

**ARM Cortex™-M0
32-bit Microcontroller**

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

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Table of Contents

1	Overview	3
2	Introduction to NuTiny-SDK-Nano130	3
2.1	NuTiny-SDK-Nano130 Jumper Description	4
2.2	Pin Assignment for Extended Connectors	5
2.3	NuTiny-SDK-Nano130 PCB Placement	7
3	Starting to Use NuTiny -SDK-Nano130 on the Keil μ Vision [®] IDE	8
3.1	Downloading and Installing Keil μ Vision [®] IDE Software.....	8
3.2	Downloading and Installing Nuvoton Nu-Link Driver.....	8
3.3	Hardware Setup.....	8
3.4	LCD_DEMO Example Program.....	9
4	Starting to Use NuTiny-SDK-Nano130 on the IAR Embedded Workbench.....	10
4.1	Downloading and Installing IAR Embedded Workbench Software	10
4.2	Downloading and Installing Nuvoton Nu-Link Driver.....	10
4.3	Hardware Setup.....	10
4.4	LCD_DEMO Example Program.....	11
5	NuTiny-EVB-Nano130 Schematics	12
6	Downloading NuMicro [™] Related Files from Nuvoton Website	14
6.1	Downloading NuMicro [™] Keil μ Vision [®] IDE Driver.....	14
6.2	Downloading NuMicro [™] IAR EWARM Driver.....	16
6.3	Downloading NuMicro [™] Nano100 series BSP Software Library	18
7	Revision History	19

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.

