ARM® Cortex®-M
32-bit Microcontroller

NuMicro® Family
NT-NM1230
User Manual

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

Table of Contents

1 OVERVIEW

NuTiny-EVB-NM1230(NT-NM1230) is the specific development tool for NuMicro® NM1230 series. Users can use NuTiny-EVB-NM1230 to develop and verify the application program easily.

The NuMicro® NM1230 series 32-bit microcontrollers are embedded with ARM® Cortex®-M0 core for industrial applications which need high performance, high integration, and low cost. The Cortex®-M0 is the newest ARM® embedded processor with 32-bit performance at a cost equivalent to the traditional 8-bit microcontroller.

The NM1230 series can run up to 48/72 MHz and operate at 2.2V ~ 5.5V, -40℃ ~ 105℃, and thus can support a variety of industrial control applications which need high CPU performance. The NM1230 offers 48/64 Kbytes embedded program Flash, size configurable Data Flash (shared with program flash), 7.5 Kbytes Flash for the ISP, 1.5 Kbytes SPROM for security, and 16Kbytes SRAM.

Many system level peripheral functions, such as I/O Port, Timer, UART, SPI, I^2C, PWM, ADC, Watchdog Timer, Analog Comparator and Brown-out Detector, have been incorporated into the NM1230 to reduce component count, board space and system cost. These useful functions make the NM1230 powerful for a wide range of applications.

Additionally, the NM1230 series is equipped with ISP (In-System Programming) and ICP (In-Circuit Programming) functions, which allow the user to update the program memory without removing the chip from the actual end product.

2 NUTINY-EVB-NM1230 INTRODUCTION

NuTiny-EVB-NM1230 uses the NM1234D as the target microcontroller. Figure 2-1 is NuTiny-EVB-NM1230 for NM1230 series, the left portion is called NuTiny-EVB-NM1230 and the right portion is Debug Adaptor called Nu-Link-Me.

NuTiny-EVB-NM1230 is similar to other development boards. Users can use it to develop and verify applications to emulate the real behavior. The on board chip covers NM1230 series features. The NuTiny-EVB-NM1230 can be a real system controller to design users' target systems.

Nu-Link-Me is a Debug Adaptor. The Nu-Link-Me Debug Adaptor connects your PC's USB port to your target system (via Serial Wired Debug Port) and allows you to program and debug embedded programs on the target hardware. The Nu-Link-Me V3.0 also supports VCOM function, which gives users more flexibility when debug. To use Nu-Link-Me Debug adaptor with IAR or Keil, please refer to "Nuvoton NuMicro® IAR ICE driver user manual "or Nuvoton NuMicro® Keil ICE driver user manual" in detail. These two documents will be stored in the local hard disk when the user installs each driver. To use Nu-Link-Me 3.0 VCOM function, please refer to Chapter 5.

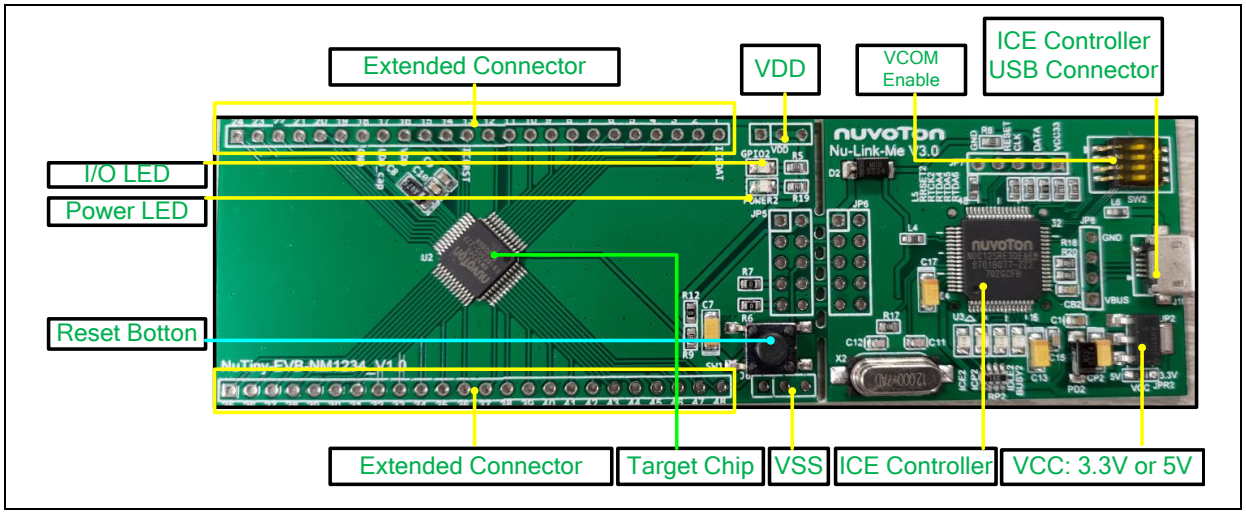


Figure 2-1 NuTiny-EVB-NM1234D (PCB Board)

2.1 NuTiny -EVB-NM1230 Jumper Description

2.1.1 Power Setting

- J10: USB port in Nu-Link-Me
- J4: VDD Voltage connecter in NuTiny-EVB-NM1230

Model	JPR2	J10 USB port	J4 VDD	MCU Voltage
Model 1	Select VCC33 (default)	Connect to PC	DC 3.3V output	DC 3.3V
Model 2	X	X	DC 2.5 V ~ 5.5 V Input	Voltage by J2 input

X: Unused.

2.1.2 Debug Connector

- JP5: Connector in target board (NuTiny-EVB-NM1230) for connecting with Nuvoton ICE adaptor (Nu-Link-Me V3.0)
- JP6: Connector in ICE adaptor (Nu-Link-Me V3.0) for connecting with a target board (for example NuTiny-EVB-NM1230)

2.1.3 USB Connector

- J10: Mini USB Connector in Nu-Link-Me V3.0 connected to a PC USB port

2.1.4 Extended Connector

- J5, J9: Show all chip pins in NuTiny-EVB-NM1230

2.1.5 Reset Button

- SW1: Reset button in NuTiny-EVB-NM1230

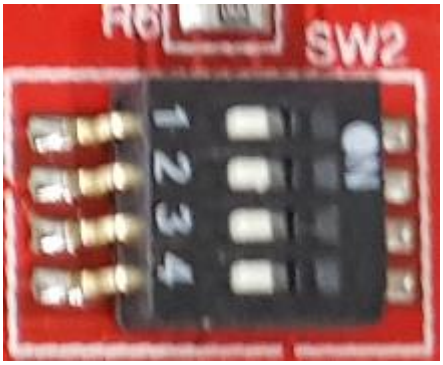
2.1.6 Power Connector

- J4: VDD connector in NuTiny-EVB-NM1230
- J6: VSS connector in NuTiny-EVB-NM1230

2.1.7 VCOM Enable

- **SW3**: VCOM function enable for NuTiny-EVB-NM1230. Switch SW2 on before power on to enable VCOM function. SW2 connects pin 5(PD6/RXD) and pin 4(PD5/TXD) in NuTiny-EVB-NM1230 with pin 19 (PD.5/TXD) and pin 2(PD.6/RXD) in Nuvoton ICE adaptor (Nu-Link-Me V3.0). SW2 connects pin 29(VCOM) in Nuvoton ICE adaptor (Nu-Link-Me V3.0) to GND to enable VCOM function.

