



HARDWARE

REFERENCE DESIGN

WWW.UNICORECOMM.COM

UM220-INS

Multi-GNSS Integrated Navigation
and Positioning Module

Copyright© 2009-2023, Unicore Communications, Inc.
Data subject to change without notice.



Revision History

Version	Revision History	Date
Ver.1.1	First release	Aug. 2019
R1.2	Update Copyright time	Apr.2020
R1.3	Add odometer and direction signal requirements	Apr. 2020
R1.4	Fix typo	Jun. 2021
R1.5	Update the range of power supply	Aug. 2021
R1.6	Add notes about ESD protection	Nov. 2021
R1.7	Optimize the description of antenna power supply; Add Chapter 3 Power Supply Requirements	Apr. 2023

Legal right notice

This manual provides information and details on the products of Unicore Communication, Inc. ("Unicore") referred to herein.

All rights, title and interest to this document and the information such as data, designs, layouts contained in this manual are fully reserved, including but not limited to the copyrights, patents, trademarks and other proprietary rights as relevant governing laws may grant, and such rights may evolve and be approved, registered or granted from the whole information aforesaid or any part(s) of it or any combination of those parts.

Unicore holds the trademarks of "和芯星通", "UNICORECOMM" and other trade name, trademark, icon, logo, brand name and/or service mark of Unicore products or their product serial referred to in this manual (collectively "Unicore Trademarks").

This manual or any part of it, shall not be deemed as, either expressly, implied, by estoppel or any other form, the granting or transferring of Unicore rights and/or interests (including but not limited to the aforementioned trademark rights), in whole or in part.

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,

UM220-INS Series Module Hardware Reference Design

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.



Contents

1	Minimum System Reference Circuit	1
2	Reference Circuit Using a Passive Antenna.....	2
3	Power Supply Requirements	3
3.1	Main Supply (VCC).....	3
3.2	Backup Supply (V_BCKP).....	3
4	Key Device Type Selection Reference.....	3
5	Odometer Waveform Diagram	4
6	Odometer and Direction Signal	5
6.1	Operation Condition.....	5
6.2	Odometer (WHEELTICK) Frequency	5
6.3	Direction (FWD) Signal	5

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
- Upgrade the module via port 1, ensuring that serial port 1 can interconnect with a PC through the interface
- 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).

