HARDWARE

REFERENCE DESIGN

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UM761 Series

Multi-GNSS Single-Frequency Integrated Positioning Module

Foreword

About This Document

This manual provides the schematic diagrams, hardware design considerations, and recommended BOM for the Unicore UM761 series modules.

Target Readers

This manual is intended for technical personnel familiar with GNSS receivers.

Statement

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Revision History

Version	Revision History	Date
R1.0	First release.	Mar. 2026

Document Status

Releases	Status Descriptions	Current Status
Primary	This is a pre-release version with target specifications that are subject to revision.	
Alpha release	This is an alpha release version, which has been preliminarily tested and verified. The content may undergo minor modifications based on user feedback and further testing.	
Production release	The document contains the complete and final specifications.	√

1 Reference Circuit Using an Active Antenna

- The voltage range of VCC and V_BCKP are described in Power Supply Requirements.
- Ground all GND pins of the module.
- Connect the RF_IN signal to the antenna and ensure 50 Ω impedance matching.
- Use an external power supply to feed the antenna.
  If the antenna's power supply and the module's main power supply (VCC) use the same power rail, the ESD, surge and overvoltage introduced at the antenna will be directly applied to 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 ≤ 10 KHz.

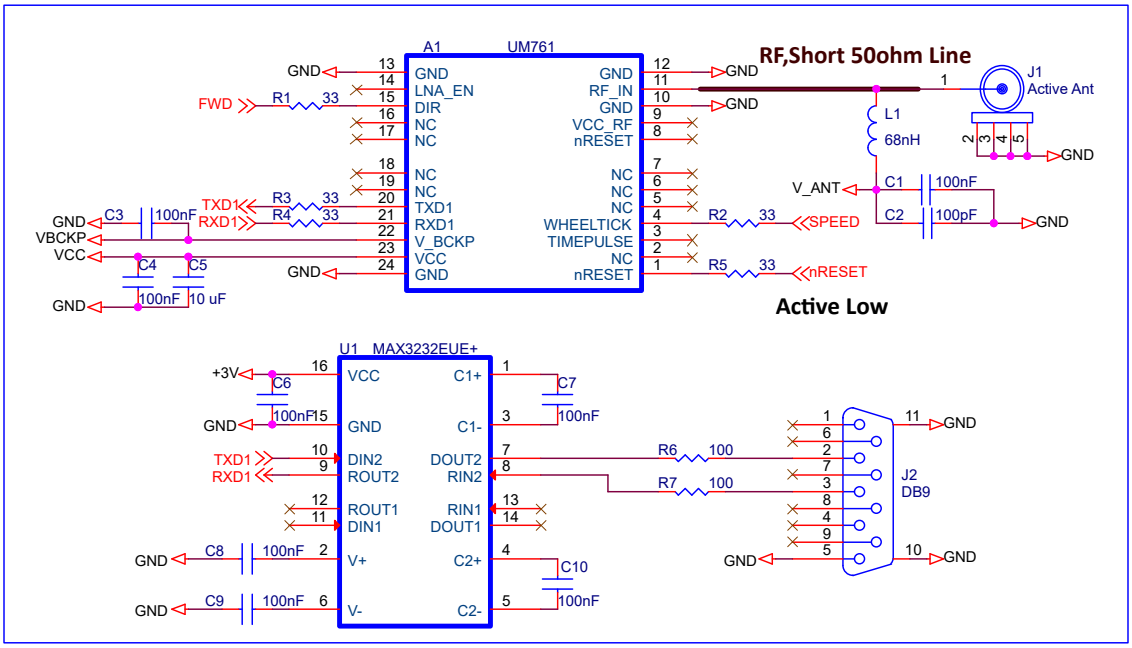

Figure 1-1 Reference Circuit Using an Active Antenna

2 Reference Circuit Using a Passive Antenna

- The voltage range of VCC and V_BCKP are described in Power Supply Requirements.
- Ground all GND pins of the module.
- For optimal system performance when using a passive antenna, an LNA (Low-Noise Amplifier) is required between the antenna and the module's RF_IN pin.
- Ensure 50 Ω impedance matching for the RF routing (antenna → LNA → RF_IN).
- Requirements for the odometer speed pulse: width ≥ 100 μs, frequency ≤ 10 KHz.

