

# User Guide

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## N32H487ZEL7\_EVB Development Board Hardware Usage Guide

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### Introduction

The purpose of this document is to enable users to quickly become familiar with the N32H487ZEL7\_EVB development board and understand the functions, usage instructions and precautions of the development board, so as to conduct MCU debugging and development based on the development board.

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# 1 Hardware Development Instructions

## 1.1 Briefly

The N32H487ZEL7\_EVB development board is used for sample development of high-performance 32-bit N32H48x series chips of National Technology Co., Ltd. This document describes in detail the functions, usage instructions and precautions of the N32H48x series development boards.

## 1.2 Development Board Function

The main MCU chip model of the development board is N32H487ZEL7, with LQFP144 pin package. All functional interfaces are connected to facilitate customer development. In addition, power supply and GND are distributed throughout the board to facilitate debugging.

The main functional interfaces are as follows:

Table 1-1 Main functional interface description

No.	Interface	Interface tag	Illustrate
1	USB COMM	J4	Mini USB connector
2	USB DEBUG	J183	NS-Link Debugging
3	USB OTG	J62	USB OTG upgrade
4	USB TO UART	J54	USB to serial port
5	DC JACK	J59	12V DC power supply
6	JTAG	J95	JTAG interface
7	SWD	J101	SWD interface
8	DVP	J61	DVP interface
9	AUDIO CODE	J70&J21	Audio interface
10	ETH	Y3	Ethernet interface
11	LCD	J14	LCD interface
12	SDIO(WIFI)	J76	SDIO interface

13	BLE	J45	BLE interface
14	ISO-7816	J49	ISO-7816 interface
15	SPI	J102	SPI interface
16	UART	J22	UART interface
17	I2C	J69	I2C interface
18	DHT11	J60	DHT11 interface
19	DAC	J63&J38	DAC interface
20	CAN	J10&J17	DAC interface
21	RS485	J11	RS485 interface
22	LIN_PHY	J23&J24	LIN interface
23	NSLINK_SWD/JTAG/UART	J3	NSLINK signal
24	MCU IO	J24、J26、J27	MCU IO pins

In addition to the above interfaces, for the chip's comparator, ADC, general GPIO and other interface definitions, please refer to the corresponding pin descriptions in the user manual. For the three-in-one environmental sensor, position sensor, magnetic encoder, infrared module, PSRAM, NANDFLASH, QSPI FLASH, SPI FLASH, EEPROM and other modules of the development board, please refer to the corresponding schematic diagram and PCB information of the full-function board.

