

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

NuMicro[®] Family

NT-NM1200

User Manual

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1 OVERVIEW

NuTiny-EVB-NM1200(**NT-NM1200**) is the specific development tool for NuMicro® NM1200 series. Users can use NuTiny-EVB-NM1200 to develop and verify the application program easily.

The ARM® Cortex®-M0 core within NuMicro® NM1200 series can run up to 48 MHz and operate at 2.1V ~ 5.5V, -40°C ~ 105°C, and thus can afford to support a variety of industrial control and applications which need high CPU performance. The NM1200/NM1100 series offers 17.5K-bytes embedded program flash, size configurable Data Flash (shared with program flash), 2K-byte flash for the ISP, and 2K-byte SRAM.

Many system level peripheral functions, such as I/O Port, Timer, UART, SPI, I₂C, PWM, ADC, Watchdog Timer, Analog Comparator and Brown-out Detector, have been incorporated into the NM1200/NM1100 series in order to reduce component count, board space and system cost. These useful functions make the NM1200/NM1100 series powerful for a wide range of applications.

2 NUTINY-EVB-NM1200 INTRODUCTION

NuTiny-EVB-NM1200 uses the NM1200EC1AE as the target microcontroller. Figure 2-1 is NuTiny-EVB-NM1200 for NM1200 series, the left portion is called NuTiny-EVB-NM1200 and the right portion is Debug Adaptor called Nu-Link-Me.

NuTiny-EVB-NM1200 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 NM1200 series features. The NuTiny-EVB-NM1200 can be a real system controller to design users' target systems, supports usb high speed interface, audio headphone out, audio line in and sdcad slot.

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. 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.

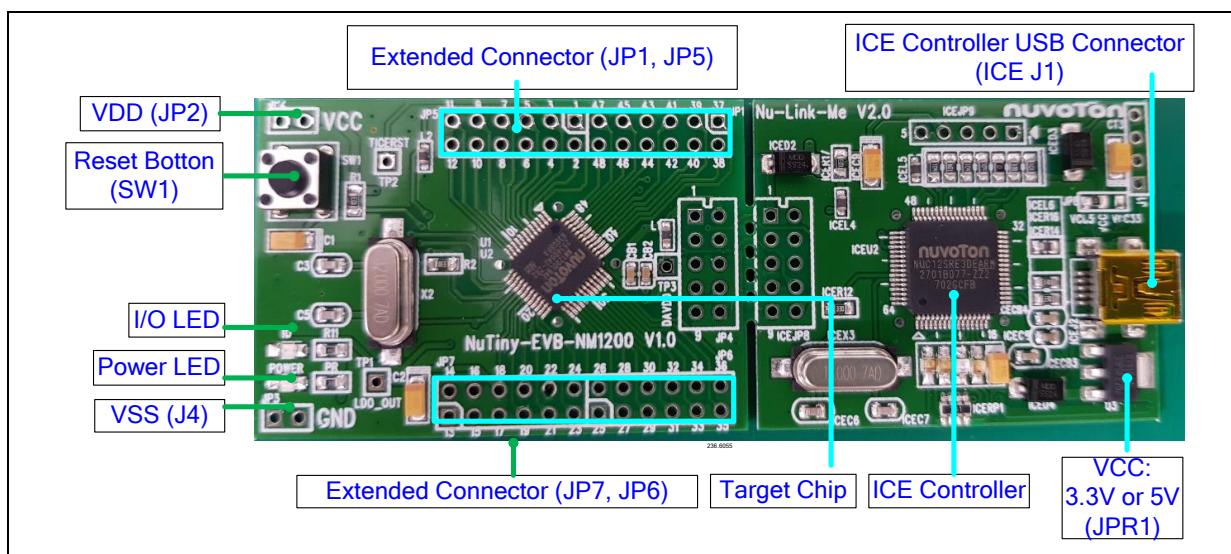


Figure 2-1 NuTiny-EVB-NM1200 (PCB Board)

2.1 NuTiny -EVB-NM1200 Jumper Description

2.1.1 Power Setting

- J1: USB port in Nu-Link-Me
- J2: VDD Voltage connector in NuTiny-EVB-NM1200

Model	JPR1	J1 USB port	J2 VDD	MCU Voltage
Model 1	Select VCC33 (default)	Connect to PC	DC 3.3V output	DC 3.3V
Model 2	X	X	DC 2.1 V ~ 5.5 V Input	Voltage by J2 input

X: Unused.

2.1.2 Debug Connector

- JP4: Connector in target board (NuTiny-EVB-NM1200) for connecting with Nuvoton ICE adaptor (Nu-Link-Me V2.0)
- JP8: Connector in ICE adaptor (Nu-Link-Me V2.0) for connecting with a target board (for example NuTiny-EVB-NM1200)

2.1.3 USB Connector

- J2: Mini USB Connector in Nu-Link-Me V2.0 connected to a PC USB port

2.1.4 Extended Connector

- JP1,JP5, JP6,JP7: Show all chip pins in NuTiny-EVB-NM1200

2.1.5 Reset Button

- SW1: Reset button in NuTiny-EVB-NM1200

2.1.6 Power Connector

- JP2: VDD connector in NuTiny-EVB-NM1200
- JP3: VSS connector in NuTiny-EVB-NM1200

2.2 Pin Assignment for Extended Connector

NuTiny-EVB-NM1200 provides NM1200VE3AE on board and the extended connector for (JP1, JP5, JP6, JP7) for TSSOP28-pin. Table 2-1 is the pin assignment for NM1200.

