M89 Reference Design

GSM/GPRS Module Series

Rev. M89_Reference_Design_Rev.B

Date: 2018-08-08

Status: Released

Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our company headquarters:

Quectel Wireless Solutions Co., Ltd.
7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
Tel: +86 21 5108 6236
Email: info@quectel.com

Or our local office. For more information, please visit:
http://quectel.com/support/sales.htm

For technical support, or to report documentation errors, please visit:
http://quectel.com/support/technical.htm
Or email to: support@quectel.com

GENERAL NOTES

QUECTEL OFFERS THE INFORMATION AS A SERVICE TO ITS CUSTOMERS. THE INFORMATION PROVIDED IS BASED UPON CUSTOMERS' REQUIREMENTS. QUECTEL MAKES EVERY EFFORT TO ENSURE THE QUALITY OF THE INFORMATION IT MAKES AVAILABLE. QUECTEL DOES NOT MAKE ANY WARRANTY AS TO THE INFORMATION CONTAINED HEREIN, AND DOES NOT ACCEPT ANY LIABILITY FOR ANY INJURY, LOSS OR DAMAGE OF ANY KIND INCURRED BY USE OF OR RELIANCE UPON THE INFORMATION. ALL INFORMATION SUPPLIED HEREIN IS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

COPYRIGHT

About the Document

History

Revision	Date	Author	Description
A	2018-06-12	Tiger CHENG	Initial
B	2018-08-08	Tiger CHENG	1. Modified the voltage domain of pin 27/28/37/38 to 2.8V. 2. Removed I2C function.

Contents

1 Reference Design

1.1. Introduction

This document provides the reference design for Quectel M89 module.

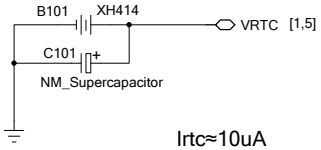
1.2. Schematics

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

Module Design

VRTC Design

Please use a supercapacitor or a battery to power the VRTC pin when VBAT is removed. If unused, keep VRTC open.

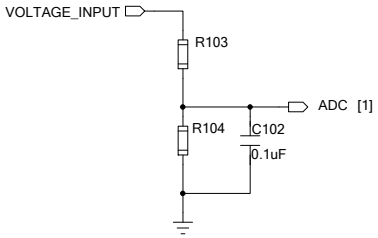


Irtc≈10uA

Note:

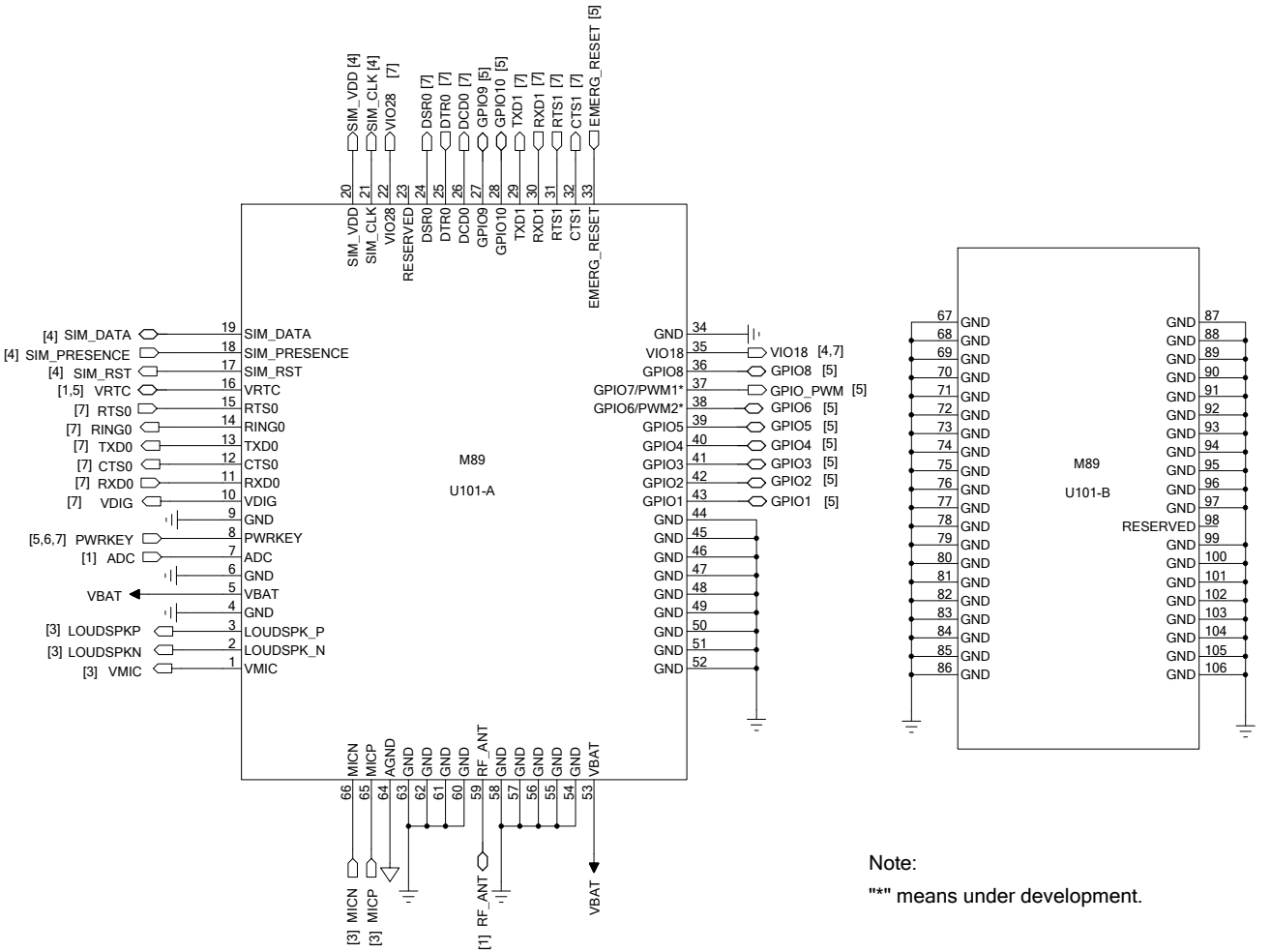
As only powering the VRTC pin to keep the RTC will lead an error of about 5 minutes a day, it is recommended to power VBAT and VRTC pins at the same time when RTC function is needed. For more details, please refer to *Quectel_M89_Hardware_Design*.

Reference Circuit of ADC



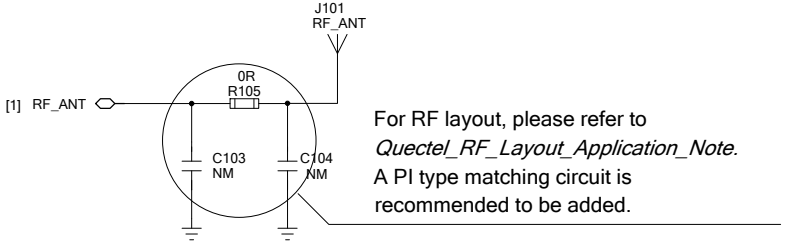
Notes:

1. The voltage range of ADC input channel is from 0V to 2.8V.
2. Please select a high-precision resistor divider whose ressistance should be greater than 10K.



Note:

"*" means under development.



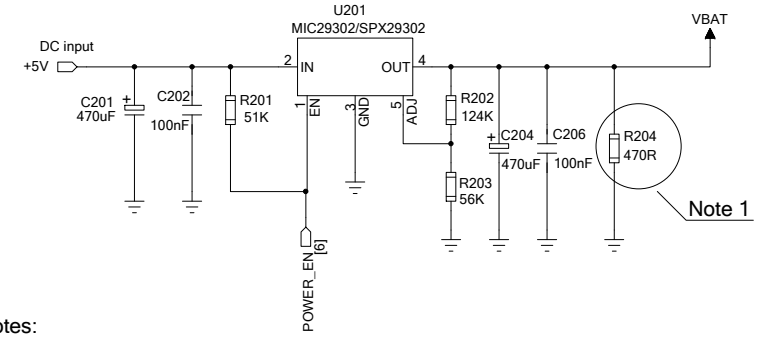
For RF layout, please refer to *Quectel_RF_Layout_Application_Note*. A PI type matching circuit is recommended to be added.

