

NuMicro[®] Family
1T 8051-based Microcontroller

NuTiny-N76S003AT
User Manual

Evaluation Board for NuMicro[®] 1T 8051 Series

The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.

Nuvoton is providing this document only for reference purposes of NuMicro microcontroller based system design. Nuvoton assumes no responsibility for errors or omissions.

All data and specifications are subject to change without notice.

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

www.nuvoton.com

Table of Contents

1	OVERVIEW	5
2	FEATURES	6
3	HARDWARE CONFIGURATION.....	7
3.1	Front View.....	7
3.2	Virtual COM Port Switch Description	7
3.3	NuTiny-N76S003AT Power Setting and Connector	8
3.3.1	Power Setting	8
3.3.2	Debug Connector	8
3.3.3	ICE USB Connector	8
3.3.4	Extended Connector.....	8
3.3.5	Reset Button.....	8
3.3.6	Power Connector.....	8
3.3.7	Virtual COM Port Function Switch.....	8
3.3.8	Pin Assignment for Extended Connector	8
4	QUICK START	10
4.1	Toolchains Supporting	10
4.2	Nuvoton Nu-Link Driver Installation	10
4.3	BSP Firmware Download	12
4.4	Hardware Setup	12
4.5	Find the Example Project	13
4.6	Execute the Project under Toolchains	14
4.6.1	Keil MDK.....	14
4.6.2	IAR EWARM.....	18
5	NUTINY-N76S003AT SCHEMATICS	20
5.1	Nu-Link2-Me	20
5.2	NuTiny-N76S003AT Schematics.....	21
5.3	PCB Placement.....	21
6	REVISION HISTORY.....	23

List of Figures

Figure 3.1-1 NuTiny-N76S003AT (PCB Board)	7
Figure 4.2-1 Nu-Link USB Driver Installation Setup	10
Figure 4.2-2 Nu-Link USB Driver Installation	11
Figure 4.4-1 Open VCOM Function	12
Figure 4.4-2 ICE USB Connector	12
Figure 4.4-3 Device Manger	13
Figure 4.4-4 PuTTY Session Setting	13
Figure 4.5-1 Template Project Folder Path	14
Figure 4.6-1 Warning Message of “Device not found”	14
Figure 4.6-2 Project File Migrate to Version 5 Format	15
Figure 4.6-3 Debugger Setting in Options Window	15
Figure 4.6-4 Programming Setting in Options Window	16
Figure 4.6-5 Compile and Download the Project	16
Figure 4.6-6 Keil MDK Debug Mode	17
Figure 4.6-7 Debug Message on Serial Port Terminal Windows	17
Figure 4.6-8 IAR EWARM Window	18
Figure 4.6-9 Compile and Download the Project	18
Figure 4.6-10 IAR EWARM Debug Mode	19
Figure 4.6-11 Debug Message on Serial Port Terminal Windows	19
Figure 5.1-1 Nu-Link2-Me Circuit	20
Figure 5.2-1 N76S003AT20 Target Board Circuit	21
Figure 5.3-1 Front Placement	21
Figure 5.3-2 Rear Placement	22

List of Tables

Table 3.3-1 Voltage connector 8

Table 3.3-2 Nu-Link-Me virtual COM port 8

Table 3.3-3 Pin Assignment for N76S003AT20 9

1 OVERVIEW

The NuTiny-N76S003AT is an evaluation board for Nuvoton NuMicro N76S003AT20 microcontrollers. The NuTiny-N76S003AT consists of two parts: an N76S003 target board and an on-board Nu-Link2-Me debugger and programmer. The NuTiny-N76S003AT is designed for project evaluation, prototype development and validation with power consumption monitoring function. The NuTiny-N76S003AT board is suitable for a wide range of applications such as home appliances, LED lighting controls, motor controls or Industrial automation.

The N76S003 target board is based on NuMicro N76S003AT20. For the development flexibility, the N76S003AT20 target board provides the extension connectors. Furthermore, the Nuvoton-designed ammeter connector can measure the power consumption instantly, which is essential for the prototype evaluation.

In addition, there is an attached on-board debugger and programmer “Nu-Link2-Me”. The Nu-Link2-Me supports on-chip debugging, online and offline ICP programming via SWD interface. The Nu-Link2-Me supports virtual COM (VCOM) port for printing debug messages on PC. Besides, the programming status could be shown on the built-in LEDs. Lastly, the Nu-Link2-Me could be detached from the evaluation board and become a stand-alone mass production programmer.

2 FEATURES

- NuMicro N76S003AT20 used as main microcontroller
- N76S003AT20 full pins extension connectors
- Flexible board power supply:
 - External V_{DD} power connector
 - ICE USB connector on Nu-Link2-Me
- On-board Nu-Link2-Me debugger and programmer:
 - Debug through OCD interface
 - Online/offline programming
 - Virtual COM port function

3 HARDWARE CONFIGURATION

3.1 Front View

NuTiny-N76S003AT uses the N76S003AT20 as the target microcontroller. Figure 3.1-1 NuTiny-N76S003AT (PCB Board)

is NuTiny-N76S003AT for the N76S003 series, the left portion is called NuTiny-N76S003AT and the right portion is Debug Adaptor called Nu-Link-Me.

NuTiny-N76S003AT is similar to other development boards. User can use it to develop and verify applications to emulate the real behavior. The on-board chip covers N76S003 series features. The NuTiny-N76S003AT can be a real system controller to design user's target systems.

Nu-Link-Me is a Debug Adaptor. The Nu-Link-Me Debug Adaptor connects your PC's USB port to the user's target system (via Serial Wired Debug Port) and allows user to program and debug embedded programs on the target hardware. To use Nu-Link-Me Debug adaptor with Keil, please refer to "Nuvoton Nu-Link debug adapter user manual" in detail. This document will be stored in the local hard disk when user installs each driver. Nu-Link-Me also supports virtual COM port function. User can use Nu-Link-Me as a USB to UART virtual COM port, which connects to on-board N76S003 AT20 UART0.

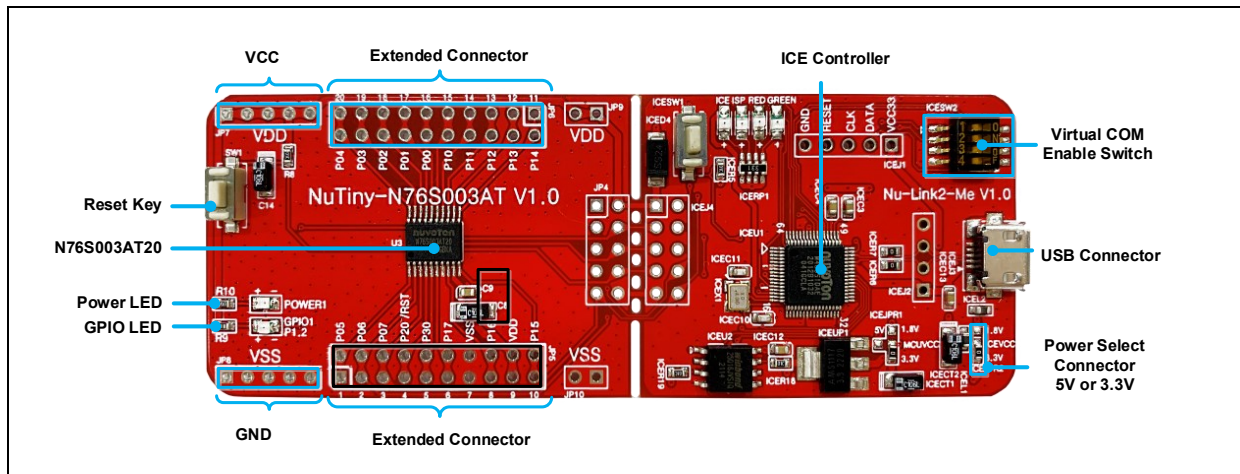


Figure 3.1-1 NuTiny-N76S003AT (PCB Board)

3.2 Virtual COM Port Switch Description

The switch in Nu-Link-Me, SW3, determines that the virtual COM port function is enabled or disabled. When user turns on all of the positions of switch, the virtual COM port function will be enabled. By using virtual COM port function, user can access the USB device in the same way as it would access a standard COM port to N76S003 AT20 UART0. To use this function, user needs to install "VCOM Driver" at first. User can get "VCOM Driver" from NuMicroDVD www.nuvoton.com/NuMicroDVD in folder "Software Utilities".