Switch Pin Number	Function Name	UART0 Mode	VCOM Mode
1	ICE_TX	Off	On
2	ICE_RX	Off	On
3	VCOM_EN	Off	On
4	X	X	X



X: Unused.

2.2 Pin Assignment for Extended Connector

NuTiny-EVB-NM1230 provides NM1234D on board and the extended connector for (**J5**, **J9**) for LQFP48-pin. Table 2-1 is the pin assignment for NM1230.

Pin No	Pin Name
01	PD2,ICE_DAT,ADC1_CH1,CCAP_P0,I2C_SDA,SPI0_MOSI,SPI1_MISO,UART0_RXD
02	PD3,BPWM_CH1,UART1_TXD
03	PD4,BPWM_CH0,UART1_RXD,ECAP0,QEI_A
04	PD5,UART0_TXD,ECAP1,QEI_B
05	PD6,UART0_RXD,ECAP2,IDX
06	PD7,ECAP_P0,I2C2_SCL,UART2_TXD,ECAP2,IDX
07	PA0,EPWM_CH0,I2C1_SCL,SPI0_SS,SPI1_CLK,UART1_TXD,CLKO
08	PA1,EPWM_CH1,I2C1_SDA,SPI0_MISO,_SPI1_MOSI,UART1_RXD
09	PA2,EPWM_CH2,I2C0_SDA,SPI0_MOSI,SPI1_MISO,UART0_RXD
10	PA3,EPWM_CH3,I2C0_SCL,SPI0_CLK,SPI1_SS,UART0_TXD
11	PA4,EPWM_CH4,XT_IN
12	PA5,EPWM_CH5,ACMP0_O,XT_OUT
13	nRESET
14	PA6,EPWM_CH5,I2C0_SCL,SPI0_MOSI,UART0_TXD
15	PA7,EPWM_CH4,ACMP0_O,I2C0_SDA,SPI0_SS,UART0_RXD
16	VDD
17	LDO_CAP
18	VSS
19	PF0,I2C2_SDA,SPI1_SS,UART2_RXD,ECAP0,QEI_A
20	PF1,EPWM_CH3,I2C2_SCL,SPI0_CLK,UART2_TXD,ECAP1,QEI_B
21	PF2,EPWM_CH2,I2C2_SDA,SPI0_MISO,UART2_RXD,ECAP2,IDX
22	PF3,ADC1_CH3,EPWM_CH1
23	PF4,ADC1_CH4,EPWM_CH0
24	PB0,ADC0_CH0,ACMP0_P0,ECAP0,QEI_A
25	PB1,ADC0_CH1,ACMP0_P1,ECAP1,QEI_B
26	PB2,ADC0_CH2,ACMP0_P2,ECAP2,BPWM_CH1,IDX
27	PB3,ACMP1_N,PGA_I,TO
28	PB4,ADC1_CH0,ACMP0_N,T1

29	PB5,ADC0_CH5,DAC0,CCAP_P0
30	PB6,ADC0_CH6,PWM_BRK_P1,CCAP_P0
31	PB7,ADC0_CH7,PWM_BRK_P2,CCAP_P0,ECAP0,QEI_A
32	PC0,ADC0_CH3,BPWM_CH0,ACMP1_P0,IC21_SCL,SPI0_SS,SPI1_CLK,UART1_TXD
33	PC1,ADC0_CH4,STADC,ACMP0_P3,ACMP1_P1,CCAP_P1,SPI0_MOSI,SPI1_MISO
34	PC2,ADC1_CH2,PWM_BRK_P0,CCAP_P1,I2C1_SDA,SPI0_MISO,SPI_MOSI,UART1_RXD
35	PC3,ACMP1_O,PGA_O,SPI0_CLK,SPI1_SS
36	PC4,OP0_O,ECAP0,I2C2_SCL,UART2_TXD,ECAP2,IDX
37	PC5,ADC1_CH5,PWM_BRK_P0,CCAP_P1
38	PC6,ADC1_CH6,DAC1,T2,I2C2_SCL,UART2_TXD
39	PC7,ADC1_CH7,T3,ECAP1,QEI_B
40	PE0,OP0_N
41	PE1,OP0_P
42	PE2,OP1_O
43	PE3,OP1_N
44	PE4,OP1_P
45	PE5,OP2_O,I2C1_SCL,SPI1_CLK,UART1_TXD
46	PE6,OP2_N,I2C1_SDA,SPI1_MISO,UART1_RXD
47	PE7,OP2_P,I2C2_SCL,SPI1_MOSI,UART2_TXD
48	PD1,ICE_CLK,ACMP1_P2,I2C0_SCL,SPI0_CLK,SPI1_SS,UART0_TXD

Table 2-1 Pin Assignment for NM1230

3 HOW TO START NUTINY-EVB-NM1230 ON THE KEIL MVISION® IDE

3.1 Keil uVision® IDE Software Download and Install

Please visit the Keil company website (http://www.keil.com) to download the Keil µVision® IDE and install the RVMDK

3.2 Nuvoton Nu-Link Driver Download and Install

Please visit the Nuvoton company NuMicro® website (http://www.nuvoton.com/NuMicro) to download "NuMicro® Keil µVision® IDE driver" file. When the Nu-Link driver has been well downloaded, please unzip the file and execute the "Nu-Link_Keil_Driver.exe" to install the driver.

3.3 Hardware Setup

The hardware setup is shown as Figure 3-1.