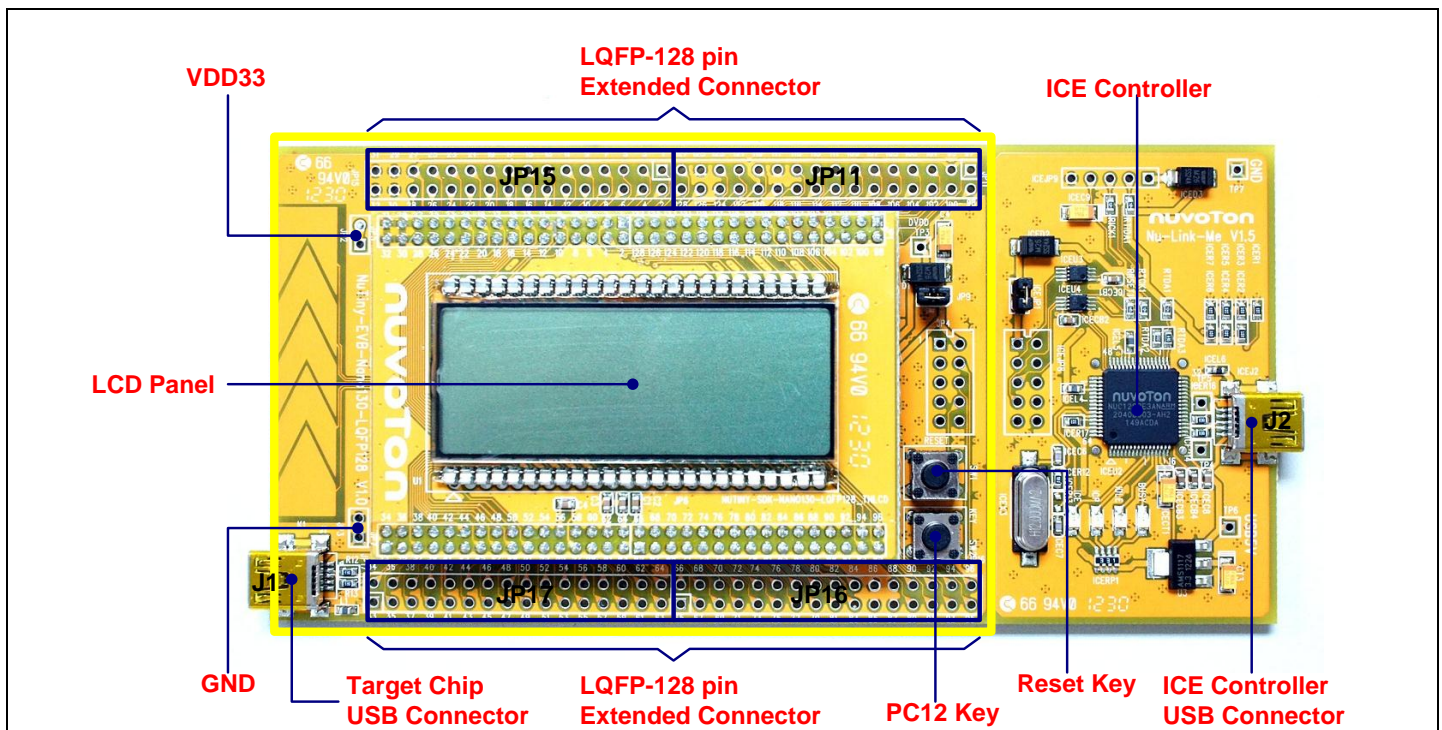


Figure 2-1 NuTiny-SDK-Nano130 (Yellow PCB Board)

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 JP2 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

3 Starting to Use NuTiny -SDK-Nano130 on the Keil μ Vision[®] IDE

3.1 Downloading and Installing Keil μ Vision[®] IDE Software

Please connect to the Keil company website (<http://www.keil.com>) to download the Keil μ Vision[®] 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 μ Vision[®] 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.