3.3 NuTiny-N76S003AT Power Setting and Connector

3.3.1 Power Setting

- J1: USB port in Nu-Link-Me
- JP7 and JP9: VCC33 Voltage connector in NuTiny-N76S003AT

Model	JPR1	J1USB port	JP7 & JP9 VCC33	MCU Voltage
Model 1	Select VCC33 (default)	Connect to PC	DC 3.3V output	DC 3.3V
Model 2	X	X	DC 2.4 V ~ 5.5 V Input	Voltage by JP7 & JP9 input

Table 3.3-1 Voltage connector

3.3.2 Debug Connector

- JP4: Connector in target board (NuTiny-N76S003AT) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- JP2: Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (for example NuTiny-N76S003AT)

3.3.3 ICE USB Connector

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

3.3.4 Extended Connector

- JP5 and JP6: Show all chip pins in NuTiny-N76S003AT

3.3.5 Reset Button

- SW1: Reset button in NuTiny-N76S003AT

3.3.6 Power Connector

- JP7 and JP9: 3.3 VCC connector in NuTiny-N76S003AT
- JP8 and JP10: GND connector in NuTiny-N76S003AT

3.3.7 Virtual COM Port Function Switch

- SW3: Switch ON/OFF to enable or disable Nu-Link-Me virtual COM port function.

Function	Switch				Descriptions
	1	2	3	4	
Enable	ON	ON	ON	ON	Enable Nu-Link-Me virtual COM port function
Disable	OFF	OFF	OFF	OFF	Disable Nu-Link-Me virtual COM port function

Table 3.3-2 Nu-Link-Me virtual COM port

3.3.8 Pin Assignment for Extended Connector

NuTiny-N76S003AT provides N76S003AT20 on board and the extended connector for TSSOP-

20 pin. Table 3.3-3 is the pin assignment for N76S003AT20.

Pin No	Pin Function	Pin No	Pin Function
01	PWM2/IC6/T0/AIN4/P0.5	11	P1.4/SDA/FB/PWM1
02	TXD/AIN3/P0.6	12	P1.3/SCL/[STADC]
03	RXD/AIN2/P0.7	13	P1.2/PWM0/IC0
04	RST/P2.0	14	P1.1/PWM1/IC1/AIN7/CLO
05	INT0/OSCIN/AIN1/P3.0	15	P1.0/PWM2/IC2/SPCLK
06	INT1/AIN0/P1.7	16	P0.0/PWM3/IC3/MOSI/T1
07	GND	17	P0.1/PWM4/IC4/MISO
08	[SDA]/TXD_1/ICPDA/OCDDA/P1.6	18	P0.2/ICPCK/OCDC/RXD_1/[SCL]
09	VDD	19	P0.3/PWM5/IC5/AIN6
10	PWM5/IC7/SS/P1.5	20	P0.4/AIN5/STADC/PWM3/IC3

Table 3.3-3 Pin Assignment for N76S003AT20

4 QUICK START

4.1 Toolchains Supporting

Install the preferred toolchain. Please make sure at least one of the toolchains has been installed.

- [KEIL PK51 Professional Developer's Kit](#)
- [IAR EMBEDDED WORKBENCH FOR 8051](#)
- [NuEclipse Windows \(For NuMicro 8051\)](#)
- [NuEclipse Linux \(For NuMicro 8051\)](#)

4.2 Nuvoton Nu-Link Driver Installation

Download and install the latest Nuvoton Nu-Link Driver.

- Download and install [Nu-Link Keil Driver](#) when using Keil MDK.
- Download and install [Nu-Link IAR Driver](#) when using IAR EWARM.

Please install the Nu-Link USB Driver as well at the end of the installation. The installation is presented in Figure 4.2-1 Nu-Link USB Driver Installation Setup and Figure 4.2-2.

