INSTALLATION AND OPERATION

USER MANUAL

UM620N

Automotive Grade Dual-frequency Multi-GNSS Positioning Module

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Revision History

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R1.0	First release	Oct. 2022

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Foreword

This document describes the information of the hardware, installation, specification and the use of Unicore UM620N modules.

Document Structure

1. Product introduction
2. Installation guide
3. Technical specifications
4. Package
5. Clean
6. Reflow soldering

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1 Introduction

1.1 Overview

UM620N is a GNSS dual-frequency module designed for automotive navigation. It is based on the multi-system, dual-frequency and high-performance GNSS SoC – UFirebird II (UC6580A), which is independently developed by Unicore Communications. UM620N supports multi-system joint positioning and single system standalone positioning. It can output accurate positioning results even in complex scenarios.

The chip of UM620N conforms to the requirements of AEC-Q100, and the manufacturing process is in line with IATF 16949.



Model	Ordering Code	Operating Temperature		Grade		System							Interface				Data Update Rate
		-40°C~+85°C	-40°C~+105°C	Professional	Automotive	GPS	BDS	GLONASS	Galileo	NAVIC*	QZSS	SBAS	UART1	UART2	I²C	SPI	
UM620N	01	•			•	•	•	•	•	•	•	•	•	•	•	•	1 Hz/ 10 Hz*
	10A2		•		•	•	•	•	•	•	•	•	•	•	•	•	1 Hz/ 10 Hz*

* The default data update rate is 1Hz, which can be configured to 10Hz (supported by specific firmware).

* NAVIC is supported by specific firmware.

1.2 Key Specifications

Power	
Voltage	+2.7 V ~ 3.6 V DC
Power Consumption	300 mW
RF Input	
Constellations	GPS/GLONASS/BDS/Galileo/QZSS/NAVIC (IRNSS)*
Standing Wave Ratio	≤ 2.5
Input Impedance	50 Ω
Antenna Gain	15 dB ~ 30 dB
Physical Characteristics	
Dimensions	16.0 mm * 12.2 mm * 2.4 mm
Input / Output Data Interface	
UART x 2	LVTTL level Supported baud rate: 115200 ~ 460800 bps
I^2C x 1	Address: 7 bit Operating in slave mode Transfer rate: 400 Kbps
SPI x 1	Alternate function of pin 18~21 Operating in slave mode Maximum transfer rate: 4 Mbps
GNSS Performance	
Frequencies (Configurable)	GPS L1 C/A, L1C*, L5 GLONASS L1 BDS B1I, B1C*, B2a Galileo E1, E5a NAVIC* L5 QZSS L1, L5 SBAS
Time to First Fix (TTFF)	Cold Start 30 s Hot Start 2 s Reacquisition 2 s

Horizontal Positioning Accuracy	1.5 m CEP (dual-frequency quad-constellation, open sky)	
Velocity Accuracy (RMS)	0.1 m/s	
Sensitivity		GNSS
	Tracking	-165 dBm
	Acquisition	-148 dBm
	Hot Start	-158 dBm
	Reacquisition	-160 dBm
GNSS Data Update Rate	1 Hz / 10 Hz*	
1PPS Accuracy (RMS)	20 ns	
Data Format	NMEA 0183, Unicore Protocol	

* Items marked with an asterisk are supported by specific firmware.

