

LG77L

Reference Design

GNSS Module Series

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Date: 2020-09-01

Status: Preliminary



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About the Document

Revision History

Version	Date	Author	Description
1.0.0	2020-09-01	Wind ZHAO/ Ali WEI	Initial

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1 Reference Design

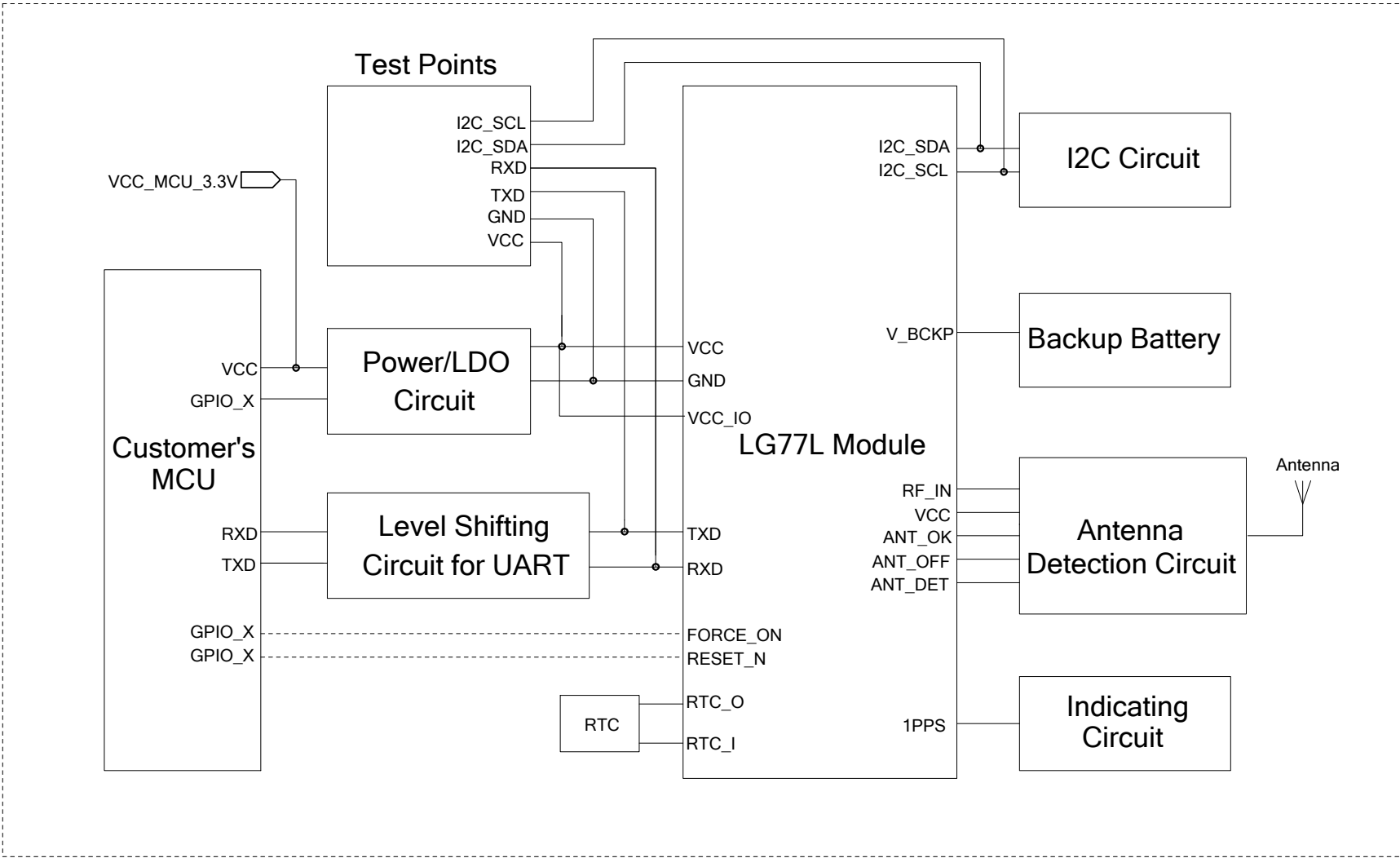
1.1. Introduction

This document provides the reference design of Quectel LG77L GNSS module, including the design of power supply, UART interface and antenna interface.

