



## ARM Cortex™-M0 32-BIT MICROCONTROLLER

# NuTiny-SDK-120 User Manual

## For NuMicro™ NUC120 Series

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## 1 Overview

NuTiny-SDK-120 is the specific development tool for NuMicro NUC120 series. Users can use NuTiny-SDK-120 to develop and verify the application program easily.

NuTiny-SDK-120 includes 2 portions. One is NuTiny-EVB-120 and the other is Nu-Link-Me. NuTiny-EVB-120 is evaluation board and Nu-Link-Me is its Debug Adaptor. Thus, users do not need other additional ICE or debug equipment.

## 2 NuTiny-SDK-120 Introduction

NuTiny-SDK-120 uses the NUC120LE3AN as the target microcontroller. Figure 2-1 is NuTiny-SDK-120 for NUC120 series and the left portion is called NuTiny-EVB-120 and the right portion is Debug Adaptor called Nu-Link-Me.

NuTiny-EVB-120 is similar to other development board. Users can use it to develop and verify applications to emulate the real behavior. The on board chip covers NUC120 series features. The NuTiny-EVB-120 can be a real system controller to design user target system.

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 2 documents will be stored in local hard disk when user installs each driver.

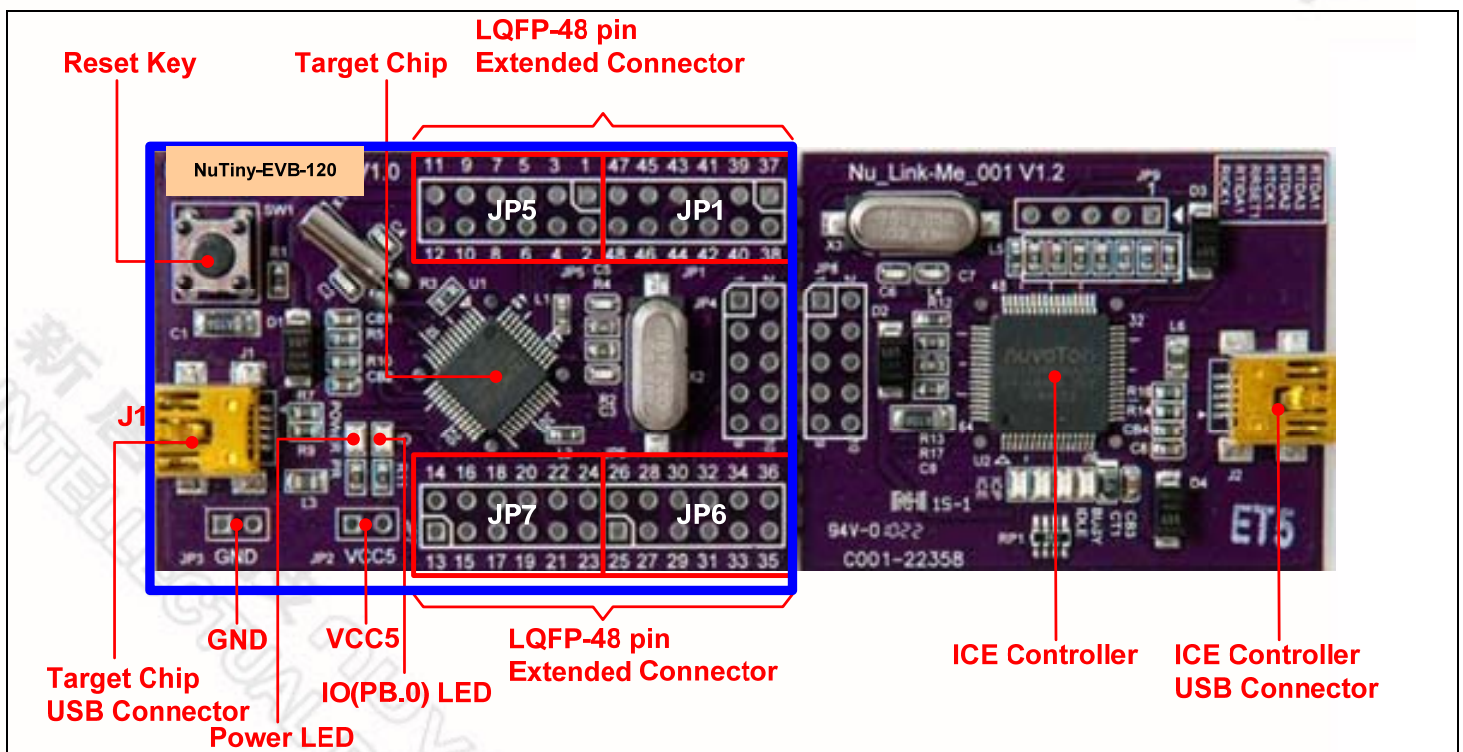


Figure 2-1 NuTiny-SDK-120 (Purple Color PCB Board)

