

# User Guide

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## N32G4FRML-STB Development Board Hardware User Guide

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### Introduction

The purpose of this document is to allow users to quickly familiarize themselves with the N32G4FRML-STB development board, understand the functions, usage instructions, precautions, and facilitate MCU debugging and development based on the development board.

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# 1 Hardware Development Instructions

## 1.1 Brief

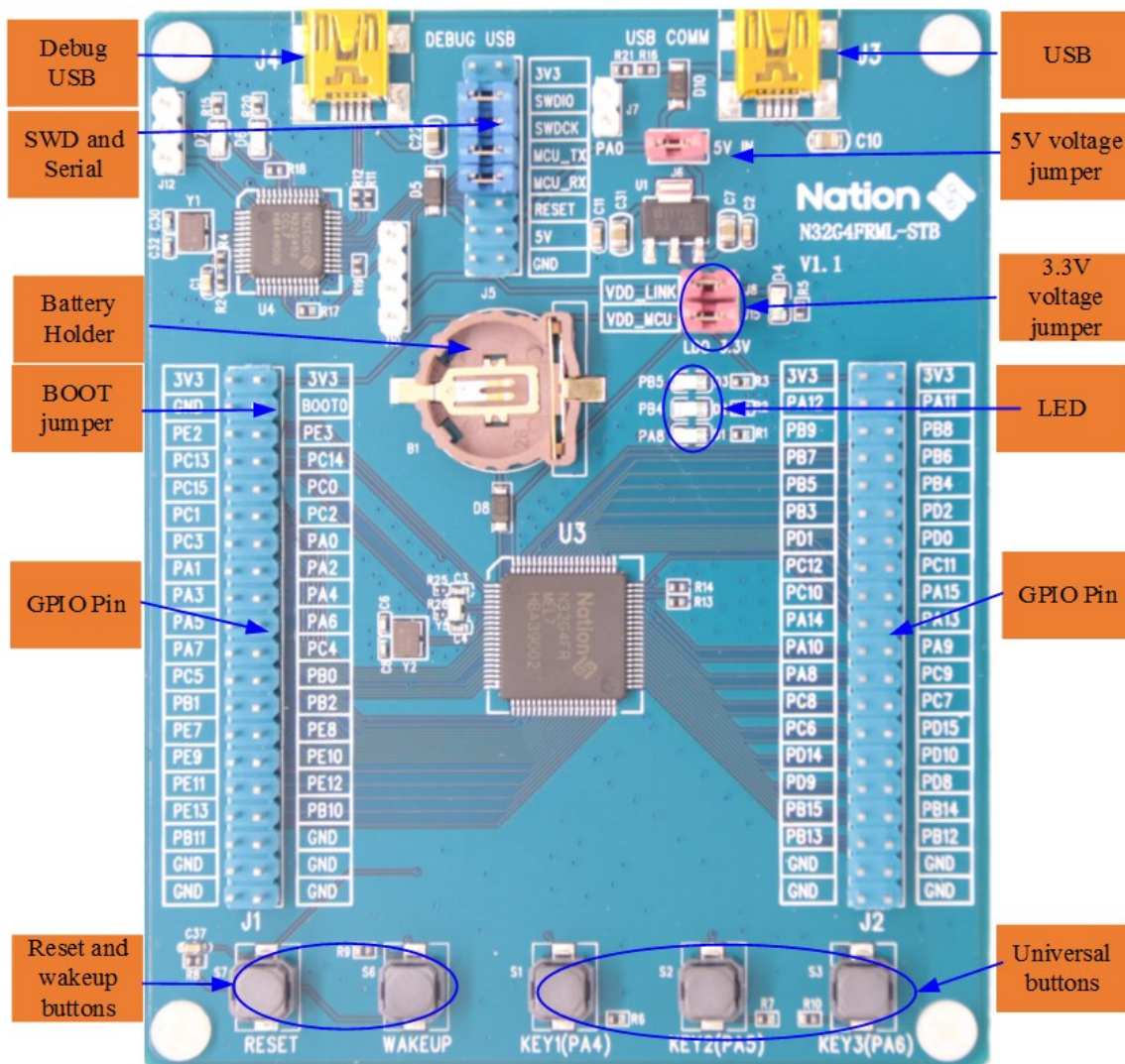
The N32G4FRML-STB development board is used for sample development of 32-bit N32G4FRM series chips of Nsing Technology Inc. This document describes the functions, usage instructions and precautions of the N32G4FRML-STB development board in detail.