### 1.3 Development Board Layout

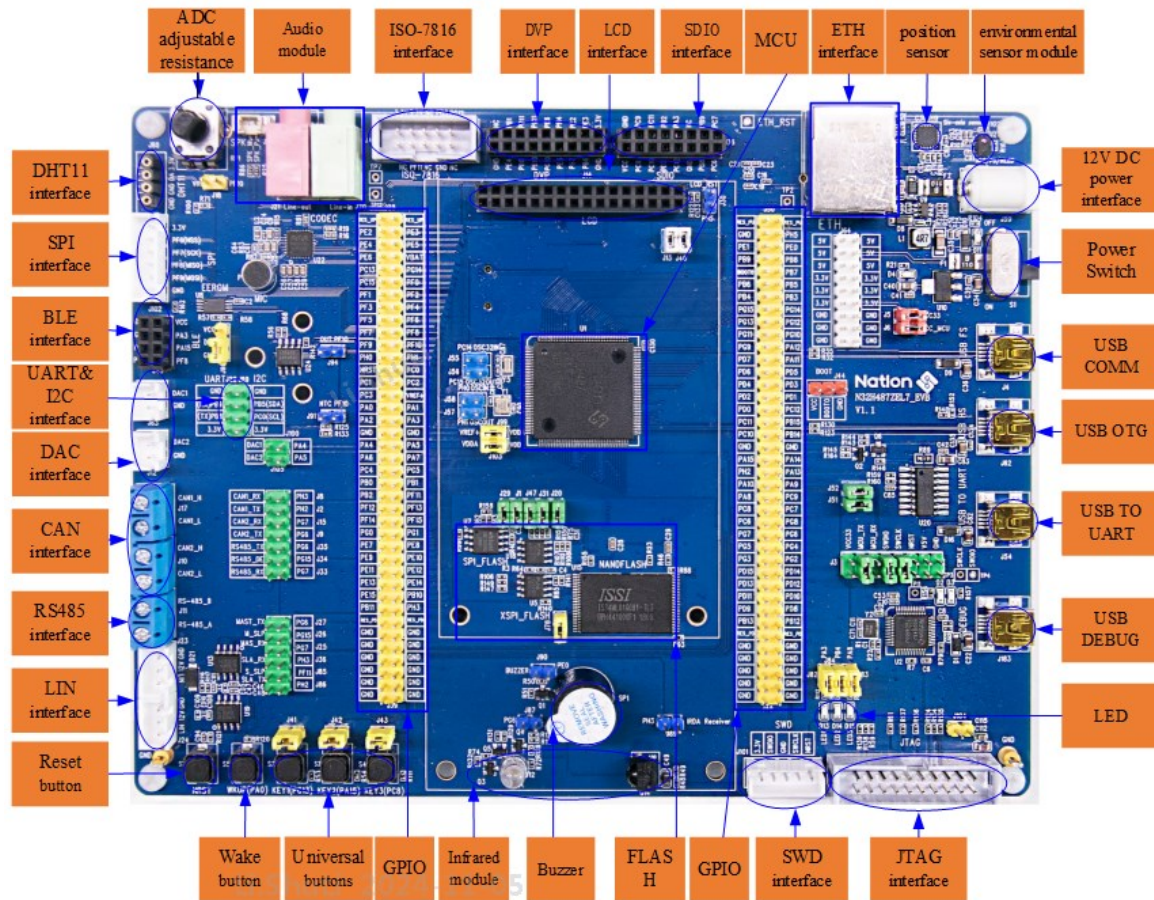


Figure 1-1 Development board top layout

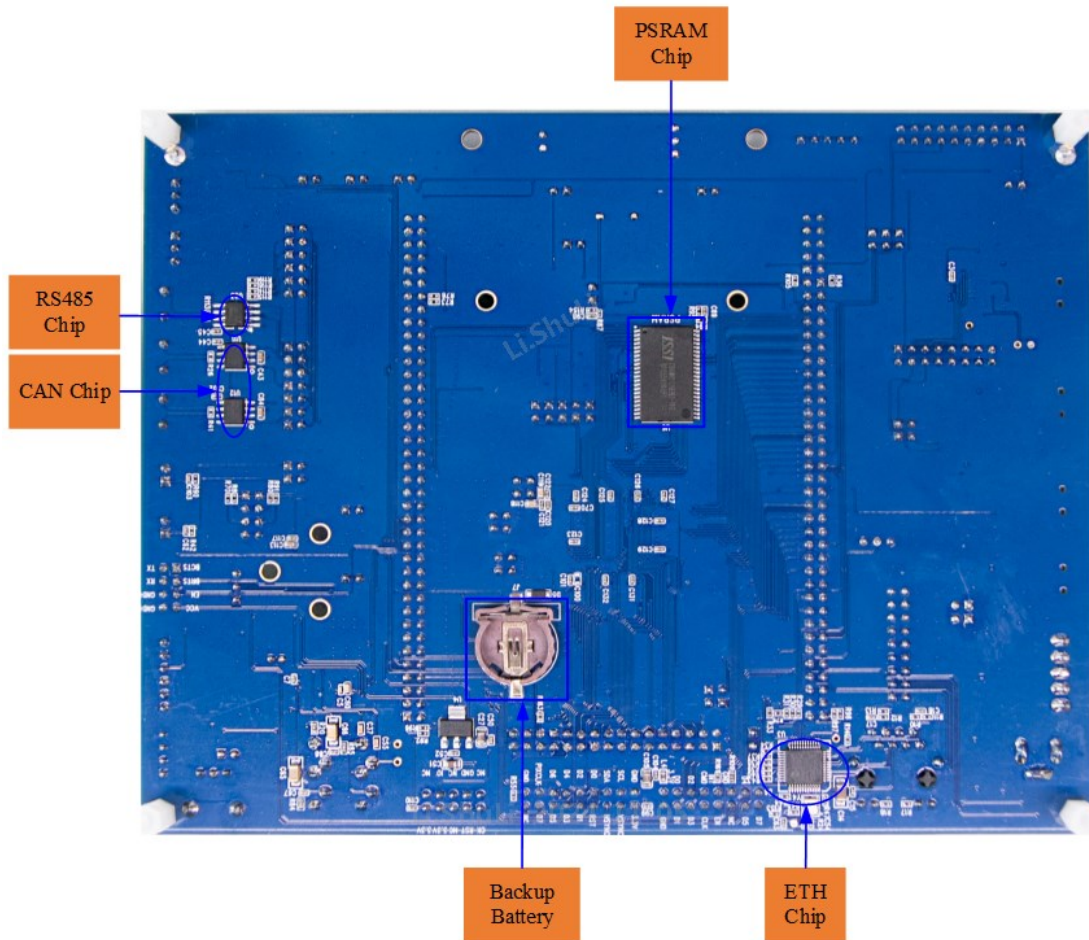


Figure 1-2 Development board bottom layout

## 1) Power supply for the development board

The development board has six power supply methods:

- 1) DCJACK interface power supply, input voltage range 9~12V;
- 2) USB COMM interface 5V power supply;
- 3) USB DEBUG interface 5V power supply;
- 4) USB OTG interface 5V power supply;
- 5) USB TO UART The interface provides 5V power supply;
- 6) The onboard battery holder VBAT supplies 3V power supply to the backup power domain;



the DCJACK 12V power supply is converted into 5V voltage by LDO, and the other four 5V power supply modes are controlled by switch S1. After passing through switch S1, the power supply is input to the LDO and converted to a 3.3V voltage. The voltage is then divided into two channels. One channel supports power supply for the MCU alone and is selected through jumper J6. The other channel supports power supply for other functional modules and is selected through jumper J5. When the power supply is supplied, the corresponding power indicator lights D11 (5V power supply) and D4 (3.3V power supply) will be displayed.

## **2) NSLINK interface**

The NSLINK interface (J3) can be used for program download and debugging. It supports two download modes: JTAG and SWD. It also has a virtual serial port, which can be selected by jumper J3.

## **3) JTAG interface and SWD interface**

The development board has a JTAG interface (J95) and a SWD interface (J101) onboard.

## **4) DVP interface**

The development board has a DVP interface (J61) onboard to support the camera function.

## **5) RS485 interface**

The development board has an onboard RS485 interface (J11), and the UART5 interface performs level switching through the RS485 interface chip (SP3485EEN). If you need to enable the RS485 interface, you need to connect jumpers J33, J34, and J35.

## **6) CAN interface**

The development board has two CAN interfaces onboard. CAN1&CAN2 convert the two CAN interfaces J10 and J17 through the CAN transceiver (TJA1042T). If you need to enable the CAN interface, you need to connect the corresponding jumpers CAN1 (J9, J15), CAN2 (J2, J8).

## **7) LIN interface**

The development board has on-board LIN interfaces, MASTER\_LIN (J23), SLAVE\_LIN (J24). If you

need to use the LIN interface, you need to connect the corresponding jumpers J25, J26, J27, J36, J85, J86.

## **8) DAC interface**

The development board has two DAC interfaces (J63, J38) onboard. When using the DAC interface, you need to connect the corresponding jumper caps J100 and J105.

## **9) ADC interface**

The development board has an onboard ADC adjustable resistor. When using the ADC, you need to connect the corresponding jumper cap J18. In addition, the development board also has an onboard NTC thermistor R125 for ADC sampling. When using it, you need to connect the corresponding jumper cap J91.

## **10) SPI, UART, I2C interface**

The development board has on-board SPI interface (J102), UART interface (J22), and I2C interface (J69).

## **11) BLE Bluetooth interface**

The development board has an onboard BLE Bluetooth interface (J45).

## **12) Temperature and humidity sensor interface**

The development board has a temperature and humidity sensor interface DHT11 onboard, with the bit number J60.

## **13) CODEC**

The onboard audio module (WM8978) on the development board supports electret MIC, analog audio input (LINE\_IN), analog audio output (LINE\_OUT), and can also be directly connected to an external 8Ω SPK (BTL). When using the audio module, jumper J46 needs to be connected.

## **14) ISO-7816 interface**

The development board has an onboard ISO-7816 interface (J49).

## **15) SDIO interface**



The development board has an onboard SDIO interface (J76).

### **16) Magnetic encoder**

The development board has an onboard magnetic encoder module (AS5600-ASOT). If you need to use this module, you need to connect the corresponding jumper J94.

### **17) 3-in-1 environmental sensor**

Development board onboard environmental sensor module (AP3216C).

### **18) position sensor**

The development board has an on-board position sensor module (MPU-6050).

### **19) ETH**

The development board uses an Ethernet chip (DM9161) to output to RJ45 interface Y3 through RMII. The Ethernet chip is located on the BOTTOM layer, with the bit number U3, and the RJ45 interface is located on the TOP layer.

### **20) EEROM、PSRAM、NANDFLASH**

The development board is equipped with an EEROM chip (AT24C02), a PSRAM chip (IS66WV51216EBLL) and a NANDFLASH chip (IS34ML01G081-TLI). The EEROM is located on the top layer of the development board, with chip number U8; the PSRAM is located on the bottom layer of the development board, with chip number U6. When using this module, you need to connect the jumper cap J20; NANDFLASH is located on the top layer of the development board, with the chip number U15. When using this module, you need to connect the jumper cap J78.

