neoway

Get connected Get smart

N725

EVK User Guide

Issue 1.0 Date 2023-02-03

Notice

This document provides guide for users to use N725.

This document is intended for system engineers (SEs), development engineers, and test engineers.

THIS DUCUMENT PROVIDES INSTRUCTIONS FOR CUSTOMERS TO DESIGN THEIR APPLICATIONS. PLEASE FOLLOW THE RULES AND PARAMETERS IN THIS GUIDE TO DESIGN AND COMMISSION. NEOWAY WILL NOT TAKE ANY RESPONSIBILITY OF BODILY HURT OR ASSET LOSS CAUSED BY IMPROPER OPERATIONS.

THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE DUE TO PRODUCT VERSION UPDATE OR OTHER REASONS.

EVERY EFFORT HAS BEEN MADE IN PREPARATION OF THIS DOCUMENT TO ENSURE ACCURACY OF THE CONTENTS, BUT ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS DOCUMENT DO NOT CONSTITUTE A WARRANTY OF ANY KIND, EXPRESS OR IMPLIED.

Neoway provides customers with complete technical support. If you have any question, please contact your account manager or email to the following email address:

Sales@neoway.com

Support@neoway.com

Website: http://www.neoway.com

Contents

Table of Figures

Table of Tables

About This Document

Scope

This document is applicable to N725 series.

Audience

This document is intended for system engineers (SEs), development engineers, and test engineers.

Change History

Issue	Date	Change	Changed By
1.0	2023-01	Initial draft	Shi Qin, Liu Guangxing

Conventions

Symbol	Indication
	This warning symbol means danger. You are in a situation that could cause fatal device damage or even bodily damage.
	Means reader be careful. In this situation, you might perform an action that could result in module or product damages.
	Means note or tips for readers to use the module

1 Overview

N725 is an LTE industrial-grade cellular module that supports FDD-LTE (Cat 4), TDD-LTE (Cat 4), UMTS and GSM communications. Its overall dimensions are (30.00±0.10) mm x (28.00±0.10) mm x (2.80±0.20) mm. The module provides rich hardware interfaces. It is applicable to the development of IoT communication devices such as wireless meter reading terminals, on-board terminals, handheld POSs and industrial routers.

The N725 EVB is designed to help the N725 full-function module with debugging and testing. The overall dimensions are 190 mm x 142 mm. The N725 EVB adopts modular design. The communication sub-board and functional sub-boards are connected to the substrate through board-to-board connector. The hardware integrates the Ethernet function, Bluetooth/WiFi function, audio codec function and vehicle navigation function.

The N725 EVB supports GNSS positioning, FOTA upgrade, USB interface, serial interface, SIM card, SD card, antenna, GNSS active antenna and related functional pins. You can debug the N725 module only by connecting the power supply, USB interface or UART interface.

The N725 EVB is mainly used for customer software and hardware debugging. It provides rich peripheral interfaces, including the power interface, UART interface, SIM card, antenna and ON/OFF. The customer can perform related debugging only by connecting the power supply and UART interface.

N725 EVK provides the following accessories.

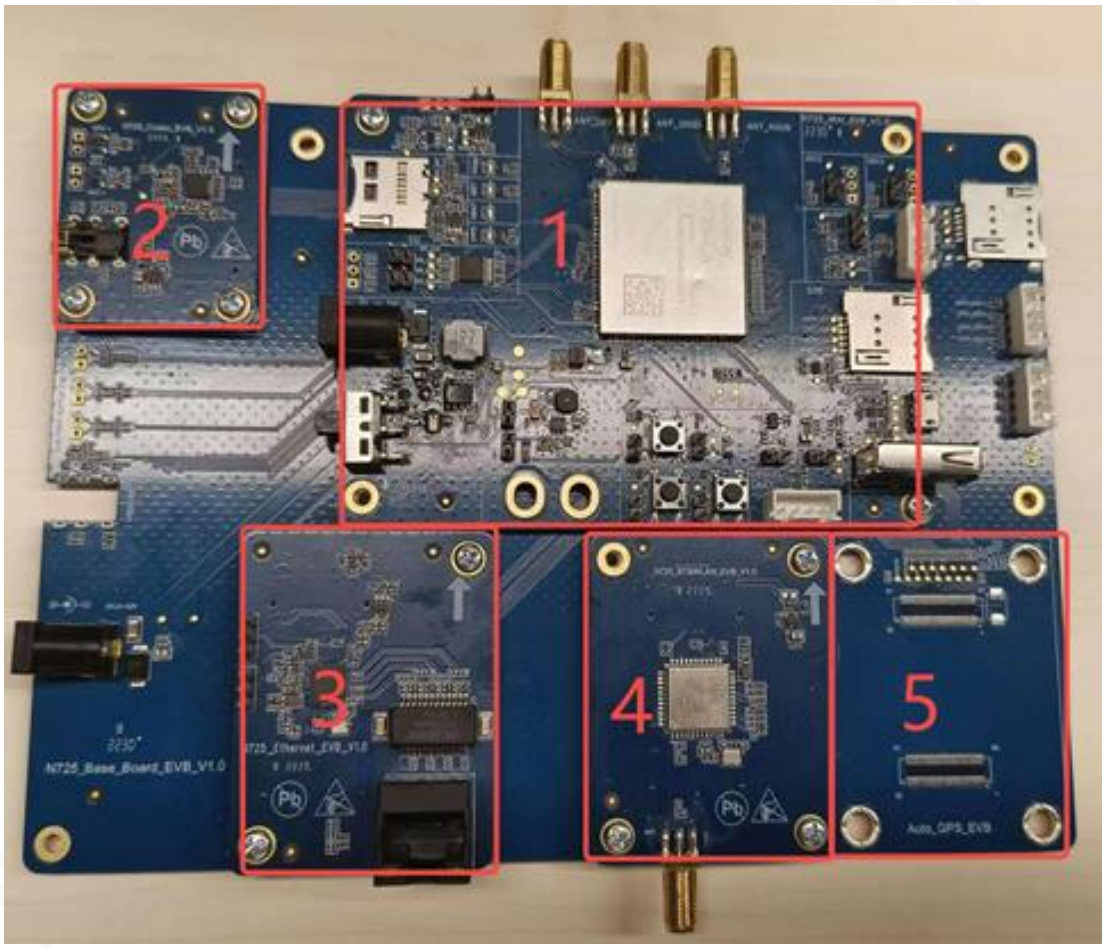
- N725_Mini_EVB (including the module)
- N725_Base_Board_EVB
- N725_Codec_EVB
- N725-CA-A-A1-E1
- Rod antenna_4G_Fullband_Black rod short antenna
- External antenna_GPS_tri-band_black

2 EVB Functions

This chapter introduces the layout of the N725 EVB and describes the functional interfaces and compatibility design of the communication sub-board, substrate and other sub-boards.

2.1 EVB Layout

Figure 2-1 Front view of the N725 EVB



For the convenience of description and use, modules of the N725 EVB are marked with red boxes. Before using the EVB, read the EVB instructions carefully and use the EVB by combining the PCB file of the EVB schematic diagram when necessary.

The bottom of the communication sub-board and functional modules is the substrate. Pay special attention to the installation direction and position of each sub-board. The upward arrow on a sub-board

indicates the installation direction. The area corresponding to the substrate is marked with the model of the sub-board. Table 2-1 describes the modules.

Table 2-1 Description of modules

No.	Description
1	N725 communication sub-board, which can be used as the smallest system board for debugging and RF testing
2	Audio functional module
3	Ethernet functional module
4	Wi-Fi/BT functional module
5	Navigation functional module (reserved)

The EVB includes two SIM card interfaces, but the N725 module supports only one SIM card. By default, the SIM card on the N725 communication sub-board is used.

The N725 full-function module must be initialized after power-on. During initialization, the status of each functional pin is not under control and may be uncertain. Please be sure to perform related operations on the EVB after the module is initialized.

2.2 EVB Interfaces

Figure 2-2 shows important functional interfaces of N725_EVB.

