

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

NuMicro[®] Family
NuTiny-SDK-Mini55
User Manual

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1 OVERVIEW

NuTiny-SDK-Mini55 is the specific development tool for NuMicro® Mini55 series. The NuTiny-SDK-Mini55 can be used to develop and verify the application program easily.

NuTiny-SDK-Mini55 includes two portions. One is NuTiny-EVB-Mini55 and the other is Nu-Link-Me. NuTiny-EVB-Mini55 is the evaluation board and Nu-Link-Me is its Debug Adaptor. Thus, user does not need other additional ICE or debug equipment.

1.1 GENERAL DESCRIPTION

The NuMicro® Mini55 series 32-bit microcontroller is embedded with ARM® Cortex®-M0 core for industrial control and applications which require 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 Mini55 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 Mini55 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 Mini55 series in order to reduce component count, board space and system cost. These useful functions make the Mini55 series powerful for a wide range of applications.

Additionally, the Mini55 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. The Mini55 series also supports In-Application-Programming (IAP) function, user switches the code executing without the chip reset after the embedded flash updated.

2 INTRODUCTION TO NUTINY-SDK-MINI55

NuTiny-SDK-Mini55 uses the Mini55LDE as the target microcontroller. Figure 2.1-1 shows the NuTiny-SDK-Mini55 for the Mini55 series, wherein the left portion is called NuTiny-EVB-Mini55 and the right portion is Debug Adaptor called Nu-Link-Me.

NuTiny-EVB-Mini55

NuTiny-EVB-Mini55 is similar to other development boards. It can be used to develop and verify applications to emulate the real behavior. The on-board chip covers Mini55 series features. The NuTiny-EVB-Mini55 can be a real system controller to design user's target systems.

Nu-Link-Me

- 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 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 user installs each driver.

- Virtual COM Port

The Nu-Link-Me also supports virtual COM port function. The Nu-Link-Me can be used as a USB to UART virtual COM port, which connects to on-board Mini55LDE UART0. Virtual COM port function is defaulted to off. User can turn on all of the positions of switch to enable it.

2.1 NuTiny-SDK-Mini55 (PCB Board)

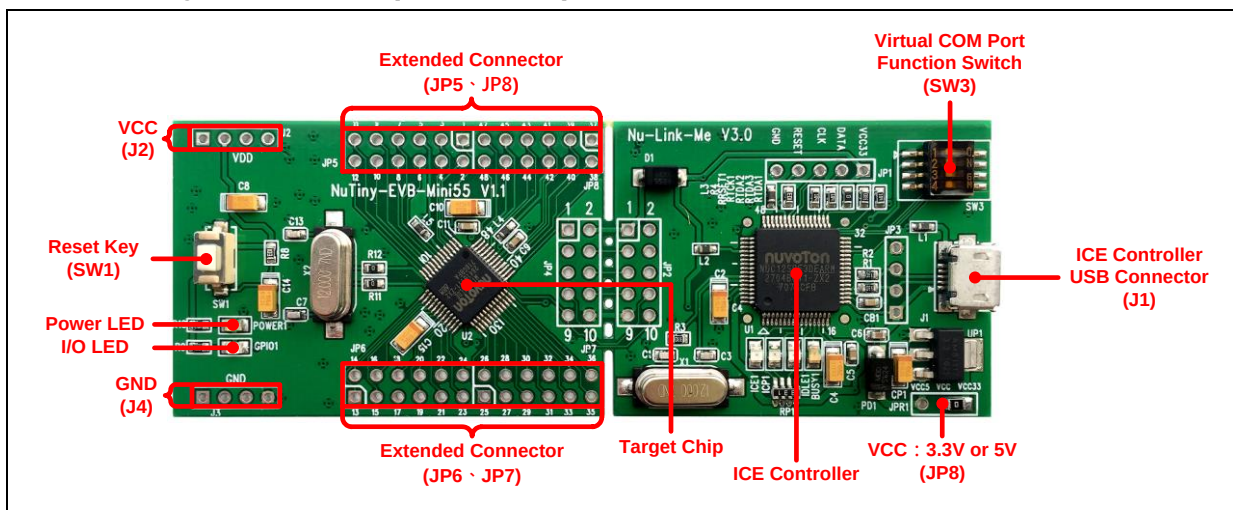


Figure 2.1-1 NuTiny-SDK-Mini55 (PCB Board)

2.2 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 Mini55LDE UART0. To use this function, user needs to install "VCOM Driver" at first. User can get "VCOM Driver" from NuMicroDVD in the folder "Software Utilities".

2.3 NuTiny-SDK-Mini55 Power Setting and Connector

2.3.1 Power Setting

- J1: USB port in Nu-Link-Me
- J2: V_{DD} Voltage connector in NuTiny-EVB-Mini55

Model	JPR1	J1 USB port	J2 V_{DD}	MCU Voltage
Model 1	Select VCC33 (default)	Connect to PC	DC 3.3V output	DC 3.3V
Model 2	Select VCC5	Connect to PC	DC 5V output	DC 5V
Model 3*	X	X	DC 2.1 V ~ 5.5 V Input	Voltage by J2 input

X: Unused

Note *: Need to separate NuTiny-EVB-Mini55 and Nu-Link-Me

2.3.2 Debug Connector

- JP4: Connector in target board (NuTiny-EVB-Mini55) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- JP2: Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (NuTiny-EVB-Mini55)

2.3.3 ICE USB Connector

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

2.3.4 Extended Connector

- JP5, JP6, JP7 and JP8: Show all chip pins in NuTiny-EVB-Mini55

2.3.5 Reset Button

- SW1: Reset button in NuTiny-EVB-Mini55

2.3.6 Power Connector

- J2: V_{DD} connector in NuTiny-EVB-Mini55
- J3: GND connector in NuTiny-EVB-Mini55

2.3.7 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

2.4 Pin Assignment for Extended Connector

The NuTiny-EVB-Mini55 provides Mini55LDE on board and the extended connector for LQFP-48 pin. Table 2.4-1 is the pin assignment for Mini55LDE.