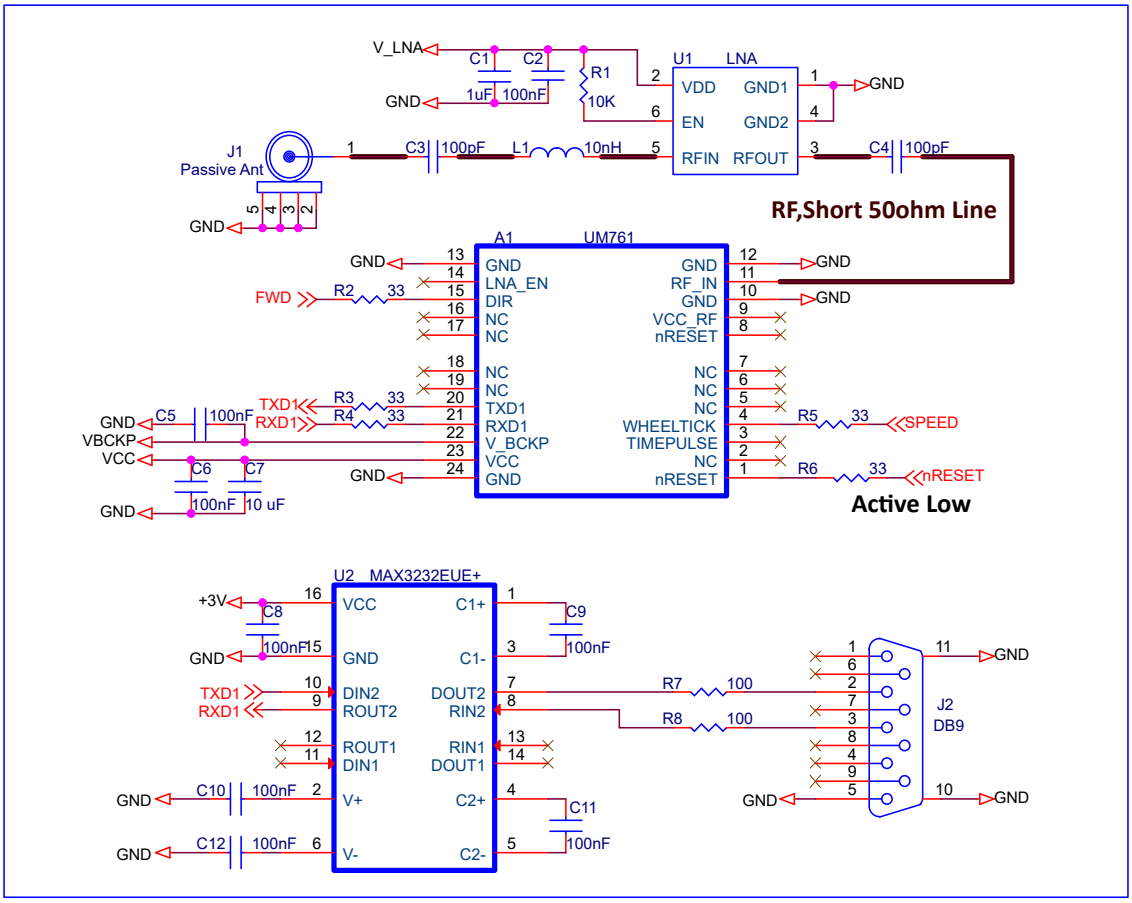

Figure 2-1 Reference Circuit Using a Passive Antenna

3 Power Supply Requirements

3.1 Main Supply (VCC)

The voltage range of VCC is 2.7 V ~ 3.6 V.

Notes:

- The initial level of VCC when powered on needs to be less than 0.4 V.
- The power-on ramp of VCC needs to be monotonic, without plateaus.
- The undershoot and ringing of VCC when powered on needs to be within 5% of VCC.
- Power-on waveform: The time interval from 10% rising to 90% needs to 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, backup power supply is required for the module. The voltage range of V_BCKP is 1.7 V ~ 3.6 V.

Notes:

- The initial level of V_BCKP when powered on needs to be less than 0.4 V.
- The power-on ramp of V_BCKP needs to be monotonic, without plateaus.
- The undershoot and ringing of V_BCKP when powered on needs to be within 5% of V_BCKP.
- Power-on waveform: The time interval from 10% rising to 90% needs to 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 hot start is not used, V_BCKP must be connected to VCC or 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 UM761 series modules via hardware interface or software interface.