## 1.2 Development board function

The part number of the main MCU chip in the development board is N32G4FRMEL7, and it is packaged with LQFP80 pins. The development board connects all functional interfaces to facilitate customer development.

## 1.3 Development Board Layout

Figure 1-1 Development Board Layout



## ● Power supply for the development board

The development board can be powered by USB COMM interface (J3) and/or DEBUG USB (J4), and connected to 3.3V LDO input port through J6 jumper.

## ● USB interface (J3)

The Mini USB interface (J3) is used to connect the DP and DM signals of the main MCU (U3) for the USB interface communication.

## ● Debug USB (J4)

Through the DEBUG USB interface of the NS-LINK chip (U4), it can provide main MCU program download and debugging functions, and can also connect to the MCU's serial port to provide USB to serial conversion function.

## SWD interface and Serial port (J5)

SWD interface: SWDIO and SWDCK are used to download and debug the main MCU program. You can use ULINK2 or JLINK to download and debug the MCU, or you can short the SWDIO signal pin and the SWDCK signal pin with the jumper cap, and perform MCU downloading and debugging through DEBUG USB.

Serial port: MCU\_TX and MCU\_RX are used as serial port external signals. MCU's PA9 (TX) and PA10 (RX) are used as serial port, which can be connected to external serial port devices separately. Or by shorting the MCU\_TX signal pin and the MCU\_RX signal pin with jumper cap, customers can use the NS-LINK on the development board to convert the USB port to a serial port for convenience.

## ● Reset and Wake Buttons (S7, S6)

S7 and S6 are the reset button and wake-up button respectively, connected to the chip's NRST pin and PA0-WKUP pin, used for chip reset and wake-up functions.

## ● Universal keys (S1, S2, S3)

S1, S2, and S3 are general buttons, which are connected to the pins PA4, PA5 and PA6 of the chip respectively.

## ● BOOT (J1 PIN4)

J1 PIN4 is BOOT0 pin, which can be shorted to power and ground through jumper caps as needed.

## ● GPIO (J1, J2)

The GPIO interfaces of the chip are all lead out, and the 3.3V voltage and GND pins are also reserved on the pins, which is convenient for testing. For the specific definitions of the GPIOs, please refer to "UM\_N32G45x Series Datasheet".