1.2. Schematics

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

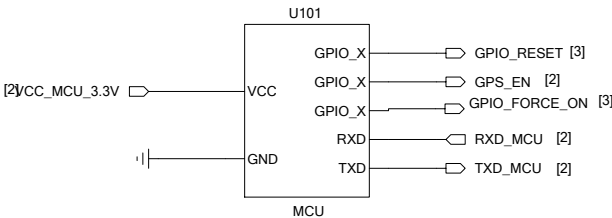
Block Diagram



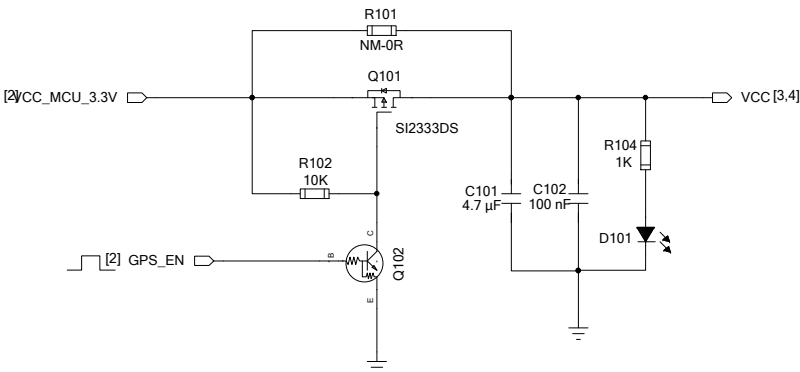
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3.3V Power Supply and UART Circuits

Customer's MCU



Power Management Circuit (Optional)

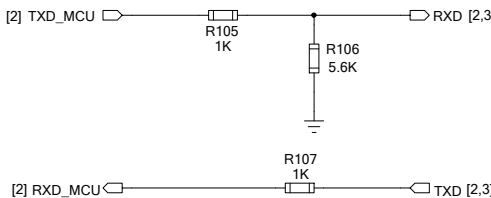


Notes:

There are two ways to enter/exit backup mode:

1. Sending \$PMTK225,4*2F command makes the module enter backup mode. In such a case, the only way to wake up the module is by pulling FORCE_ON high. In the solution, Q101, Q102 and R102 are not mounted; R101 is 0 Ω.
2. Cutting off the power supply of VCC while keeping V_BCKP powered, the module will enter backup mode. As soon as the VCC power supply is restored, the module enters full on mode immediately. In the solution, Q101, Q102 and R102 are mounted; R101 and R103 are not mounted.

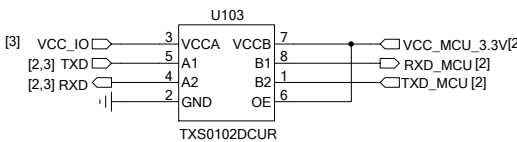
Level Shifting for UART - Resistor Solution



Note:

The resistor solution is applicable for modules with 2.8 V I/O power domain only.