Quectel Wireless Solutions		
DRAWN BY Tiger CHENG	PROJECT M89	TITLE Reference Design
CHECKED BY Storm BAO	SIZE A2	VER B
	SHEET 1 OF 7	DATE 2018/8/8

Power Supply and VBAT Design

LDO Application

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

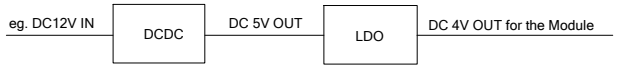


Notes:

1. The minimum load current of U201 is 7mA, therefore the R204 resistance should be added.
2. If customers adopt the low power design, please select a low power LDO.
3. The voltage converter should provide a minimum current of 2A.

DC-DC Application

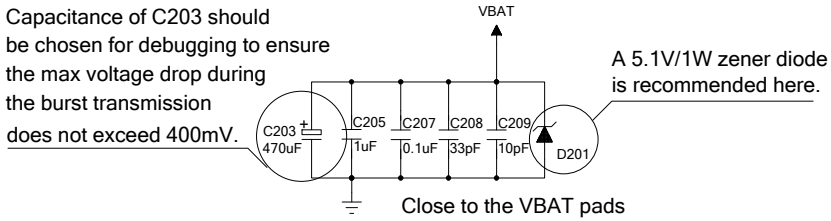
1. It can be used when the input voltage is above 7V in vehicle applications.
2. Use a DC-DC converter to convert high input voltage to 5V and then the LDO will generate a 4V voltage for the module.



Note:

The voltage converter should provide a minimum current of 2A.

VBAT Design



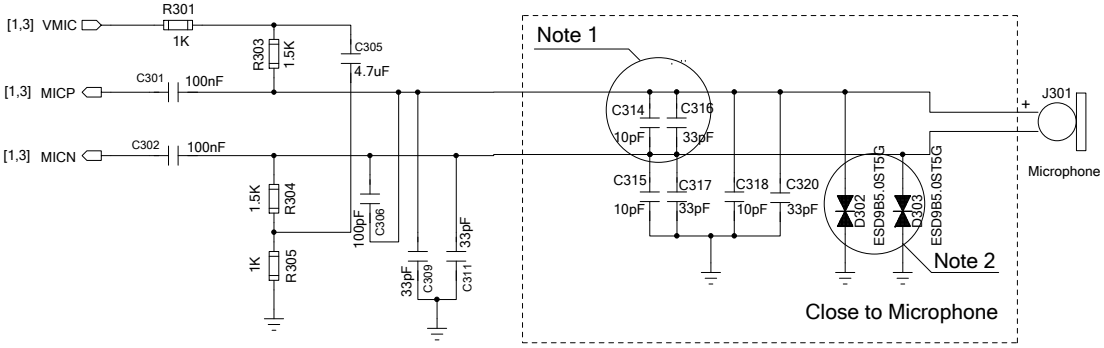
Notes:

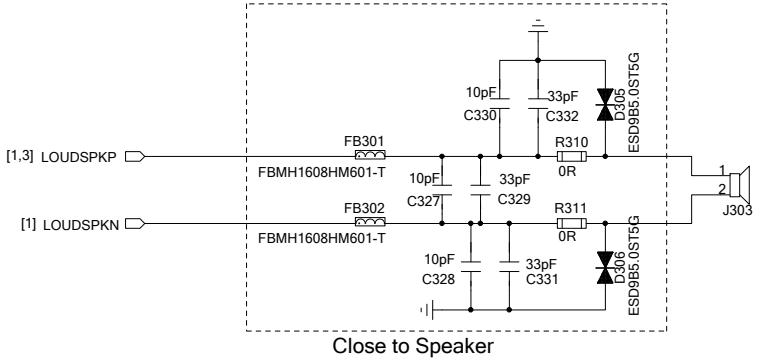
1. The input voltage of VBAT ranges from 3.3V to 4.6V.
2. During burst transmission (577us), the maximum current of the module may reach up to 1.6A.
3. The width of VBAT trace is recommended to be more than 2mm.
4. The capacitors are arranged in ascending order, with the smallest one closing to the VBAT pin (the pin 53 of the module). And all these capacitors should be placed as close to the VBAT pin (the pin 53 of the module) as possible.