1.3 Interfaces

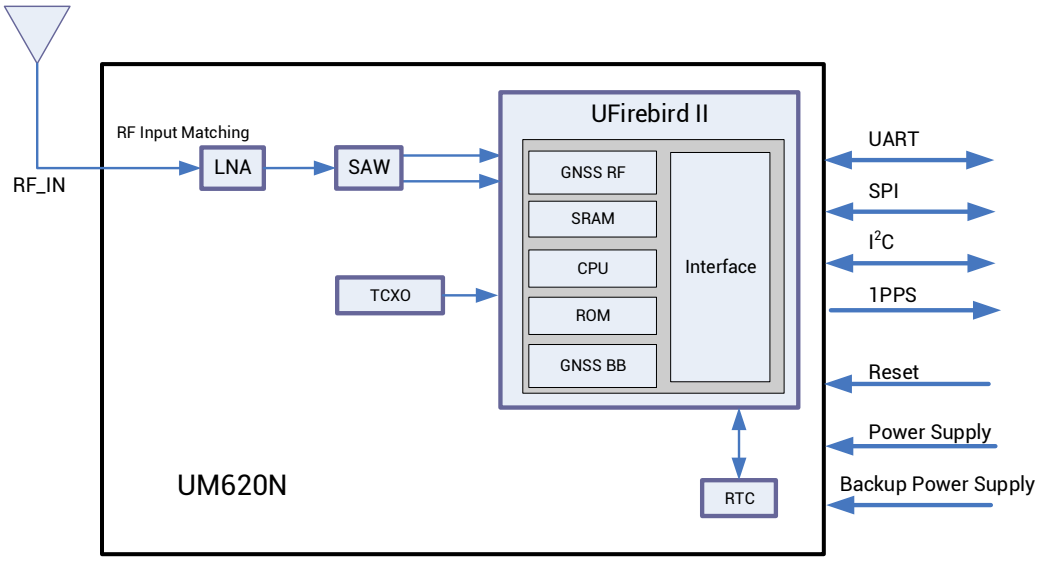


Figure 1-1 UM620N Block Diagram

UART

UM620N has two configurable UART ports. UART1 is the main serial port, which supports data transmission and firmware upgrade, and the signal input/output voltage

level is LVTTL. The baud rate can be configured up to 460800 bps. **Ensure that UART1 is connected to a PC or an external processor for firmware upgrade.**

UART2 only supports data transmission and can't be used for firmware upgrade.

1PPS

UM620N outputs 1PPS with adjustable pulse width and polarity.

1PPS is not for timing application.

nRESET

Active low, and the active time is required to last at least 10 ms.

2 Product Installation

2.1 Preparations

UM620N modules are Electrostatic Sensitive Devices (ESD) and must be installed with special precautions when handling. Please follow the instructions below before opening the anti-static plastic box.

1) Follow the steps in section 2.2 in the correct order.
2) Electrostatic discharge (ESD) may cause damage to the device. All operations mentioned in this chapter should be performed on an antistatic workbench, using an antistatic wristband and a conductive foam pad. If the antistatic workbench is not available, wear an antistatic wrist strap and connect the other end to a metal frame to play the anti-static role.
3) Hold the edge of the module, and DO NOT touch any components of the module.
4) Please check carefully whether the module is obviously loose or damaged. If there are any problems, please contact Unicore or the local dealer.

Figure 2-1 shows the typical installation of UM620N evaluation kit (EVK).

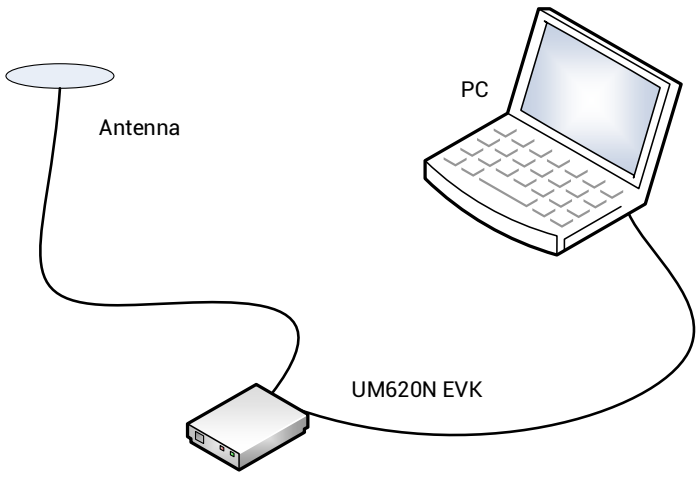


Figure 2-1 Typical Installation of UM620N

Please prepare the following items before installing UM620N.