## 2.1 NuTiny -SDK-120 Jumper Description

### 2.1.1 Power Setting

- J1: USB port in NuTiny-EVB-120
- JP2: VCC5 Voltage connector in NuTiny-EVB-120
- J2: USB port in Nu-Link-Me

POWER model	J1 USB port	J2 USB port	JP2 VCC5	MCU Voltage
Model 1	Connect to PC	X	DC 5V output	DC 5V
Model 2	X	Connect to PC	DC 5V output	DC 5V
Model 3	X	X	DC 2.8-5.5V input	Voltage by VCC input

X: Not use.

### 2.1.2 Debug Connector

- JP4: Connector in target board(NuTiny-EVB-120) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- JP8: Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (for exampl NuTiny-EVB-120)

### 2.1.3 USB Connector

- J1: Mini USB Connector in NuTiny-EVB-100 for application use
- J2: Mini USB Connector in Nu-Link-Me connected to a PC USB port

### 2.1.4 Extended Connector

- JP1, JP5, JP6 and JP7: Show all of chip pins in NuTiny-EVB-120

### 2.1.5 Reset Button

- SW1: Reset button in NuTiny-EVB-120

### 2.1.6 Power Connector

- JP2: VCC connector in NuTiny-EVB-120
- JP3: GND connector in NuTiny-EVB-120

## 2.2 Pin Assignment for Extended Connector

NuTiny-EVB-120 provides NUC120LE3AN on board and the extended connector for LQFP-48 pin. Table 2-1 is the pin assignment for NUC120LE3AN.

Pin No	Pin Name	Pin No	Pin Name
01	PB.12, CPO0, CLKO	25	PA.15, PWM3, I2SMCLK
02	X32O	26	PA.14, PWM2,
03	X32I	27	PA.13, PWM1
04	PA.11, I2C1SCL	28	PA.12, PWM0
05	PA.10, I2C1SDA	29	ICE_DAT
06	PA.9, I2C0SCL	30	ICE_CLK
07	PA.8, I2C0SDA	31	AVSS
08	PB.4, RX1	32	PA.0, ADC0
09	PB.5, TX1	33	PA.1, ADC1
10	LDO	34	PA.2, ADC2
11	VDD	35	PA.3, ADC3
12	VSS	36	PA.4, ADC4
13	VBUS	37	PA.5, ADC5
14	VDD33	38	PA.6, ADC6
15	D-	39	PA.7, ADC7
16	D+	40	AVDD
17	PB.0, RX0	41	PC.7, CPN0
18	PB.1, TX0	42	PC.6, CPP0
19	PB.2, RTS0	43	PB.15, /INT1
20	PB.3, CTS0	44	XT1_OUT
21	PC.3, MOSI00, I2SDO	45	XT1_IN
22	PC.2, MISO00, I2SDI	46	/RESET
23	PC.1, SPICLK0, I2SBCLK	47	PVSS
24	PC.0, /SPISS00, I2SLRCLK	48	PB.8, STADC, TM0

Table 2-1 Pin Assignment for NUC 120 Series

## 2.3 NuTiny-SDK-120 PCB Placement

Users can refer Figure 2-2 for the NuTiny –SDK-120 PCB placements.

