HARDWARE

REFERENCE DESIGN

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UM220-IV M0

Industry Grade Multi-GNSS Positioning Module

Revision History

Version	Revision History	Date
Ver. 1.0	HW reference design, primary	Aug. 2018
Ver. 1.1	Change the symbol of V_BCKP from button battery to power; TXD connects 1K resistance in series	Aug. 2019
R1.2	Update Copyright time	Apr. 2020
R1.3	Fix typo	Jun. 2021
R1.4	Update the range of power supply; Add reference circuits and solution to avoid leakage power	Nov. 2021
R1.5	Add notes about ESD protection	Nov. 2021
R1.6	Optimize the description of antenna power supply; Add Chapter 3 Power Supply Requirements	Apr. 2023

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Contents

1 Minimum System Reference Circuit

- Supply 3.0V~3.6V power VCC
- Ground all GND pins of the module
- Connect RF_IN signal to antenna, note the 50 Ω impedance match on the circuit
- If the user has a high requirement for ESD (> ±2000 V), the user should consider other method to feed the antenna rather than using the VCC_RF pin.

  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 designing the antenna feed circuit, it is recommended to choose a power supply chip with high ESD protection level. Gas discharge tube, varistor, TVS tube 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).

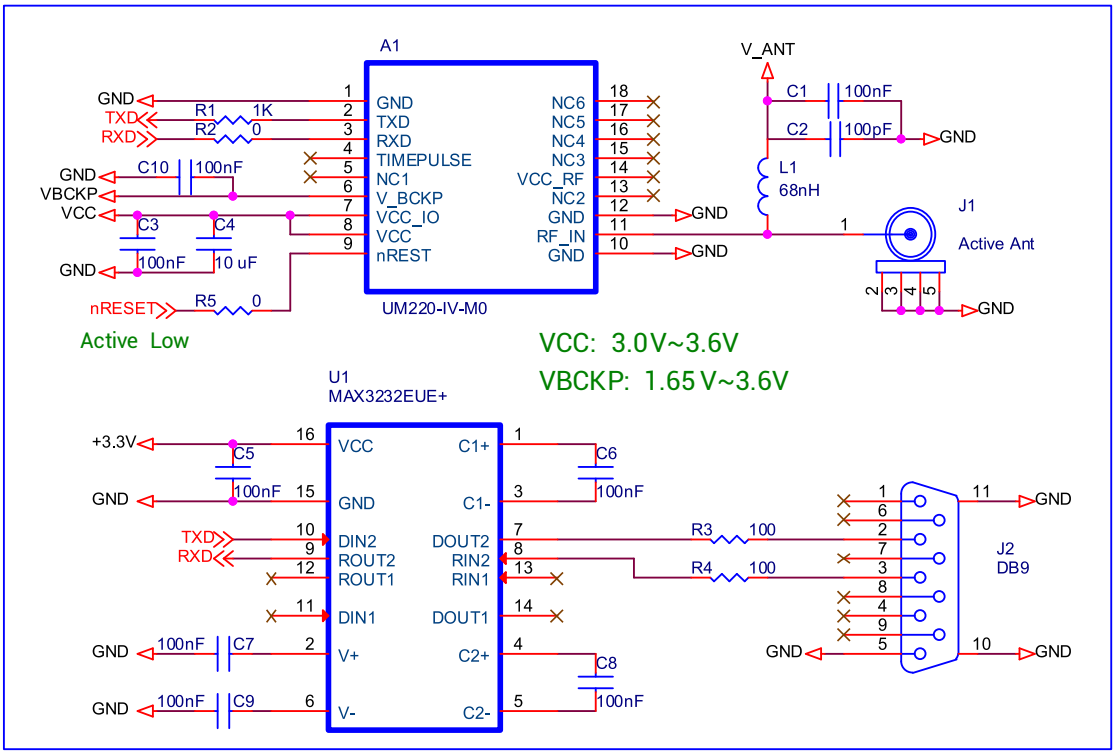

Figure 1 Minimum System Reference Circuit (Only for the Module with PN of 2330322000028)