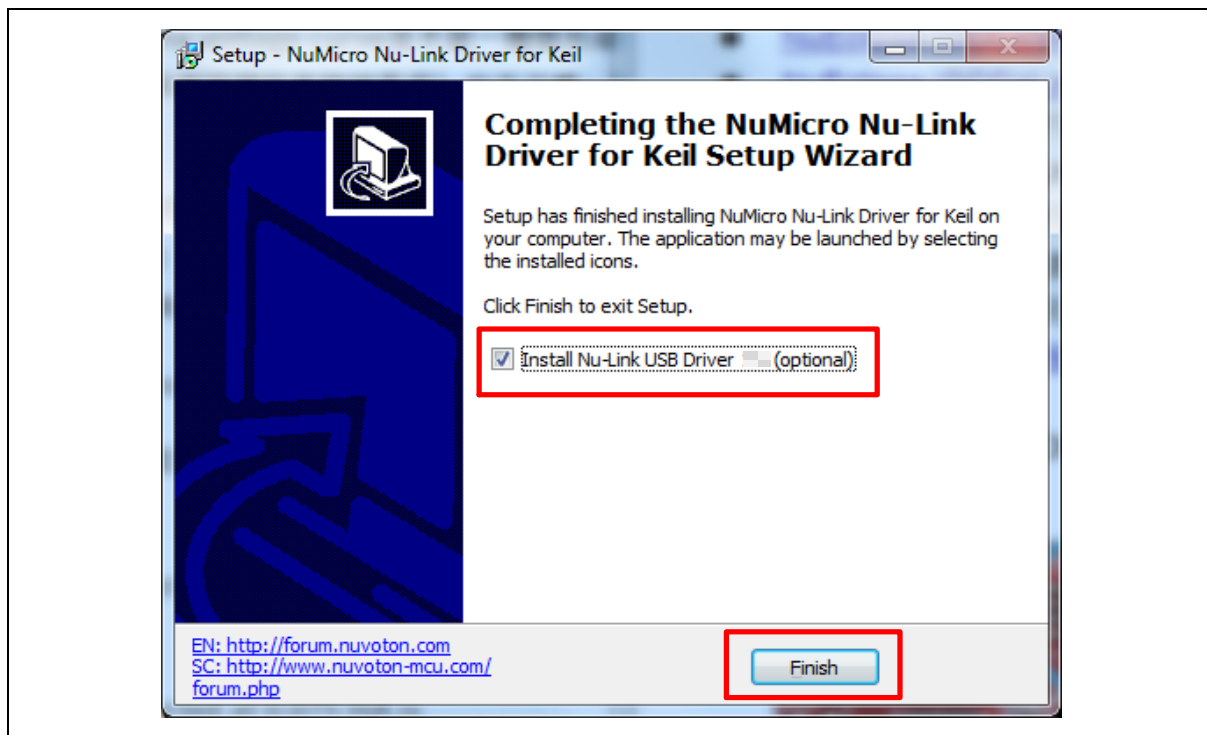


Figure 4.2-1 Nu-Link USB Driver Installation Setup

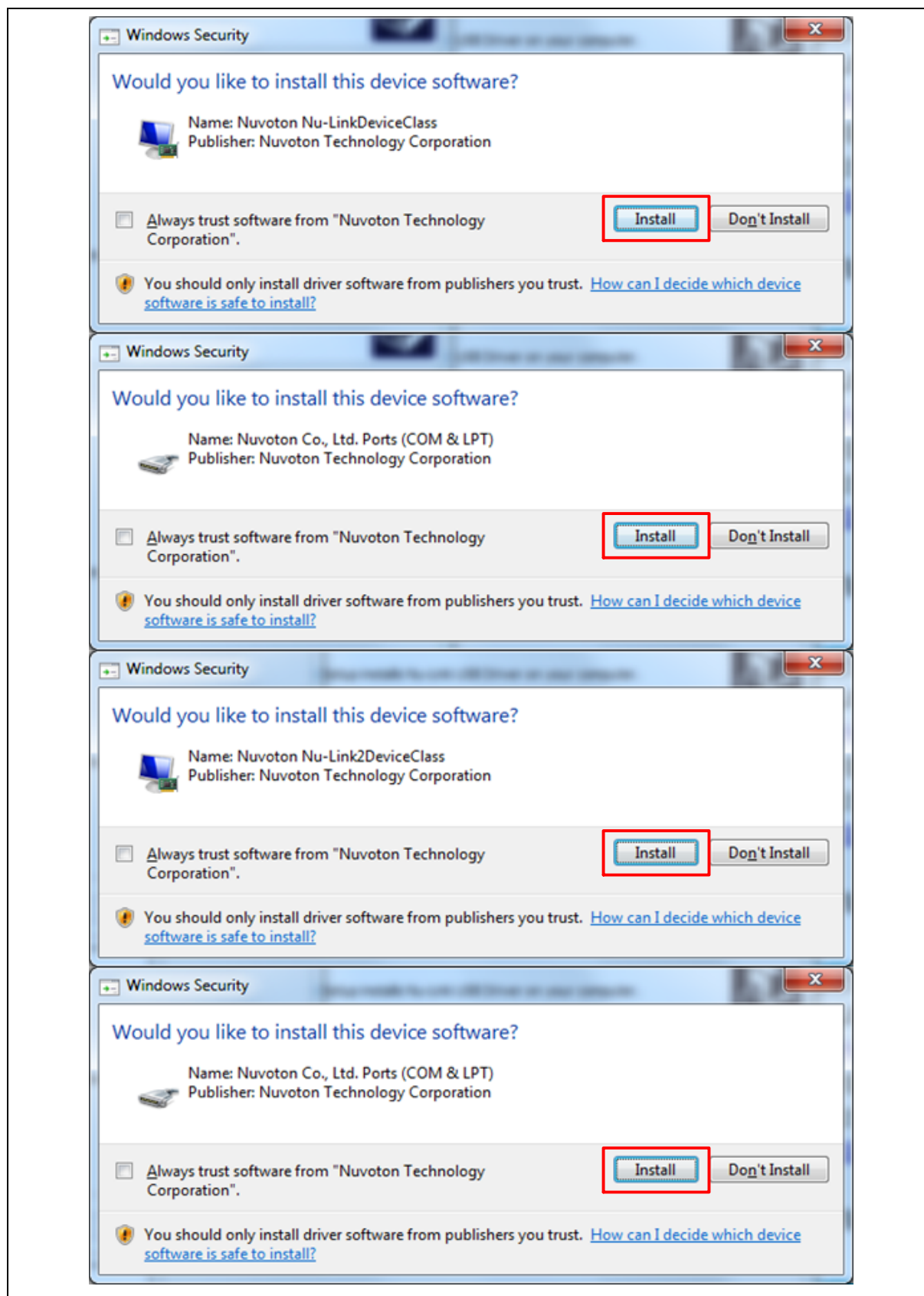


Figure 4.2-2 Nu-Link USB Driver Installation

4.3 BSP Firmware Download

Download and unzip the [Board Support Package \(BSP\)](#).

4.4 Hardware Setup

1. Open the virtual COM (VCOM) function by changing Nu-Link2-Me VCOM Switch No. 1 and 2 to ON.

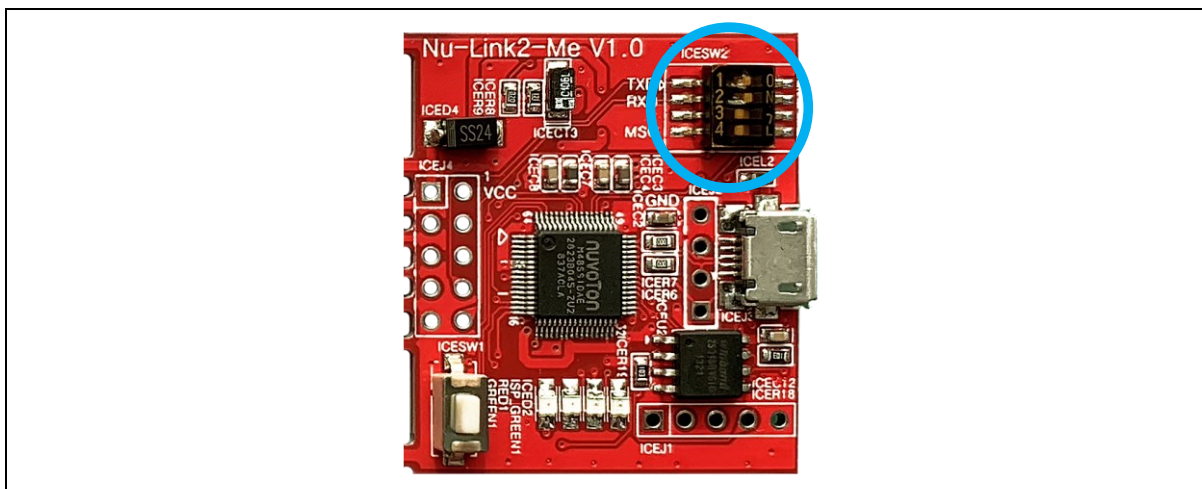


Figure 4.4-1 Open VCOM Function

2. Connect the ICE USB connector shown in Figure 4.4-2 to the PC USB port through a USB cable.

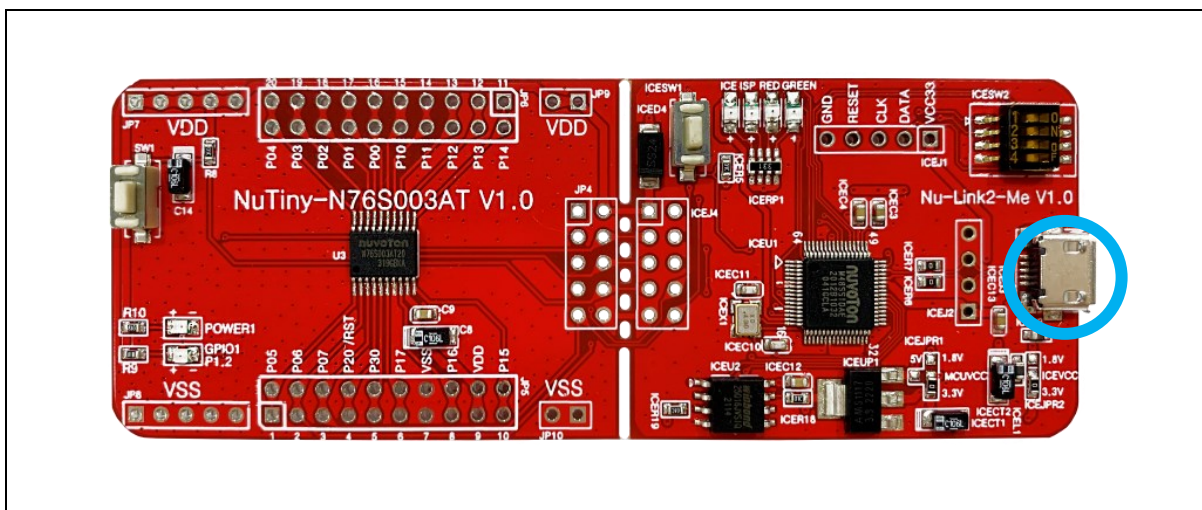


Figure 4.4-2 ICE USB Connector

- Find the “Nuvoton Virtual COM Port” on the Device Manger as Figure 4.4-3.

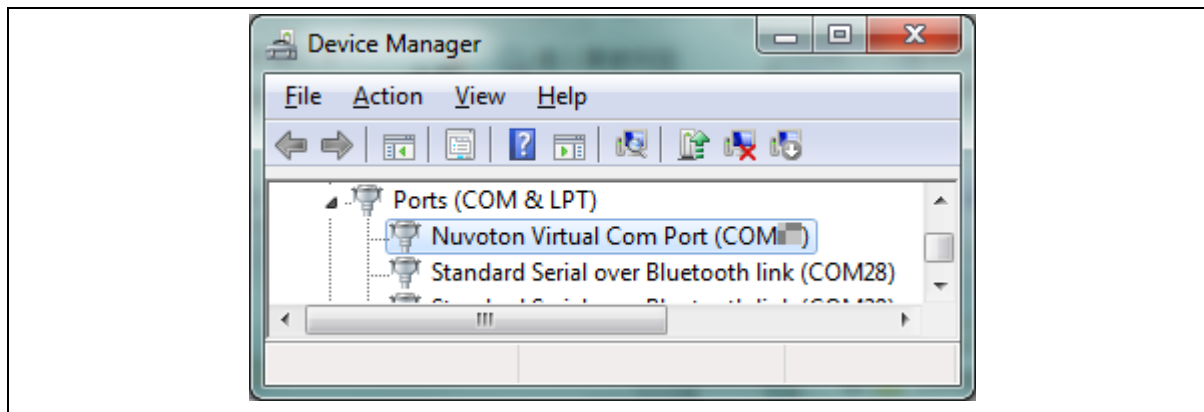


Figure 4.4-3 Device Manger

- Open a serial port terminal, PuTTY for example, to print out debug message. Set the speed to 115200. Figure 4.4-4 presents the PuTTY session setting.

