

**ARM Cortex™-M0
32-bit Microcontroller**

**NuEdu-SDK-NUC472 User Manual
for NuMicro™ NUC442/472 Series**

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1 Overview

The NuEdu-SDK-NUC472, which consists of NuEdu-EVB-NUC472 and NuEdu-Advance02, is a development tool for Cortex®-M4 based on Nuvoton NUC442/472 series micro controller. The NuEdu-SDK-NUC472 purposes to provide user a useful and powerful learning material for how to develop and verify the application program. Furthermore, user can change or add another module to develop specific function. shows the NuEdu-SDK-NUC472.

The NuEdu-EVB-NUC472 includes two parts, the left portion NuEdu-EVB-NUC472 and the right portion Nu-Link-Me.

The NuEdu-EVB-NUC472 uses the NUC472JI8AE as the target microcontroller with embedded Cortex®-M4 core with DSP extensions and a Floating Point Unit runs up to 84 MHz with 512 Kbytes embedded flash memories and 64 Kbytes embedded SRAM. It is also equipped with plenty of peripheral devices, such as Timers, Watchdog Timers, RTC, PDMA, EBI, UART, Smart Card interface, SD HOST, SPI, I2C, I2S, PWM Timer, GPIO, LIN, CAN, PS/2, 12-bit ADC, analog comparator, operational amplifier, temperature sensor, Low Voltage Reset Controller and Brown-out Detector. The NUC472JI8AE also provides Ethernet 10/100 MAC with MII and RMII interface, USB 2.0 full-speed Device/Host/OTG, USB 2.0 HS device and security functions such as tamper detection, symmetric cryptographic accelerator and secure Hash function accelerator.

The NuEdu-EVB-NUC472 is similar to other development boards, by which user can develop and verify applications to emulate the real behavior.

The Nu-Link-Me is a Debug Adaptor based on SWD (Serial Wire Debug) interface, user can connect your PC's USB port to your target system (via right side USB port) and allows you to program and debug embedded programs on the target hardware.

The NuEdu-EVB-NUC472 also support user to use Arduino Kit for expansion.

Figure 1-1 shows the NuEdu-SDK-NUC472.

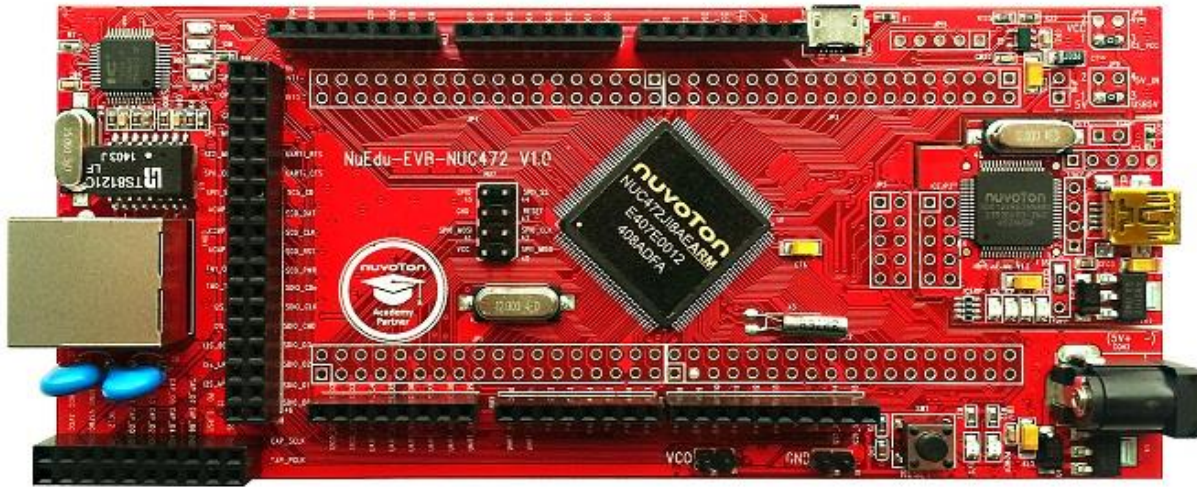


Figure 1-1 NuEdu-EVB-NUC472

We also provide Nu-Bridge tool for user to connect serial communication interfaces from NuEdu-Advance02 to PC. Figure 1-2 shows the Nu-Bridge.



Figure 1-2 Nu-Bridge

This user manual provides information about hardware features of NuEdu-SDK-NUC472 and users how to start using NuEdu-SDK-NUC472.

2 NuEdu SDK Board Introduction

2.1 Block Diagram

Figure 2-1 shows specific function pins of the NuEdu-EVB- NUC472. First pin of each header is marked red rectangle.

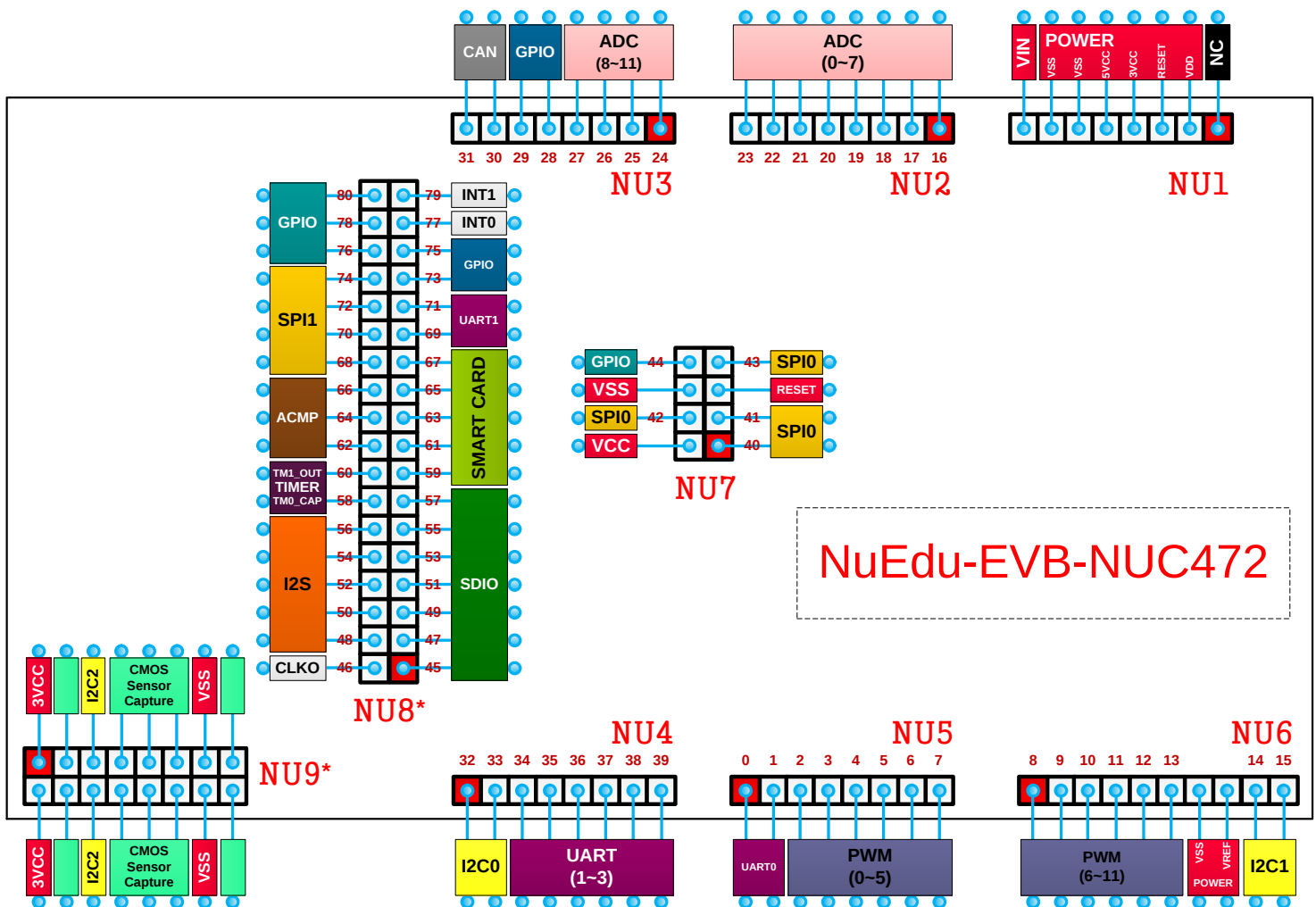


Figure 2-1 Specific function pins of the NuEdu-EVB-NUC472

Figure 2-2 shows specific function pins of the NuEdu-Advance02. First pin of each header is marked red rectangle.