Pin No	Pin Function	Pin No	Pin Function
01	NC	25	P2.5, PWM3, TX1
02	P1.5, AIN5, ACMP0_P, TX1	26	P2.6, PWM4, ACMP1_O
03	nRESET	27	P2.7
04	P3.0, AIN6, ACMP1_N	28	NC
05	AV _{SS}	29	P4.6, ICE_CLK
06	P5.4, AIN8	30	P4.7, ICE_DAT
07	P3.1, AIN7, ACMP1_P	31	NC
08	P3.2, INT0, STADC, T0EX, ACMP1_P	32	P0.7, SPICLK
09	P3.4, T0, SDA, ACMP1_P, AIN9	33	P0.6, MISO
10	P3.5, T1, SCL, ACMP1_P, AIN10	34	P0.5, MOSI
11	P3.7	35	P0.4, SPISS, PWM5
12	NC	36	NC
13	NC	37	P0.1, RTSn, RX0, SPISS
14	P3.6, ACMP0_O, CKO, T1EX, AIN11	38	P0.0, CTSn, TX0
15	P5.1, XT_OUT	39	NC
16	P5.0, XT_IN	40	NC
17	V _{SS}	41	P5.3, AIN0, ADC_VREF
18	LDO_CAP	42	V _{DD}
19	P5.5	43	AV _{DD}
20	P5.2, INT1	44	P1.0, AIN1, ACMP0_P
21	NC	45	P1.2, AIN2, RX, ACMP0_P
22	P2.2, PWM0	46	P1.3, AIN3, TX, ACMP0_P, INT0
23	P2.3, PWM1	47	P1.4, AIN4, ACMP0_N, RX1
24	P2.4, PWM2, RX1	48	P1.6

Table 2.4-1 Pin Assignment for Mini55LDE

2.5 NuTiny-SDK-Mini55 PCB Placement

User can refer to Figure 2.5-1 for the NuTiny-SDK-Mini55 PCB placements.

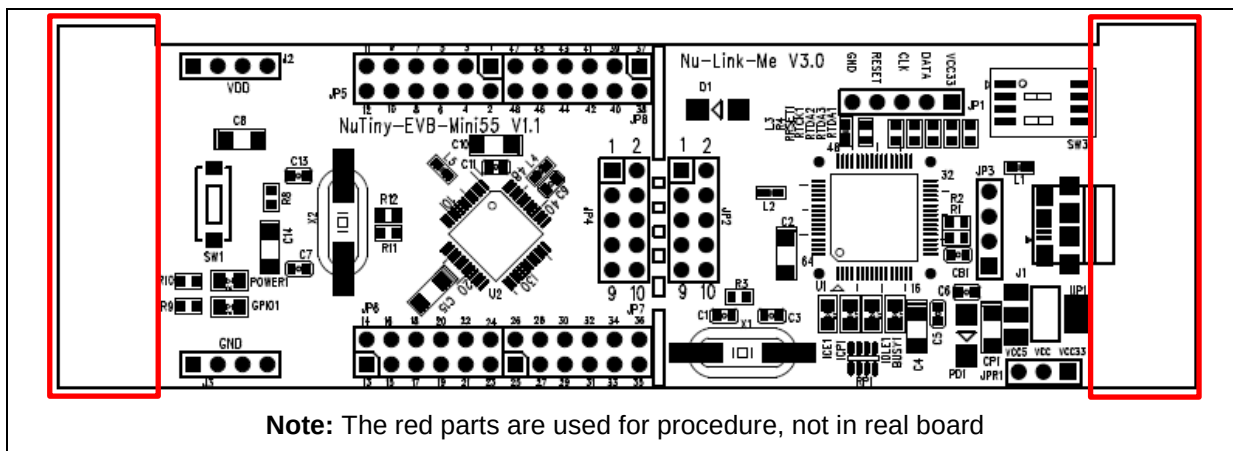


Figure 2.5-1 NuTiny-SDK-Mini55 PCB Placement

3 HOW TO START NUTINY -SDK-MINI55 ON THE KEIL MVISION® IDE

3.1 Downloading and Installing Keil μVision® IDE Software

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

3.2 Downloading and Installing Nuvoton Nu-Link Driver

Please connect to Nuvoton NuMicro® website (<http://www.nuvoton.com/NuMicro>) to download the “NuMicro® Keil μVision® IDE driver” file. Please refer to section 6.1 for the detailed download flow. After the Nu-Link driver is 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 3.3-1



Figure 3.3-1 NuTiny-SDK-Mini55 Hardware Setup

3.4 Example Program

This example demonstrates downloading and debugging an application on a NuTiny-SDK-Mini55 board. The example file can be downloaded from Nuvoton NuMicro® website and found in the directory list shown in Figure 3.4-1.