Pin No	Pin Name
01	NC
02	P1.5, ADC_CH5, ACMP0_P0, UART1_TX0
03	/RESET
04	P3.0, ADC_CH6, ACMP1_N, CCAP
05	AVSS
06	P5.4, ADC_CH8
07	P3.1, ADC_CH7, ACMP1_P0, CCAP
08	P3.2, INT0, STADC, TM0_EXT, ACMP1_P1
09	P3.4, TM0, I2C_SDA, ACMP1_P2, ADC_CH9
10	P3.5, TM1, I2C_SCL, ACMP1_P3, ADC_CH10
11	P3.7
12	NC
13	NC
14	P3.6, ACMP0_O, CKO, TM1_EXT, ADC_CH11
15	P5.1, XTAL2
16	P5.0, XTAL1
17	VSS
18	LDO_CAP
19	P5.5
20	P5.2, INT1, CCAP
21	NC
22	P2.2, PWM0
23	P2.3, PWM1
24	P2.4, PWM2, UART1_RX1
25	P2.5, PWM3, UART1_TX1
26	P2.6, PWM4, ACMP1_O
27	P2.7
28	NC

29	P4.6, ICE_CLK
30	P4.7, ICE_DAT
31	NC
32	P0.7, SPI_CLK, CCAP
33	P0.6, SPI_MISO, CCAP
34	P0.5, SPI莫斯I, CCAP
35	P0.4, SPI_SS, PWM5, CCAP
36	NC
37	P0.1, nRTS, UART0_RX0, SPI_SS
38	P0.0, nCTS, UART0_TX0
39	NC
40	NC
41	P5.3, ADC_CH0,
42	VDD
43	AVDD
44	P1.0, ADC_CH1, ACMP0_P1
45	P1.2, ADC_CH2, UART0_RX1, ACMP0_P2
46	P1.3, ADC_CH3, UART0_TX1, ACMP0_P3, INT0
47	P1.4, ADC_CH4, ACMP0_N, UART1_RX0
48	P1.6

Table 2-1 Pin Assignment for NM1200

3 HOW TO START NUTINY-EVB-NM1200 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-NM1200 Hardware Setup

3.4 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-EVB-NM1200 board. It can be found on Figure 3-2 list directory and downloaded from Nuvoton NuMicro® website.

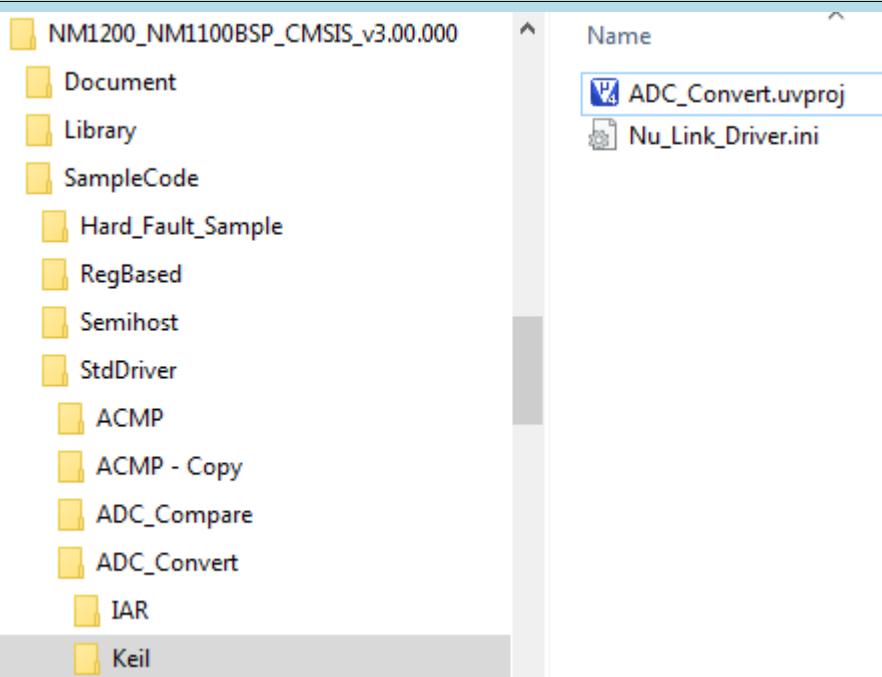
Directory	C:\ Nuvoton\BSP Library\NM1200BSP\SampleCode \StdDriver\SYS\KEIL
Project File	

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
 - ◆  RST Reset the device
 - ◆  Run the application

4 HOW TO START NUTINY -EVB-NM1200 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-NM1200 Hardware Setup

4.4 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-EVB-NM1200 board. It can be found on Figure 4-2 list directory and downloaded from Nuvoton NuMicro® website.