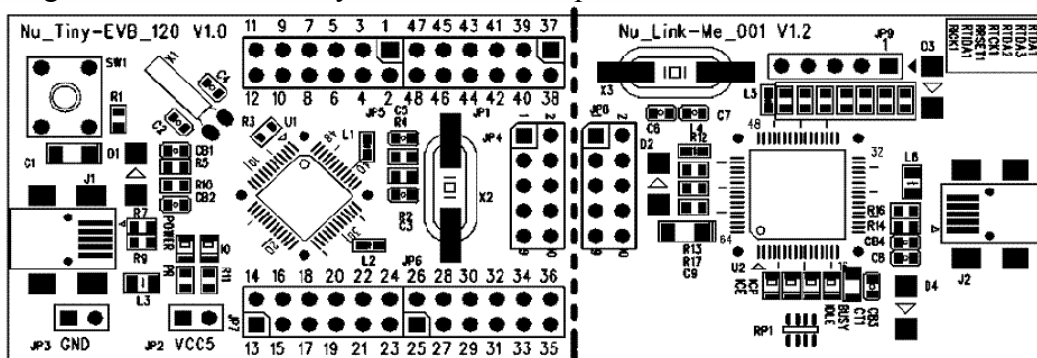


Figure 2-2 NuTiny-SDK-120 PCB Placement

## 3 How to Start NuTiny -SDK-120 on the Keil $\mu$ Vision<sup>®</sup> IDE

### 3.1 Keil $\mu$ Vision<sup>®</sup> IDE Software Download and Install

Please visit the Keil company website (<http://www.keil.com>) to download the Keil  $\mu$ Vision<sup>®</sup> IDE and install the RVMDK.

### 3.2 Nuvoton Nu-Link Driver Download and Install

Please visit the Nuvoton company NuMicro<sup>™</sup> website (<http://www.nuvoton.com/NuMicro>) to download “NuMicro<sup>™</sup> Keil  $\mu$ Vision<sup>®</sup> IDE driver” file. Please refer the Chapter 6.1 for the detail download flow. When the Nu-Link driver have been download ok, 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

