ARM Cortex™-M0

32-BIT MICROCONTROLLER

NuTiny-SDK-NUC123 User Manual
for NuMicro™ NUC123 Series

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1 Overview

The NuTiny-SDK-NUC123 is a specific development tool for NuMicro™ NUC123 series. User can use NuTiny-SDK-NUC123 to develop and verify the application program easily. The NuTiny-SDK-NUC123 includes two parts: NuTiny-EVB-NUC123 and Nu-Link-Me. The NuTiny-EVB-NUC123 is the evaluation board and Nu-Link-Me is its Debug Adaptor. Therefore, user does not need other additional ICE or debug equipment.

2 Introduction to NuTiny-SDK-NUC123

The NuTiny-SDK-NUC123 uses the NUC123SD4AN0 as the target microcontroller. *Figure 2-1* shows the NuTiny-SDK-NUC123 for NUC123 series, in which the left portion is called NuTiny-EVB-NUC123 and the right portion is called Nu-Link-Me.

The NuTiny-EVB-NUC123 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 NUC123 series features. The NuTiny-EVB-NUC123 can be a real system controller to design users' target systems.

The Nu-Link-Me is a Debug Adaptor, which 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 the Nu-Link-Me Debug Adaptor with IAR or Keil, please refer to the "*Nuvoton NuMicro™ IAR ICE Driver User Manual*" or "*Nuvoton NuMicro™ Keil ICE Driver User Manual*" for details. The two documents will be stored in the local hard disk when each driver is installed.

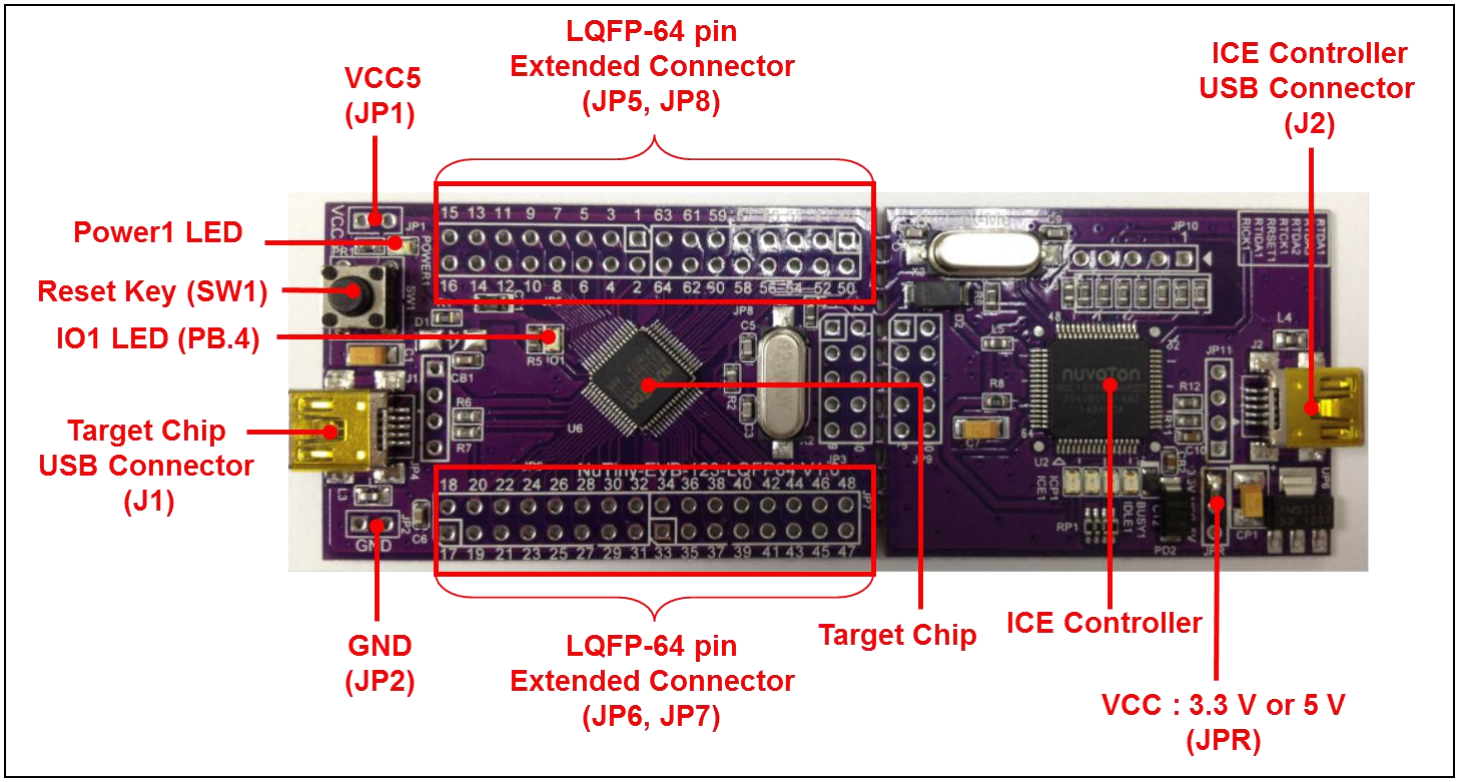


Figure 2-1 NuTiny-SDK-NUC123 (Purple PCB Board)

2.1 Jumper Description

2.1.1 Power Settings

- **J1**: USB port in NuTiny-EVB-NUC123
- **JP1**: VCC voltage connecter in NuTiny-EVB-NUC123
- **J2**: USB port in Nu-Link-Me

POWER Mode	J2 USB Port	J1 USB Port	JP1 VCC	MCU Voltage
Mode 1	Connected to PC	X	DC 3.3 V or 5 V Output [1]	DC 3.3 V or 5 V [1]
Mode 2	X	Connect to PC	DC 4.8 V or 5 V Output [2]	DC 4.8 V or 5 V [2]
Mode 3	X	X	DC 2.5 V ~ 5.5 V Input	DC 2.5 V ~ 5.5 V Decided by **JP1** VCC Input

X: Unused.
Note [1]: It depends on the setting (VCC via connecting to 3.3 V or 5 V) at **JPR** jumper in the Nu-Link-Me.
Note [2]: A diode device (4.8 V) must be put or both pins should be short (5 V) at **D1** in the NuTiny-EVB-NUC123.

