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ARM Cortex™-M0  
32-bit Microcontroller

**NuTiny-SDK-Nano130 User Manual**  
**for NuMicro™ Nano130 Series**

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## 1 Overview

The NuTiny-SDK-Nano130 is a specific development tool for the NuMicro Nano130 series users to develop and verify the application program easily. The NuTiny-SDK-Nano130 includes two portions: NuTiny-EVB-Nano130 (an evaluation board) and Nu-Link-Me (its Debug Adaptor), such that users do not need additional ICE or debug equipment.

## 2 Introduction to NuTiny-SDK-Nano130

The NuTiny-SDK-Nano130 uses the NANO130KE3BN as the target microcontroller. *Figure 2-1* shows the NuTiny-SDK-Nano130 for Nano130 series, in which the left portion is called NuTiny-EVB-Nano130 and the right portion is called Nu-Link-Me.

The NuTiny-EVB-Nano130 is similar to other development boards, by which users can develop and verify applications to emulate the real behavior. The on board chip covers Nano130 series features. The NuTiny-EVB-Nano130 can be a real system controller to design the users' target systems.

The Nu-Link-Me is a Debug Adaptor, which connects your PC's USB port to a 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 “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 is installed.

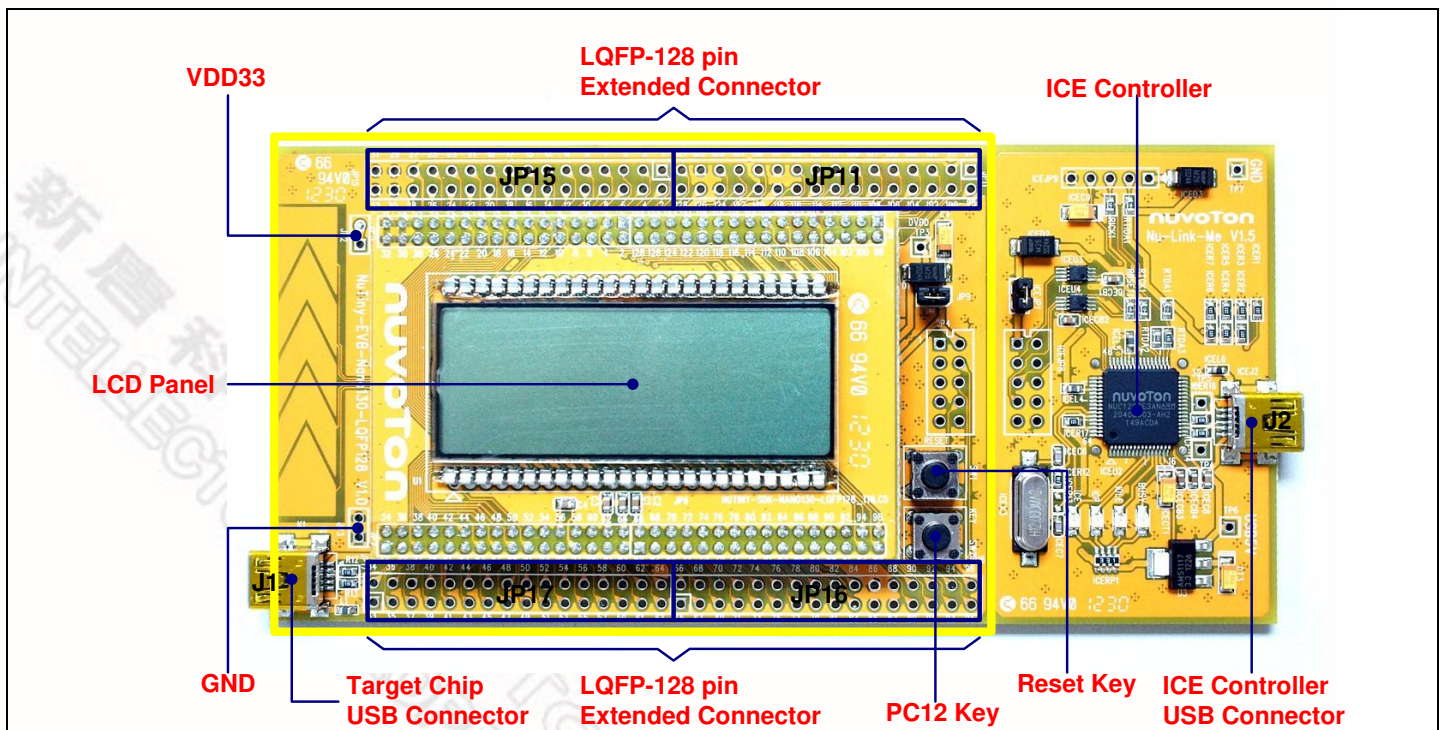


Figure 2-1 NuTiny-SDK-Nano130 (Yellow PCB Board)

## 2.1 NuTiny-SDK-Nano130 Jumper Description

### 2.1.1 Power Settings

- **J1**: USB port in NuTiny-EVB-Nano130
- **JP2**: VDD33 Voltage connector in NuTiny-EVB-Nano130
- **J2**: USB port in Nu-Link-Me

Power Model	J2 USB Port	J1 USB Port	JP2 VDD33	MCU Voltage
Model 1	Connect to PC	X	DC 3.3V output	DC 3.3V
Model 2	X	Connect to PC	DC3.3V output	DC 3.3V
Model 3	X	X	DC 1.8 V ~ 3.6 V Input	DC 1.8 V ~ 3.6 V Decided by <b>JP2</b> VDD33 Input

X: Unused.