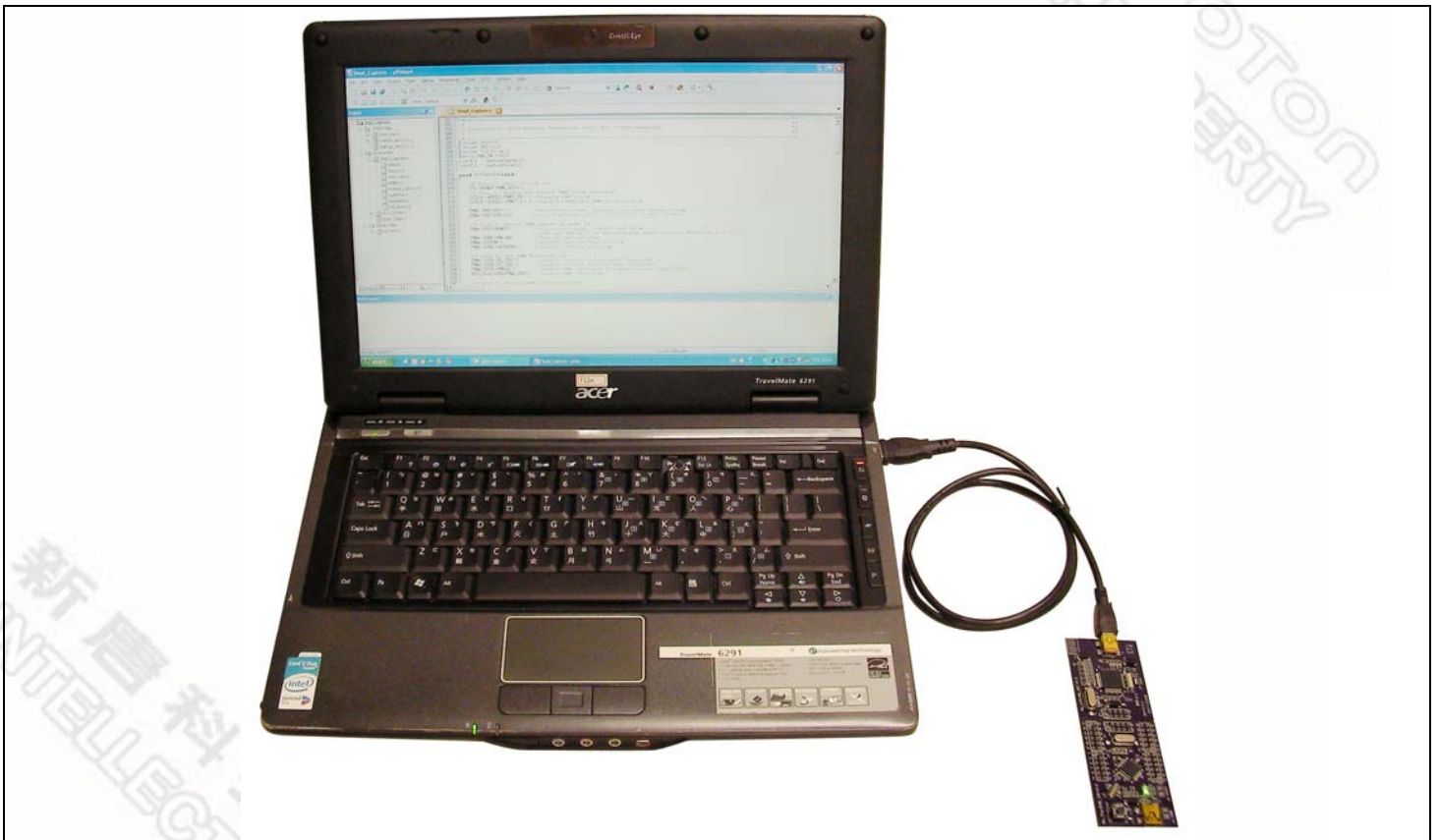


Figure 3-1 NuTiny-SDK-120 Hardware Setup

## 3.4 Smpl\_NuTiny-NUC120 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-SDK-120 board. It can be found on the Figure 3-2 list directory and downloaded from Nuvoton NuMicro™ Website following Chapter 6.3.

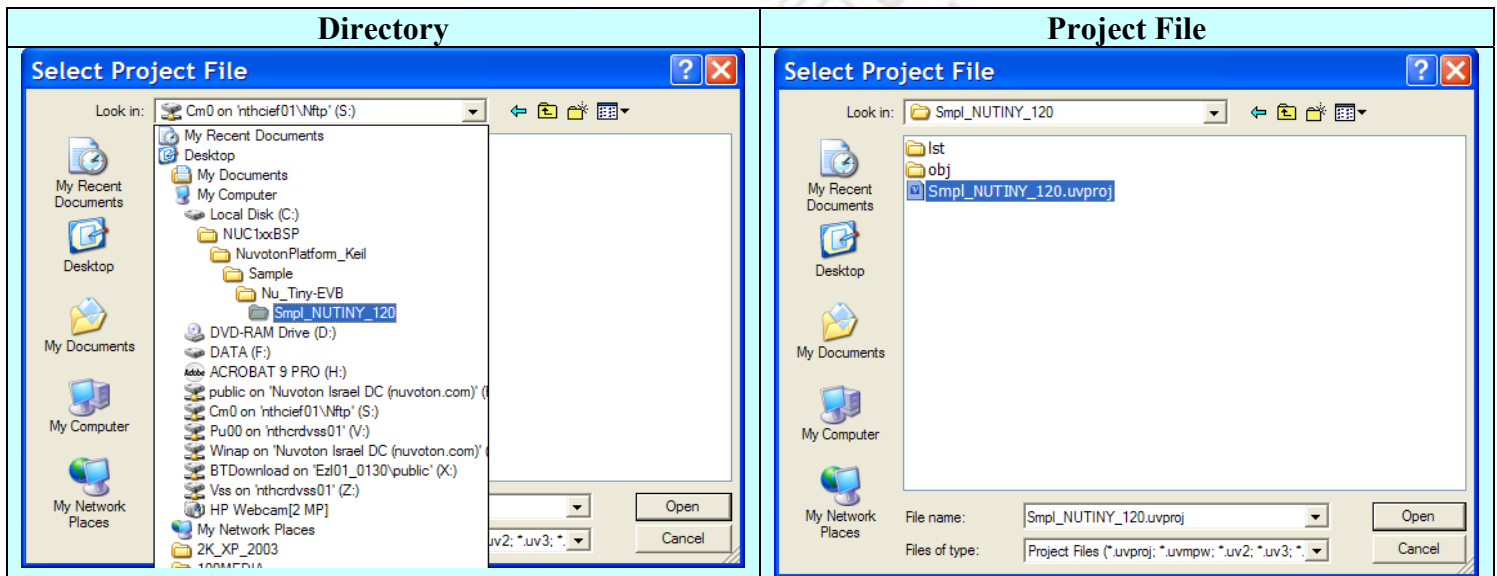










Figure 3-2 Smpl\_NuTiny\_120 Example Directory

To use this example:

The PB.0 LED will toggle on the NuTiny-EVB-120 board.