Directory	C:\ Nuvoton\BSP Library\NM1200BSP\SampleCode \StdDriver\SYS\IAR						
Project File	<ul style="list-style-type: none"> NM1200_NM1100BSP_CMSIS_v3.00.000 Document Library SampleCode Hard_Fault_Sample RegBased Semihost StdDriver ACMP ACMP - Copy ADC_Compare ADC_Convert IAR Keil 	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Name</th> </tr> </thead> <tbody> <tr> <td>ADC.icf</td> </tr> <tr> <td>ADC_Covert.ewd</td> </tr> <tr> <td>ADC_Covert.ewp</td> </tr> <tr> <td>ADC_Covert.eww</td> </tr> </tbody> </table>	Name	ADC.icf	ADC_Covert.ewd	ADC_Covert.ewp	ADC_Covert.eww
Name							
ADC.icf							
ADC_Covert.ewd							
ADC_Covert.ewp							
ADC_Covert.eww							

Figure 4-2 Example Directory

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

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

5 STARTING TO USE NU-LINK-ME 2.0 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.

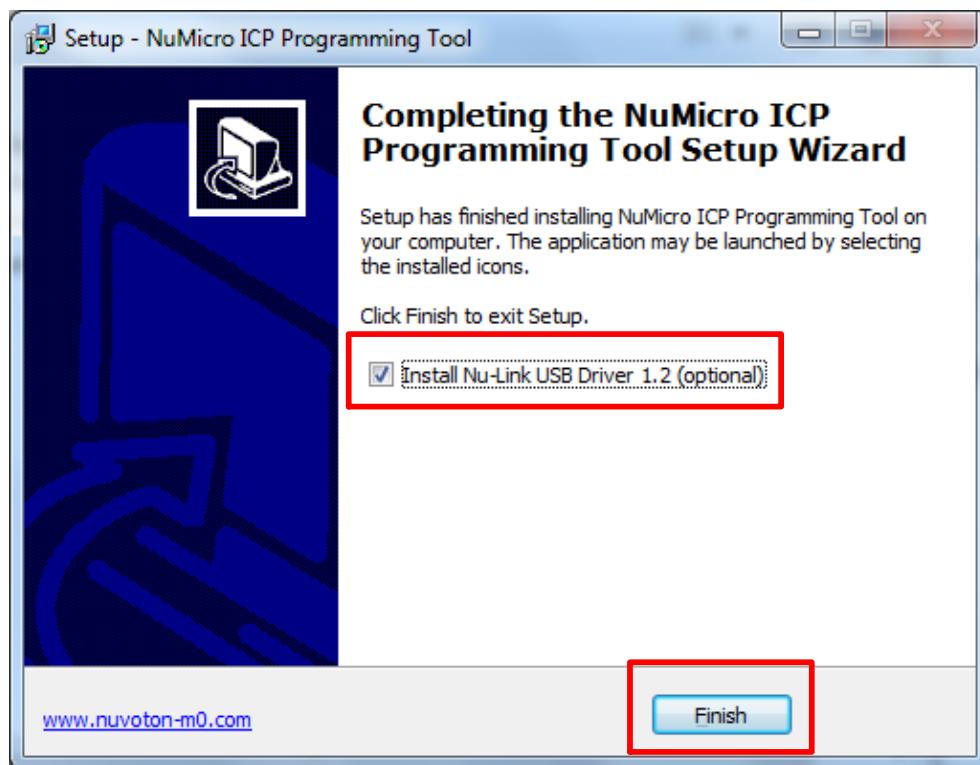


Figure 5-1 Optional Step after ICP Programming Tool Installation

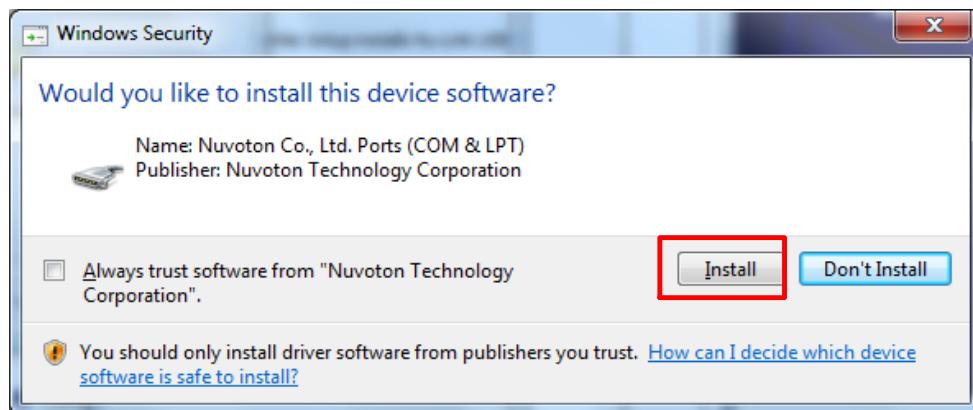


Figure 5-2 Install Nuvoton COM&LPT Driver

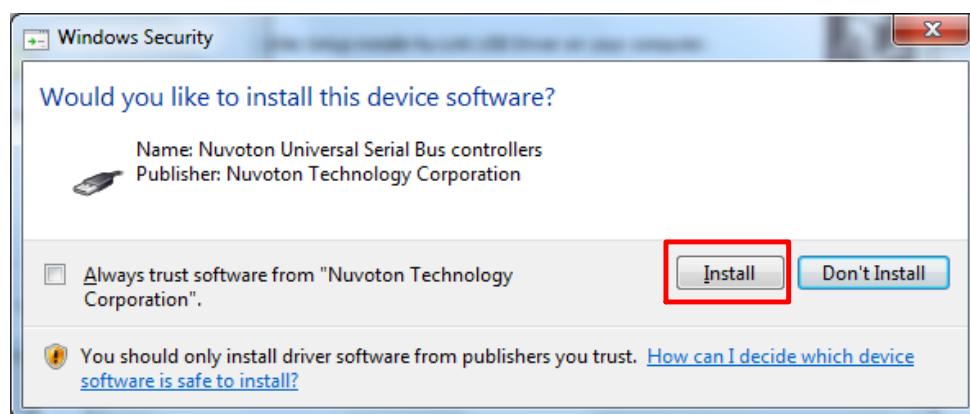


Figure 5-3 Install Nuvoton Universal Serial Bus Controllers