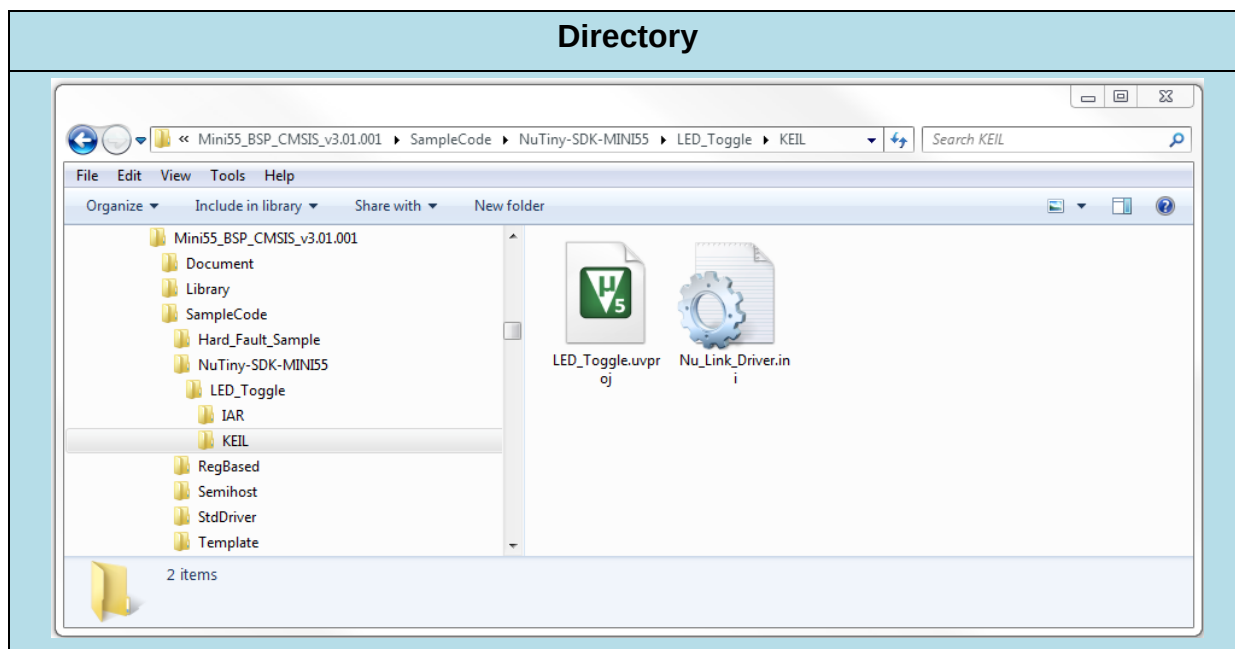
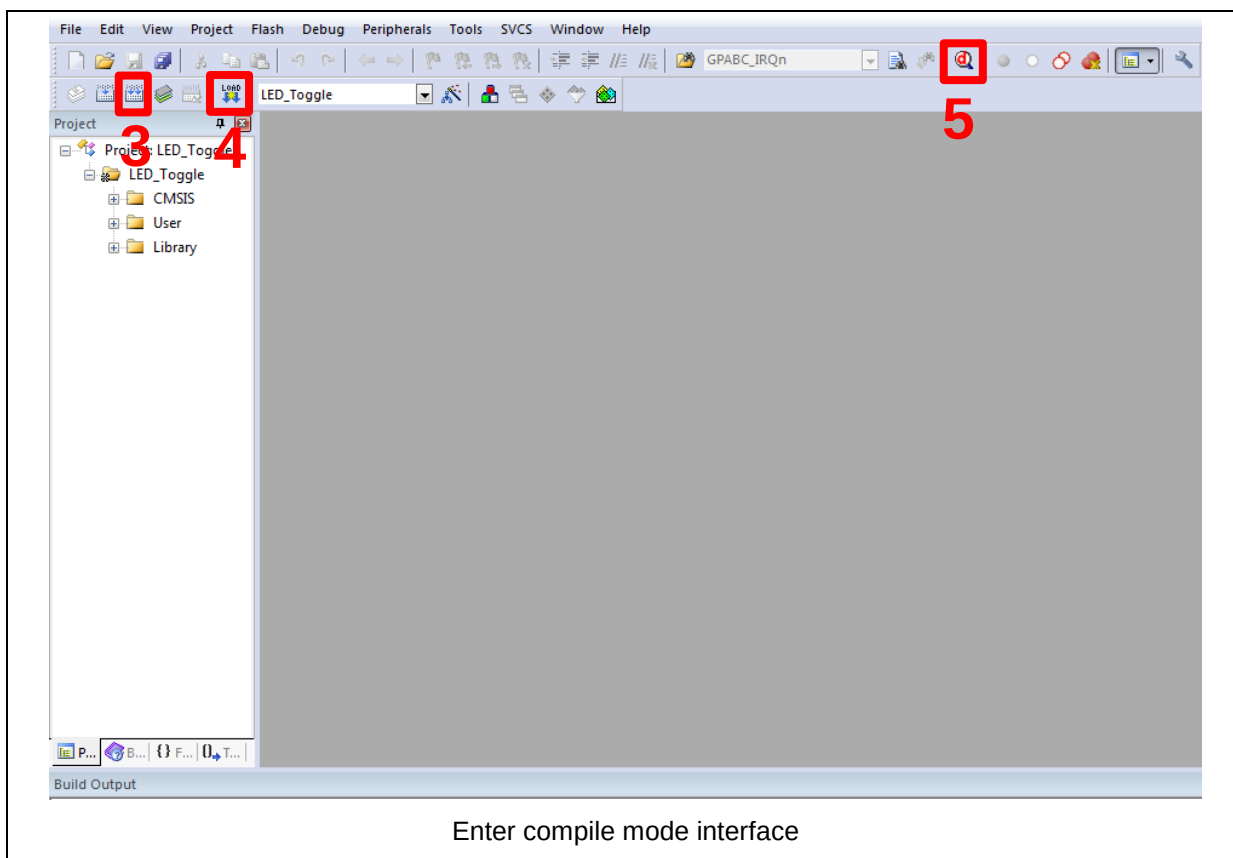


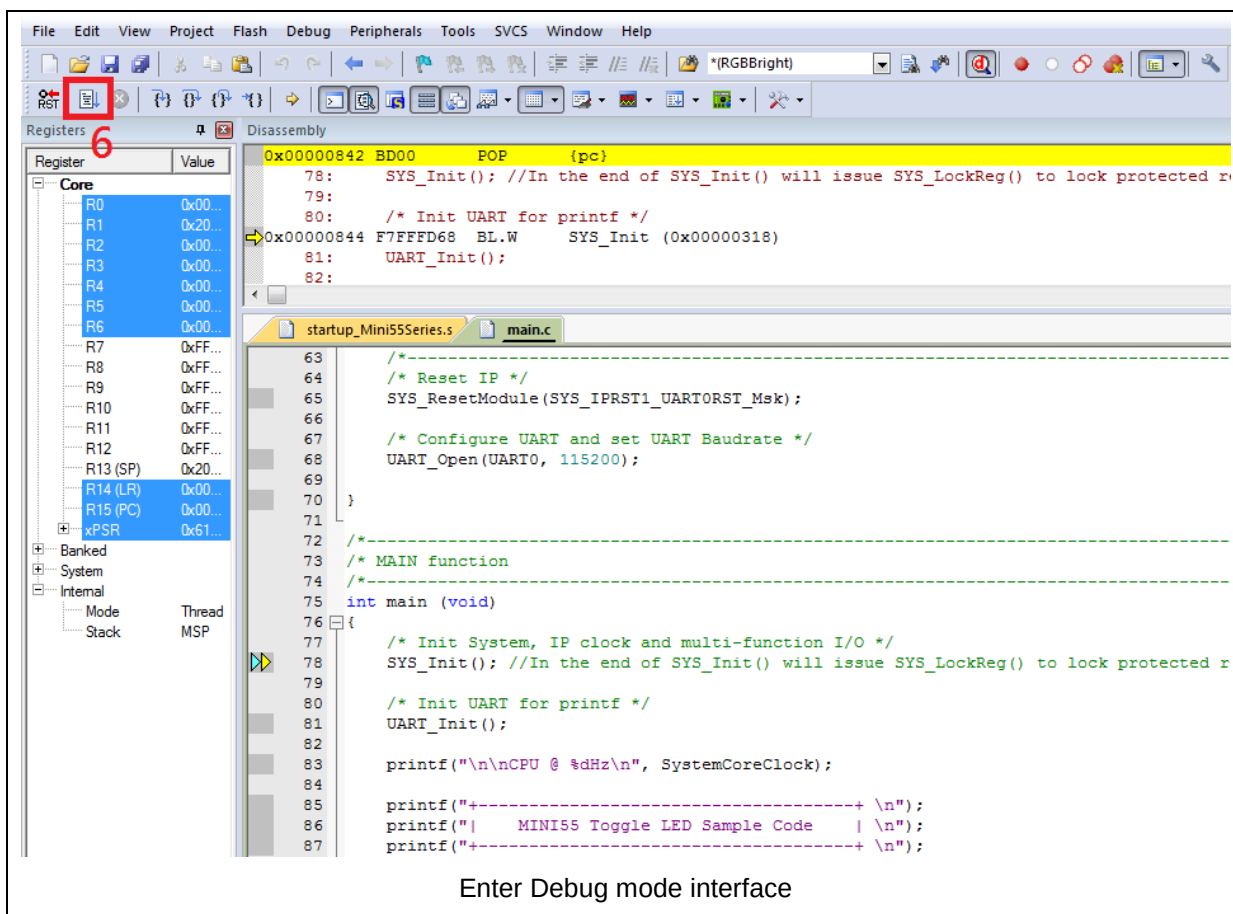
Figure 3.4-1 Example Directory

To use this example:

1. Open a project from the BSP installation folder (default as C:\Nuvoton) using the following path :
 \Mini55_BSP_CMSIS_v3.xx.xxx\SampleCode\NuTiny-SDK-MINI55\LED_Toggle\KEIL
2. Execute “**LED_Toggle.uvproj**”



3.  Compiler
4.  Download the program code to Flash
5.  Enter / Exit Debug mode



6.  Execute the program
7. The I/O LED on the NuTiny-EVB-Mini55 board will be toggled on.

4 HOW TO START NUTINY -SDK-MINI55 ON THE IAR EMBEDDED WORKBENCH

4.1 Downloading and Installing IAR Embedded Workbench Software

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

4.2 Downloading and Installing Nuvoton Nu-Link Driver

Please connect to Nuvoton NuMicro® website (<http://www.nuvoton.com/NuMicro>) to download the “NuMicro® IAR EWARM Driver” file. Please refer to section 6.2 for the detailed download flow. After the Nu-Link driver is downloaded, please unzip the file and execute the “Nu-Link_IAR_Driver.exe” to install the driver.

4.3 Hardware Setup

The hardware setup is shown as Figure 4.3-1.

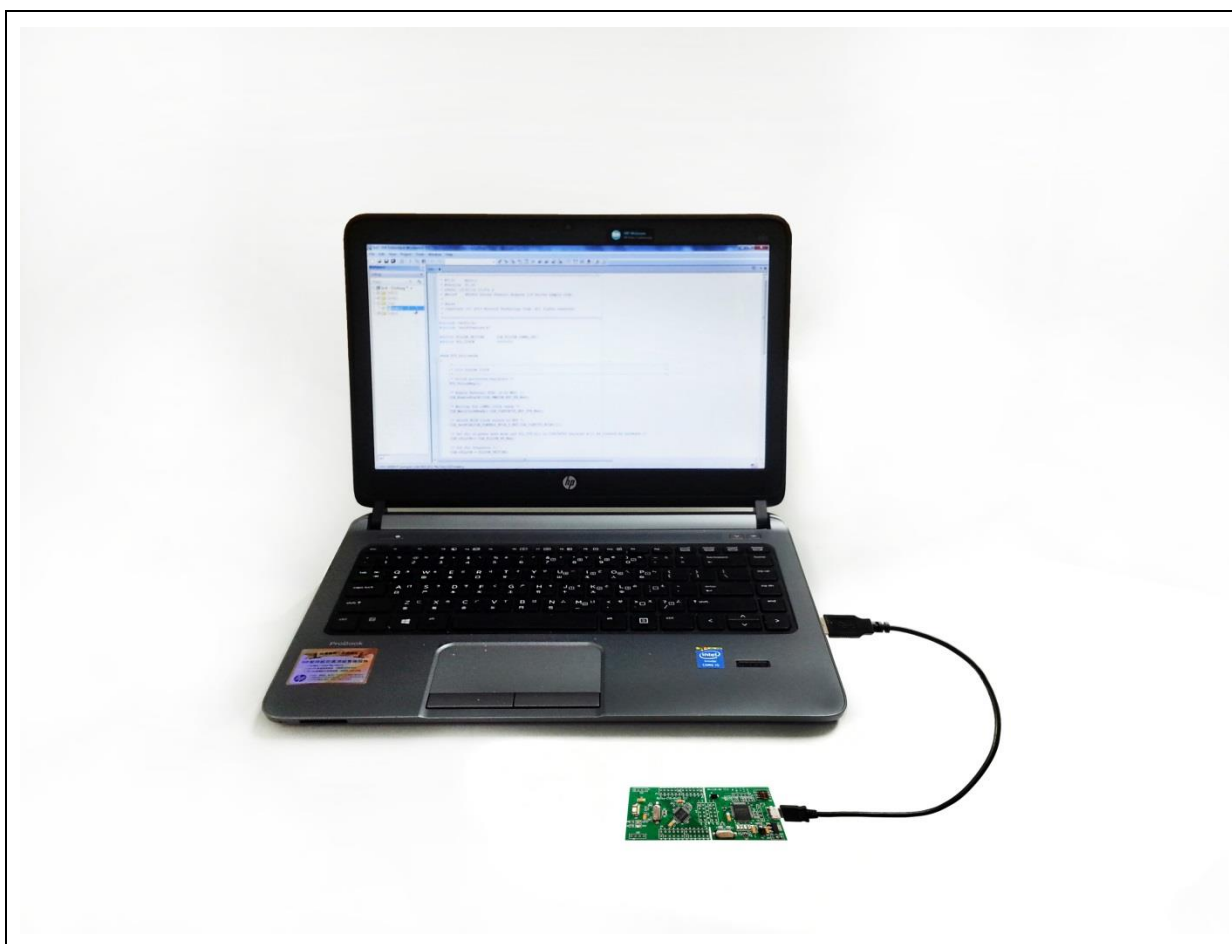


Figure 4.3-1 NuTiny-SDK-Mini55 Hardware Setup

4.4 Example Program

This example demonstrates downloading and debugging an application on a NuTiny-SDK-Mini55 board. The example file can be downloaded from Nuvoton NuMicro® website and found in the directory list shown in Figure 4.4-1.