-  **Start uVision®**
- **Project-Open**  
Open the Smpl\_NuTiny\_100.uvproj project file
-  **Project - Build**  
Compile and link the Smpl\_NuTiny-NUC100 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
  - ◆  RST Reset the device
  - ◆  Run the application

## 4 How to Start NuTiny-SDK-120 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 & Install

Please connect to the Nuvoton Company NuMicro™ website (<http://www.nuvoton.com/NuMicro>) to download “NuMicro™ IAR ICE driver user manual” file. Please refer the 6.2 for the detail download flow. When the Nu-Link driver have been download ok, 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 4-1



Figure 4-1 NuTiny- SDK-20 Hardware Setup



## 4.4 Smpl\_NuTiny-NUC120 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-SDK-120 board. It can be found on the Figure 4-2 list directory and downloaded from Nuvoton NuMicro™ Website following Chapter 6.3.

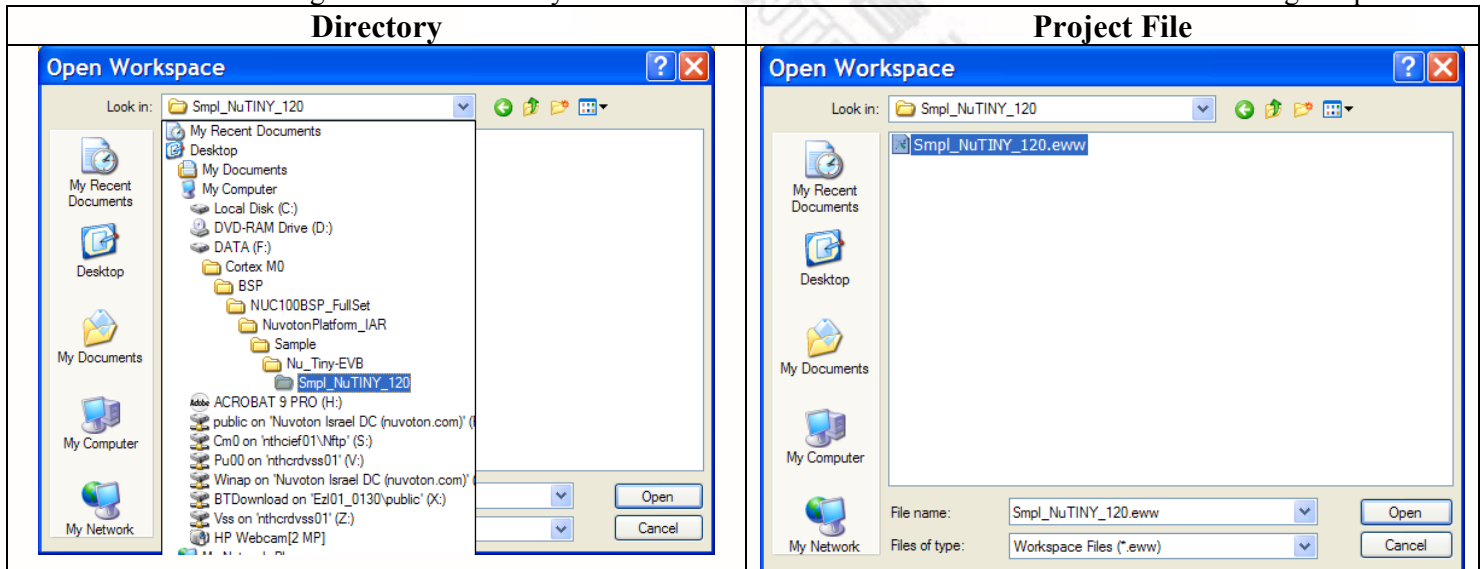


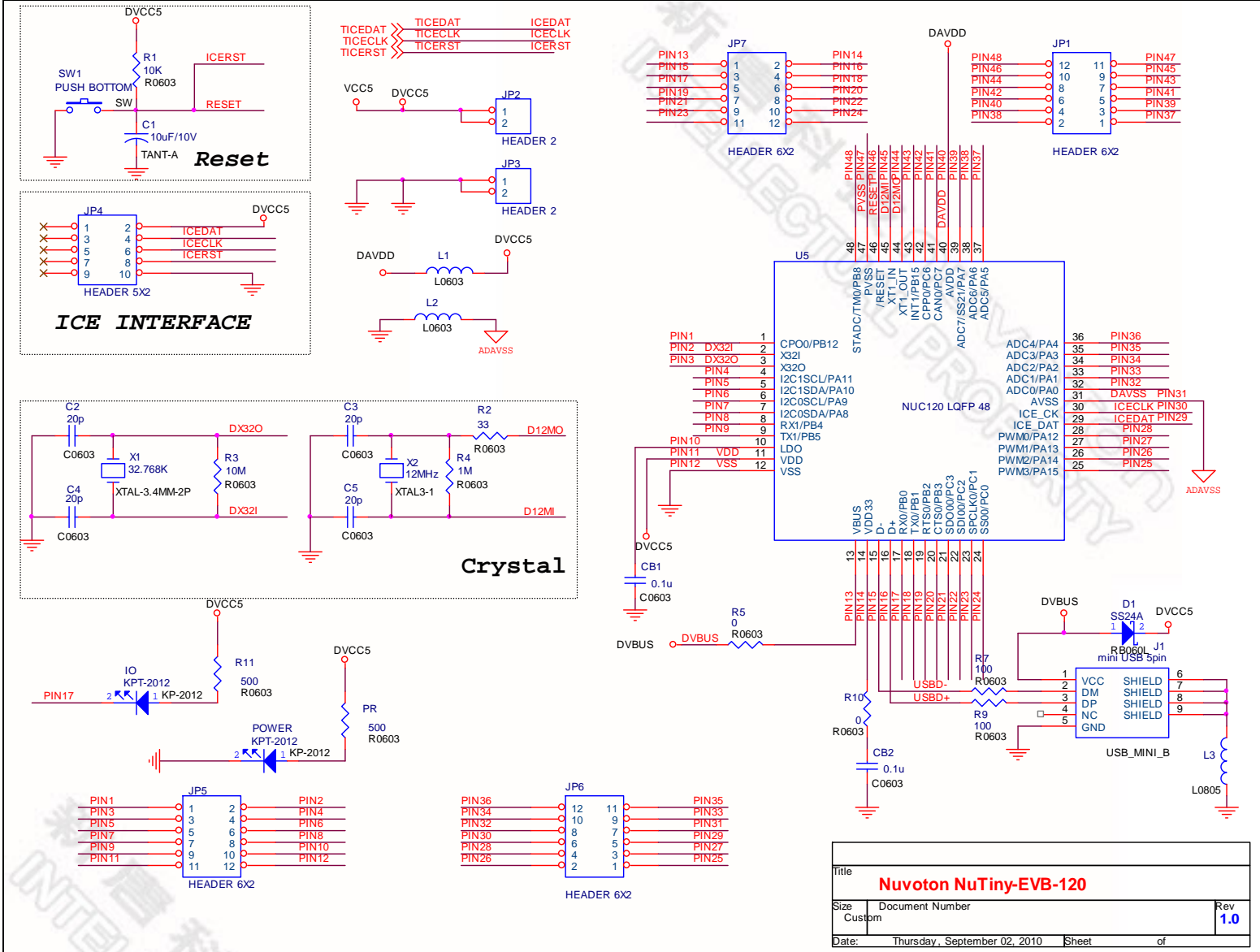
Figure 4-2 Smpl\_NuTiny-NUC120 Example Directory

To use this example:

The PB.0 LED will toggle on the NuTiny-EVB-120 board.

- **Start IAR Embedded Workbench**
- **File-Open-Workspace**  
Open the Smpl\_NuTiny\_100.eww workspace file
- **Project - Make**  
Compile and link the Smpl\_NuTiny-100 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-EVB-120 Schematic



Title		
<b>Nuvoton NuTiny-EVB-120</b>		
Size	Document Number	Rev
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Date:	Thursday, September 02, 2010	Sheet of