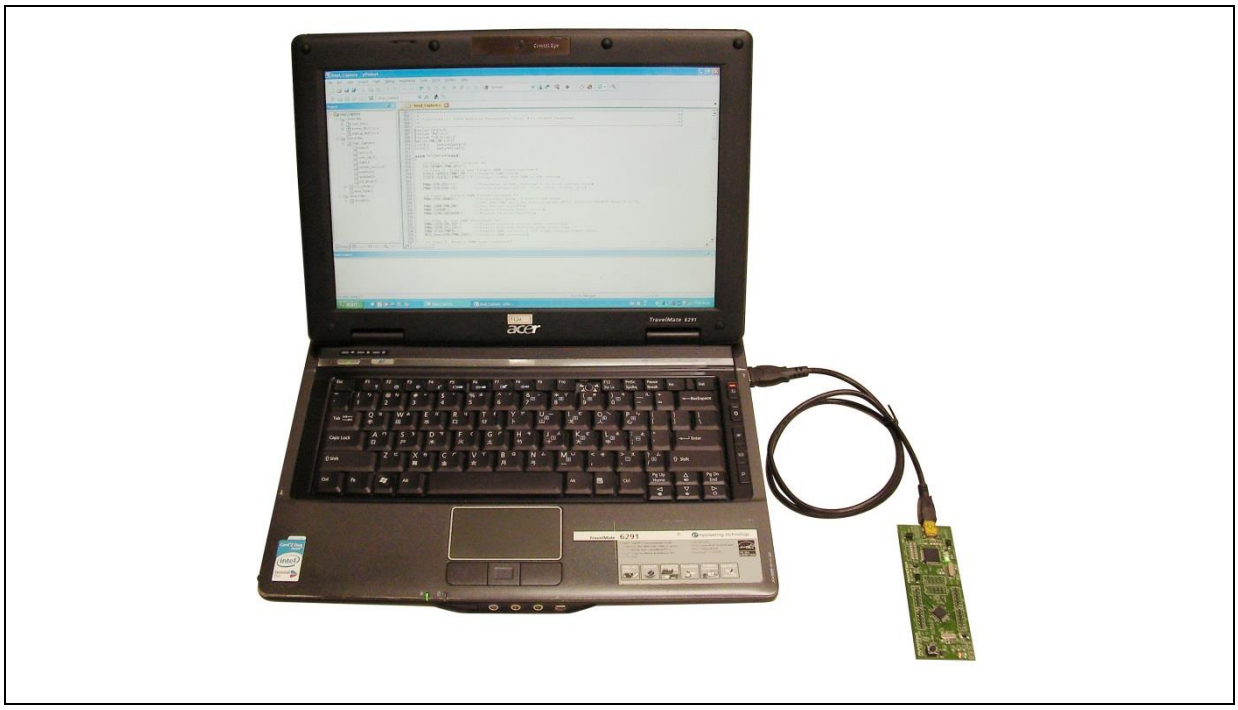


Figure 3-1 NuTiny-EVB-NM1230 Hardware Setup

3.4 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-EVB-NM1230 board. It can be found on Figure 3-2 list directory and downloaded from Nuvoton NuMicro® website.

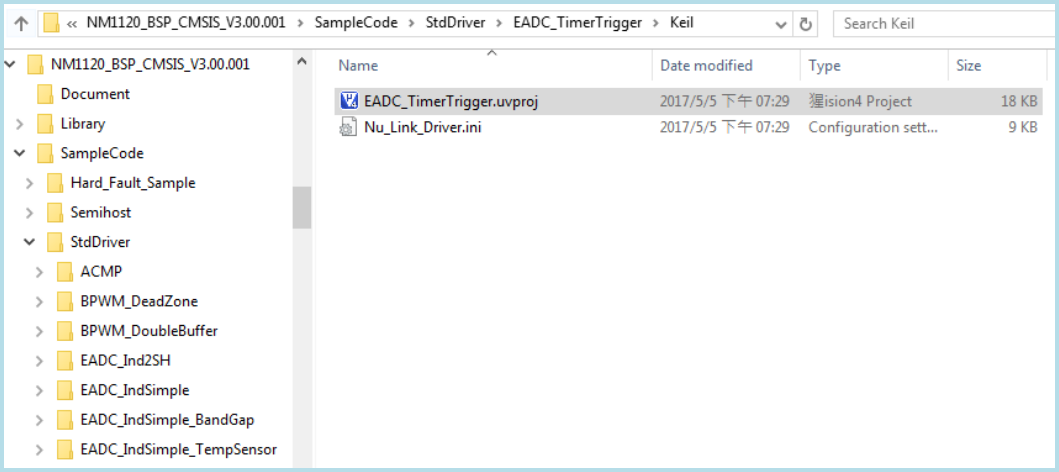
Directory	C:\ Nuvoton\BSP Library\NM1230BSP\SampleCode \StdDriver\SYS\KEIL
Project File	

Figure 3-2 Example Directory

This sample code will show some functions about system manager controller and clock controller.

- Start uVision®
- Project – Open
  Open the SYS.uvproj project file
- Project – Build
  Compile and link the SYS application
- Flash – Download
  Program the application code into on-chip Flash ROM
- Start debug mode
  When using the debugger commands, you may:
  - Review variables in the watch window
  - Single step through code
  - Reset the device
  - Run the application

4 HOW TO START NUTINY -EVB-NM1230 ON THE IAR EMBEDDED WORKBENCH

4.1 IAR Embedded Workbench Software Download and Install

Please connect to IAR company website (http://www.iar.com) to download the IAR Embedded Workbench and install the EWARM.

4.2 Nuvoton Nu-Link Driver Download and Install

Please visit the Nuvoton company NuMicro® website (http://www.nuvoton.com/NuMicro) to download the "NuMicro® IAR EWARM Driver" file. When the Nu-Link driver has been well downloaded, please unzip the file and execute the "Nu-Link_Keil_Driver.exe" to install the driver.

4.3 Hardware Setup

The hardware setup is shown as Figure 4-1.

Figure 4-1 NuTiny-EVB-NM1230 Hardware Setup

4.4 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-EVB-NM1230 board. It can be found on Figure 4-2 list directory and downloaded from Nuvoton NuMicro® website.

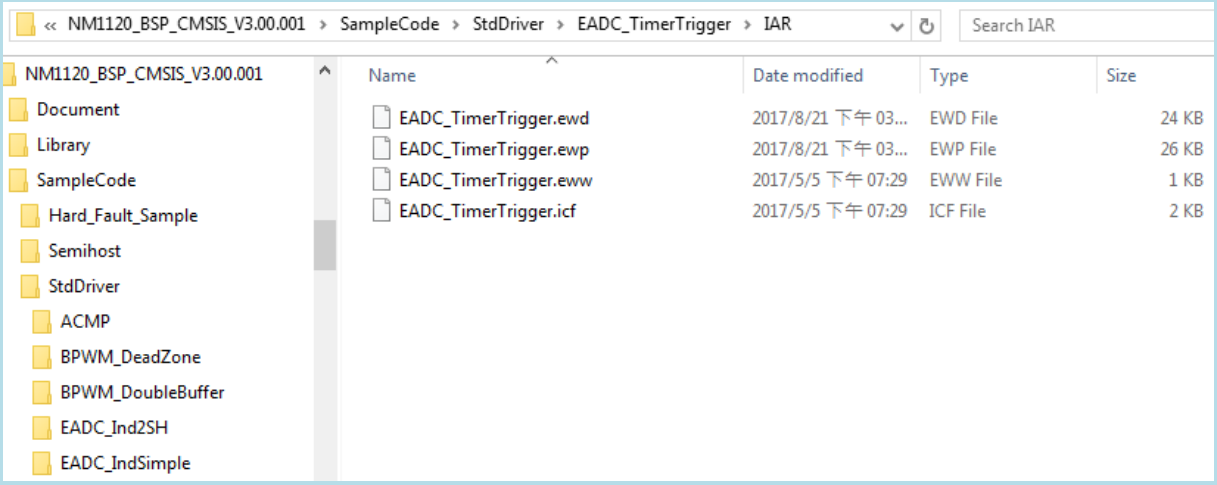
Directory	C:\ Nuvoton\BSP Library\NM1230BSP\SampleCode \StdDriver\SYS\IAR
Project File	

Figure 4-2 Example Directory

This sample code will show some functions about system manager controller and clock controller.