Quectel Wireless Solutions		
DRAWN BY Tiger CHENG	PROJECT M89	TITLE Reference Design
CHECKED BY Storm BAO	SIZE A2	VER B
	SHEET 2 OF 7	DATE 2018/8/8

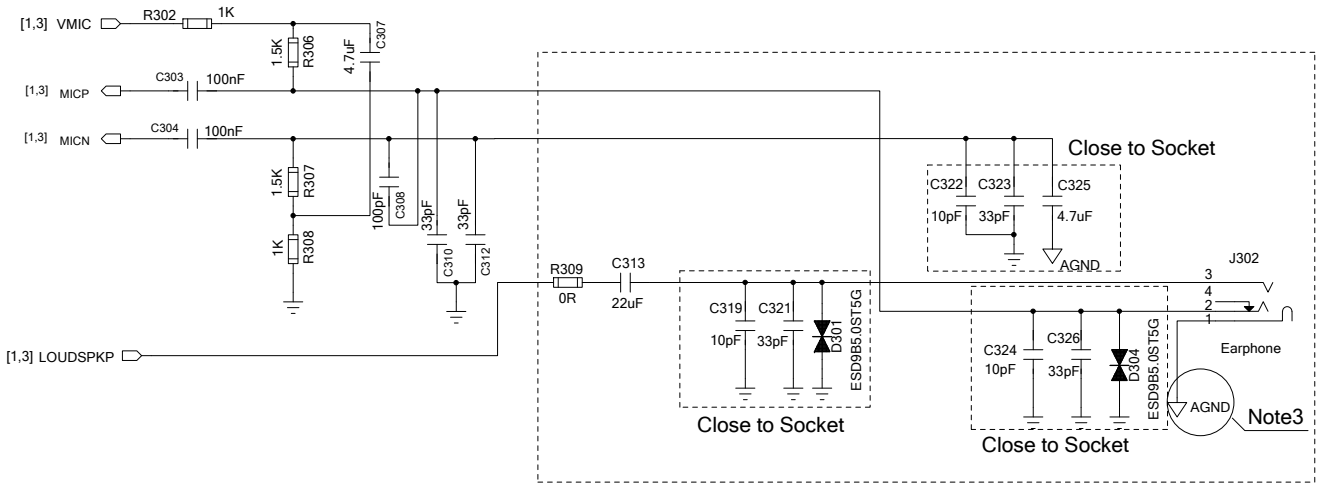
Audio Design

Hands-free Application of AIN/AOUT





Earphone Application of AIN/AOUT



Notes:

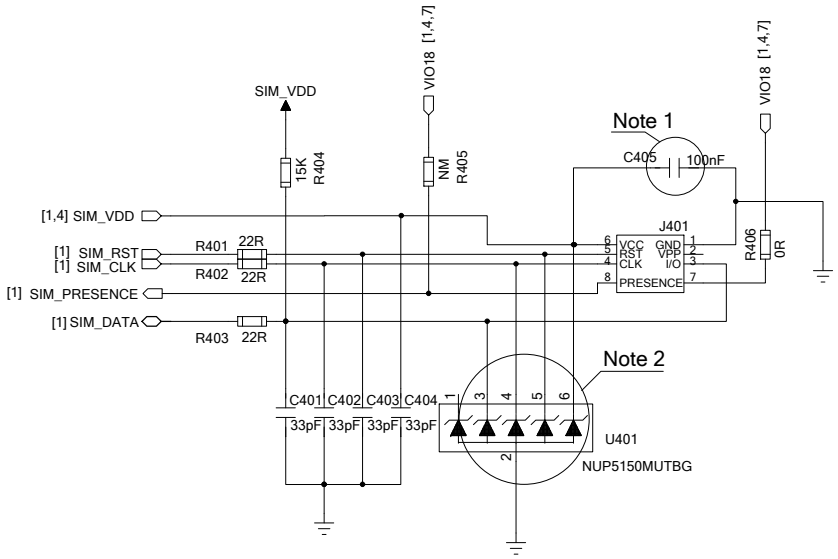
1.10pF and 33pF capacitors are used for filtering TDD noise.

