



**ARM Cortex[®]-M0
32-bit Microcontroller**

**NuEdu-SDK-NUC240 User Manual
for NuMicro[®] NUC230/240 Series**

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1 Overview

The NuEdu-SDK-NUC240, which consists of NuEdu-EVB-NUC240 and NuEdu-Basic01, is a development tool for Cortex[®]-M0 based on Nuvoton NUC240 series micro controller. The NuEdu-SDK-NUC240 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. Figure 1-1 shows the NuEdu-SDK-NUC240.

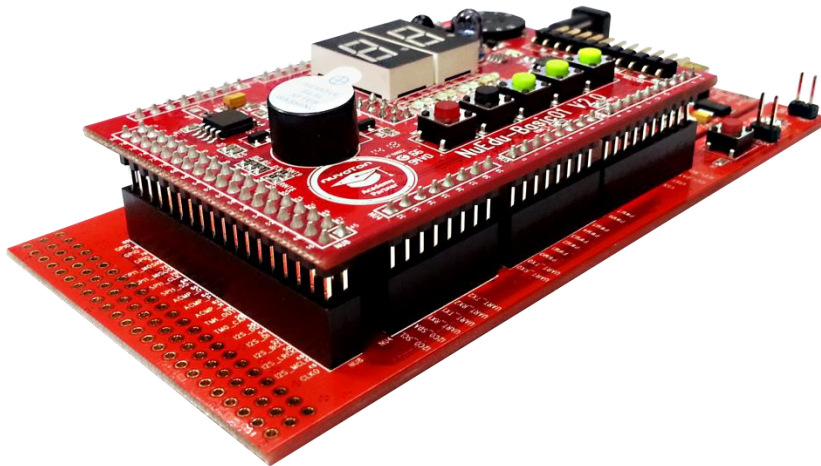


Figure 1-1 NuEdu-SDK-NUC240

The NuEdu-EVB-NUC240 includes two parts, the left portion NuEdu-EVB-NUC240 and the right portion Nu-Link-Me.

The NuEdu-EVB-NUC240 uses the NUC240VE3AE as the target microcontroller with embedded Cortex[®]-M0 core runs up to 72 MHz with 128 Kbytes embedded flash memories and 16 Kbytes embedded SRAM. It is also equipped with plenty of peripheral devices, such as Timers, Watchdog Timers, RTC, PDMA, UART, SPI, I2C, I2S, PWM Timer, GPIO, LIN, CAN, PS/2, 12-bit ADC, analog comparator, Low Voltage Reset Controller and Brown-out Detector.

The NuEdu-EVB-NUC240 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-NUC240 also support user to use Arduino Kit for expansion. Figure 1-2 shows the NuEdu-SDK-NUC240.

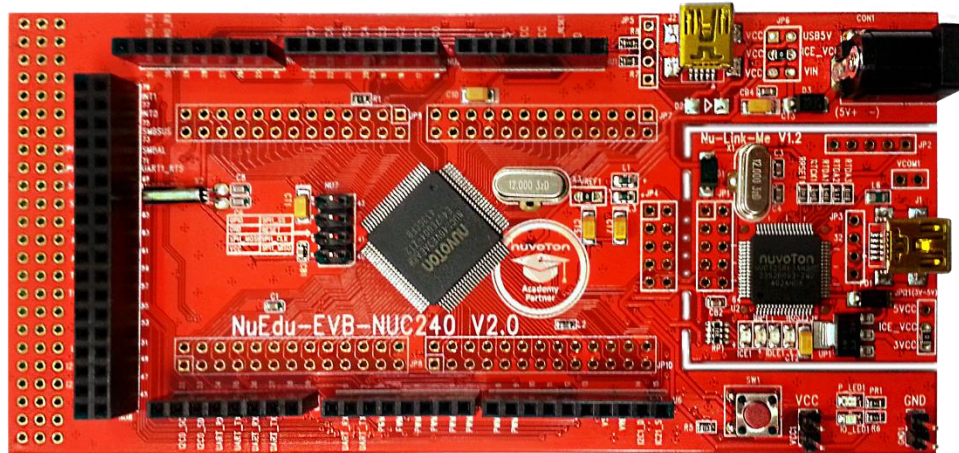


Figure 1-2 NuEdu-EVB-NUC240

NuEdu-Basic01 is included with many components like 7-segment display, buttons, LEDs...etc. Figure 1-3 shows the NuEdu-Basic01.

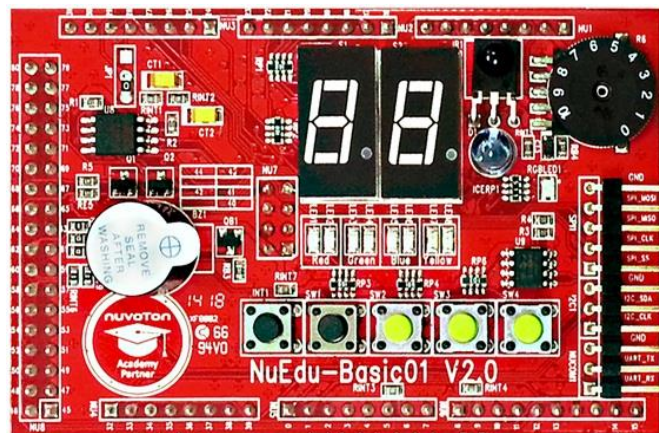


圖 1-3 NuEdu-Basic01

We also provide Nu-Bridge tool for user to connect serial communication interfaces from NuEdu-Basic01 to PC. Figure 1-5 shows the Nu-Bridge.



Figure 1-4 Nu-Bridge

This user manual provides information about hardware features of NuEdu-SDK-NUC240 and users how to start using NuEdu-SDK-NUC240.

2 NuEdu SDK Board Introduction

Figure 2-1 introduces the NuEdu-EVB-NUC240 main components.

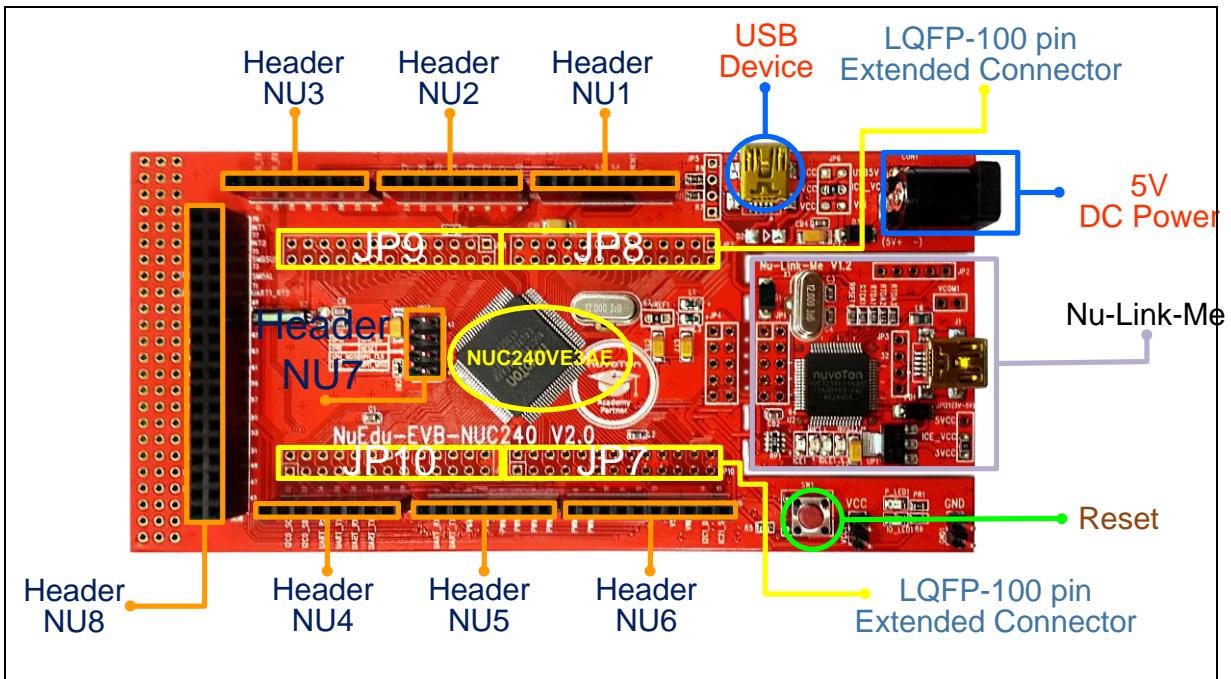


Figure 2-1 NuEdu-EVB-NUC240 Introduction

Figure 2-2 NuEdu-Basic01 Introduction

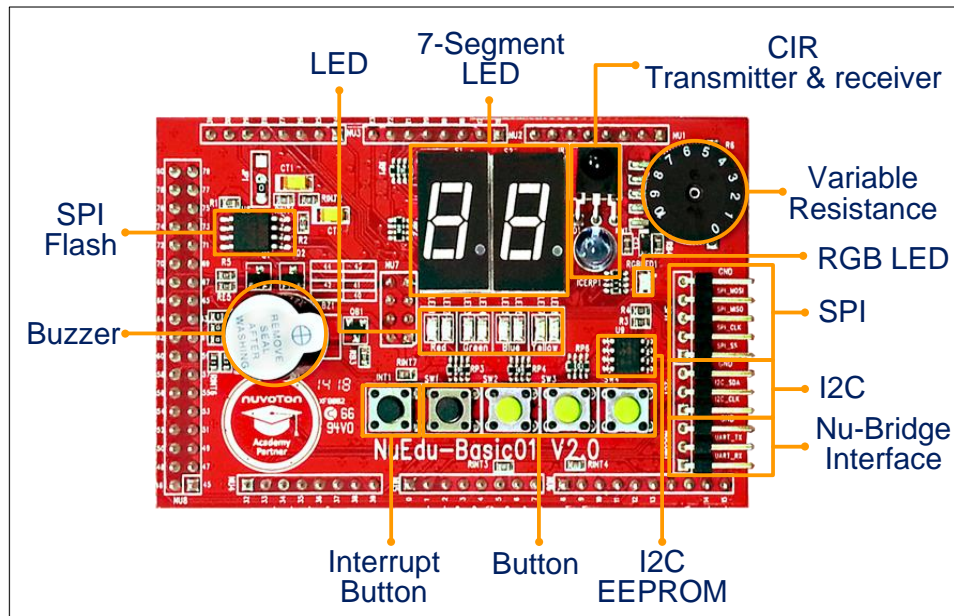


Figure 2-2 NuEdu-Basic01 Introduction

2.1 Block Diagram

Figure 2-3 shows specific function pins of the NuEdu-EVB- NUC240. First pin of each header is marked red rectangle.