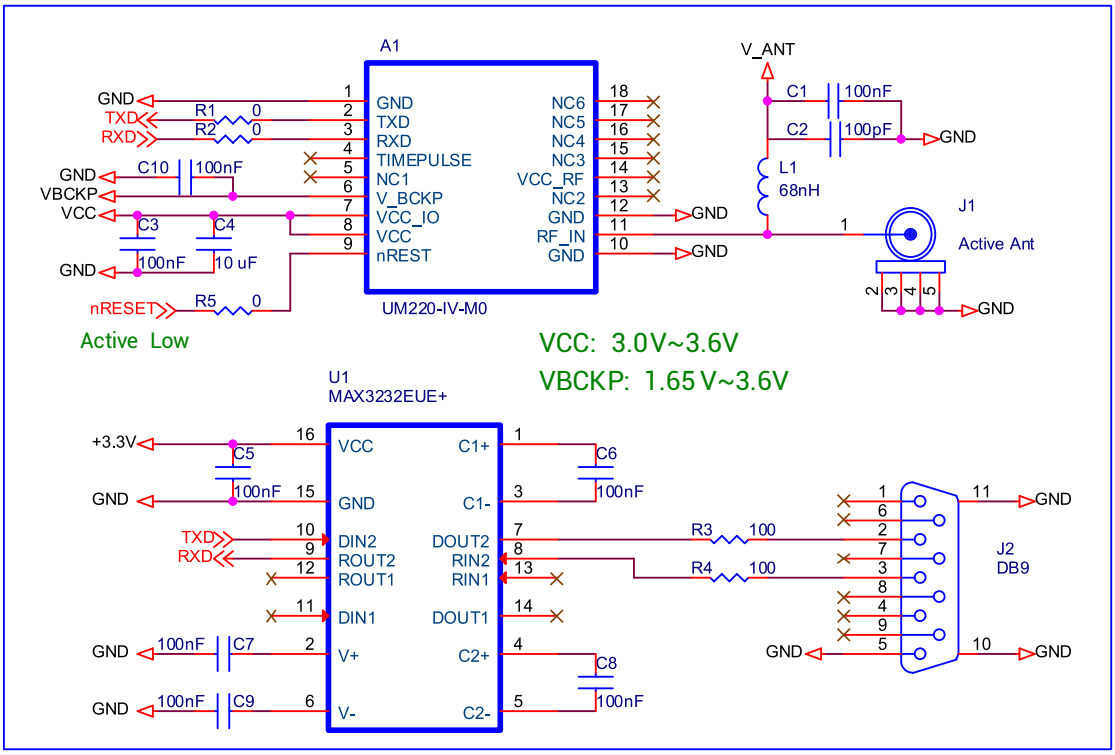

Figure 2 Minimum System Reference Circuit (Only for the Module with PN of 2310408000024)

2 Reference Circuit Using a Passive Antenna

- To ensure the system performance, low noise amplifier and filter should be added between the passive antenna and the module RF_IN
- If the user has a high requirement for ESD (> ±2000 V), 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 tube, varistor, TVS tube 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).
- RF wire (Antenna → LNA → SAW → RF_IN), note the impedance matching at 50Ω

