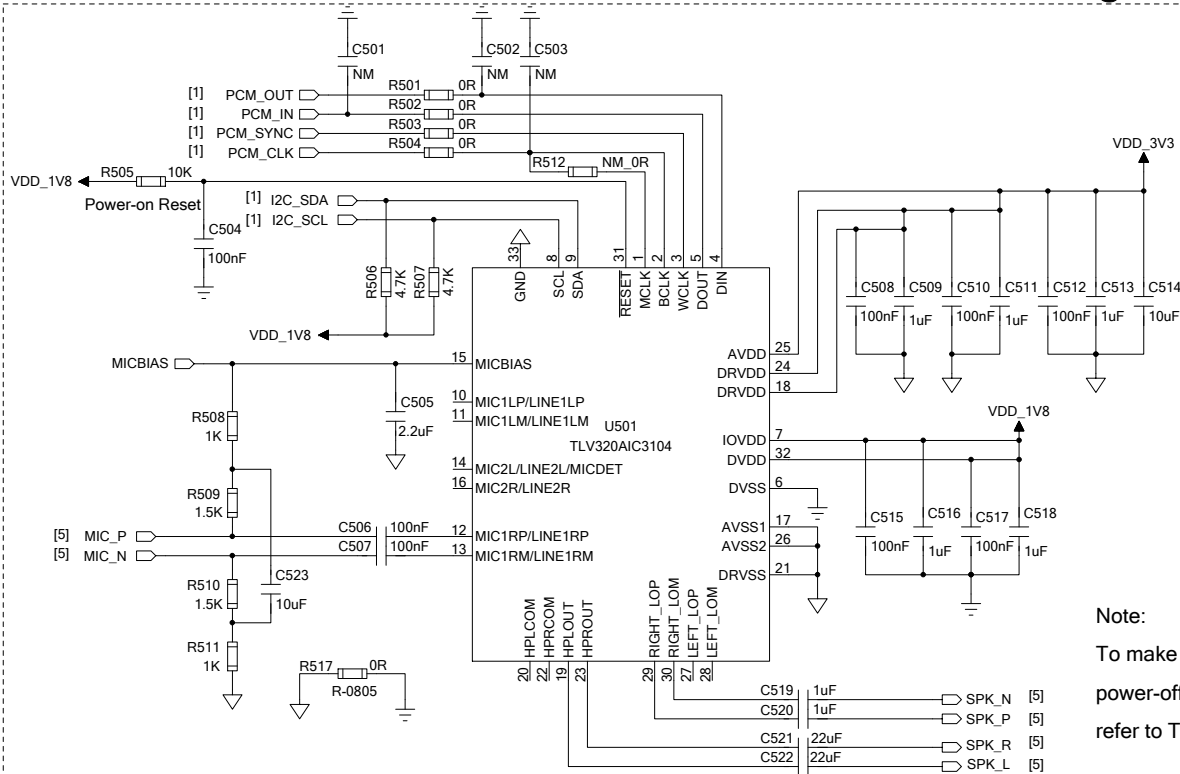


## Notes:

- The decouple capacitors of USIM1\_VDD and USIM2\_VDD must be near to (U)SIM card connectors.
- EM06 provides the pins of USIM1\_DET and USIM2\_DET for (U)SIM card insertion detection, and supports high level detection.  
The circuits above show the reference designs for normally short-circuited (U)SIM card connector. For more details, please refer to *Quectel\_EM06\_Hardware\_Design*.
- R403~R408 are applied to suppress the EMI spurious transmission and enhance the ESD protection.
- It is recommended to take electrostatic discharge (ESD) protection measures near the (U)SIM card connector.  
A TVS diode with junction capacitance less than 10pF must be placed as close as possible to the (U)SIM card connector.
- R401 and R402 can improve anti-jamming capability of the (U)SIM card circuit and they should be placed close to the (U)SIM card connector.
- The (U)SIM card connector should be placed near the M.2 interface, because a long circuit may lead to waveform distortion, thus affecting signal quality.

