

# L80&L86&LC86L

## Reference Design

**GNSS Module Series**

Version: 1.3

Date: 2021-12-20

Status: Released



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# About the Document

## Document Information

<b>Title</b>	<b>L80&amp;L86&amp;LC86L Reference Design</b>
<b>Subtitle</b>	GNSS Module Series
<b>Document Type</b>	Reference Design
<b>Document Status</b>	Released

## Revision History

Version	Date	Description
1.0	2013-08-10	Initial
1.1	2014-09-04	Added the applicable module L86.
1.2	2020-05-06	Added the applicable module LC86L.
1.3	2021-12-20	<ol style="list-style-type: none"> <li>1. Changed the FORCE_ON of L86 to WAKEUP and the RESET of L80 and L86 to RESET_N.</li> <li>2. Added WAKEUP/TIMER pin and a note for the pin in Block Diagram (sheet 1).</li> <li>3. Added a note for UART Circuit (sheet 2).</li> <li>4. Updated the notes about V_BCKP and RESET_N (sheet 3).</li> <li>5. Added 33 pF capacitors in the Module Interfaces and Charging Circuit for RTC Domain sections (sheet 3).</li> <li>6. Updated the values in notes 1 and 4 for Integrated Patch Antenna (sheet 4).</li> </ol>