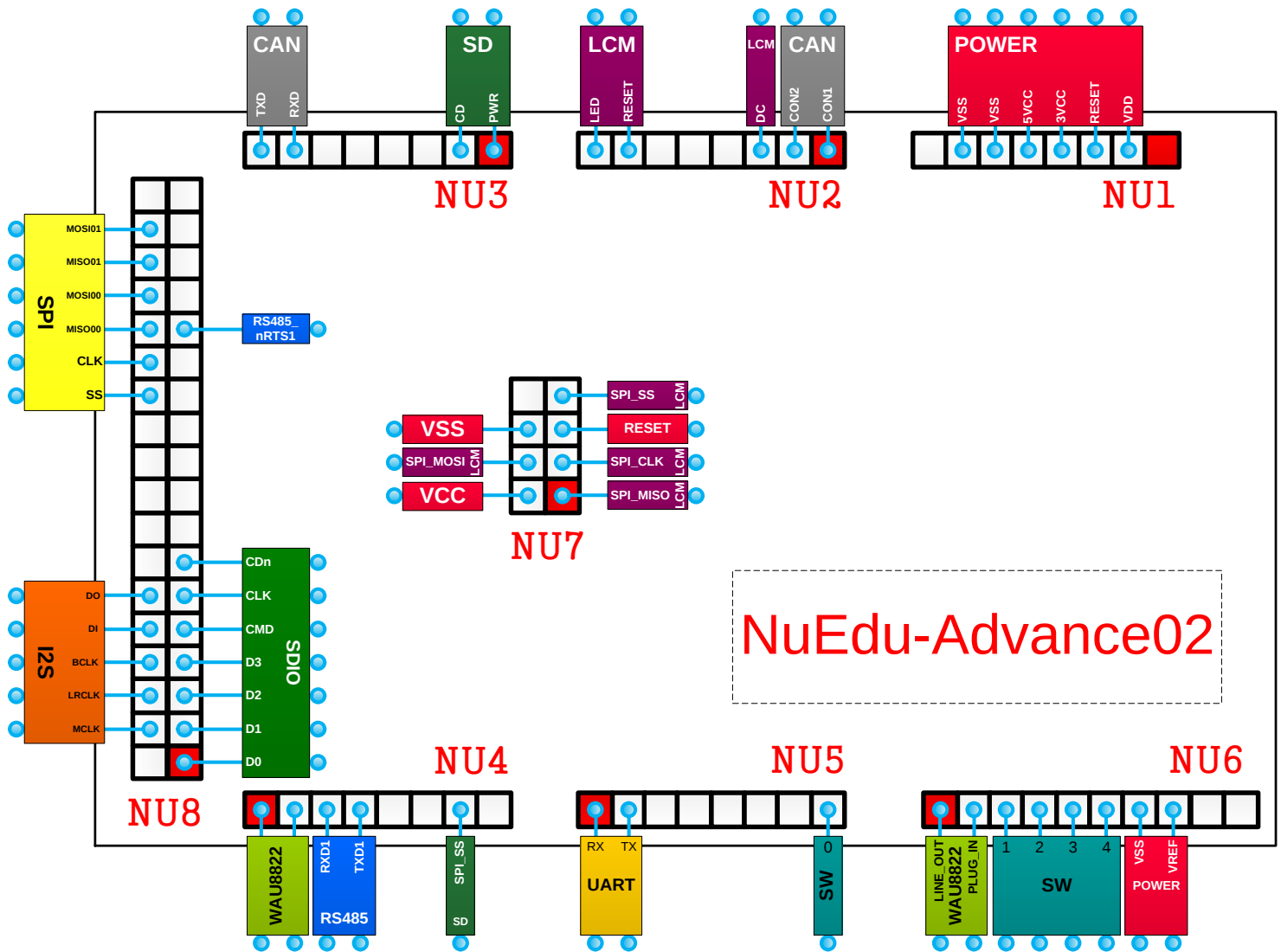


Figure 2-2 Specific function pins of the NuEdu-Advance02

2.2 Board Interpretation

The NuEdu-EVB-NUC472 also supports Arduino development kits. User can replace NuEdu development kits (EX: NuEdu-Advance02) to Arduino development kits. It marks the function of every pin on the NuEdu-EVB-NUC472 front side, shown as Figure 2-3 yellow frame. It also marks the pin numbers which correspond to Arduino software, shown as Figure 2-3 blue frame. User can choose suitable development kits according to this information.

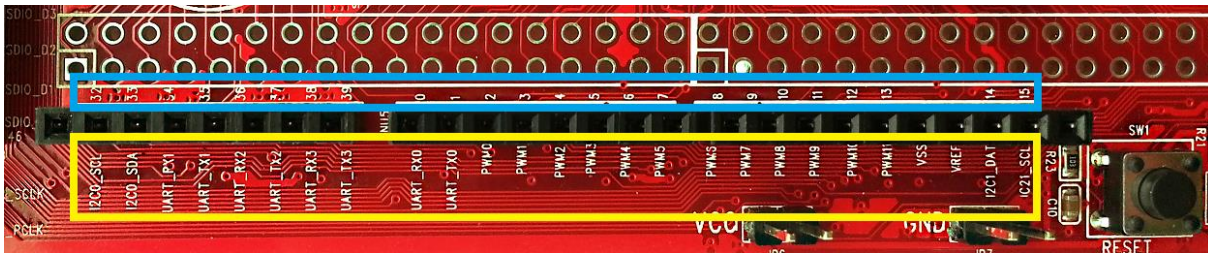


Figure 2-3 Marks on the NuEdu-EVB-NUC472 front side

2.3 System Configuration

2.3.1 Power Settings

- **CON3**: 5V_IN connector in NuEdu-EVB-NUC472
- **ICEJ1**: USB port in Nu-Link-Me

Model	JP8	JP9	ICEJ1 USB Port	CON3 VIN	MCU Voltage	USB OTG Voltage
Model 1	Short(1,3)	Short(1,3)	Connect to PC	X	DC 3.3V	DC 5V
Model 2	Short(2,4)	Short(2,4)	X	DC 5V Input	DC 3.3V	DC 5V

X: Unused.

2.3.2 Debug Connectors

- **JP5**: Connector in target board (NuEdu-EVB-NUC472) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- **ICEJP2**: Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (e.g. NuEdu-EVB-NUC472)

2.3.3 USB Connectors

- **CON2**: Micro USB Connector in NuEdu-EVB-NUC472 for application use

- **ICEJ1**: Mini USB Connector in Nu-Link-Me connected to a PC USB port.

2.3.4 Ethernet Connectors

- **CON1**: Ethernet Connector in NuEdu-EVB-NUC472 for application use

2.3.5 Extended Connectors

- **JP1, JP2, JP3, and JP4**: Show all chip pins in NuEdu-EVB-NUC472.

2.3.6 Button

- **SW1**: Reset button in NuEdu-EVB-NUC472

2.3.7 Power Connectors

- **VCC**: VCC connector in NuEdu-EVB-NUC472
- **GND**: GND connector in NuEdu-EVB-NUC472

3 Starting to Use NuEdu-SDK-NUC472

3.1 System Requirements

- Windows XP, Windows 7 OS
- Keil RVMDK (version 4.50 or above) or IAR EWARM (version 6.5 or above) development environment
- NuEduEvaluation Board

3.2 Hardware Setup

1. Use NuEdu-Advance02
Plug NuEdu-Advance02 into NuEdu-EVB-NUC472, and connect from the right side USB port to your PC.
2. NuEdu-EVB-NUC472
Connect NuEdu-EVB-NUC472 , from the right side USB port to your PC.

3.3 Starting to Use NuEdu-SDK-NUC472 on the Keil μ Vision® IDE

- Install Keil μ Vision® IDE Software
Please connect to the Keil company website (<http://www.keil.com>) to download the Keil μ Vision® IDE and install RVMDK .
- Install Nuvoton Nu-Link Driver
Please connect to Nuvoton NuMicro™ website (<http://www.nuvoton.com/NuMicro>) to download the “*Nu-Link Driver for Keil RVMDK*” file from “*Device Driver and Software Library*”. After the Nu-Link driver is downloaded, please unzip the file and execute the “*Nu-Link_Keil_Driver.exe*” to install the driver.

3.4 Starting to Use NuEdu-SDK-NUC472 on the IAR Embedded Workbench

- Install IAR Embedded Workbench Software
Please connect to the IAR company website (<http://www.iar.com>) to download the IAR Embedded Workbench and install the EWARM.
- Install Nuvoton Nu-Link Driver
Please connect to Nuvoton NuMicro™ website (<http://www.nuvoton.com/NuMicro>) to download the “Nu-Link Driver for IAR EWARM” file from “Device Driver and Software Library”. After the Nu-Link driver is downloaded, please unzip the file and execute the “Nu-Link_Driver_for_IAR_EWARM.exe” to install the driver.

3.5 Nu-Bridge Setup

- Install USB Device Driver
 1. Double click the WinUSB4NuVCOM.exe to install the driver.
 2. Click the “Next” button shown on the Setup Wizard window.
 3. Two warnings will be shown during installation. Please select “Install this driver software anyway” to install the driver.
 4. After driver installation is complete, Windows operating system should be able to detect the Nu-Bridge dongle, and load the corresponding USB configuration automatically. Users can confirm if the driver is installed correctly by checking USB Tool through “Control Panel->Devices and Printers”. If the Nu-Bridge Virtual Com Port and WinUSB Driver (Nu-Bridge BULK) are shown, the driver is installed successfully.
- Update Firmware
 1. Short pin 2 and pin 7 of the Nu-Bridge dongle and then plug the dongle to an USB port on a computer. The Nu-Bridge dongle will be identified as a removable storage device with 64 KB capacity.
 2. Select and copy firmware to the device for firmware update.
- Install Dual Virtual Com Port Driver
 1. Plug Nu-Bridge dongle to an USB port on a computer.
 2. Stop Windows from getting the driver automatically.
 3. Open “Control Panel->Devices and Printers”, and there will be exclamation marks shown on two USB Virtual COM devices.
 4. Update the drivers manually for the two Virtual COM Port devices.
 5. Select the directory where the driver file is stored.
 6. A Windows security warning message will appear after you select the driver file. Please select “Install this driver software anyway” to proceed with installation.
 7. Virtual COM Port installation is complete.
 8. Please follow Step 4 ~ 7 to install the driver for another Virtual Com Port.

3.6 Downloading NuEdu-SDK-NUC472 BSP

Please connect to Nuvoton NuMicro™ website (<http://www.nuvoton.com/NuMicro>) to download the “*NUC400 Series CMSIS BSP_EN_V3.00.000*” file from “*Device Driver and Software Library*”.