Figure 2-2 Important interfaces of N725 EVB

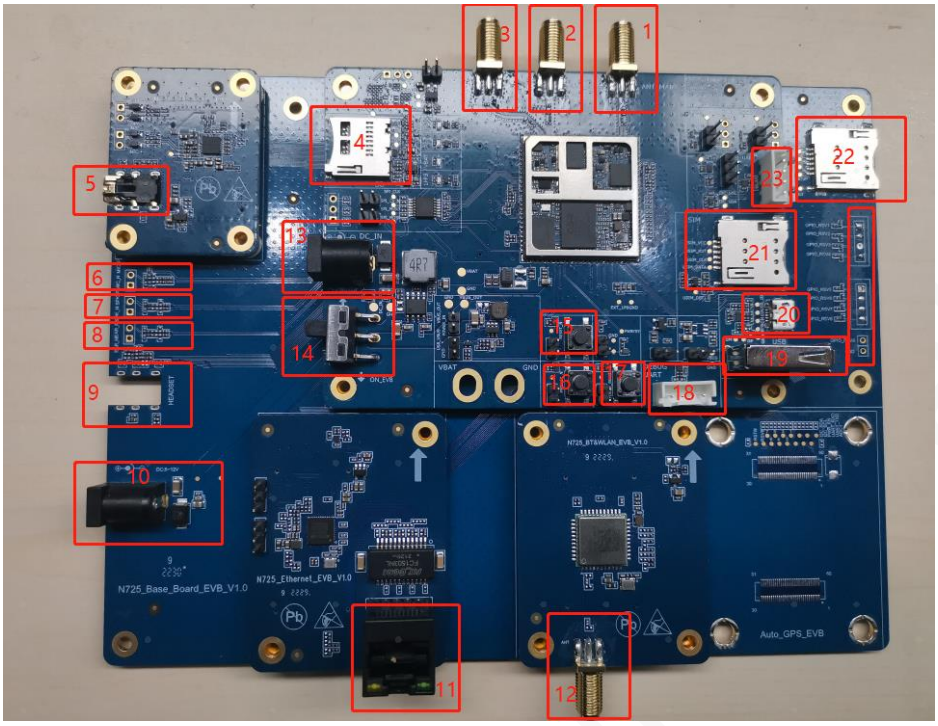


Table 2-2 describes important interfaces of the EVB.

Table 2-2 Description of important interfaces of N725 EVB

No.	Description
1	LTE main antenna
2	GNSS antenna (an active antenna is supported)
3	LTE diversity antenna
4	SD card holder
5	4-section headphone jack 1, supporting 3.5 mm American standard headphone
6	MIC input interface, audio input source (reserved, not in use currently)
7	SPK audio output interface (reserved, not in use currently)
8	RCV audio output interface (reserved, not in use currently)
9	4-section headphone jack 2, supporting 3.5 mm American standard headphone (reserved, not in use currently)
10	Substrate power input interface. 5-12 V DC power input is recommended, and DC round hole input is supported.
11	RJ45 network connector. The Ethernet external communication interface supports the network rate of 10M/100M/1000M.

12	Wi-Fi/BT antenna
13	Sub-board power input interface. 5-12 V DC power input is recommended, and DC round hole input is supported.
14	Power toggle switch. The substrate input interface or sub-board input interface is selected.
15	Reset button. It is triggered when a low-level pulse in the range 0.5s to 2s is input and is used to control reset of the module.
16	Power-on button. It is triggered when the pulse of low level in the range 0.5s to 2s is input and is used to control power-on and power-off of the module.
17	Forced loading button. After the EVB is powered on, if the forced loading point is short-circuited and the power-on button is pressed, the forced download mode is enabled.
18	It is used for the debug interface in the 3.3 V power domain by default.
19	USB TYPE-A interface, used for OTG function debugging (reserved)
20	USB Micro-USB interface, mainly used for program download, data communication and sending of AT commands
21	Micro SIM card holder 1. By default, the card holder is selected to connect a SIM card.
22	Micro SIM card holder 2 (reserved)
23	UART interface, used for serial port debugging, 3.3 V power domain (reserved)

3 Description of EVB Modules

N725_EVB includes five modules, including N725 EVB substrate, communication sub-board, audio functional sub-board, Ethernet functional sub-board and Wi-Fi/BT functional sub-board. The following introduces the modules.

3.1 N725 EVB substrate

The substrate is the base plate of the whole N725 EVB, and other sub-boards are connected to the substrate. The substrate provides rich external interfaces and provides the following functions:

- Providing the system with reliable and stable power supply.
- Leading out the external communication and control interface of the N725 module, USIM card, audio interface and GPIO interface.
- Transferring the functional interfaces of the N725 module to the corresponding functional module interfaces.

3.1.1 Functions and Interfaces

Figure 3-1 shows the front view of the substrate.

Figure 3-1 Front view of the substrate

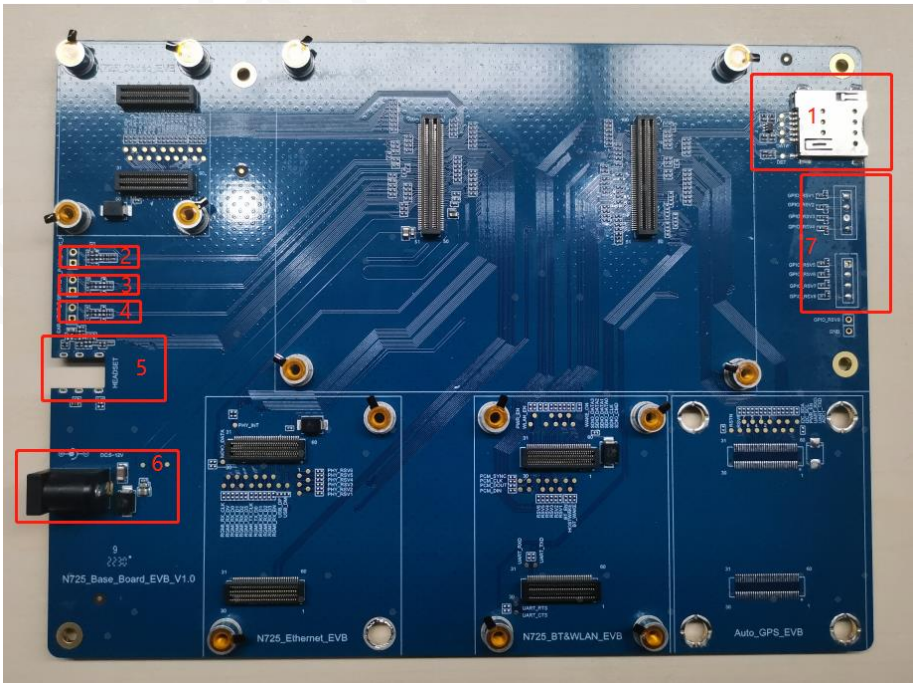


Table 3-1 describes the functions and interfaces of the N725 communication sub-board.

Table 3-1 Description of important interfaces of the N725 substrate

No.	Description
1	Micro SIM card holder (reserved)
2	MIC input interface, audio input source (reserved)
3	SPK audio output interface (reserved)
4	RCV audio output interface (reserved)
5	4-section headphone jack 1, supporting 3.5 mm American standard headphone
6	Power input interface. 5/12 V DC power input is recommended, and DC round hole input is supported.
7	GPIO expansion pin (reserved)

3.2 N725 Communication Sub-board

The N725 communication sub-board contains the N725 module, which integrates the functions such as SIM card, USB interface, antenna interface, debugging serial port, GPIO interface, power-on button and reset button. It can be used as the smallest system board for RF debugging or simple function debugging.

3.2.1 Functions and Interfaces

Figure 3-2 shows the front view of the N725 communication sub-board.

Figure 3-2 Important interfaces of the N725 communication sub-board

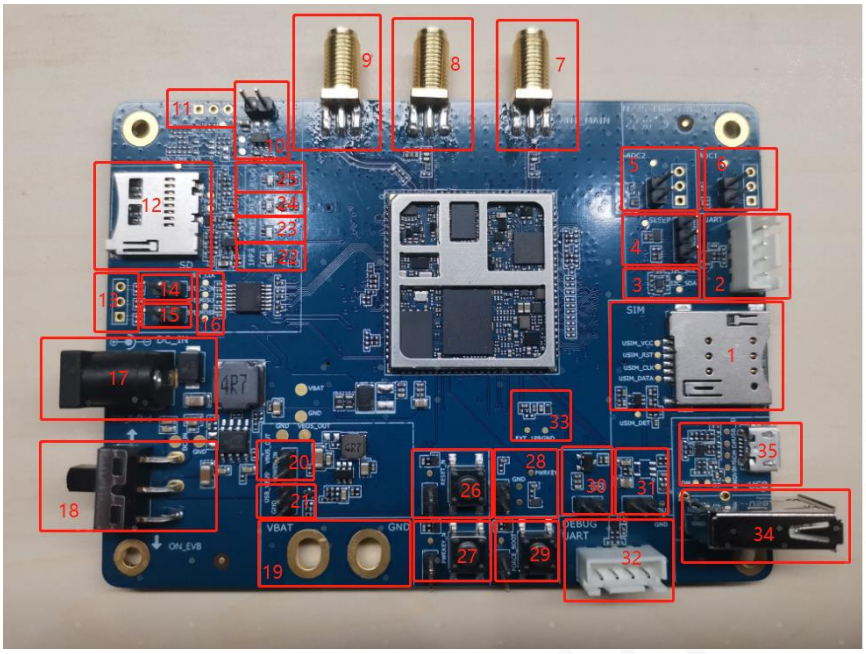


Table 3-2 describes the functions and interfaces of the N725 communication sub-board.