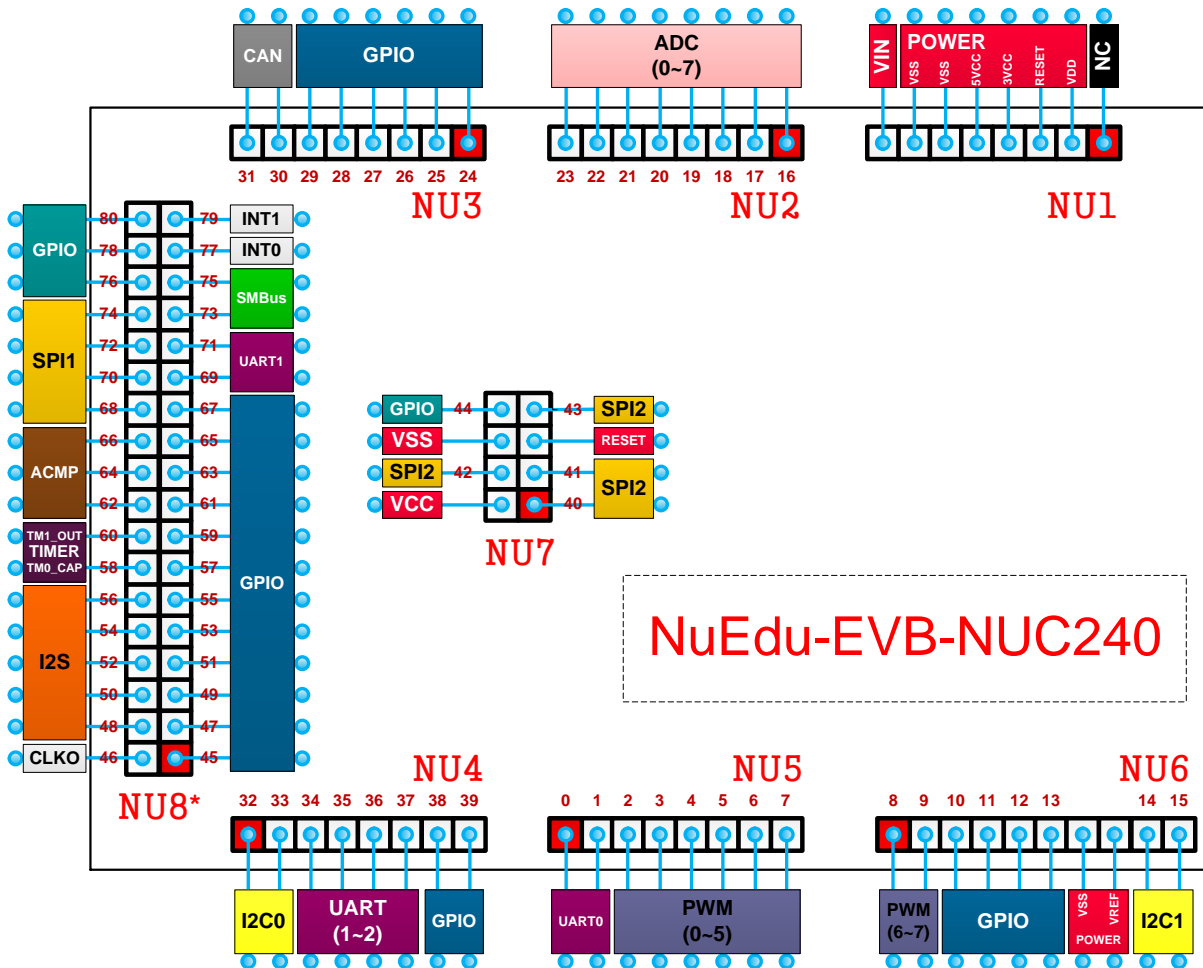


Figure 2-3 Specific function pins of the NuEdu-EVB-NUC240

Figure 2-4 shows specific function pins of the NuEdu-Basic01. First pin of each header is marked red rectangle.

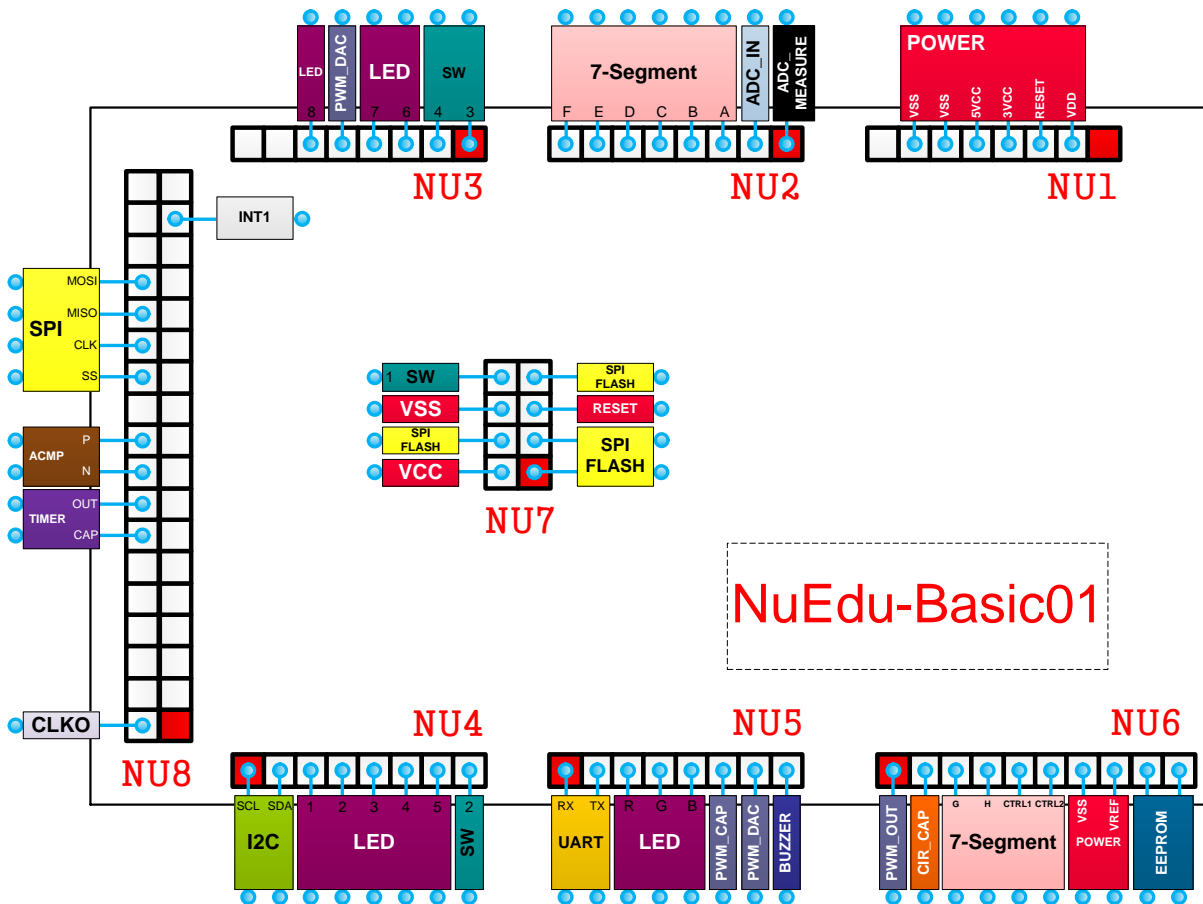


Figure 2-4 Specific function pins of the NuEdu-Basic01

2.2 Board Interpretation

The NuEdu-EVB-NUC240 also supports Arduino development kits. User can replace NuEdu development kits (EX: NuEdu-Basic01) to Arduino development kits. It marks the function of every pin on the NuEdu-EVB-NUC240 front side, shown as Figure 2-5 yellow frame. It also marks the pin numbers which correspond to Arduino software, shown as Figure 2-5 blue frame. User can choose suitable development kits according to this information.

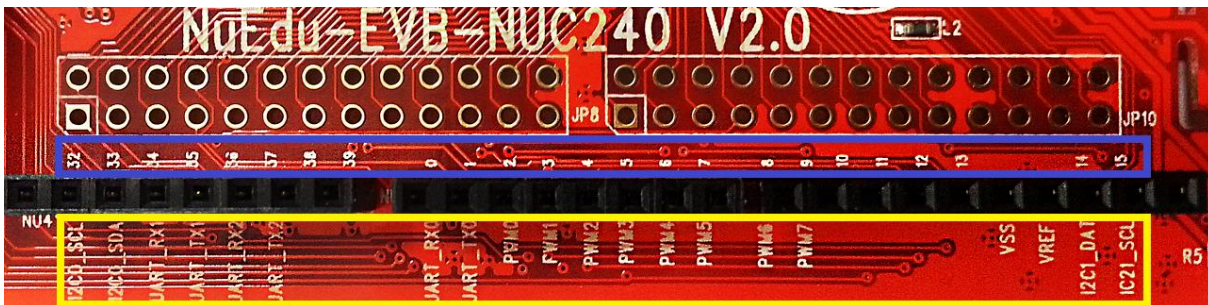


Figure 2-5 Marks on the NuEdu-EVB-NUC240 front side

2.3 System Configuration

2.3.1 Power Settings

- **J2:** NuEdu-EVB-NUC240 USB port
- **CON1:** NuEdu-EVB-NUC240 VIN power input
- **J1:** Nu-Link-Me USB port

Model	J1 USB Port	J2 USB Port	CON1 VIN	MCU Voltage
Model 1	Connect to PC	X	X	DC 3.3V
Model 2	X	Connect to PC	X	DC 5V
Model 3	X	X	DC 5V Input	DC 5V

X: Unused.

2.3.2 Debug Connectors

- **JP4:** Connector in target board (NuEdu-EVB-NUC240) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- **ICEJP8:** Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (e.g. NuEdu-EVB-NUC240)

2.3.3 USB Connectors

- **J2:** Mini USB Connector in NuEdu-EVB-NUC472 for application use.

- **J1**: Mini USB Connector in Nu-Link-Me connected to a PC USB port.

2.3.4 Extended Connectors

- **JP7, JP8, JP9,JP10**: Show all chip pins in NuEdu-EVB-NUC240.