4 Pin Description

Header		NuEdu-EVB-NUC472		NuEdu-Advance02	Header		NuEdu-EVB-NUC472		NuEdu-Advance02
		Correspond to Arduino	Function Pin				Correspond to Arduino	Function Pin	
NU1	NU1.1	NC	NC		NU5	NU5.1	UART_RX0	PG.1	NUCOM1_RX
	NU1.2	VDD	VDD	VDD		NU5.2	UART_TX0	PG.2	NUCOM1_TX
	NU1.3	MCU_RESET	MCU_RESET	MCU_RESET		NU5.3	PWM0	PF.9	
	NU1.4	3VCC	3VCC	3VCC		NU5.4	PWM1	PF.10	
	NU1.5	5VCC	5VCC	5VCC		NU5.5	PWM2	PC.10	
	NU1.6	VSS	VSS	VSS		NU5.6	PWM3	PC.11	
	NU1.7	VSS	VSS	VSS		NU5.7	PWM4	PA.12	
	NU1.8	VIN	VIN			NU5.8	PWM5	PA.11	BUTTON_0
NU2	NU2.1	ADC0	PE.1	CAN0_CON1	NU6	NU6.1	PWM6	PA.10	WAU8822_LINE_OUT
	NU2.2	ADC1	PE.2	CAN0_CON2		NU6.2	PWM7	PA.9	WAU8822_PLUG_IN
	NU2.3	ADC2	PE.3	LCM_DC		NU6.3	PWM8	PA.8	BUTTON_1
	NU2.4	ADC3	PE.4			NU6.4	PWM9	PA.7	BUTTON_2
	NU2.5	ADC4	PE.5			NU6.5	PWM10	PA.13	BUTTON_3
	NU2.6	ADC5	PE.6			NU6.6	PWM11	PA.14	BUTTON_4
	NU2.7	ADC6	PE.8	LCM_RESET		NU6.7	VSS	VSS	
	NU2.8	ADC7	PE.9	LCM_LED		NU6.8	VREF	VREF	
NU3	NU3.1	ADC8	PE.10	SD_PWR	NU7	NU6.9	I2C1_DAT	PD.12	
	NU3.2	ADC9	PE.11	SD_CD		NU6.10	I2C1_SCL	PD.10	
	NU3.3	ADC10	PE.12			NU7.1	SPI0_MISO	PD.15	LCM_SPI_MISO
	NU3.4	ADC11	PE.13			NU7.3	SPI0_CLK	PD.14	LCM_SPI_CLK
	NU3.5		PG.8			NU7.5	MCU_RESET	MCU_RESET	
	NU3.6		PG.9			NU7.7	SPI0_SS	PD.13	LCM_SPI_SS
	NU3.7	CAN0_RX	PA.0	CAN0_RXD		NU7.2	VCC	VDD	VCC
	NU3.8	CAN0_TX	PA.1	CAN0_TXD		NU7.4	SPI0_MOSI	PF.0	LCM_SPI_MOSI
NU4	NU4.1	I2C0_SCL	PD.8	WAU8822		NU7.6	VSS	VSS	VSS
	NU4.2	I2C0_SDA	PD.9	WAU8822		NU7.8	GPIO	PF.15	
	NU4.3	UART_RX1	PF.14	RS485_RXD1					
	NU4.4	UART_TX1	PF.13	RS485_TXD1					
	NU4.5	UART_RX2	PD.4						
	NU4.6	UART_TX2	PD.5						
	NU4.7	UART_RX3	PH.0	SD_SPI_SS					
	NU4.8	UART_TX3	PH.1	WAU8822					

NuEdu-SDK-NUC472 User Manual



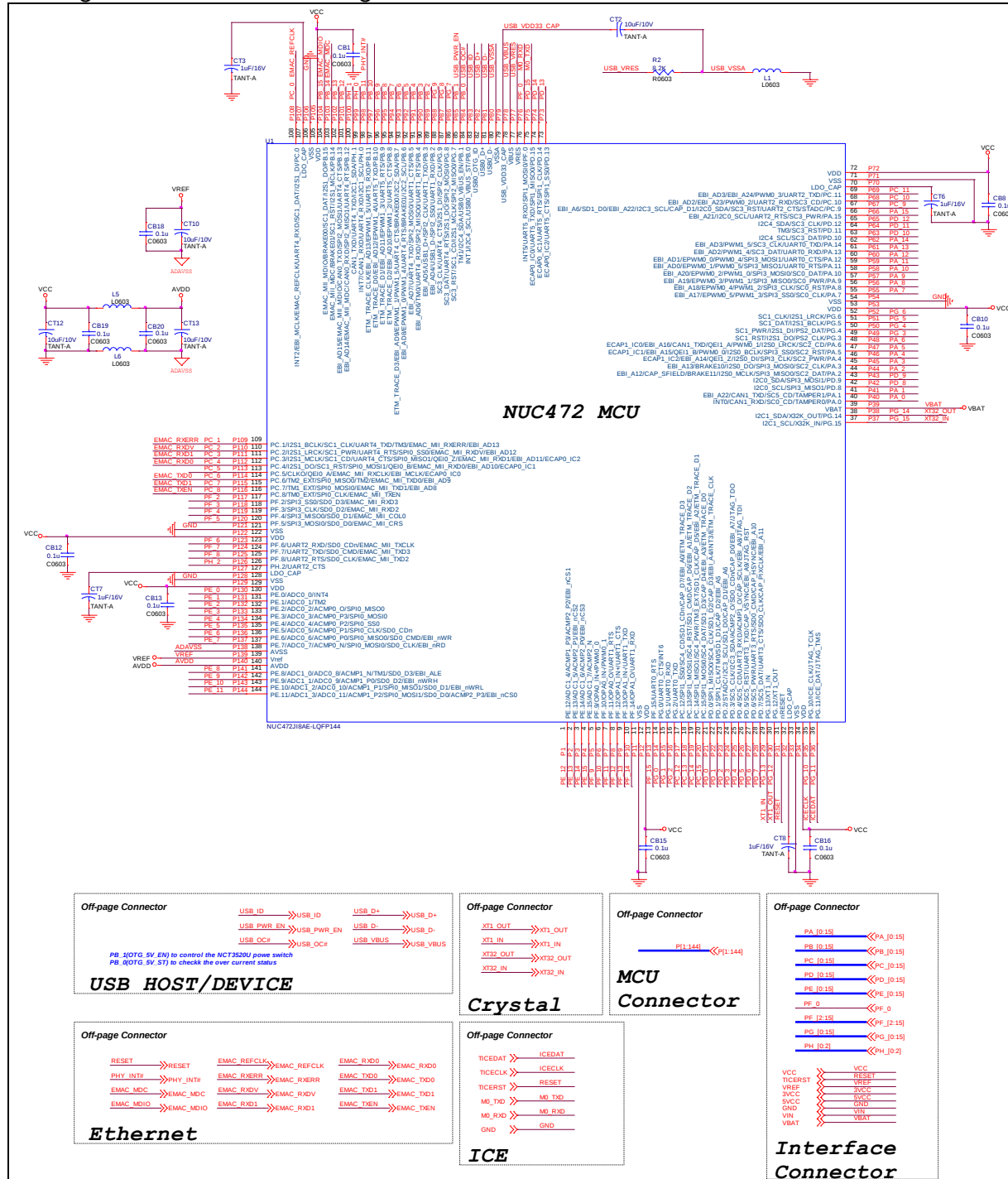
Header		NuEdu-EVB-NUC472		NuEdu-Advance02	Header		NuEdu-EVB-NUC472		NuEdu-Advance02
		Correspond to NuEdu	Function Pin				Correspond to NuEdu	Function Pin	
NU8	NU8.1	SDIO_D0	PF.5	SDIO_D0	NU8	NU8.2	CLKO	PC.5	
	NU8.3	SDIO_D1	PF.4	SDIO_D1		NU8.4	I2S_MCLK	PA.2	I2S_MCLK
	NU8.5	SDIO_D2	PF.3	SDIO_D2		NU8.6	I2S_LRCK	PA.6	I2S_LRCLK
	NU8.7	SDIO_D3	PF.2	SDIO_D3		NU8.8	I2S_BCLK	PA.5	I2S_BCLK
	NU8.9	SDIO_CMD	PF.7	SDIO_CMD		NU8.10	I2S_DI	PA.4	I2S_DI
	NU8.11	SDIO_CLK	PF.8	SDIO_CLK		NU8.12	I2S_DO	PA.3	I2S_DO
	NU8.13	SDIO_CDn	PF.6	SDIO_CDn		NU8.14	TM0_CAP	PC.14	
	NU8.15	SC0_PWR	PG.4			NU8.16	TM1_OUT	PD.11	
	NU8.17	SC0_RST	PG.3			NU8.18	ACMP_N	PE.15	
	NU8.19	SC0_CLK	PG.6			NU8.20	ACMP_P	PE.14	
	NU8.21	SC0_DAT	PG.5			NU8.22	ACMP_O	PD.3	
	NU8.23	SC0_CD	PG.7			NU8.24	SPI1_SS	PB.2	SPI_Flash_SS
	NU8.25	UART1_CTS	PF.12			NU8.26	SPI1_CLK	PB.3	SPI_Flash_CLK
	NU8.27	UART1_RTS	PF.11	RS485_nRTS1		NU8.28	SPI1_MISO0	PB.4	SPI_Flash_MISO00
	NU8.29		PB.8			NU8.30	SPI1_MOSI0	PB.5	SPI_Flash_MOSI00
	NU8.31		PB.9			NU8.32	GPIO	PB.12	SPI_Flash_MISO01
	NU8.33	INT0	PE.0			NU8.34	GPIO	PB.13	SPI_Flash_MOSI01
	NU8.35	INT1	PG.0			NU8.36	GPIO	PH.2	
NU9	NU9.1	3VCC	3VCC		NU9	NU9.2	3VCC	3VCC	
	NU9.3	CAP_HSYNC	PD.6			NU9.4	CAP_VSYNC	PD.5	
	NU9.5	I2C2_SDA	PB.7			NU9.6	I2C2_SCL	PB.6	
	NU9.7	CAP_D1	PD.2			NU9.8	CAP_D0	PD.3	
	NU9.9	CAP_D3	PD.0			NU9.10	CAP_D2	PD.1	
	NU9.11	CAP_D5	PC.14			NU9.12	CAP_D4	PC.15	
	NU9.13	CAP_D7	PC.12			NU9.14	CAP_D6	PC.13	
	NU9.15	CAP_PD	PA.15			NU9.16	CAP_RST	PE.7	
	NU9.17	VSS	VSS			NU9.18	VSS	VSS	
	NU9.19	CAP_SCLK	PD.4			NU9.20	CAP_PCLK	PD.7	

UART_RX2 and CAP_SCLK use the same pin (PD.4).
 UART_TX2 and CAP_VSYNC use the same pin (PD.5).
 ACMP_O and CAP_D0 use the same pin (PD.3).
 TM0_EXT and CAP_D5 use the same pin (PC.14).