### **21) SPI\_FLASH & QSPI\_FLASH**

The development board has one SPI FLASH (W25Q128JVSIQTR) and two QSPI FLASH (P25Q40HA-SSH-IT) onboard. The SPI FLASH is located on the TOP layer, with the bit number U7, and the QSPI FLASH is located on the TOP layer, with the bit numbers U5 and U18. Both are connected through jumpers. Select, if you choose SPI FLASH, you need to connect jumpers J29 and J31; if you choose

QSPI FLASH, you need to connect jumpers QSPI FLASH\_1 (J1, J12), QSPI FLASH\_2 (J47, J73) respectively.

## **22) LCD**

The development board has an onboard LCD display, and the connector is located on the TOP layer with the bit number J14. When using the LCD screen, you also need to connect the jumper J16.

## **23) Infrared module and buzzer**

The development board has an onboard infrared transmitter circuit and an integrated infrared receiver. The infrared transmitter tube is located on the TOP layer, with the bit number D12, and the integrated infrared receiver is located on the TOP layer, with the bit number U14. The development board has an onboard buzzer located on the TOP layer with the bit number SP1. When using the infrared module, jumper caps J87 and J89 need to be connected; when using the buzzer, jumper cap J90 needs to be connected.

## **24) LED & KEY**

There are three LED lights on the development board for development and debugging. They are located on the TOP layer and are numbered D6, D14, and D15. When using LED lights, you need to connect the corresponding jump caps J82, J83, and J84; in addition, the development board has five mechanical buttons on the TOP layer, one reset button (S7), one wake-up button (S5), and three general buttons (S2, S3, S4), among which the corresponding jump caps J41, J42 and J43 need to be connected when using the universal buttons.

## **25) GPIO port**

The 118 independent GPIO ports can be multiplexed with other function pins. For details, please refer to "DS\_N32H48x Series Data Manual".

## 1.4 Development Board Key Jumper Usage Instructions

Table 1 2 Development board key jumper description list

No.	Jumper number	Jumper function	Instructions for use
1	J5	3.3V power supply option	In addition to the MCU, other functional modules are powered and must be connected
2	J6	3.3V power supply option	To power the MCU, it must be connected
3	J48、J13	ETH clock selection	Must be connected when using the Ethernet function.
4	J44	BOOT0 pull-down selection	Then pull up on the left and pull down on the right.
5	J3	NSlink jumper	Press the silk screen to select the desired download method.
6	J46	CODEC CSB	CODEC line control interface chip select needs to connect this item
7	J29、J31、	SPI flash	Connect this item when using SPI flash
8	J1、J12、J47、J73	QSPI flash	Connect this item when using QSPI flash
9	J2、J8、J9、J15	CAN interface	Connect this item when using the CAN interface
10	J33、J34、J35	RS485 interface	Connect this item when using the RS485 interface
11	J25、J26、J27、J36、J85、J86	LIN interface	Connect this when using the LIN interface
12	J41、J42、J43	Mechanical keys	Connect this item when using mechanical buttons
13	J82、J83、J84	LED light	Connect this item when using LED lights
14	J90	buzzer	Connect this when using the buzzer
15	J94	position sensor	Connect this when using a position sensor

16	J87、J89	Infrared module	Connect this item when using an infrared module
17	J18	ADC adjustable resistor	Connect this when using an ADC adjustable resistor
18	J91	ADC NTC thermistor	Connect this when using ADC NTC thermistor
19	J100、J105	DAC module	Connect this when using a DAC
20	J16	LCD module CS pin	Connect this item when using the LCD module
21	J20	PSRAM module CS pin	Connect this when using the PSRAM module
22	J78	NANDFLASH module CS pin	Connect this item when using NANDFLASH module

## 1.5 N32H487ZEL7\_EVB Development Board Schematic Diagram

For details of the N32H487ZEL7\_EVB schematic diagram, please refer to the PDF file "N32H487ZEL7\_EVB".

MCU peripheral device description:

- 1) MCU VCC\_MCU: Place two capacitors, 10uF and 0.1uF, nearby the pin VDD (144PIN), and place 0.1uF capacitors nearby the other VDD power pins.
- 2) VDDA: VDDA is the analog power supply, providing power for ADC, DAC, and COMP. It is recommended to place a 0.1uF and a 10uF capacitor on the VDDA input pin.
- 3) VREF+: VREF+ is the reference voltage, providing reference levels for ADC and DAC. When VREF+ uses the built-in reference source VREFBUF, it is recommended to place a 0.1uF and a 1uF capacitor nearby the VREF+ pin. When VREF+ is powered externally, it is recommended to place a 0.1uF and a 10uF capacitor nearby the VREF+ pin.

## 2 Version History

Version	Date	Changes
V1.0	2024-3-02	Initial version
V1.1	2024-4-02	Updated the IO multiplexing issues of LCD, ETH reset circuit and other modules;

### 3 Disclaimer

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