### 2.1.2 Debug Connectors

- **JP4**: Connector in target board (NuTiny-EVB-Nano130) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- **JP8**: Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (e.g. NuTiny-EVB-Nano130)

### 2.1.3 USB Connectors

- **J1**: Mini USB Connector in NuTiny-EVB-Nano130 for application use
- **J2**: Mini USB Connector in Nu-Link-Me connected to a PC USB port

### 2.1.4 Extended Connectors

- **JP11**, **JP15**, **JP16** and **JP17**: Show all chip pins in NuTiny-EVB-Nano130

### 2.1.5 Buttons

- **SW1**: Reset button in NuTiny-EVB-Nano130
- **SW2**: PC12 button in NuTiny-EVB-Nano130

### 2.1.6 Power Connectors

- **JP2**: VDD33 connector in NuTiny-EVB-Nano130
- **JP3**: GND connector in NuTiny-EVB-Nano130

### 2.1.7 Power Jumpers

- **JP1**: Jumper in ICE adaptor (Nu-Link-Me) for power source selection of **JP8**.
- **JP9**: Jumper in NuTiny-EVB-Nano130 to set power source from **JP4** and **J1**



## 2.2 Pin Assignment for Extended Connectors

The NuTiny-EVB-Nano130 provides the NANO130KE3BN target chip on board and the extended connectors (**JP11**, **JP15**, **JP16** and **JP17**) for LQFP128-pin.

No	Pin Name	No	Pin Name	No	Pin Name	No	Pin Name
01	PE13/LCD_SEG27	33	PE12/UART1_CTSn	65	PE4/SPI0_MOSI0	97	VREF
02	PB14/INT0/SC2_CD/ SPI2_SS1/LCD_SEG12/ LCD_SEG26	34	PE11/UART1_RTSn	66	PE3/SPI0_MISO0	98	NC
03	PB13/EBI_AD1/ LCD_SEG11/LCD_SEG25	35	PE10/UART1_TXD	67	PE2/SPI0_CLK	99	AVDD
04	PB12/EBI_AD0/ CLKO/LCD_SEG10/ LCD_SEG24	36	PE9/UART1_RXD	68	PE1/PWM1_CH3/SPI0_SS0	100	PD0/UART1_RXD/ SPI2_SS0/SC1_CLK/ CTK0/AD8
05	NC	37	PE8/LCD_SEG9	69	PE0/PWM1_CH2/ I2S_MCLK	101	PD1/UART1_TXD/ SPI2_CLK/SC1_DAT/ AD9/CTK1
06	X320	38	PE7/LCD_SEG8	70	PC13/SPI_MOSI1/ PWM1_CH1/SNOOPER/ INT0/I2C0_SCL	102	PD2/UART1_RTSn/ I2S_LRCLK/SPI2_MISO0/ SC1_PWR/AD10/CTK2
07	X32I	39	NC	71	PC12/SPI1_MISO1/ PWM1_CH0/ INT0/I2C0_SDA	103	PD3/UART1_CTSn/ I2S_BCLK/SPI2_MOSI0/ SC1_RST/AD11/CTK3
08	NC	40	NC	72	PC11/SPI1_MOSI0/ UART1_TXD/ CTK15/LCD_SEG31	104	NC
09	PA11/I2C1_SCL/EBI_nRD/ SC0_RST/SPI2_MOSI0/ LCD_SEG9/LCD_SEG23	41	NC	73	PC10/SPI1_MISO0/ UART1_RXD/ CTK14/LCD_SEG30	105	PD4/I2S_DI/ SPI2_MISO1/SC1_CD/ CTK4/LCD_SEG35
10	PA10/I2C1_SDA/EBI_nWR/ SC0_PWR/SPI2_MISO0/ LCD_SEG8/LCD_SEG22	42	NC	74	PC9/SPI1_CLK/I2C1_SCL/ CTK13/LCD_SEG29	106	PD5/I2S_DO/ SPI2_MOSI1/CTK5/ LCD_SEG34
11	PA9/I2C0_SCL/ SC0_DAT/SPI2_CLK/ LCD_SEG7/LCD_SEG21	43	NC	75	PC8/SPI1_SS0/ EBI_MCLK/I2C1_SDA/ CTK12/LCD_SEG28	107	PC7/DA1_OUT/ EBI_AD5/TC1/ PWM0_CH1/LCD_SEG17
12	PA8/I2C0_SDA/ SC0_CLK/SPI2_SS0/ LCD_SEG6/LCD_SEG20	44	PB0/UART0_RXD/ SPI1_MOSI0/ LCD_SEG1/LCD_SEG7	76	PA15/PWM0_CH3/ I2S_MCLK/TC3/SC0_PWR/ UART0_TXD/LCD_SEG27	108	PC6/DA0_OUT/ EBI_AD4/TC0/ SC1_CD/PWM0_CH0
13	PD8/LCD_SEG19	45	PB1/UART0_TXD/ SPI1_MISO0/ LCD_SEG0/LCD_SEG6	77	PA14/PWM0_CH2/ EBI_AD15/TC2/ UART0_RXD/LCD_SEG26	109	PC15/EBI_AD3/ TC0/PWM1_CH2/ LCD_SEG16/LCD_SEG33
14	PD9/LCD_SEG18	46	PB2/UART0_RTSn/ EBI_nWRL/SPI1_CLK/ LCD_COM3/LCD_SEG 5	78	PA13/PWM0_CH1/ EBI_AD14/TC1/I2C0_SCL/ CTK11/LCD_SEG25	110	PC14/EBI_AD2/ PWM1_CH3/ LCD_SEG15/LCD_SEG32
15	PD10/LCD_SEG17	47	PB3/UART0_CTSn/ EBI_nWRH/SPI1_SS0/ LCD_COM2/LCD_SEG 4	79	PA12/PWM0_CH0/ EBI_AD13/TC0/I2C0_SDA/ CTK10/LCD_SEG24	111	PB15/INT1/ SNOOPER/ LCD_SEG14/LCD_SEG31
16	PD11/LCD_SEG16	48	PD6/LCD_SEG3	80	PF0/ICE_DAT/INT0	112	NC
17	PD12/LCD_SEG15	49	PD7/LCD_SEG2	81	PF1/ICE_CLK/ CLKO/INT1	113	XT1_IN
18	PD13/LCD_SEG14	50	PD14/LCD_SEG1	82	NC	114	XT1_OUT
19	PB4/UART1_RXD/ SC0_CD/SPI2_SS0/ LCD_SEG5/LCD_SEG13	51	PD15/LCD_SEG0	83	VDD	115	NC
20	PB5/UART1_TXD/	52	PC5/SPI0_MOSI1/	84	NC	116	nRESET