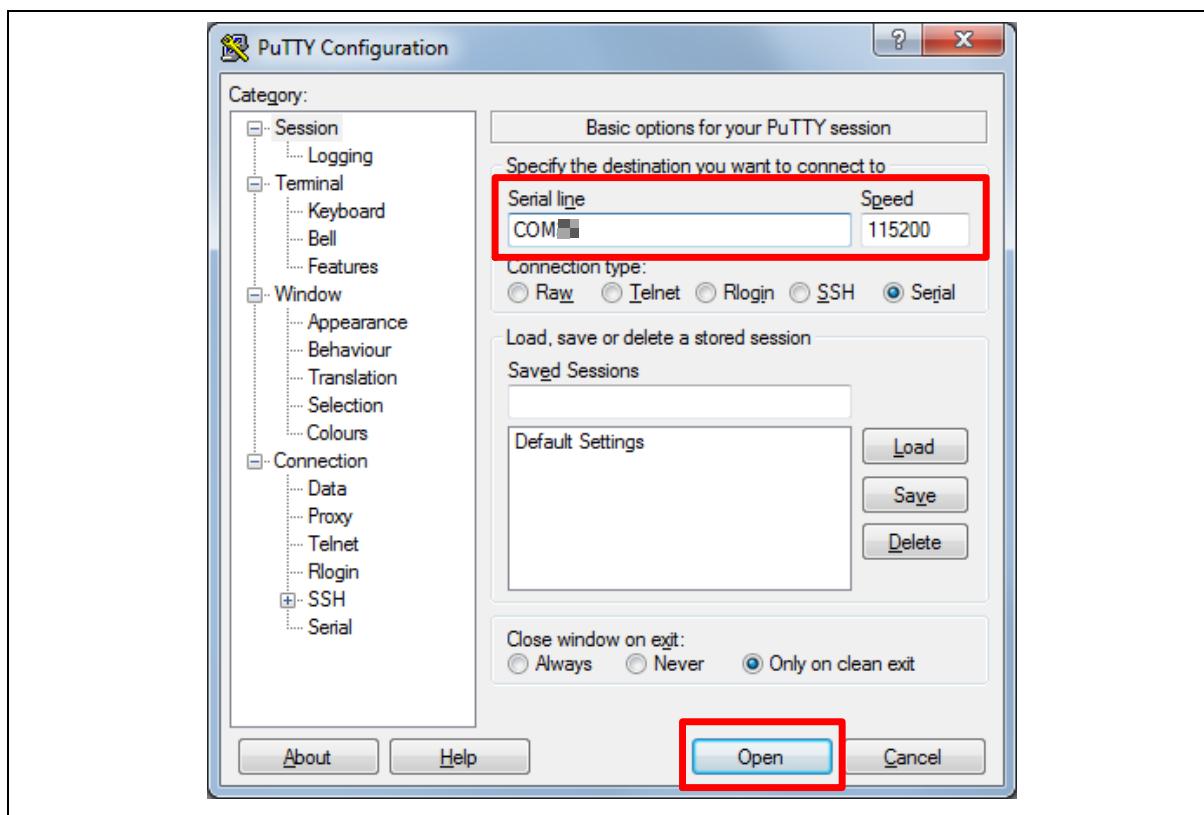


Figure 4.4-4 PuTTY Session Setting

4.5 Find the Example Project

Use the “Template” project as an example. The project can be found under the BSP folder as shown in Figure 4.5-1.

-  N76S003_BSP_C51_V1.00.000
-  SampleCode



Figure 4.5-1 Template Project Folder Path

4.6 Execute the Project under Toolchains

Open and execute the project under the toolchain. The section 4.6.1 and 4.6.2 describe the steps of executing project in Keil MDK and IAR EWARM, respectively.

4.6.1 Keil MDK

This section provides steps to beginners on how to run a project by using Keil MDK.

5. Double-click the “Template.uvproj” to open the project.

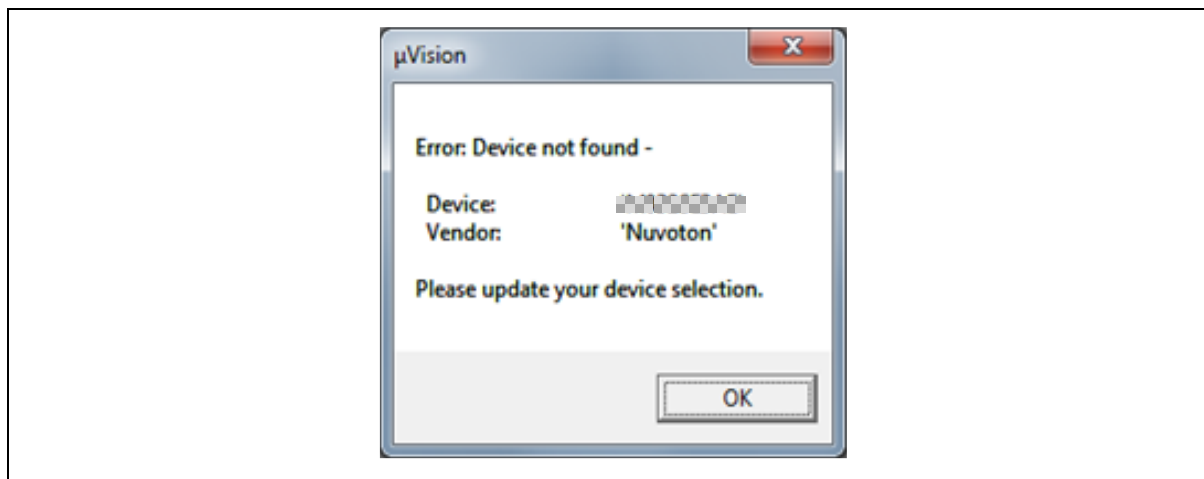


Figure 4.6-1 Warning Message of “Device not found”

Note: If Figure 4.6-1 warning message jumps out, please migrate to version 5 format as shown in Figure 4.6-2. The “.uvproj” filename extension will change to “.uvprojx”.

