HARDWARE

REFERENCE DESIGN

WWW.UNICORECOMM.COM

UM220-IV L

Single Frequency Multi-GNSS Timing Module

Revision History

Version	Revision History	Date
R1.0	First release	2022-03-21
R1.1	If hot start is not used, V_BCKP pin should be connected to VCC.	2022-11-16
R1.2	Optimize the description of antenna power supply; Add Chapter 4 Power Supply Requirements	Apr. 2023

Legal right notice

Disclaimer

The information contained in this manual is provided “as is" and is believed to be true and correct at the time of its publication or revision. This manual does not represent, and in any case, shall not be construed as a commitments or warranty on the part of Unicore with respect to the fitness for a particular purpose/use, the accuracy, reliability and correctness of the information contained herein.

Information, such as product specifications, descriptions, features and user guide in this manual, are subject to change by Unicore at any time without prior notice, which may not be completely consistent with such information of the specific product you purchase.

Should you purchase our product and encounter any inconsistency, please contact us or our local authorized distributor for the most up-to-date version of this manual along with any addenda or corrigenda.

Foreword

This document describes the hardware design of UNICORECOMM UM220-IV L module.

Target Readers

This manual is created for the technical personnel, who possess the expertise of GNSS products.

Contents

1 Minimum System Reference Circuit

- Supply 3.0 V ~ 3.6 V power VCC
- Ground all GND pins of the module
- Connect RF_IN to antenna, noting the 50 Ω impedance match on the circuit
- Upgrade the module via serial port 1, ensuring that serial port 1 can communicate with PC through appropriate interfaces

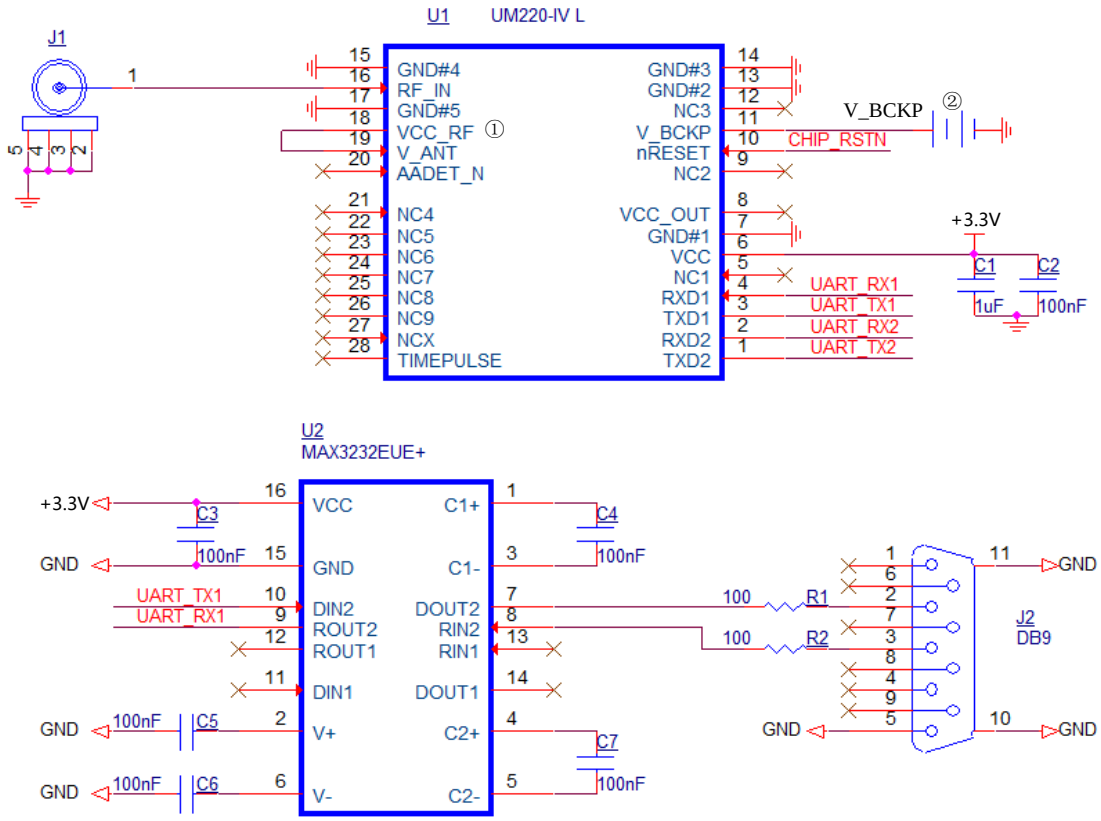

Figure 1-1 Minimum System Reference Circuit

Notes:

1. When the operating voltage of the active antenna is 3.3 V, connect the VCC_RF pin to the V_ANT pin to power the antenna.