5 NuEdu-EVB-NUC472 Schematics

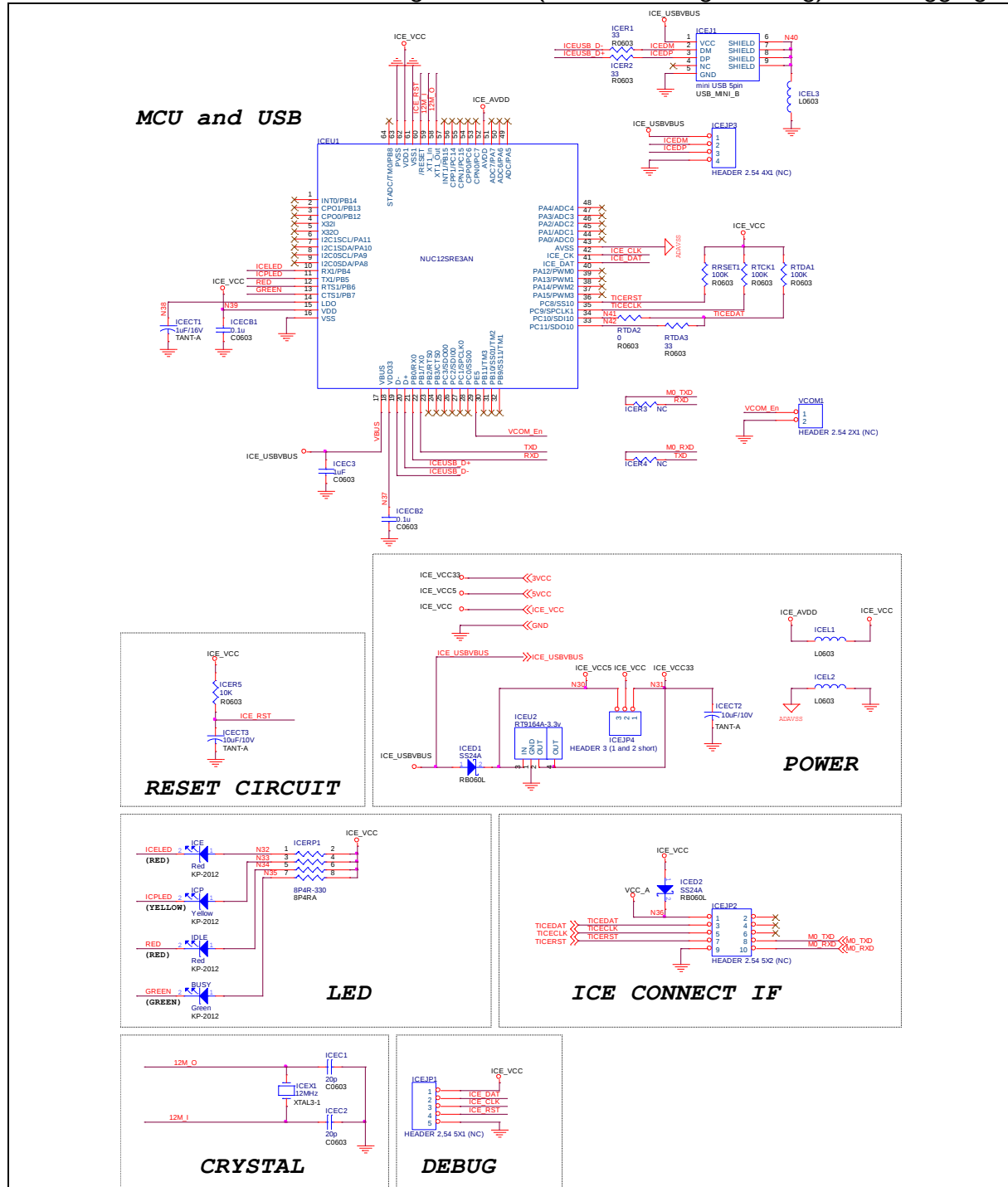
5.1 NUC472 MCU

This figure shows the Pin assignment of NUC472.



5.2 Nu-Link-Me

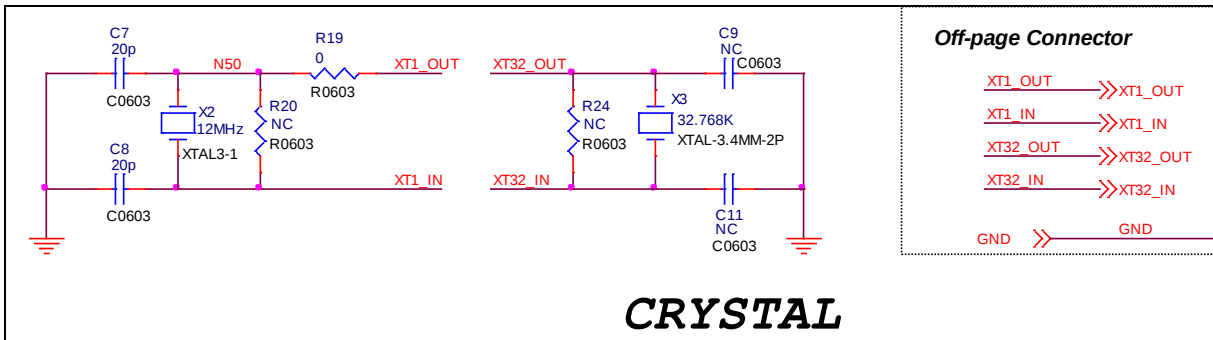
Nu-Link-Me is a USB-to-SWD bridge for ICP (In Circuit Programming) or debugging.



This figure shows the I/O port and function of NU1~8 connector.

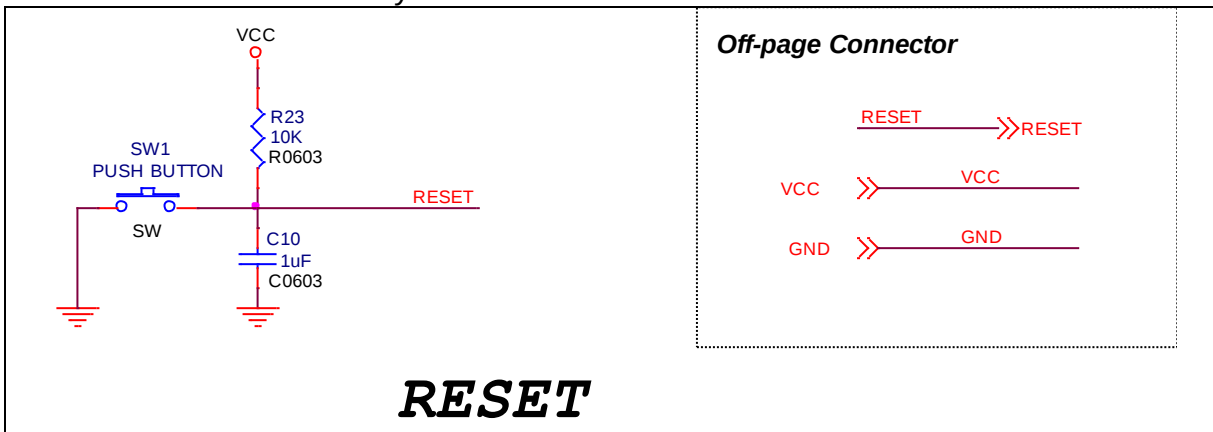


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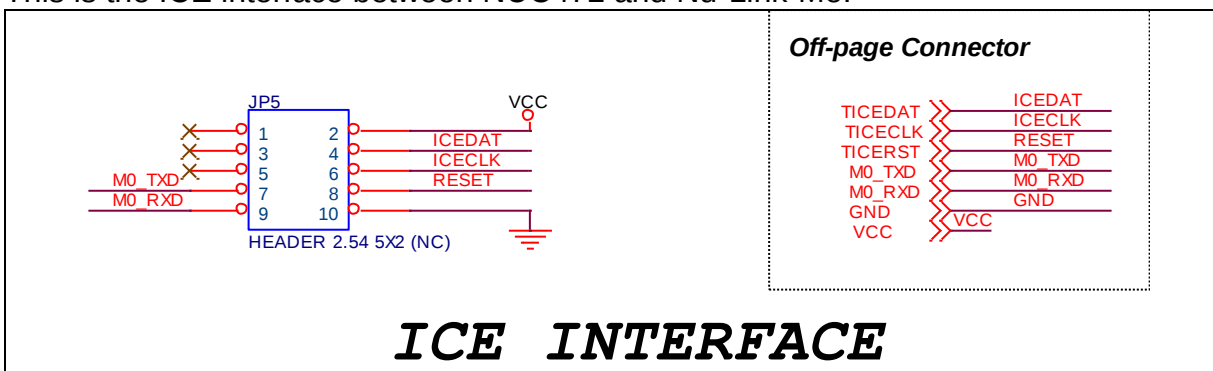
5.5 Reset

Push SW1 button to reset system.



