

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

NuMicro[®] Family
NuTiny-SDK-Nano112
User Manual

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1 OVERVIEW

The NuTiny-SDK-Nano112 is a specific development tool for NuMicro® Nano102/112 series. With the NuTiny-SDK-Nano112, users can develop and verify the application program easily.

The NuTiny-SDK-Nano112 includes two portions — NuTiny-EVB-Nano112 and Nu-Link-Me. The NuTiny-EVB-Nano112 is an evaluation board and the Nu-Link-Me is its debug adaptor. Thus, users do not need other additional ICE or debug equipment.

2 INTRODUCTION TO NUTINY-SDK-NANO112

The NuTiny-SDK-Nano112 uses the Nano112VC2AN as the target microcontroller (MCU). Figure 2-1 shows the NuTiny-SDK-Nano112 board for the Nano102/112 series. The left portion is called NuTiny-EVB-Nano112 and the right portion is a debug adaptor called Nu-Link-Me.

The NuTiny-EVB-Nano112 is similar to other development boards. It can be used as a real system controller to design user target systems and develop and verify applications to emulate the real behavior. The on-board chip covers the Nano102/112 features.

The Nu-Link-Me is a Debug Adaptor, which connects the USB port of a computer to a target system (via Serial Wired Debug port) for users 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.

Additionally, the TNLCD panel, another portion of NuTiny-SDK-Nano112, can provide 4 x 36 COM/SEG LCD display function. With the TNLCD panel, user can implement LCD driver function of Nano112 easily.

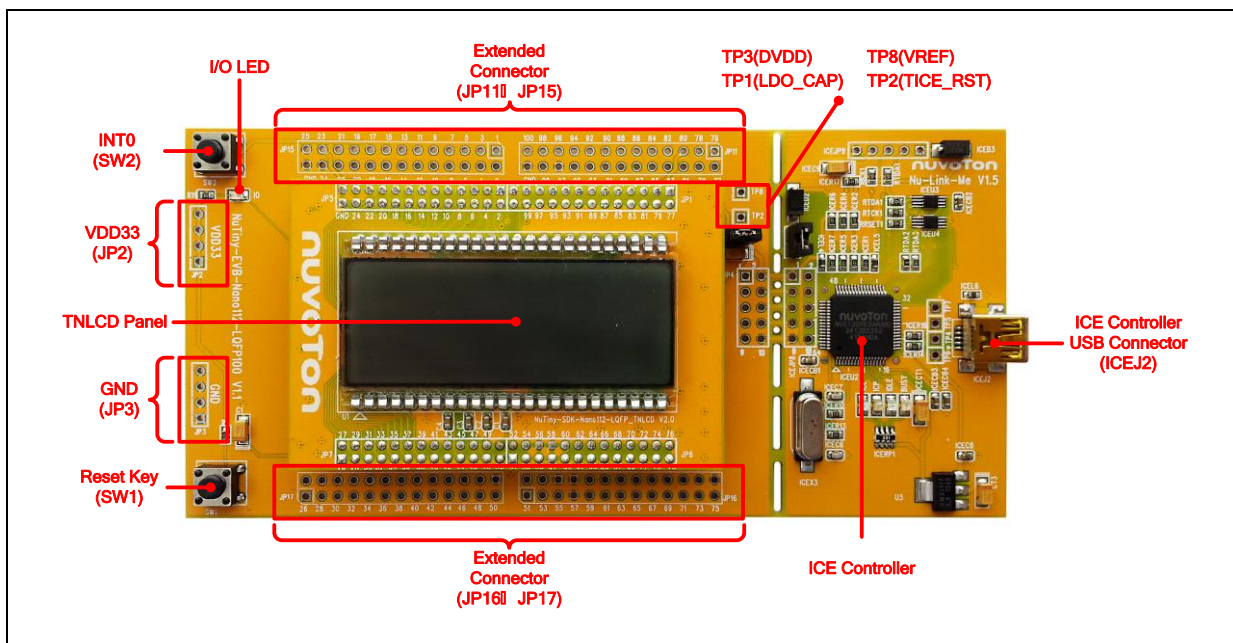


Figure 2-1 NuTiny-SDK-Nano112 (PCB Board)