2.3.5 Button

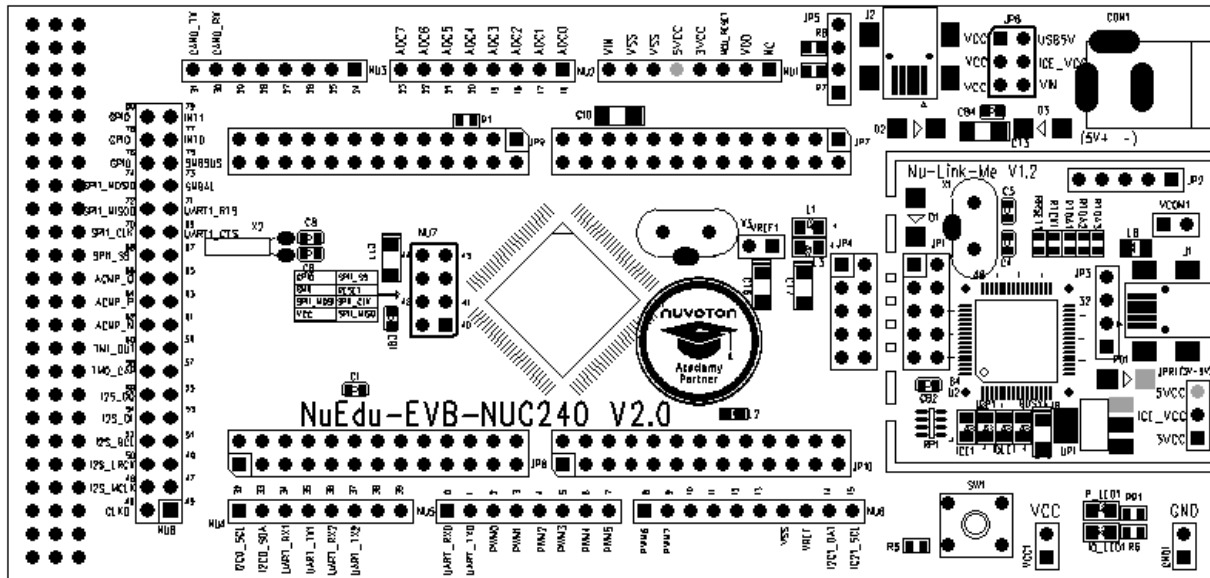
- **SW1**: Reset button in NuEdu-EVB-NUC240

2.3.6 Power Connectors

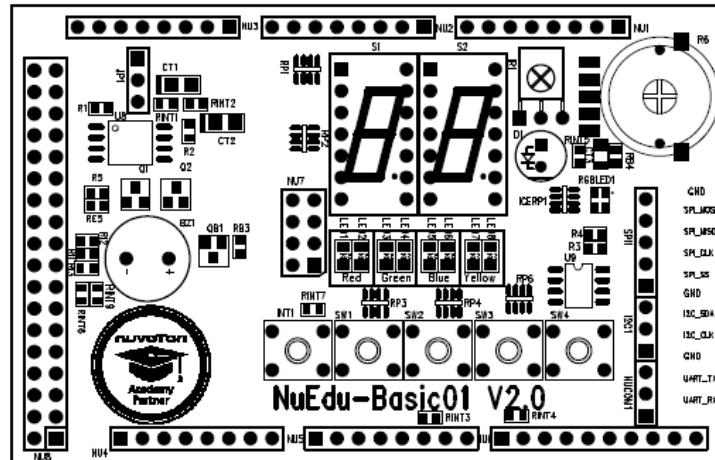
- **VCC1**: VCC connector in NuEdu-EVB-NUC240
- **GND1**: GND connector in NuEdu-EVB-NUC240

2.4 PCB Placement

NuEdu-EVB-NUC240 :



NuEdu-Basic01 :



3 Starting to Use NuEdu-SDK-NUC240

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. UseNuEdu-Basic01

Plug NuEdu-Basic01 into NuEdu-EVB-NUC240, and connect from the right side USB port to your PC, shown as Figure 3-1.

2. NuEdu-EVB-NUC240

Connect NuEdu-EVB-NUC240 , from the right side USB port to your PC, shown as Figure 3-2.

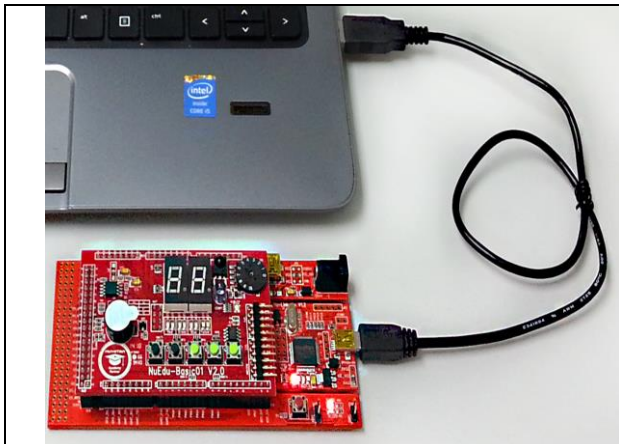


Figure 3-1 Use NuEdu-Basic01

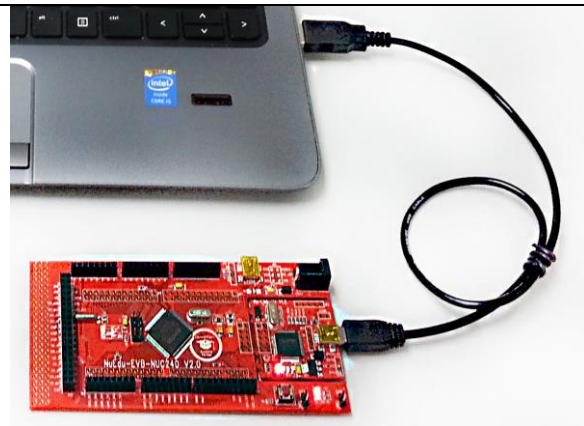


Figure 3-2 NuEdu-EVB-NUC240

3.3 Starting to Use NuEdu-SDK-NUC240 on the Keil μ Vision® IDE

- Install Keil μ Vision® IDE Software
Please connect to the Keil company website 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-NUC240 on the IAR Embedded Workbench

- Install IAR Embedded Workbench Software
Please connect to the IAR company website 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-NUC240 BSP

Please connect to Nuvoton NuMicro® website (<http://www.nuvoton.com/NuMicro>) to download the “NUC230_240Series CMSIS BSP_EN_V3.00.001” file from “Device Driver and Software Library”.

4 Pin Description

Header		NuEdu-EVB-NUC240		NuEdu-Basic01	Header		NuEdu-EVB-NUC240		NuEdu-Basic01
		Correspond to Arduino	Function Pin				Correspond to Arduino	Function Pin	
NU1	NU1.1	NC	NC		NU5	NU5.1	UART_RX0	PB.0	NUCOM1_RX
	NU1.2	VDD	VDD	VDD		NU5.2	UART_TX0	PB.1	NUCOM1_TX
	NU1.3	MCU_RESET	MCU_RESET	MCU_RESET		NU5.3	PWM0	PA.12	LED_R
	NU1.4	3VCC	3VCC	3VCC		NU5.4	PWM1	PA.13	LED_G
	NU1.5	5VCC	5VCC	5VCC		NU5.5	PWM2	PA.14	LED_B
	NU1.6	VSS	VSS	VSS		NU5.6	PWM3	PA.15	PWM Cap
	NU1.7	VSS	VSS	VSS		NU5.7	PWM4	PB.11	PWM_DAC
	NU1.8	VIN	VIN			NU5.8	PWM5	PE.5	BUZZER
NU2	NU2.1	ADC0	PA.0	ADC_MEASURE	NU6	NU6.1	PWM6	PE.0	PWM_OUT
	NU2.2	ADC1	PA.1	ADC_IN		NU6.2	PWM7	PE.1	CIR_Cap
	NU2.3	ADC2	PA.2	7-Segment_A		NU6.3		PC.4	7-Segment_G
	NU2.4	ADC3	PA.3	7-Segment_B		NU6.4		PB.9	7-Segment_H
	NU2.5	ADC4	PA.4	7-Segment_C		NU6.5		PC.5	7-Segment_CTRL1
	NU2.6	ADC5	PA.5	7-Segment_D		NU6.6		PE.6	7-Segment_CTRL2
	NU2.7	ADC6	PA.6	7-Segment_E		NU6.7	VSS	VSS	VSS
	NU2.8	ADC7	PA.7	7-Segment_F		NU6.8	VREF	VREF	VREF
NU3	NU3.1		PC.15	Button_3	NU7	NU6.9	I2C1_DAT	PA.10	EEPROM
	NU3.2		PC.14	Button_4		NU6.10	I2C1_SCL	PA.11	EEPROM
	NU3.3		PE.15	LED_6		NU7.1	SPI2_MISO	PD.2	SPI FLASH
	NU3.4		PE.14	LED_7		NU7.3	SPI2_CLK	PD.1	SPI FLASH
	NU3.5		PD.4	PWM_DAC		NU7.5	MCU_RESET	MCU_RESET	MCU_RESET
	NU3.6		PD.5	LED_8		NU7.7	SPI2_SS	PD.0	SPI FLASH
	NU3.7	CAN0_RX	PD.6			NU7.2	VCC	VDD	VCC
	NU3.8	CAN0_TX	PD.7			NU7.4	SPI2_MOSI	PD.3	SPI FLASH
NU4	NU4.1	I2C0_SCL	PA.9	I2C_SCL		NU7.6	VSS	VSS	VSS
	NU4.2	I2C0_SDA	PA.8	I2C_SDA		NU7.8	GPIO	PC.13	BUTTON_1
	NU4.3	UART_RX1	PB.4	LED_1					
	NU4.4	UART_TX1	PB.5	LED_2					
	NU4.5	UART_RX2	PD.14	LED_3					
	NU4.6	UART_TX2	PD.15	LED_4					
	NU4.7		PE.7	LED_5					
	NU4.8		PE.8	Button_2					