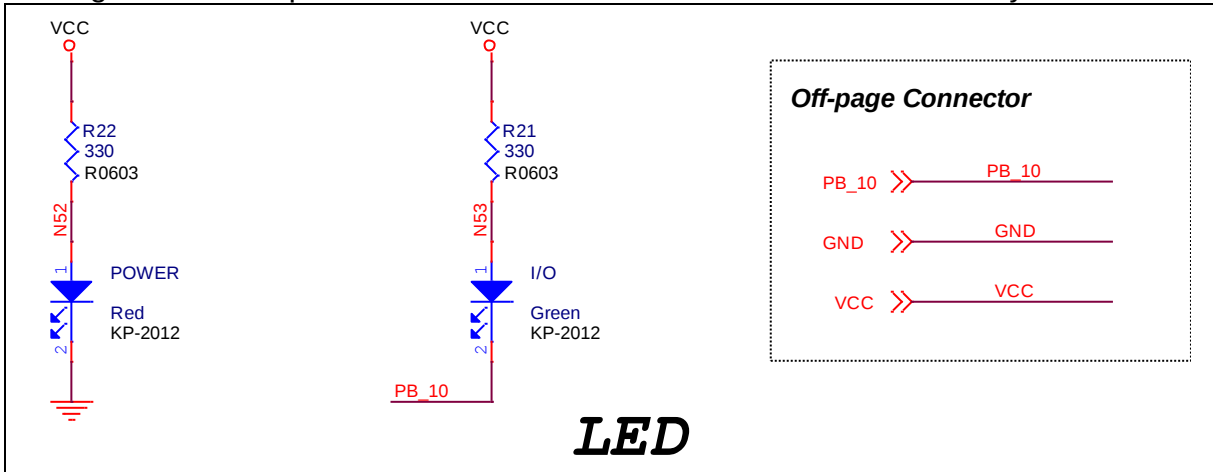
5.6 ICE Interface

This is the ICE interface between NUC472 and Nu-Link-Me.



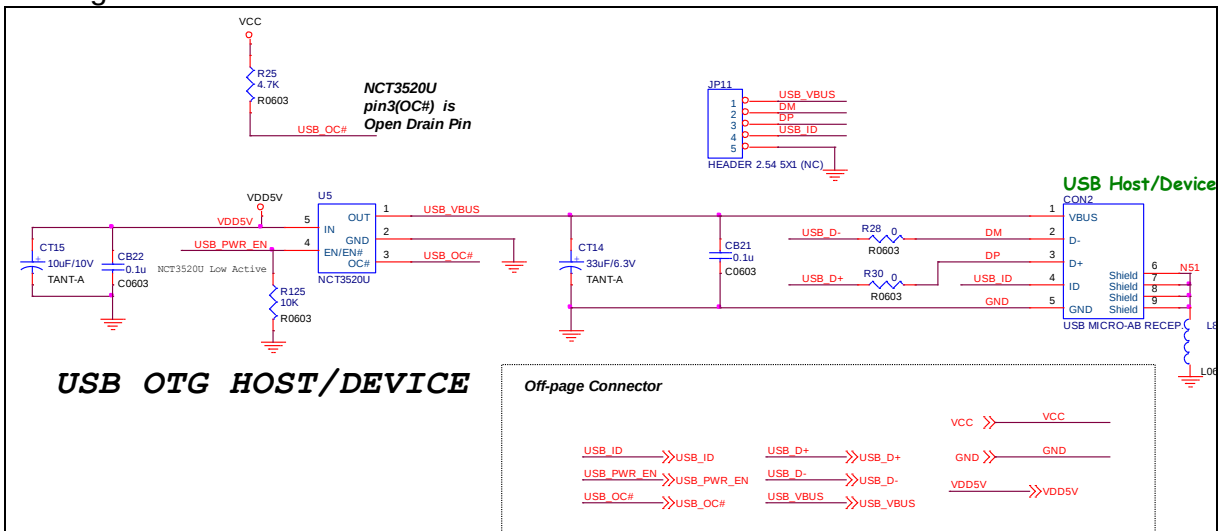
5.7 LED

This figure shows a power LED and an IO LED that can be controlled by PB.10.



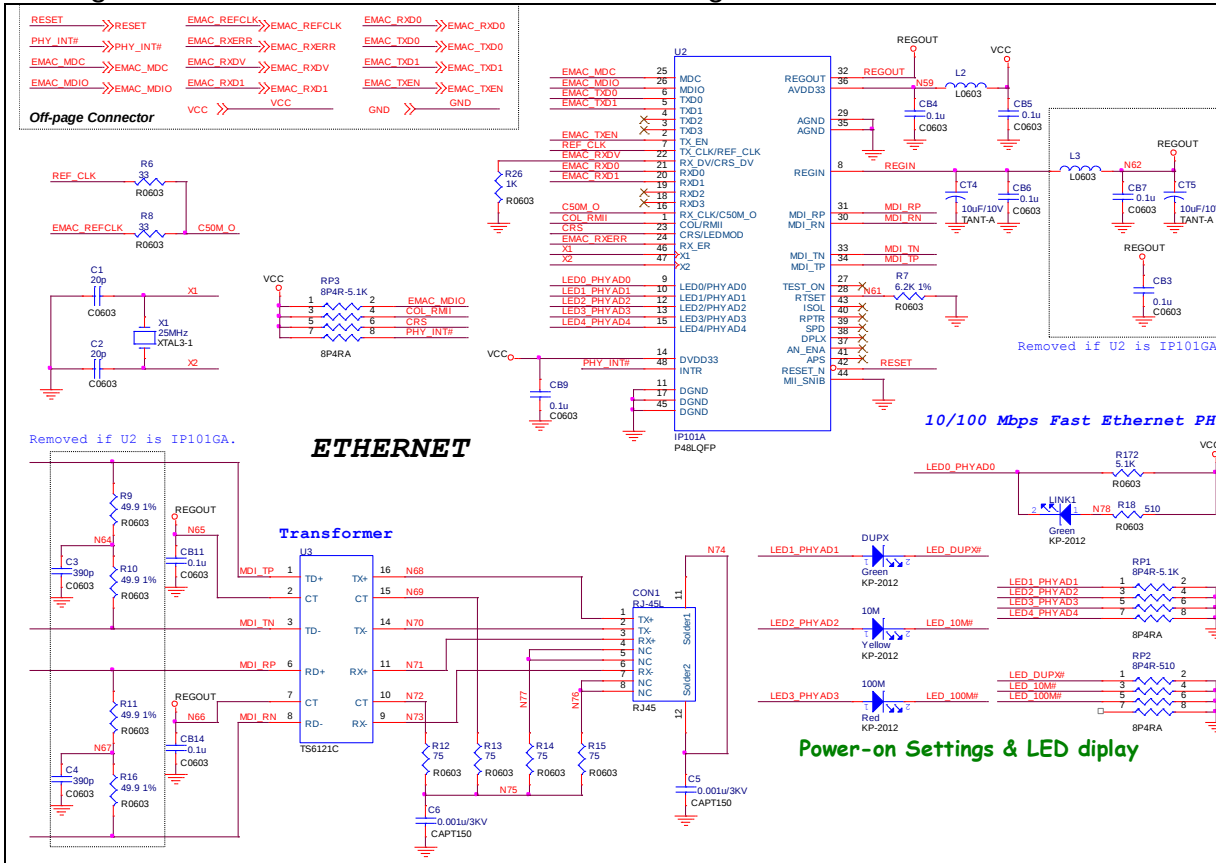
5.8 USB OTG Host/Device

This figure shows USB OTG interface.