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# 1 Reference Design

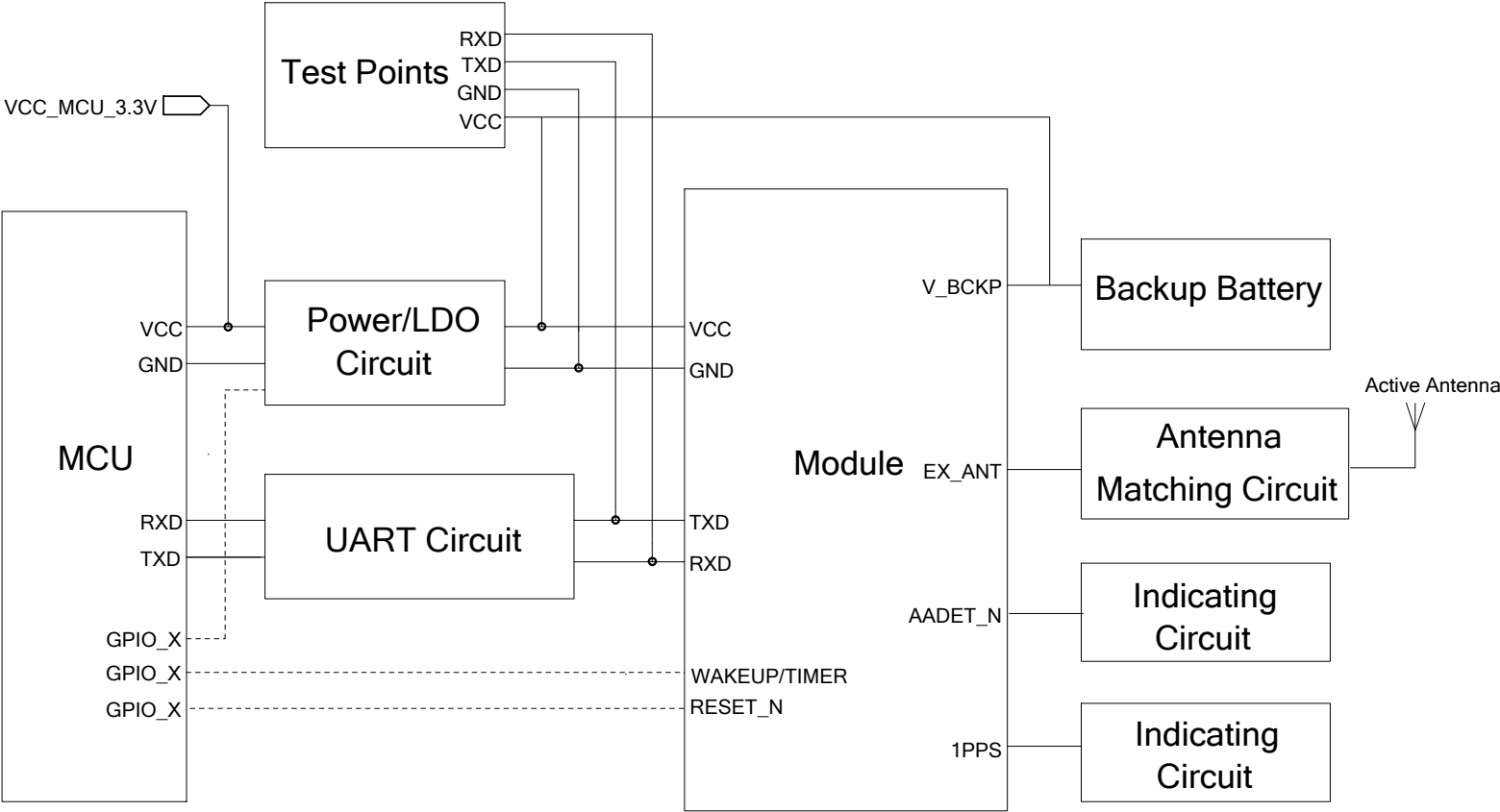
## 1.1. Introduction

This document provides the reference design of Quectel GNSS modules L80, L86 and LC86L, including the design of block diagram, power supply and UART circuits, module interfaces and antenna interfaces.

## 1.2. Schematics

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

Block Diagram

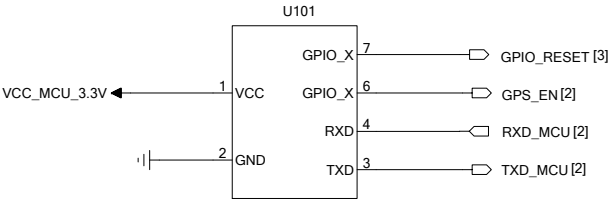


**NOTE:**  
Definition difference of Pin 7: WAKEUP in L86/LC86L, and TIMER in L80.

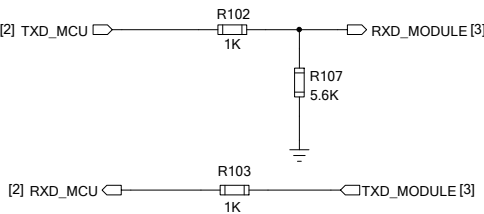
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# Power Supply and UART Circuits

## MCU Circuit

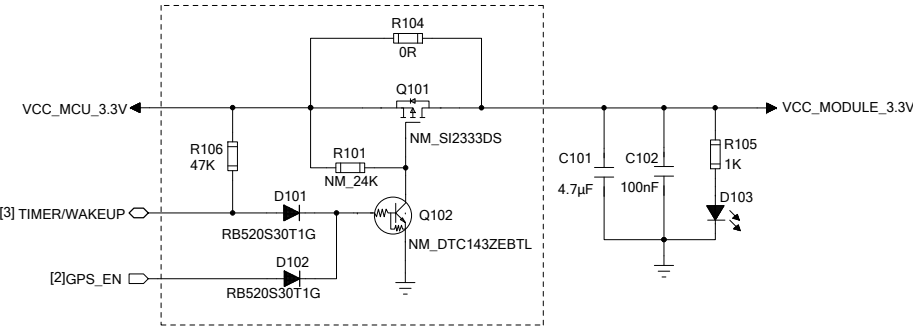


## UART Circuit



- NOTE:**
1. The above level shifting circuit can be used only when TXD\_MCU is 3.3 V and RXD\_MODULE is 2.8 V (power domain of UART), and it can prevent the current leakage from the power-on devices to power-off devices.
  2. If the voltage domain on any side is changed, the resistance value of R102 and R107 should be adjusted accordingly.

## Power Management Circuit (Optional)



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

(NM: Not Mounted)

- NOTE:**
1. WAKEUP (input) in L86/LC86L: pulling the WAKEUP pin high to force the GNSS module to wake up from Backup mode.
  2. TIMER (output) in L80 module: an open drain output signal used for power on/off control of the GPS module.
- Ensure V\_BCKP is powered all the time when TIMER function is enabled. For more information, see *Quectel\_L80\_Hardware Design*.

