HARDWARE

REFERENCE DESIGN

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UM621 Series

Multi-GNSS Dual-frequency Integrated Positioning Module

Revision History

Version	Revision History	Date
R1.0	First release	Oct. 2022
R1.1	Optimize the description of antenna power supply; Add Chapter 3 Power Supply Requirements	Apr. 2023
R2.0	Expand the document scope: applicable to UM621 series	Sept. 2023
R2.1	Modify the voltage range of V_BCKP; Add the voltage requirements of VCC and V_BCKP for the module that supports wake-on-motion (WOM)	Feb. 2024
R2.2	Add Chapter 5: Odometer Interfaces	Apr. 2024

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.

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1 Reference Circuit Using an Active Antenna

- The voltage range of VCC and V_BCKP are described in Chapter 3: Power Supply Requirements
- Ground all GND pins of the module
- Connect the RF_IN signal to the antenna and note the 50 Ω impedance matching
- Feed the antenna with an external power supply

  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.

- Requirements for the odometer speed pulse: width ≥ 100 μs, frequency ≤ 5K Hz

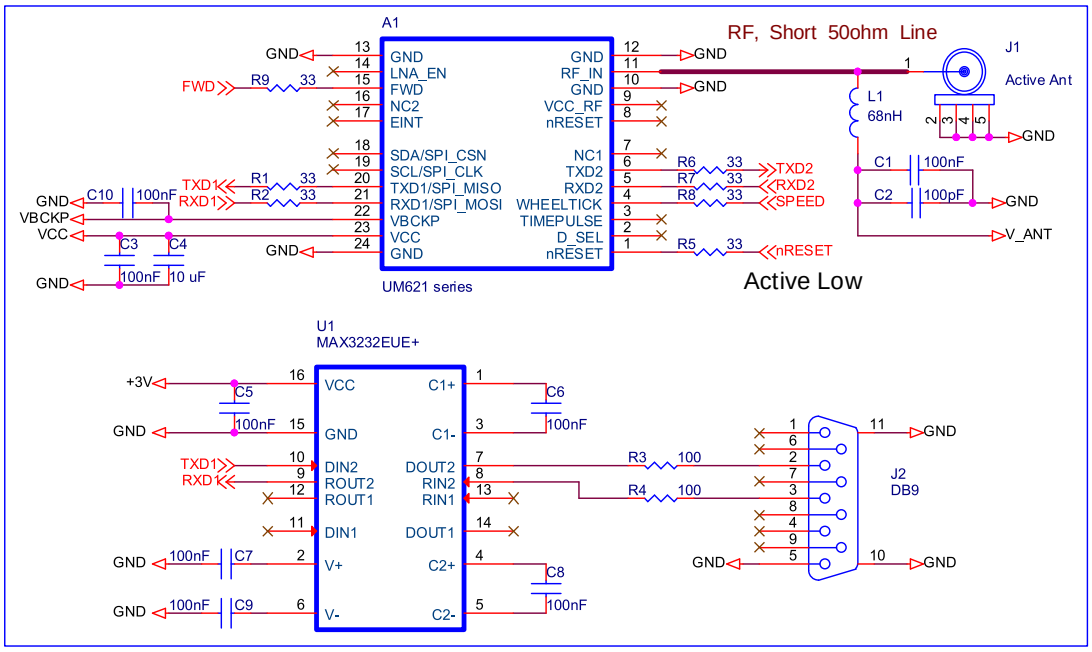

Figure 1-1 Reference Circuit Using an Active Antenna

2 Reference Circuit Using a Passive Antenna

- When using a passive antenna, a low noise amplifier should be added between the antenna and the RF_IN of the module in order to ensure the performance of the system.
- For the RF routing (antenna → LNA → RF_IN), note the 50 Ω impedance matching
- For the voltage range of V_BCKP, see Chapter 3: Power Supply Requirements
- Requirements for the odometer speed pulse: width ≥ 100 μs, frequency ≤ 5 KHz