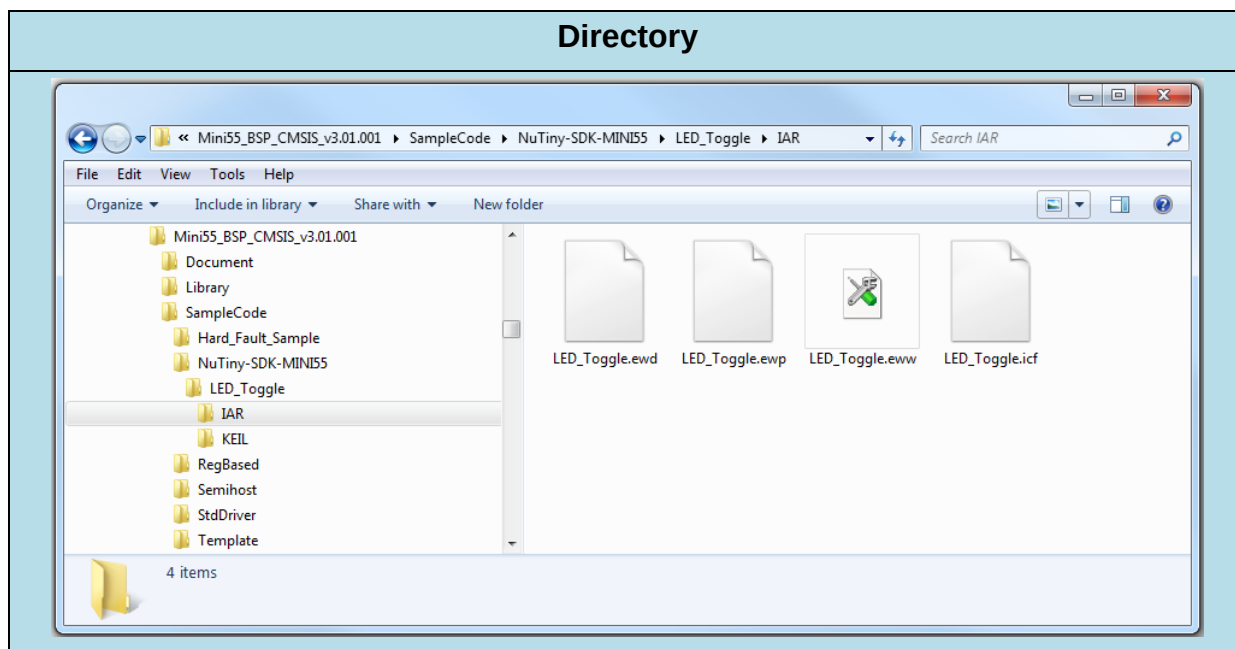
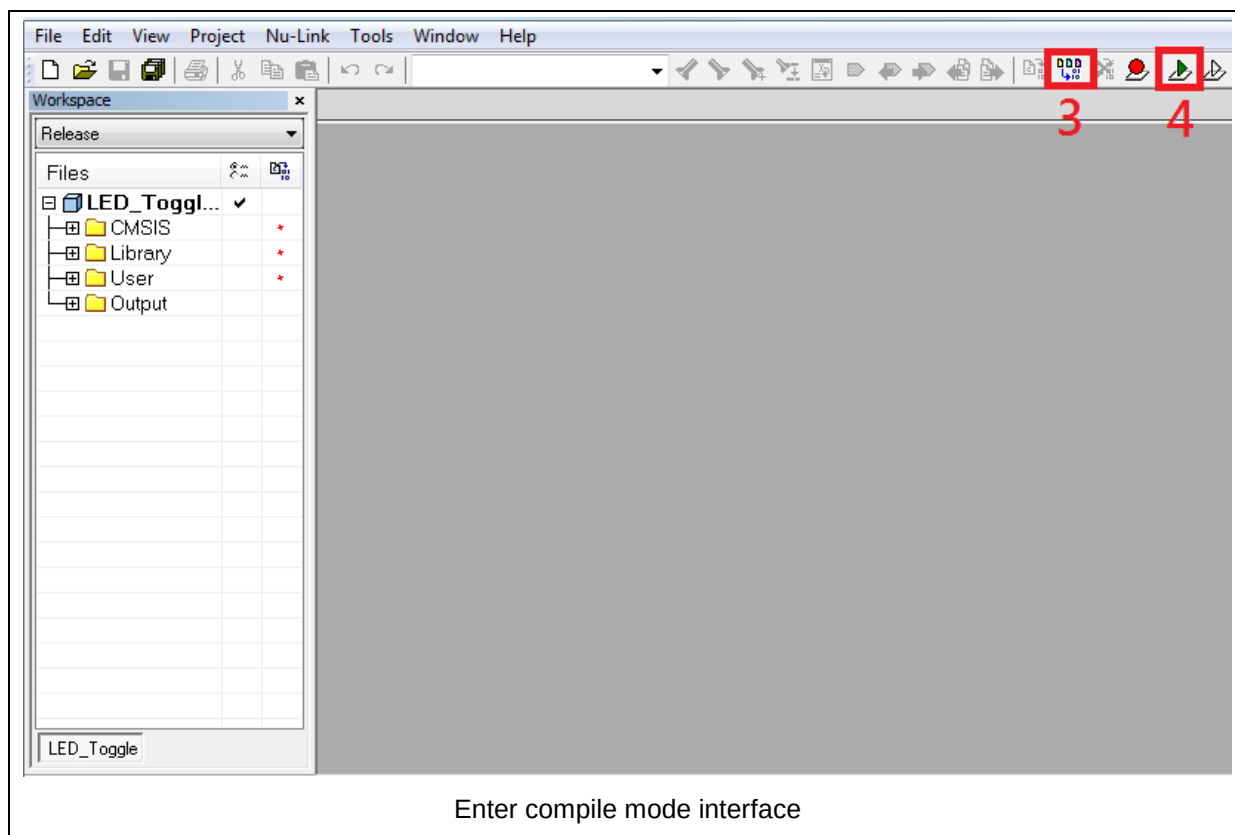


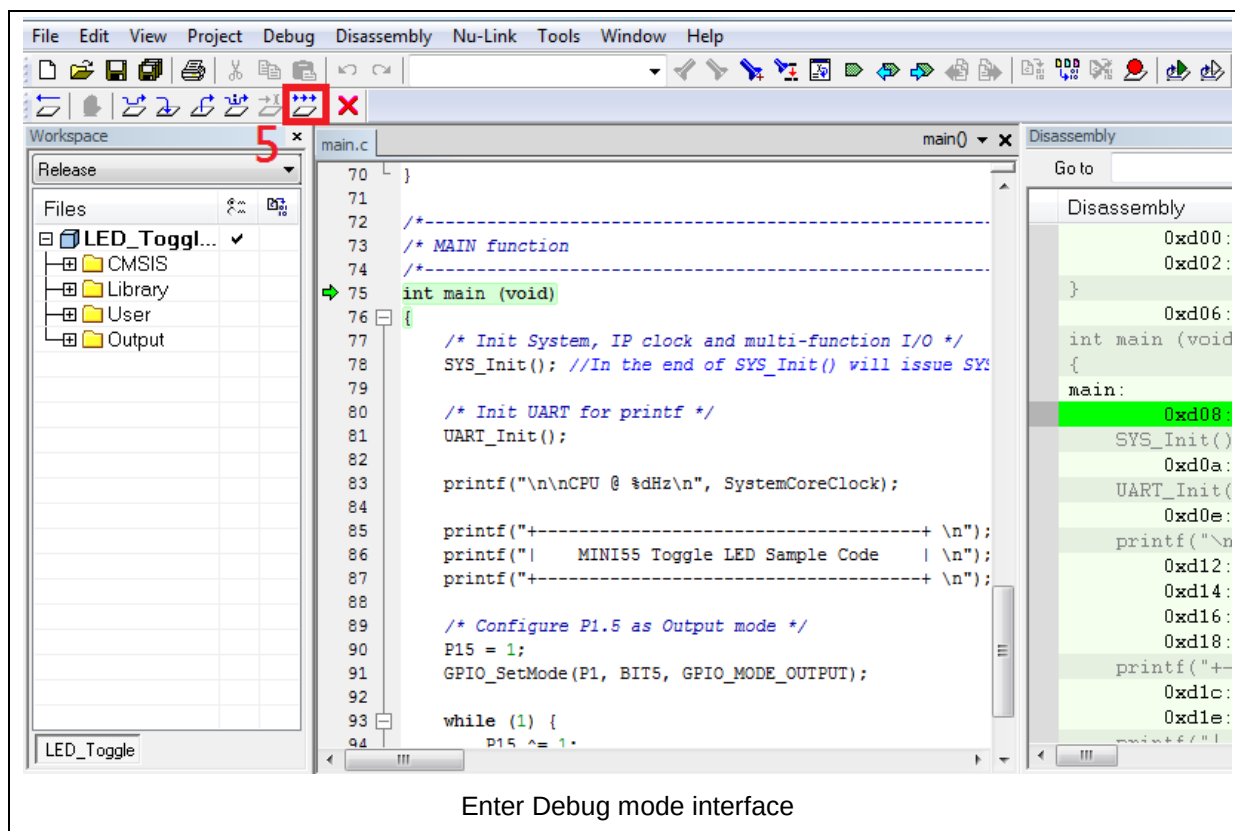
Figure 4.4-1 Example Directory

To use this example:

1. Open a project from the BSP installation folder (default as C:\Nuvoton) using the following path :
`\Mini55_BSP_CMSIS_v3.xx.xxx\SampleCode\NuTiny-SDK-MINI55\LED_Toggle\IAR`
2. Execute "**LED_Toggle.eww**"

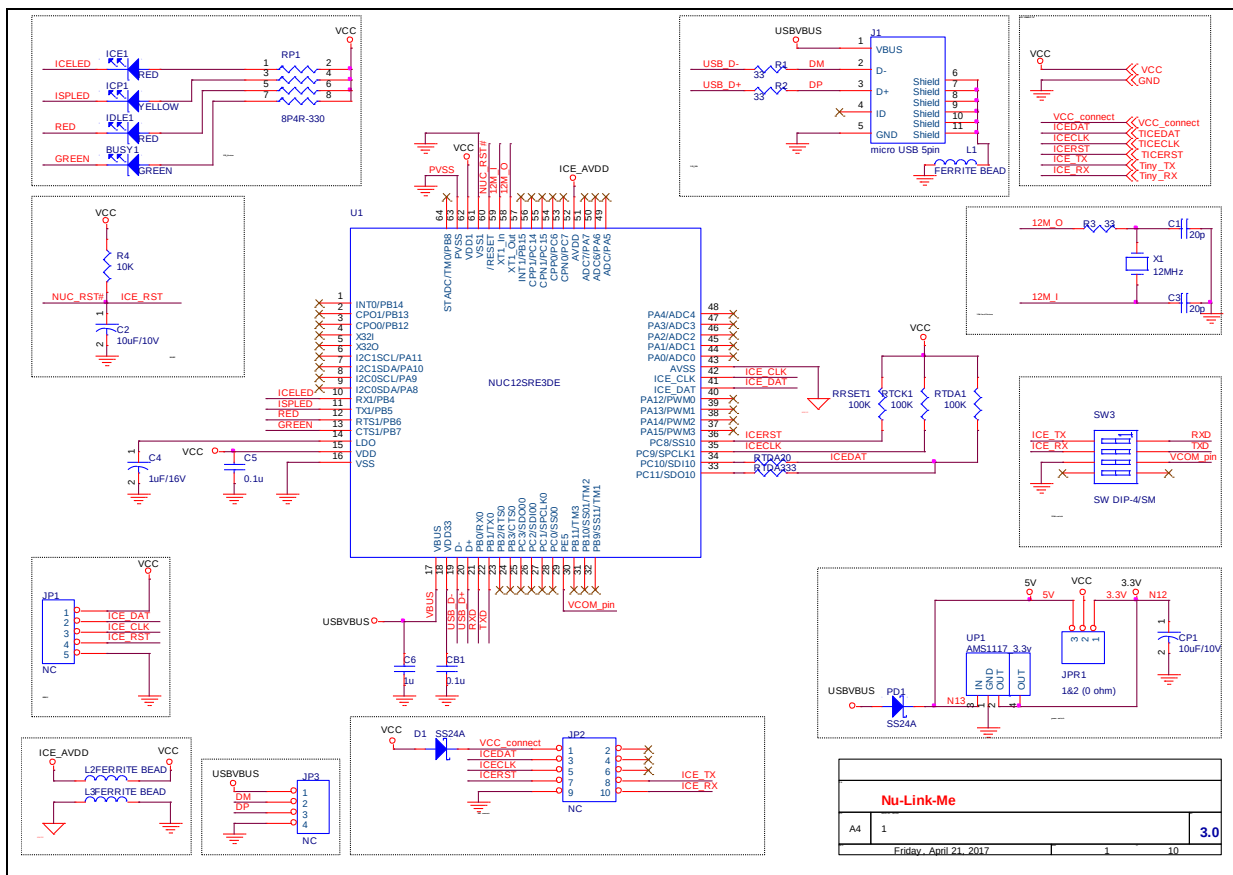


3.  Compile and make
4.  Download the program code to Flash and Enter Debug mode

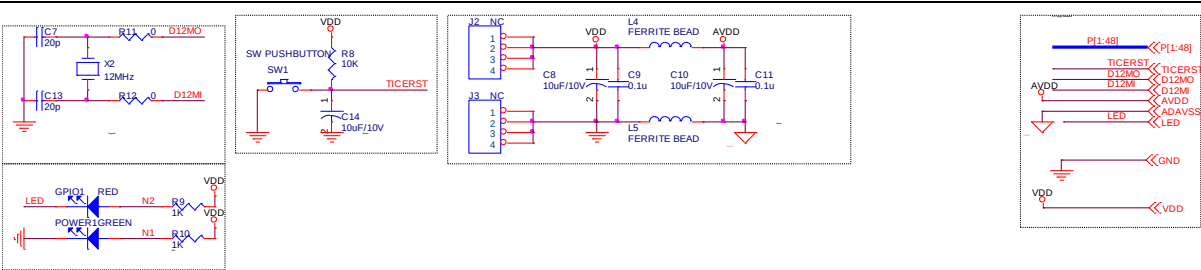


5.  Execute the program
6. The I/O LED on the NuTiny-EVB-Mini55 board will be toggled on.

5.1 Nu-Link-Me Schematic

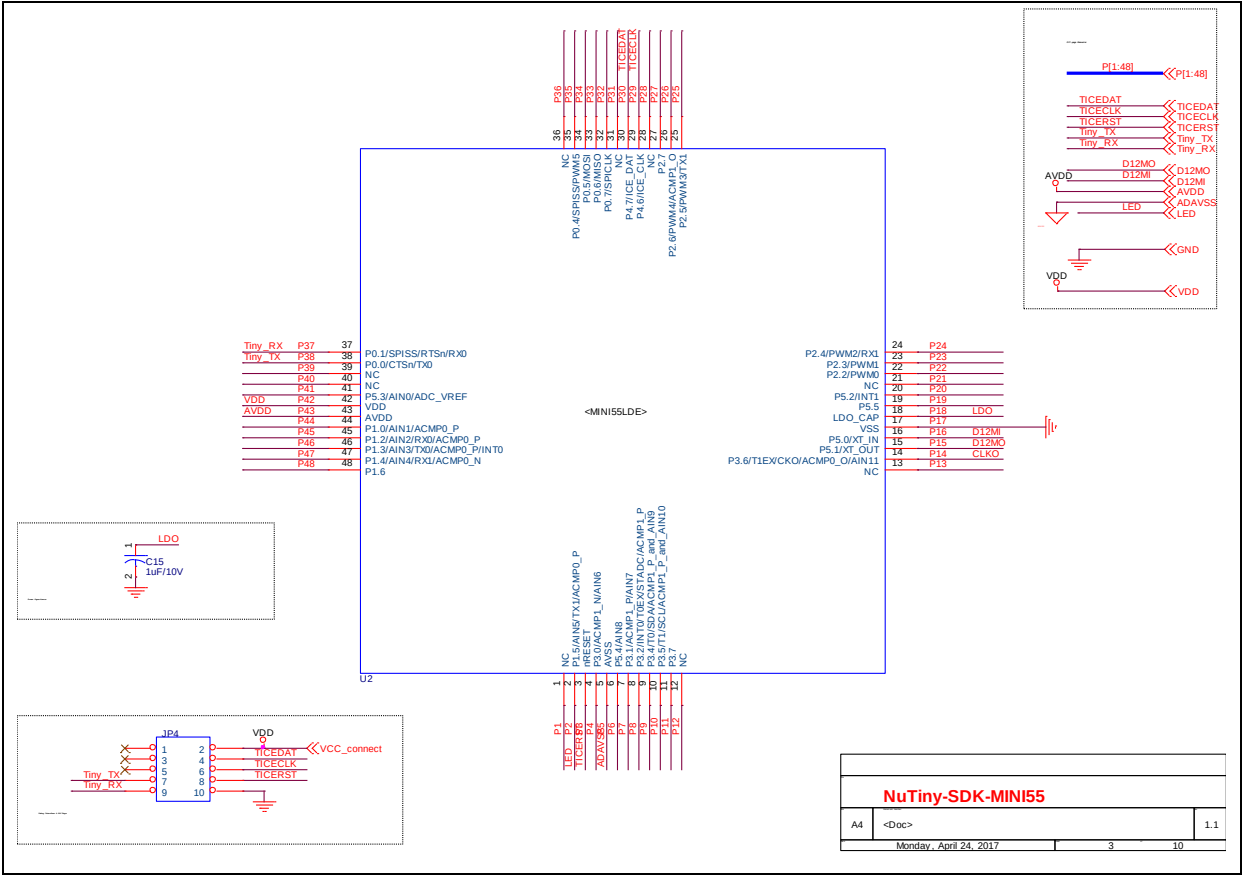


5.2 SDK Circuit Schematic

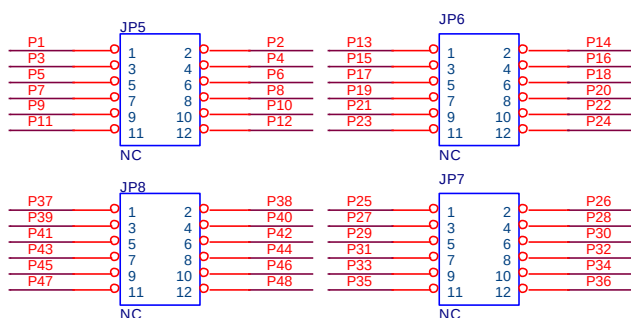


SDK Circuit			
A4	2		1.0
Friday, April 21, 2017		2	10

5.3 NuTiny-SDK-MINI55 Schematic



5.4 GPIO for 48 pin Schematic



GPIO for 48 pin			
A4	<Doc>		1.0
Eridav April 21, 2017		4	10

6 DOWNLOADING NUMICRO® RELATED FILES FROM NUVOTON WEBSITE

6.1 Downloading NuMicro® Keil µVision® IDE Driver

Step1 Visit the Nuvoton NuMicro® website: <http://www.nuvoton.com/NuMicro>.

Step2

2-1. Move to "Support"

2-2. Click here to enter Tool & Software

The screenshot shows the Nuvoton NuMicro website. The 'Support' link in the top navigation bar is highlighted with a red dashed box. A yellow oval with an arrow points to the 'Support' link, labeled '2-1. Move to "Support"'. Another yellow oval with an arrow points to the 'Tool & Software' link in the dropdown menu, labeled '2-2. Click here to enter Tool & Software'. The website features a sidebar with 'ARM Cortex™-M0 MCUs' and 'Resources' sections. The