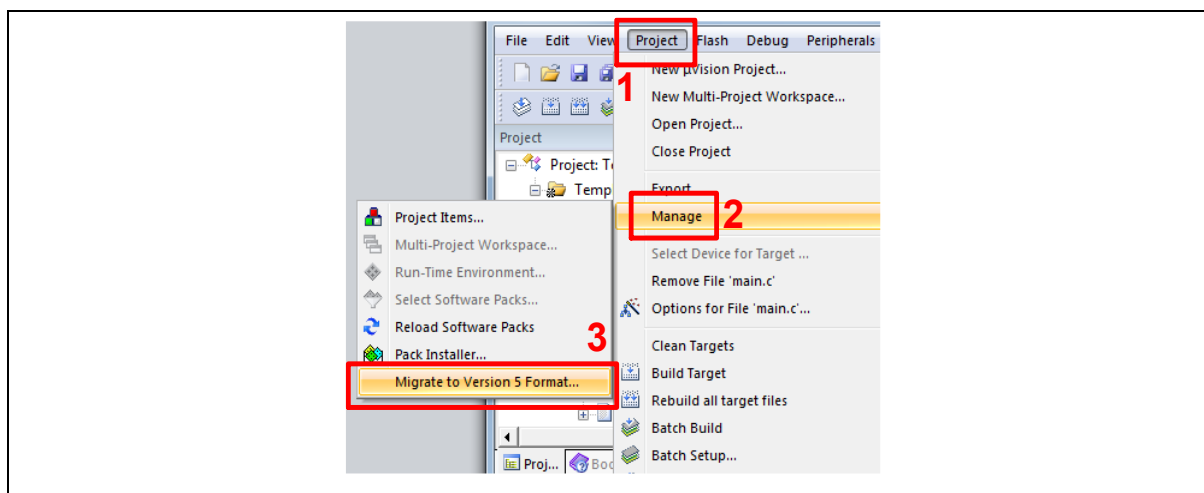


Figure 4.6-2 Project File Migrate to Version 5 Format

6. Make sure the debugger is “Nuvoton Nu-Link Debugger” as shown in Figure 4.6-3 and Figure 4.6-4.

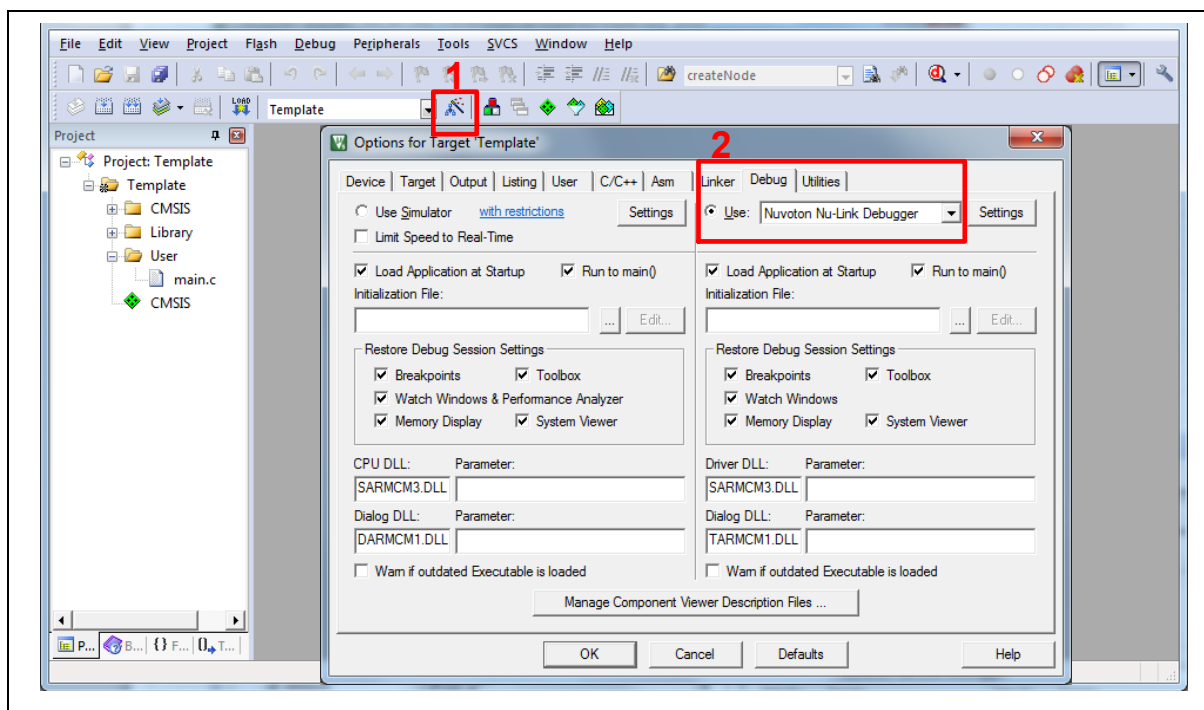


Figure 4.6-3 Debugger Setting in Options Window

Note: If the dropdown menu in Figure 4.6-3 does not contain “Nuvoton Nu-Link Debugger” item, please rework section.

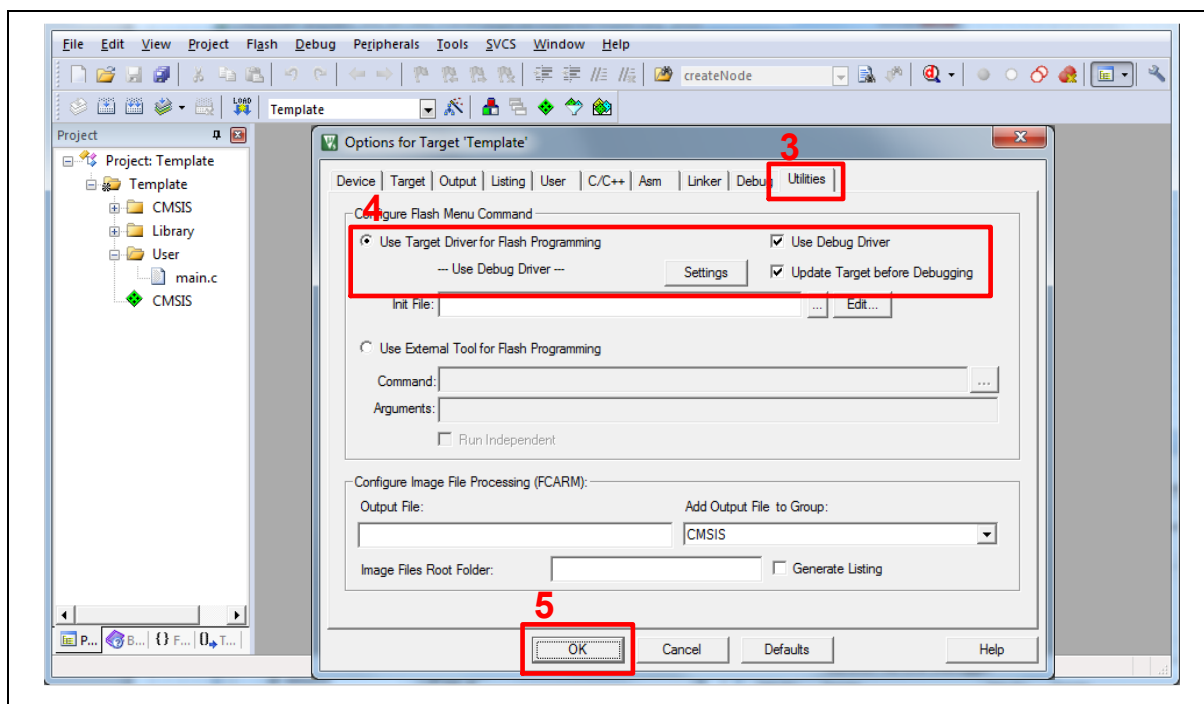


Figure 4.6-4 Programming Setting in Options Window

7. Rebuild all target files. After successfully compiling the project, download code to the Flash memory. Click **"Start/Stop Debug Section"** button to enter debug mode.

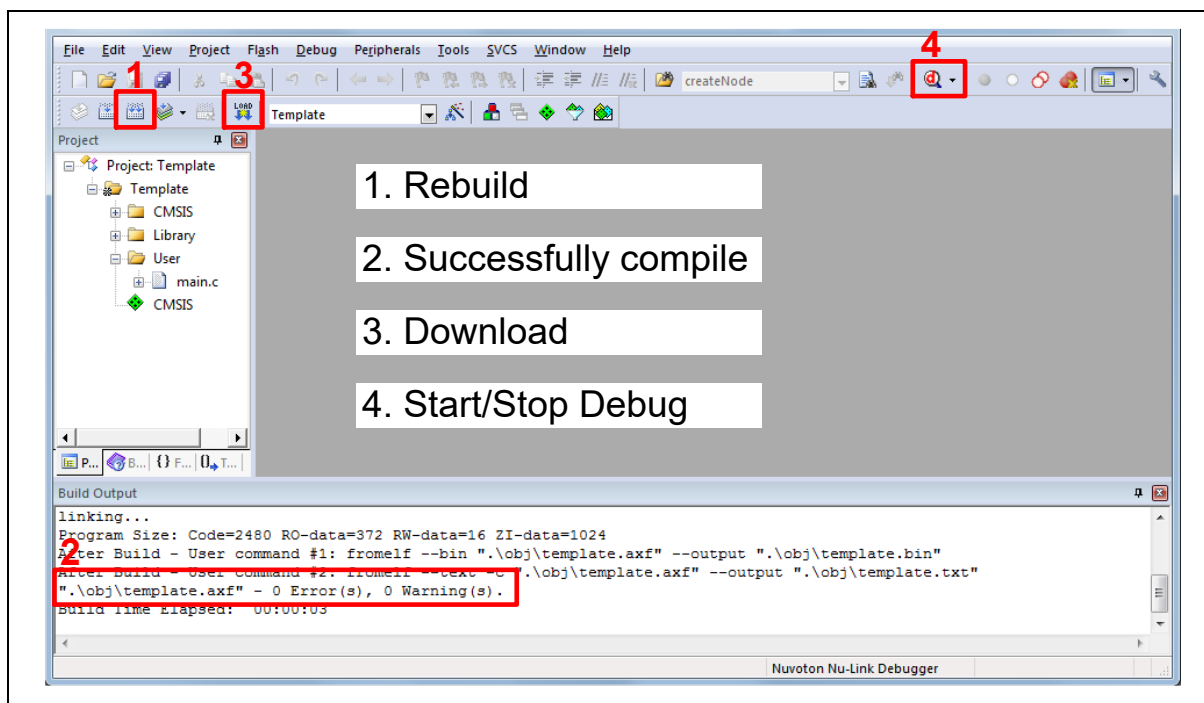


Figure 4.6-5 Compile and Download the Project

8. Figure 4.6-6 shows the debug mode under Keil MDK. Click **"Run"** and the debug message will

be printed out as shown in Figure 4.6-7. User can debug the project under debug mode by checking source code, assembly language, peripherals' registers, and setting breakpoint, step run, value monitor, etc.