	SC0_RST/SPI2_CLK/ LCD_SEG4/LCD_SEG12		LCD_COM3				
21	PB6/UART1_RTSn/ EBI_ALE/SPI2_MISO0/ LCD_SEG3/LCD_SEG11	53	PC4/SPI0_MISO1/ LCD_COM2	85	VSS	117	VSS
22	PB7/UART1_CTSn/ EBI_nCS/SPI2_MOSI0/ LCD_SEG2/LCD_SEG10	54	PC3/SPI0_MOSI0/ I2S_DO/SC1_RST/ LCD_COM1	86	VSS	118	VSS
23	NC	55	PC2/SPI0_MISO0/ I2S_DI/SC1_PWR/ LCD_COM0	87	AVSS	119	NC
24	LDO_CAP	56	PC1/SPI0_CLK/ I2S_BCLK_SC1_DAT/ LCD_DH2	88	AVSS	120	VDD
25	NC	57	PC0/SPI0_SS0/ I2S_LRCLK/ SC1_CLK/LCD_DH1	89	PA0/AD0/ SC2_CD/CTK8	121	NC
26	NC	58	PE6	90	PA1/AD1/EBI_AD12/CTK9	122	PF4/I2C0_SDA/CTK6
27	VDD	59	LCD_VLCD	91	PA2/AD2/EBI_AD11/ UART1_RXD/LCD_SEG23	123	PF5/I2C0_SCL/CTK7
28	NC	60	LCD_VLCD	92	PA3/AD3/EBI_AD10/ UART1_TXD/LCD_SEG22	124	VSS
29	VSS	61	PE5	93	PA4/AD4/EBI_AD9/ SC2_PWR/I2C0_SDA/ LCD_SEG21/LCD_SEG39	125	PVSS
30	VSS	62	PB11/PWM1_CH0/ TM3/SC2_DAT/ SPI0_MISO0/LCD_V1	94	PA5/AD5/EBI_AD8/ SC2_RST/I2C0_SCL/ LCD_SEG20/LCD_SEG38	126	PB8/STADC/TM0/ INT0/SC2_PWR/ LCD_SEG13/LCD_SEG30
31	VSS	63	PB10/SPI0_SS1/ TM2/SC2_CLK/ SPI0_MOSI0/LCD_V2	95	PA6/AD6/EBI_AD7/ TC3/SC2_CLK/PWM0_CH3/ LCD_SEG19/LCD_SEG37	127	PE15/LCD_SEG29
32	VSS	64	PB9/SPI1_SS1/ TM1/SC2_RST/ INT0/LCD_V3	96	PA7/AD7/EBI_AD6/ TC2/SC2_DAT/ PWM0_CH2/CTK_CAP/ LCD_SEG18/LCD_SEG36	128	PE14/LCD_SEG28

Table 2-1 NANO130KE3BN LQFP 128-pin Assignment for Extended Connectors

## 2.3 NuTiny-SDK-Nano130 PCB Placement

The following figure shows the NuTiny-SDK-Nano130 PCB placement.

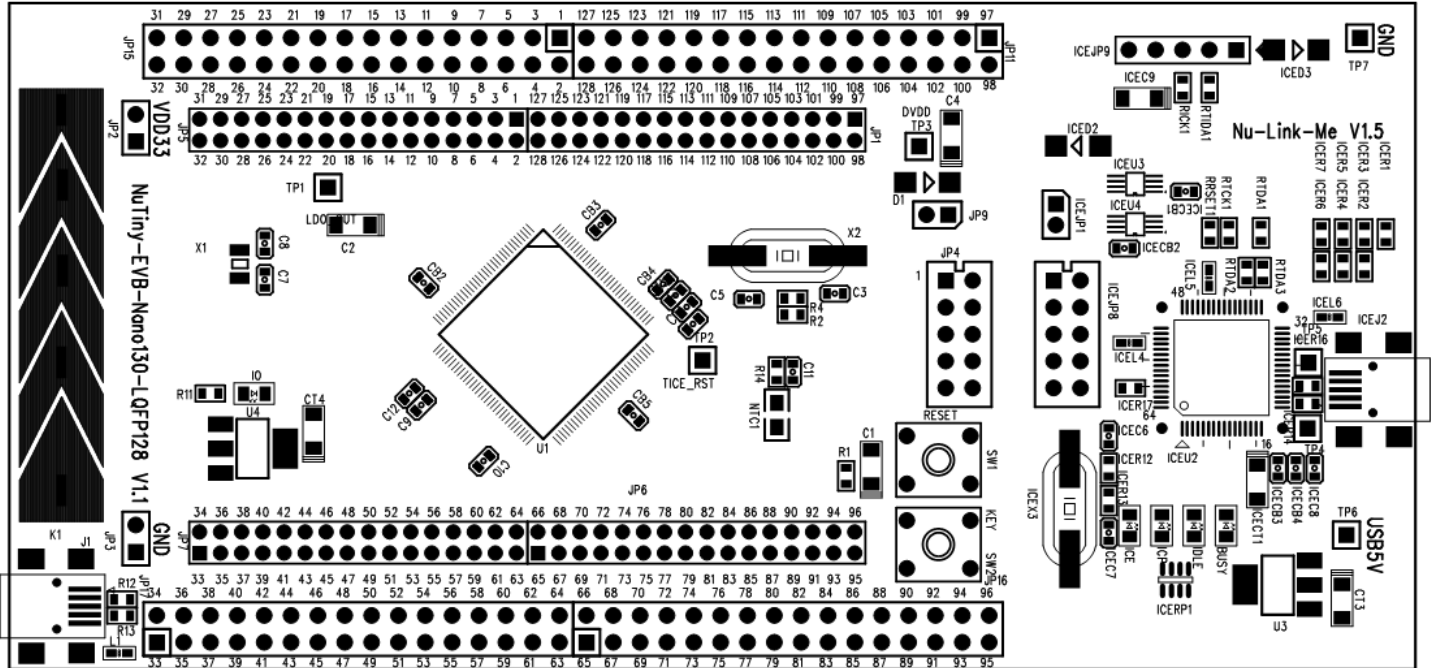


Figure 2-2 NuTiny-SDK-Nano130 PCB Placement



### 3 Starting to Use NuTiny -SDK-Nano130 on the Keil $\mu$ Vision<sup>®</sup> IDE

#### 3.1 Downloading and Installing Keil $\mu$ Vision<sup>®</sup> IDE Software

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

#### 3.2 Downloading and Installing Nuvoton Nu-Link Driver

Please connect to Nuvoton NuMicro<sup>™</sup> website (<http://www.nuvoton.com/NuMicro>) to download the “NuMicro<sup>™</sup> Keil  $\mu$ Vision<sup>®</sup> 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 in the following figure.