## 6 To Download NuMicro™ Family Related Files from Nuvoton Company

### 6.1 To Download NuMicro™ Keil μVision® IDE driver

<p><b>Step1</b></p>	<p>To visit the Nuvoton NuMicro™ Website: <a href="http://www.nuvoton.com/NuMicro">http://www.nuvoton.com/NuMicro</a></p>																																							
<p><b>Step2</b></p>	<p>The screenshot shows the NuMicro™ Family website. A yellow callout bubble says "Click here to enter Development Tools page" pointing to the "Development Tools &amp; File Download" link in the "Development Tools and Study" section. Other sections include "Technical Library" and "Information Notes".</p>																																							
<p><b>Step 3</b></p>	<table border="1"> <tr> <td><b>Nu-LB</b></td> <td>&gt; Nu-LB</td> <td>NUC100 NUC120 NUC130 NUC140</td> <td> <ul style="list-style-type: none"> <li>&gt; A Starter Kit made by Nuvoton</li> <li>&gt; Keil MDK-ARM (evaluation version) included</li> <li>&gt; Examples with source code included</li> </ul> </td> <td></td> <td>Check Disty!</td> </tr> <tr> <td><b>Nu-IAR-SKT</b></td> <td> <ul style="list-style-type: none"> <li>&gt; EVB w/M-Link</li> <li>&gt; USB Cable</li> <li>&gt; Setup CD</li> </ul> </td> <td>NUC100 NUC120 NUC130 NUC140</td> <td> <ul style="list-style-type: none"> <li>&gt; Starter Kit made by IAR</li> <li>&gt; IAR EWARM (evaluation version) Included</li> <li>&gt; IAR C/C++ Compiler included</li> <li>&gt; USB Plug &amp; Play</li> </ul> </td> <td></td> <td>Buy Online!</td> </tr> <tr> <td><b>Nu-Keil-SKT</b></td> <td> <ul style="list-style-type: none"> <li>&gt; U-LINK-ME</li> <li>&gt; MCBNUC1XX</li> <li>&gt; USB Cable</li> <li>&gt; Setup CD</li> </ul> </td> <td>NUC100 NUC120 NUC130 NUC140</td> <td> <ul style="list-style-type: none"> <li>&gt; Starter Kit made by Keil</li> <li>&gt; Keil MDK-ARM (evaluation version) included</li> <li>&gt; ARM C/C++ Compiler included</li> <li>&gt; USB Plug &amp; Play</li> </ul> </td> <td></td> <td>Check Disty!</td> </tr> </table> <table border="1"> <thead> <tr> <th>File name</th> <th>Description</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td> NUC1xx Quick Start Guide for Keil uVision4 V1.00.zip</td> <td>Quick start guide using Keil™ RVMDK</td> <td>V1.00</td> </tr> <tr> <td> NuMicro Keil uVision® IDE driver (Build 4033) V1.02.zip</td> <td>The Nuvoton NuMicro Keil uVision® Driver allows the Keil uVision® IDE to communicate with Nuvoton Nu-Link ICE bridge.</td> <td>V1.02</td> </tr> <tr> <td> NuMicro IAR Embedded Workbench® driver (Build 4033) V1.02.zip</td> <td>The Nuvoton NuMicro IAR Embedded Workbench® driver allows the IAR Embedded Workbench IDE above v5.41 to communicate with Nuvoton Nu-Link ICE bridge.</td> <td>V1.02</td> </tr> <tr> <td> NuMicro ICP (Build 4033) V1.02.zip</td> <td>NuMicro ICP tool &amp; user manual</td> <td>V1.02</td> </tr> <tr> <td> NUC1xx ISP V1.08.zip</td> <td>NUC1xx ISP tool &amp; user manual</td> <td>V1.08</td> </tr> <tr> <td> NIIC1xx Nu-EVB_001 Board Schematic v2.0.pdf</td> <td>NUC1xx Nu-EVB_001 Board Schematic</td> <td>V2.0</td> </tr> </tbody> </table> <p>A yellow callout bubble says "To download the file" pointing to the "NuMicro Keil uVision® IDE driver (Build 4033) V1.02.zip" entry in the File Download table.</p>	<b>Nu-LB</b>	> Nu-LB	NUC100 NUC120 NUC130 NUC140	<ul style="list-style-type: none"> <li>&gt; A Starter Kit made by Nuvoton</li> <li>&gt; Keil MDK-ARM (evaluation version) included</li> <li>&gt; Examples with source code included</li> </ul>		Check Disty!	<b>Nu-IAR-SKT</b>	<ul style="list-style-type: none"> <li>&gt; EVB w/M-Link</li> <li>&gt; USB Cable</li> <li>&gt; Setup CD</li> </ul>	NUC100 NUC120 NUC130 NUC140	<ul style="list-style-type: none"> <li>&gt; Starter Kit made by IAR</li> <li>&gt; IAR EWARM (evaluation version) Included</li> <li>&gt; IAR C/C++ Compiler included</li> <li>&gt; USB Plug &amp; Play</li> </ul>		Buy Online!	<b>Nu-Keil-SKT</b>	<ul style="list-style-type: none"> <li>&gt; U-LINK-ME</li> <li>&gt; MCBNUC1XX</li> <li>&gt; USB Cable</li> <li>&gt; Setup CD</li> </ul>	NUC100 NUC120 NUC130 NUC140	<ul style="list-style-type: none"> <li>&gt; Starter Kit made by Keil</li> <li>&gt; Keil MDK-ARM (evaluation version) included</li> <li>&gt; ARM C/C++ Compiler included</li> <li>&gt; USB Plug &amp; Play</li> </ul>		Check Disty!	File name	Description	Version	NUC1xx Quick Start Guide for Keil uVision4 V1.00.zip	Quick start guide using Keil™ RVMDK	V1.00	NuMicro Keil uVision® IDE driver (Build 4033) V1.02.zip	The Nuvoton NuMicro Keil uVision® Driver allows the Keil uVision® IDE to communicate with Nuvoton Nu-Link ICE bridge.	V1.02	NuMicro IAR Embedded Workbench® driver (Build 4033) V1.02.zip	The Nuvoton NuMicro IAR Embedded Workbench® driver allows the IAR Embedded Workbench IDE above v5.41 to communicate with Nuvoton Nu-Link ICE bridge.	V1.02	NuMicro ICP (Build 4033) V1.02.zip	NuMicro ICP tool & user manual	V1.02	NUC1xx ISP V1.08.zip	NUC1xx ISP tool & user manual	V1.08	NIIC1xx Nu-EVB_001 Board Schematic v2.0.pdf	NUC1xx Nu-EVB_001 Board Schematic	V2.0
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## 6.3 To Download NuMicro™ NUC120 series BSP Software Library