2.1 NuTiny-SDK-Nano112 System

2.1.1 Power Settings

- **ICEJ2:** The USB port on the Nu-Link-Me
- **JP2:** The VCC33 voltage connector on the NuTiny-EVB-Nano112

Model	ICEJ2 USB port	JP2 VDD33	MCU Voltage
Model 1	Connect to PC	DC 3.3V output	DC 3.3V
Model 2	X	DC 1.8 V - 3.6 V Input	Voltage by JP2 input

2.1.2 Debug Connectors

- **JP4:** The connector on the target board (NuTiny-EVB-Nano112) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- **ICEJP8:** The connector on the ICE adaptor (Nu-Link-Me) for connecting with a target board (e.g., NuTiny-EVB-Nano112)

2.1.3 ICE USB Connector

- **ICEJ2:** The 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 pins in NuTiny-EVB-Nano112
- **TP1:** Show LDO_CAP pin in Nano112VC2AN
- **TP2:** Show Reset pin in Nano112VC2AN
- **TP3:** Show DVDD pin in Nano112VC2AN
- **TP8:** Show V_{REF} pin in Nano112VC2AN

2.1.5 Buttons

- **SW1:** Reset button in NuTiny-EVB-Nano112
- **SW2:** INT0 button in NuTiny-EVB-Nano112

2.1.6 Power Connectors

- **JP2:** 3.3 VCC connector in NuTiny-EVB-Nano112
- **JP3:** GND connector in NuTiny-EVB-Nano112

2.1.7 TNLCD Panel

- Provides 4 x 36 COM/SEG C-type LCD display

2.2 Pin Assignment for Extended Connectors

The NuTiny-EVB-Nano112 provides Nano112VC2AN on board and the extended connectors for LQFP100 pins. Table 2-1 shows the pin assignment for Nano112VC2AN.

Pin No	Pin Function	Pin No	Pin Function
1	PB.7/SC0_CD/UART1_CTSn/LCD_SEG33	51	nRESET
2	PB.8/INT1/TMR0_CNT/PWM0_CH0/SNOOPER/LCD_SEG32/TMR0_OUT	52	LDO_CAP
3	PB.9/PWM0_CH1/LCD_SEG31	53	V _{DD}
4	PE.8/PWM0_CH2/LCD_SEG30	54	PF.0/TMR3_CNT/TMR3_OUT/X32_IN
5	PE.9/PWM0_CH3/LCD_SEG29	55	PF.1/TMR2_CNT/TMR2_OUT/X32_OUT
6	PB.10/SPI0_MOSI1/UART1_RXD/LCD_SEG28	56	VSS_PLL
7	PB.11/TMR1_CNT/SPI0_MISO1/UART1_RTSn/LCD_SEG27/TMR1_OUT	57	V _{SS}
8	PB.12/FCLK0/TMR0_CNT/SPI0_MOSI0/UART0_RTSn/LCD_SEG26/TMR0_OUT	58	V _{SS}
9	PB.13/SPI0_MISO0/UART0_RXD/LCD_SEG25	59	PF.2/INT1/TC3/UART1_RXD/XT1_IN
10	PB.14/SPI0_CLK/UART0_TXD/LCD_SEG24	60	PF.3/INT0/TC2/UART1_TXD/XT1_OUT
11	NC	61	NC
12	PB.15/SPI0_SS0/UART0_CTSn/LCD_SEG23	62	PE.0/SPI0_MOSI0
13	PC.0/PWM0_CH0/I2C0_SCL/SPI0_SS1/LCD_SEG22	63	PE.1/SPI0_MISO0
14	PC.1/PWM0_CH1/I2C0_SDA/LCD_SEG21	64	PE.2/SPI0_CLK
15	PC.2/PWM0_CH2/I2C1_SCL/LCD_SEG20	65	PE.3/SPI0_SS0
16	PC.3/PWM0_CH3/I2C1_SDA/LCD_SEG19	66	PE.4/SC1_RST
17	PC.4/INT0/SC0_CLK/UART1_CTSn/LCD_SEG18	67	PE.5/SC1_PWR
18	PC.5/SC0_CD/LCD_SEG17	68	PE.6/SC1_CLK
19	PC.6/SC0_DAT/UART1_RTSn/LCD_SEG16	69	PE.7/SC1_DAT
20	PC.7/SC0_PWR/UART1_RXD/LCD_SEG15	70	AV _{SS}
21	PC.8/SC0_RST/UART1_TXD/LCD_SEG14	71	AV _{SS}
22	PC.9/LCD_SEG13	72	PA.0/AD0
23	V _{DD}	73	PA.1/AD1/ACMP0_P3/ACMP0_CHDIS
24	V _{SS}	74	PA.2/INT0/AD2/ACMP0_P2/SC0_CLK/ACMP0_CHDIS
25	V _{SS}	75	PA.3/INT1/AD3/ACMP0_P1/SC0_DAT/ACMP0_CHDIS
26	PC.10/SC1_CD/I2C1_SCL/LCD_SEG12	76	PA.4/AD4/ACMP0_P0/SC0_CD/ACMP0_CHDIS
27	PC.11/SC1_PWR/I2C1_SDA/LCD_SEG11	77	PA.5/AD5/ACMP0_N/SC0_PWR/I2C1_SDA/SP