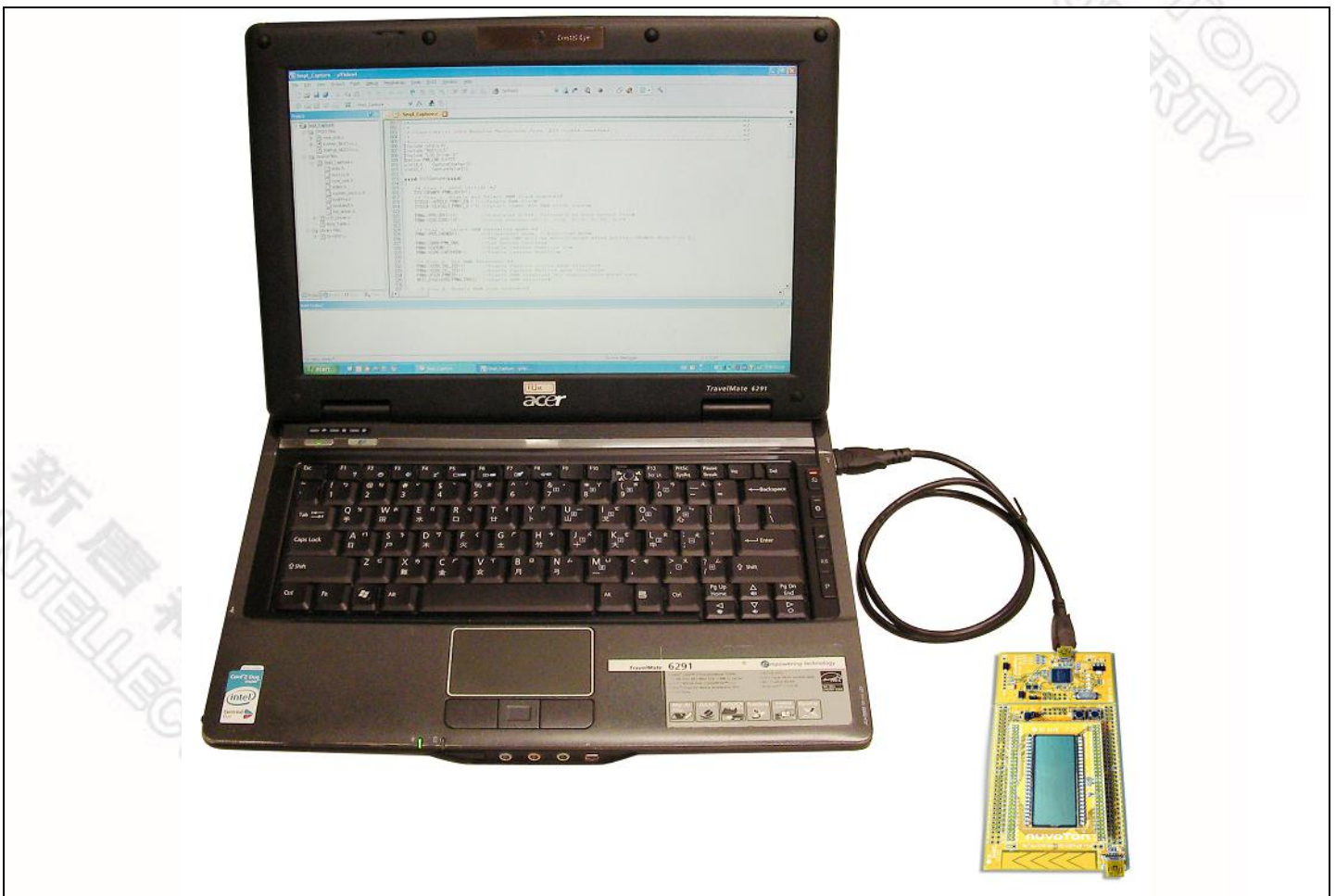


Figure 3-1 NuTiny-SDK-Nano130 Hardware Setup

### 3.4 LCD\_DEMO Example Program

This example, as shown in the directory of *Figure 3-2*, demonstrates the download and debugging of an application on a NuTiny-SDK-Nano130 board. The example file can be downloaded from Nuvoton NuMicro™ website as described in *6.3 Downloading NuMicro™ Nano100 series BSP Software Library*.