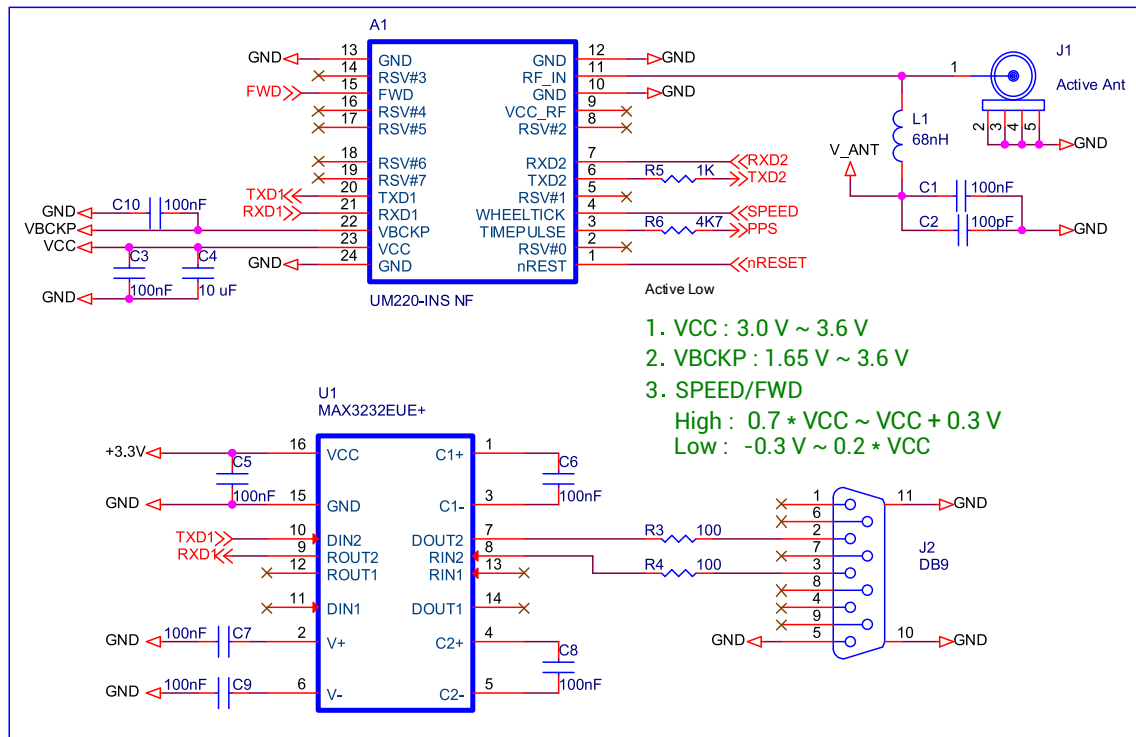


Figure 1 Minimum System Reference Circuit

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 ($> \pm 2000$ V), the user should consider other method to power LNA rather than using VCC_RF.

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).

- RF wire (Antenna \rightarrow LNA \rightarrow SAW \rightarrow RF_IN), note the impedance matching at 50 Ω

