

EM05 Reference Design

LTE Module Series

Rev. EM05_Reference_Design_Rev.A

Date: 2017-09-22



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About the Document

History

Revision	Date	Author	Description
A	2017-09-22	Yeoman CHEN	Initial

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1 Reference Design

1.1. Introduction

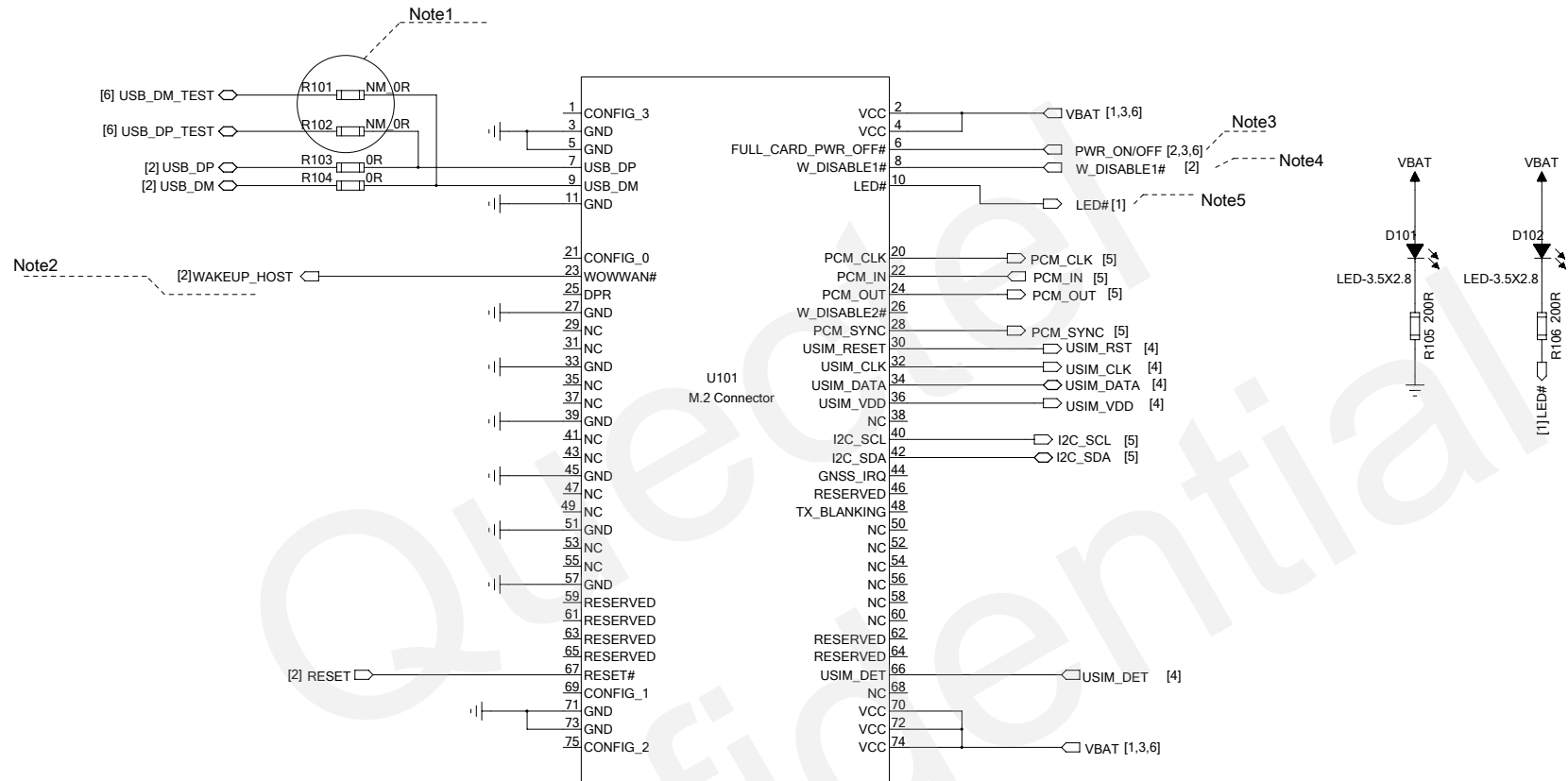
This document provides the reference design for Quectel EM05 module.