Table 3-2 Description of important interfaces of the N725 communication sub-board

No.	Description
1	Micro SIM card holder 1. By default, the card holder is selected to connect a SIM card.
2	UART interface, used for serial port debugging, 3.3 V power domain (reserved)
3	I2C test point, used to extend functions, in the 3.3 V power supply domain.
4	Sleep function test socket. The jumper can be pulled up or down. The socket is used with an AT command to control the module in enabling the sleep mode. For details, refer to the *Neoway_N725_AT Command Manual*.
5	Test circuit of ADC interface 1. It must be connected to the jumper cap to support external analog signal collection.
6	Test circuit of ADC interface 2. It must be connected to the jumper cap to support external analog signal collection.
7	LTE main antenna connector
8	GNSS antenna connector (an active antenna is supported)
9	LTE diversity antenna connector
10	GNSS antenna power pin. After the jumper cap is short-circuited, 3.3 V power supply is provided for GNSS active antenna debugging.
11	SD card IO signal pull-up supply voltage selection 1 (reserved)
12	SD card holder

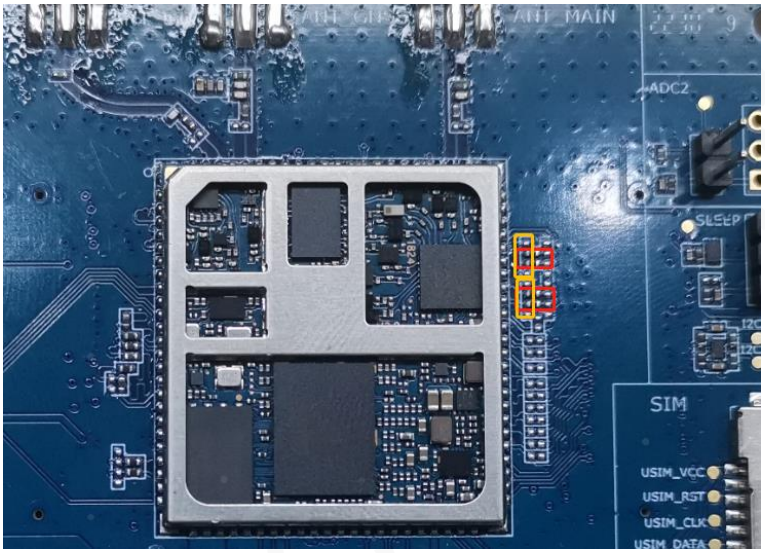
13	SD card IO signal pull-up supply voltage selection 2 (reserved)
14	Test pin 1. It is connected using a jumper cap. Pin 10 of the module outputs the reset signal of GNSS.
15	Test pin 2. It is connected using a jumper cap. Pin 10 of the module outputs the reset signal of the Ethernet functional module.
16	SPI test interface, which is in the 3.3 V power domain
17	Power input interface 1. 5/12 V DC power input is recommended, and DC round hole input is supported.
18	Power toggle switch. Power input interface 1 or power input interface 2 is selected to provide the main power supply.
19	The supply voltage range is 3.4 V to 4.2 V, and the typical value is 3.6 V. Please note that the output current of the power supply is at least 2.5 A.
20	It is used to short-circuit the jumper for the OTG front-end power supply and can be used only when the main supply voltage of EVB is 5 V (reserved).
21	It is used for the OTG front-end power supply to enable short-circuit of the jumper. After the jumper is short-circuited, the OTG power supply is not output (reserved).
22	1PPS signal indicator (GPS synchronization signal)
23	VBAT power indicator
24	Network indicator
25	Incoming call information indicator
26	Reset button. It is triggered when a low-level pulse in the range 0.5s to 2s is input and is used to control reset of the module.
27	Power-on button. It is triggered when a low-level pulse in the range 0.5s to 2s is input and is used to control power-on, power-off and reset of the module.
28	Module power-on control pin. The power-on function is triggered when the jumper cap is short-circuited.
29	Forced download button. After the EVB is powered on, if the forced loading point is short-circuited and the power-on button is pressed, the forced download mode is enabled.
30	Backup power pin. It supplies power to the GNSS backup power after the jumper cap is short-circuited (voltage: 1.8 V).
31	OTG 5 V power supply circuit. The jumper cap is short-circuit to supply power to the OTG (reserved).
32	It is used for the debug interface in the 3.3 V power domain by default.
33	Circuit test point of 1.8 V power output of the module
34	USB TYPE-A interface, used for OTG function debugging (reserved)
35	USB Micro-USB interface, mainly used for program download, data communication and sending of AT commands

3.2.2 Compatibility Settings

- Compatibility design of the PCM interface

  Because the main control platform outputs only one PCM signal, the EVB board uses a 0 ohm resistor for compatibility design, which is compatible with the audio functional module and the Wi-Fi/BT functional module. Figure 3-3 shows the position of the compatible resistor.

Figure 3-3 Compatible circuit of the PCM interface



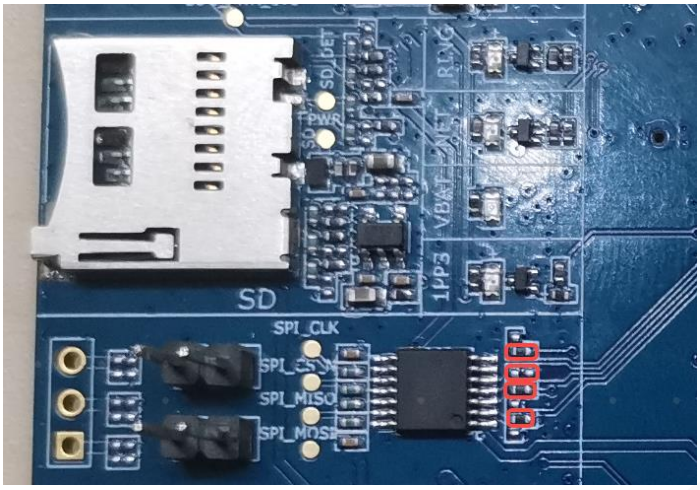
  - To connect the Wi-Fi/BT functional module by default, that is, to weld the resistors in red boxes, disconnect the resistors in yellow boxes.
  - To debug the audio functional module, weld the resistors in yellow boxes and disconnect the resistors in red boxes.

- Compatibility of the SPI

  Because the main control platform outputs the GPIO interface in preference, the EVB board uses a 0 ohm resistor for compatibility design, which is compatible with the SPI, GNSS reset control pin and control pin of the Wi-Fi/BT functional module.

Figure 3-4 shows the default output of the SPI.

Figure 3-4 Default SPI of the compatible circuit

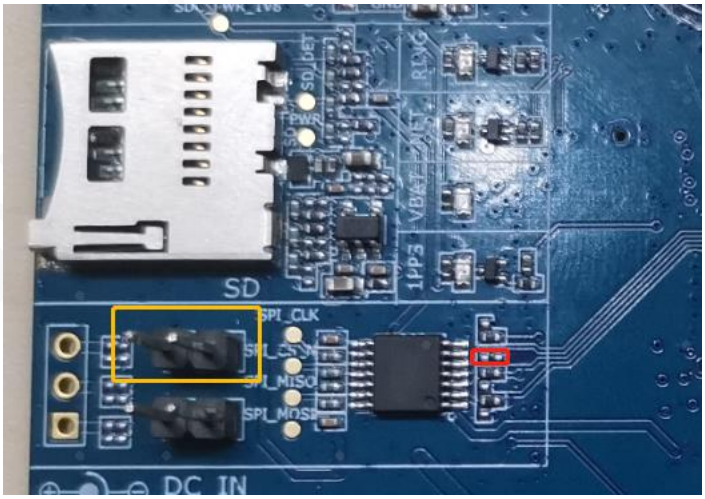


The preceding figure shows the default output of the SPI, that is, resistors in red boxes.

GNSS Reset Function of the Module

If you need the GNSS reset function of the module, use the 2.54 jumper cap to short circuit (or disconnect, depending on the specific test driver configuration) the terminal block in the yellow box and disconnect the resistor in the red box, as shown in Figure 3-5.