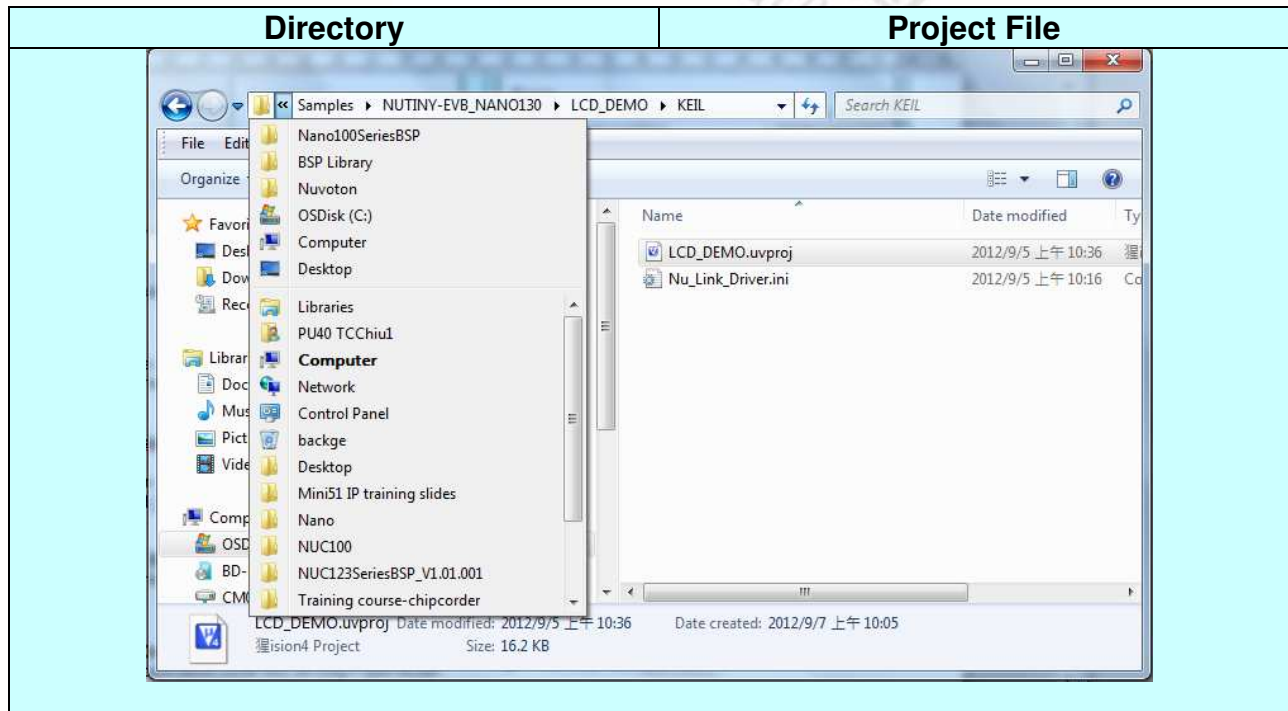


Figure 3-2 LCD\_DEMO Example Directory

To use this example:

The LCD panel on the NuTiny-EVB-Nano130 board will display a NUVOTON logo.

- **Start µVision®**
- **Project-Open**  
Open the LCD\_DEMO.uvproj project file
- **Project - Build**  
Compile and link the LCD\_DEMO 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 Starting to Use NuTiny-SDK-Nano130 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 Company NuMicro™ website (<http://www.nuvoton.com/NuMicro>) to download the “NuMicro™ IAR ICE Driver User Manual” file. Please refer to section 6.2 for the detailed 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.

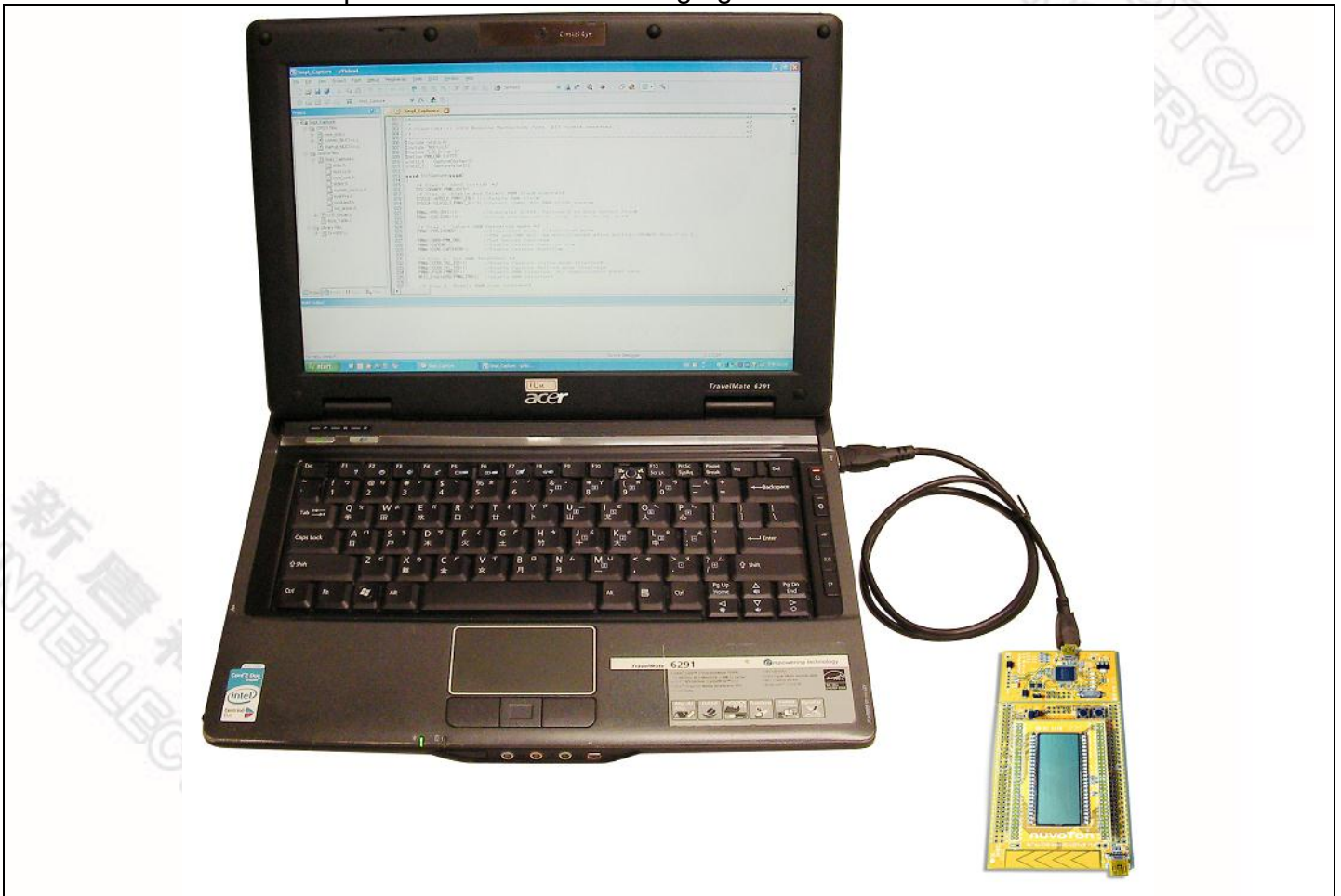


Figure 4-1 NuTiny- SDK-Nano130 Hardware Setup

#### 4.4 LCD\_DEMO Example Program

The example, as shown in the directory of *Figure 4-2*, demonstrates the download and debugging of an application on a NuTiny-SDK-Nano130 board. The example file can be downloaded from Nuvoton NuMicro™ website as described in *6.3 Downloading NuMicro™ Nano100 series BSP Software Library*.