	EG11		I1_SS0/ACMP0_CHDIS
28	PC.12/SC1_CLK/LCD_SEG10	78	PA.6/AD6/ACMP0_OUT/SC0_RST/ACMP0_C HDIS
29	PC.13/SC1_DAT/LCD_SEG9	79	PA.7/AD7/SC1_CD
30	PC.14/SC1_CD/LCD_SEG8	80	V _{REF}
31	PC.15/SC1_PWR/LCD_SEG7	81	AV _{DD}
32	PD.0/LCD_SEG6	82	PF.4/FCLK1/TC1/PWM0_CH2/CLK_Hz/ICE_C LK
33	PD.1/LCD_SEG5	83	PF.5/TC0/PWM0_CH3/ACMP0_CHDIS/ICE_D AT
34	PD.2/LCD_SEG4	84	PA.8/SC0_PWR
35	PD.3/LCD_SEG3	85	PA.9/SC0_RST
36	PD.4/SC1_RST/LCD_SEG2	86	PA.10/SC0_CLK
37	PD.5/LCD_SEG1	87	PA.11/STADC/SC0_DAT
38	PD.6/LCD_SEG0	88	PA.12/ACMP1_P/I2C0_SCL/SPI1_MOSI0/UAR T0_TXD
39	PD.7/SC1_CLK/LCD_COM3	89	PA.13/ACMP1_N/I2C0_SDA/SPI1_MISO0/UA RT0_RXD
40	PD.8/SC1_DAT/LCD_COM2	90	PA.14/I2C1_SCL/SPI1_CLK/ACMP0_CHDIS
41	PD.9/PWM0_CH3/SC1_RST/LCD_C OM1	91	PA.15/TC3/ACMP1_OUT/I2C1_SDA/SPI1_SS 0
42	PD.10/TC1/PWM0_CH2/LCD_COM0	92	PB.0/FCLK1/UART0_TXD
43	PD.11/TC0/PWM0_CH1/LCD_DH2	93	PB.1/INT1/TC2/UART0_RXD
44	PD.12/FCLK0/TMR1_CNT/PWM0_C H0/LCD_DH1/CLK_Hz/TMR1_OUT	94	PB.2/TMR3_CNT/I2C0_SCL/SPI1_MOSI1/UA RT0_RTsn/TMR3_OUT
45	NC	95	PB.3/TMR2_CNT/I2C0_SDA/SPI1_MISO1/UA RT0_CTsn/TMR2_OUT
46	VLCD	96	V _{DD}
47	NC	97	V _{SS}
48	PD.13/INT1/LCD_V1	98	PB.4/SPI1_MISO1/UART1_RTsn
49	PD.14/LCD_V2	99	PB.5/SPI1_MOSI1/UART1_RXD/LCD_SEG35
50	PD.15/LCD_V3	100	PB.6/FCLK0/SPI1_SS1/UART1_TXD/LCD_SE G34