## 1.4 Development Board Jumper Usage Instructions

Figure 1-2 Development Board Jumper Description

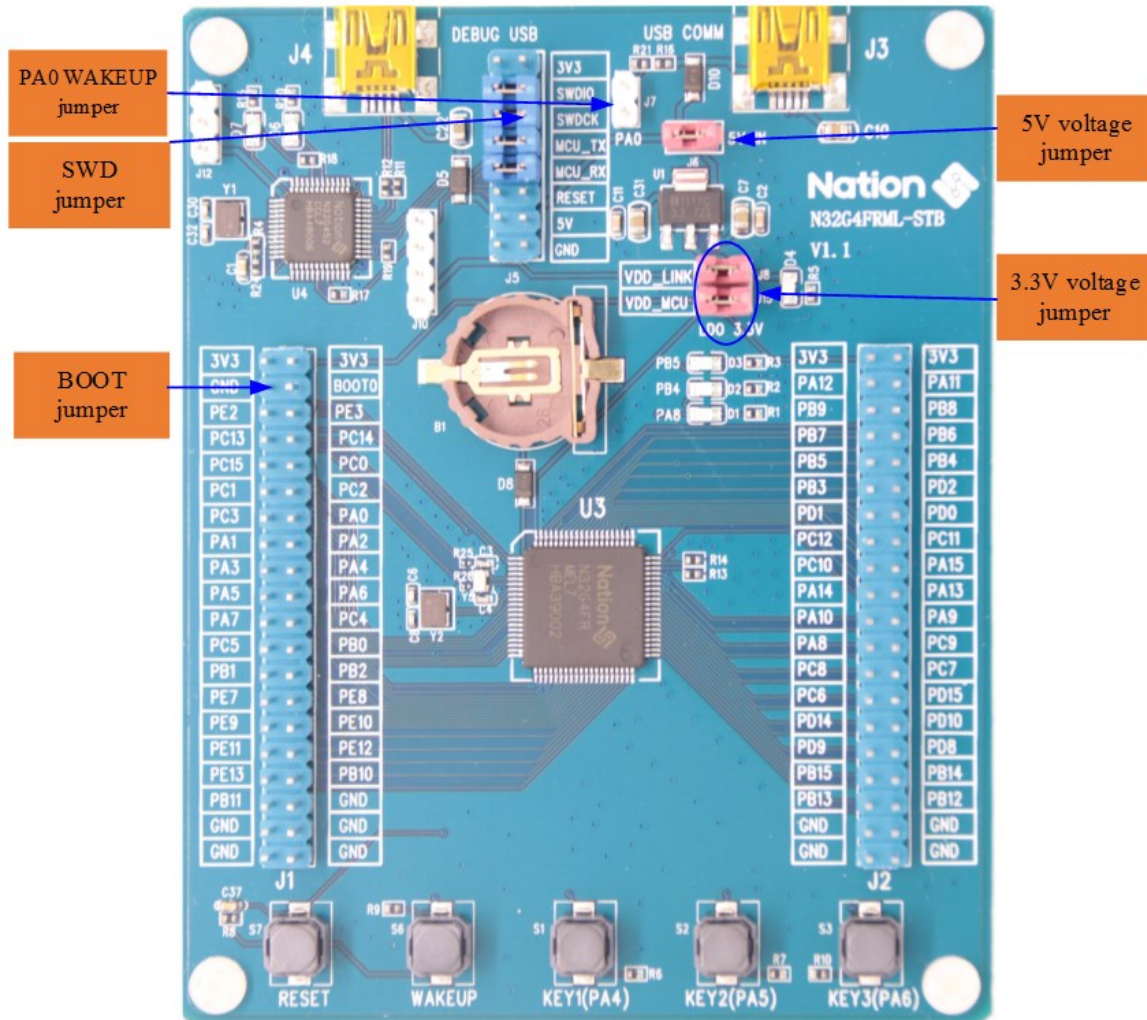


Table 1-1 Development Board Jumper Description List

No.	Jumper Bit Number	Jumper Function	Instructions For Use
1	J6	5V input voltage jumper	The jumper J6 is used to connect the two USB ports J3 and J4 to supply power to the LDO3.3V input port.
2	J8、J15	3.3V power supply jumper	J8: Power supply 3.3V to NS-LINK MCU chip. J15: Power supply 3.3V to the main MCU chip.
3	J5	SWD jumper	Using NS-LINK to download the program to the MCU through the USB DEBUG port, you need to short the SWDIO signal pin and the SWDCK signal pin.



No.	Jumper Bit Number	Jumper Function	Instructions For Use
	J5	Serial jumper	When using NS-LINK as a serial port through the USB DEBUG port, you need to short the MCU_TX signal pin and the MCU_RX signal pin.
4	J1 PIN4	BOOT jumper	J1 PIN4: BOOT0.
5	J7	PA0 WAKEUP jumper	J7: When the USB interface is inserted, shorting this jumper can wake up the MCU through PA0 (set the PA0 bit as the WKUP signal).