Level Shifting for UART - Level Shifter IC Solution



Note:

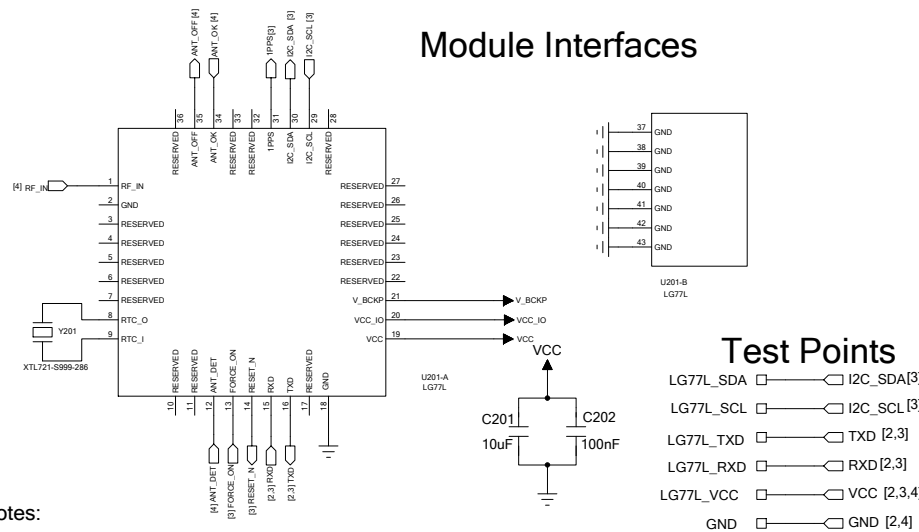
The level shifter IC solution generally requires $V_{CCA} \leq V_{CCB}$, please pay attention to the voltage relationship.

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Module Interfaces

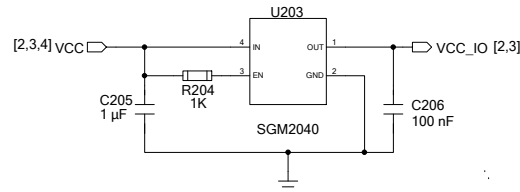
Module Interfaces



Notes:

1. UART can be used for NMEA sentences output and firmware upgrade.
2. When I2C interface is supported, I2C interface will be used for NMEA sentences output by default.
3. It is recommended that test points be reserved for debugging GNSS modules.
4. Module 37-43 pins are at the bottom of the chip and are GND pins.

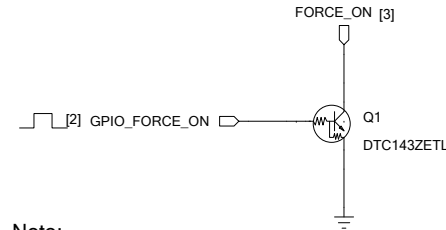
Level Shifting from VCC to VCC_IO



Note:

The design is applicable to modules with either 2.8 V or 1.8 V I/O power domain.

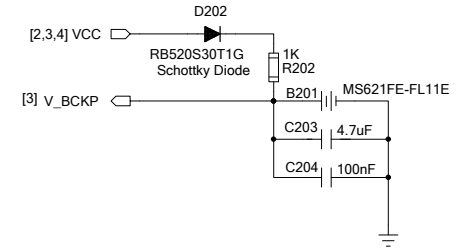
FORCE_ON Circuit



Note:

When GPIO_FORCE_ON low, FORCE_ON active.

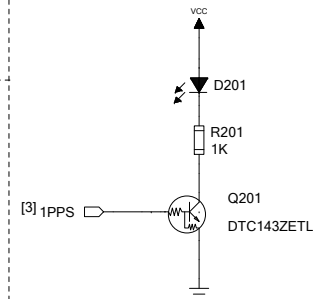
RTC Backup Power Supply



Note:

V_BCKP is designed to supply power for LG77L RTC logic circuit when VCC is powered off.

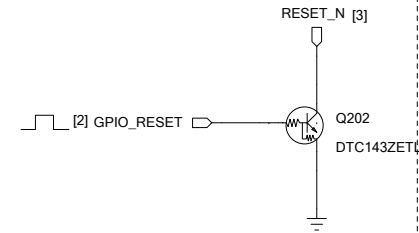
Indicating Circuit



Note:

The 1PPS indicator will blink at 1 Hz frequency after fixing the position.

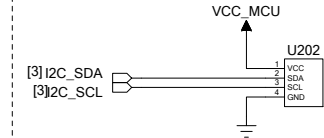
Reset Circuit



Note:

When GPIO_RESET high, RESET_N active.