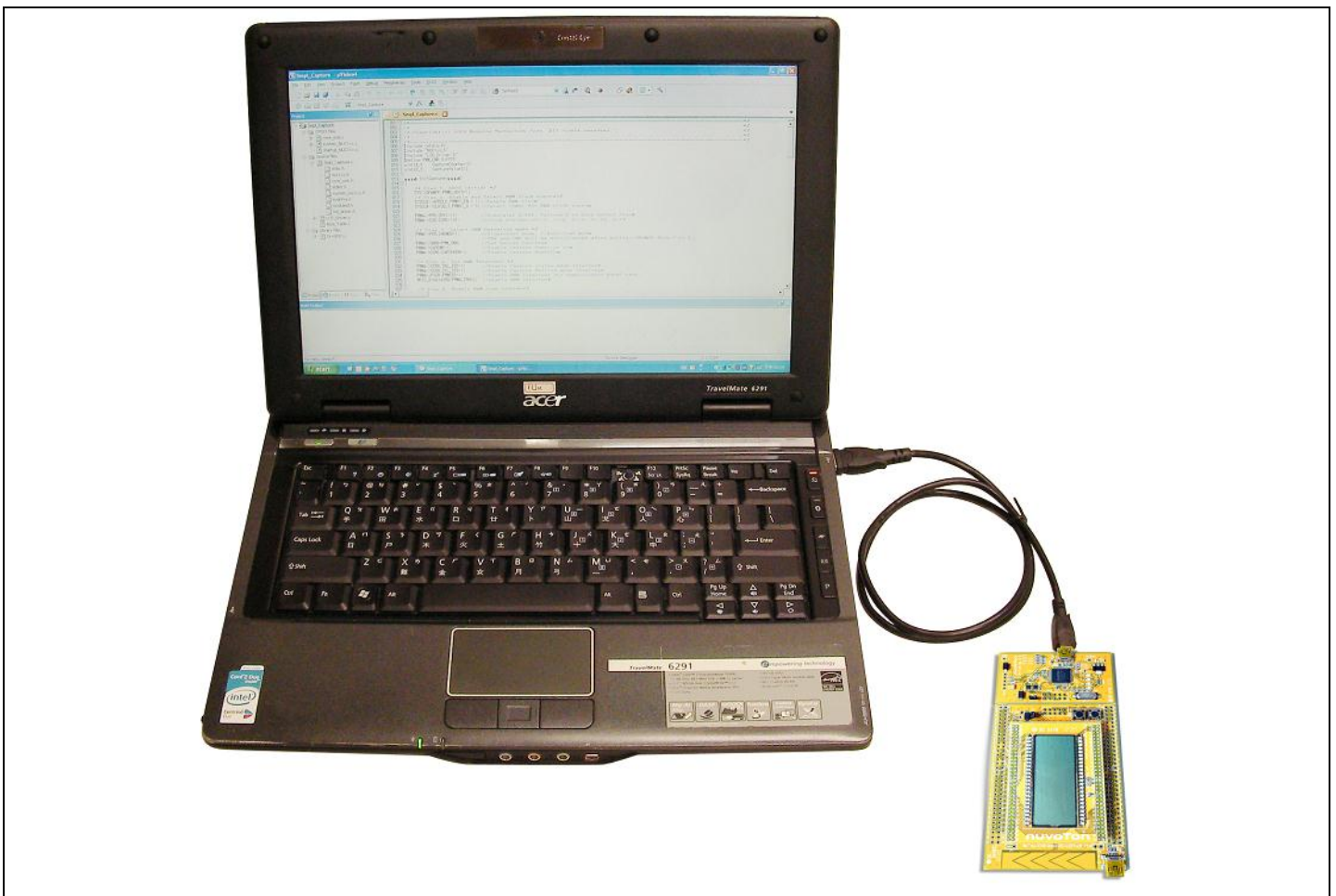


Figure 3-1 NuTiny-SDK-Nano130 Hardware Setup

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*.

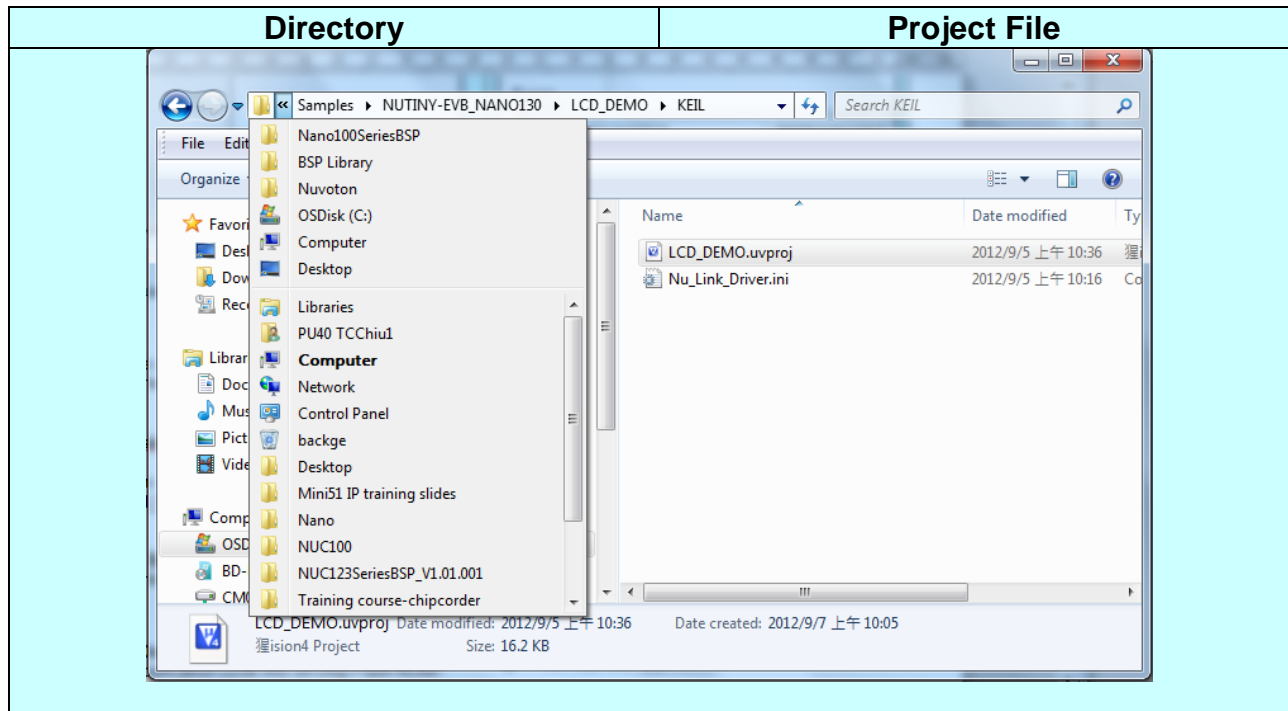










Figure 3-2 LCD_DEMO Example Directory

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
 - ◆  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.