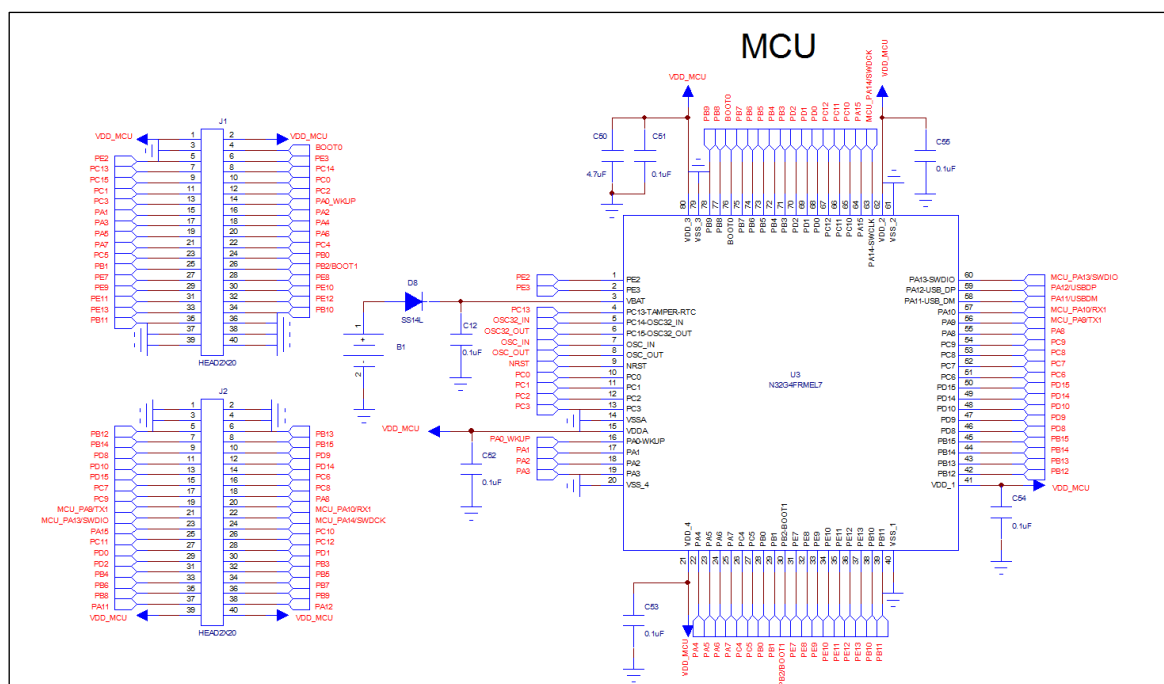
## 1.5 Development Board Schematic

The schematic diagram of the N32G4FRML-STB development board is described as follows (For details, please refer to "N32G4FRML-STB V1.1").

- **MCU connection**

Refer to Figure 1-3 for the schematic diagram of the MCU connection. Each VDD pin of the MCU is connected with a capacitor, and all GPIOs are connected to the J1 and J2 pins for easy debugging.

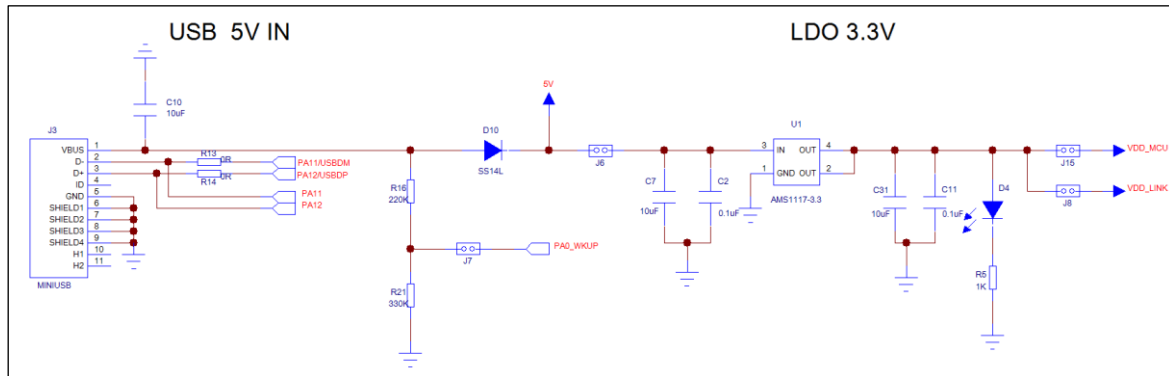
### Figure 1-3 MCU Connection Diagram



- **Power design**

Refer to Figure 1-4 for the schematic diagram of the power supply design. The PCB is powered by 5V through USB, and then outputs 3.3V through the LDO to supply power to the entire PCB board.