1.2. Schematics

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

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Module Interface



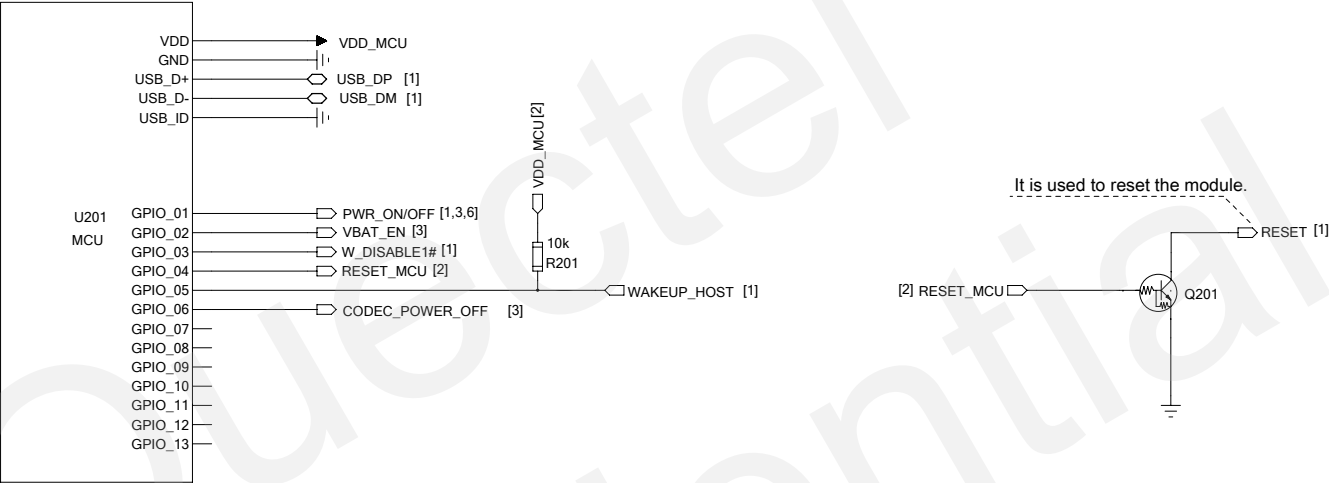
Notes:

- It is recommended to reserve the test points for upgrading the firmware over USB interface and minimizing the stub length of USB test signals.
- The WOWWAN# signal is an open drain signal, and requires a pull up resistor on the host.
- PWR_ON/OFF is controlled by MCU. And the module can be turned on when PWR_ON/OFF is driven to a high level. The module can be turned off when PWR_ON/OFF is driven to a low level.
- W_DISABLE1# signal is used to disable or enable the RF function through hardware operation. RF function is disabled when W_DISABLE1# is at low level.
- LED# is used to indicate RF status of the module, which can absorb the current up to 40mA. RF function is turned on when LED# is at low level, and RF function will be turned off when LED# is at high level.

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MCU Interface



Notes:

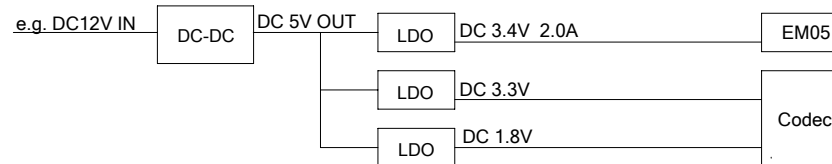
1. U201 represents customers' MCU.
2. EM05 can only work as a USB device and supports Full Speed and High Speed modes. To communicate with USB interface, MCU needs to support USB host or OTG function.