5.2 VCOM Mode Setting on NuTiny-EVB-NM1200

Before the NuTiny-EVB-NM1200 is connected to the PC, please enable SW2 VCOM function by switching on SW2. The NuTiny-EVB-NM1200 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_NM1200.h to check the using UART in DEBUG_PORT, which has to be the same as the using UART in the NuTiny-EVB-NM1200.

The screenshot shows the Keil µVision IDE interface. On the left is the project tree for "ADC_Covert" containing CMSIS, User, and Library folders with files like main.c, clk.c, retarget.c, sys.c, uart.c, and adc.c. On the right is the code editor showing the "retarget.c" file. The code includes a conditional compilation directive #ifdef DEBUG_ENABLE_UART1 followed by #define DEBUG_PORTUART1, which is highlighted with a red box. The code also includes #endif directives and other definitions for sys.c and uart.c.

```

17 /* Insist on keeping widthprec, t
18 #pragma import _printf_widthprec
19 #endiff
20 #endiff
21
22 #ifdef DEBUG_ENABLE_UART1
23 #define DEBUG_PORTUART1
24 #else
25 #define DEBUG_PORTUART0
26 #endiff
27
28 /* Un-comment this line to disable
29 // #define DISABLE_UART
30

```

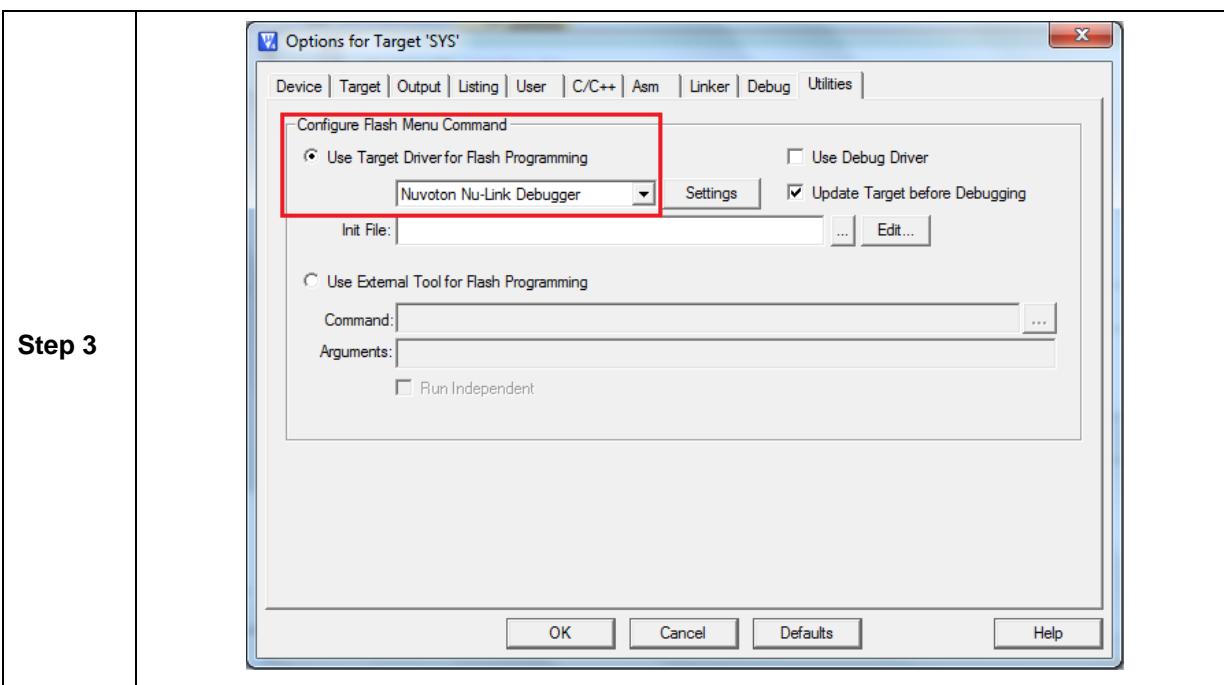
Figure 5-4 The Using UART on Keil µVision® IDE