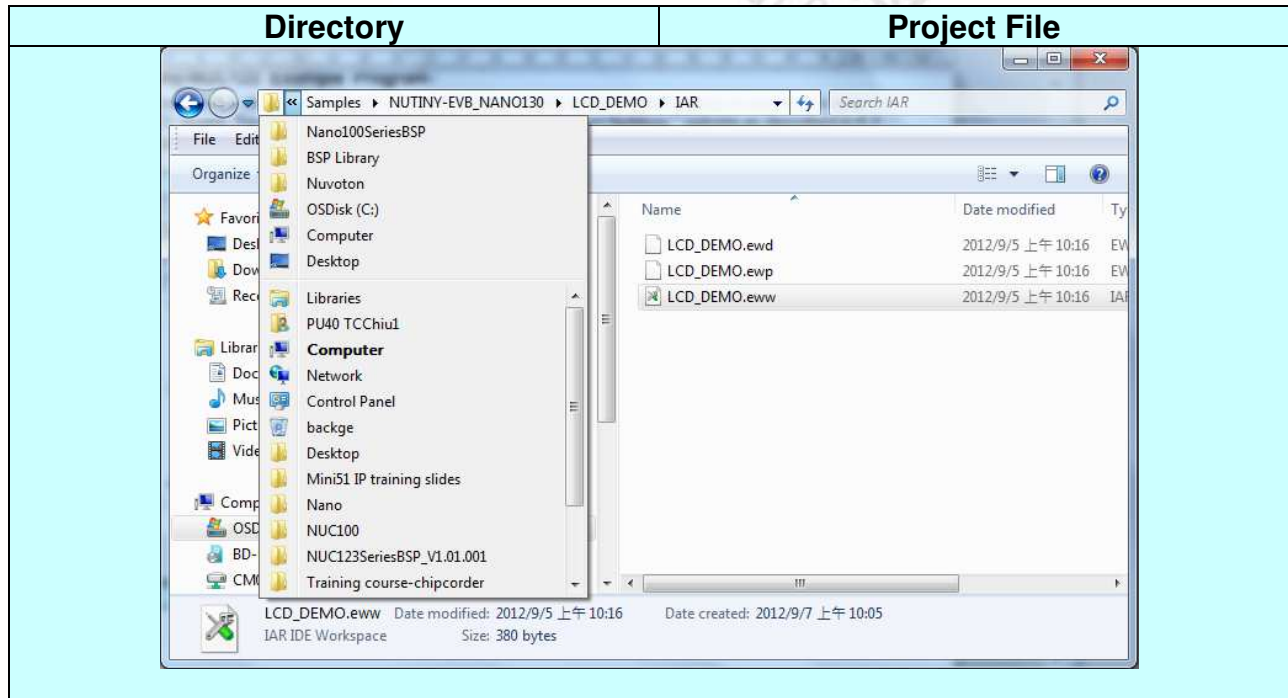








Figure 4-2 LCD\_DEMO Example Directory

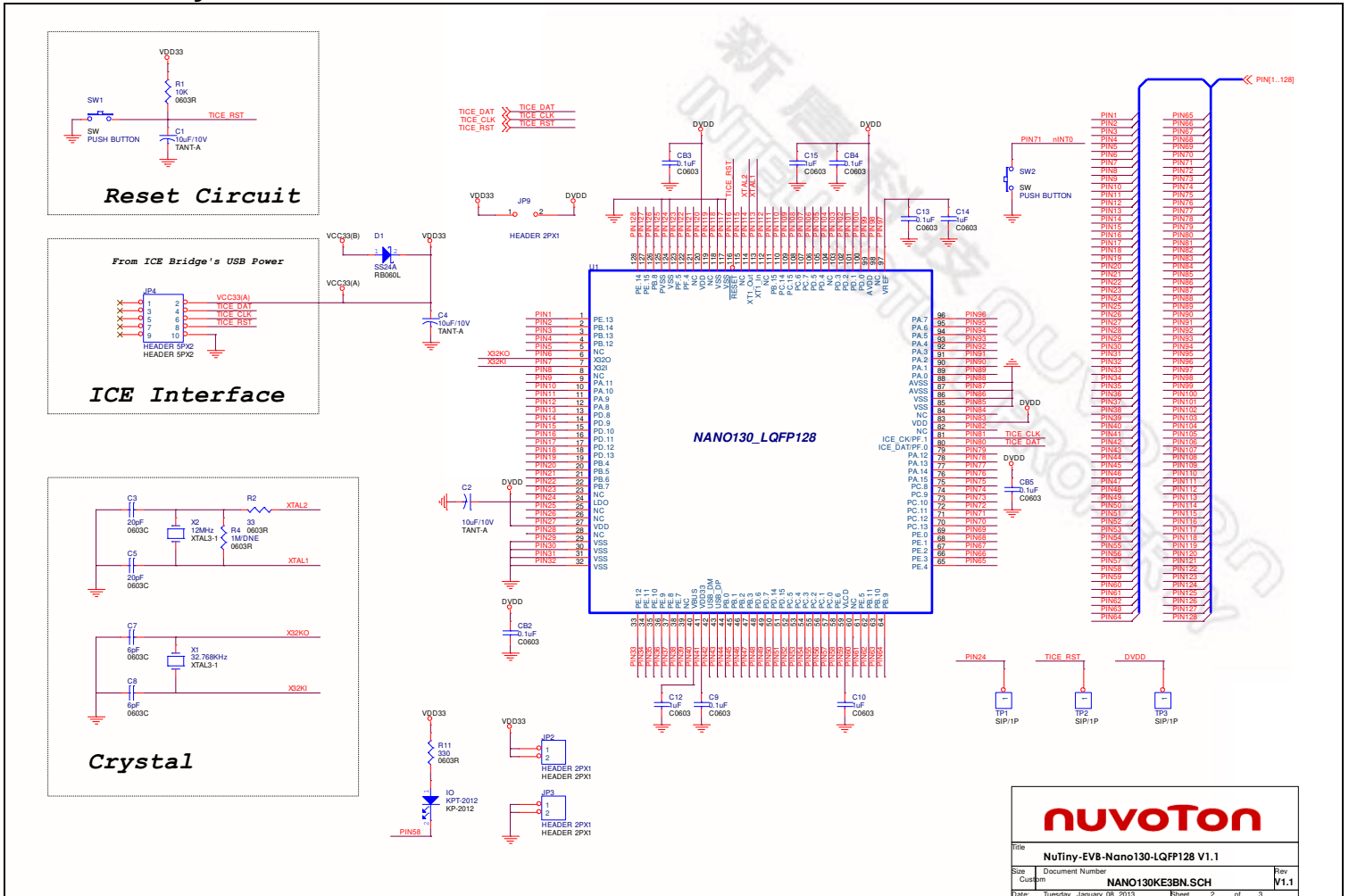
To use this example:

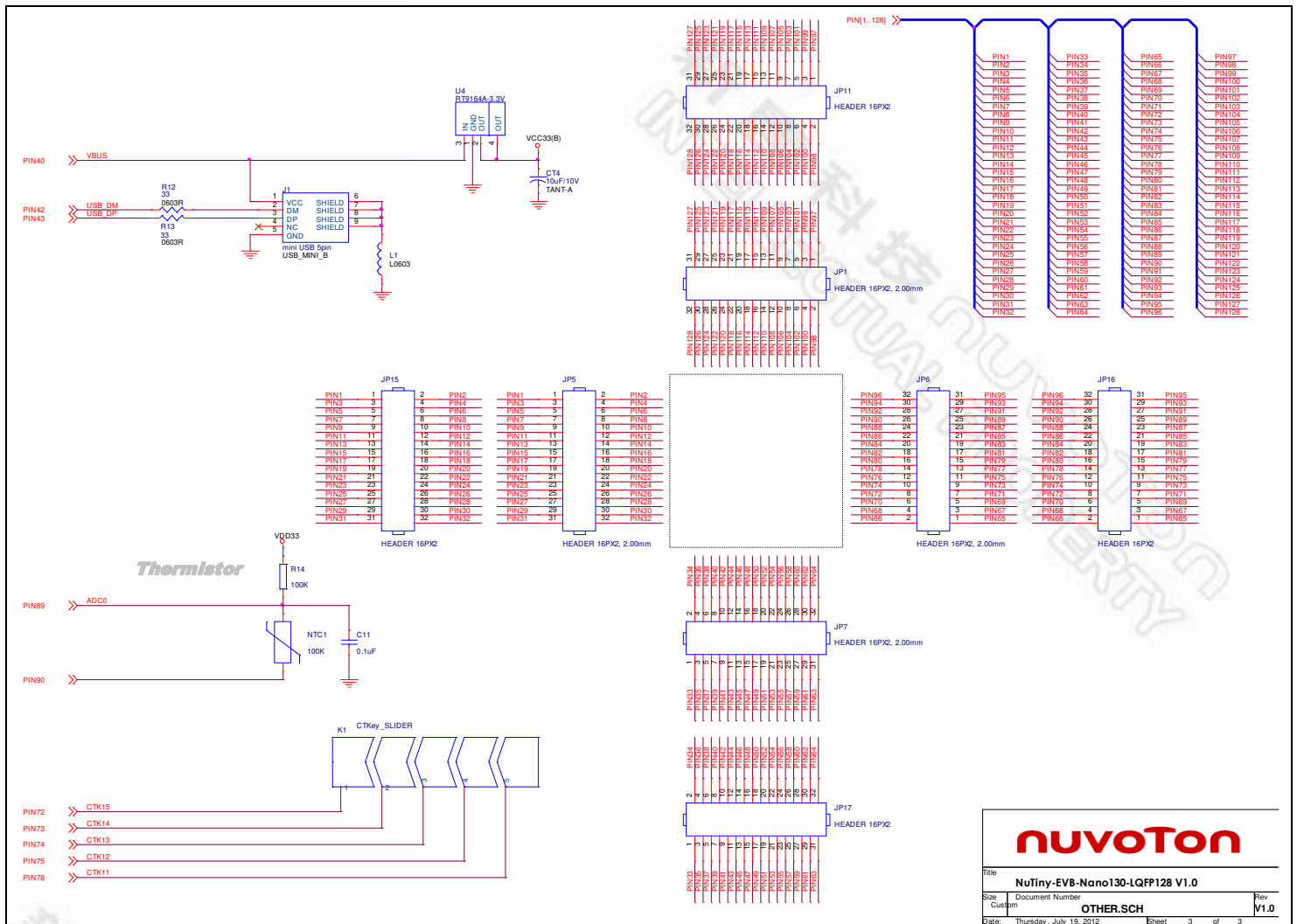
The LCD panel on the NuTiny-EVB-Nano130 board will display a NUVOTON logo.

-  **Start IAR Embedded Workbench**
- **File-Open-Workspace**  
Open the LCD\_DEMO.eww workspace file
-  **Project - Make**  
Compile and link the LCD\_DEMO 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-Nano130 Schematics





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Title: **NuTiny-EVB-Nano130-LQFP128 V1.0**

Size: Document Number: **OTHER.SCH** Rev: **V1.0**

Date: Thursday, July 19, 2012 Sheet: 3 of 3

## 6 Downloading NuMicro™ Related Files from Nuvoton Website

### 6.1 Downloading NuMicro™ Keil µVision® IDE Driver

<p><b>Step 1</b></p>	<p>Visit the Nuvoton NuMicro™ website: <a href="http://www.nuvoton.com/NuMicro">http://www.nuvoton.com/NuMicro</a></p>
<p><b>Step 2</b></p>	<p>The screenshot shows the Nuvoton website for the ARM Cortex™-M0 NuMicro® Family. The 'Development Resources' section is expanded, and 'Device Driver and Software Library' is highlighted with a red dashed box. A yellow callout bubble with a red arrow points to this link, containing the text: 'Click here to enter Device Driver and Software Library.'</p>