2.1.2 Debug Connectors

- **JP3:** The connector in the target board (NuTiny-EVB-NUC123) for connecting with Nuvoton ICE adaptor (Nu-Link or Nu-Link-Me)
- **JP9:** The connector in the ICE adaptor (Nu-Link-Me) for connecting with a target board (e.g. NuTiny-EVB-NUC123)

2.1.3 USB Connectors

- **J1:** Mini USB connector in NuTiny-EVB-NUC123 for application use
- **J2:** Mini USB connector in Nu-Link-Me connected to a PC USB port

2.1.4 Extended Connectors

- **JP5, JP6, JP7** and **JP8:** Show all chip pins in NuTiny-EVB-NUC123

2.1.5 Reset Button

- **SW1:** Reset button in NuTiny-EVB-NUC123

2.1.6 Power Connectors

- **JP1:** VCC connector in NuTiny-EVB-NUC123
- **JP2:** GND connector in NuTiny-EVB-NUC123

2.2 Pin Assignment for Extended Connectors

The NuTiny-EVB-NUC123 provides the NUC123SD4AN0 target chip on board and the extended connectors (**JP5**, **JP6**, **JP7** and **JP8**) for LQFP 64-pin.

No	Pin Name	No	Pin Name	No	Pin Name	No	Pin Name
1	PB.14/ $\overline{INT0}$	17	VBUS	33	VSS	49	PD.0/ADC0/ SPISS20/SPISS11
2	PB.13	18	VDD33	34	PC.13/MOSI11/ PWM3/CLKO	50	PD.1/ADC1/ SPICLK2/SPISS01
3	PB.12/SPISS10/ CLKO	19	D-	35	PC.12/MISO11/ PWM2/I2SMCLK	51	PD.2/ADC2/ MISO20/MISO01
4	PA.11/SPICLK1/ MOSI20/I2C1SCL	20	D+	36	PC.11/MOSI10	52	PD.3/ADC3/ MOSI20/MOSI01
5	PA.10/MISO10/ MISO20/I2C1SDA	21	PB.0/RXD0	37	PC.10/MISO10	53	PD.4/ADC4/ MISO21
6	PD.8/MOSI10	22	PB.1/TXD0	38	VDD	54	PD.5/ADC5/ MOSI21
7	PD.9	23	PB.2/RTS0/ T2EX	39	PC.9/SPICLK1	55	PB.15/ $\overline{INT1}$/ T0EX
8	PD.10/CLKO	24	PB.3/CTS0/ T3EX	40	PC.8/SPISS10	56	PF.0/XT1_OUT
9	PD.11/ $\overline{INT1}$	25	PC.5/MOSI01/ TXD0	41	PA.15/PWM3/ I2SMCLK/CLKO	57	PF.1/XT1_IN
10	PB.4/RXD1/ SPISS20/SPISS11	26	PC.4/MISO01/ RXD0	42	VSS	58	/RESET
11	PB.5/TXD1 SPICLK2	27	PC.3/MOSI00/ I2SDO	43	PA.14/PWM2	59	VSS
12	PB.6/RTS1 MOSI20	28	PC.2/MISO00/ I2SDI	44	PA.13/PWM1	60	VDD
13	PB.7/CTS1 MISO20	29	PC.1/SPICLK0/ I2SBCLK	45	PA.12/PWM0	61	PF.2/ADC6/ I2C0SDA/PS2DAT
14	LDO	30	PC.0/SPISS00/ I2SLRCLK	46	ICE_DAT	62	PF.3/ADC7/ I2C0SCL/PS2CLK
15	VDD	31	PB.10/SPISS01/ TM2	47	ICE_CK	63	PVSS
16	VSS	32	PB.9/SPISS11/ TM1	48	AVDD	64	PB.8/TM0

Table 2-1 NUC123SD4AN0 LQFP 64-pin Assignment for Extended Connectors

2.3 PCB Placement

The following figure shows the NuTiny-SDK-NUC123 PCB placement.