NuEdu-SDK-NUC240 User Manual

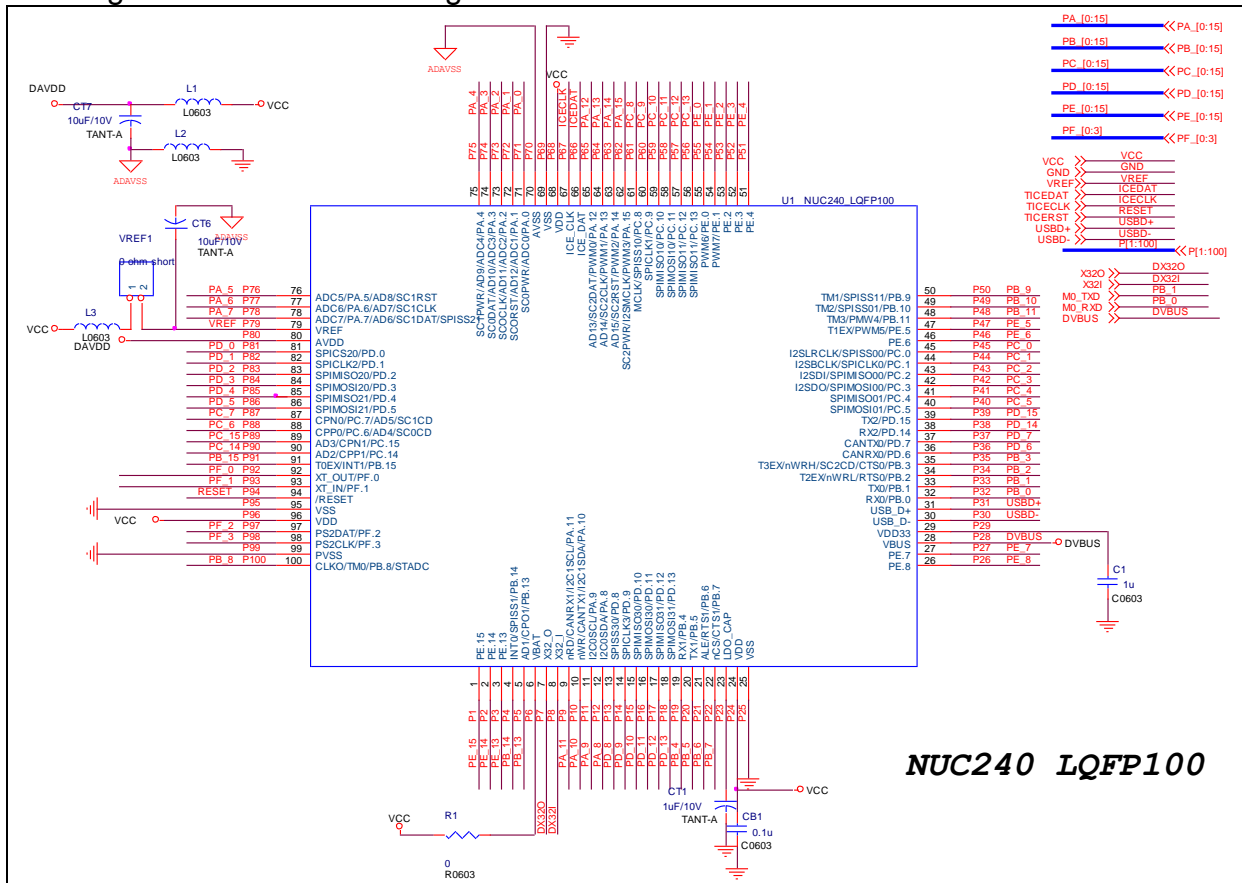


Header		NuEdu-EVB-NUC240		NuEdu-Basic01	Header		NuEdu-EVB-NUC240		NuEdu-Basic01
		Correspond to NuEdu	Function Pin				Correspond to NuEdu	Function Pin	
NU8	NU8.1		PD.8		NU8	NU8.2	CLKO	PB.8	CLKO
	NU8.3		PD.9			NU8.4	I2S_MCLK	PA.15	
	NU8.5		PD.10			NU8.6	I2S_LRCK	PC.0	
	NU8.7		PD.11			NU8.8	I2S_BCLK	PC.1	
	NU8.9		PD.12			NU8.10	I2S_DI	PC.2	
	NU8.11		PD.13			NU8.12	I2S_DO	PC.3	
	NU8.13		PC.12			NU8.14	TM0_CAP	PB.3	TM0_CAP
	NU8.15					NU8.16	TM1_OUT	PB.10	TM1_OUT
	NU8.17					NU8.18	ACMP_N	PC.7	ACMP_N
	NU8.19					NU8.20	ACMP_P	PC.6	ACMP_P
	NU8.21					NU8.22	ACMP_O	PB.2	ACMP_O
	NU8.23					NU8.24	SPI1_SS	PC.8	SPI_SS
	NU8.25	UART1_CTS	PB.7			NU8.26	SPI1_CLK	PC.9	SPI_CLK
	NU8.27	UART1_RTS	PB.6			NU8.28	SPI1_MISO0	PC.10	SPI_MISO0
	NU8.29	SMBAL	PF.2			NU8.30	SPI1_MOSI0	PC.11	SPI_MOSI0
	NU8.31	SMBSUS	PF.3			NU8.32	GPIO	PE.2	
	NU8.33	INT0	PB.14	Interrupt_Button		NU8.34	GPIO	PE.3	
	NU8.35	INT1	PB.15			NU8.36	GPIO	PE.4	