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	<p>The screenshot shows the Nuvoton IDE interface. On the left, the project tree for 'ADC_Covert' is visible, containing CMSIS, User, Library, and retarget.c files. The 'retarget.c' file is selected. On the right, the 'Options for Target' dialog is open, specifically the 'Device' tab. The 'Device' dropdown is set to 'NuMicro Cortex-M Database'. Under 'Vendor: Nuvoton', 'Device: NM1200LBAE', and 'Toolset: ARM' are listed. A search bar is present. A list of devices is shown, with 'NM1200LBAE' highlighted in blue. To the right of the list, device details are displayed: Part number: NM1200LBAE, CPU Core: ARM 32-bit Cortex-M0, Memories: - SRAM: 2K, - App Flash: 17.5K, - ISP Flash: 2K, - Data Flash: 0~17.5K, and Features: - I/O: up to 34, - Timer: 2x32bit.</p>
Step 2	<p>The screenshot shows the 'Options for Target' dialog for the 'Debug' tab. The 'Device' tab is still selected. The 'Use' dropdown menu is open, showing 'Use Simulator' and 'Use: Nuvoton Nu-Link Debugger'. The 'Nuvoton Nu-Link Debugger' option is selected and highlighted with a red box. Other tabs like 'Target', 'Output', etc., are visible at the top. The 'Debug' tab contains settings for the Nu-Link debugger, including Driver Version (6725r), ICE Version, Device Family (Cortex-M), Device ID, Port (SW), Max Clock (1MHz), Chip Select (Chip Type: NM1200), Reset Options (Connect: Normal, Reset: Autodetect), and Download Options (Verify Memory Code). Buttons for 'Cancel' and 'OK' are at the bottom right.</p>



5.3.3 Build and Download Code to NuTiny-EVB-NM1200

Please build the project and download code to NuTiny-EVB-NM1200.

5.3.4 Open the Serial Port Terminal

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

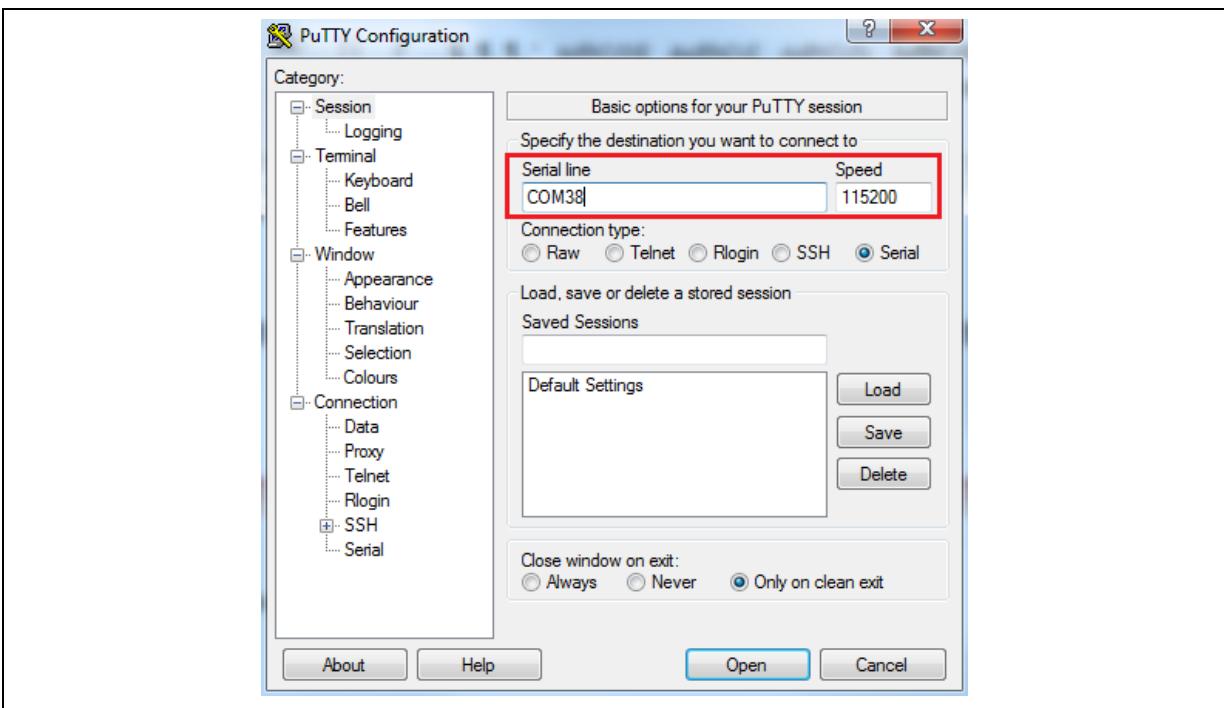
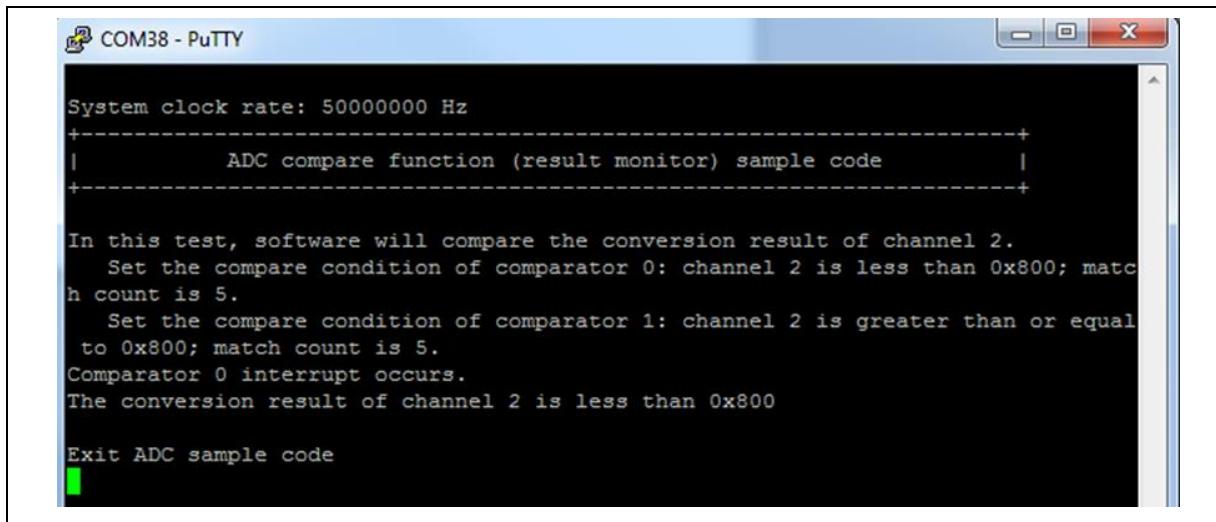