- Start IAR Embedded Workbench
- File-Open-Workspace
  Open the SYS.eww workspace file
- Project - Make
  Compile and link the SYS application
- Project – Download and Debug
  Program the application code into on-chip Flash ROM
  - Single step through code
  - Reset the device
  - Run the application

5 STARTING TO USE NU-LINK-ME 3.0 VCOM FUNCTION

5.1 Downloading and Installing VCOM Driver

Please connect to Nuvoton NuMicro® website (http://www.nuvoton.com/NuMicro) to download the "NuMicro® ICP Programming Tool" file. After the ICP Programming Tool driver is downloaded, please unzip the file and execute the "ICP Programming Tool.exe". Simply follow the installation and optional steps to install ICP Programming Tool and Nu-Link USB Driver, which included VCOM driver.

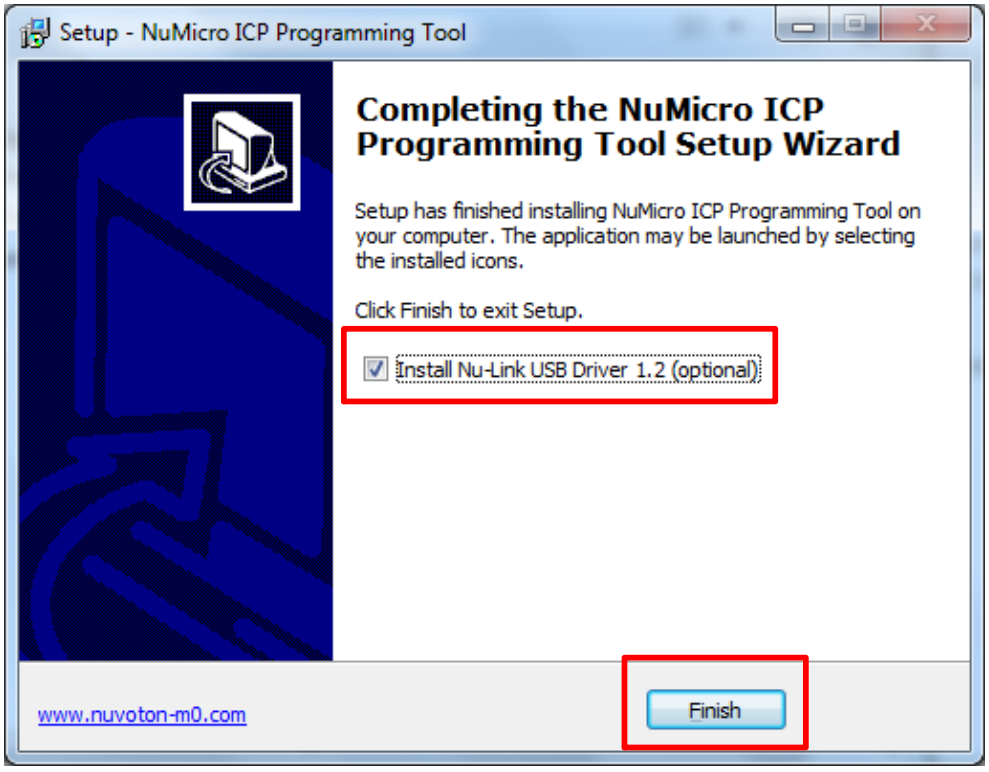


Figure 5-1 Optional Step after ICP Programming Tool Installation

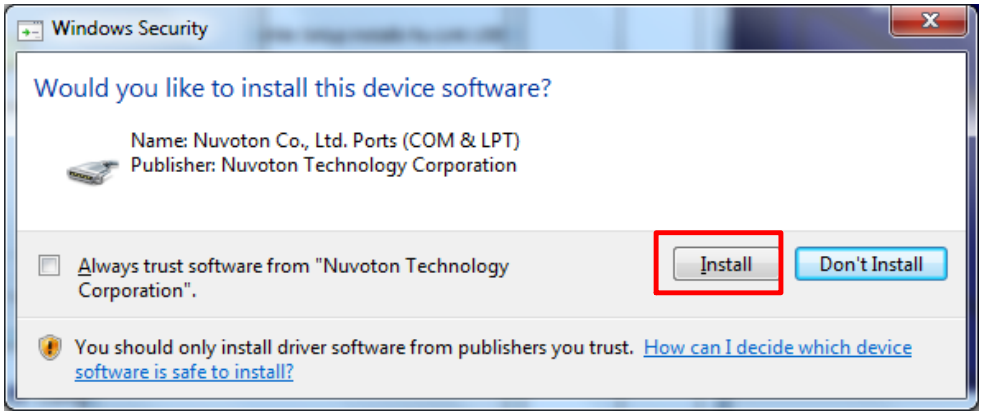


Figure 5-2 Install Nuvoton COM&LPT Driver

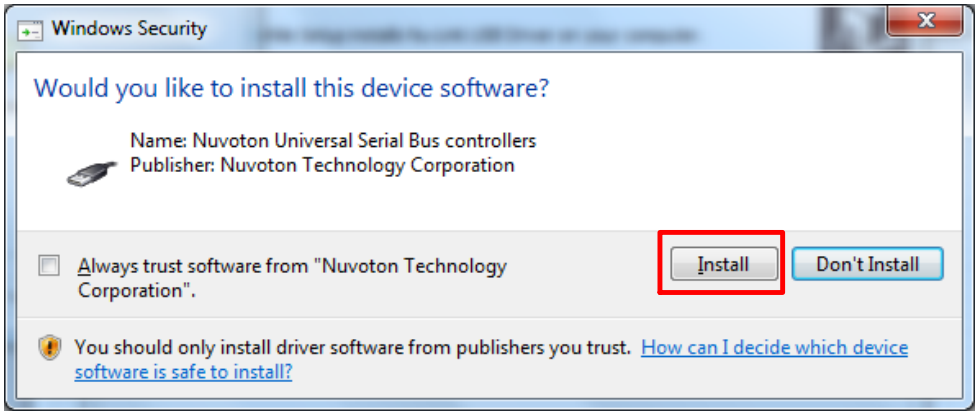


Figure 5-3 Install Nuvoton Universal Serial Bus Controllers

5.2 VCOM Mode Setting on NuTiny-EVB-NM1230

Before the NuTiny-EVB-NM1230 is connected to the PC, please enable SW2 VCOM function by switching on SW2. The NuTiny-EVB-NM1230 transmits through UART0 to VCOM to send out data. Switch SW2 off when using UART0 function without VCOM function.