5 NuEdu-EVB-NUC240 Schematics

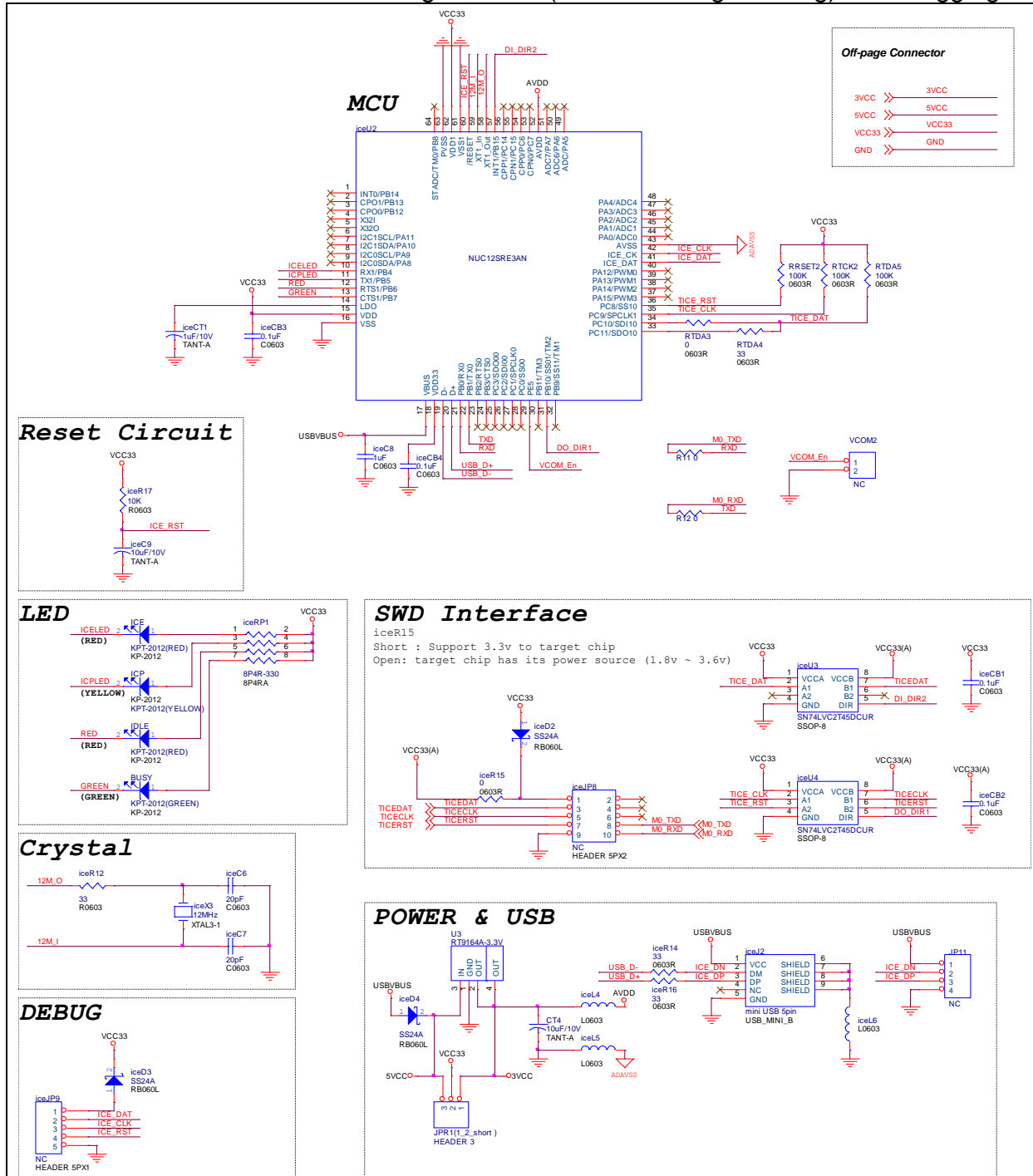
5.1 NUC240 MCU

This figure shows the Pin assignment of NUC240

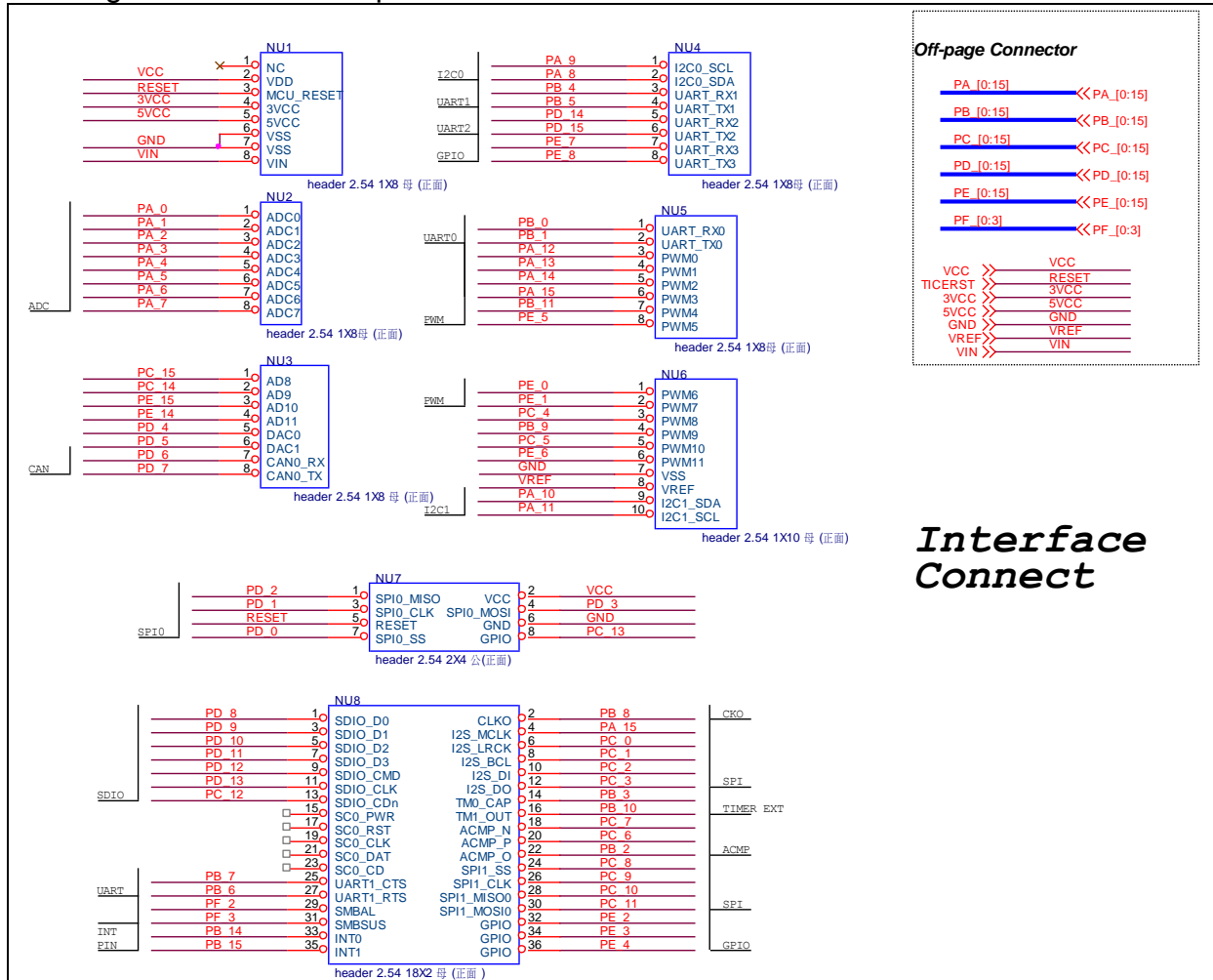


5.2 Nu-Link-Me

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

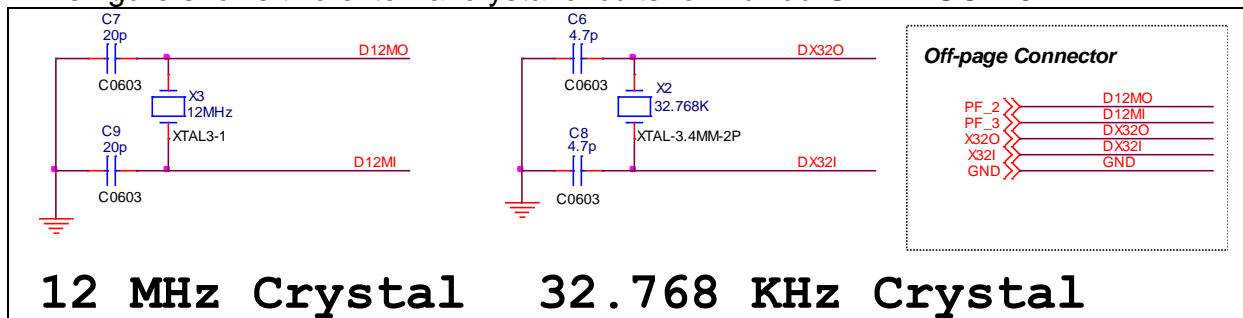


This figure shows the I/O port and function of NU1~8 connector.



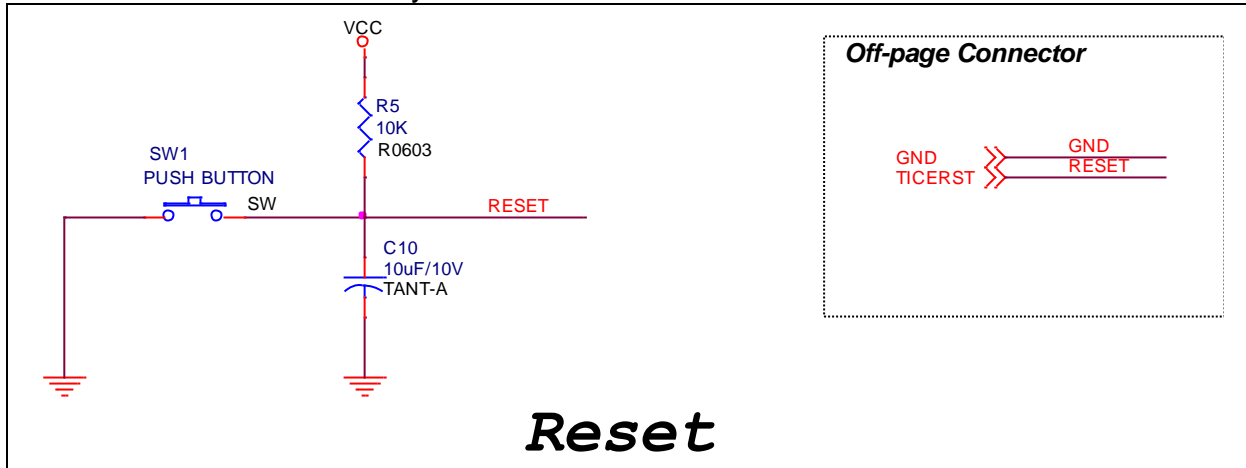
5.4 Crystal

This figure shows two external crystal circuits for NuEdu-SDK- NUC240.



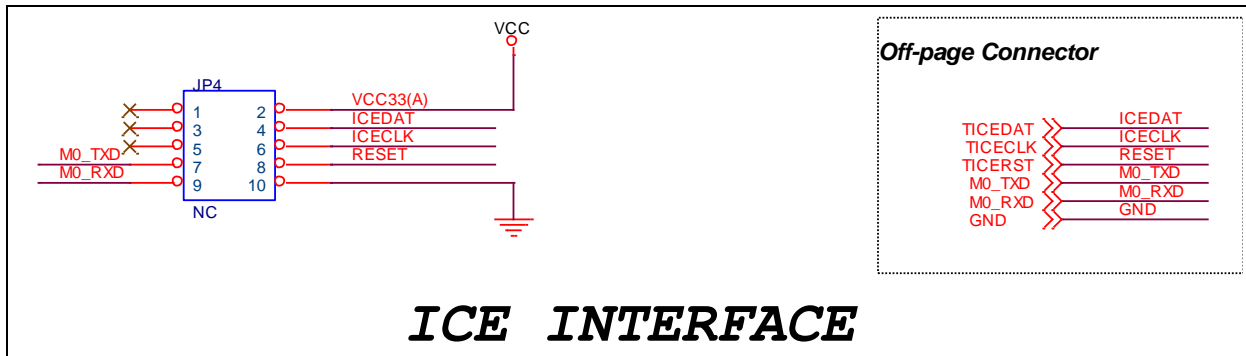
5.5 Reset

Push SW1 button to reset system.



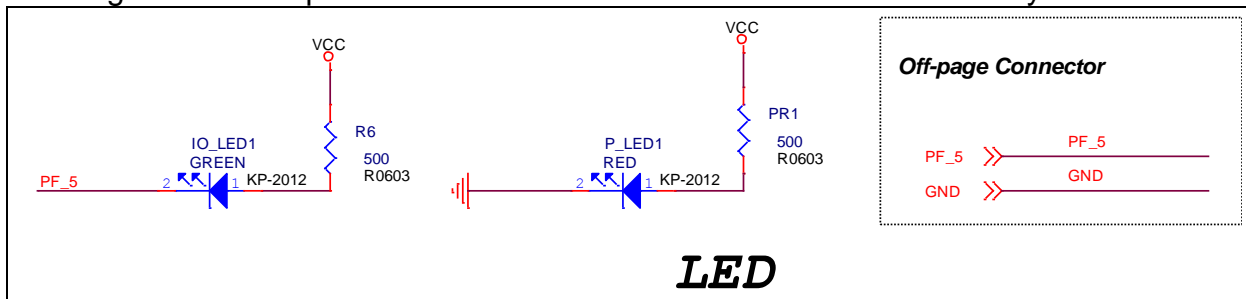
5.6 ICE Interface

This is the ICE interface between NUC240 and Nu-Link-Me.



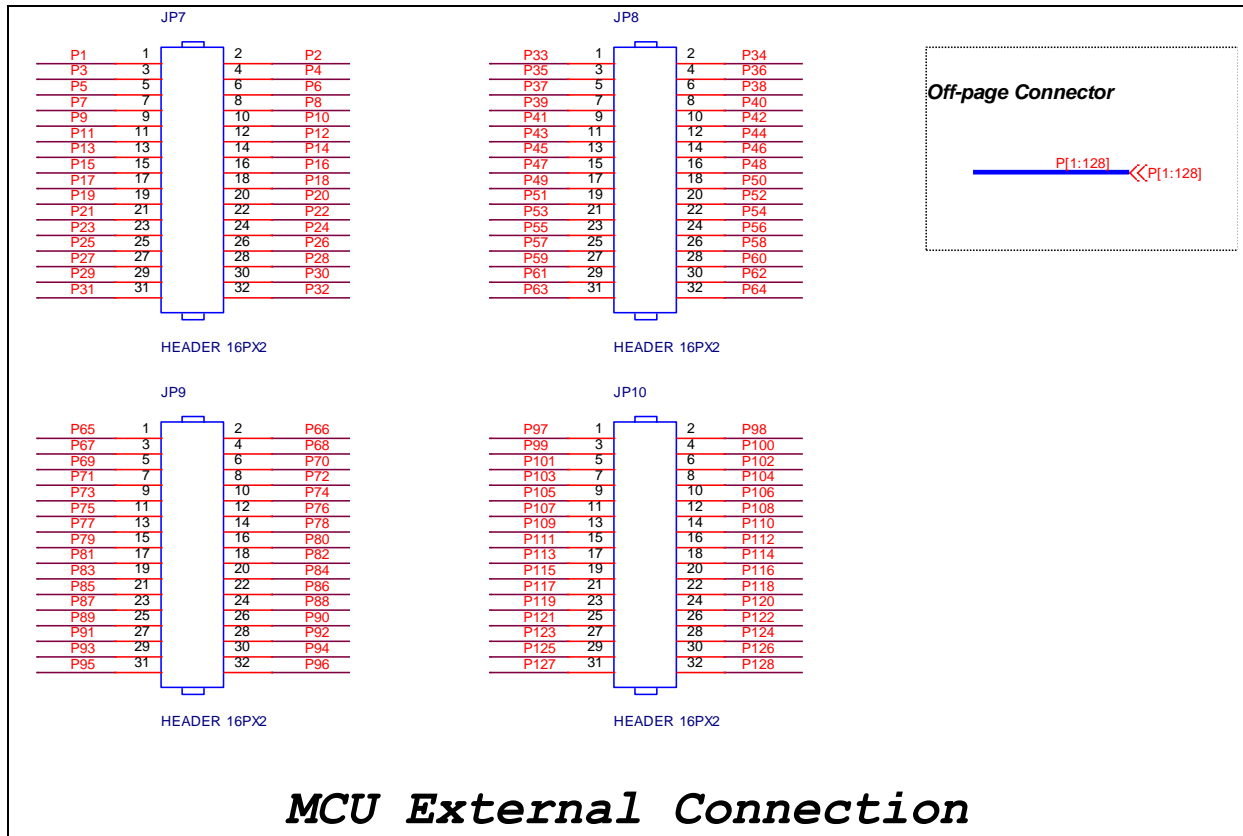
5.7 LED

This figure shows a power LED and an IO LED that can be controlled by PF.5.