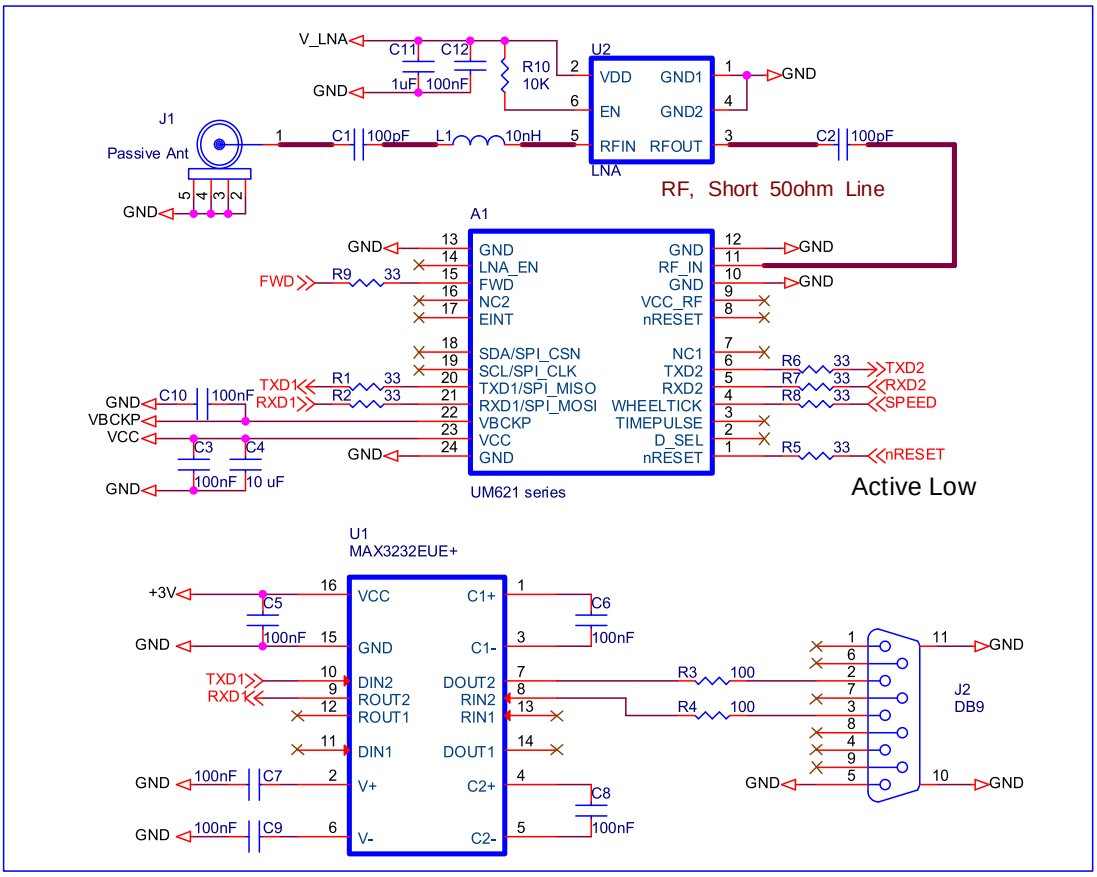

Figure 2-1 Reference Circuit Using a Passive Antenna

3 Power Supply Requirements

3.1 Main Supply (VCC)

- For the module that does not support wake-on-motion, the voltage range of VCC is 2.7 V ~ 3.6 V.
- For the module that supports wake-on-motion, 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)

When using hot start, users should supply backup power to the module.

- For the module that does not support wake-on-motion, the voltage range of V_BCKP is 2.0 V ~ 3.6 V.
- For the module that supports wake-on-motion, the voltage range of V_BCKP is 3.0V ~ 3.6 V. Meanwhile, ensure that the voltage at V_BCKP is lower than that at VCC.

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 Recommended BOM

Table 4-1 Recommended BOM

	Component	Order No.	Manufacturer
U1	RS-232 Transceivers	MAX3232EUE+	TI
U2	LNA	MXDLN14TP	MAXSCEND

5 Odometer Interfaces

Odometer data can be input to the UM621 series modules via hardware interface or software interface.

☞ The two ways cannot be used at the same time.

5.1 Hardware Interface

The Pin4 (WHEELTICK) of the UM621 series modules is used to receive the speed pulse signal from the odometer, and the Pin15 (FWD) is used to receive the direction signal from the odometer.