Figure 3-5 GNSS function supported by the compatible circuit

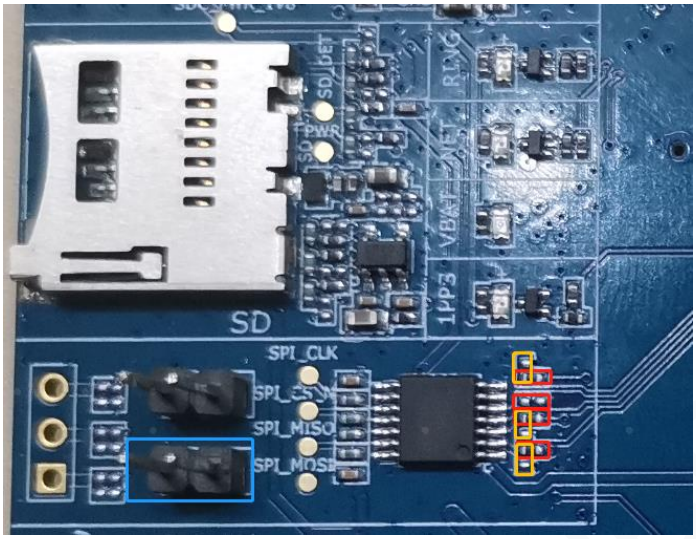


Supporting Functions of the Wi-Fi/BT Module

If you need the Wi-Fi/BT function module, use the 2.54 jumper cap to short-circuit the terminal blocks in yellow boxes, weld the resistors in red yellow boxes and disconnect the resistors in the red boxes,

as shown in Figure 3-6.

Figure 3-6 Wi-Fi/BT functional module supported by the compatible circuit



3.3 Audio Functional Sub-board

The audio functional module (NAU88U10YG scheme) supports an MIC input, a 4-section earphone (American standard) and an SPK output (1 W/8 Ω). To use the module, directly connect it to the substrate.

3.3.1 Functions and Interfaces

Figure 3-7 shows the front view of the audio functional module.

Figure 3-7 Important interfaces of the N725 audio functional module

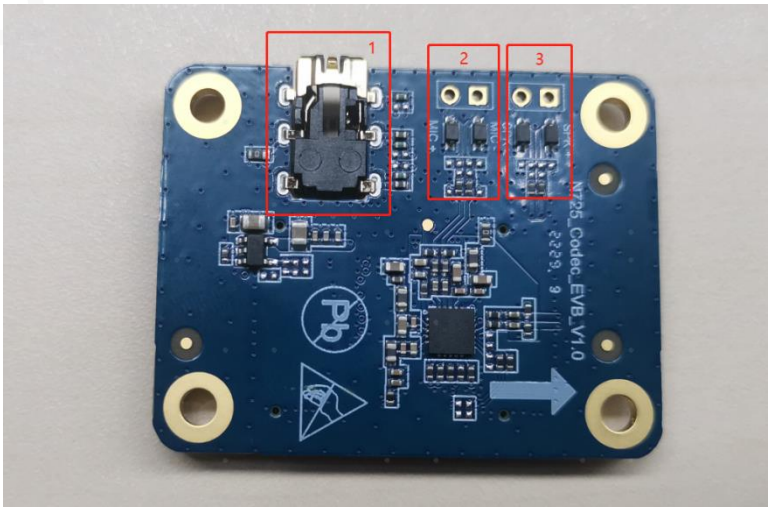


Table 3-3 describes the functions and interfaces of the audio functional module.

Table 3-3 Description of important interfaces of the audio functional module

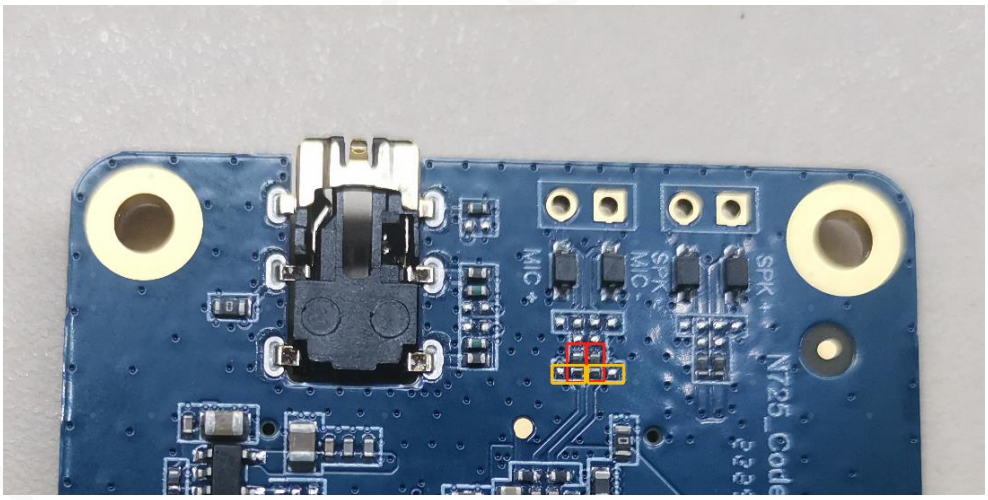
No.	Description
1	Headphone jack, supporting 4-section 3.5 mm American standard headphone
2	MIC wiring point, default audio input source
3	SPK wiring point, default audio output interface. It is connected to a 16Ω speaker, with the maximum output power of 1 W.

3.3.2 Compatibility Design

Compatibility design of the MIC interface

Because the main control platform outputs only one set of MIC audio input sources, the EVB board uses a 0 ohm resistor for compatibility design, which is compatible with the MIC input and the headphone NIC input. Figure 3-8 shows the position of the compatible resistor.

Figure 3-8 Default MIC interface of the compatible resistor



- If an MIC is connected as the audio input source by default, that is, the resistor in the red box is welded, disconnect the resistor in the yellow box.
- To debug the headphone, weld the resistor in the yellow box and disconnect the resistor in the red box.

3.4 Ethernet Functional Sub-board

The Ethernet functional sub-board complies with the IEEE 802.3bw on-board Ethernet standard. To use the sub-board, directly connect it to the substrate. Figure 3-9 shows the front view of the Ethernet functional module.

Figure 3-9 Important interfaces of the Ethernet functional module

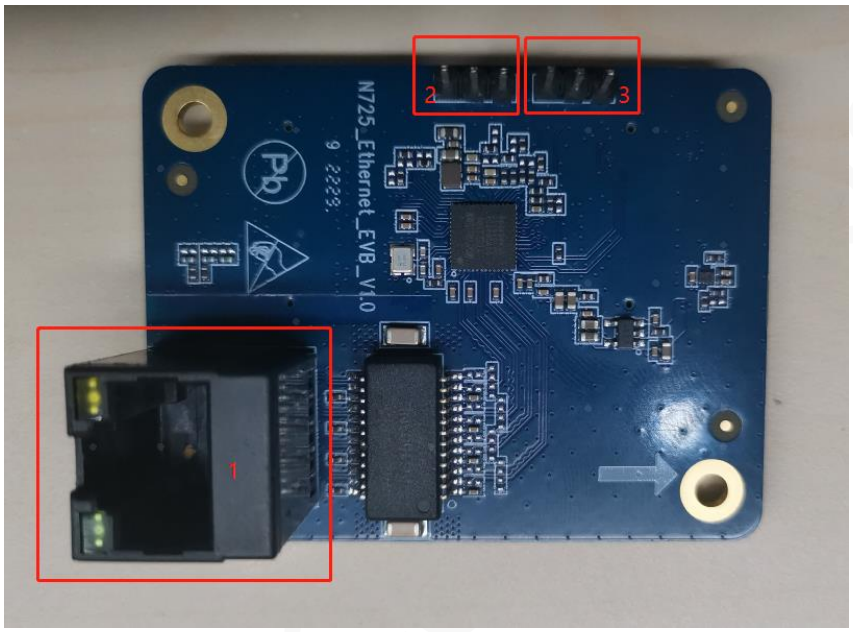


Table 3-4 describes the functions and interfaces of the Ethernet functional module.

Table 3-4 Description of important interfaces of the Ethernet functional module

No.	Description
1	RJ45 network connector. The Ethernet external communication interface supports the network rate of 10M/100M/1000M.
2	Function selection pin interface 0, which can select the working mode with interface 1.
3	Function selection pin interface 1, which can select the working mode with interface 0.

The numbers 2 and 3 indicate bus working mode selection pin interfaces. When the jumper cap is used to connect the interfaces, values can be assigned to the interfaces. The following describes the interfaces.