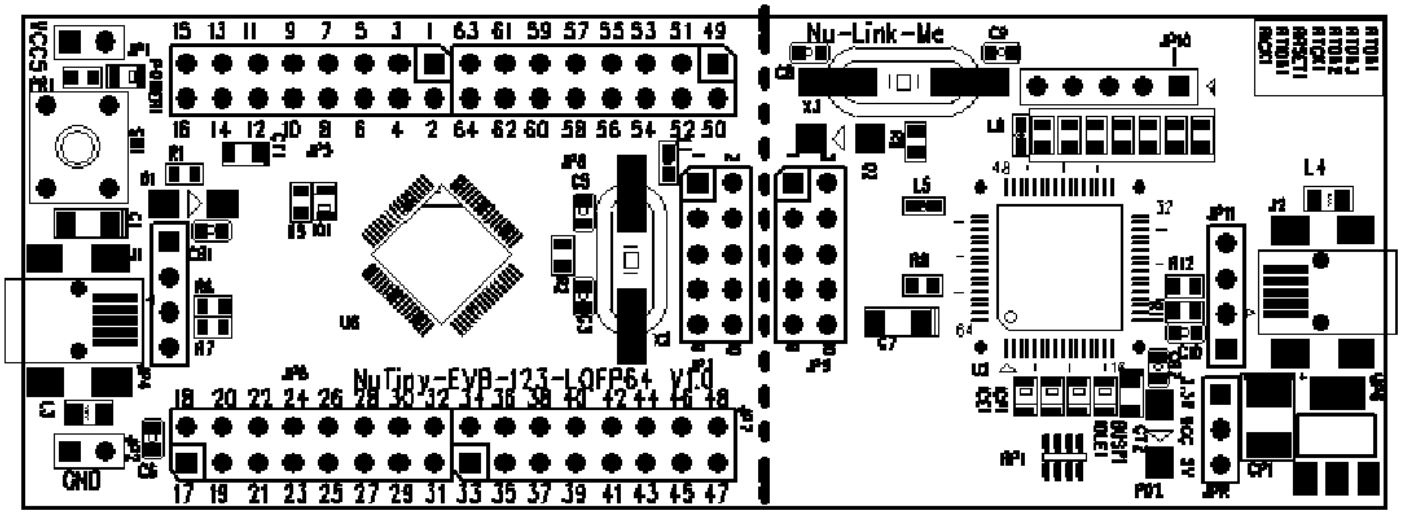


Figure 2-2 NuTiny-SDK-NUC123 PCB Placement

3 Starting to Use NuTiny-SDK-NUC123 with Keil µVision® IDE

3.1 Downloading and Installing Keil uVision® IDE Software

Please visit 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 visit Nuvoton NuMicro™ website (http://www.nuvoton.com/NuMicro) to download the "NuMicro™ Keil µVision® IDE driver" file. Please refer to *6.1 Downloading NuMicro™ Keil µVision® IDE Driver* 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 in the following figure.

Figure 3-1 NuTiny-SDK-NUC123 Hardware Setup

3.4 Smpl_NuTiny-NUC123 Example Program

This example, as shown in the directory in *Figure 3-2*, demonstrates downloading and debugging an application on a NuTiny-SDK-NUC123 board. The example file can be downloaded from Nuvoton NuMicro™ website as described in *6.3 Downloading NuMicro™ NUC123 Series BSP Software Library*.

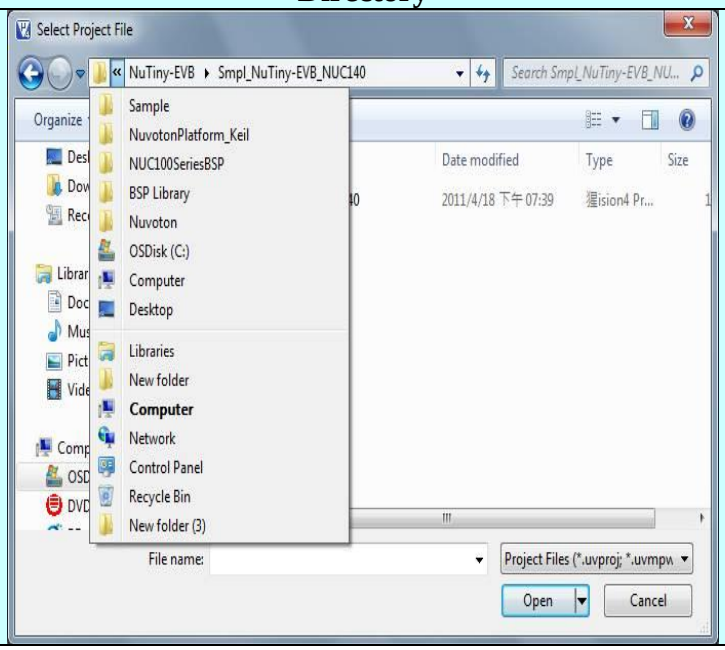
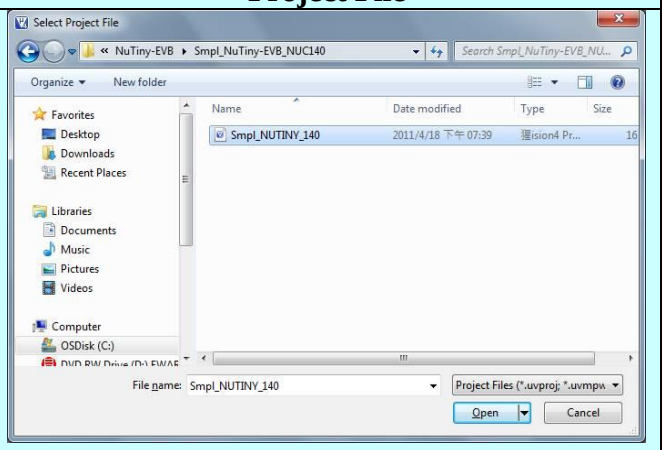
Directory	Project File
	

Figure 3-2 Smpl_NuTiny_NUC123 Example Directory

To use the example:
The PB.4 LED on the NuTiny-EVB-NUC123 board will be toggled On.

- **Start µVision®**
- **Project - Open**
  Open the Smpl_NuTiny_NUC123.uvproj project file
- **Project - Build**
  Compile and link the Smpl_NuTiny-NUC123 application
- **Flash – Download**
  Program the application code into on-chip Flash ROM
- **Start debug mode**
  Using the debugger commands, you may:
  - Review variables in the watch window
  - Single step through code
  - Reset the device
  - Run the application

4 Starting to Use NuTiny-SDK-NUC123 with 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 the Nuvoton Company NuMicro™ website (http://www.nuvoton.com/NuMicro) to download "NuMicro™ IAR ICE driver user manual" file. Please refer to Chapter 6.2 for the detail download flow. When the Nu-Link driver has been well 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 in the following figure.