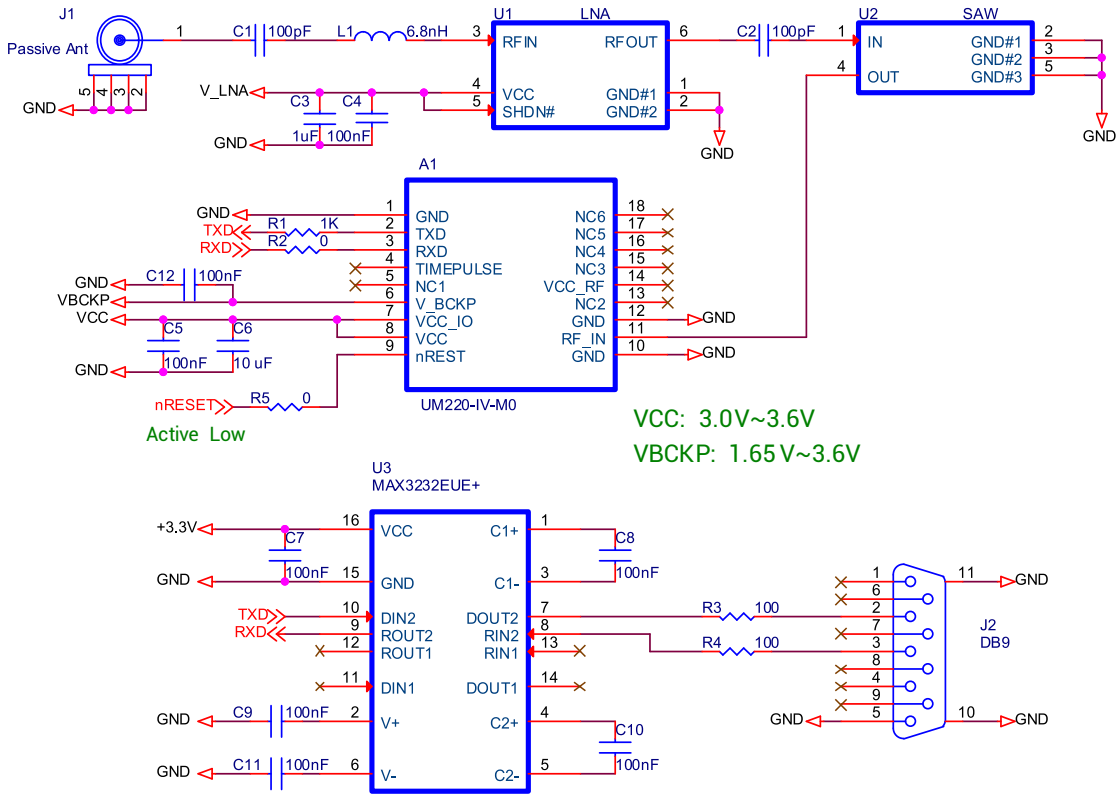

Figure 3 Reference Circuit Using a Passive Antenna (Only for the Module with PN of 2330322000028)

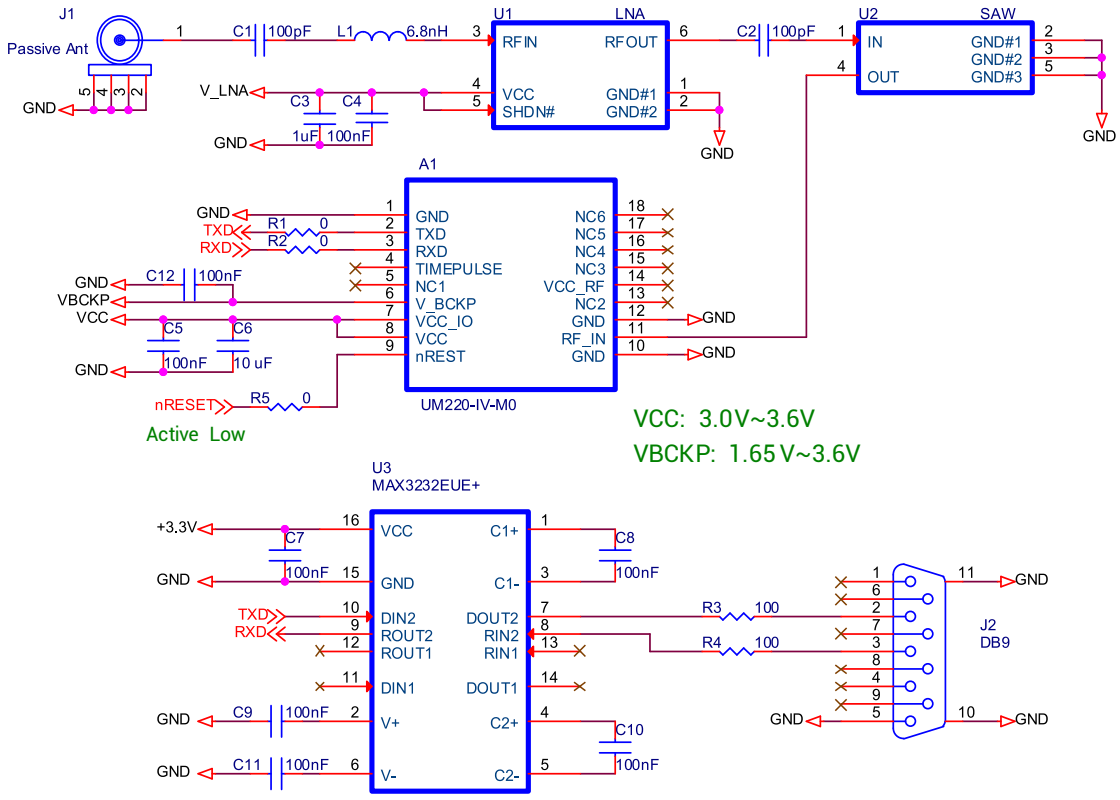

Figure 4 Reference Circuit Using a Passive Antenna (Only for the Module with PN of 2310408000024)

3 Power Supply Requirements

3.1 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.

3.2 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.

4 Attachment

To Avoid Abnormal Start Up Caused By Leakage Power

The module input ports of UM220-IV M0 include: RXD and GPIO. When the module is not powered on, if there is data input in the above ports, it will form leakage power on the module VCC. When the leakage voltage is higher than 1.6V, it may cause a failure of starting up when the module is powered on.

Solution:

When the module is not powered on, make sure that the IO port connected to the module is in a high-resistance state or a low level to avoid leakage power. Another solution is to connect a 1KΩ resistor in series to the serial port RX, and connect a 33Ω or 1KΩ resistor in series to TX (There is no need to connect any resistor to the TX of the module with PN 2310408000024). It is also recommended to connect a 4.7KΩ resistor in series to the Pin of other necessary PIOs.

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