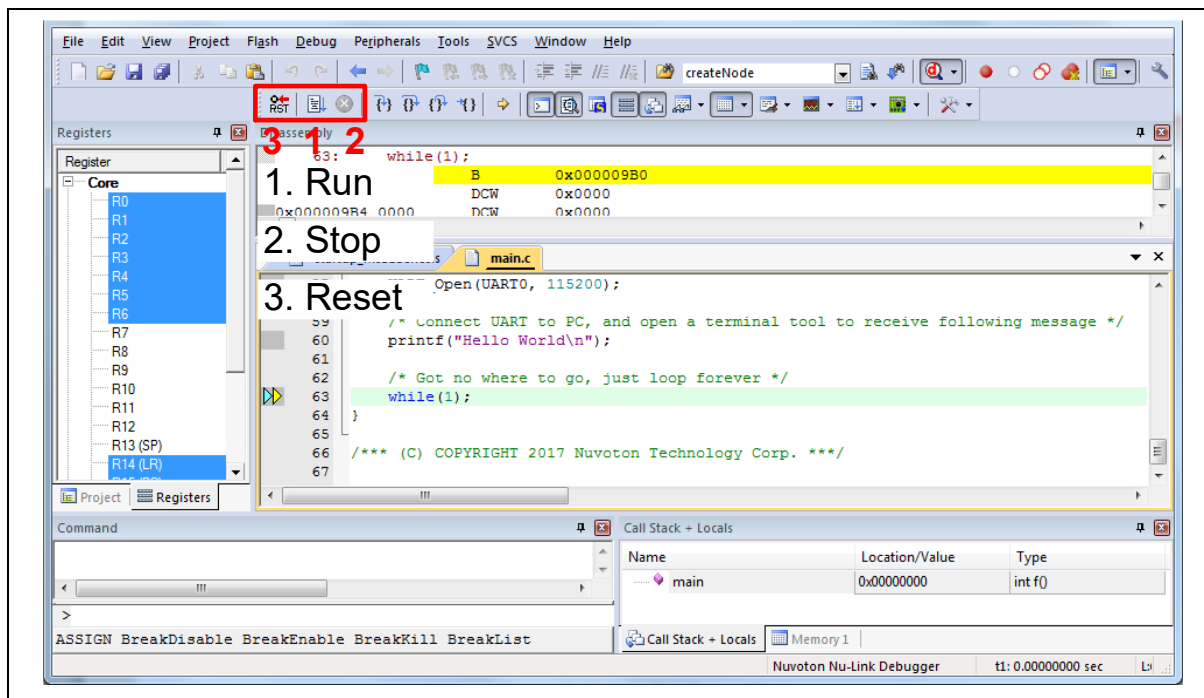


Figure 4.6-6 Keil MDK Debug Mode

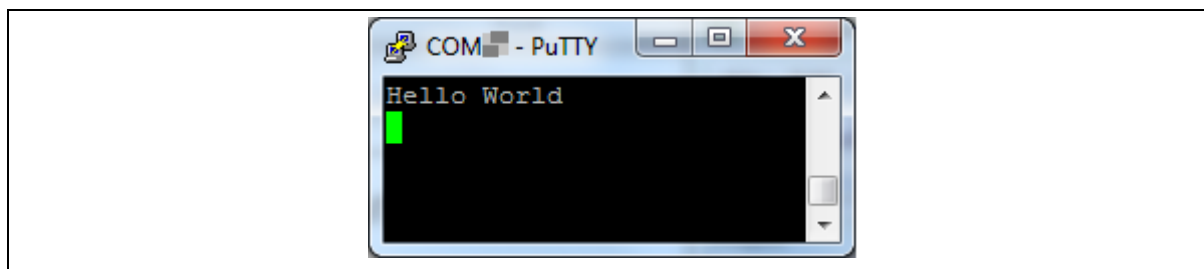


Figure 4.6-7 Debug Message on Serial Port Terminal Windows

4.6.2 IAR EWARM

This section provides steps to beginners on how to run a project by using IAR EWARM.

9. Double click the “Template.eww” to open the project.

10. Make sure the toolbar contains “Nu-Link” item as shown in Figure 4.6-8.

Note: If the toolbar does not contain “Nu-Link” item, please rework section .

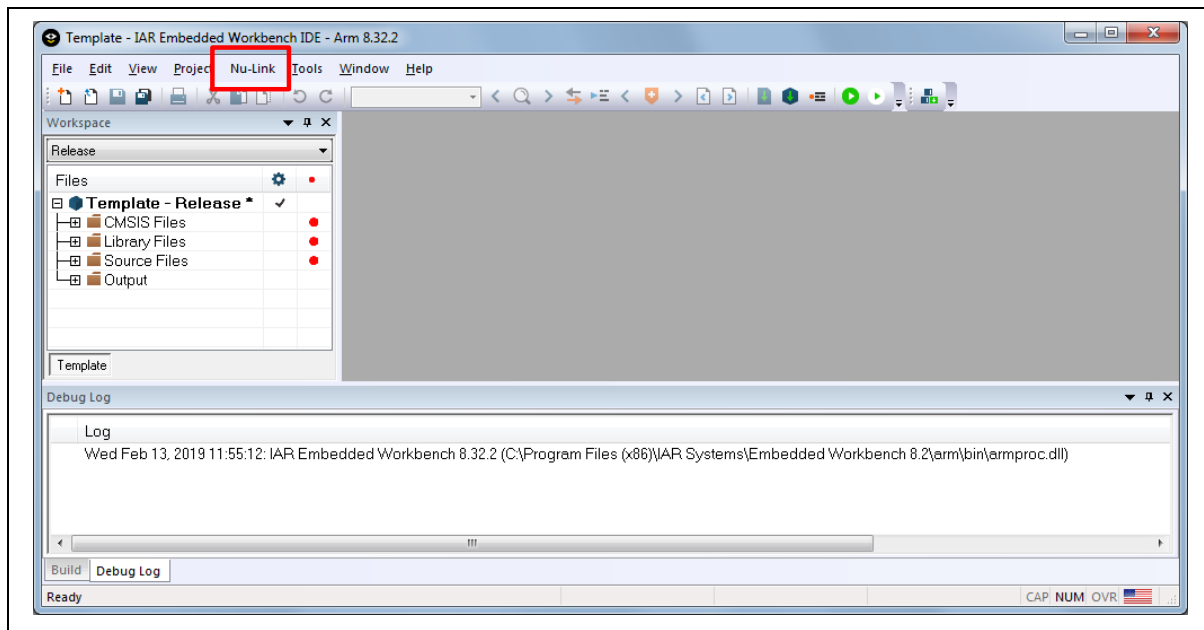


Figure 4.6-8 IAR EWARM Window

11. Make a target file as presented in Figure 4.6-9. After successfully compiling the project, download code to the Flash memory and enter debug mode.