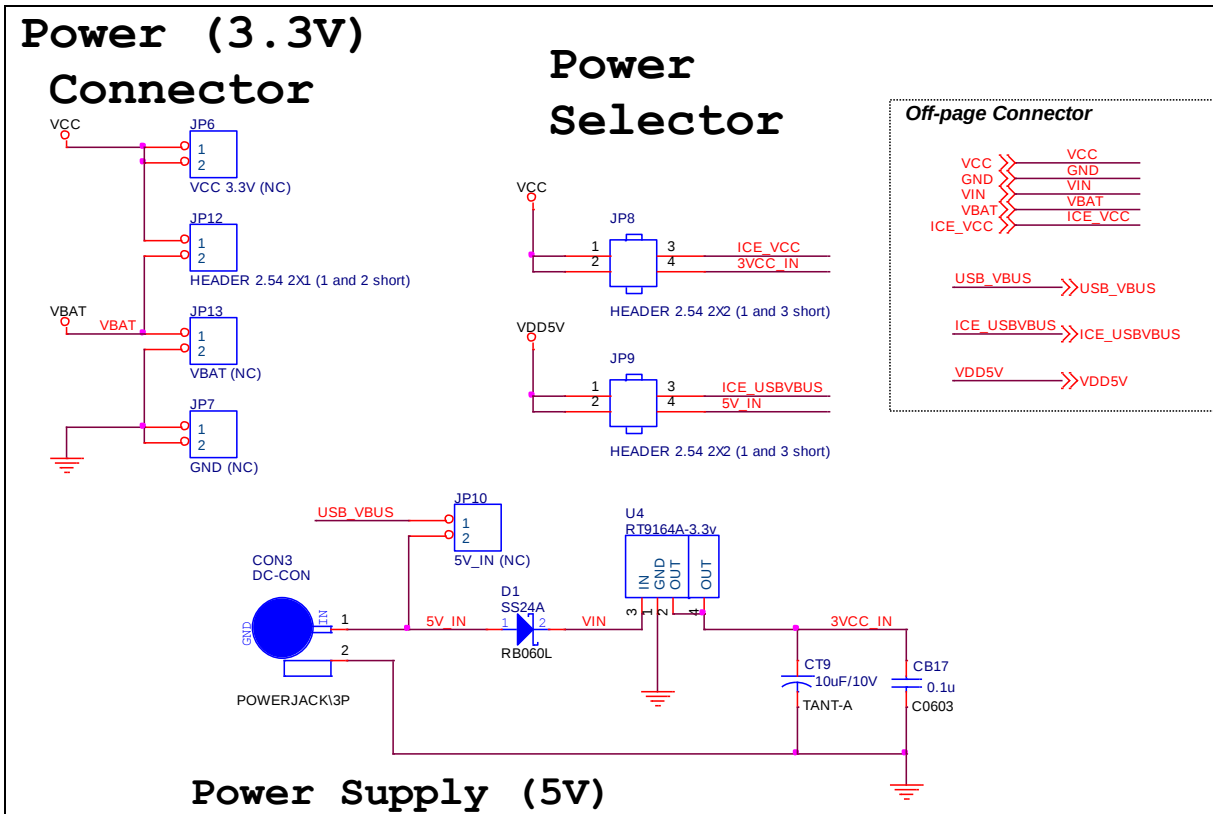
5.9 Ethernet

This figure shows Ethernet interface for networking.



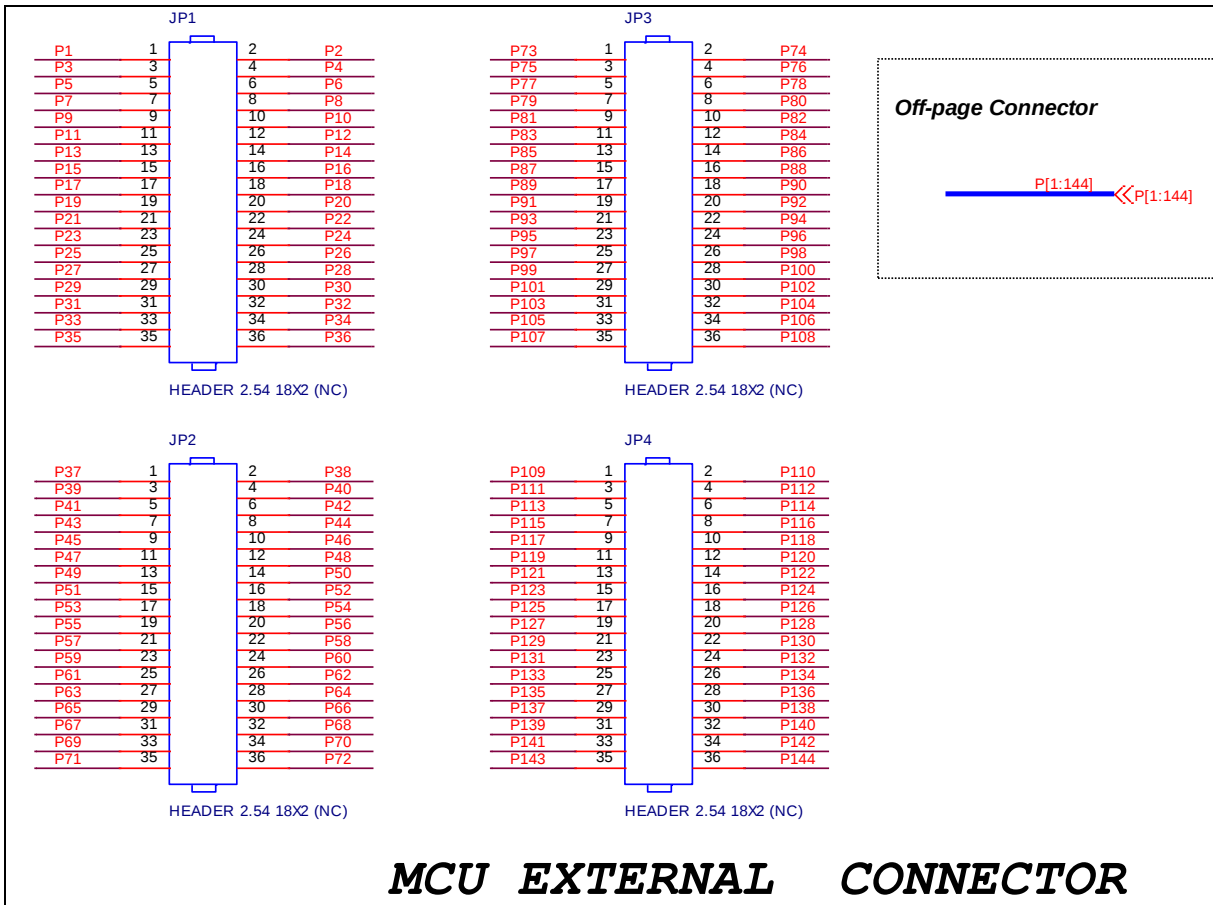
5.10 Power Supply

This figure shows power configuration of NuEdu-SDK-NUC472.



5.11 MCU External Connector

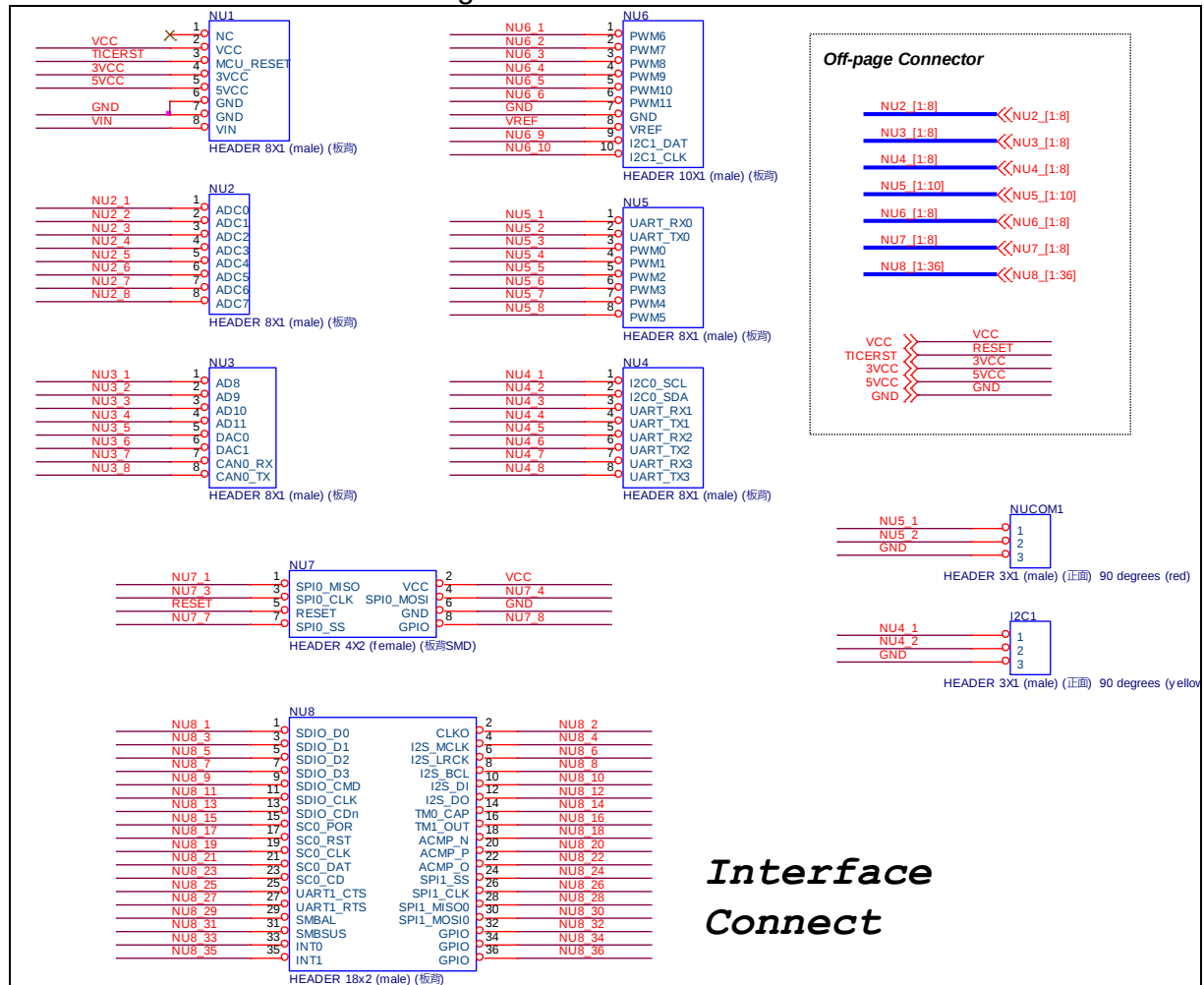
This figure shows external connector of NuEdu-SDK-NUC472.