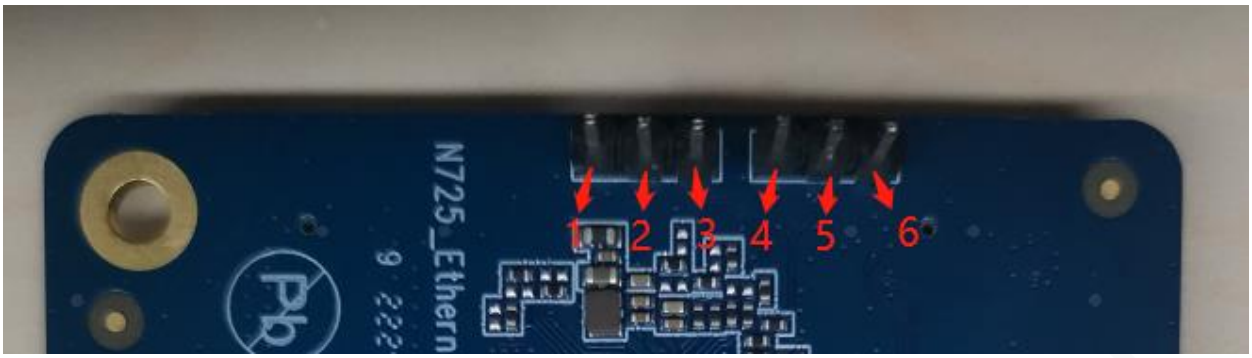


Table 3-5 Description of interfaces 0 and 1

	No.	Description
Interface 0	1	VDDIO_ RGMII (high level. When it is short-circuited with DFG_MODE0, the value 1 can be assigned)
	2	DFG_MODE0.
	3	GND (low level. When it is short-circuited with DFG_MODE0, the value 0 can be assigned)
Interface 1	4	VDDIO_ RGMII (high level. When it is short-circuited with DFG_MODE1, the value 1 can be assigned)
	5	DFG_MODE1.
	6	GND (low level. When it is short-circuited with DFG_MODE1, the value 0 can be assigned)

The jumper cap is used to select the PHY working mode. When DFG_MODE is used to connect VDDIO_RGMII, 1 is recorded; when DFG_MODE is used to connect GND, 0 is recorded. The two interfaces have many combinations. At present, only two working modes are supported, as described in the table below.

Table 3-6 Working mode truth table

DFG_MODE0 (interface 0)	DFG_MODE1 (interface 1)	Working mode
0	0	UTP <-> RGMII
1	1	UTP <-> SGMII

When the Ethernet functional module is inserted on the substrate, pay attention to the direction (the module is marked with an upward arrow) and the position of the corresponding module. The substrate is marked with the corresponding silk screen.

3.5 Wi-Fi/BT Functional Sub-board

The Wi-Fi/BT functional module supports the IEEE 802.11 a/b/g/n/ac standard and the BT4.2 standard. To use the module, directly connect it to the substrate.Figure 3-10 shows the front view of the Wi-Fi/BT functional module.

Figure 3-10 Front view of the Wi-Fi/BT functional sub-board

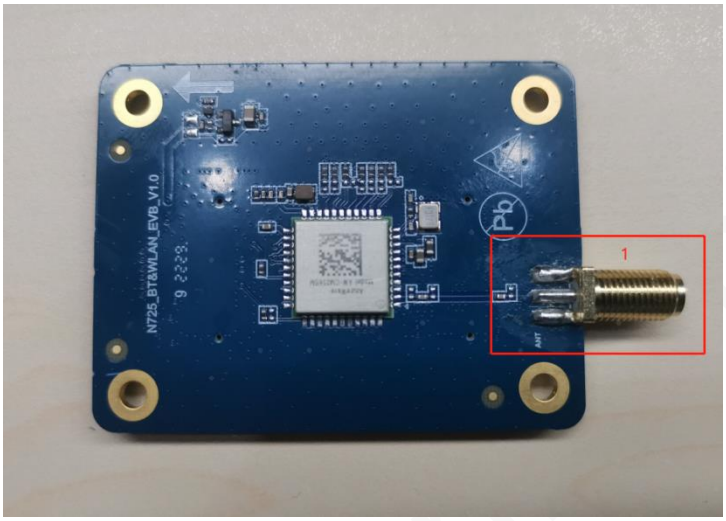


Table 3-7 describes the functions and interfaces of the Wi-Fi/BT functional module.

Table 3-7 Description of important interfaces of the audio functional module

No.	Description
1	Wi-Fi/BT antenna.

When the Wi-Fi/BT functional module is inserted on the substrate, pay attention to the direction (the module is marked with an upward arrow) and the position of the corresponding module. The substrate is marked with the corresponding silk screen.

4 Connection/Power Supply

N725 EVB can only be powered by the external power supply. The M5X0-PWR serial port board or Micro-USB cable is used for data communication.

The following provides the power supply methods and communication methods of the EVB.

4.1 EVB Power Supply

The N725 EVB supports two power supply modes:

- Power supply through adapter: The standard 12V@2A and 5V@2A specifications are supported.
- b. Power supply through welding of an external power cable

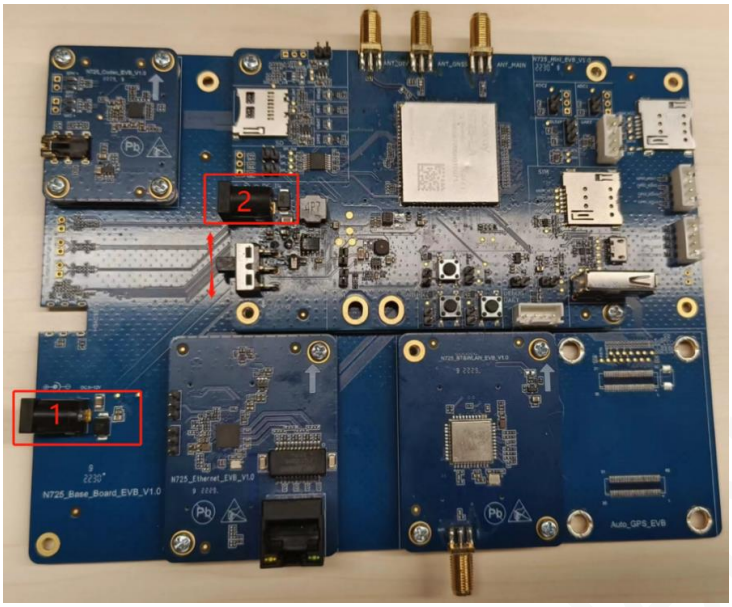
4.1.1 Power Supply through Adapter

A 12 V/2 A (or 5 V/3 A) power adapter is recommended for the N725 EVB. Figure 4-1 shows the power adapter.

Figure 4-1 Power adapter

Different power supply interfaces can be selected for power supply through the adapter, which are the power supply interface on the substrate and the power supply interface on the communication sub-board. Select a power supply interface by turning the switch on the communication sub-board, as shown in Figure 4-2. When the switch is turned to the upper part, power supply through the substrate (that is, power supply interface 1) is selected by default; when the switch is turned to the lower part, power supply through the communication sub-board (that is, power supply interface 2) is selected.

Figure 4-2 EVB power supply interface



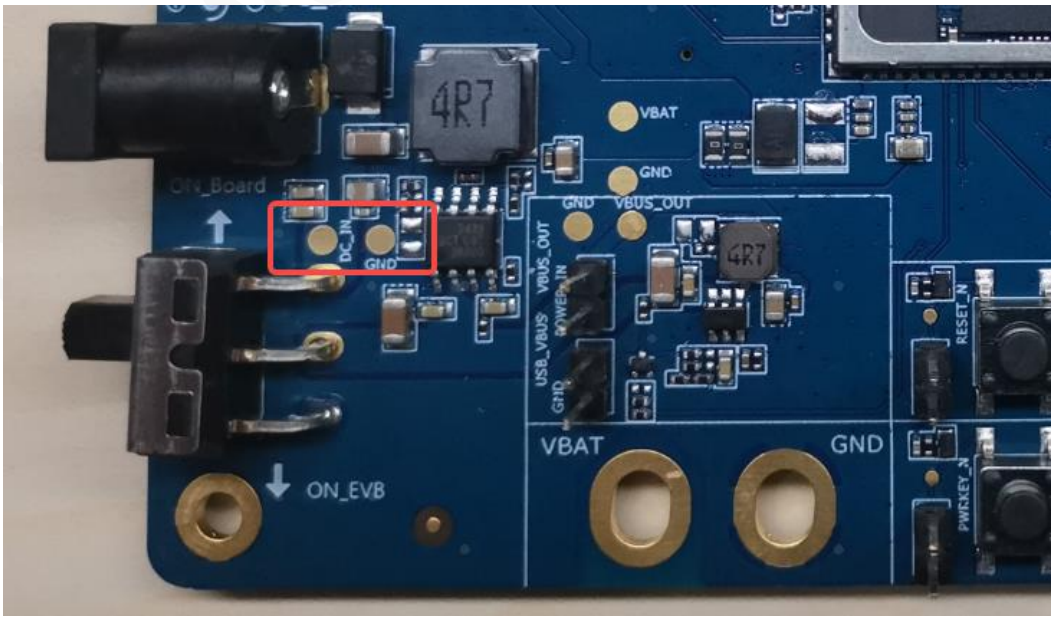
4.1.2 Power Supply Through Welding of an External Power Cable

The N725 EVB can provide power input by welding a cable. The voltage range is 5 to 12V, and there are two power input modes:

- Direct welding of the power cable for the main power supply (test point of DC-IN)

  The supply voltage range is 5 V to 12 V. Adjust the load capacity of the power supply to make it higher than 2 A. A value in the range 2 to 2.5 A is recommended. Figure 4-3 shows the welding test point of the main power supply. Do not inversely connect the power supply.