Figure 5-5 Set Baud Rate

5.3.5 Reset Chip

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



```
System clock rate: 50000000 Hz
+-----+
|       ADC compare function (result monitor) sample code   |
+-----+
In this test, software will compare the conversion result of channel 2.
Set the compare condition of comparator 0: channel 2 is less than 0x800; match
count is 5.
Set the compare condition of comparator 1: channel 2 is greater than or equal
to 0x800; match count is 5.
Comparator 0 interrupt occurs.
The conversion result of channel 2 is less than 0x800

Exit ADC sample code
```

Figure 5-6 Serial Port Terminal Windows

Notice: Please switch SW2 on before the NuTiny-EVB-NM1200 connects to the PC. When the NuTiny-EVB-NM1200 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-NM1200 SCHEMATIC

6.1 NuTiny-EVB-NM1200 PCB Placemen (TOP)

Users can refer to Figure 6-1 for the NuTiny-EVB-NM1200 PCB placements.

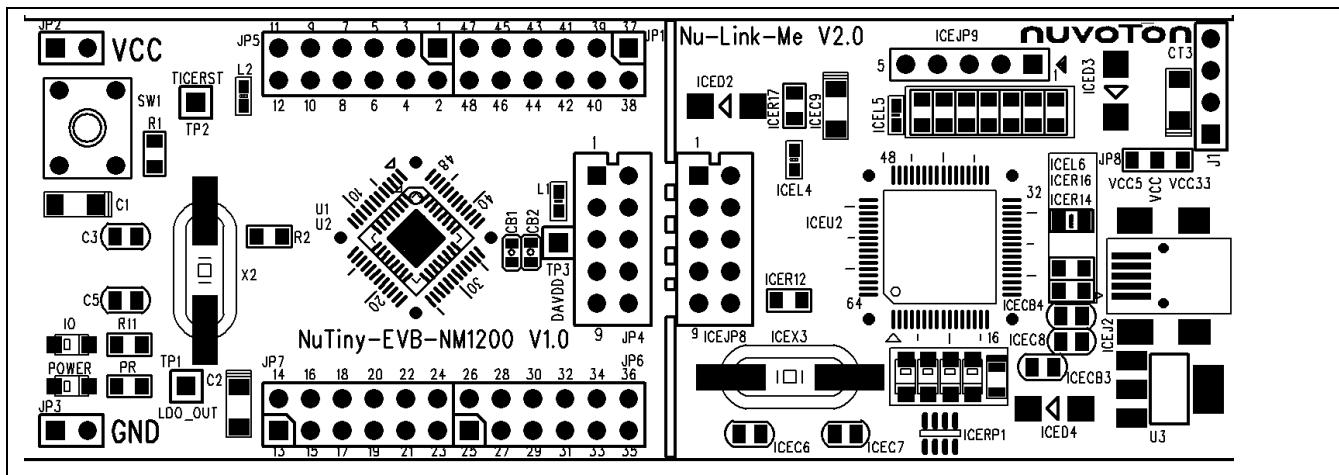


Figure 6-1 NuTiny-EVB-NM1200 PCB Placement

6.2 NuTiny-EVB-NM1200 PCB Placemen (Bottom)

Users can refer to Figure 6-1 for the NuTiny-EVB-NM1200 PCB placements.