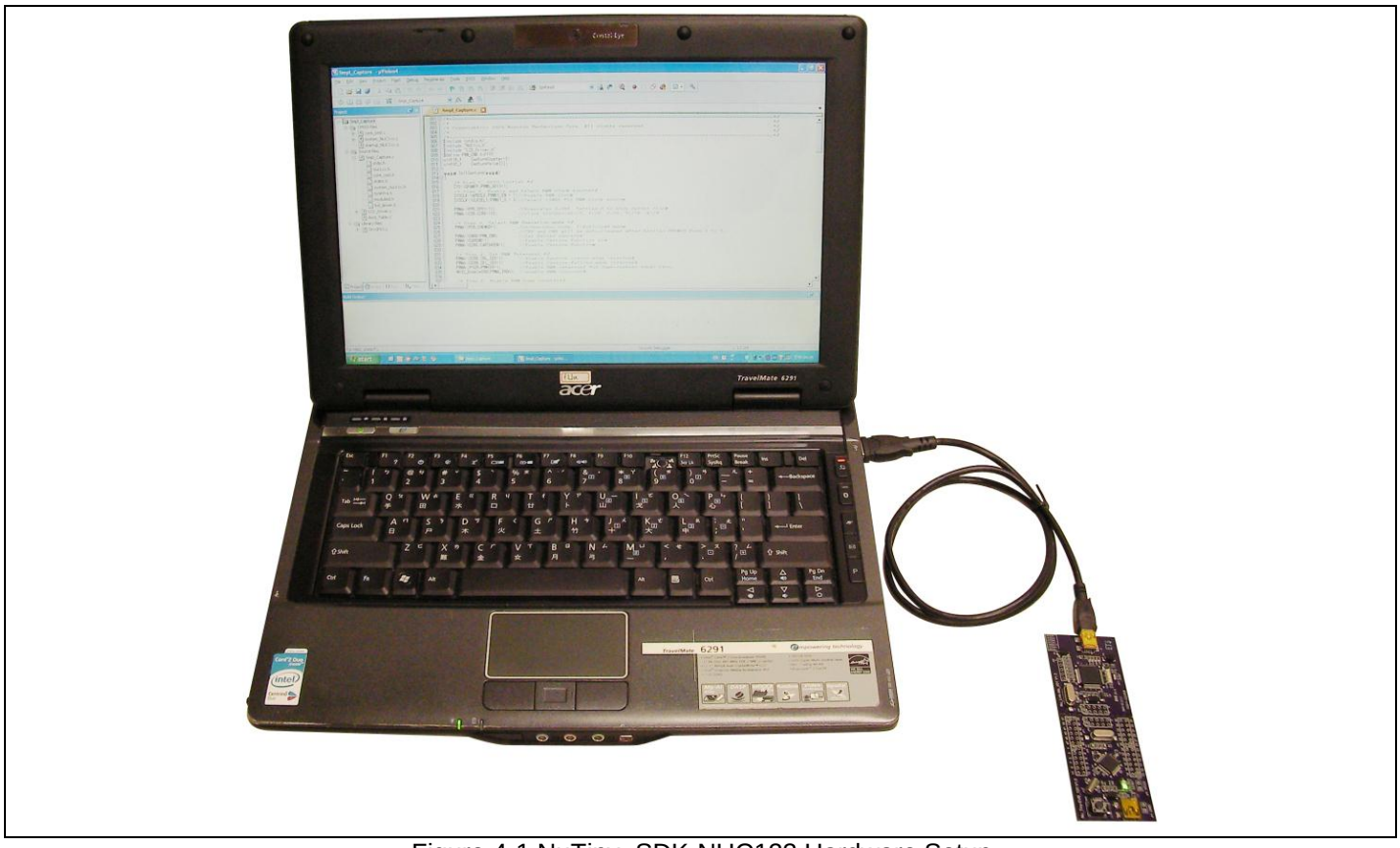


Figure 4-1 NuTiny- SDK-NUC123 Hardware Setup

4.4 Smpl_NuTiny-NUC123 Example Program

This example, as shown in the directory in *Figure 4-2*, demonstrates downloading and debugging an application on a NuTiny-SDK-NUC123 board. The example file can be downloaded from Nuvoton NuMicro™ website as described in *6.3 Downloading NuMicro™ NUC123 Series BSP Software Library*.

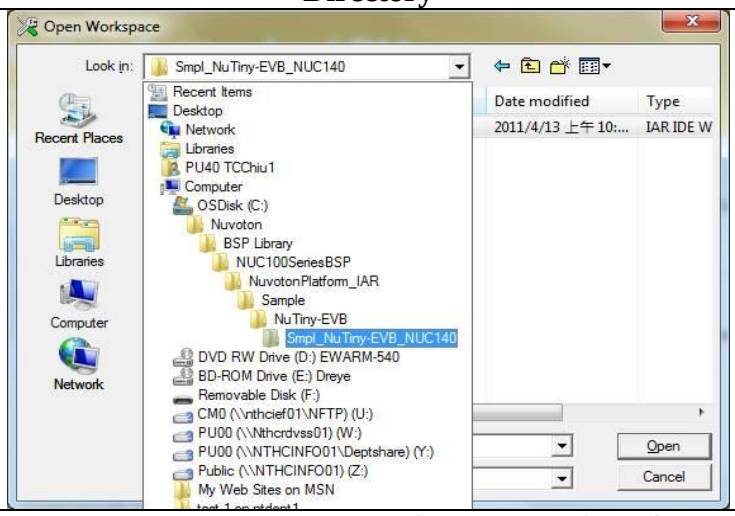
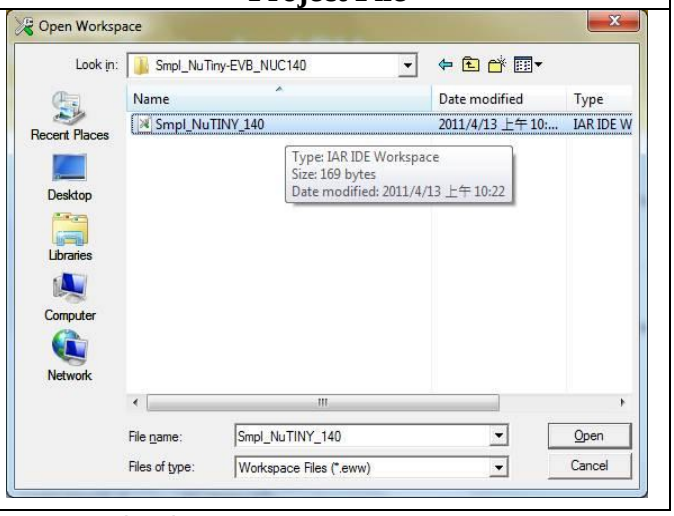
Directory	Project File
	