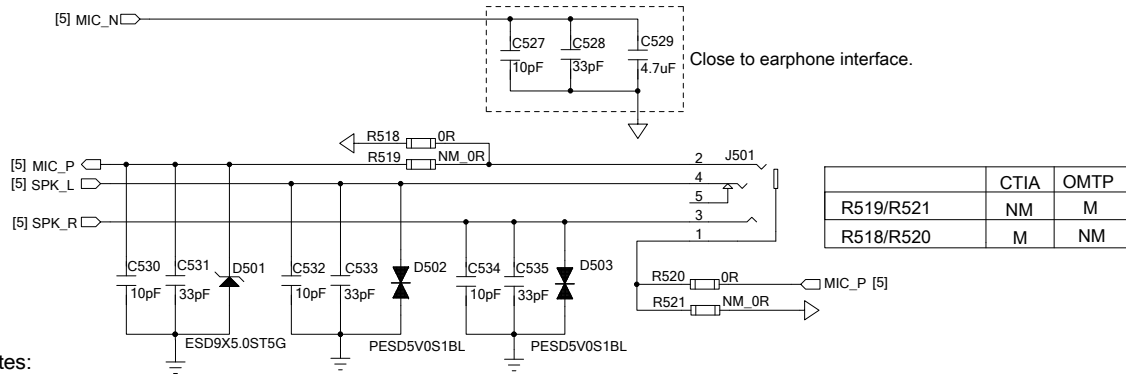
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# Audio Design



**Note:**  
To make sure the audio function works normally, please follow the power-on and power-off sequences of TLV320AIC3104's power supply. For more details please refer to TLV320AIC3104 datasheet.

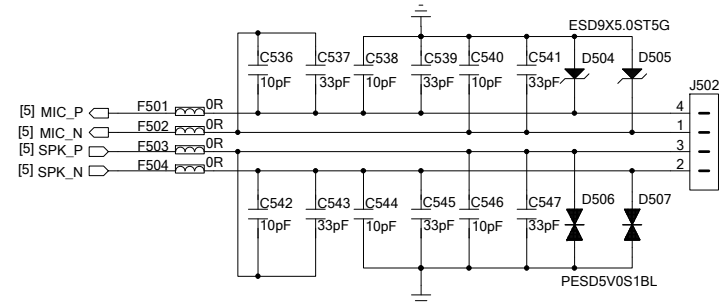
## Audio - Earphone Application



**Notes:**

1. The analog output only drives earphone and headset. For devices which need larger power loads, such as speakers, an audio power amplifier needs to be added in the design.
2. The maximum capacitive loading for speaker is 330pF and the maximum capacitive loading for microphone is 250pF.

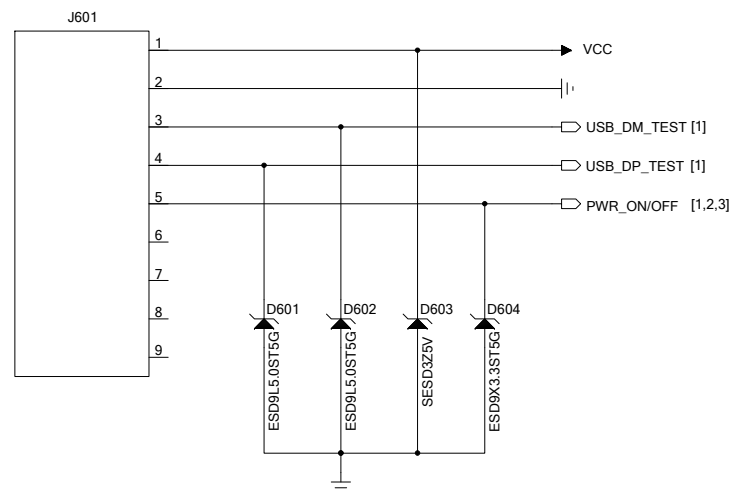
## Audio - Handset Application



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# Test Points Design



### Notes:

1. USB interface can also be used to upgrade firmware.
2. Keep USB test points as close as possible to USB pins.  
Please pay attention that the junction capacitance of ESD protection components on USB data lines might influence the signal. Typically, the capacitance should be less than 1pF.

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