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Power Supply Design

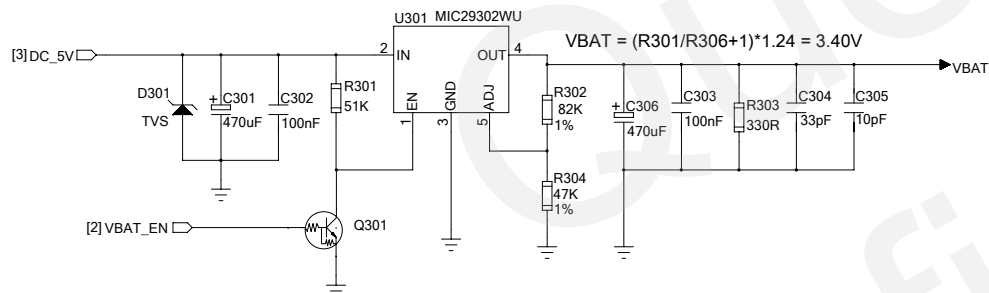
DC-DC Application

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



LDO Application

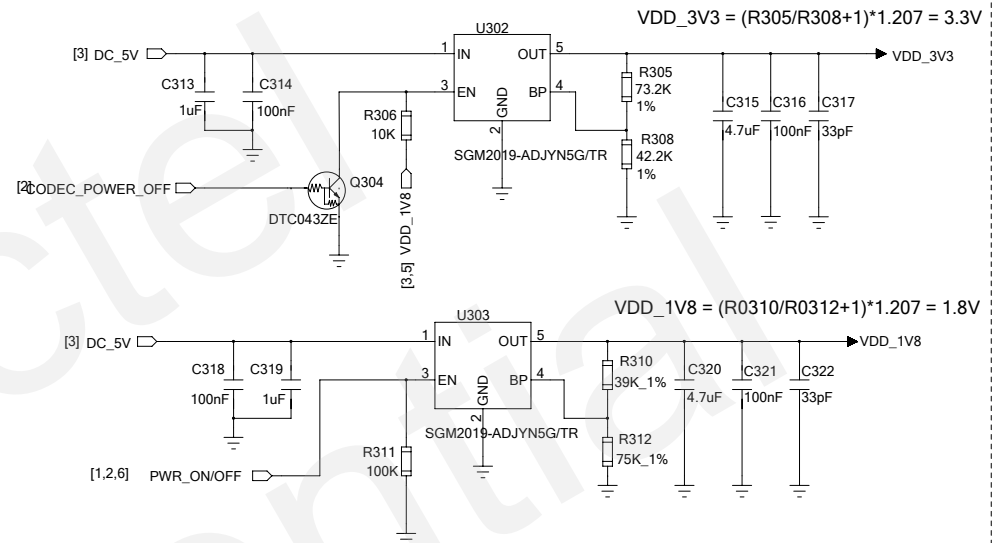
It is used when the input voltage is below 7V.



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 VBAT is 3.135V~4.4V.

Supply Power for PCM Codec



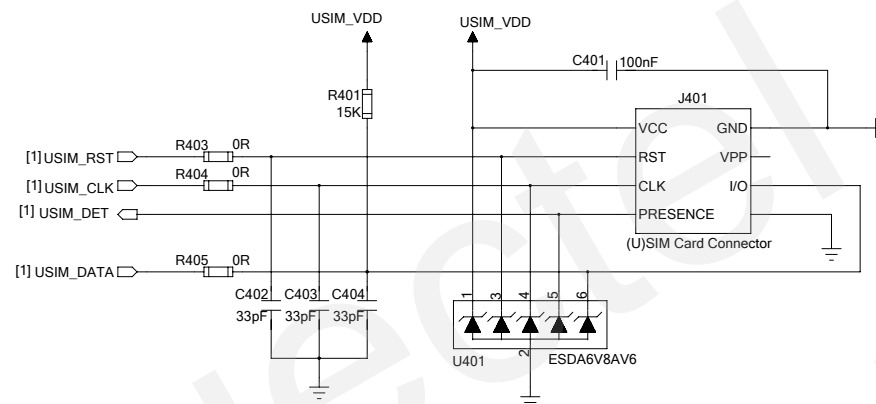
Notes:

1. CODEC_POWER_OFF must be at low level in order to ensure the normal output voltage of VDD_3V3.
If VDD_3V3 power supply needs to be switched off, please keep CODEC_POWER_OFF at high level.
2. To make sure ALC5616 works normally, please follow ALC5616 power-on and power-off sequences of its power supply.
Power-on Sequence: power on VDD_1V8 first, then VDD_3V3
Power-off Sequence: power off VDD_3V3 first, then VDD_1V8

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(U)SIM Interface Design



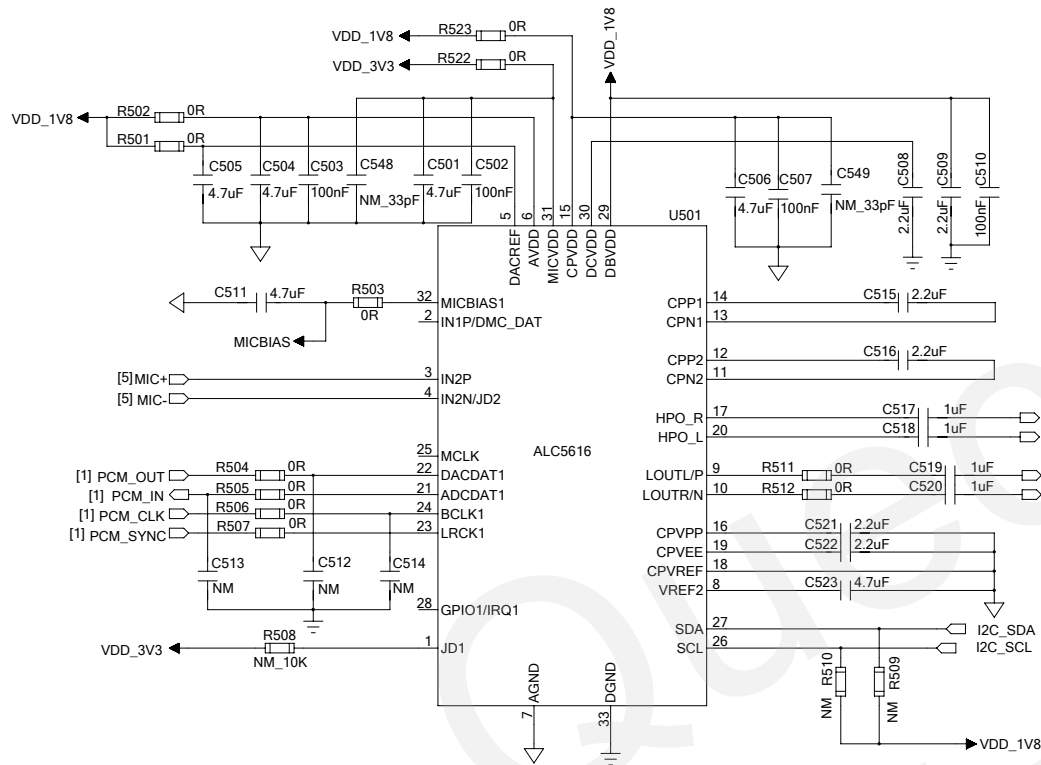
Notes:

1. The decouple capacitor of USIM_VDD must be near to (U)SIM card connector.
2. EM05 module provides an input pin (USIM_DET) to detect whether the (U)SIM card exists or not.
It shows a reference design for normally short-circuited (U)SIM card connector and it supports high level detection. For more details, please refer to *Quectel_EM05_Hardware_Design*.
3. R403~R405 are applied to suppress the EMI spurious transmission and enhance the ESD protection.
4. 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.
5. R401 can improve anti-jamming capability of the (U)SIM card circuit and it should be placed close to the (U)SIM card connector.
6. The (U)SIM card connector should be placed near the M.2 interface, because a long circuit may lead to wave distortion, thus affecting signal quality.