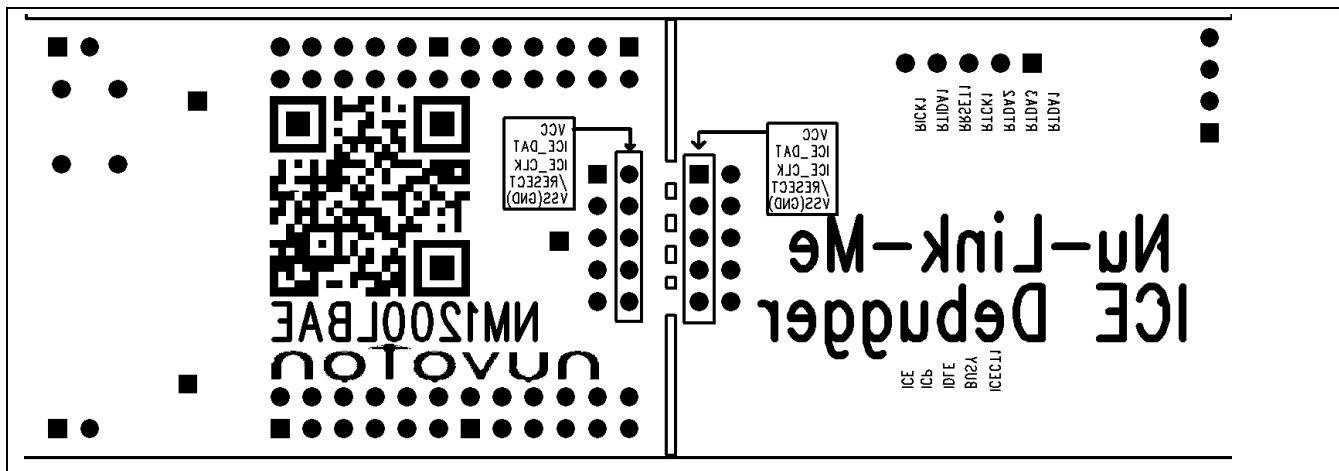
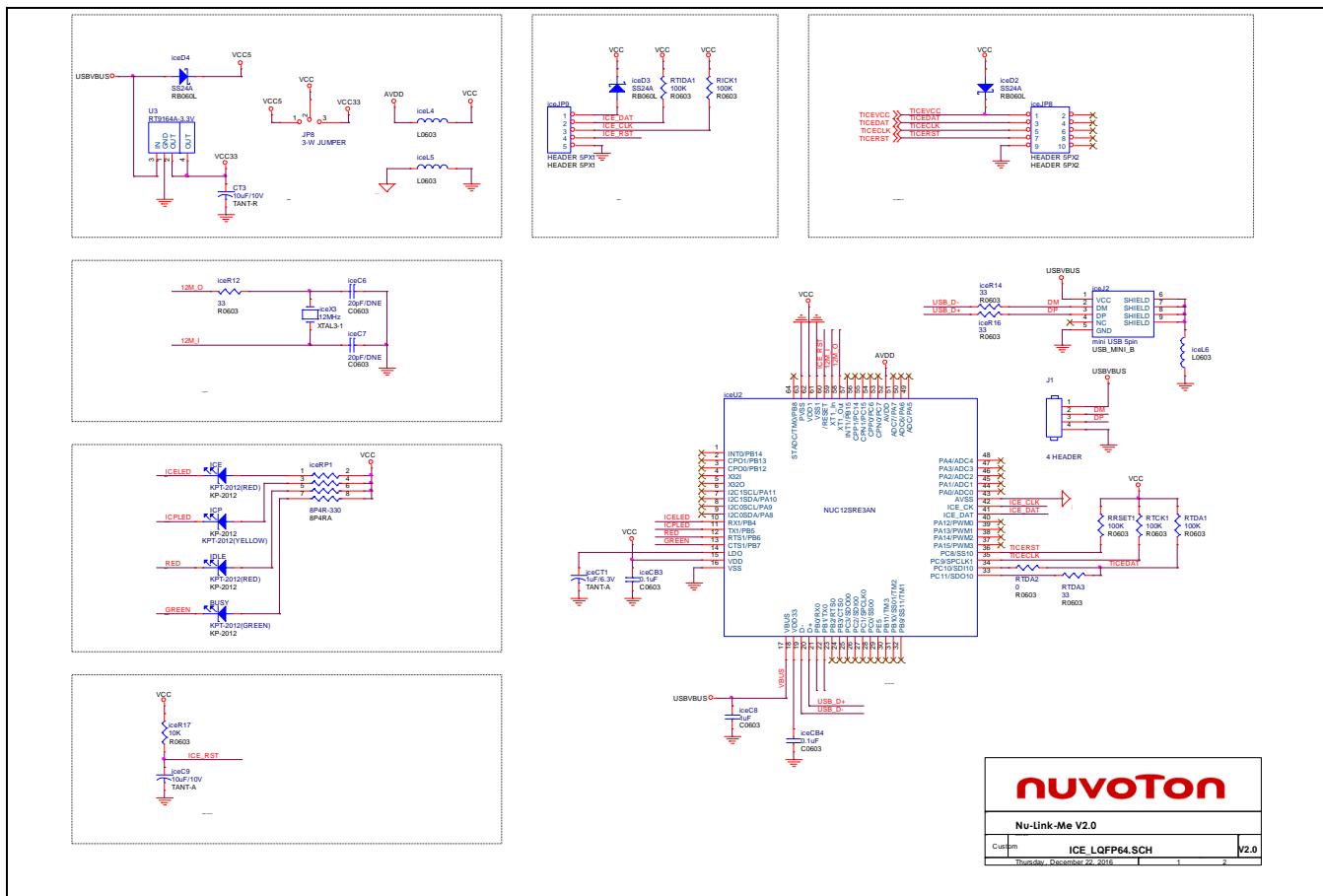