Figure 4-3 Test point of DC-IN



- Power supply through external VBAT pad (VBAT: 3.4 V to 4.2 V, typical value: 3.6 V)

  The 3.6 V stabilized power supply is recommended. Adjust the load capacity of the stabilized power supply to make it reach at least 2.5 A. Do not inversely connect the power supply. Figure 4-4 shows the position of the VBAT access test point.

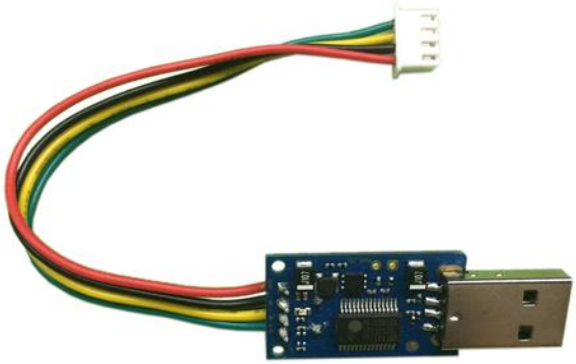
Figure 4-4 VBAT test point

The N725 EVB needs to directly supply power to modules through the power pad. Do not inversely connect the positive and negative poles of the power supply. As shown in the figure above, use a black alligator clip to connect the negative pole of the power supply and use a red alligator clip to connect the positive pole of the power supply.

Otherwise, the module will be burned and cannot be repaired.

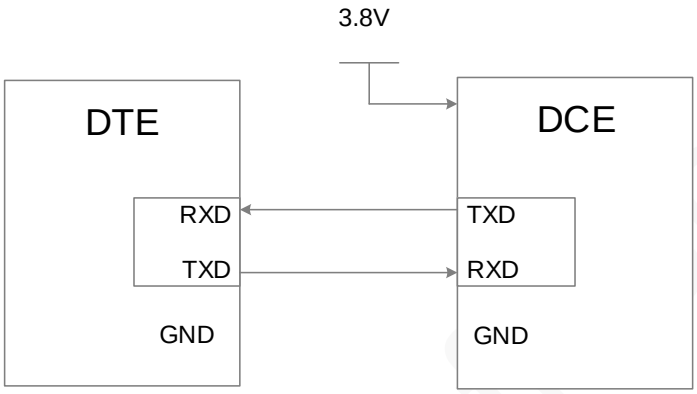
4.2 Communication Connection

4.2.1 M5X0-PWR Serial Port Board



The figure above shows the M5X0-PWR serial port board. The board is used to output 3.3 V COMS level through a USB-to-serial-port chip and realize communication between the module and the PC serial port tool through TXD/RXD. The M5X0-PWR serial port board is designed, produced and used by Neoway based on the PL2303 chip. The driver of the PL2303 chip needs to be installed before the board is used. You can also select another USB serial port conversion cable or board based on chips such as FT2232 and CP210X and install the corresponding driver.

When the MCU is used to control this module, three wires need to be connected. The following figure shows the connection block diagram.



4.2.2 Micro-USB cable

The following figure shows a micro-USB cable, which is connected to the USB interface of the N725 EVB and can be used for software upgrade, USB communication and capture of module logs.

Figure 4-5 USB cable

5 Product Commissioning

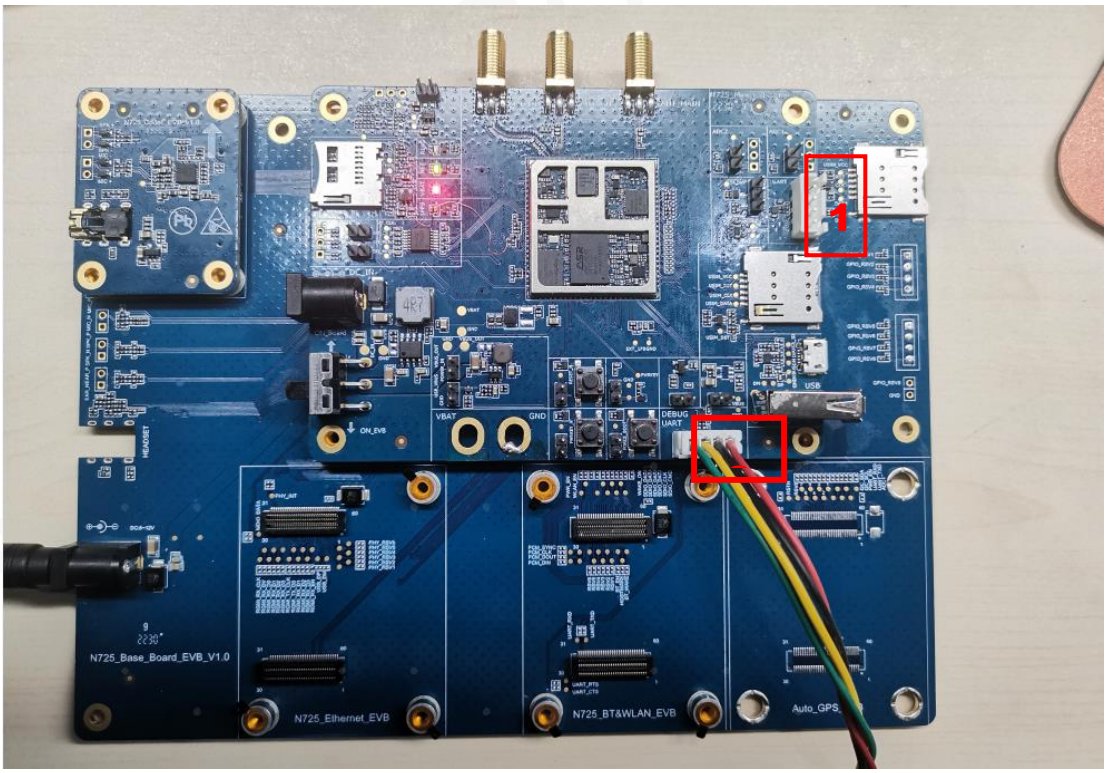
Product debugging can be performed through a serial port or USB interface. The following introduces the two methods.

5.1 Debugging through Serial Port

Step 1: Insert a SIM card and connect the antenna.

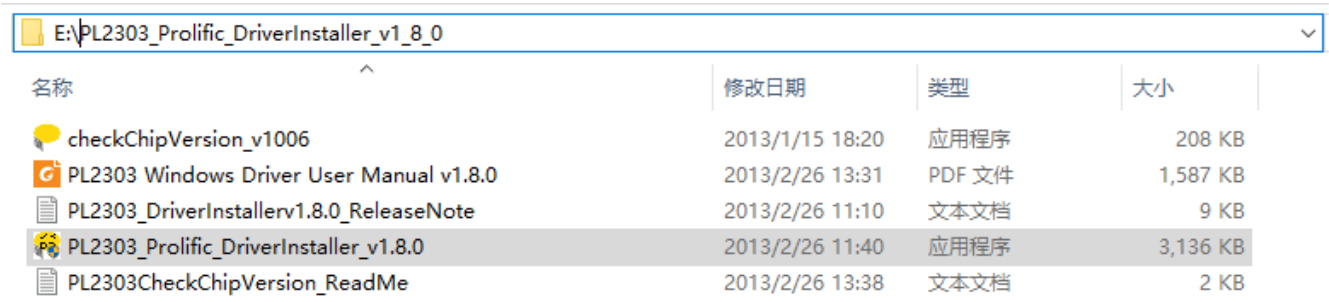
Step 2: Supply power to the N725 EVB through a 5 V/12 V power adapter and turn the switch to power on the module. Then the module can be powered on normally. Refer to Section 4.1 . After power is supplied, the red POWER indicator on the development board is on. If the NET indicator is on, the module is successfully registered with the network.