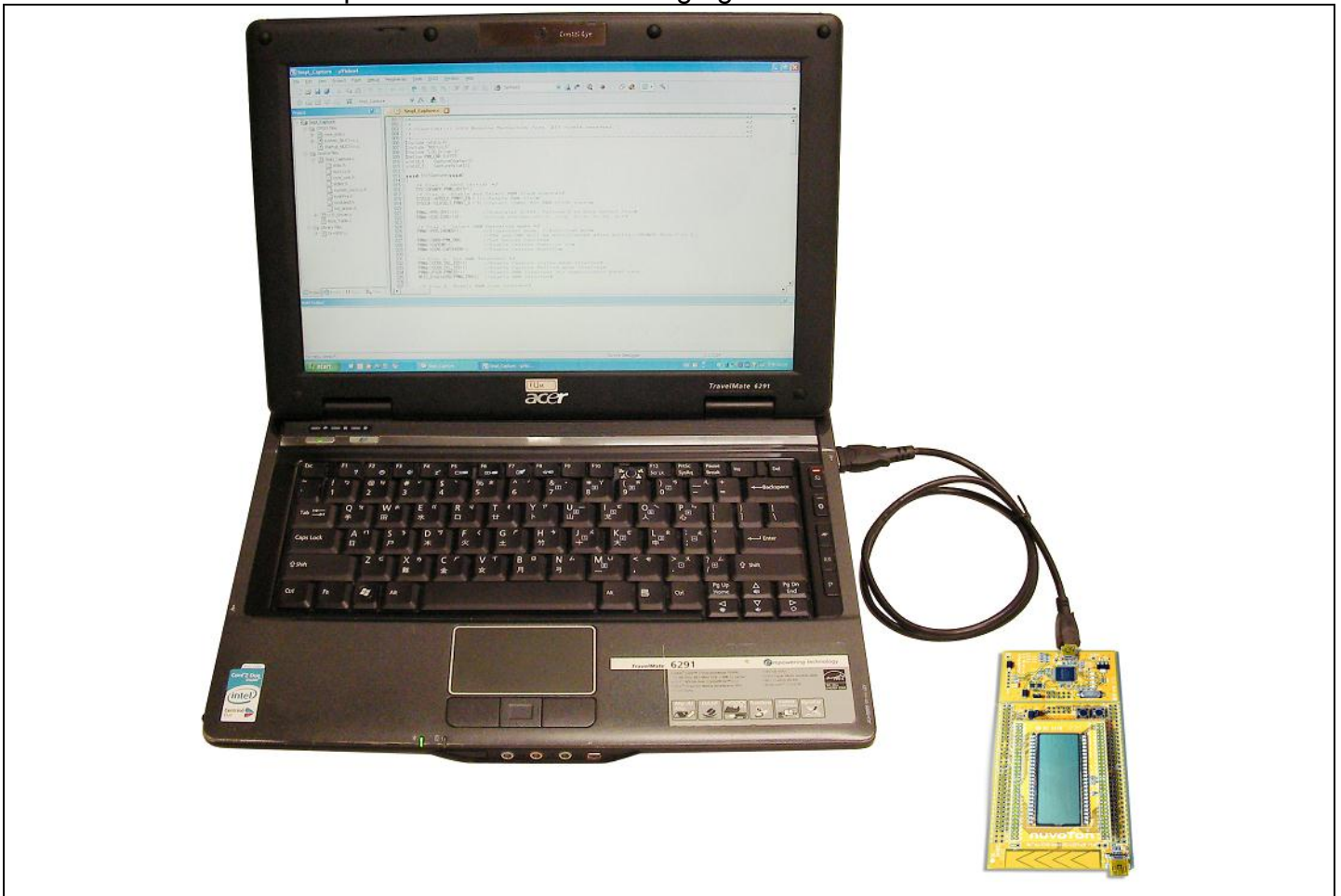


Figure 4-1 NuTiny- SDK-Nano130 Hardware Setup

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*.