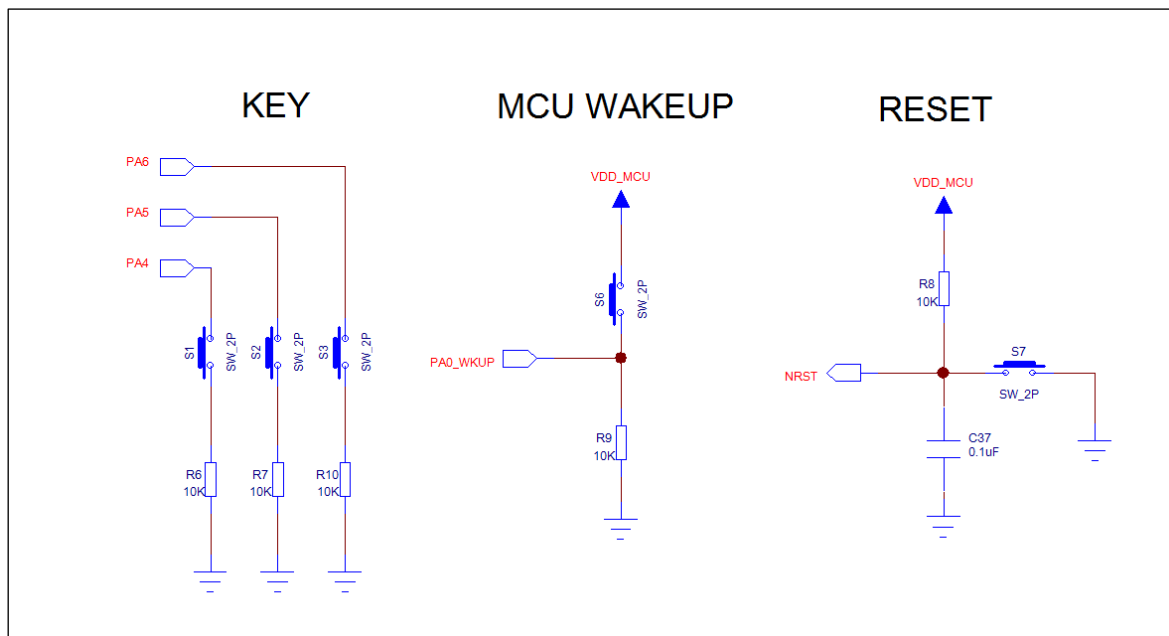
**Figure 1-4 Power Design**



### ● Button design

Refer to Figure 1-5 for the schematic diagram of the key design. There are a total of 5 keys, which are the three general keys, the MCU wake-up key and reset key.

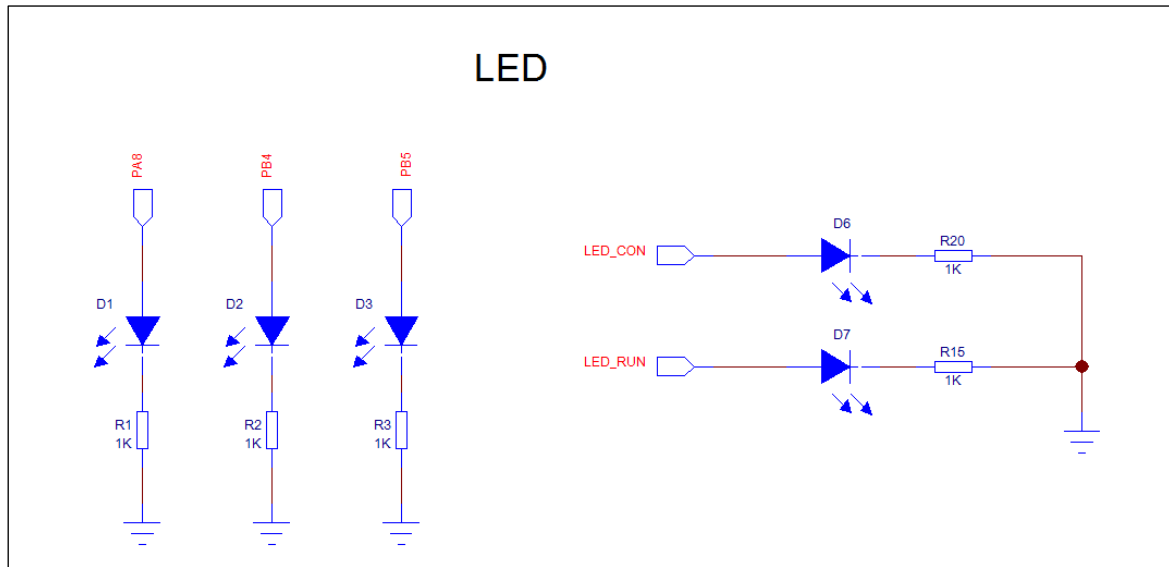
**Figure 1-5 Button Design**



### ● LED light design

Refer to Figure 1-6 for the schematic diagram of LED light design. There are a total of 5 LED lights. D1, D2, and D3 are connected to PA8, PB4 and PB5 of the main MCU respectively, which can be used for debugging. D6 and D7 are used for NS-LINK MCU control to monitor the running status of NS-LINK.