Table 2-1 Pin Assignment for Nano112VC2AN

2.3 NuTiny-SDK-Nano112 PCB Placement

Figure 2-2 and Figure 2-3 show the NuTiny-SDK-Nano112 and NuTiny-SDK-Nano112-TNLCDC PCB placement.

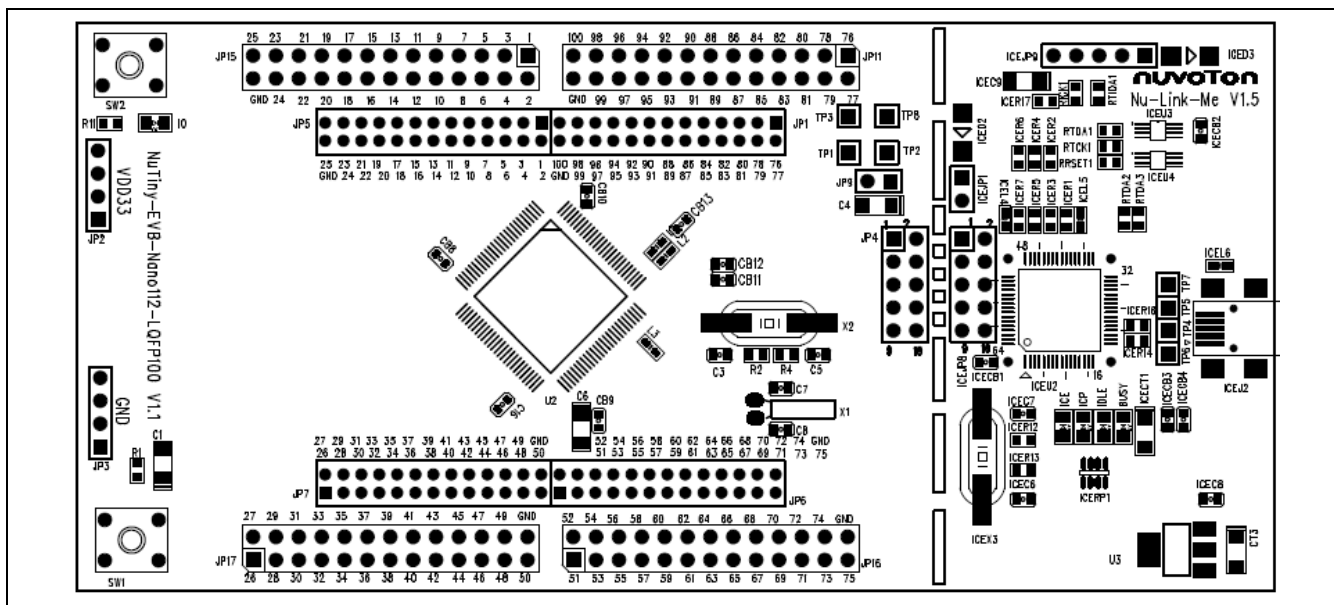


Figure 2-2 NuTiny-SDK-Nano112 PCB Placement

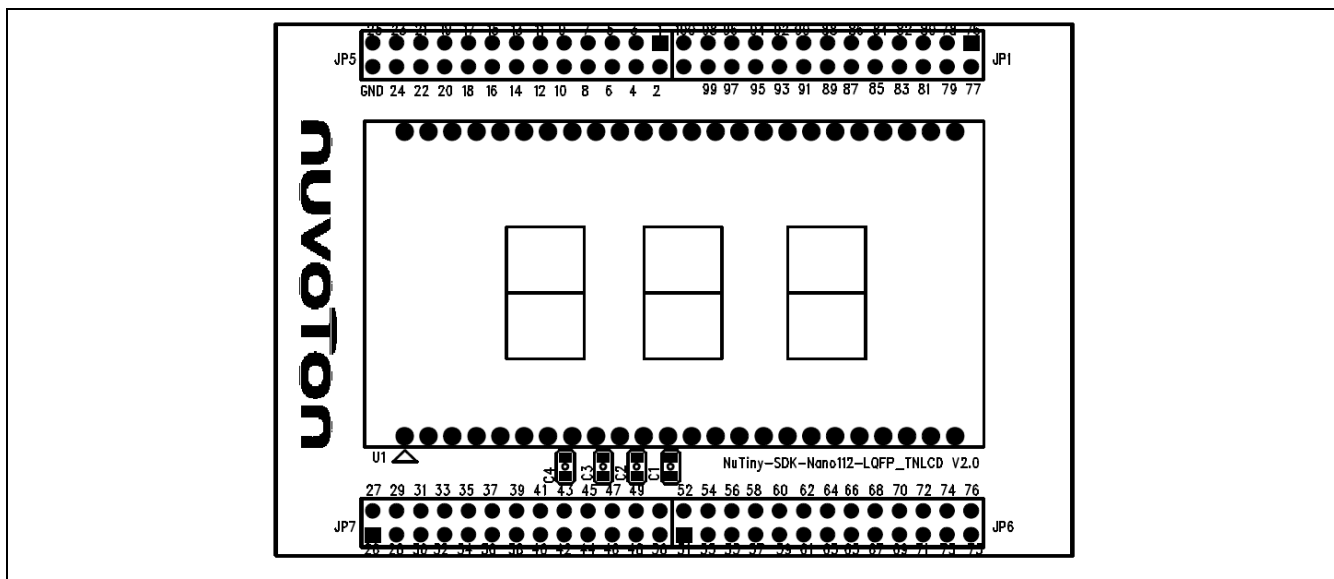


Figure 2-3 NuTiny-SDK-Nano112-TNLCDC PCB Placement

3 STARTING TO USE NUTINY-SDK-NANO112 ON THE KEIL UVISION® 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 in Figure 3-1.



Figure 3-1 NuTiny-SDK-Nano112 Hardware Setup

3.4 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-SDK-Nano112 board. It can be found on Figure 3-2 list directory and downloaded from Nuvoton NuMicro® website.

The example file can be found in the directory list shown in the following figure.