- UM620N EVK (with AC Adapter)
- UM620N User Manual
- Unicore uSTAR software package
- Ancillary GNSS antenna
- USB cable and straight through serial cable

- PC or Laptop with serial ports (Windows 7 and above)

☞ Please keep the packing box and anti-static plastic box for storage and handling.

2.2 Hardware Installation

After the above preparations, please follow the steps below to install the module, which is only for satellite navigation test.

Step 1: Make sure to take full anti-static measures, such as wearing an anti-static wrist strap and grounding the workbench.

Step 2: Open the UM620N evaluation kit and take out the evaluation board.

Step 3: Use the GNSS antenna with appropriate gain and fix it in a non-blocking area; use the appropriate cable to connect the antenna with UM620N evaluation board.

Step 4: Connect a PC to the EVK serial port through the USB cable or straight through serial cable.

Step 5: Open uSTAR software on the PC.

Step 6: Control the receiver through uSTAR to display constellations view, log messages, and receiver status, etc.

3 Technical Specifications

3.1 Electrical Specifications

Absolute Maximum Ratings

Item	Min	Max	Unit	Description
Power Supply (VCC)	-0.5	3.6	V	Main power supply
Backup Voltage (V_BCKP)	-0.5	3.6	V	Backup power supply for RTC
Digital IO Voltage	-0.5	3.6	V	Voltage of the digital signal pins
Antenna Input Power (RF_IN)	-	+3	dBm	Maximum input power of antenna
Storage Temperature (T_{STG})	-40	+85	°C	Storage temperature for the module

3.2 Operational Conditions

Item	Symbol	Min	Typical	Max	Unit	Condition
Power Supply	VCC	2.7	3.3	3.6	V	
Ripple Voltage	V_{p-p}			50	mV	
Peak Current	I_{ccp}			134	mA	VCC=3.0 V
Tracking Average Current	I_{ACQ}	90	100	116	mA	VCC=3.0 V
Low Level Input Voltage	V_{IL}	0		0.2*VCC	V	
High Level Input Voltage	V_{IH}	0.7*VCC		VCC+0.2	V	
Low Level Output Voltage	V_{OL}	0		0.4	V	I_{out}=-2 mA
High Level Output Voltage	V_{OH}	VCC–0.4		VCC	V	I_{out}=2 mA
Antenna Gain	G_{ANT}	15	20	30	dB	

3.3 Dimensions

Symbol	Min (mm)	Typical (mm)	Max (mm)
A	15.9	16.0	16.5
B	12.05	12.2	12.35
C	2.2	2.4	2.6
D	0.9	1.0	1.3
E	1.0	1.1	1.2
F	2.9	3.0	3.1
G	0.9	1.0	1.3
H	0.7	0.8	0.9
K (Outer edge of the stamp hole)	0.7	0.8	0.9
N (Inner edge of the stamp hole)	0.4	0.5	0.6
M	0.8	0.9	1.0