The odometer signal of vehicles is generally 12 V and the signal quality is poor. Therefore, signal filtering, optocoupler isolation and level conversion are required before transferring the odometer signal to the UM621 series modules for use.

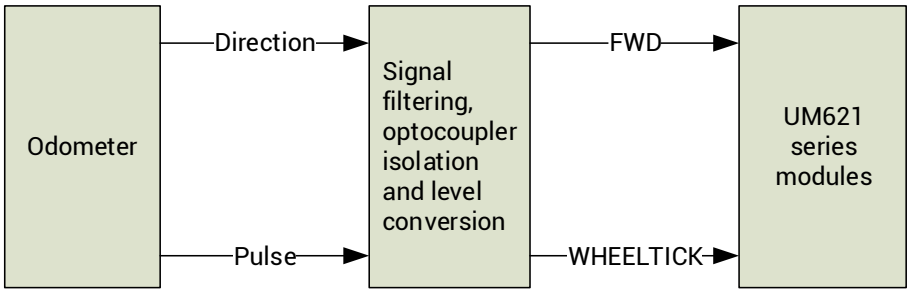

Figure 5-1 Odometer Connection

5.1.1 Odometer Reference Circuit and Waveform Diagram

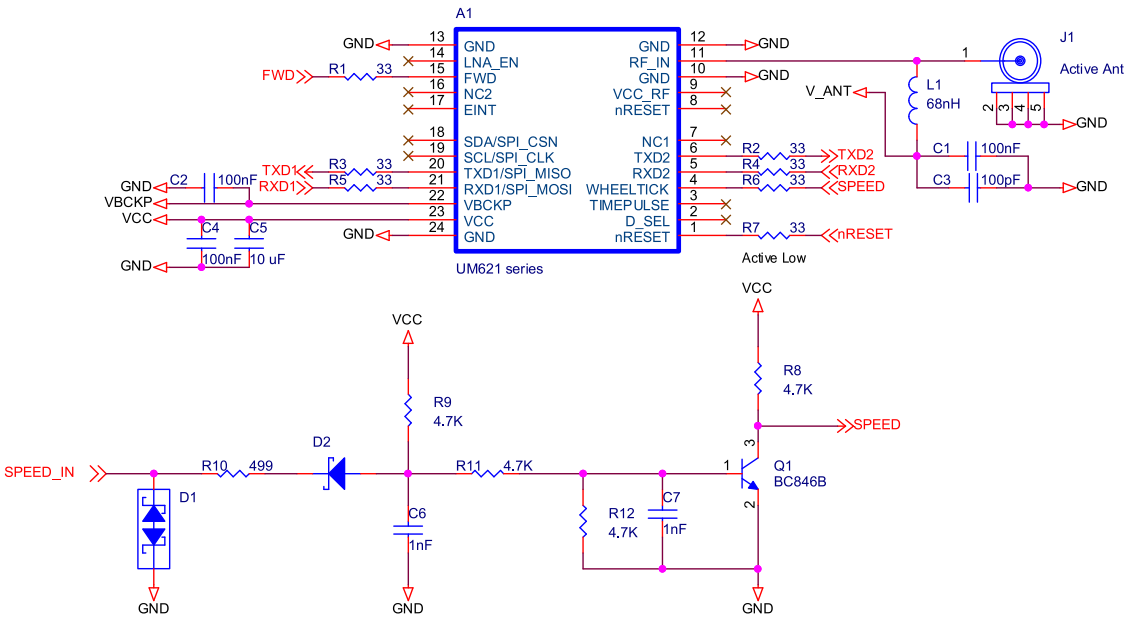

Figure 5-2 Reference Circuit for Odometer

The voltages of VCC, V_BCKP and SPEED/FWD shall meet the requirements in Table 5-1.