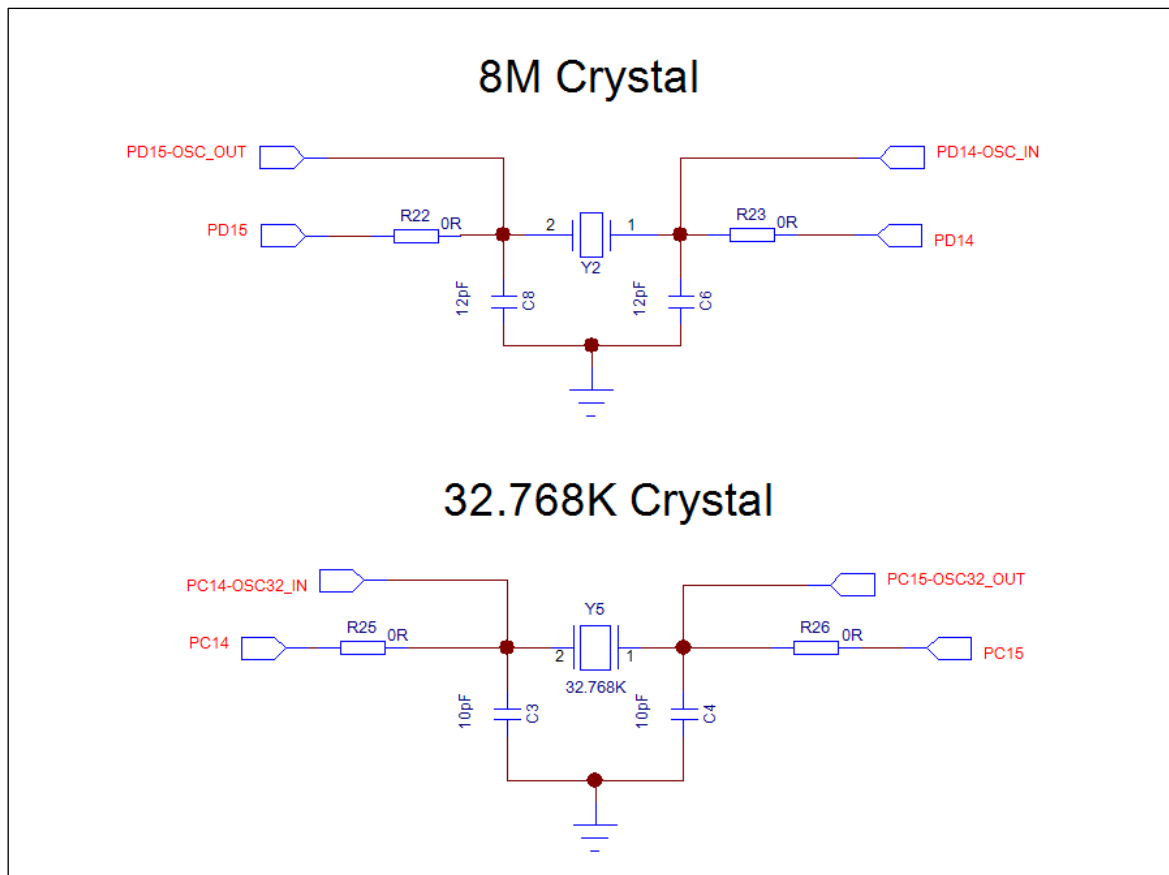
Figure 1-6 LED Light Design



## ● Crystal

Refer to Figure 1-7 for the crystal connection diagram. The chip has two external crystals, 32.768KHz and 8MHz respectively.