5.3 Setup on the Development Tool

The example is demonstrated on the Keil µVision® IDE.

5.3.1 Check the Using UART on the Keil µVision® IDE

Please open the project and find system_NM1230.h to check the using UART in DEBUG_PORT, which has to be the same as the using UART in the NuTiny-EVB-NM1230.

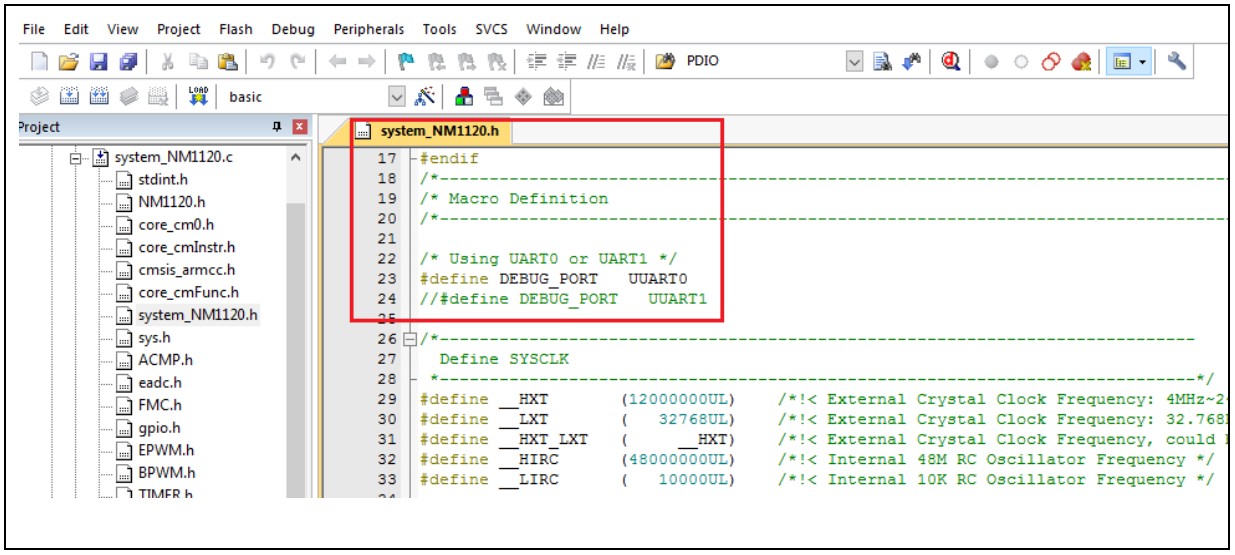


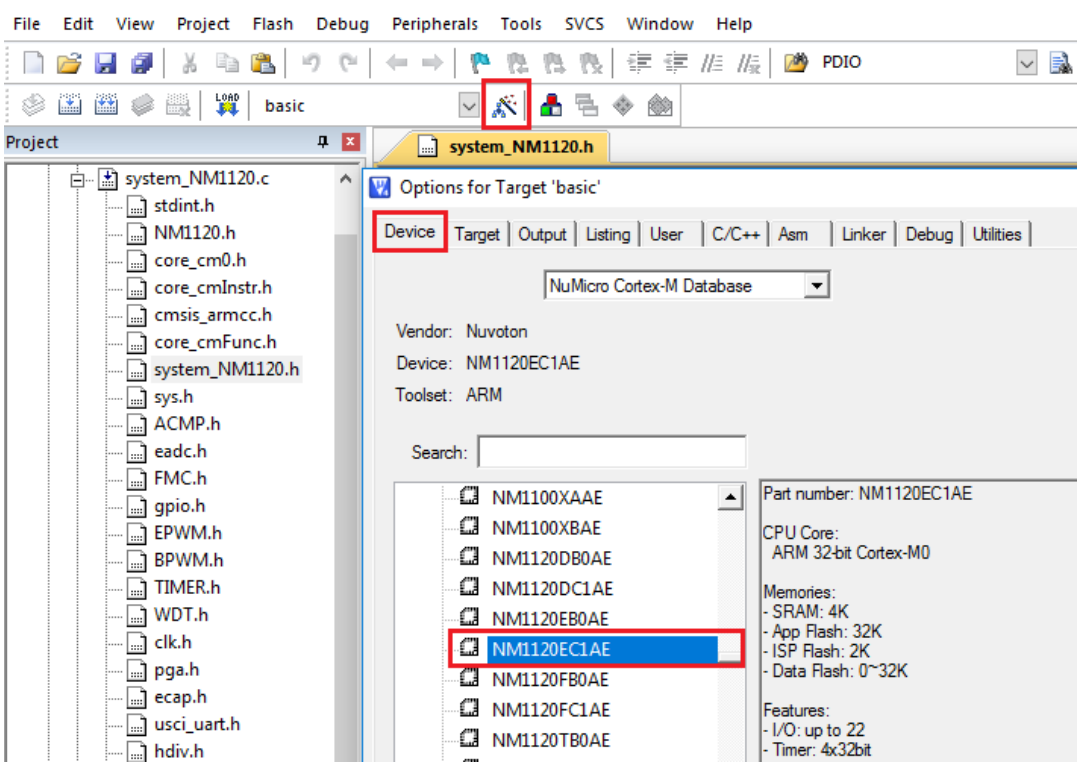
Figure 5-4 The Using UART on Keil µVision® IDE