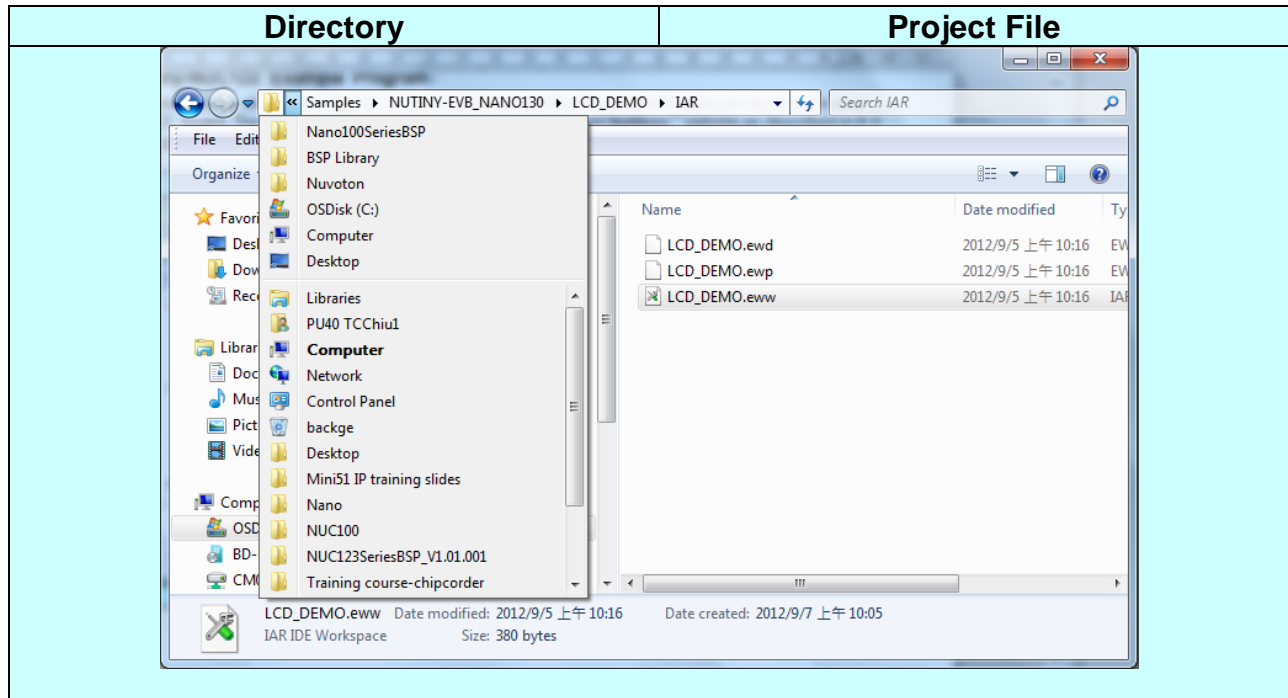








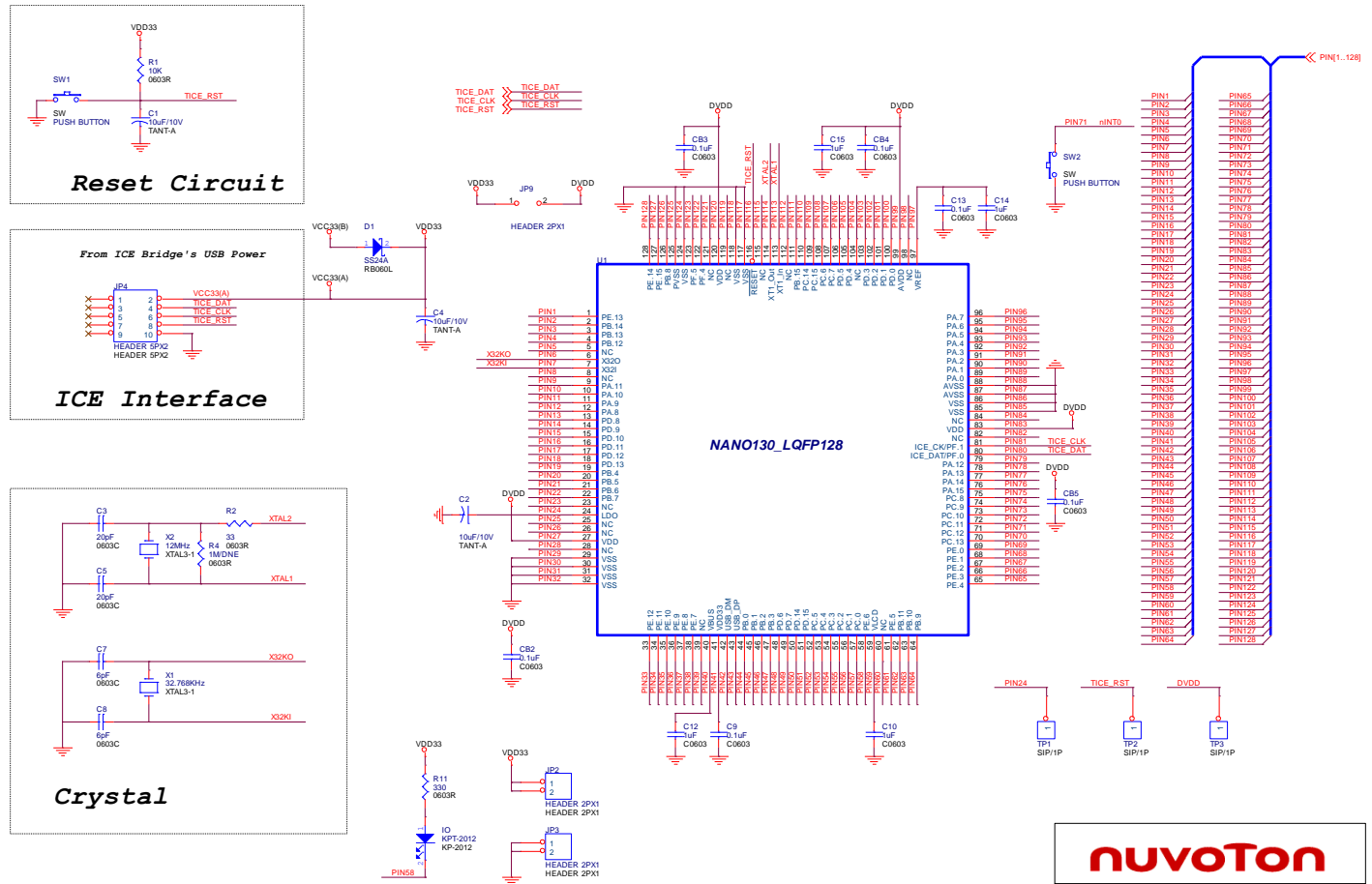
Figure 4-2 LCD_DEMO Example Directory

To use this example:

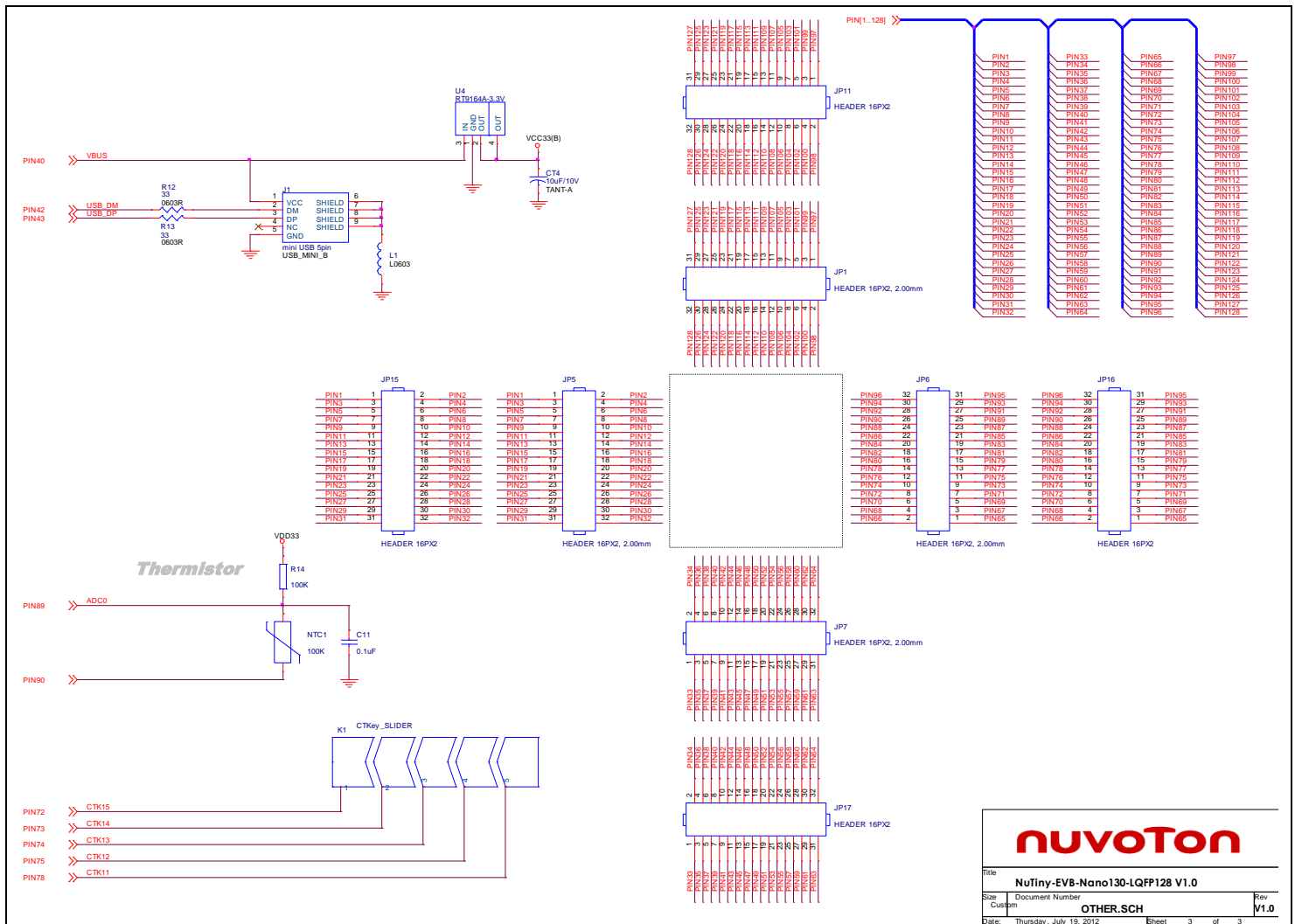
The LCD panel on the NuTiny-EVB-Nano130 board will display a NUVOTON logo.

-  **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



nuvoTon		
Title: NuTiny-EVB-Nano130-LQFP128 V1.1		
Size: Custom	Document Number: NANO130KE3BN.SCH	Rev: V1.1
Date: Tuesday, January 08, 2013	Page: 2	of 3