Figure 1-7 Crystal Design

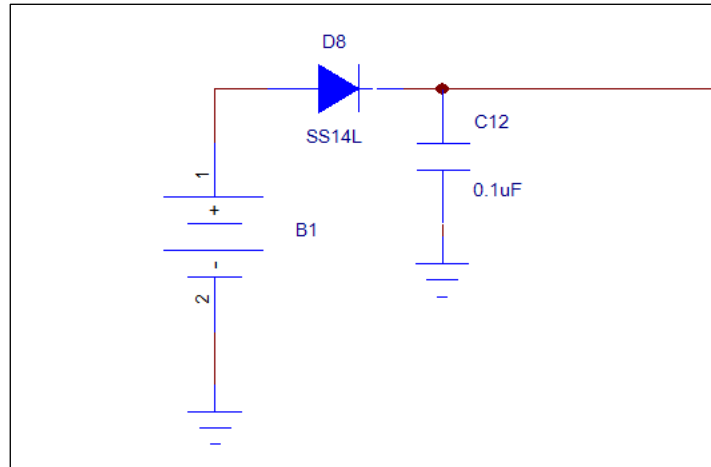




## ● BAT

Refer to Figure 1-8 for the external schematic diagram of the BAT battery, which can supply power to the VBAT pin through the external battery holder on the PCB board and an external CR1220 battery.

**Figure 1-8 BAT**

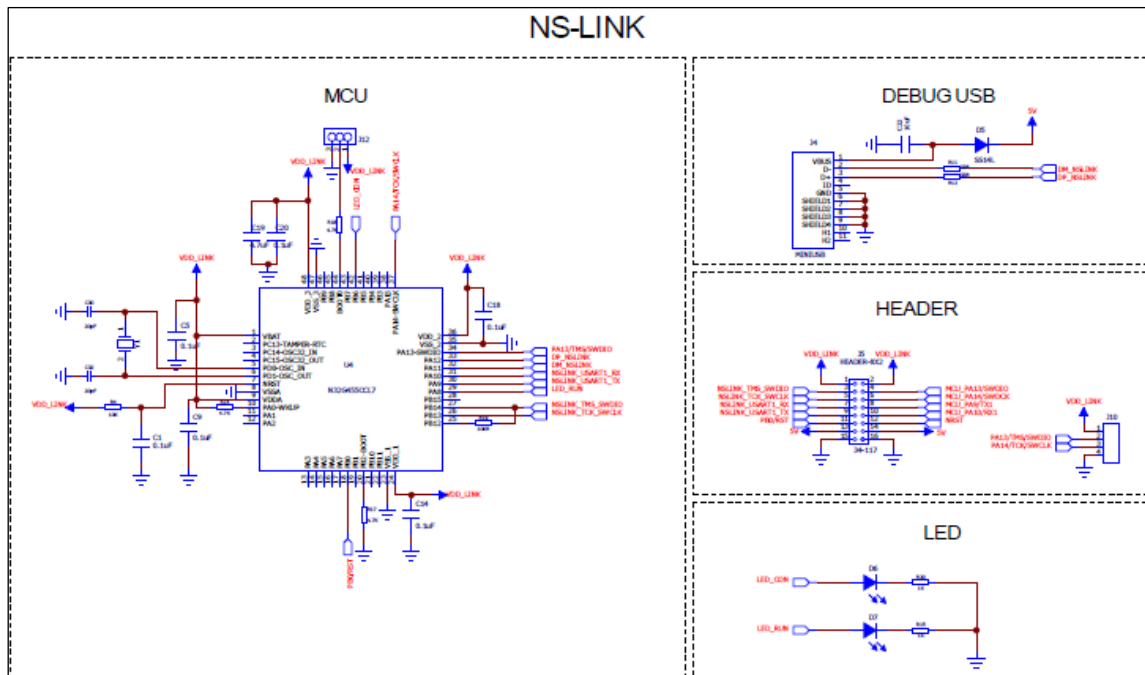


## ● NS-LINK

Refer to Figure 1-9 for the schematic diagram of NS-LINK. Users can directly connect the USB cable to download the program through the DEBUG USB port, without the need for a ULINK or JLINK debugger.

You can also debug through the DEBUG USB analog serial port.

**Figure 1-9 NS-LINK**



## ● Description of peripheral devices:

- 1) When designing PCB LAYOUT, put two capacitors near VDD (PIN80), 4.7uF and 0.1uF respectively, and put

0.1uF capacitors near the other VDD pins

- 2) PC14-OSC32\_IN, PC15-OSC32\_OUT: When there is a need for an external high-precision RTC clock, a 32.768KHz crystal needs to be connected close to the two pins, and it can be omitted if there is no need.
- 3) DP, DM: 33 $\Omega$  series resistance, placed close to the pins

## 2 Version History

Version	Date	Changes
V1.0	2020.07.25	Initial version

### 3 Disclaimer

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