5.3.2 Check the Target Device and Debug Setting

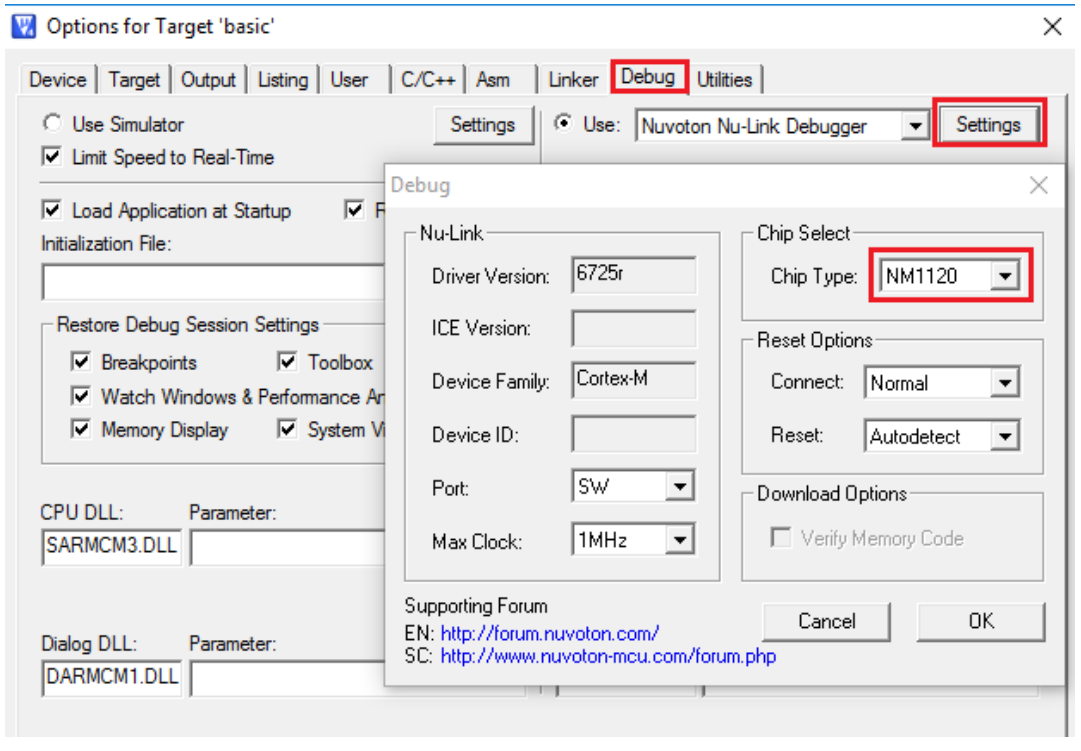
The target device has to be the same as the setting in Debug. Please click “Target Option” to

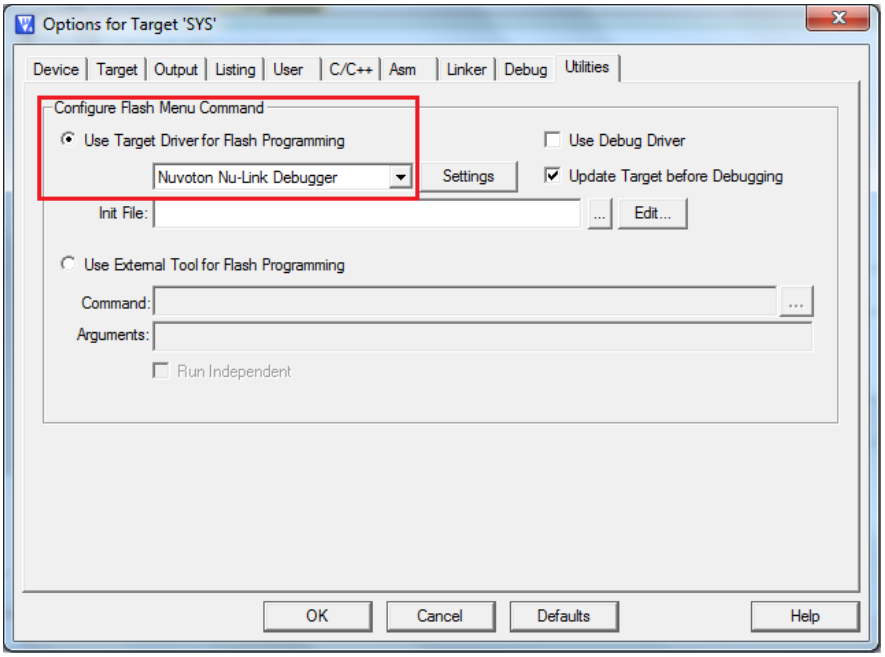
open the Option windows, and find the setting in “Device”, “Debug”, and “Utilities” page. Please follow the steps below to check the setting.

Step 1



Step 2



Step 3	

5.3.3 Build and Download Code to NuTiny-EVB-NM1230

Please build the project and download code to NuTiny-EVB-NM1230.

5.3.4 Open the Serial Port Terminal

User can use serial port terminal, PuTTY for example, to print out debug message.

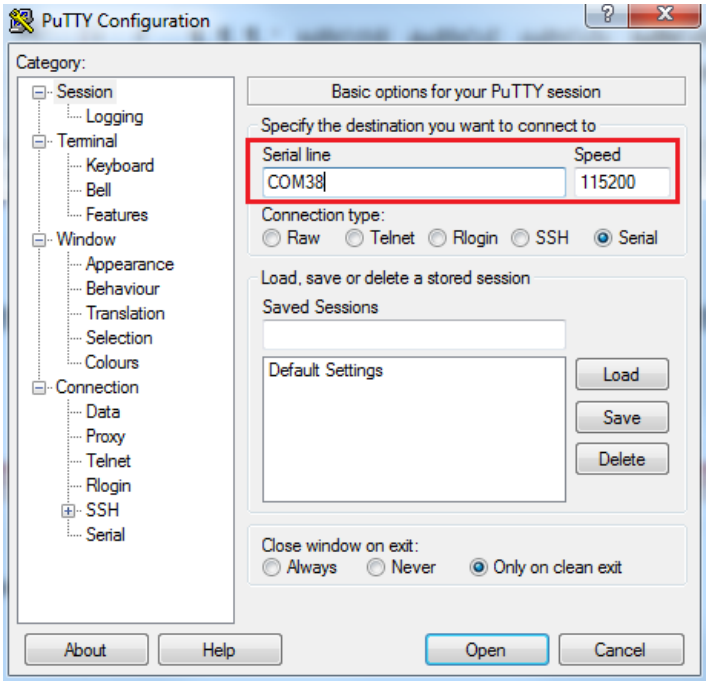


Figure 5-5 Set Baud Rate

5.3.5 Reset Chip

After pushing the reset button, the chip will reprogram application and print out debug message.