Step 3: Use the M5X0-PWR serial port board to connect the UART interface of the development board and connect the other end of the serial port board to the USB interface of the computer. (Serial port 1 is used for AT command communication, and serial port 2 is used for module debugging.)



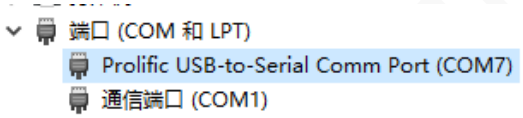
Step 4: Install the serial port driver (of PL2303) and read the serial port.

1. Decompress the serial port driver package. The following figure shows the decompressed folder.



2. Double-click **PL2303_Prolific_DriverInstaller_v1.8.0** and install the serial port driver according to the setup wizard.

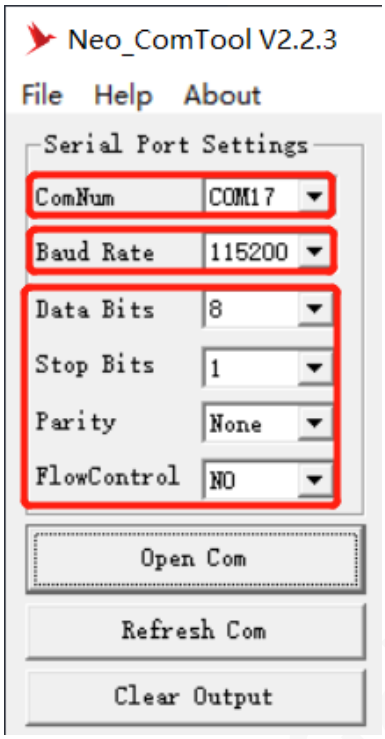
   After the driver is installed, if the M5X0-PWR power board is inserted and the device manager port (COM and LPT1) displays **Profile USB-to-Serial Comm Port**, the serial port is read normally and debugging can be performed normally.



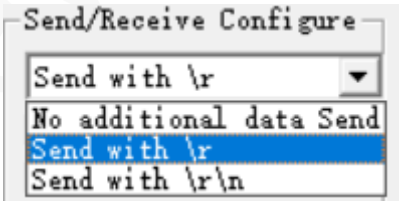
If you use the M5X0-PWR serial port board provided by Neoway, please contact our technical support engineers or download the PL2303 driver by yourself.

3. Open the serial port tool and perform corresponding settings. Assume the serial port tool is Neo_ComTool (you can also use other serial tools).

The following figure shows the parameter settings of the serial port tool.



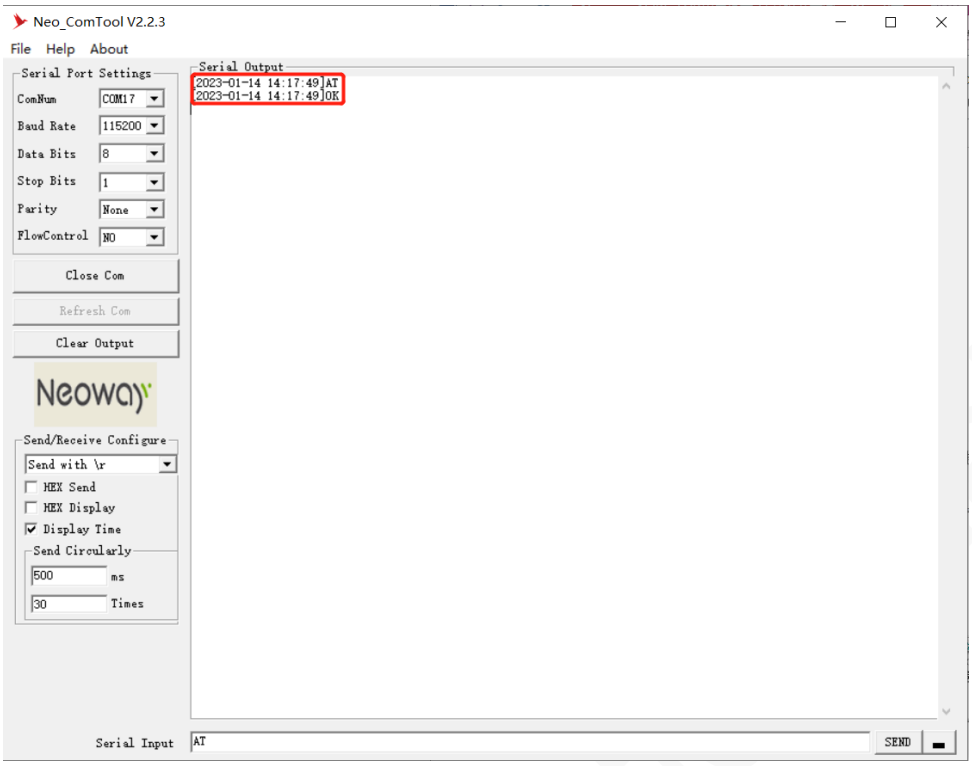
4. Select **ComNum** (corresponding to the USB-to-Serial Port serial port number displayed on the device manager interface).
5. Set **Baud Rate** of the serial port tool to **115200** or a smaller value.
6. Set **Parity** to **None** and **FlowControl** to **NO**.
7. Select the configuration option **Send with r** or **Send with \r\n**.



8. Open the serial port.

Step 5: Commission the module through the serial-port tool.

Send any AT command, for example, **AT**, to the module through the serial port tool and perform an adaptive operation on the baud rate. When characters are displayed on the serial port tool interface, adaptive baud rate of the module is set successfully.

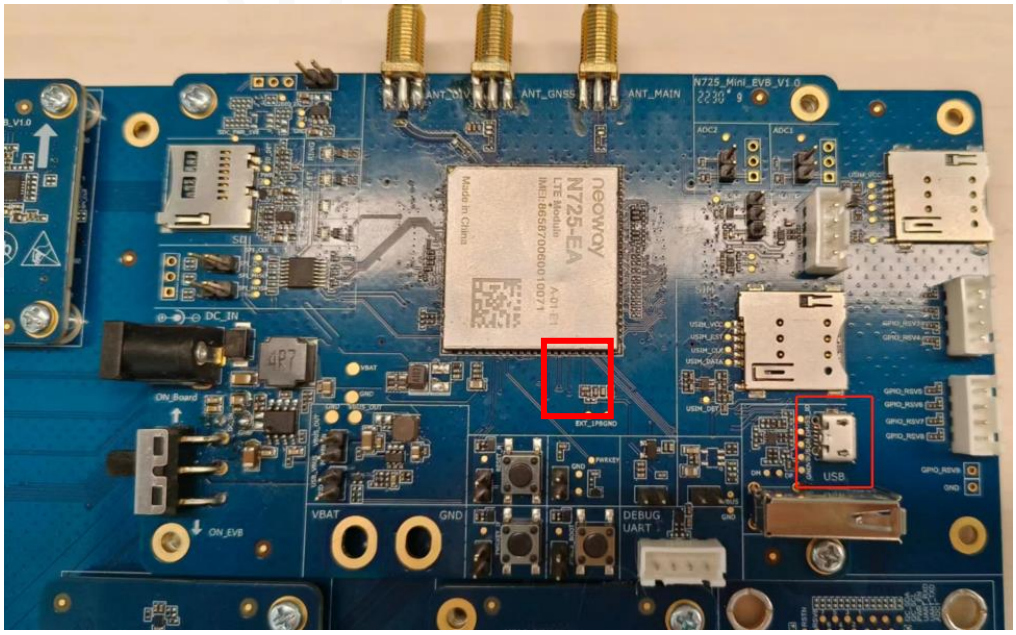


5.2 Debugging Through USB Interface

Step 1: Insert a SIM card and connect the antenna.

Step 2: Power on the N725 EVB (this step is the same as Step 2 in Section 5.1) to power on the module.

Step 3: Use a Micro-USB cable to connect the USB interface of the computer to the USB interface of the development board. The figure below shows the USB interface.



Step 4: Install the USB drivers.

Install the USB driver by manually updating the driver in the Device Manager.

Please contact our technical support engineers to obtain the USB driver file of the N725 module.