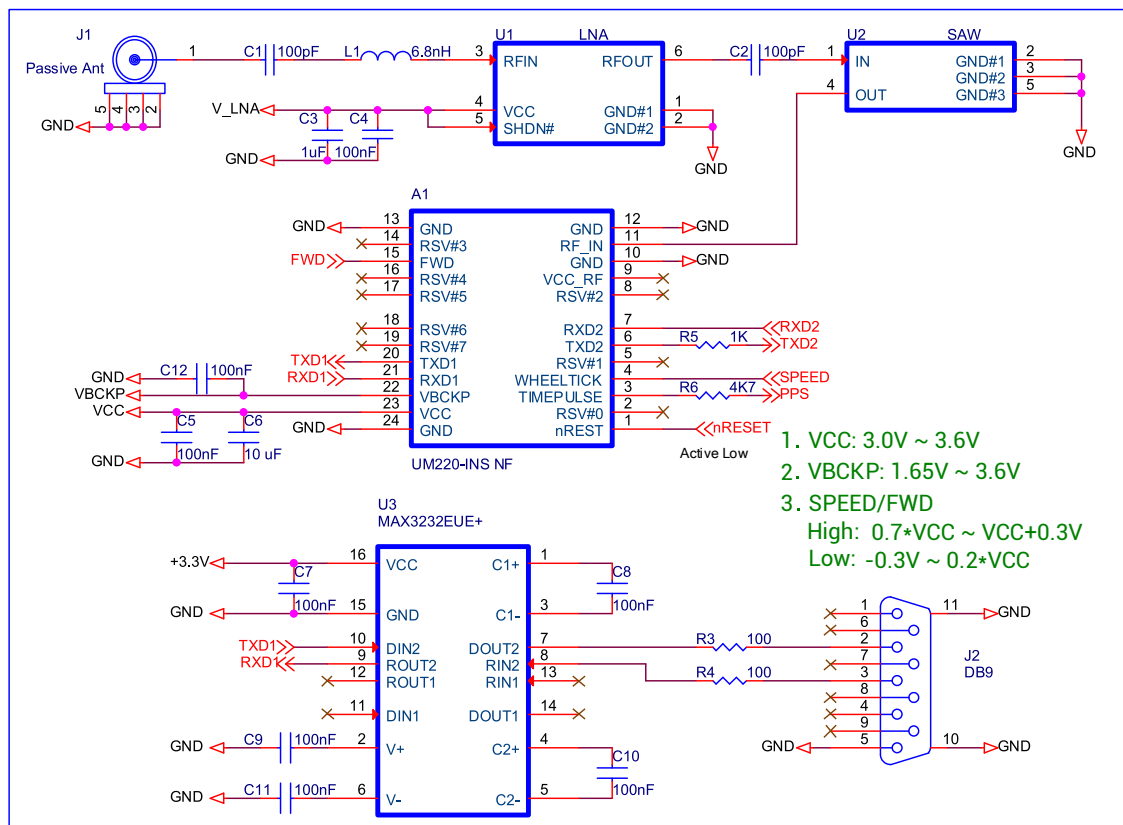


Figure 2 Reference Circuit Using a Passive Antenna

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 μ s ~ 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 μ s ~ 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 Key Device Type Selection Reference

	Component	Order No	Manufacturer
U1	LNA	MAX2659ELT+	Maxim
U2	SAW	TA0757A/TA1661A	TAI-SAW