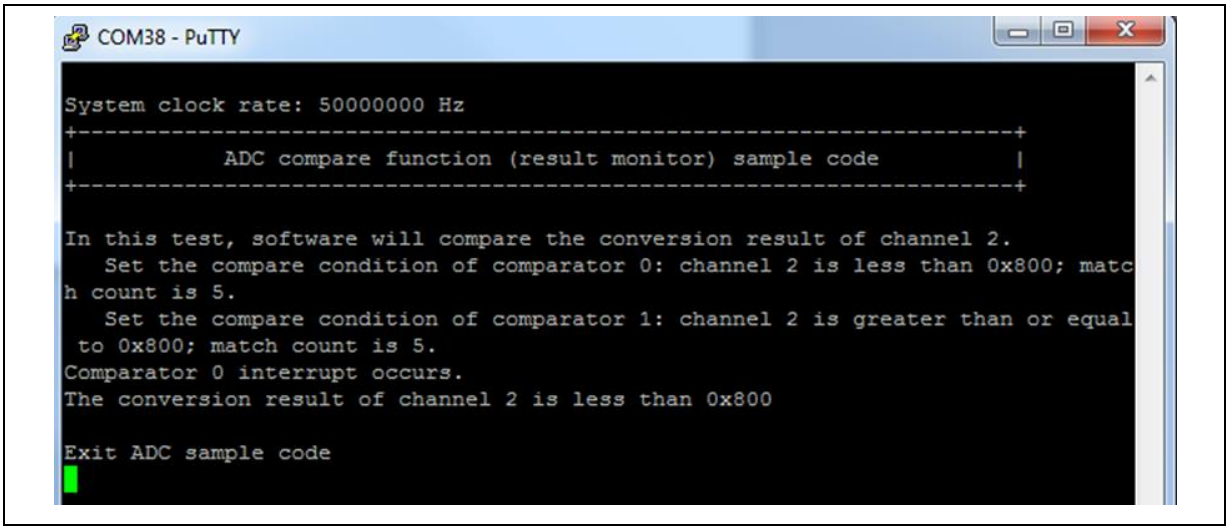


Figure 5-6 Serial Port Terminal Windows

Notice: Please switch SW2 on before the NuTiny-EVB-NM1230 connects to the PC. When the NuTiny-EVB-NM1230 connects to the PC with SW2 switch on, PC will detect VCOM as a USB device and the detection will only be processed once. VCOM will not function if switch on SW2 after the connection.

6 NUTINY-EVB-NM1234D SCHEMATIC

6.1 NuTiny-EVB-NM1234D PCB Placemen (TOP)

Users can refer to Figure 6-1 for the NuTiny-EVB-NM1234D PCB placements.

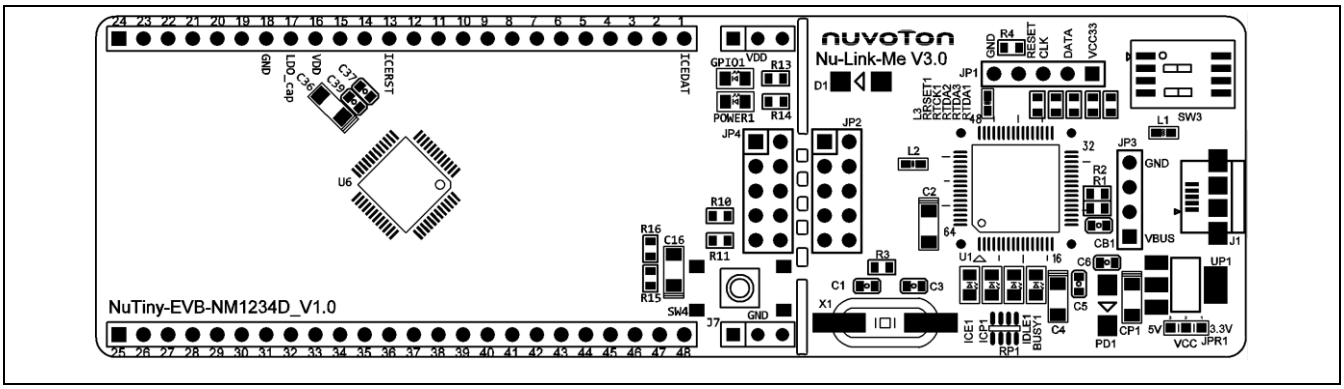


Figure 6-1 NuTiny-EVB-NM1234D PCB Placement

6.2 NuTiny-EVB-NM1234D PCB Placemen (Bottom)

Users can refer to Figure 6-1 for the NuTiny-EVB-NM1234D PCB placements.