5.8 USB

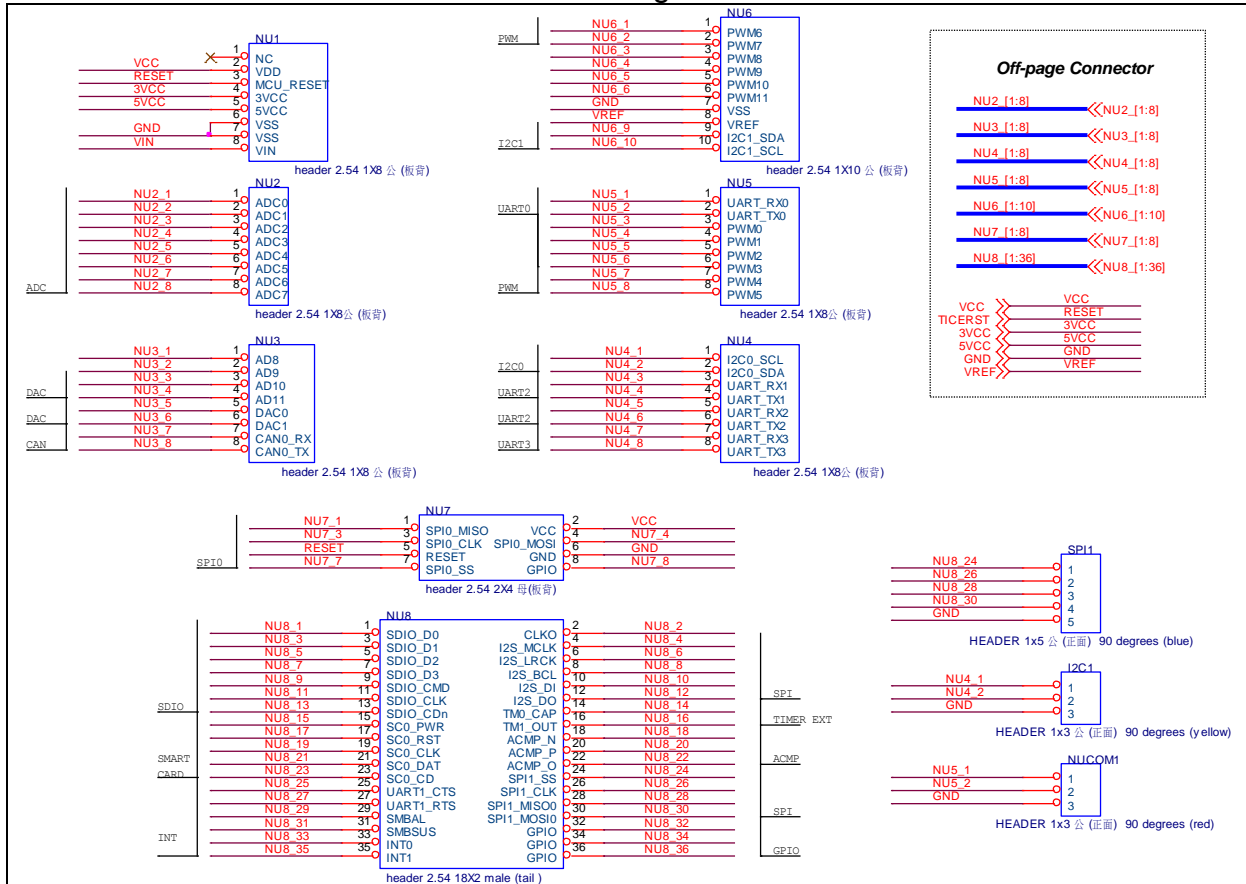
This figure shows USB interface.



6 NuEdu-Basic01 Schematics

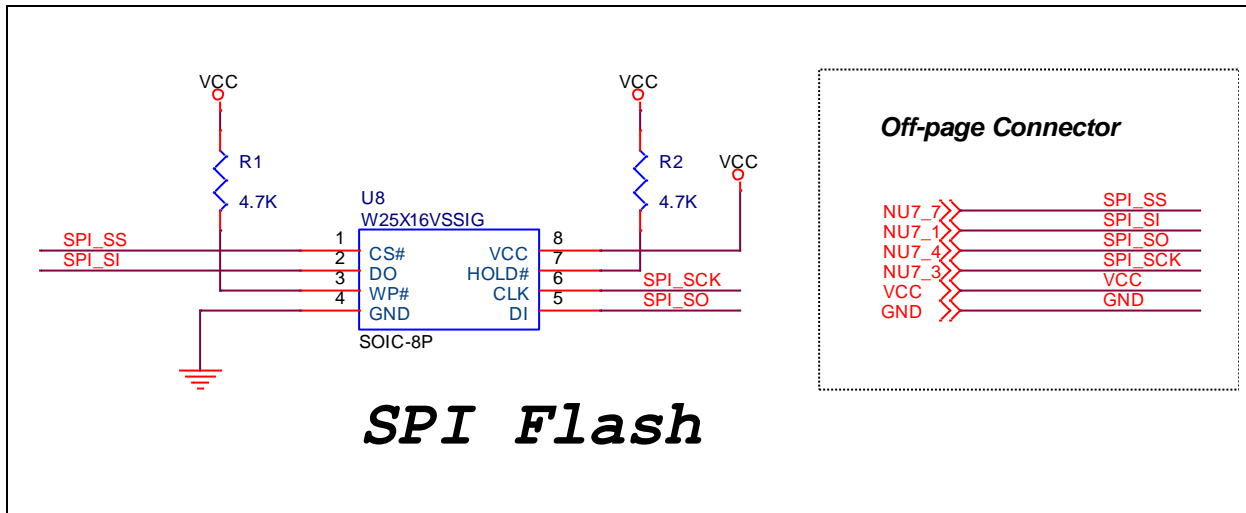
6.1 Interface Connection

This figure shows the function block of NU1~8 Connector. NUCOM1, SPI1 and I2C1 are the connection interfaces of Nu-Bridge.



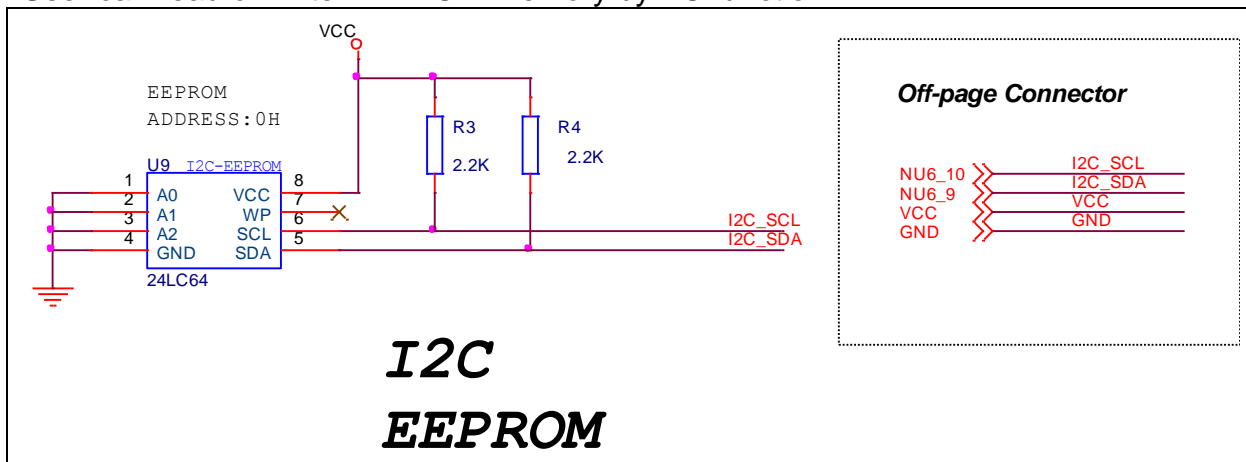
6.2 SPI Flash

User can read or write flash memory by SPI function.



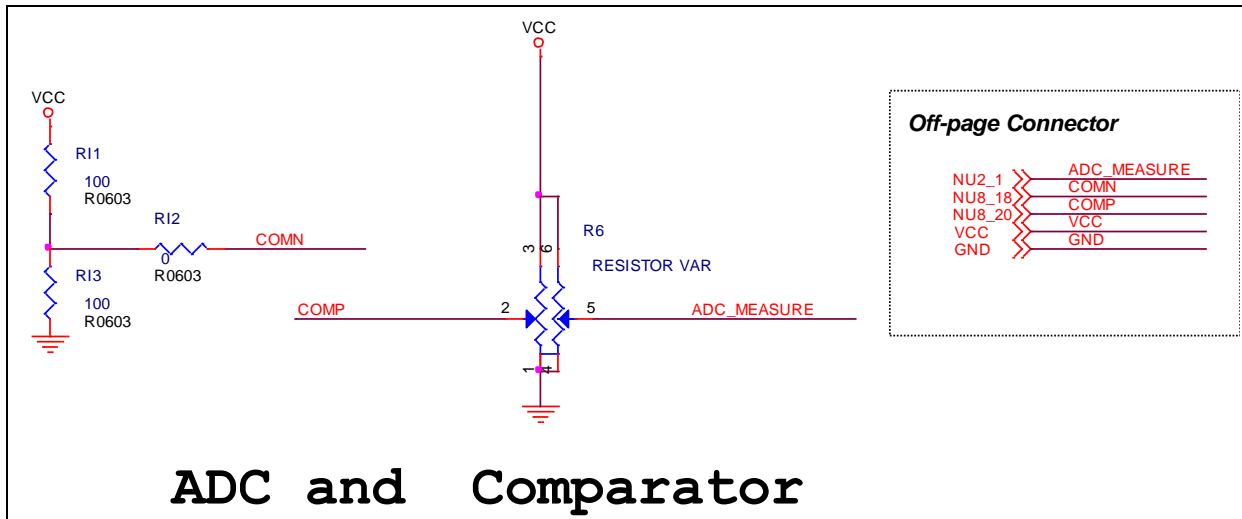
6.3 I²C EEPROM

User can read or write EEPROM memory by I²C function.