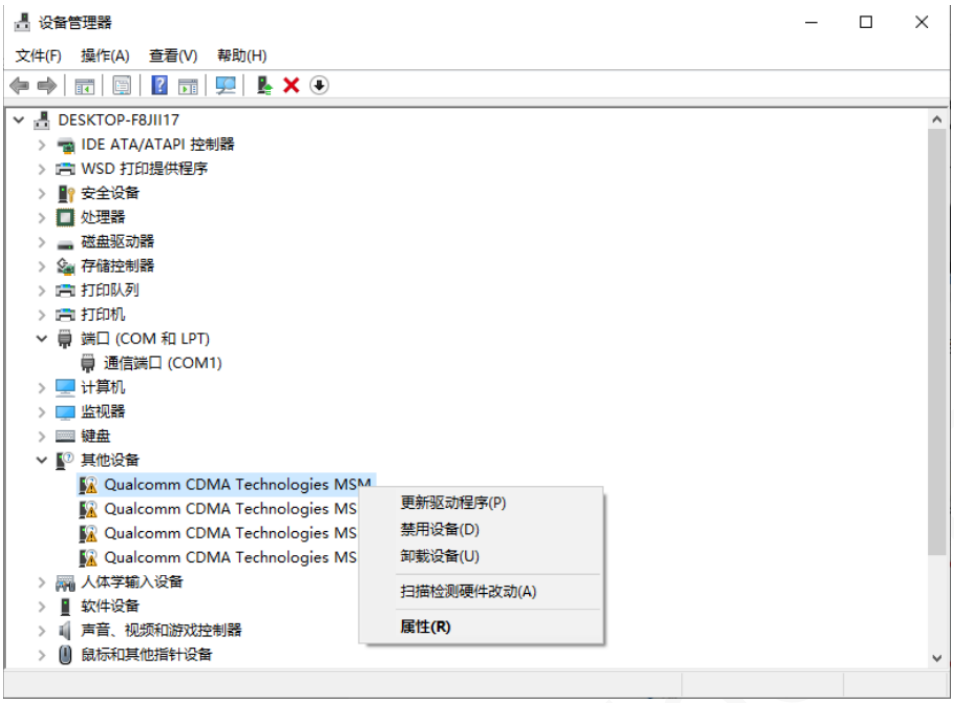
1. Decompress the USB driver installation package to the following path.

2. Open the Device Manager. If the N725 USB driver is not installed, the Device Manager displays the device port to be installed, as shown in the following figure.

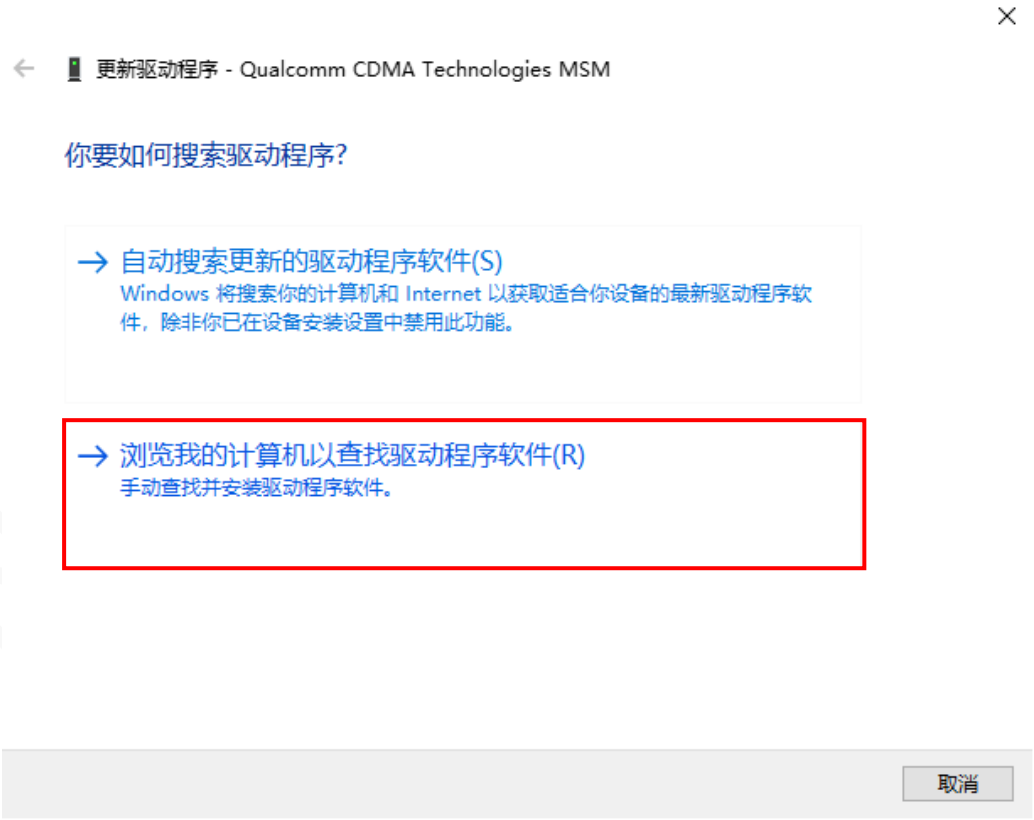
3. Disable digital signature.

   On Windows 8 or Windows 10, you need to disable driver signature enforcement before installing the USB drivers. If the Win7 operating system is used, skip this step.

4. Click **Update Driver (P)**.

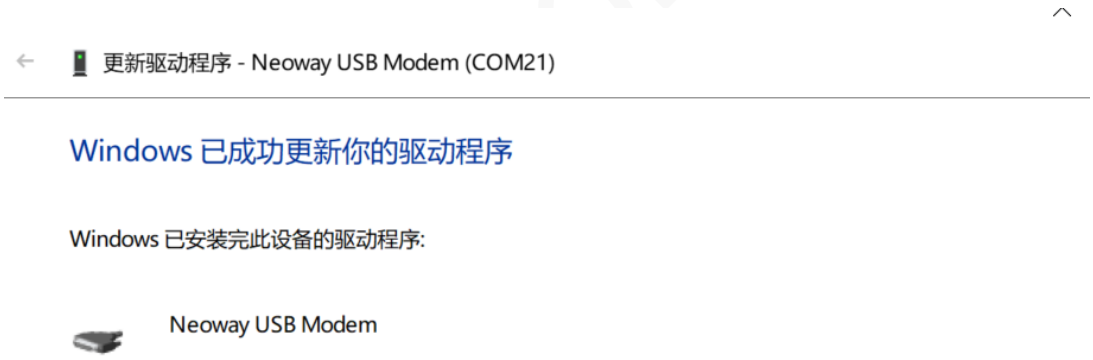


5. In the dialog box that is displayed, select **Browse the computer to find driver software (R)**.



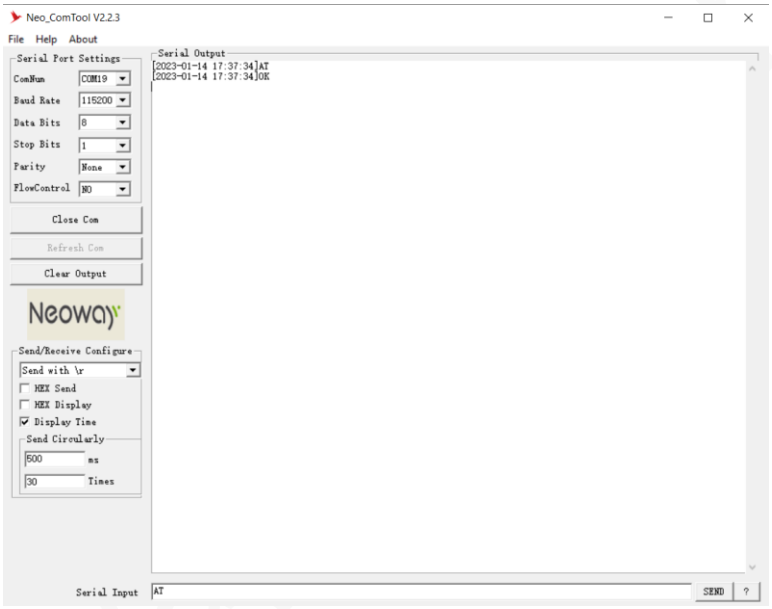
6. Click **Browse (R)…**, select the driver file and click **Next**.

7. A message indicating that the USB driver is successfully installed is displayed.



8. Repeat Steps 4, 5 and 6 above to install drivers of the remaining three USB interfaces. The following figure shows the interfaces after the drivers are installed successfully.

Select the USB AT port and set it through the serial port tool SScom. (Same as Step 6 in Section 4.1)



Step 5: Commission the module through the serial-port tool.

Through the USB interface of the N725 EVB, you can also upgrade the firmware of the module and capture logs. In this case, you need to select the diagnostic COM port that is virtualized from the USB interface, for example, Neoway ACM AT 7252 (COM28) in this example. For the specific operation, refer to the related application guide.