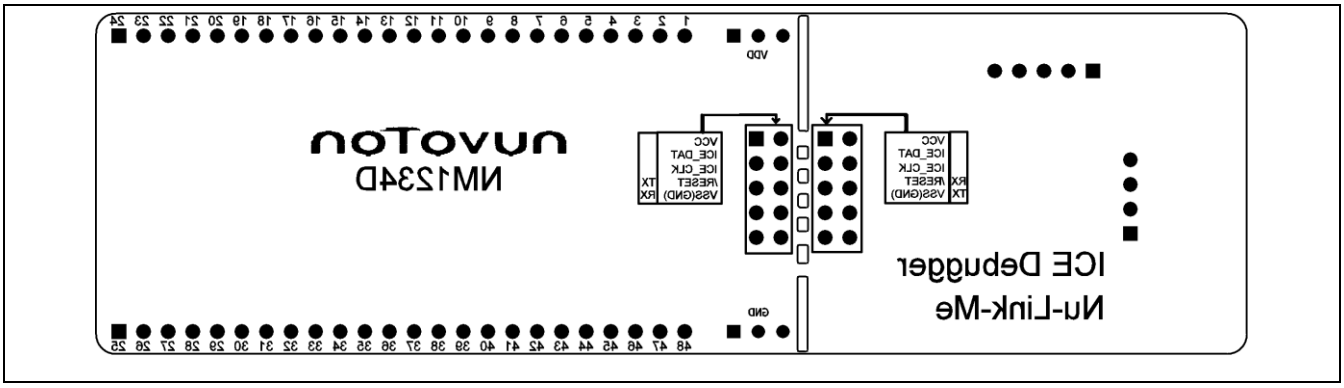
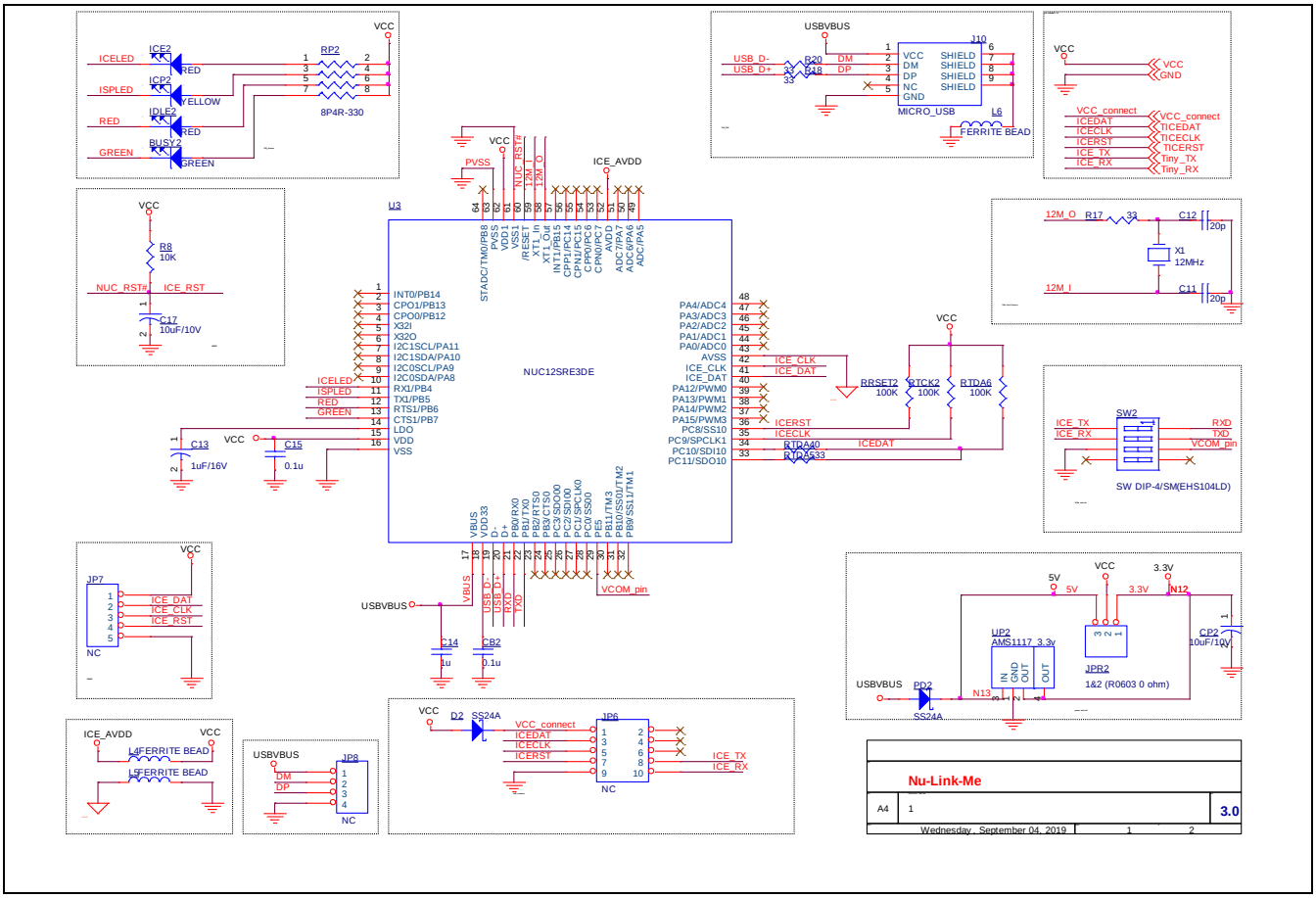
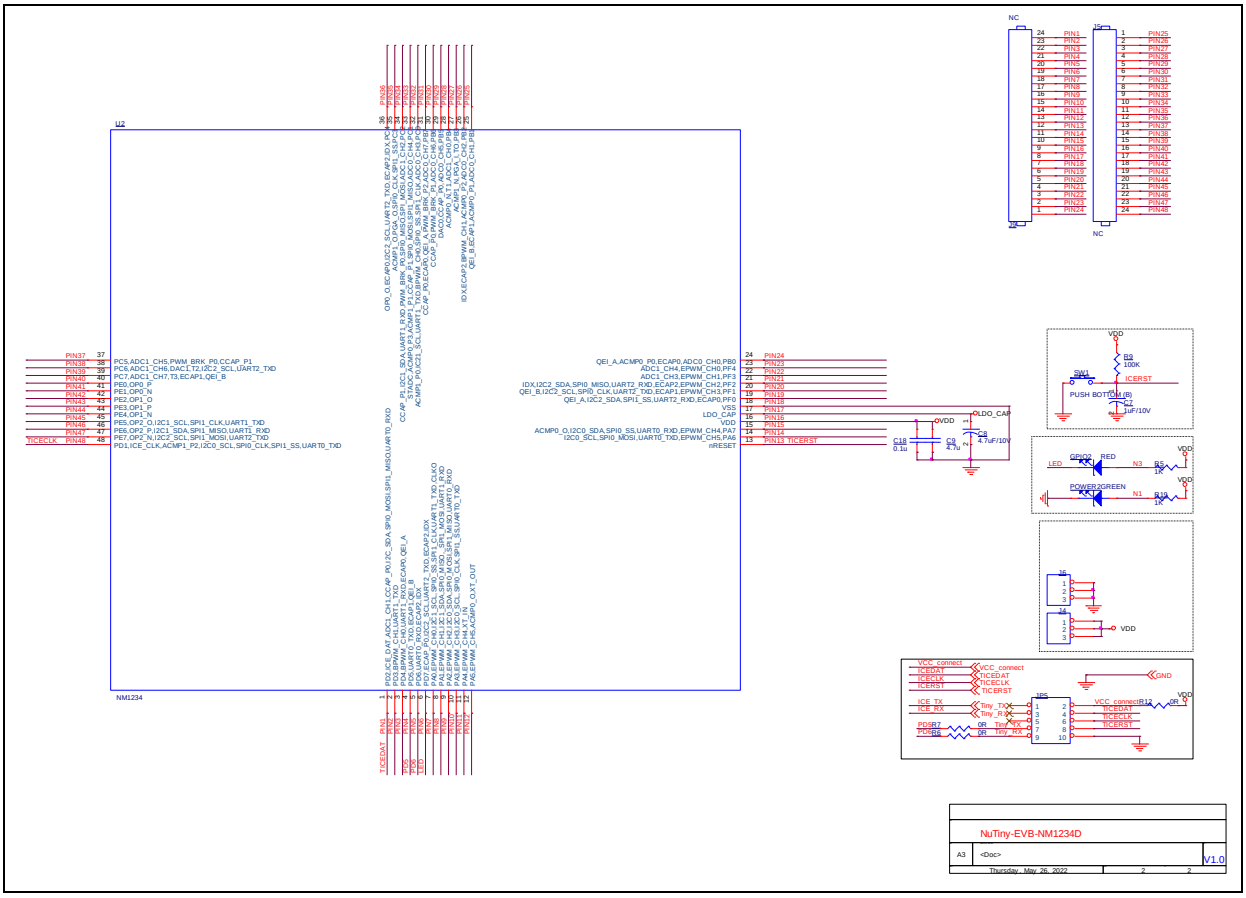


Figure 6-2 NuTiny-EVB-NM1234D PCB Placement

6.3 Nu-Link-Me V3.0 Schematic



6.4 NuTiny-EVB-NM1234D Schematic



7 REVISION HISTORY

Date	Revision	Description
2022.05.26	1.00	1. 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.