

# **L80&L86&LC86L**

# **Reference Design**

**GNSS Module Series**

Rev. L80&L86&LC86L\_Reference\_Design\_V1.2

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# About the Document

## Revision History

Version	Date	Author	Description
1.0	2013-08-10	Tony GAO	Initial
1.1	2014-09-04	Tony GAO	Added the applicable module L86.
1.2	2020-05-06	Andy ZHAO	Added the applicable module LC86L.

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# 1 Reference Design

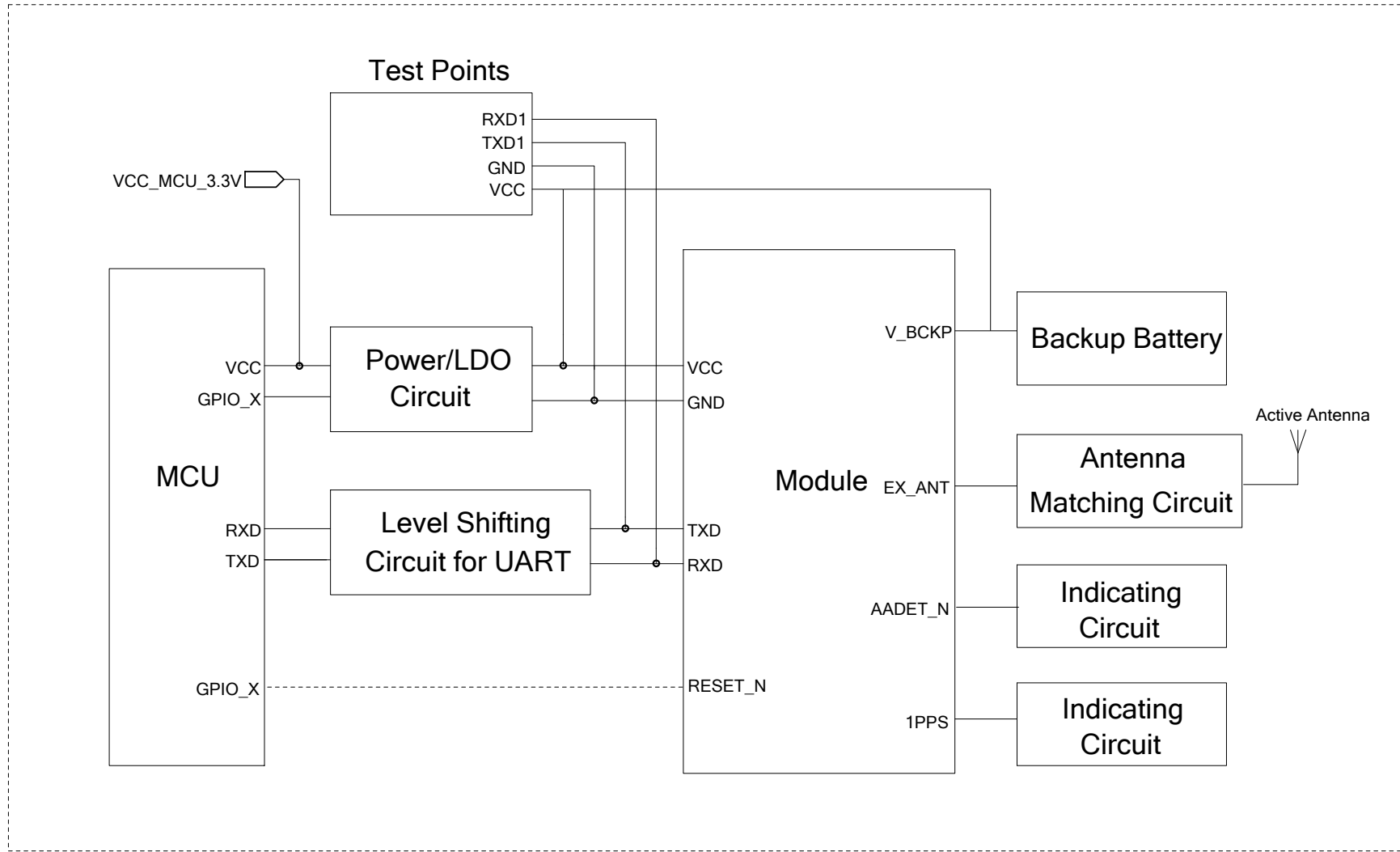
## 1.1. Introduction

This document provides the reference design of Quectel L80, L86 and LC86L modules, 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.