   ☞ If there is a high requirement for ESD (higher than the ESD standard specified in *User Manual*), users shall design their own power supply for the antenna instead of using VCC_RF. When designing circuit to power the antenna, it is recommended to choose a power supply chip with high ESD protection level. Gas discharge tubes, varistors, TVS tubes and other high-power protective devices may also be used in the power supply circuit to further protect the module from ESD damage or other Electrical Over-Stress (EOS).

   When the operating voltage of the active antenna is 5 V, leave the VCC_RF pin floating and supply 5 V power to the V_ANT pin to power the antenna.

   ☞ If the antenna power supply and the module's main supply VCC use the same power rail, the ESD, surge and overvoltage from the antenna will have an effect on VCC, which may cause damage to the module. Therefore, it's recommended to design an independent power rail for the antenna to reduce the possibility of damage to the module.

   When using a passive antenna, leave the VCC_RF pin floating and ground V_ANT.

2. V_BCKP power supply is used for hot start, and the power voltage is 1.65 V~3.6 V. If hot start is not necessary, V_BCKP pin should be connected to VCC. Do NOT leave it floating or connect it to ground.

2 Reference Circuit Using a Passive Antenna

- To ensure the system performance, a low noise amplifier (LNA) should be added between the passive antenna and the module RF_IN.
- If the user has a high requirement for ESD (higher than the specified value in User Manual), the user should consider other method to power LNA rather than using VCC_RF.

  When designing circuit to power LNA, it is recommended to choose a power supply chip with high ESD protection level. Gas discharge tubes, varistors, TVS tubes and other high-power protective devices may also be used in the power supply circuit to further protect the module from ESD damage or other Electrical Over-Stress (EOS).
- Note the 50 Ω impedance matching of the RF wiring (Antenna → LNA → RF_IN).

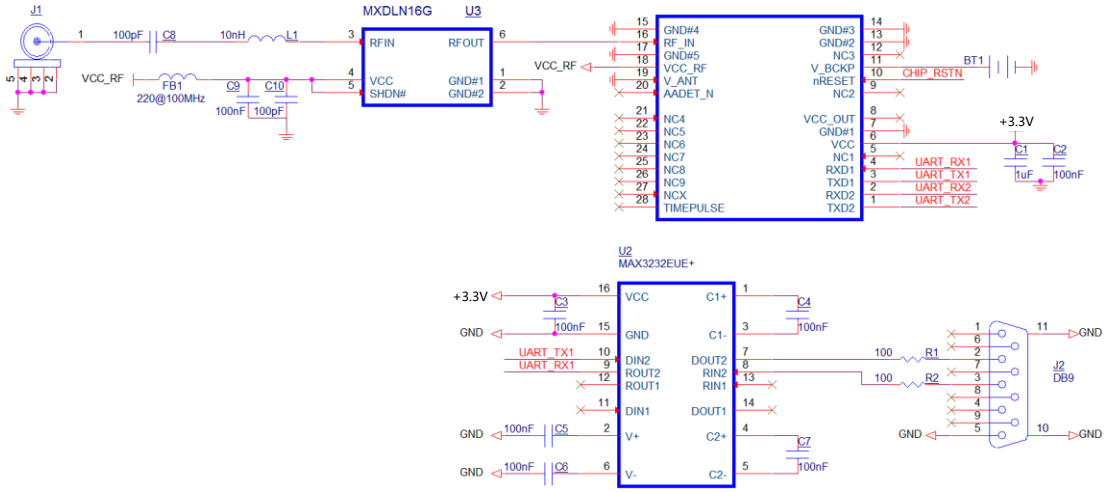

Figure 2-1 Reference Circuit Using a Passive Antenna

3 Reference Circuit of Antenna State Detection

Antenna state detection uses the principle of feeding current detection. If no feeding current is detected, the antenna state detection function is not supported.

The detection circuit for antenna state is not integrated inside the UM220-IV L module; the antenna state detection function can be realized through the external circuit. It is suggested to add the following design to the antenna feeding circuit:

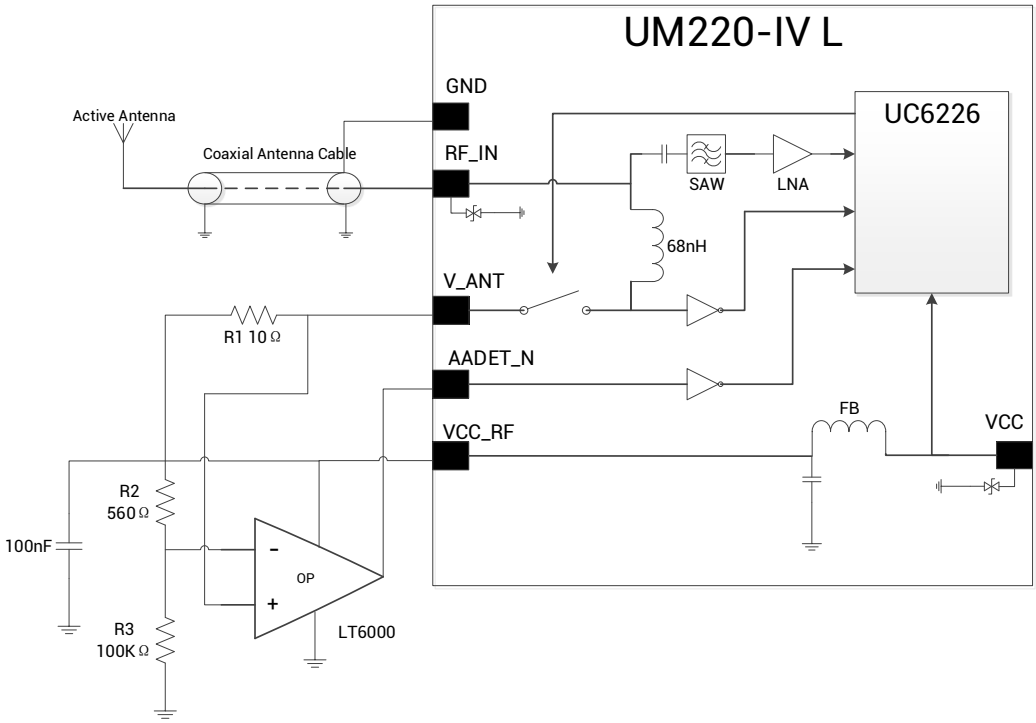

Figure 3-1 Reference Circuit of Antenna State Detection

In the figure above, "V_ANT" is a standard +3.3 V power supply for antenna, and it feeds the antenna through a 68 nH inductor. The antenna state indicator signals "NOT (AADET_N)" and "NOT (V_ANT)" are described in the following table, respectively.

Table 3-1 Index Signal of Antenna Detection

State	NOT (V_ANT)	NOT (AADET_N)
Open Circuit	LOW	LOW
Short Circuit	HIGH	HIGH
Normal	LOW	HIGH

☞ The antenna supply voltage in the reference circuit is +3.3 V, and the power supply current shall not exceed 80 mA. If the voltage and current are not in that range, adjust the parameters to ensure that NOT (V_ANT) and NOT (AADET_N) signals match the state values in the above table.

4 Power Supply Requirements

4.1 Main Supply (VCC)

The voltage range of VCC is 3.0 V ~ 3.6 V.

Notes:

- The VCC initial level when power-on should be less than 0.4 V.
- The VCC ramp when power-on should be monotonic, without plateaus.
- The voltages of undershoot and ringing should be within 5% VCC.
- VCC power-on waveform: The time interval from 10% rising to 90% must be within 100 μs ~ 10 ms.
- Power-on time interval: The time interval between the power-off (VCC < 0.4 V) to the next power-on is recommended to be larger than 500 ms.

4.2 Backup Supply (V_BCKP)

If the hot start function is needed, users should supply backup power to the module. The voltage range of V_BCKP is 1.65 V ~ 3.6 V.

Notes:

- The V_BCKP initial level when power-on should be less than 0.4 V.
- The V_BCKP ramp when power-on should be monotonic, without plateaus.
- The voltages of undershoot and ringing should be within 5% V_BCKP.
- V_BCKP power-on waveform: The time interval from 10% rising to 90% must be within 100 μs ~ 10 ms.
- Power-on time interval: The time interval between the power-off (V_BCKP < 0.4 V) to the next power-on is recommended to be larger than 500 ms.
- The V_BCKP pin cannot be floating or connected to ground. When V_BCKP is not used, it should be connected to VCC or connected to backup power.

5 Appendix

Avoid Leakage Power

Description

In the designing of UM220-IV L, the input interfaces (including RXD, GPIO, etc.) are connected to VCC through pull-up resistors to prevent the impact caused by the input variable state. Therefore, if there is data input on the above interfaces under the power-down mode, it can form leakage power on the module's VCC, which may cause failure of startup when the module is powered on.

Solution

When the module is not powered on, make sure the IO ports connected to the module are in high resistance state or low level to avoid leakage power.

和芯星通科技（北京）有限公司

Unicore Communications, Inc.

北京市海淀区丰贤东路 7 号北斗星通大厦三层
F3, No.7, Fengxian East Road, Haidian, Beijing, P.R.China, 100094
www.unicorecomm.com

Phone: 86-10-69939800

Fax: 86-10-69939888

info@unicorecomm.com