5 Odometer Waveform Diagram

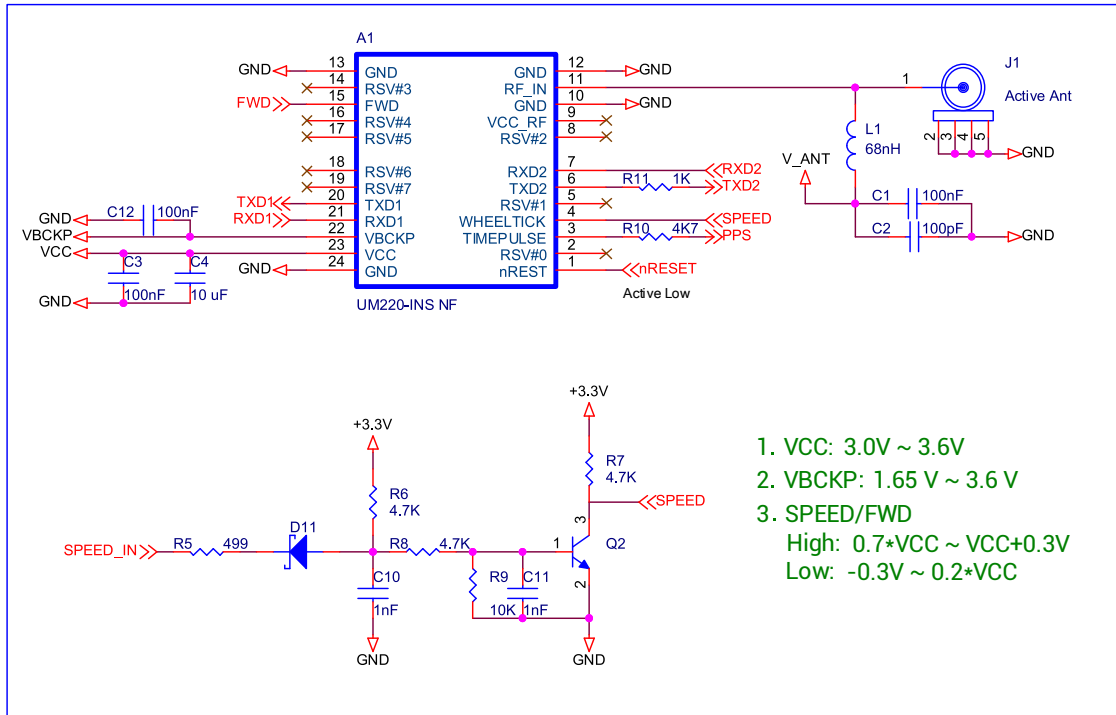


Figure 3 Odometer Reference Circuit

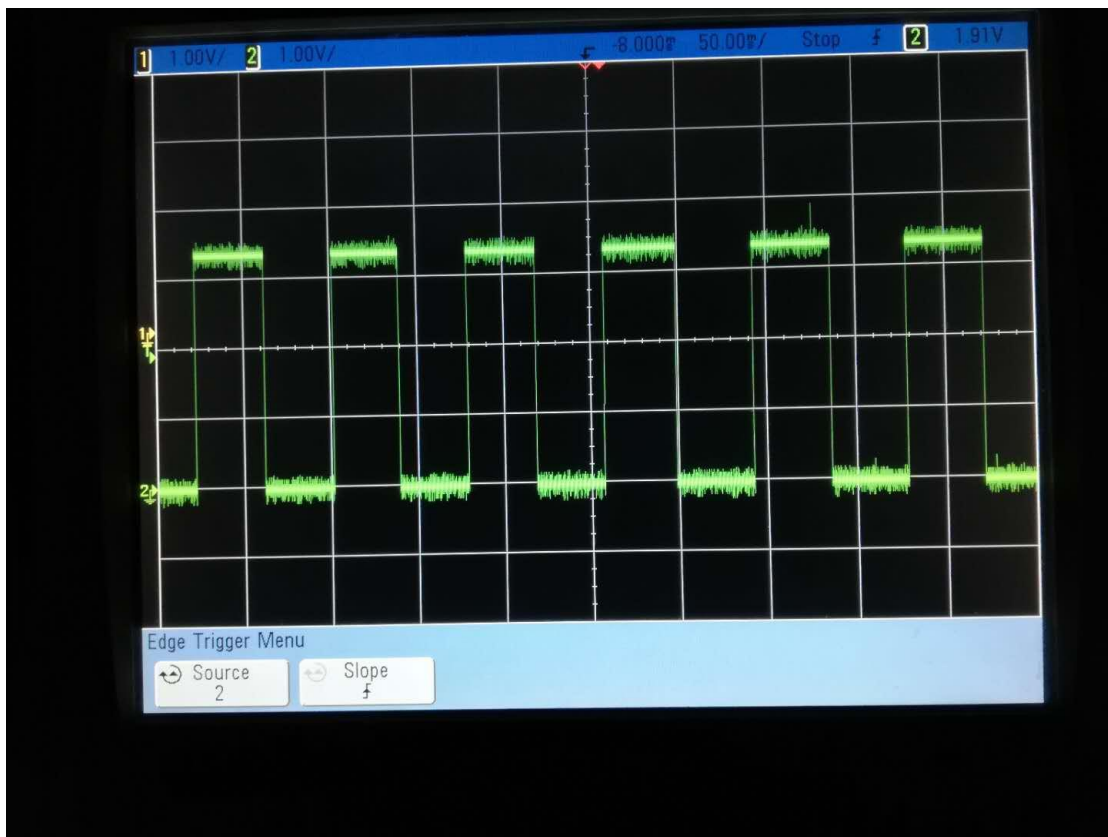


Figure 4 Odometer Waveform Diagram

6 Odometer and Direction Signal

6.1 Operation Condition

Item	Pin	Min.	Typ.	Max.	Unit	Condition
Power Supply (VCC)	Vcc	3.0	3.3	3.6	V	
Ripple Voltage	Vp-p			50	mV	
Low Level Input Voltage	V _{IL}	-0.3		0.2*V _{cc}	V	
High Level Input Voltage	V _{IH}	0.7*V _{cc}		V _{cc} +0.3	V	

6.2 Odometer (WHEELTICK) Frequency

1. The odometer signal requires the input of a square wave signal with a frequency not higher than 5KHz.
2. The distance of a square wave signal is required to be between 1cm and 50cm, and the typical value is 10cm.
3. The chip detects the rising edge quantities of square wave signal, and the time of high level and low level should not be lower than that of 100μs.
4. If the carrier is still (for example, parking), WHEELTICK pin level must remain constant

6.3 Direction (FWD) Signal

The module defaults to forward at high level and reverse at low level.

It can be configured through the commands as shown below. Please refer to the protocol manual for details

\$CFGODOFWD,1 *forward at high level and reverse at low level*
 \$CFGODOFWD,0 *forward at low level and reverse at high level*

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



www.unicorecomm.com