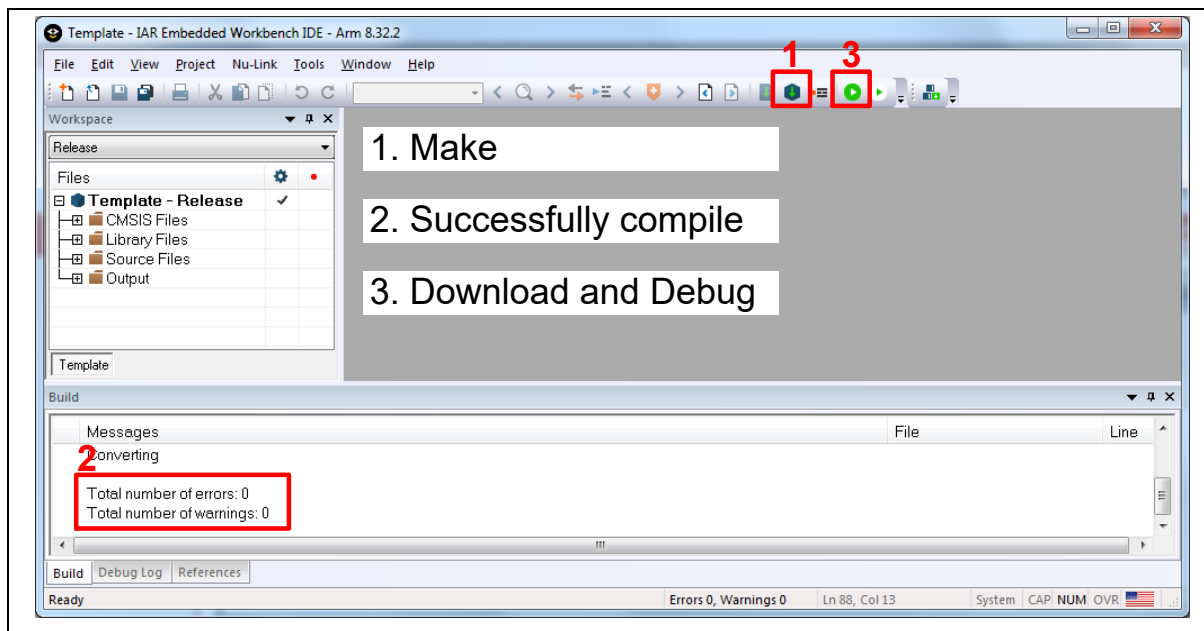


Figure 4.6-9 Compile and Download the Project

12. Figure 4.6-10 shows the debug mode under IAR EWARN. Click “Go” and the debug message will be printed out as shown in Figure 4.6-11. User can debug the project under debug mode by checking source code, assembly language, peripherals’ registers, and setting breakpoint, step run, value monitor, etc.

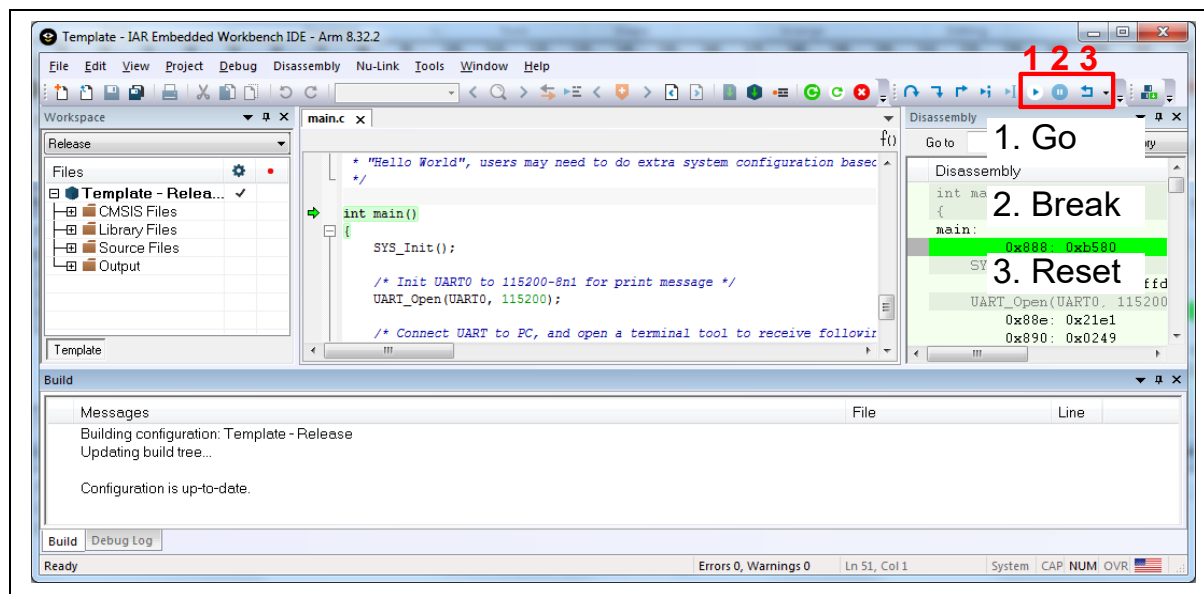


Figure 4.6-10 IAR EWARM Debug Mode

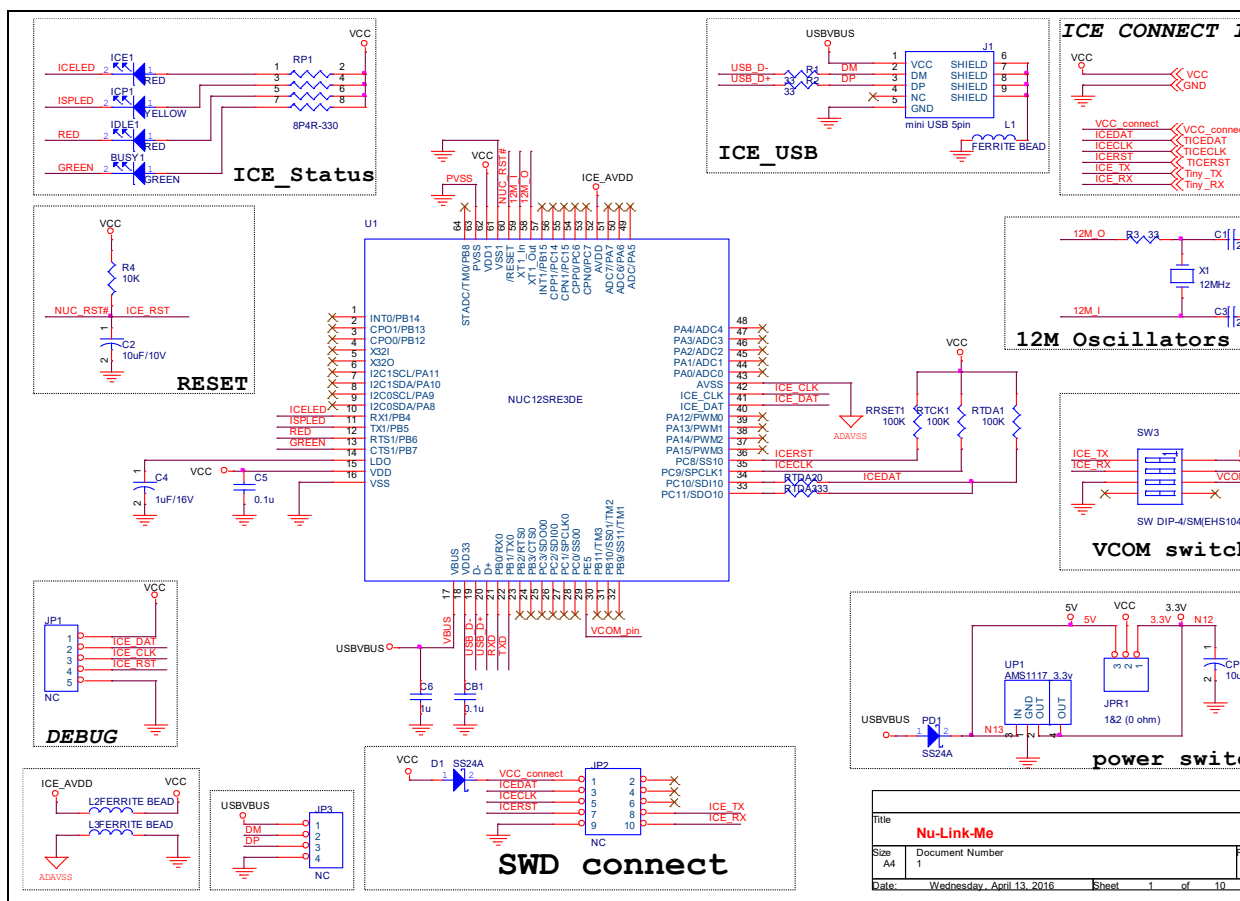


Figure 4.6-11 Debug Message on Serial Port Terminal Windows

5 NUTINY-N76S003AT SCHEMATICS

5.1 Nu-Link2-Me

Figure 5.1-1 shows the Nu-Link2-Me circuit.