6 Downloading NuMicro™ Related Files from Nuvoton Website


6.1 Downloading NuMicro™ Keil µVision® IDE Driver

Step 1	Visit the Nuvoton NuMicro™ website: http://www.nuvoton.com/NuMicro
Step 2	<p>The screenshot shows the Nuvoton website's NuMicro Family page. The page includes a navigation bar with links like 'About Nuvoton', 'Products & Sales', 'News & Events', 'Investor', 'Human Resources', 'Member Area', and 'Download Service'. Below the navigation bar, there's a section for 'ARM Cortex™-M0 NuMicro® Family' featuring a product image and a description. A sidebar on the left contains four main categories: 'Products', 'Development Resources', 'Technical Support', and 'News and Events'. Under 'Development Resources', the 'Development Tools' link is highlighted with a red dashed box, and a red arrow points from a yellow callout box to it. The callout box contains the text: 'Click here to enter Device Driver and Software Library.' Below the sidebar, there's a 'NuMicro® Family' section with a progress bar for the 'M051 Base Line'.</p>

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 website's NuMicro Family page. At the top, there's a navigation bar with the Nuvoton logo, a region selector (REGION +), and links for Headquarters, 繁體中文, 简体中文, 日本語, and Contact Us. Below this is a search bar and an 'Advanced Product Search' button. The main navigation menu includes About Nuvoton, Products & Sales, News & Events, Investor, Human Resources, Member Area, and Download Service. The breadcrumb trail reads: Home \ Product & Sales \ Product Lines \ Industrial IC \ ARM Microcontroller \ ARM Cortex™-M0 NuMicro™ Family.

The page title is 'ARM Cortex™-M0 NuMicro® Family'. Below the title is a product image of a NuMicro M032AN chip. To the right of the image, a paragraph describes the NuMicro® Family as Nuvoton's brand-new 32-bit Microcontroller product line based on the ARM® Cortex™-M0 processor, offering superb features and connectivity capability. It mentions the NUC100, NUC120, NUC130, and NUC140 series, and a new series, the NuMicro M051™ series, including the M052/54/58/516, designed to satisfy the worldwide customers' 8-bit/16-bit microcontroller demand with a higher performance of a 32-bit microcontroller.





Below the product image and text are four main sections:

- Products**
 - MCU Products Brochure (English)
 - MCU Products Brochure (Chinese)
 - Online Products Selection
 - Distributor Information
- Development Resources**
 - Products Brief, DataSheet
 - Technical Reference Manual
 - Development Tools
 - Device Driver and Software Library (highlighted with a red dashed box and a red arrow pointing to a yellow callout box)
 - NuMicro Development Tools
 - Third Party Starter Kit
 - Application Notes
- Technical Support**
 - Quick Start
 - Online Training
 - Forum (Chinese version)
 - FAQ
- News and Events**
 - NuMicro® NEWS List
 - IAR KickStart Kit™ for NuMicro® Family 32-bit ARM® Cortex™-M0 MCU - 1/24/2011
 - Events
 - Mar. 1, 2011: Nuvoton Technology to Display Powerful NuMicro® Family at Embedded World 2011 Exhibition & Conference in Germany




At the bottom of the page, there's a 'NuMicro® Family' banner with a progress bar showing 'M051 Base Line'.

Click here to enter Device Driver and Software Library.



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 Learning 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

Step 4

Download the NuMicro™ IAR Embedded Workbench® driver.

6.3 Downloading NuMicro™ Nano100 series BSP Software Library

Step 1	Visit the Nuvoton NuMicro™ website: http://www.nuvoton.com/NuMicro
Step 2	 <p>The screenshot shows the Nuvoton website's NuMicro Family page. The page includes a navigation bar with links like 'About Nuvoton', 'Products & Sales', 'News & Events', 'Investor', 'Human Resources', 'Member Area', and 'Download Service'. Below the navigation bar, there's a section for 'ARM Cortex™-M0 NuMicro® Family' featuring a product image and a description. A sidebar on the left contains four main categories: Products, Development Resources, Technical Support, and News and Events. Under 'Development Resources', the 'Device Driver and Software Library' link is highlighted with a red dashed box and a red arrow. A yellow callout bubble with the text 'Click here to enter Device Driver and Software Library.' points to this link. Below the sidebar, there's a 'NuMicro® Family' section with a progress bar for 'M051 Base Line'.</p>
Step 3	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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