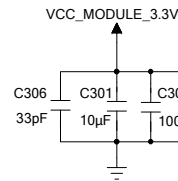
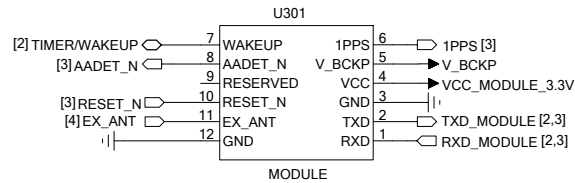
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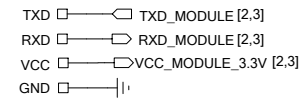


# Module Interfaces

## Module Interfaces



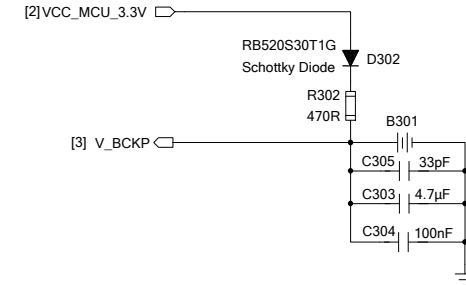
### Test Points



#### NOTE:

1. The UART interface is used for standard NMEA messages output, PMTK commands input and output, and firmware upgrade.
2. Definition difference of Pin 7: WAKEUP (input) in L86/LC86L, and TIMER (output) in L80.
3. The test points are reserved for debugging the modules.

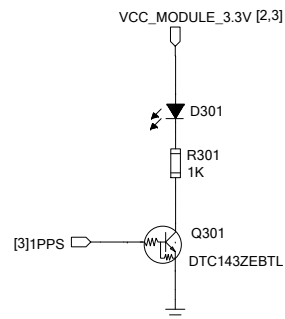
## Charging Circuit for RTC Domain



#### NOTE:

1. V\_BCKP must be connected to power supply to start the module, and it should be always powered if hot (warm) start is needed.
2. V\_BCKP pin can be directly powered by an external rechargeable battery.
3. It is necessary to add an external charging circuit for the rechargeable battery.

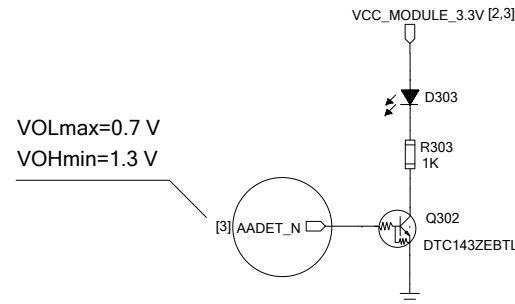
## 1PPS Indicating Circuit



#### NOTE:

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

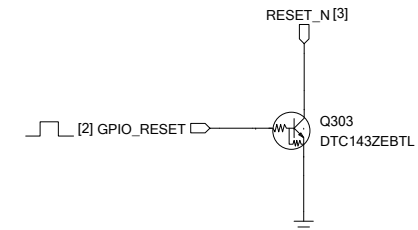
## AADET\_N Indicating Circuit



#### NOTE:

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

## Reset Circuit



#### NOTE:

The pin has been pulled up internally.

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# Antenna Interfaces

## Integrated Patch Antenna

**NOTE:**

1. It is recommended to place the module in the center of the motherboard, or at least 5 mm away from the nearest edge of the motherboard.

2. Keep the patch antenna at least 10 mm away from other tall metal 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 in open-sky environment.

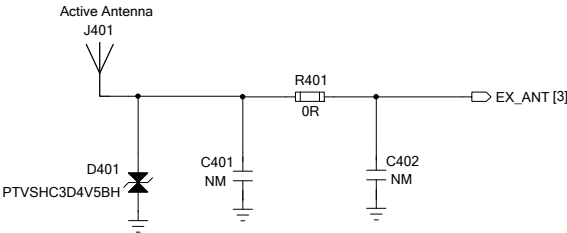
4. The device enclosure should be made of non-metal materials, especially those parts that are around the antenna. The minimum distance between the antenna and the enclosure is 3 mm.

5. It is recommended that the motherboard should be bigger than 80 mm × 40 mm to achieve better performance, and to pour copper on the GND area around the module.
6. Make sure the RF system (such as Wi-Fi, Bluetooth, 2G, 3G, 4G and 5G) is on the opposite side of the module, and keep it away from the module as far as possible, preferably in diagonal position of the board.

7. It is highly recommended to place the MCU on the other side of the PCB, and keep it far away from the module to ensure antenna performance.

8. For more information, see *Quectel\_L80\_Hardware Design*, *Quectel\_L86\_Hardware Design* and *Quectel\_LC86L\_Hardware Design*.

## External Active Antenna



**NOTE:**

1. By default, R401 is 0 Ω, and 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 information, see *Quectel\_L80\_Hardware Design*, *Quectel\_L86\_Hardware Design* and *Quectel\_LC86L\_Hardware Design*.

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