5.2 NuTiny-N76S003AT Schematics

Figure 5.2-1 shows the N76S003AT20 target board circuit.

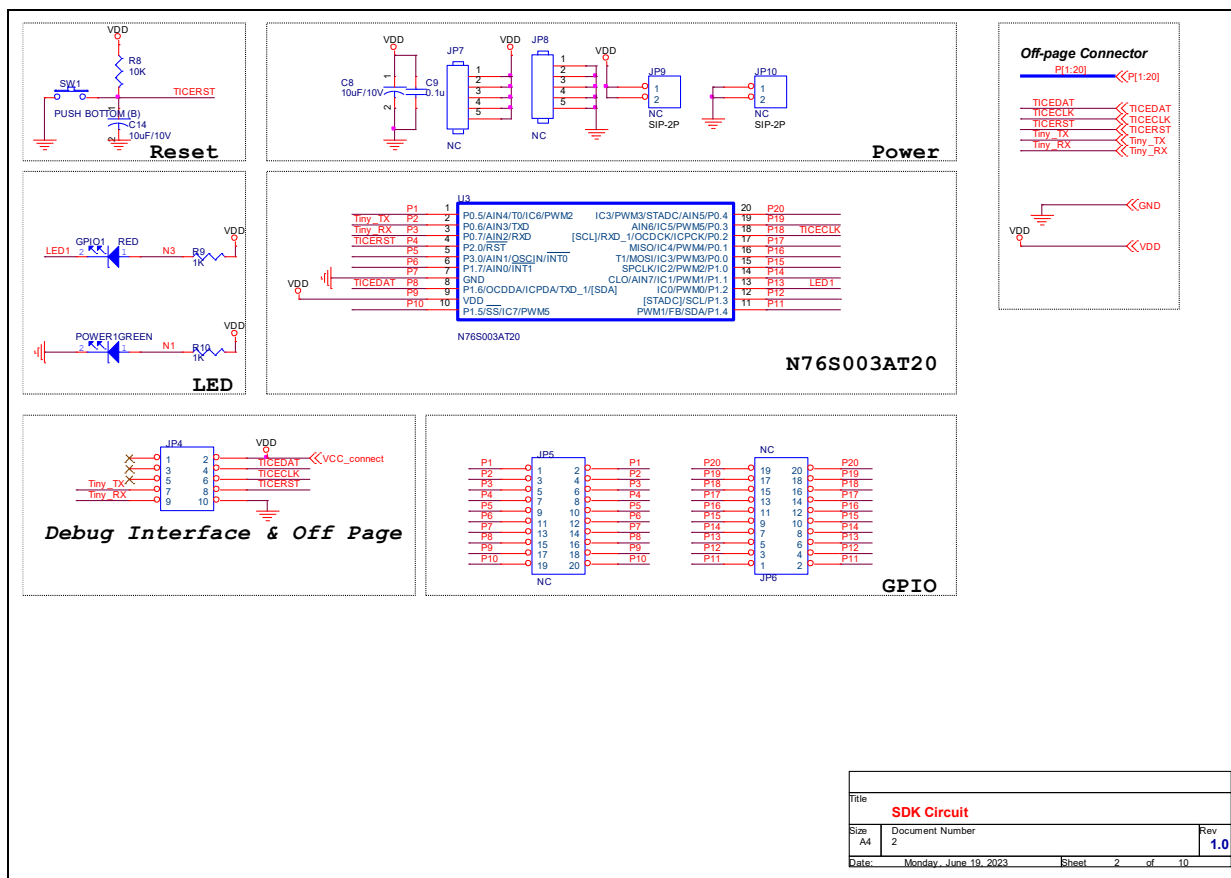


Figure 5.2-1 N76S003AT20 Target Board Circuit

5.3 PCB Placement

Figure 5.3-1 and Figure 5.3-2 show the front and rear placement of NuTiny- N76S003AT.

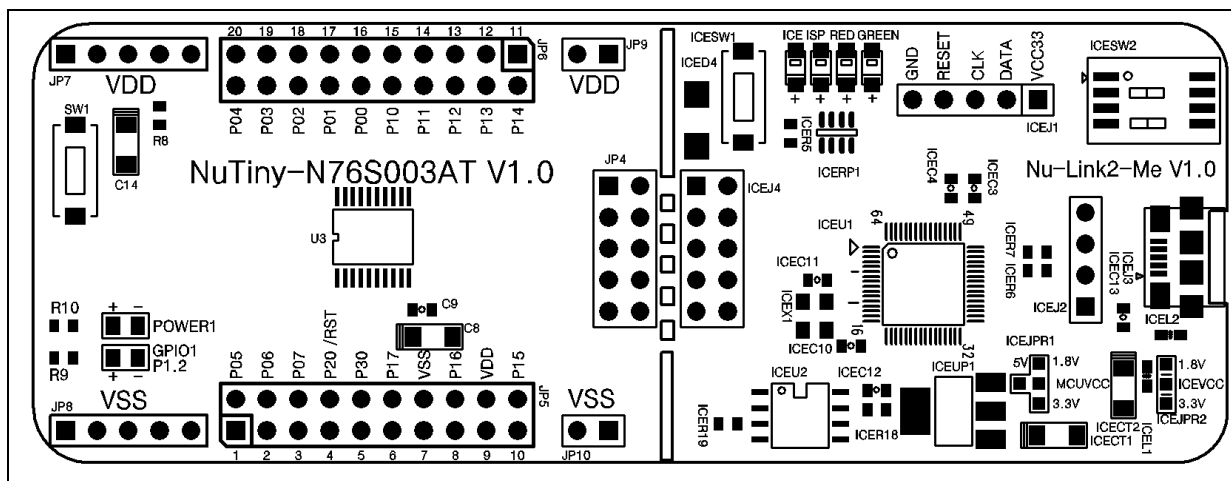


Figure 5.3-1 Front Placement

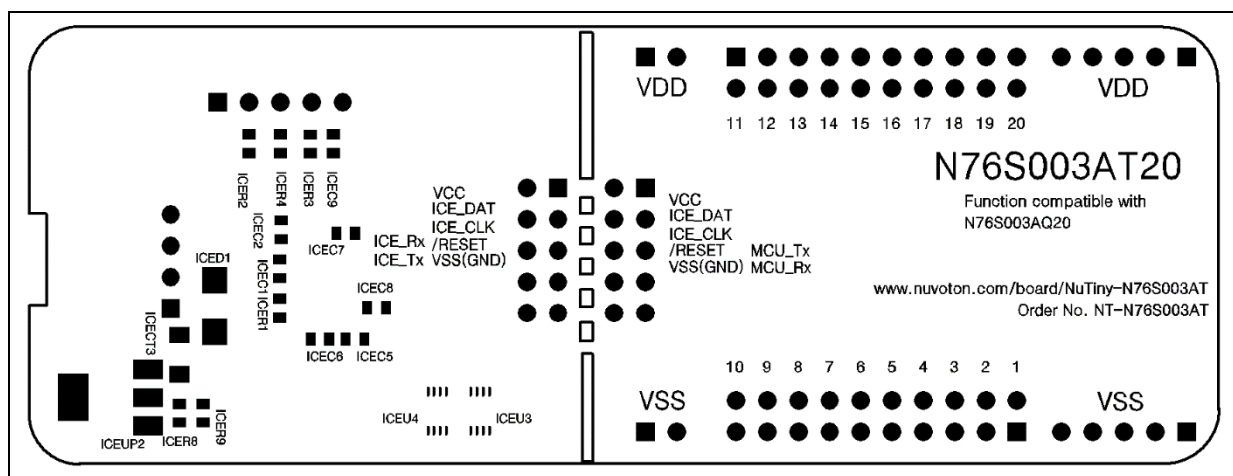


Figure 5.3-2 Rear Placement

6 REVISION HISTORY

Date	Revision	Description
2023.11.15	1.00	Initial Release

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.

*Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.*