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<b>Step 3</b>	<b>M051 Series BSP_RegCtrlPrg_v1.00.001.zip</b> <b>NUC100 Series Driver Reference Guide</b>	M051 series software package based on register programming coding rule for sample code & user guide.	V1.00.001 V1.03.001												
	<b>NUC100 Series BSP_CMSIS_v1.03.002.zip</b> <b>NUC100 Series Driver Reference Guide (Simplified Chinese)</b>	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 Learning Board are included. For detailed, please download it and unzip it.	V1.03.002 V1.03.001												
	<p><b><u>Programmer Software Tools Package</u></b></p> <table border="1"> <thead> <tr> <th>File name</th> <th>Description</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td> <b>ICP Programming Tool (Build 4228) V1.03.zip</b></td> <td>NuMicro ICP tool &amp; user manual</td> <td>V1.03</td> </tr> <tr> <td> <b>ISP Programming Tool.zip</b></td> <td>NuMicro ISP Programming Tool &amp; user manual</td> <td>V1.40</td> </tr> <tr> <td> <b>NuGang Programmer V5.31.zip</b></td> <td>NuGang Programmer software &amp; user manual</td> <td>V5.31</td> </tr> </tbody> </table>			File name	Description	Version	<b>ICP Programming Tool (Build 4228) V1.03.zip</b>	NuMicro ICP tool & user manual	V1.03	<b>ISP Programming Tool.zip</b>	NuMicro ISP Programming Tool & user manual	V1.40	<b>NuGang Programmer V5.31.zip</b>	NuGang Programmer software & user manual	V5.31
	File name	Description	Version												
<b>ICP Programming Tool (Build 4228) V1.03.zip</b>	NuMicro ICP tool & user manual	V1.03													
<b>ISP Programming Tool.zip</b>	NuMicro ISP Programming Tool & user manual	V1.40													
<b>NuGang Programmer V5.31.zip</b>	NuGang Programmer software & user manual	V5.31													
<p><b><u>Nu-Link Driver</u></b></p> <table border="1"> <thead> <tr> <th>File name</th> <th>Description</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td> <b>Nu-Link Driver for Keil RVMDK(Build 4228) V1.03.zip</b></td> <td>This driver is to support Nu-Link recognized by Keil RVMDK Development Environment and support all NuMicro Family Devices selectable.</td> <td>V1.03</td> </tr> <tr> <td> <b>Nu-Link Driver for IAR EWARM(Build 4228) V1.03.zip</b></td> <td>This driver is to support Nu-Link recognized by IAR EWARM Development Environment and support all NuMicro Family Devices selectable.</td> <td>V1.03</td> </tr> </tbody> </table> <p>Contact us: <a href="mailto:NuMicro@nuvoton.com">NuMicro@nuvoton.com</a></p>			File name	Description	Version	<b>Nu-Link Driver for Keil RVMDK(Build 4228) V1.03.zip</b>	This driver is to support Nu-Link recognized by Keil RVMDK Development Environment and support all NuMicro Family Devices selectable.	V1.03	<b>Nu-Link Driver for IAR EWARM(Build 4228) V1.03.zip</b>	This driver is to support Nu-Link recognized by IAR EWARM Development Environment and support all NuMicro Family Devices selectable.	V1.03				
File name	Description	Version													
<b>Nu-Link Driver for Keil RVMDK(Build 4228) V1.03.zip</b>	This driver is to support Nu-Link recognized by Keil RVMDK Development Environment and support all NuMicro Family Devices selectable.	V1.03													
<b>Nu-Link Driver for IAR EWARM(Build 4228) V1.03.zip</b>	This driver is to support Nu-Link recognized by IAR EWARM Development Environment and support all NuMicro Family Devices selectable.	V1.03													
<b>Step 4</b>	Download the NuMicro Keil $\mu$ Vision <sup>®</sup> IDE driver.														

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## 6.2 Downloading NuMicro™ IAR EWARM Driver

**Step 1** Visit the Nuvoton NuMicro™ website: <http://www.nuvoton.com/NuMicro>

**Step 2**

The screenshot shows the Nuvoton NuMicro website. At the top, there is a navigation bar with the Nuvoton logo, a search bar, and links for 'About Nuvoton', 'Products & Sales', 'News & Events', 'Investor', 'Human Resources', 'Member Area', and 'Download Service'. Below the navigation bar, the page title is 'ARM Cortex™-M0 NuMicro® Family'. A central image shows a NuMicro M0522AN chip with the text '32-bit ARM Cortex™-M0 MCU'. To the right of the image, there is a paragraph describing the NuMicro Family. Below this, there are four columns of links: 'Products', 'Development Resources', 'Technical Support', and 'News and Events'. In the 'Development Resources' column, 'Device Driver and Software Library' is highlighted with a red dashed box. A yellow callout bubble with a red arrow points to this link, containing the text: 'Click here to enter Device Driver and Software Library.' Below the links, there is a 'NuMicro® Family' banner and a progress bar for 'M051 Base Line'.

	<b>M051 Series BSP_RegCtrlPrg_v1.00.001.zip</b> <b>NUC100 Series Driver Reference Guide</b>	M051 series software package based on register programming coding rule for sample code & user guide.	V1.00.001 V1.03.001												
	<b>NUC100 Series BSP_CMSIS_v1.03.002.zip</b> <b>NUC100 Series Driver Reference Guide (Simplified Chinese)</b>	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 Learning Board are included. For detailed, please download it and unzip it.	V1.03.002 V1.03.001												
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Contact us: <a href="mailto:NuMicro@nuvoton.com">NuMicro@nuvoton.com</a>															
<b>Step 4</b>	Download the NuMicro™ IAR Embedded Workbench® driver.														

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## 6.3 Downloading NuMicro™ Nano100 series BSP Software Library

<b>Step 1</b>	Visit the Nuvoton NuMicro™ website: <a href="http://www.nuvoton.com/NuMicro">http://www.nuvoton.com/NuMicro</a>
<b>Step 2</b>	 <p>The screenshot shows the Nuvoton website's navigation menu and the 'ARM Cortex™-M0 NuMicro® Family' page. Under the 'Development Resources' section, the 'Device Driver and Software Library' link is highlighted with a red dashed box and a red arrow pointing to a yellow callout bubble that says 'Click here to enter Device Driver and Software Library.' Other sections include Products, Technical Support, and News and Events.</p>
<b>Step 3</b>	Download the NuMicro™ Nano100 series software library.

## 7 Revision History

Revision	Date	Description
1.00	Oct. 16, 2012	Preliminary version
1.01	Jan. 8, 2013	Changed the value of C7 and C8 in the schematics from 10pF to 6 pF

### Important Notice

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