> **Caution:** The two methods cannot be used at the same time.

5.1 Hardware Interface

The Pin 4 (WHEELTICK) of the UM761 series modules is used for receiving speed pulse signals from the odometer, and the Pin 15 (DIR) is used for receiving direction signals from the odometer.

The odometer signals of vehicles are generally 12 V and the signal quality is poor. Therefore, signal filtering, optocoupler isolation and level conversion are required before transferring the odometer signals to the UM761 series modules for use.

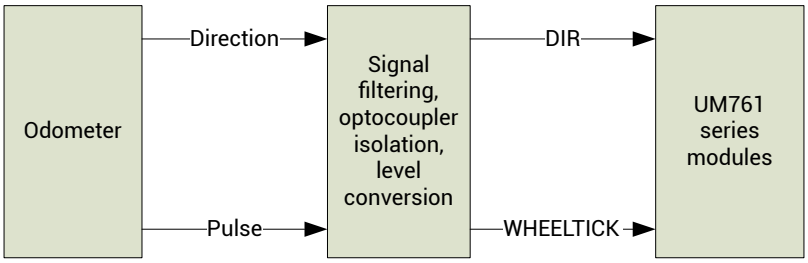

Figure 5-1 Odometer Connection

5.1.1 Odometer Reference Circuit and Waveform Diagram

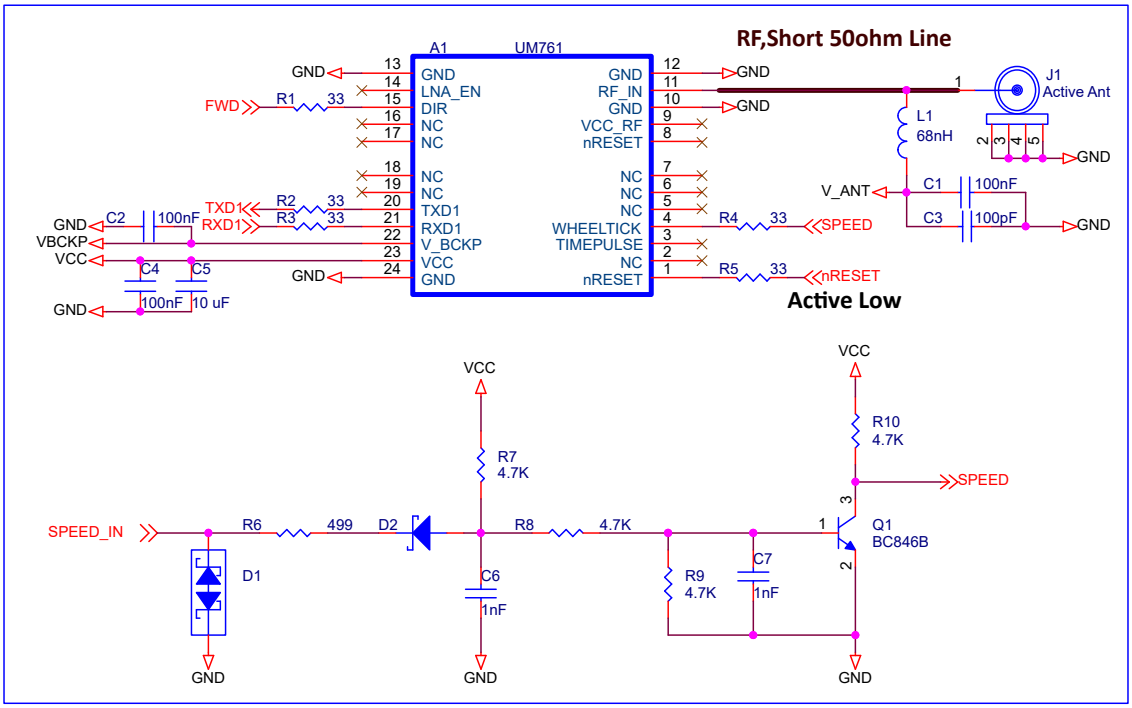

Figure 5-2 Odometer Reference Circuit

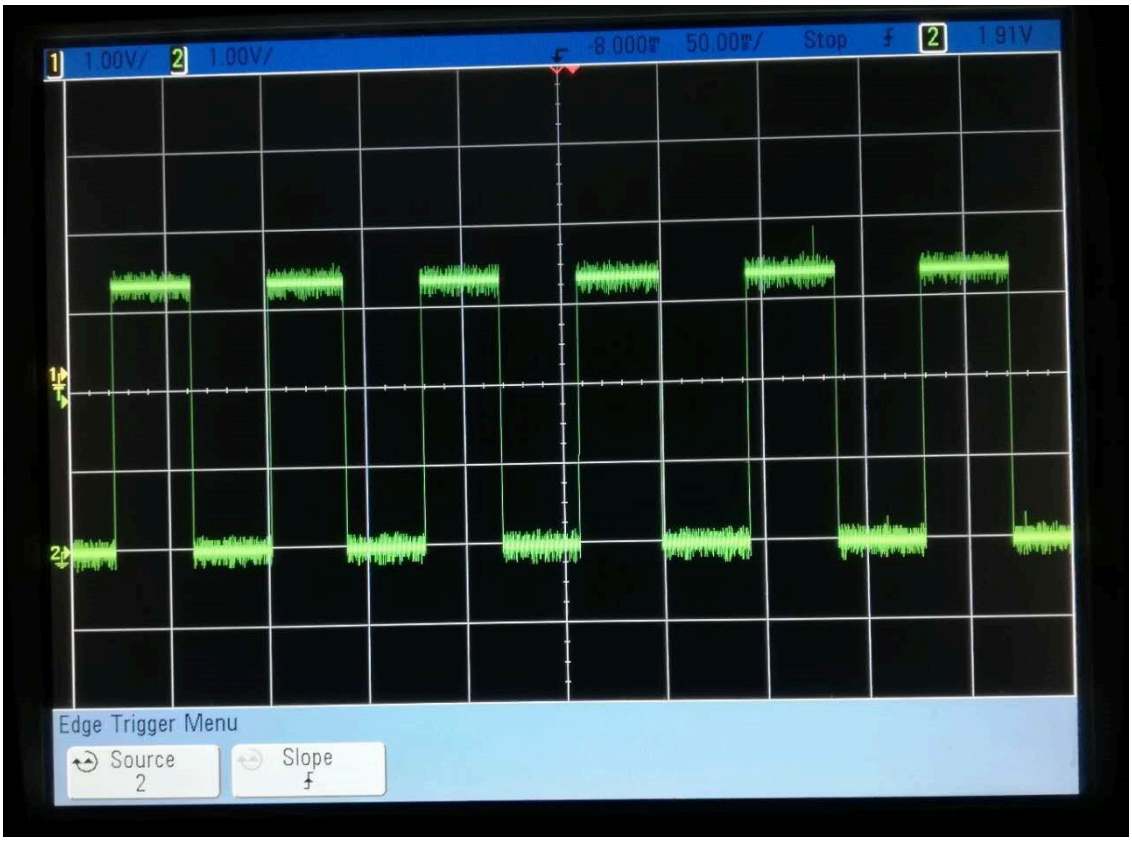

Figure 5-3 Odometer Waveform Diagram

5.1.2 Odometer Speed and Direction Signals

Table 5-1 Voltage Requirements

Item	Symbol	Min.	Typ.	Max.	Unit
Main Supply	VCC	2.7	3.3	3.6	V
Backup Supply	V_BCKP	1.7	/	3.6	V
Ripple Voltage	V_{p-p}	/	/	50	mV
WHEELTICK/DIR Low Level Input Voltage	V_{IL}	0	/	0.2×VCC	V
WHEELTICK/DIR High Level Input Voltage	V_{IH}	0.8×VCC	/	3.6	V

Odometer Pulse (WHEELTICK)

1. The odometer pulse is required to be a square wave signal with a frequency not higher than 10 KHz.
2. The distance corresponding to a square wave signal is required to be between 1 cm and 27 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. Both high-level and low-level durations are required to be no less than 100 μs.
4. If the vehicle is stationary (for example, parking), the voltage level of WHEELTICK pin must remain constant.

Direction Signal (DIR)

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

The configuration can be set by commands as shown below. For more information, refer to the *UFirebird IV Protocol Specification*.

- `$CFGODOFWD,1` //forward at high level and reverse at low level
- `$CFGODOFWD,0` //forward at low level and reverse at high level

5.2 Software Interface

Speed and direction signals can be input to the UM761 series modules via UART1 using 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

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.unicore.com

Phone: 86-10-69939800

Fax: 86-10-69939888

info@unicorecomm.com