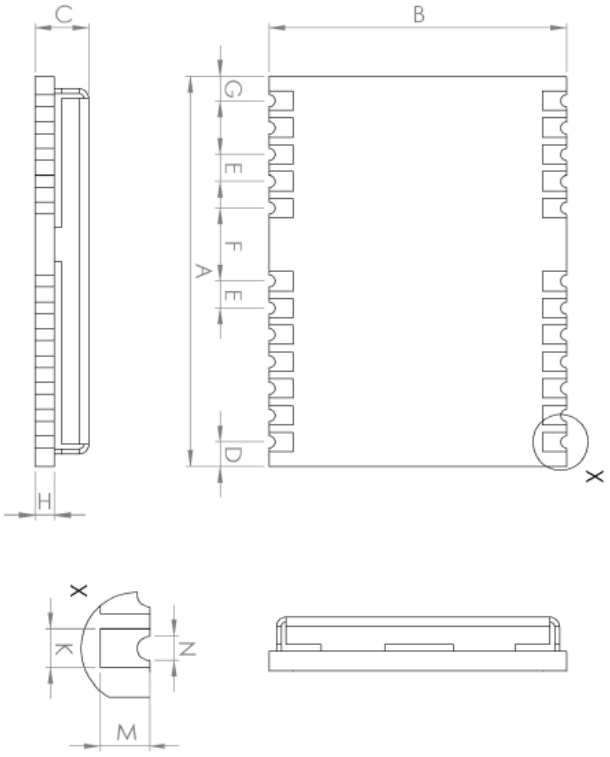


Figure 3-1 Mechanical Layout

3.4 Pin Definition

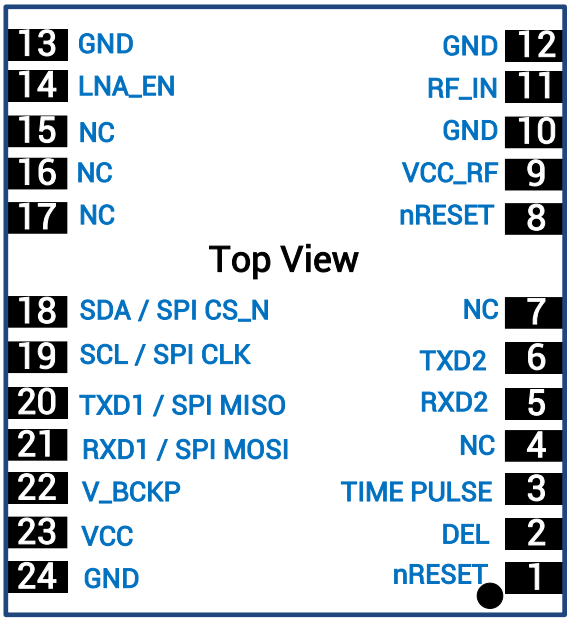


Figure 3-2 Pin Assignment

Pin No.	Name	I/O	Electrical Level	Description
1	nRESET	I	LVTTL	Reset. Active low. Leave it floating if not in use.
2	DEL	I	—	Interface selection pin. If DEL is set low level, SPI is available. If DEL is set high or floating, UART and I^2C become available.
3	TIMEPULSE	O	LVTTL	Time pulse (1PPS)
4	NC	—	—	Floating
5	RXD2	I	LVTTL	UART 2 receiving data
6	TXD2	O	LVTTL	UART 2 transmitting data
7	NC	—	—	Floating
8	nRESET	I	LVTTL	Reset. Low active. Leave it floating if not in use.
9	VCC_RF	O		Antenna feed output. It is recommended to use an external power supply rather than VCC_RF to feed the antenna.
10	GND	—	—	Ground

Pin No.	Name	I/O	Electrical Level	Description
11	RF_IN	I	—	GNSS signal input
12	GND	—	—	Ground
13	GND	—	—	Ground
14	LNA_EN	O	—	Enable external LNA
15	NC	—	—	Floating
16	NC	—	—	Floating
17	NC	—	—	Floating
18	SDA / SPI CS_N	—	—	I^2C data (D_SEL=VCC or floating)/SPI chip select (D_SEL=GND)
19	SCL / SPI CLK	—	—	I^2C clock (D_SEL=VCC or floating)/SPI clock (D_SEL=GND)
20	TXD1/ SPI MISO	O	LVTTL	SPI Master In Slave Out (D_SEL=GND)/ UART TXD signal (D_SEL=VCC or floating)
21	RXD1/ SPI MOSI	I	LVTTL	SPI Master Out Slave In (D_SEL=GND)/ UART RXD signal (D_SEL=VCC or floating)
22	V_BCKP	I	1.7V~3.6V	Backup voltage supply, applicable for hot start. If you do not use hot start, connect V_BCKP to VCC. Do NOT connect it to ground or leave it floating.
23	VCC	—	2.7V~3.6V	Supply voltage
24	GND	—	—	Ground