main content area displays a product matrix with various NuMicro series (NUC100, Nano120, NUC120, NUC230, NUC140, NUC130, NUC122, NUC123, Nano102, Nano112, Mini51, M051, AU9110, AU9120*) categorized by application (Industrial Control, Low Power, USB Application, Automotive Application, Audio Application). The right sidebar includes 'Online Support', 'Featured Products', 'Featured Videos', and 'Featured Applications' sections.

Step3

Step4

Programmer Software Tools Package

File name	Description	Version	Date
ICP Programming Tool V1.25.6287.zip Revision History	NuMicro ICP tool & user manual	V1.25.6287	2014-01-16
ISP Programming Tool V1.44.zip Revision History	NuMicro ISP tool & user manual	V1.44	2014-01-20
NuGang Programmer V6.21.zip Revision History	NuMicro NuGang Programmer user manual	V6.21	2014-01-24

Nu-Link Driver

File name	Description	Version	Date
Nu-Link Driver for Keil RVMDK V1.25.6287.zip Revision History	This driver is to support Nu-Link to work under Keil RVMDK Development Environment for all NuMicro Family Devices.	V1.25.6287	2014-01-16
Nu-Link Driver for IAR EWARM V1.25.6287.zip Revision History	This driver is to support Nu-Link to work under IAR EWARM Development Environment for all NuMicro Family Devices.	V1.25.6287	2014-01-16

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Step5

Download the NuMicro® Keil µVision® IDE driver.

6.2 Downloading NuMicro® IAR EWARM Driver

Step1 Visit the Nuvoton NuMicro® website: <http://www.nuvoton.com/NuMicro>.