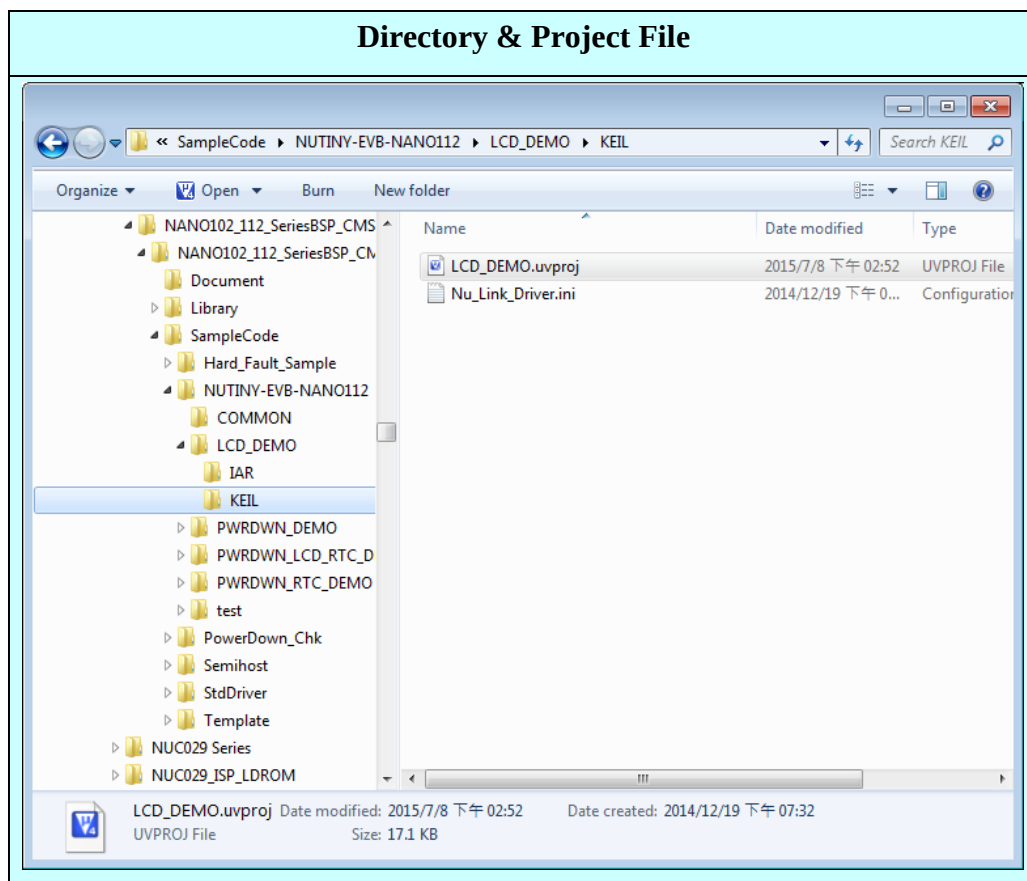


Figure 3-2 Keil Example Directory and Project File

To use this example:

The word “Nano112” and “NUVOTON” will be displayed on TNLCD panel of NuTiny-SDK-Nano112.

■ **Start µVision®**

■ **Project – Open**

Open the led.uvproj project file

■ **Project – Build**

Compile and link the LED 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-NANO112 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 4-1.



Figure 4-1 NuTiny-SDK-Nano112 Hardware Setup

4.4 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-SDK-Nano112 board. It can be found on Figure 4-2 list directory and downloaded from Nuvoton NuMicro® website.

The example file can be found in the directory list shown in the following figure.