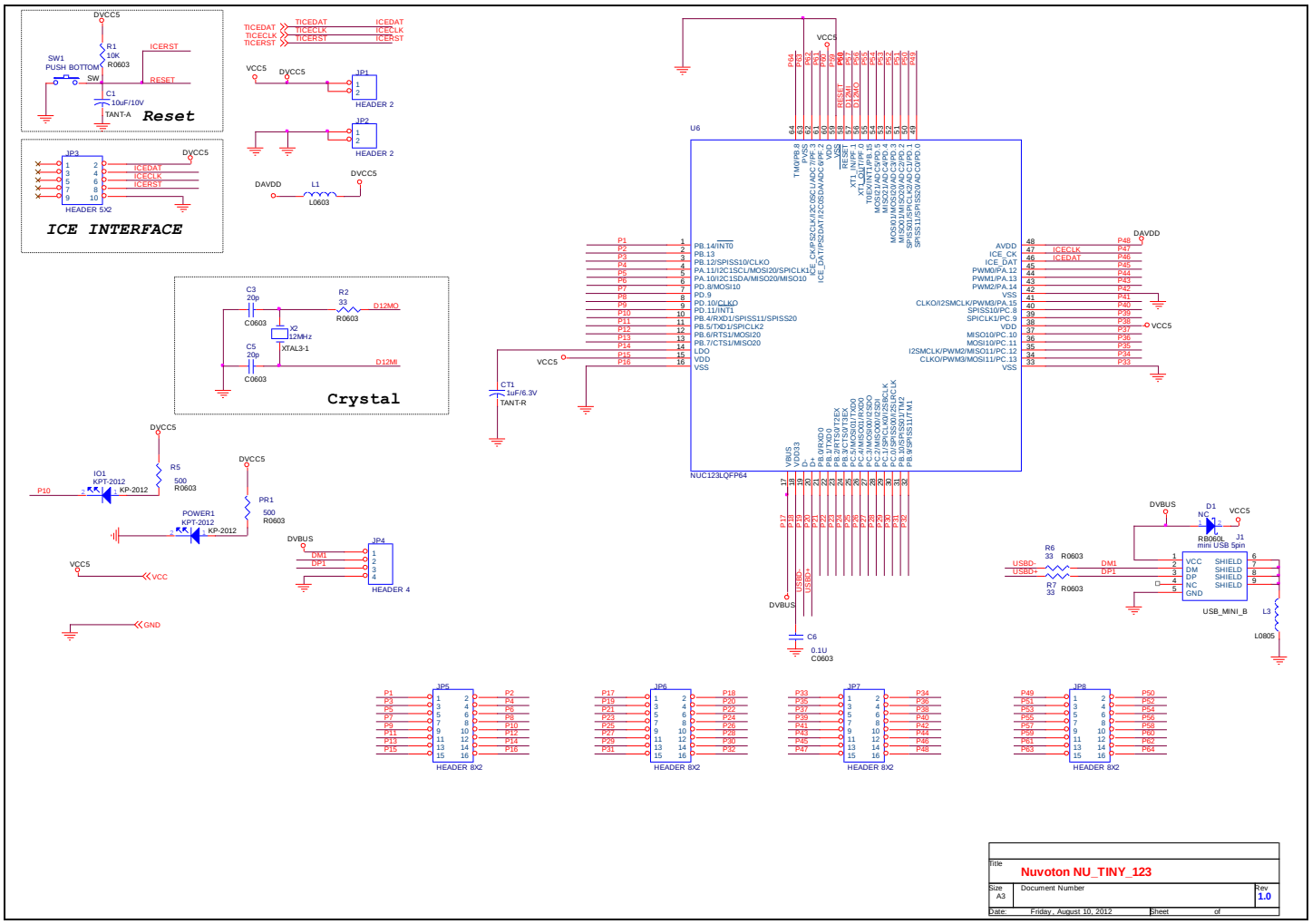
Figure 4-2 Smpl_NuTiny-NUC123 Example Directory

To use this example:
The PB.4 LED will toggle on the NuTiny-EVB-NUC123 board.