<b>Step1</b>	To visit the Nuvoton NuMicro™ Website: <a href="http://www.nuvoton.com/NuMicro">http://www.nuvoton.com/NuMicro</a>
<b>Step2</b>	<p><b>ARM Cortex™-M0 NuMicro® Family</b></p> <p>NuMicro® Family is Nuvoton's brand-new 32-bit Microcontroller product line based on the ARM® Cortex™-M0 processor with rich peripherals to offer superb features and connectivity capability. Besides the NUC100, NUC120, NUC130 and NUC140 series, a new series the NuMicro M051™ series, including the M052/54/58/516 is to satisfy the worldwide customers' 8-bit/16-bit microcontroller demand with a higher performance of a 32-bit microcontroller.</p> <div style="display: flex; justify-content: space-between;"> <div data-bbox="261 1018 634 1186"> <p><b>Technical Library</b></p> <ul style="list-style-type: none"> <li>On-Line Products Selection Guide</li> <li>Datasheet &amp; Technical Reference Manual</li> <li><b>Software Library</b></li> <li>Application Notes</li> <li>FAQ</li> </ul> </div> <div data-bbox="711 1018 1084 1186"> <p><b>Development Tools and Study</b></p> <ul style="list-style-type: none"> <li>Development Tools &amp; File Download</li> <li>Starter Kit</li> <li>On-Line Training</li> </ul> </div> <div data-bbox="1161 1018 1534 1186"> <p><b>Information Notes</b></p> <ul style="list-style-type: none"> <li>Events</li> <li>E-News</li> <li>M051 Series TRM <span style="background-color: yellow;">New</span></li> <li>M051 Series BSP by CMSIS <span style="background-color: yellow;">New</span></li> <li>NuMicro Keil uVision® IDE Driver <span style="background-color: yellow;">New</span></li> </ul> </div> </div> <div style="text-align: center; margin-top: 20px;"> <p><b>NuMicro® Family</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid gray; padding: 5px;"> <p>M051 Base Line</p> <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="background-color: red; color: white; padding: 2px;">Up to 64KB Flash ROM</div> <div style="background-color: red; color: white; padding: 2px;">Up to 4KB SRAM</div> </div> <p style="background-color: red; color: white; padding: 2px; border-radius: 10px;">• NuMicro M051 •</p> </div> <div style="border: 1px dashed red; padding: 5px;"> <p style="background-color: green; color: white; padding: 2px; border-radius: 10px;">Cortex-M0</p> <p style="background-color: green; color: white; padding: 2px; border-radius: 10px;">UART</p> </div> </div> <p style="font-size: small; margin-top: 5px;">NUC100 Advance Line</p> </div>
<b>Step 3</b>	To download the NuMicro™ NUC100 series software library

## 7 Revision History

Version	Date	Page	Description
1.0	Aug. 20, 2010	--	Initial Release

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