6 NuEdu-Advance02 Schematics

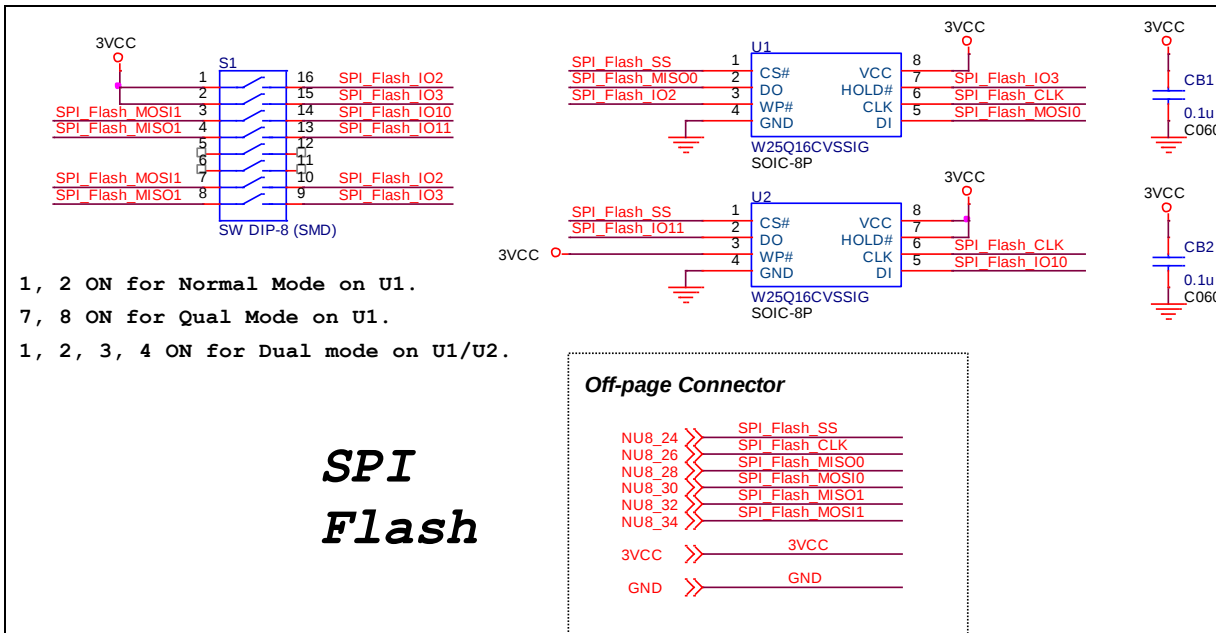
6.1 Interface Connection

This figure shows the function block of NU1~8 Connector. NUCOM1 and I2C1 are the connection interfaces of Nu-Bridge.



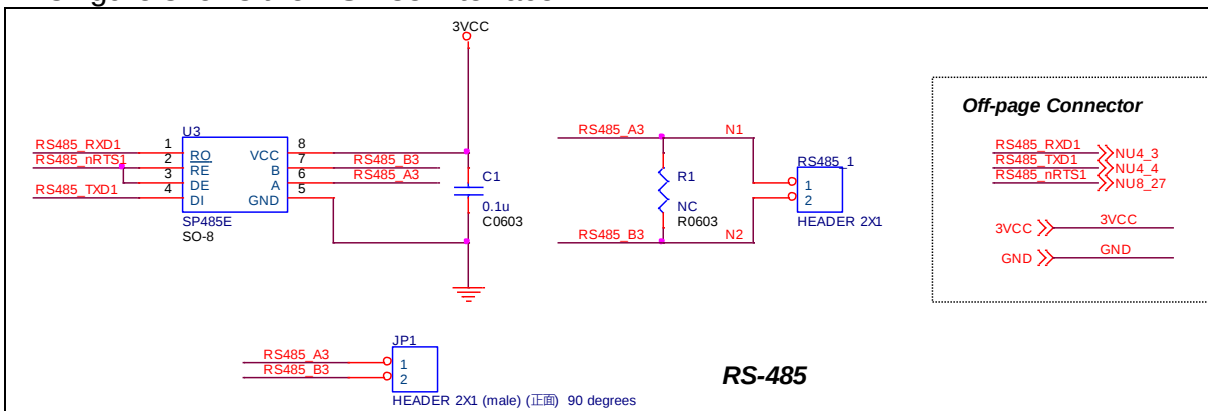
6.2 SPI Flash

User can read or write flash memory by SPI function.



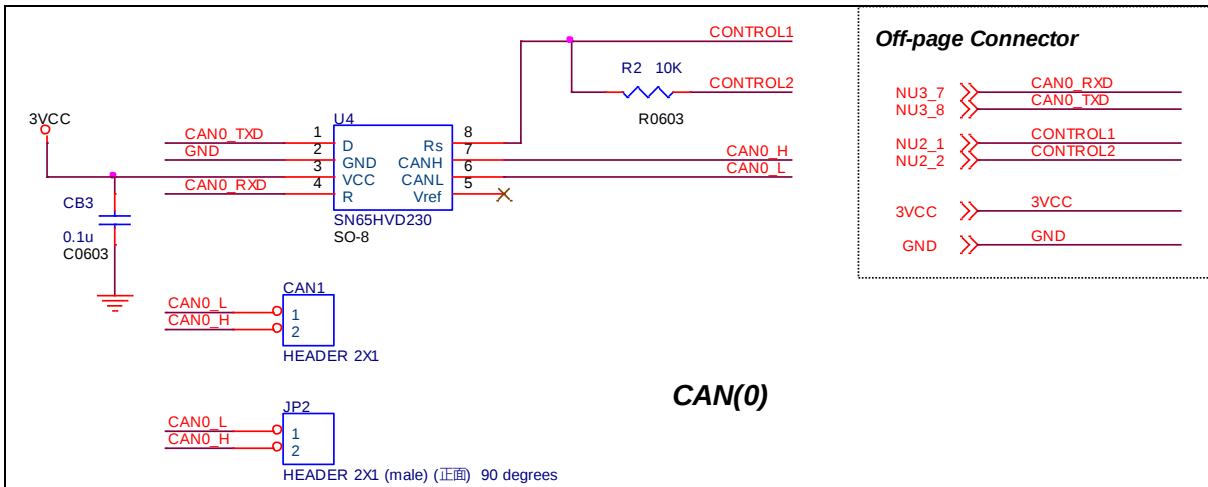
6.3 RS-485

This figure shows the RS-485 interface.



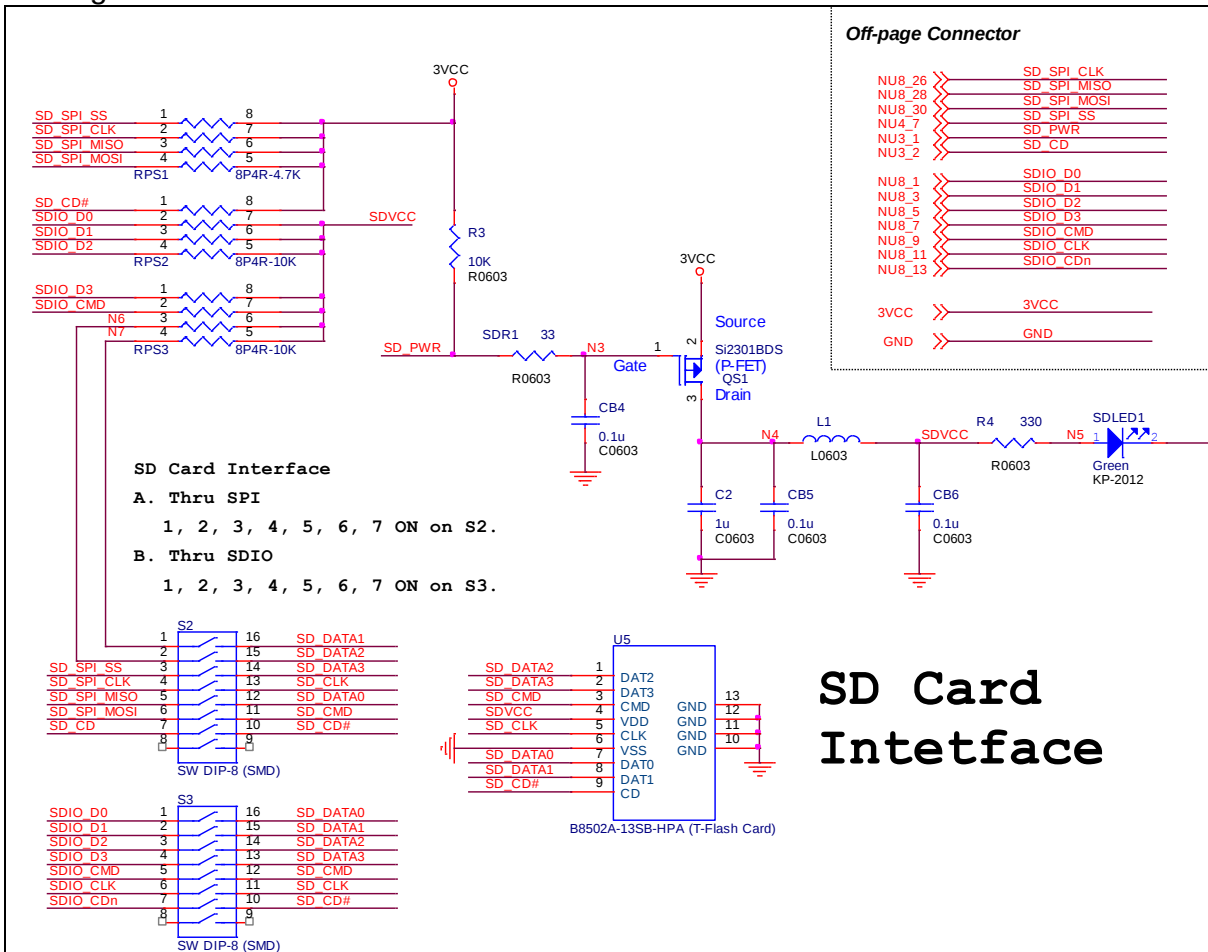
6.4 CAN

This figure shows the CAN interface.