Step2

The screenshot shows the Nuvoton NuMicro website. A yellow oval labeled "2-1. Move to 'Support'" points to the "Support" link in the top navigation bar. A red dashed box highlights the "Support" link. A yellow oval labeled "2-2. Click here to enter Tool & Software" points to the "Tool & Software" link in the "Support" dropdown menu. The website features a navigation bar with links for Products, Applications, Support, Foundry Service, Buy, myNuvoton, and About Nuvoton. A search bar and a "Parametric Search" button are also present. The main content area displays a list of ARM Cortex™-M0 MCUs, including AU9110 Audio Series, M051 Base Series, and Nano100/102 Base Series. A "Resources" section lists various documents like Application Note, Data Sheet, and Development Tool. A "Featured Products" section highlights M0516LDE, MINI54FDE, and NANO130KE3BN. A "Featured Videos" section shows a video titled "M0 Introduction(06:35)". A "Featured Applications" section is also visible. A large diagram in the center shows the product portfolio, including Mini51, M051, Nano100, Nano102, Nano110, Nano112, NUC100, NUC120, NUC122, NUC123, NUC130, NUC140, NUC230, NUC240, and AU9110, categorized by application (Industrial Control, Low Power, USB Application, Automotive Application, Audio Application) and memory size (16K, 32K, 64K). A note at the bottom states: "As one of the leading Microcontroller (MCU) companies in the world, Nuvoton provides the state-of-the-art solutions for various applications."

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Off-Line In Circuit Programming

IC Programming

Upgrade

In System Programming

NuMicro M4 MCU NUC472

with Ethernet MAC

Events

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Step4

Programmer Software Tools Package

File name	Description	Version	Date
ICP Programming Tool V1.25.6287.zip Revision History	NuMicro ICP tool & user manual	V1.25.6287	2014-01-16
ISP Programming Tool V1.44.zip Revision History	NuMicro ISP Programming Tool & user manual	V1.44	2014-01-20
NuGang Programmer V6.21.zip Revision History	NuGang Programmer & user manual	V6.21	2014-01-24

Click here to download

Nu-Link Driver

File name	Description	Version	Date
Nu-Link Driver for Keil RVMDK V1.25.6287.zip Revision History	This driver is to support Nu-Link to work under Keil RVMDK Development Environment for all NuMicro Family Devices.	V1.25.6287	2014-01-16
Nu-Link Driver for IAR EWARM V1.25.6287.zip Revision History	This driver is to support Nu-Link to work under IAR EWARM Development Environment for all NuMicro Family Devices.	V1.25.6287	2014-01-16

User Feedback

TOP

Step5

Download the NuMicro® IAR EWARM driver.

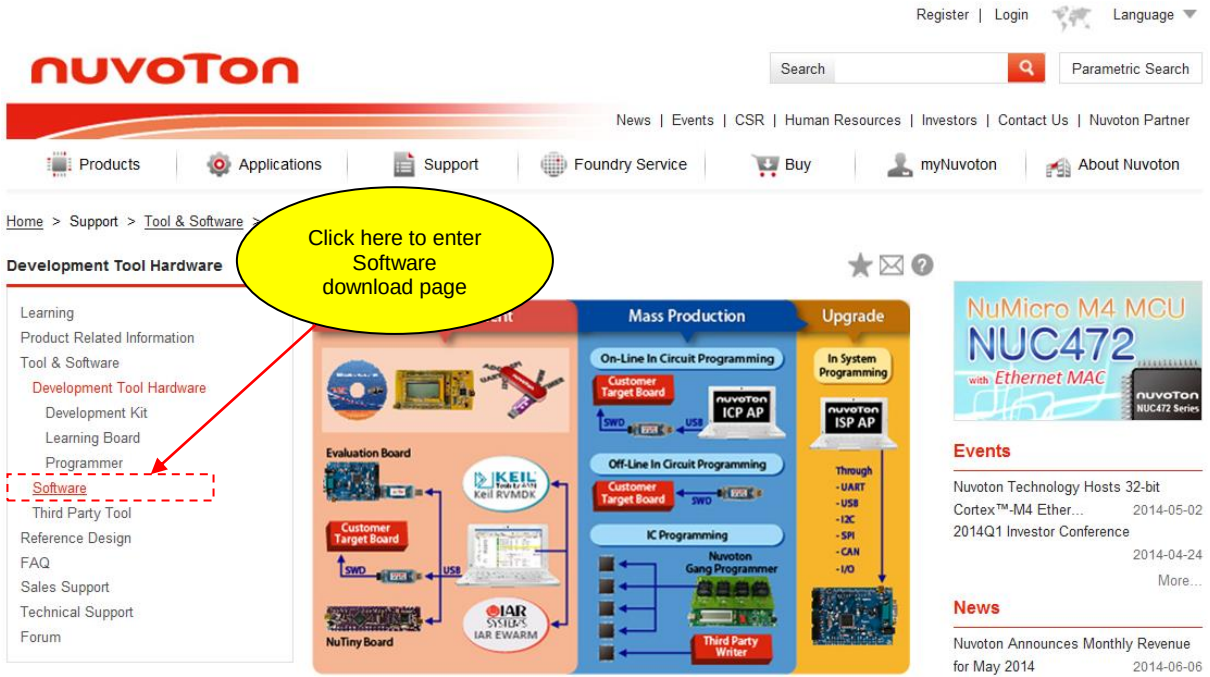
6.3 Downloading NuMicro® Mini55 Series BSP Software Library

Step 1

Visit the Nuvoton NuMicro® website: <http://www.nuvoton.com/NuMicro>.

Step 2

The screenshot shows the Nuvoton NuMicro website. A yellow oval labeled "2-1. Move to 'Support'" points to the "Support" link in the top navigation bar. Another yellow oval labeled "2-2. Click here to enter Tool & Software" points to the "Tool & Software" link in the dropdown menu under "Support". The website features a navigation bar with links for Products, Applications, Support, Foundry Service, Buy, myNuvoton, and About Nuvoton. A search bar is located in the top right. The main content area displays a list of ARM Cortex™-M0 MCUs on the left, a central grid of product models (NUC100, Nano120, NUC120, NUC230, NUC140, NUC130, NUC122, NUC123, Nano102, Nano112, M051, Mini51, AU9110, AU9120*), and a right sidebar with sections for Online Support, Featured Products, Featured Videos, and Featured Applications. The footer includes the text: "As one of the leading Microcontroller (MCU) companies in the world, Nuvoton provides the state-".

Step 3	 The screenshot shows the NuvoTon website's 'Tool & Software' page. The left sidebar contains a list of links: Learning, Product Related Information, Tool & Software, Development Tool Hardware, Development Kit, Learning Board, Programmer, Software (highlighted with a red dashed box), Third Party Tool, Reference Design, FAQ, Sales Support, Technical Support, and Forum. A yellow callout bubble with the text 'Click here to enter Software download page' points to the 'Software' link. The main content area is divided into three columns: 'Development Tool Hardware' (showing Evaluation Board, Customer Target Board, and NuTiny Board), 'Mass Production' (showing On-Line In Circuit Programming, Off-Line In Circuit Programming, and IC Programming), and 'Upgrade' (showing In System Programming). The right sidebar features a banner for 'NuMicro M4 MCU NUC472 with Ethernet MAC' and a list of events and news.
Step 4	Download the NuMicro® Mini55 Series CMSIS BSP.

7 REVISION HISTORY

Date	Revision	Description
2017.06.28	1.00	1. Preliminary version.

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.

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