2. It is strongly recommended to reserve these components to enhance ESD protection performance of the microphone traces.

3. AGND is reommended to be routed separately.

Quectel Wireless Solutions		
DRAWN BY Tiger CHENG	PROJECT M89	TITLE Reference Design
CHECKED BY Storm BAO	SIZE A2	VER B
	SHEET 3 OF 7	DATE 2018/8/8

(U)SIM Interface



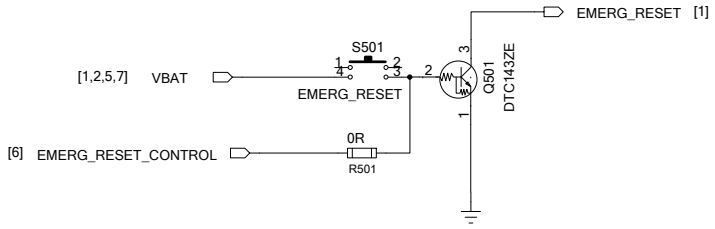
Notes:

1. The value of C405 should be less than 1uF.
2. U401 is recommended to be used to offer good ESD protection, and junction capacitance should be less than 50pF. And it should be placed nearby (U)SIM card connector J401.

Quectel Wireless Solutions		
DRAWN BY Tiger CHENG	PROJECT M89	TITLE Reference Design
CHECKED BY Storm BAO	SIZE A2	VER B
	SHEET 4 OF 7	DATE 2018/8/8

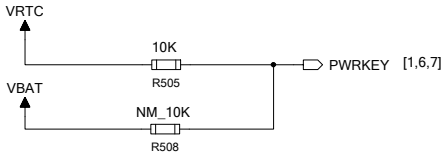
Driver and GPIO Circuits

EMERG_RESET Circuit



The module can be emergently reset through the S501 or an MCU.

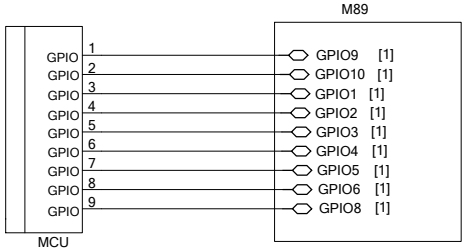
Automatic Startup Circuit



Customers can choose the automatic startup circuit or MCU control circuit according to actual needs. If VRTC is used,R505 is mounted and R508 is not mounted; if VBAT is used,R505 is not mounted and R508 is mounted.

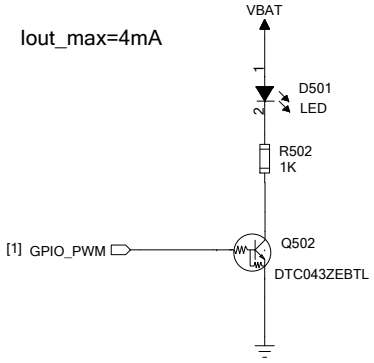
For details about MCU control circuit, please refer to *sheet 6.*

GPIO Connection



Please pay attention to the level match of GPIO in product applications.

LED Indication

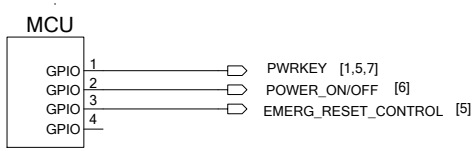


PWM function is under development.