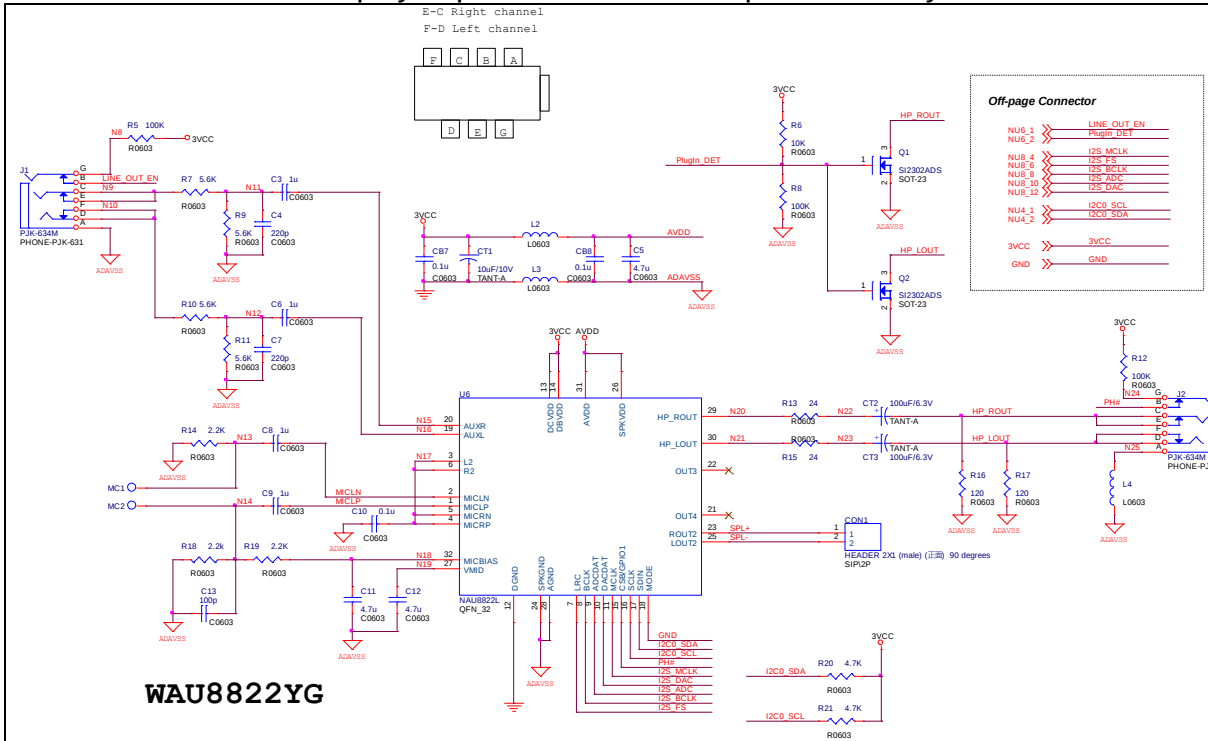
6.5 SD Card Interface

This figure shows the SD Card interface.



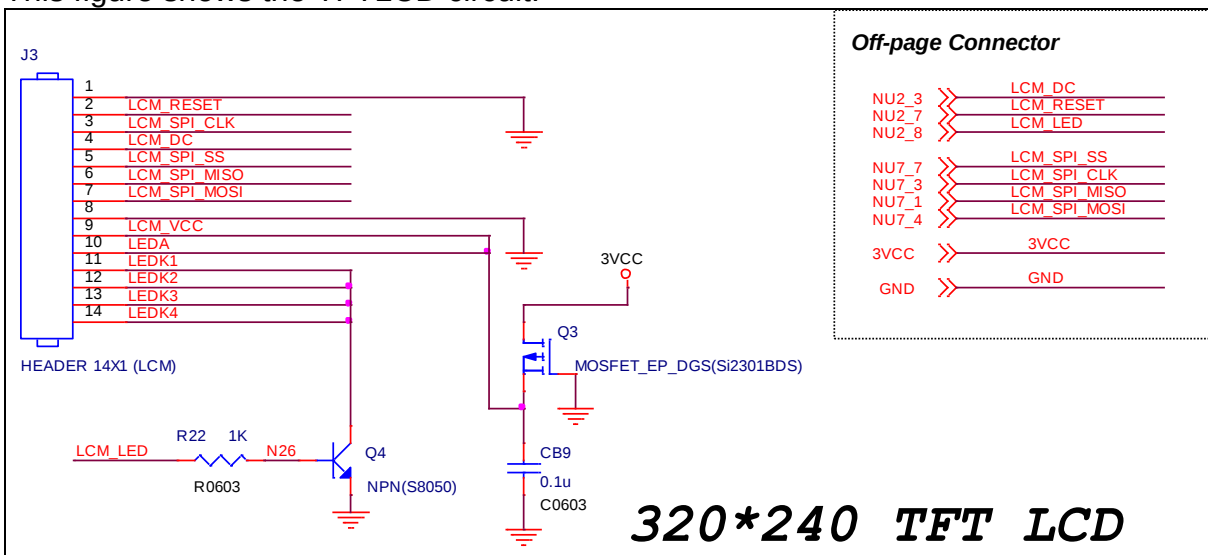
6.6 24-bit Stereo Audio Codec

Use WAU8822YG to simplify implementation of complete audio system solutions.



6.7 TFT LCD

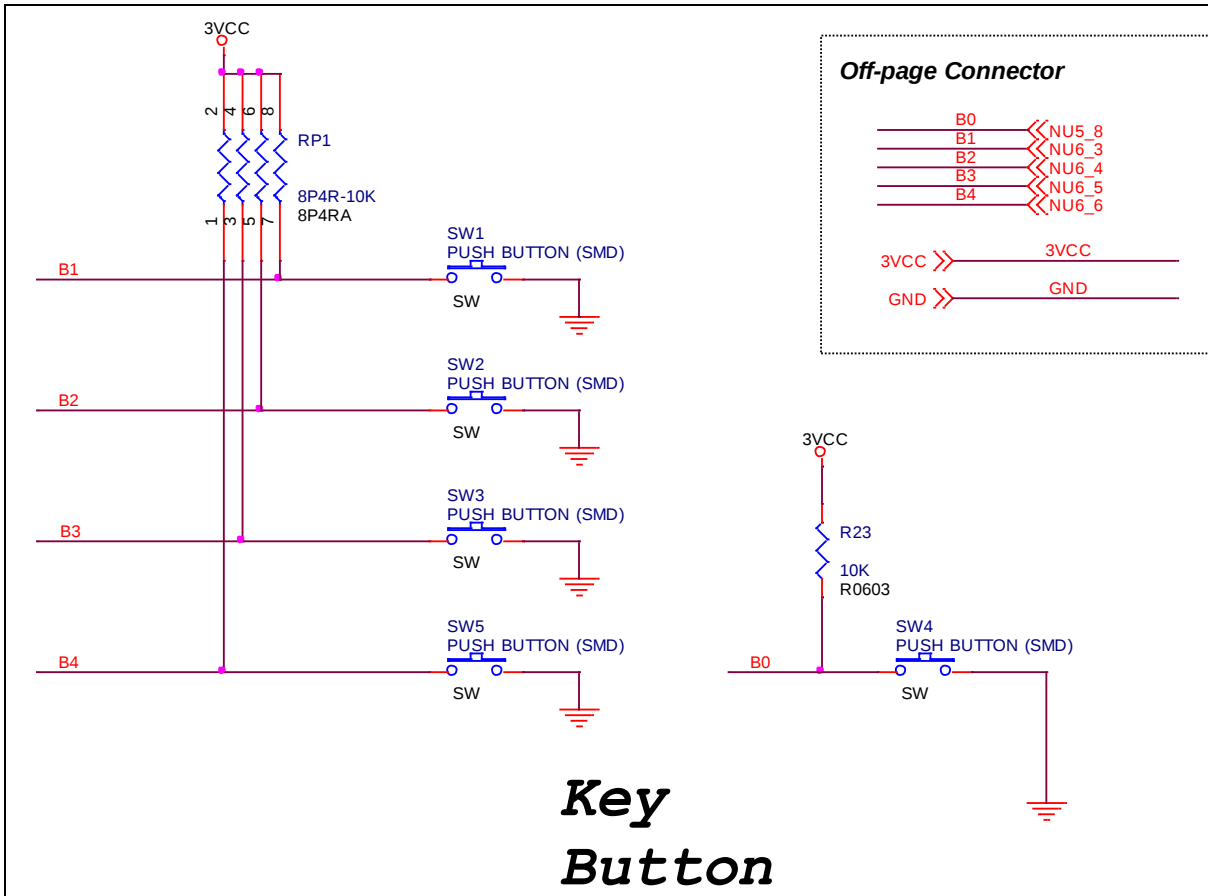
This figure shows the TFTLCD circuit.



6.8 Button

This figure shows five buttons that can be used for I/O input.

	SW1	SW2	SW3	SW4	SW5
NuEdu- Advance02	NU6_3	NU6_4	NU6_5	NU5_8	NU6_6
NUC472 GPIO	PA.8	PA.7	PA.13	PA.11	PA.14



7 Revision History

Revision	Date	Description
1.00	May. 28, 2014	Initially issued.

Important Notice

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Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

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