Figure 6-2 NuTiny-EVB-NM1200 PCB Placement

6.3 Nu-Link-Me V2.0 Schematic



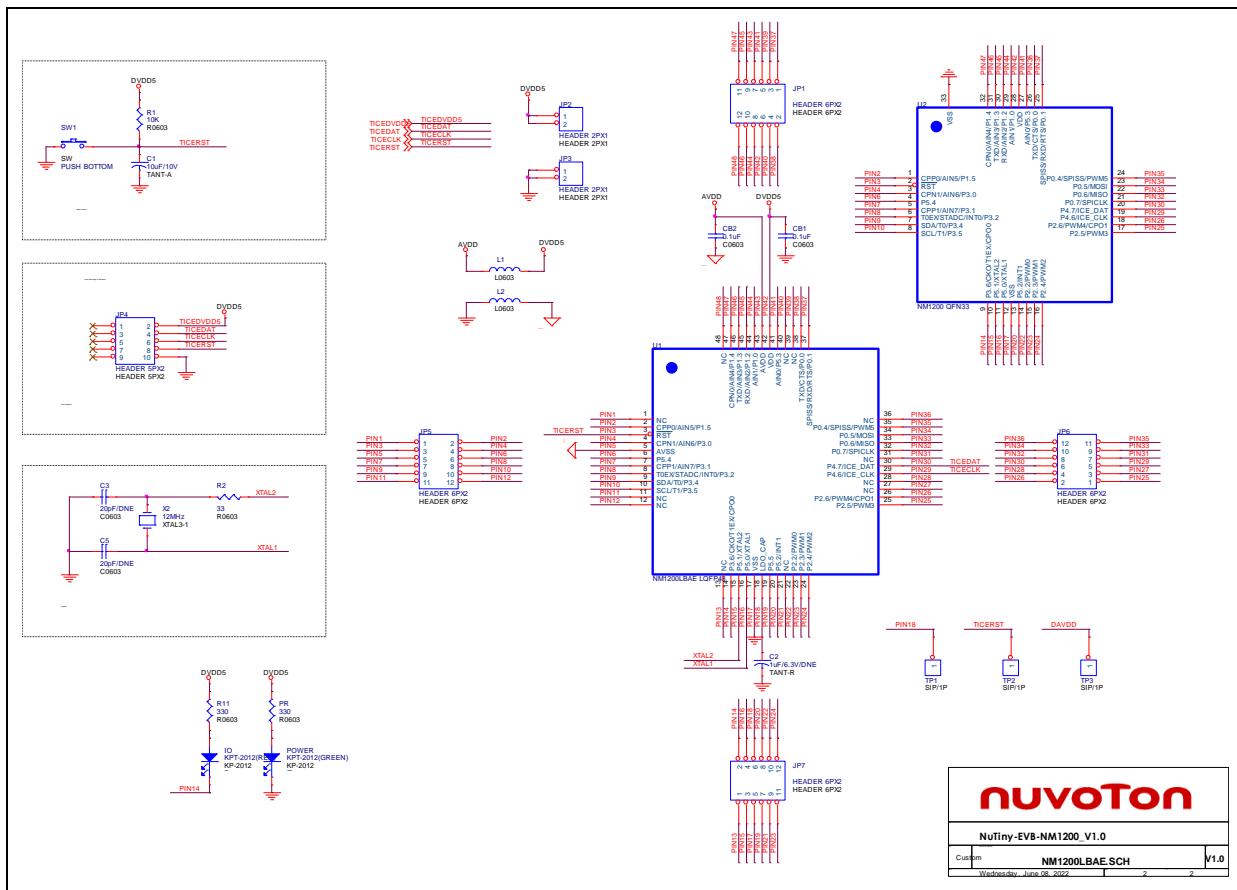
nuvoTon

Nu-Link-Me V2.0

Custom ICE LOFP64.SCH V2.0

Thursday, December 22, 2016 1 2

6.4 NuTiny-EVB-NM1200 Schematic



nuvoTon

NuTiny-EVB-NM1200_V1.0

NM1200BAE.SCH

Wednesday, June 08, 2022

V1.0

7 REVISION HISTORY

Date	Revision	Description
2018.04.16	1.00	1. Initially issued.

Important Notice

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