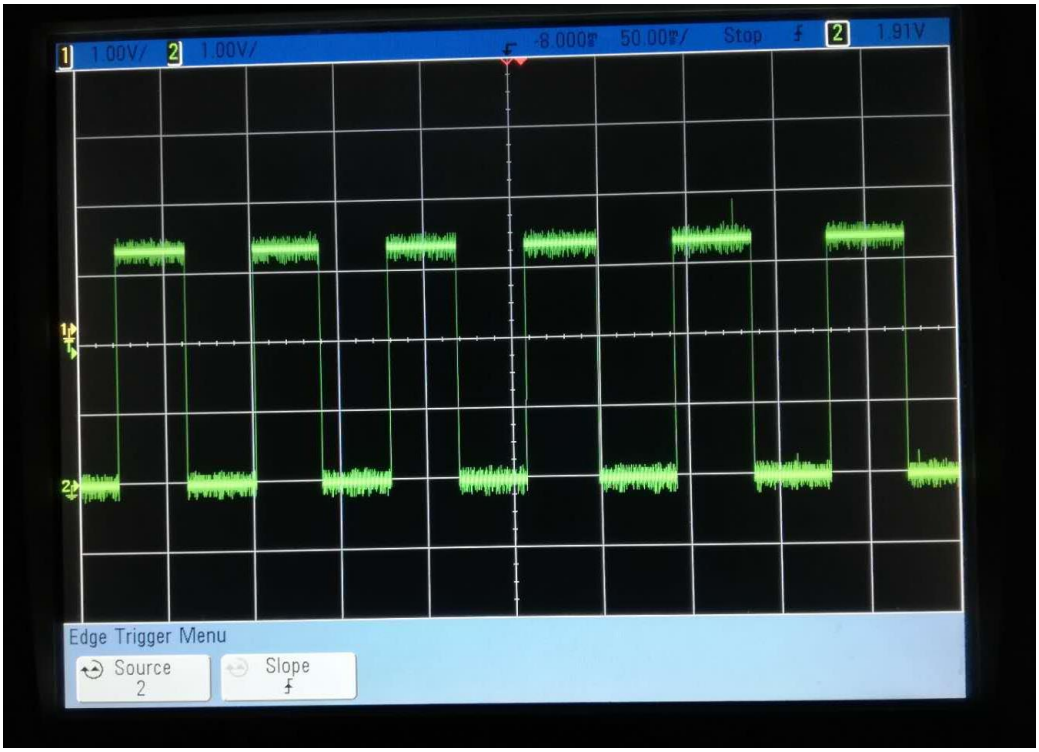

Figure 5-3 Odometer Waveform Diagram

5.1.2 Odometer Speed and Direction Signal

5.1.2.1 Voltage Requirements

Table 5-1 Voltage Requirements

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Main Supply	VCC	2.7	3.3	3.6	V	Non-WOM
		3.0	3.3	3.6	V	WOM
Backup Supply	V_BCKP	2.0		3.6	V	Non-WOM
		3.0		3.6	V	WOM
Ripple Voltage	V_{p-p}			50	mV	
WHEELTICK/FWD Low Level Input Voltage	V_{IL}	0		0.2*VCC	V	
WHEELTICK/FWD High Level Input Voltage	V_{IH}	0.7*VCC		VCC+0.2	V	

5.1.2.2 Odometer (WHEELTICK) Frequency

1. The odometer signal input to the module is required to be a square wave signal with a frequency not higher than 5 KHz.
2. The distance corresponding to a square wave signal is required to be between 1 cm and 40 cm. For example, if the distance is 20 cm, the output frequency is

$$f = [(1000/20) * V/36] Hz$$

where V is the velocity of the vehicle and its unit is km/h.

3. The chip detects the number of rising edges of the square wave signal, and the time of high level and low level should not be lower than 100 μs.
4. If the vehicle is still (for example, parking), the level of WHEELTICK pin must remain constant.

5.1.2.3 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*

5.2 Software Interface

Speed and direction information can be input to the UM621 series modules via UART1 or UART2, which can be configured by the following command.

Syntax: $ODODATA,time,speed,forward,RSV,RSV,RSV
Example: $ODODATA,091649.00,10000,1,,,,

Table 5-2 Parameter Description of ODODATA

Parameter	Format	Description
time	STR	UTC time; in the format of hhmmss.ss hh - Hour mm - Minute ss.ss - Second
speed	UINT	Driving speed; unit: 1e-3 m/s
forward	UINT	Driving direction: 0 - Forward 1 - Reverse
RSV		Reserved
RSV		Reserved
RSV		Reserved

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