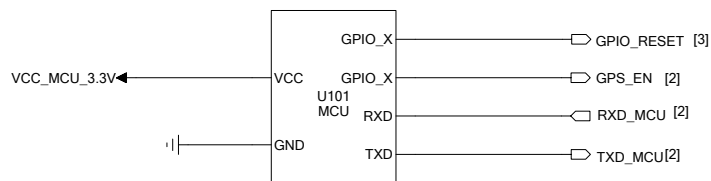
# Block Diagram



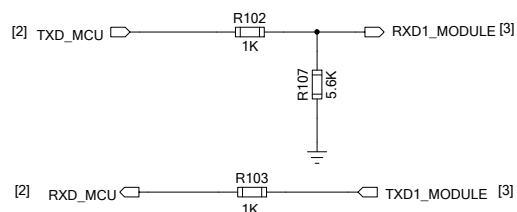
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# Power Supply and UART Circuit

## Customer's MCU



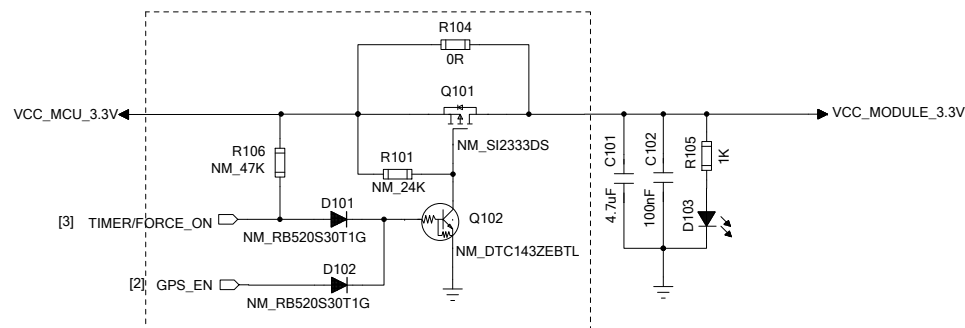
## UART Circuit



**Note:**

The above level shifting circuits realize the voltage-level shifting between VCC\_MCU\_3.3V and 2.8 V (power domain of UART), and block the leakage current from the power-on devices to power-off devices.

## Power Management Circuit (Optional)



**Note:**

Please ensure the output voltage (VCC\_MODULE\_3.3V) drop time is greater than 100 ms (from 2.7 to 0.5 V).

	R101	R104	R106	D101	D102	Q101	Q102
L80	24 kΩ	NM	47 kΩ	RB520S30T1G	RB520S30T1G	SI2333DS	DTC143ZEBTL
L86/LC86L	NM	0R	NM	0R	0R	NM	NM

(NM: Not Mounted)

FORCE\_ON in L86/LC86L: Logic high of FORCE\_ON will force the GNSS module to be woken up from backup mode.

TIMER in L80 module: An open drain output signal used for power on/off control of the GPS module.

When TIMER function is used in L80 module, please ensure V\_BCKP is powered all the time.

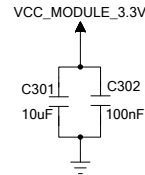
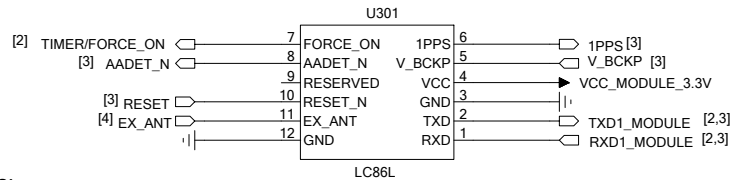
For more details about TIMER & FORCE\_ON, please refer to the corresponding hardware design manuals.