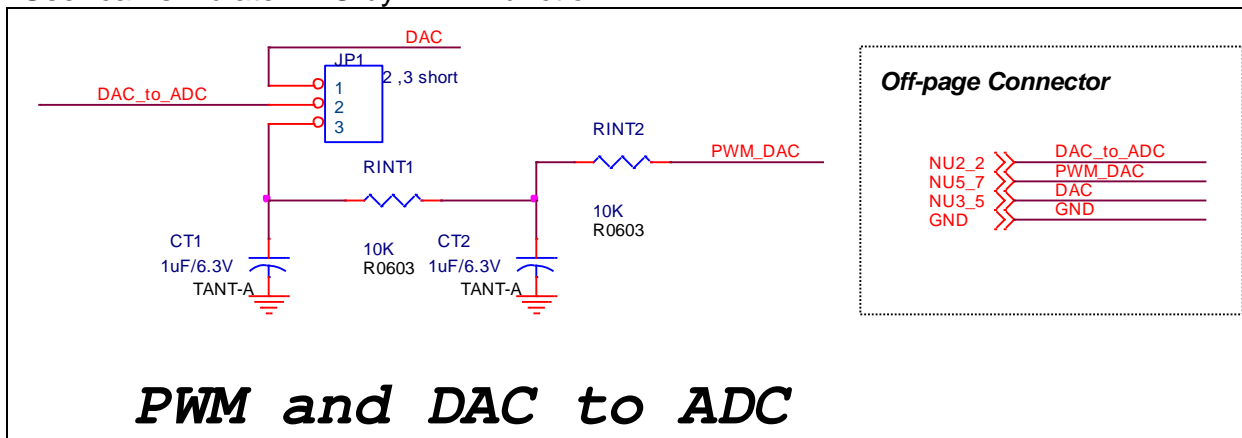
6.4 ADC and comparator

User can adjust the variable resistor to output voltage for ADC function.

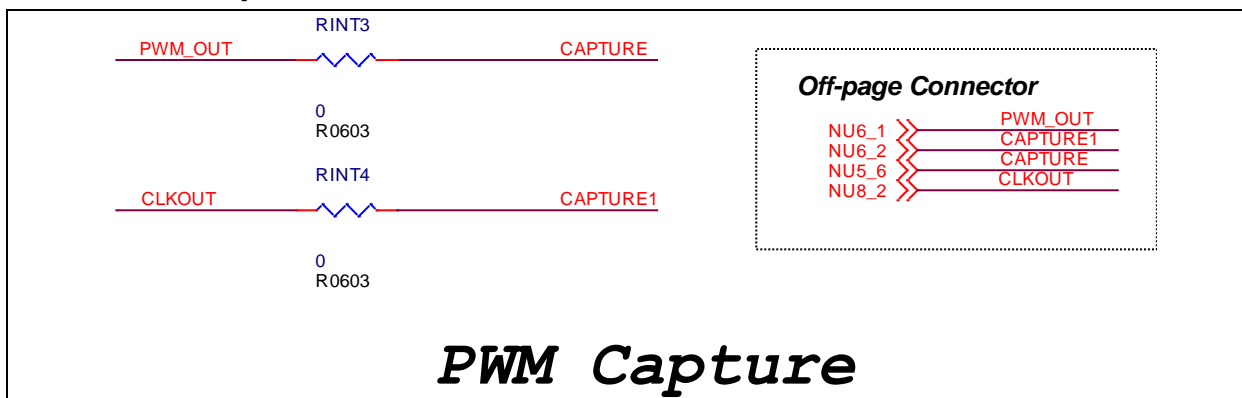


6.5 PWM and DAC to ADC

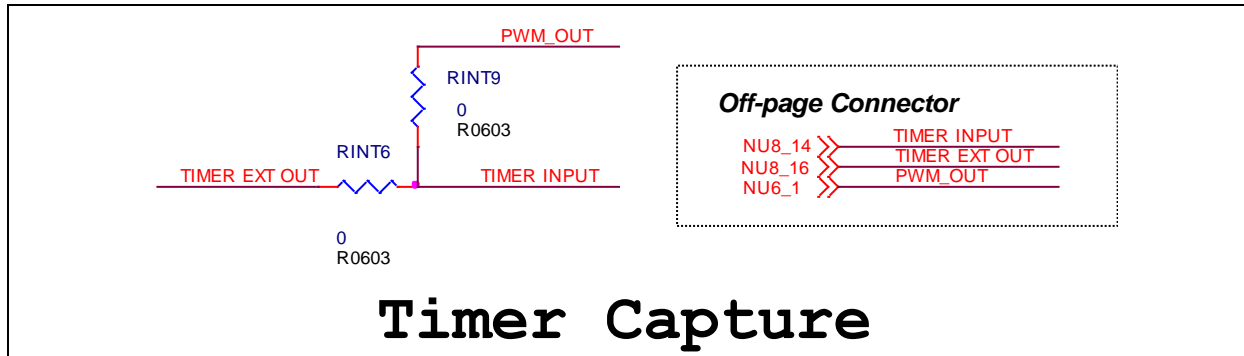
User can simulate DAC by PWM function.



6.6 PWM Capture

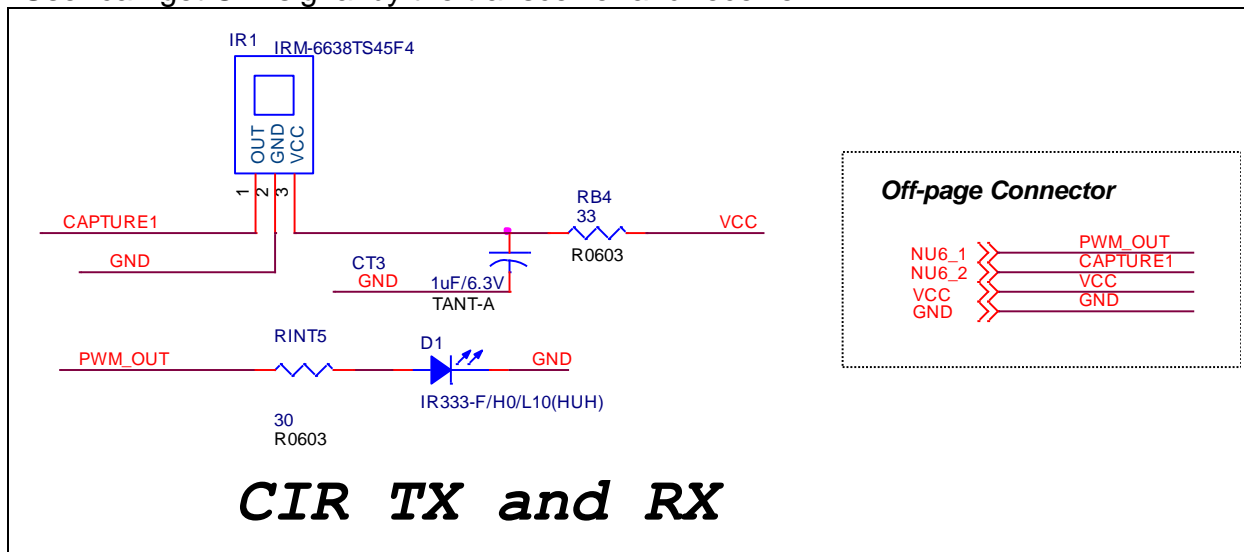


6.7 Timer Capture

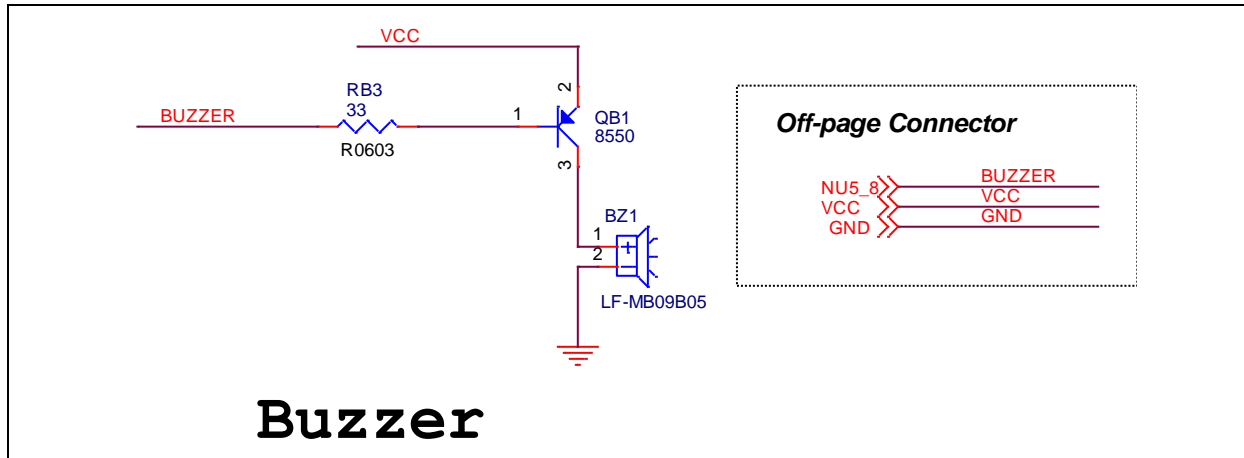


6.8 CIR TX and RX

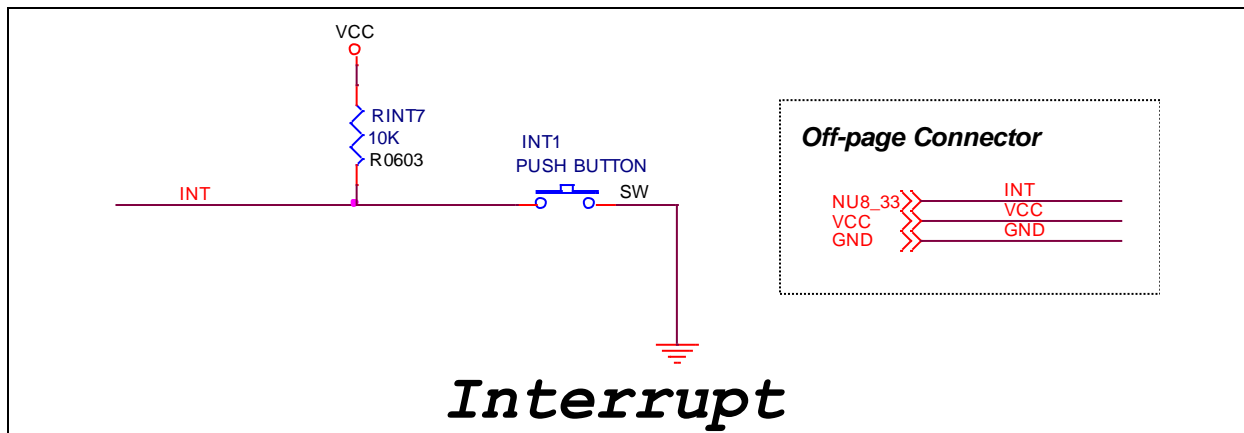
User can get CIR signal by the transceiver and receiver.