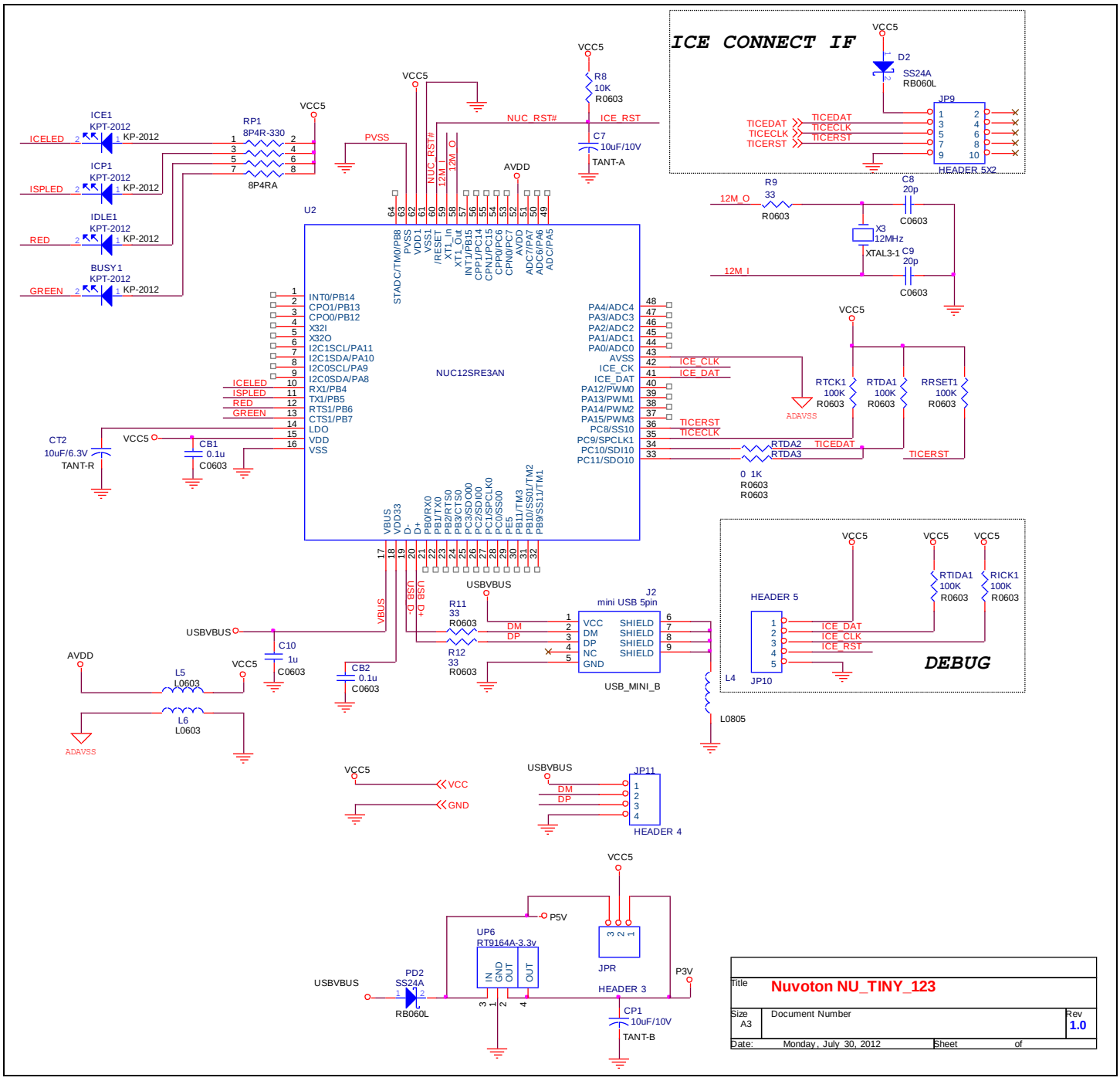
- **Start IAR Embedded Workbench**
- **File-Open-Workspace**
  Open the Smpl_NuTiny_NUC123.eww workspace file
- **Project - Make**
  Compile and link the Smpl_NuTiny-NUC123 application
- **Project – Download and Debug**
  Program the application code into on-chip Flash ROM
  - Single step through code
  - Reset the device
  - Run the application