I2C Circuit



Notes:

The power domain of I2C is 2.8 V or 1.8V. If the system voltage is not consistent with it, a level shifter circuit must be used.

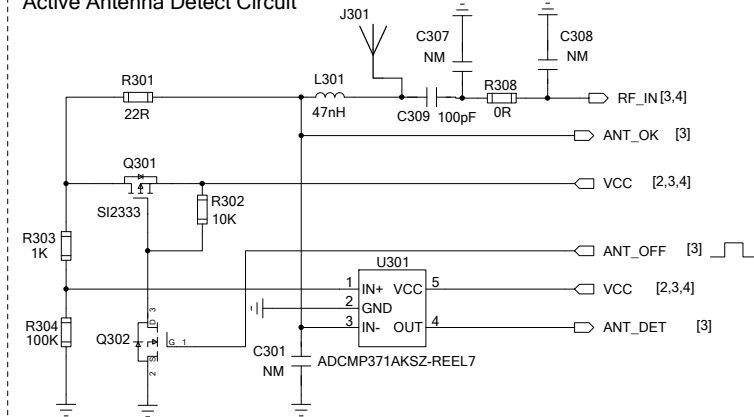
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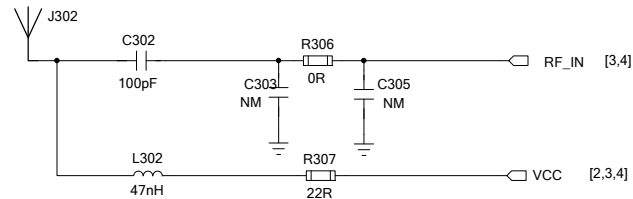
Antenna Interface

Active Antenna

Active Antenna Detect Circuit

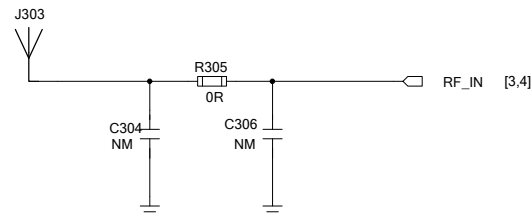


Active Antenna without Antenna Status Detection



Passive Antenna

Passive Antenna



Notes:

1. The comparator U301 is used to distinguish the antenna connection status, either normal or open circuit. When ANT_OFF is pulled up, the voltage division circuit (R303, R304) divides the voltage of VCC. It is recommended to adjust the value of R303 and R304 appropriately according to the power consumption of active antenna, so as to achieve the following conditions:
When antenna status is open circuit: pin 4 (output) of U301 at low level
When antenna status is normal: pin 4 (output) of U301 at high level
2. The R_BIAS (R301) is a must, otherwise the module may be damaged permanently when the antenna is short circuited.
3. VCC can be used to supply power for the active antenna. Its voltage range is 2.8 to 4.3 V, and the typical value is 3.3 V. If VCC cannot meet the antenna's power supply requirements, an external LDO is needed.
4. R308, C307, C308 constitute a reserved matching circuit for antenna impedance correction, By default, R308 is 0R, C307 and C308 are not mounted.
5. R306, C303, C305 constitute a reserved matching circuit for antenna impedance correction, By default, R306 is 0R, C303 and C305 are not mounted.
6. In the event of an antenna short circuit, R307 acts as a protection.
7. Please keep 50 Ω impedance for RF traces, and keep the trace length as short as possible.
For more details, please refer to *Quectel_LG77L_Hardware_Design*.

Notes:

1. The Π type matching circuit (R305, C304, C306) is reserved for antenna impedance matching. By default, C304 and C306 are not mounted and R305 is 0 Ω .
2. Please keep 50 Ω impedance for RF traces, and keep the trace length as short as possible.
For more details, please refer to *Quectel_LG77L_Hardware_Design*.

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