3.5 PCB Packaging

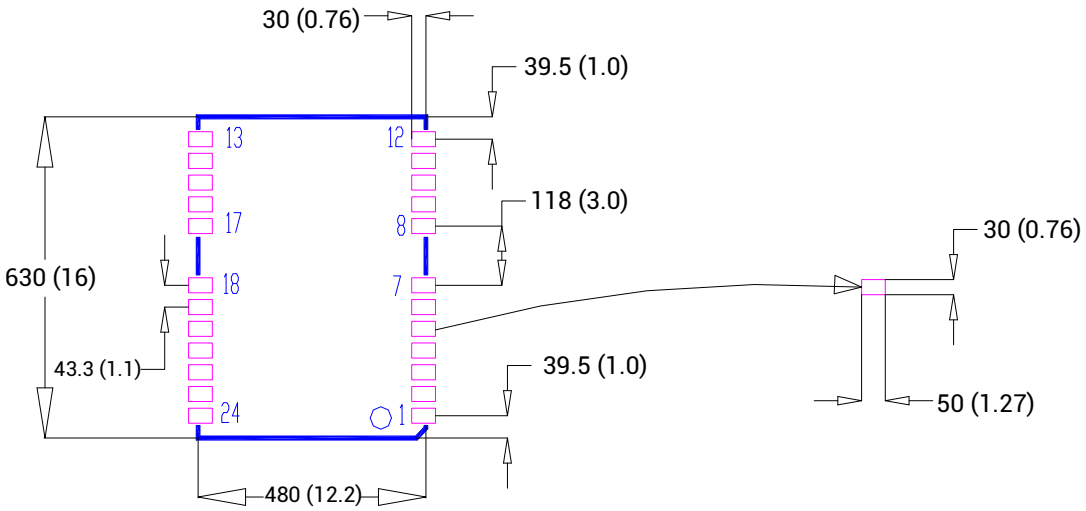
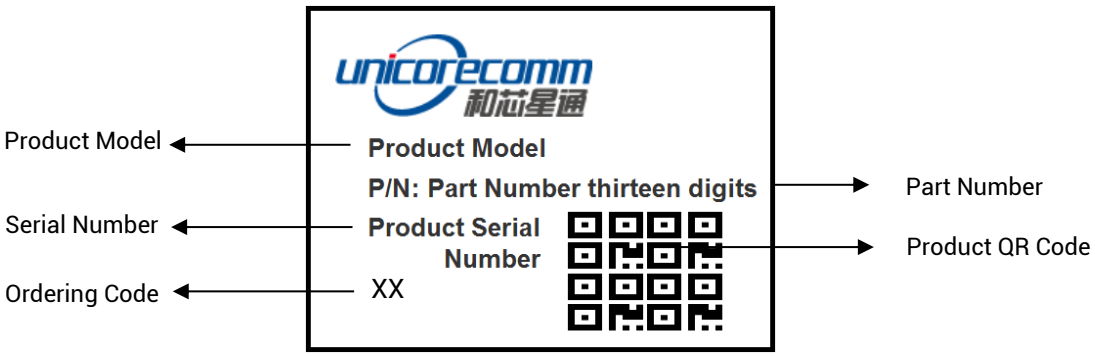


Figure 3-3 UM620N Recommended PCB Packaging (unit: mil, in brackets: mm)

☞ When designing PCB solder mask, make sure that the area under UM620N is completely coated with solder mask.

4 Package

4.1 Label Description



4.2 Ordering Information

Product Model	Ordering Code	Description
UM620N	01	Automotive grade dual-frequency navigation module, operating temperature: -40℃~+85℃, supporting firmware upgrade, 16.0 mm x 12.2 mm, 500 pieces/reel
	10A2	Automotive grade dual-frequency navigation module, operating temperature: -40℃~+105℃, supporting firmware upgrade, 16.0 mm x 12.2 mm, 500 pieces/reel

4.3 Package Description

The UM620N modules use carrier tape and reel (suitable for mainstream surface mount devices), packaged in vacuum-sealed aluminum foil antistatic bags, with a desiccant inside to prevent moisture. When using reflow soldering process to solder the modules, please strictly comply with IPC standard to conduct temperature and humidity control. As packaging materials such as the carrier tape can only withstand the temperature of 55 degrees Celsius, modules shall be removed from the package during baking.