6.9 Buzzer

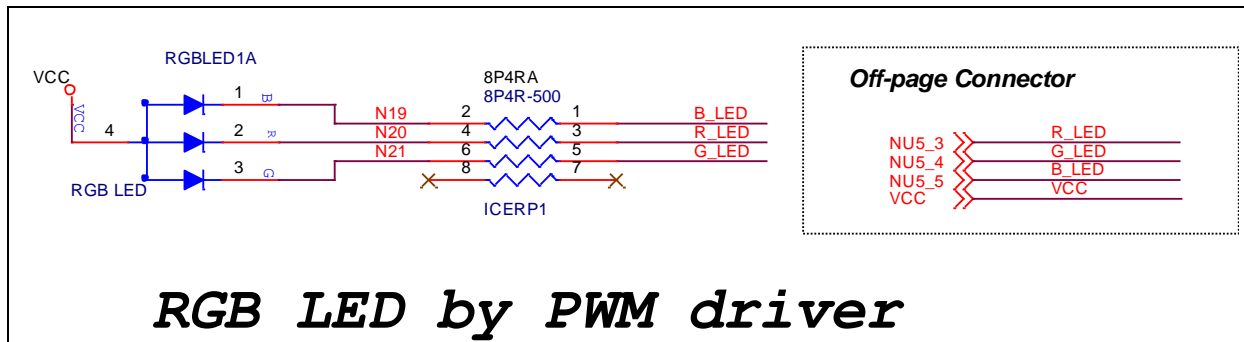


6.10 Interrupt Button



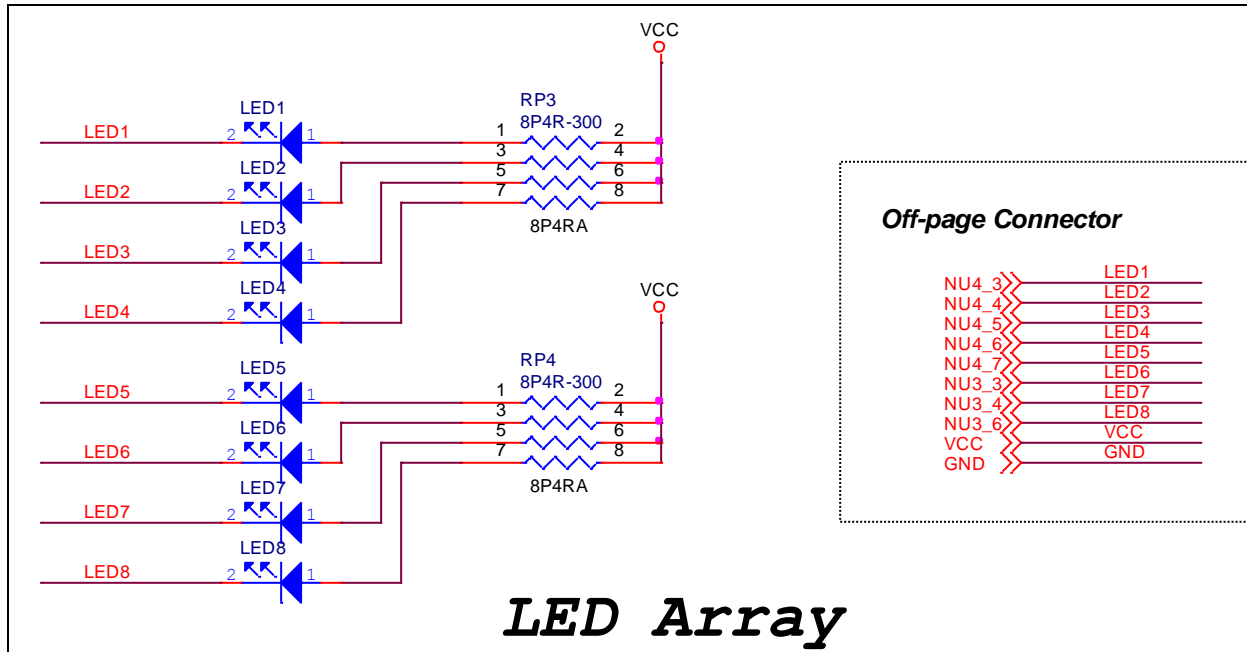
6.11 RGB LED by PWM driver

User can use PWM function to drive RGB LED



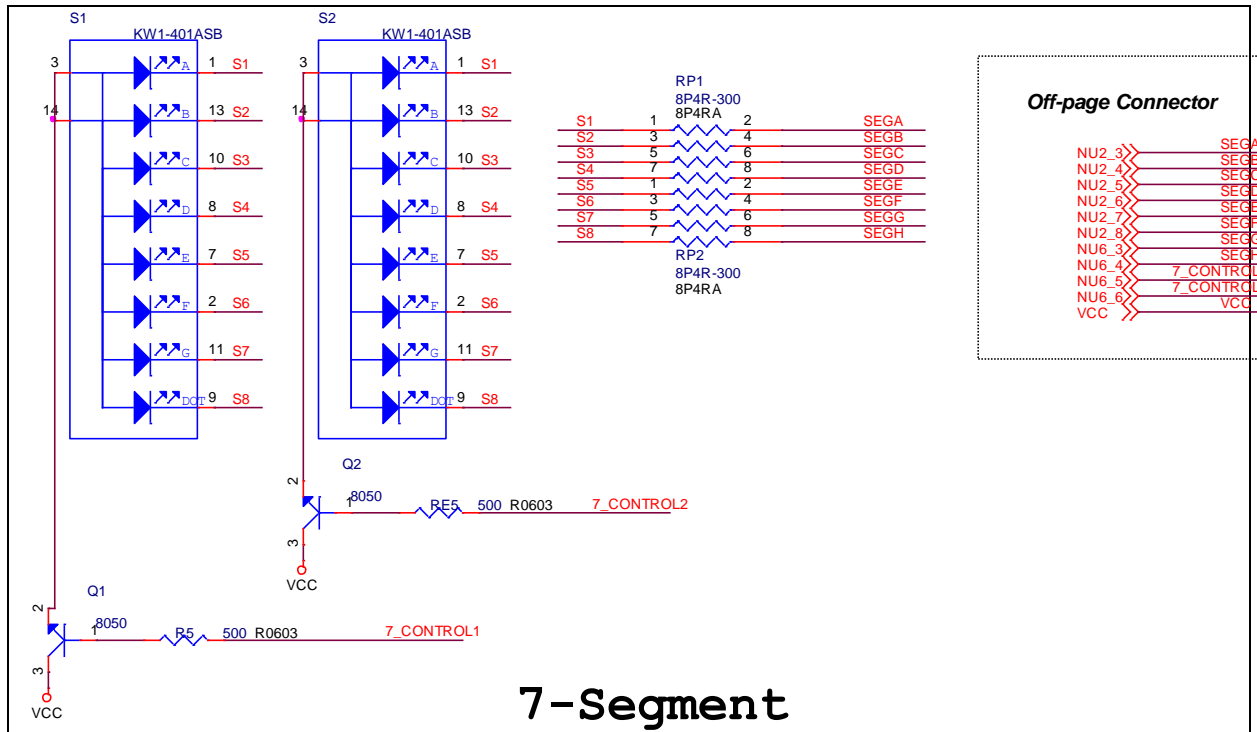
6.12 LED Array

	LED1	LED2	LED3	LED4	LED5	LED6	LED7	LED8
NuEdu-Basic01	NU4_3	NU4_4	NU4_5	NU4_6	NU4_7	NU3_3	NU3_4	NU3_6



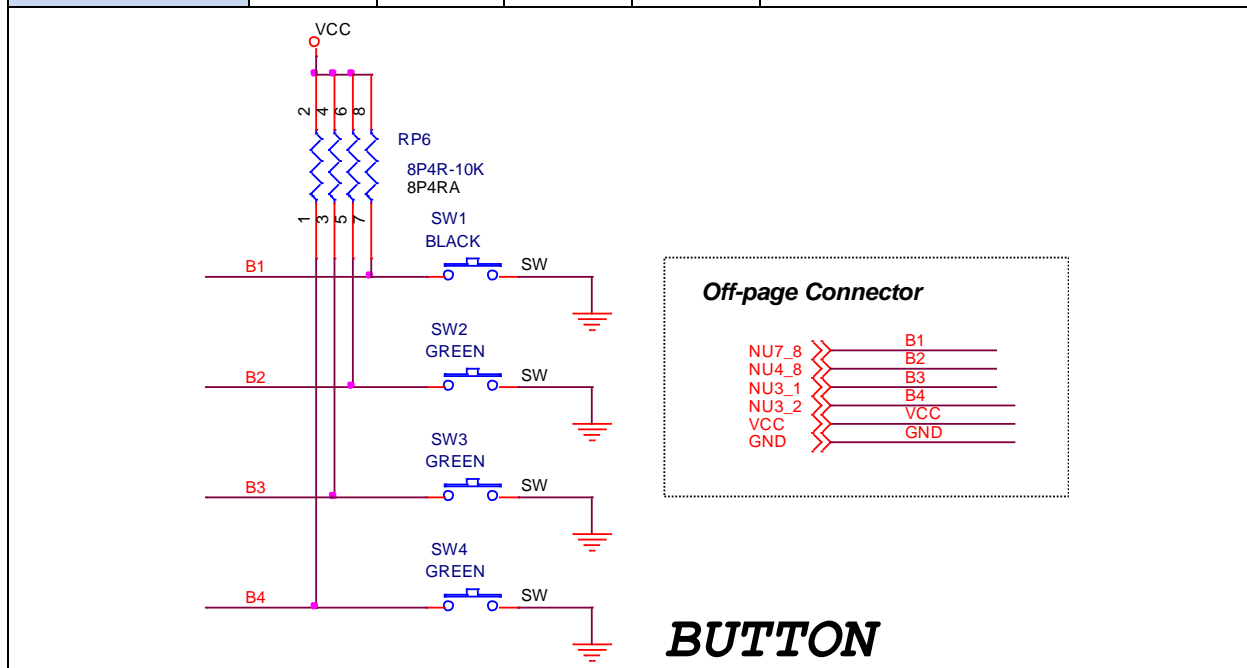
6.13 7-Segments Display

	Seg_A	Seg_B	Seg_C	Seg_D	Seg_E	Seg_F	Seg_G	Seg_H	Control 2	Control 1
NuEdu-Basic01	NU2_3	NU2_4	NU2_5	NU2_6	NU2_7	NU2_8	NU6_3	NU6_4	NU6_5	NU6_6



6.14 Buttons

	SW1	SW2	SW3	SW4
NuEdu-Basic01	NU7_8	NU4_8	NU3_1	NU3_2



7 Revision History

Revision	Date	Description
1.00	May. 26, 2014	Initially issued.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

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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