5 NuTiny-SDK-NUC123 Schematics

5.1 NuTiny-EVB-NUC123 Schematic

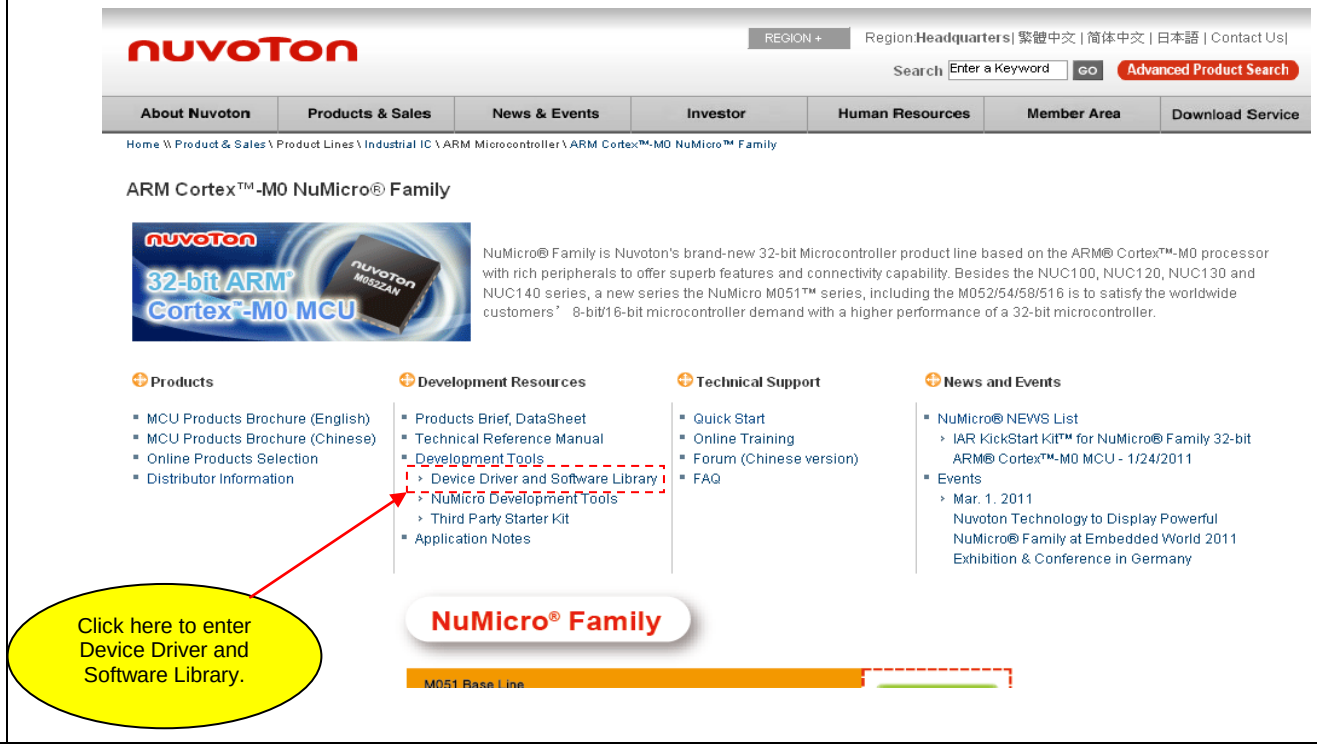


5.2 Nu-Link-Me Schematic



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	

Step 3

M051 Series BSP_RegCtrlPrg_v1.00.001.zip NUC100 Series Driver Reference Guide	M051 series software package based on register programming coding rule for sample code & user guide.	V1.00.001 V1.03.001
NUC100 Series BSP_CMSIS_v1.03.002.zip NUC100 Series Driver Reference Guide (Simplified Chinese)	NUC100 series software package based on CMSIS version 1.3. It supports both IAR and Keil development environment with drivers and samples codes. Examples source code for NuTiny-100/120 and Learining Board are included. For detailed, please download it and unzip it.	V1.03.002 V1.03.001

Programmer Software Tools Package

File name	Description	Version
ICP Programming Tool (Build 4228) V1.03.zip	NuMicro ICP tool & user manual	V1.03
ISP Programming Tool.zip	NuMicro ISP Programming Tool & user manual	V1.40
NuGang Programmer V5.31.zip	NuGang Programmer software & user manual	V5.31

Nu-Link Driver

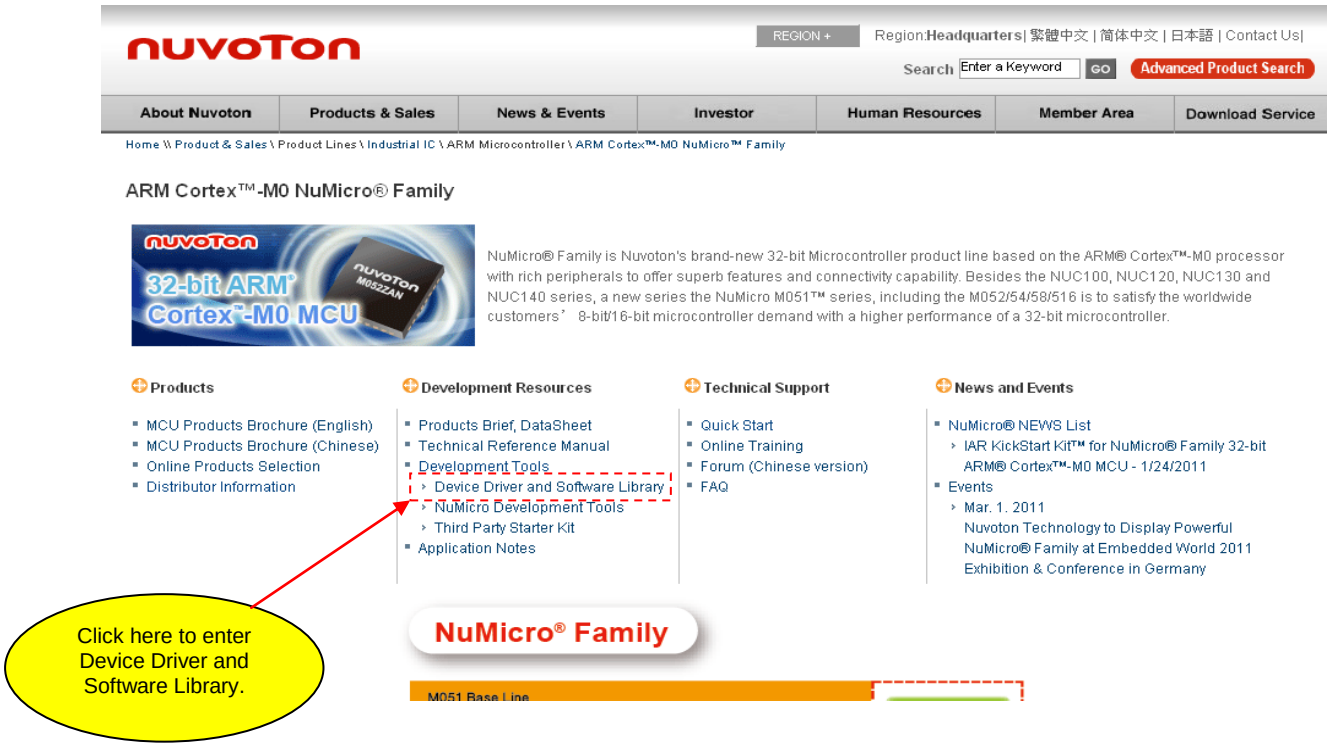
File name	Description	Version
Nu-Link Driver for Keil RVMDK(Build 4228) V1.03.zip	This driver is to support Nu-Link recognized by Keil RVMDK Development Environment and support all NuMicro Family Devices selectable.	V1.03
Nu-Link Driver for IAR EWARM(Build 4228) V1.03.zip	This driver is to support Nu-Link recognized by IAR EWARM Development Environment and support all NuMicro Family Devices selectable.	V1.03

Contact us: NuMicro@nuvoton.com

Click here to download the file.