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Audio Design



Note:

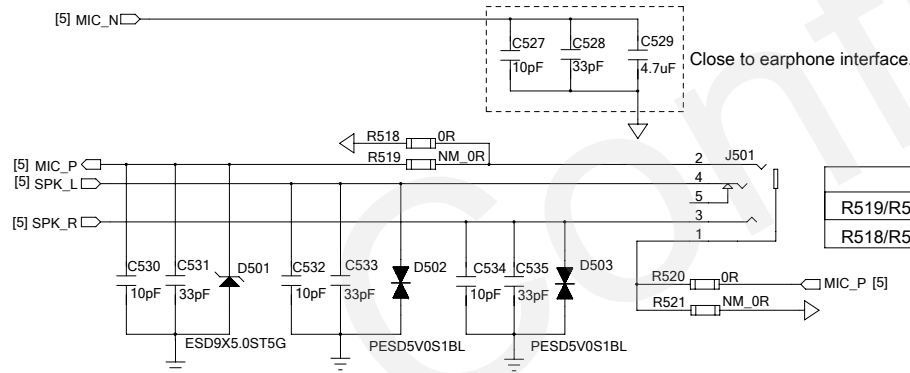
To ensure that the audio function works normally, please follow ALC5616 power-on and power-off sequences of its power supply.

Power-on Sequence: power on DBVDD/AVDD/DACREF/CPVDD first, then MICVDD

Power-off Sequence: power on MICVDD first, then DBVDD/AVDD/DACREF/CPVDD

For more details please refer to ALC5616 datasheet.

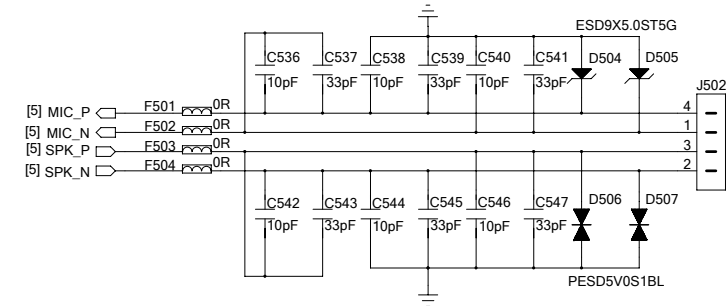
Audio - Earphone Application



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 SPK is 330pF and the maximum capacitive loading for MIC is 250pF.

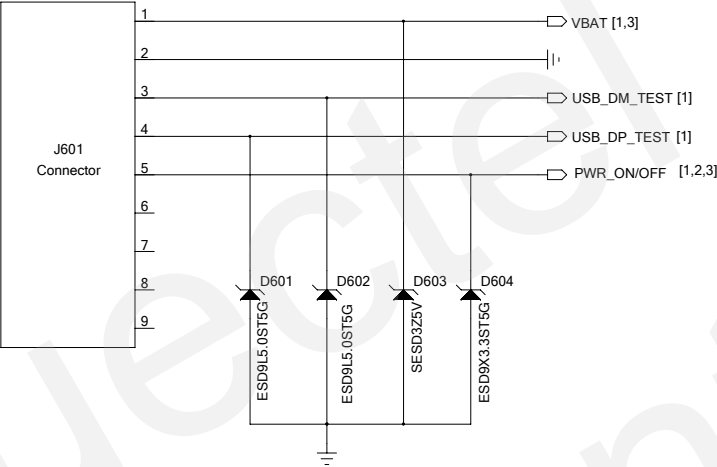
Audio - Handset Application



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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 junction capacitance of ESD components on USB data lines might influence the signal.
Typically, the capacitance should be less than 1pF.

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