Figure 4-1 UM620N Module Package

Item	Description
Number of Modules	500 pcs/reel
Reel Size	Tray: 13" External diameter: 330 mm Internal diameter: 100 mm Width: 24 mm Thickness: 2.0 mm
Carrier Tape	Space between (center-to-center distance): 20 mm

UM620N modules are rated at MSL level 3. Please refer to the relevant IPC/JEDEC standards for baking requirements. Users may access to the website www.jedec.org to get more information.

The shelf life of UM620N modules packaged in a vacuum-sealed aluminum foil antistatic bags is one year.

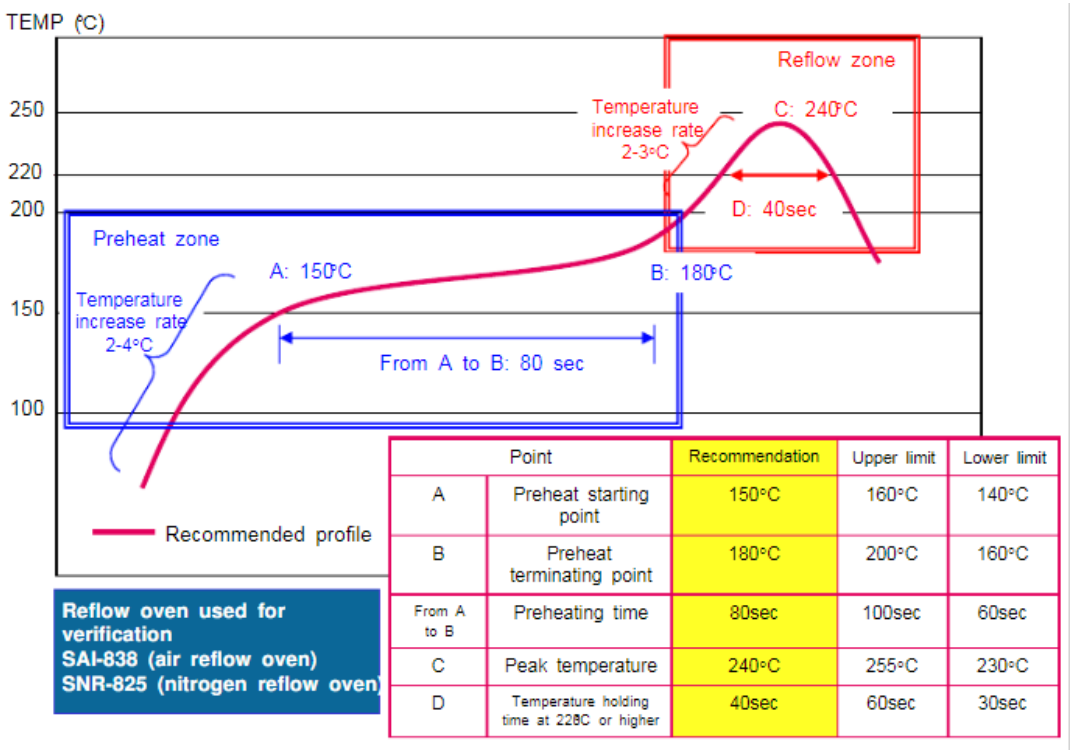
5 Clean

DO NOT use alcohol or other organic solvents to clean the module, which may lead to soldering flux residues flooding into the shielding shell, causing mildew and other problems.

6 Reflow Soldering

In order to avoid the device falling off, the module should be placed on the top of the main board during soldering. Reflow soldering temperature curve is recommended as shown in figure 6-1 below (M705-GRN360 is recommended for solder paste).

Note: The module can only be soldered once.



Point		Recommendation	Upper limit	Lower limit
A	Preheat starting point	150°C	160°C	140°C
B	Preheat terminating point	180°C	200°C	160°C
From A to B	Preheating time	80sec	100sec	60sec
C	Peak temperature	240°C	255°C	230°C
D	Temperature holding time at 228C or higher	40sec	60sec	30sec

Figure 6-1 Reflow Soldering Temperature Curve

Note: The apertures in the stencil need to meet the customer's own design requirements and inspection specifications, and the thickness of the stencil should be above 0.15 mm. It is recommended to be 0.18 mm.

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