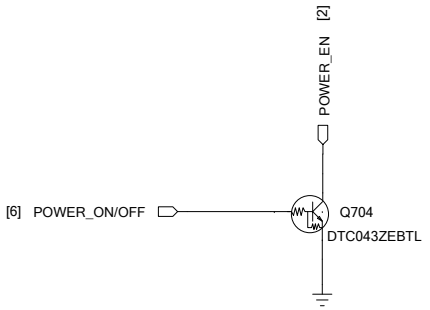
Quectel Wireless Solutions		
DRAWN BY Tiger CHENG	PROJECT M89	TITLE Reference Design
CHECKED BY Storm BAO	SIZE A2	VER B
	SHEET 5 OF 7	DATE 2018/8/8

MCU Control Circuit

MCU GPIO



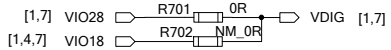
Power Control Circuit by an MCU



Quectel Wireless Solutions		
DRAWN BY Tiger CHENG	PROJECT M89	TITLE Reference Design
CHECKED BY Storm BAO	SIZE A2	VER B
	SHEET 6 OF 7	DATE 2018/8/8

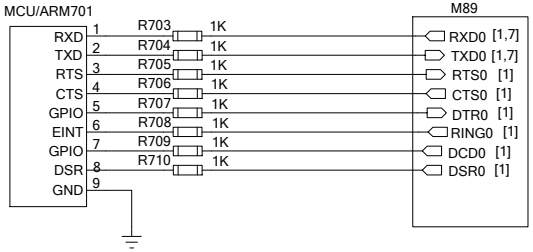
UART Interfaces

UART0 Interface Level Selection



Interface	R101	R102	R101	R102
	0R	NM	NM	0R
	Voltage level at interface		Voltage level at interface	
UART0	2.8V		1.8V	

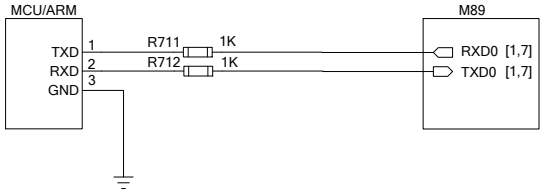
Full-function UART0 Connection



Notes:

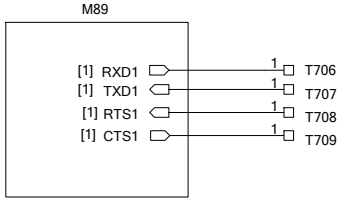
1. CTS and RTS will be used for hardware flow control when mass data needs to be sent.
2. When AT+QSCLK=1 is set on the module, the DTR pin can be used to control the module to enter into or exit from the sleep mode.
   When DTR is set to high level, and there are no on-air or hardware interrupts, such as GPIO interrupts or data on serial port, the module will enter into sleep mode automatically.
3. RI will output an indication signal when activities such as a call or SMS message is received.
4. DCD is mainly applied in modem communication (PPP). The active status represents the communication link has been set up.
5. If the serial port voltage of MCU is 1.8V or 2.8V,can refer directly to this diagram,if it is another voltage, Please pay attention to the level match of UART in product applications.

Three-line UART0 Connection



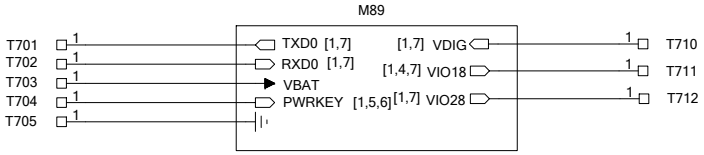
Please pay attention to the level match of UART in product applications.

Test Points (Reserved for UART1 Port)



It is recommended to reserve the test points for debugging.

Test Points (Reserved for Firmware Upgrading)



It is recommended to reserve the test points for upgrading the firmware.
Please pay attention to the level match of UART in product applications.

Quectel Wireless Solutions		
DRAWN BY Tiger CHENG	PROJECT M89	TITLE Reference Design
CHECKED BY Storm BAO	SIZE A2	VER B
	SHEET 7 OF 7	DATE 2018/8/8