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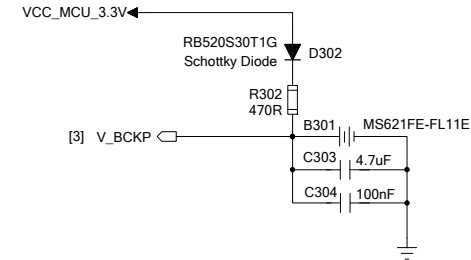
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# Module Interfaces

## Module Interfaces



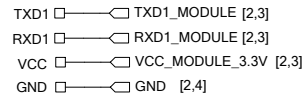
## Charging Circuit for RTC Domain



### Notes:

1. UART port can be used to output NMEA messages as well as to upgrade firmware.
2. Pin definition differences:  
Pin 7: FORCE\_ON in L86/LC86L, and TIMER in L80.
3. Pin name differences:  
Pin 1/2: RXD1/TXD1 in L86/L80, and RXD/TXD in LC86L.  
Pin 10: RESET in L86/L80, and RESET\_N in LC86L.
4. The test points are reserved for debugging L80/L86/LC86L module.

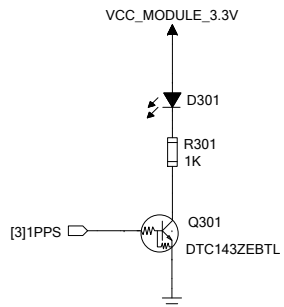
## Test Points



### Note:

V\_BCKP pin can be directly powered by an external rechargeable battery. Furthermore, it is necessary to add an external charging circuit for the rechargeable battery.

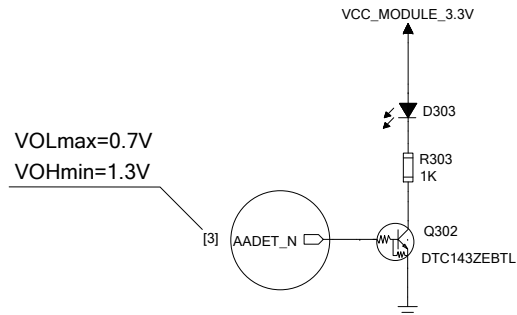
## 1PPS Indicating Circuit



### Note:

The 1PPS indicator blinks at 1 Hz frequency after the position fixes.

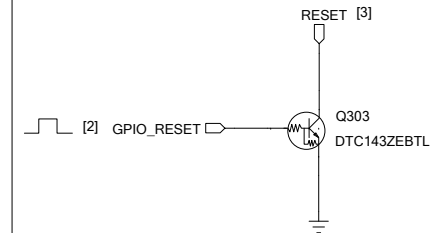
## AADET\_N Indicating Circuit



### Note:

The AADET\_N signal indicates whether the external active antenna is connected well.

## Reset Circuit



### Notes:

1. If the reset function is unused, the pin can be connected to the VCC directly.
2. The pin has been pulled up internally.

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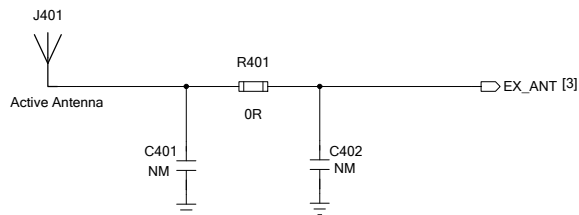
# Antenna Interface

## Integrated Patch Antenna

### Notes:

1. It is recommended to place the module in the center of the motherboard, or at least 10 mm away from the nearest edge of the motherboard.
2. Keep the patch antenna at least 10 mm away from tall components (height > 6 mm) on the motherboard.
3. To ensure good receiving performance, it is recommended to put the module on the top side of customer devices and keep the antenna under open sky.
4. The device enclosure should be made of non-metal materials especially the areas around the antenna. The minimum distance between the antenna and the enclosure is 1 mm.
5. It is recommended that the motherboard is bigger than 80 mm × 40 mm to achieve better performance, and to pour ground copper on the whole motherboard.
6. Other antennas such as BT, Wi-Fi, 2/3/4/5G antennas should be kept at least 10 mm away from the embedded patch antenna in L80/L86/LC86L.
7. It is highly recommended to place the MCU, especially the MCU of STMicroelectronics, on the other side of the PCB, and keep it far way from the module to ensure antenna performance.
8. For more details about PCB design guide, please refer to the hardware design manuals.

## External Active Antenna



### Notes:

1. By default, R401 is 0 Ω, while C401 and C402 are not mounted.
  2. The Π type circuit (C401, R401, C402) is reserved for antenna impedance matching.
  3. R401 cannot be replaced with a capacitor, as DC will flow from R401 to the active antenna.
  4. The impedance of RF trace should be controlled as 50 Ω and the trace length should be kept as short as possible.
- For more details, please refer to the hardware design manuals.

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