Step 4 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	

Step 3

M051 Series BSP_RegCtrlPrg_v1.00.001.zip NUC100 Series Driver Reference Guide	M051 series software package based on register programming coding rule for sample code & user guide.	V1.00.001 V1.03.001
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File name	Description	Version
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Nu-Link Driver for IAR EWARM(Build 4228) V1.03.zip	This driver is to support Nu-Link recognized by IAR EWARM Development Environment and support all NuMicro Family Devices selectable.	V1.03

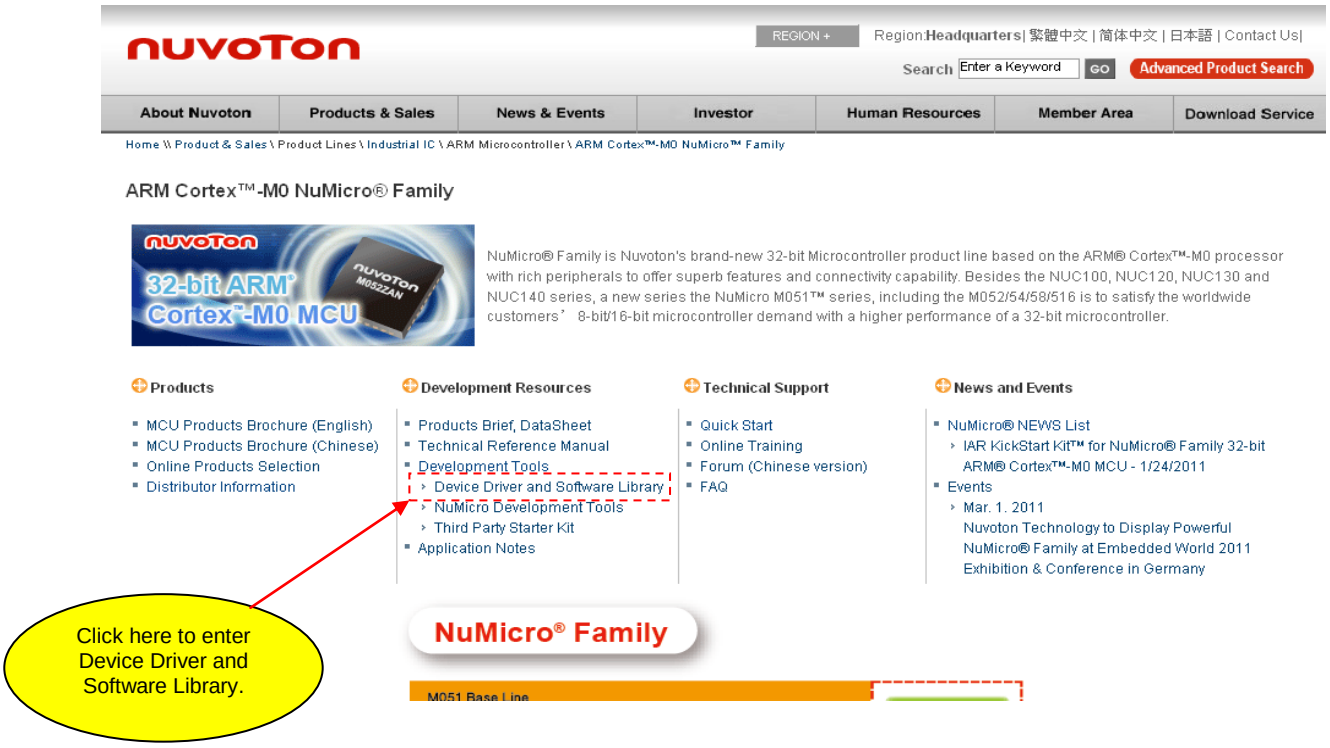
Contact us: NuMicro@nuvoton.com

Click here to download the file.

Step 4

Download the NuMicro™ IAR Embedded Workbench® driver.

6.3 Downloading NuMicro™ NUC123 Series BSP Software Library

Step1	Visit the Nuvoton NuMicro™ website: **http://www.nuvoton.com/NuMicro**.
Step2	

Step 3

Click here to download the file.

M051 Series BSP_RegCtrlPrg_v1.00.001.zip NUC100 Series Driver Reference Guide	M051 series software package based on register programming coding rule for sample code & user guide.	V1.00.001 V1.03.001
NUC100 Series BSP_CMSIS_v1.03.002.zip NUC100 Series Driver Reference Guide (Simplified Chinese)	NUC100 series software package based on CMSIS version 1.3. It supports both IAR and Keil development environment with drivers and samples codes. Examples source code for NuTiny-100/120 and Learining Board are included. For detailed, please download it and unzip it.	V1.03.002 V1.03.001

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Nu-Link Driver for IAR EWARM(Build 4228) V1.03.zip	This driver is to support Nu-Link recognized by IAR EWARM Development Environment and support all NuMicro Family Devices selectable.	V1.03

Contact us: NuMicro@nuvoton.com

Step 4 Download the NuMicro™ NUC123 series software library.

7 Revision History

Revision	Date	Description
1.0	Aug. 16, 2012	Preliminary version

Important Notice

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