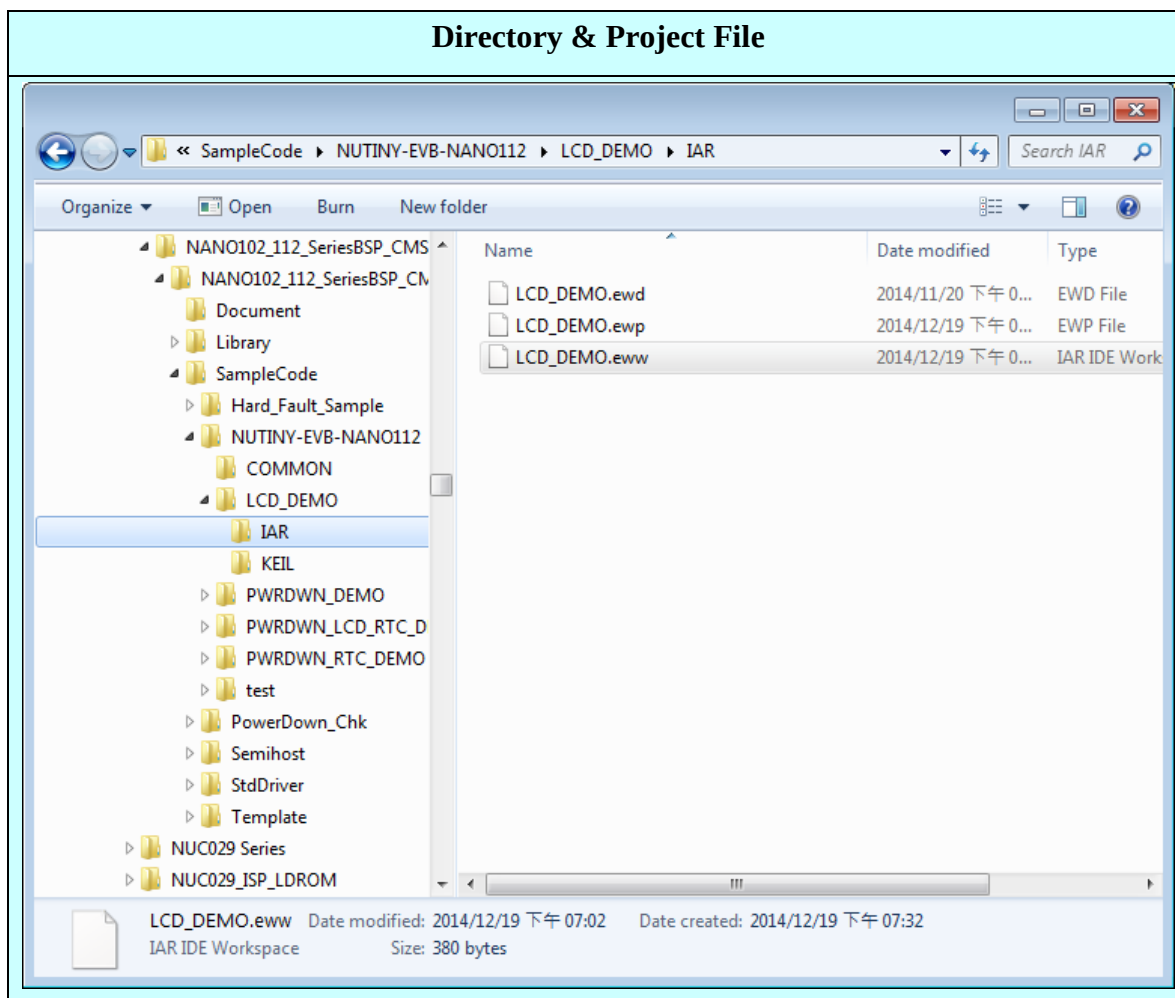


Figure 4-2 IAR Example Directory and Project File

To use this example:

The word “Nano112” and “NUVOTON” will be displayed on TNLCD panel of NuTiny-SDK-Nano112.

-  **Start IAR Embedded Workbench**
- **File-Open-Workspace**
Open the led.eww workspace file
-  **Project - Make**
Compile and link the LED 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 DOWNLOADING NUMICRO® RELATED FILES FROM NUVOTON WEBSITE

5.1 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 top navigation bar includes links for Register, Login, Language, and a search bar. Below this is a secondary navigation bar with links for Products, Applications, Support, Foundry Service, Buy, myNuvoton, and About Nuvoton. The 'Support' link is highlighted with a red dashed box and a yellow callout bubble labeled '2-1. Move to "Support"'. A dropdown menu is open under 'Support', showing options: Learning, Product Related Information, Tool & Software (highlighted with a red dashed box and a yellow callout bubble labeled '2-2. Click here to enter Tool & Software'), Reference Design, FAQ, Sales Support, and Technical Support. The main content area features a product matrix for ARM Cortex-M0 MCUs, with various models like NUC100, Nano120, NUC120, NUC230, NUC140, NUC130, NUC220, NUC240, AU9110, AU9120*, M051, Nano100, Nano102, Nano112, and Mini51. The matrix is organized by memory size (64K, 32K, 16K) and application type (Industrial Control, Low Power, USB Application, Automotive Application, Audio Application). On the right side, there are sections for Online Support (Online Training, Forum, FAQ), Featured Products (M0516LDE, MINI54FDE, NANO130KE3BN), Featured Videos (M0 Introduction(06:35)), and Featured Applications.

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- Product Related Information
- Tool & Software
- Development Tool Hardware
- Development Kit
- Learning Board
- Programmer
- Software**
- Third Party Tool
- Reference Design
- FAQ
- Sales Support
- Technical Support
- Forum

Click here to enter Software download page

Evaluation Board

Customer Target Board

NuTiny Board

Mass Production

On-Line In Circuit Programming

Off-Line In Circuit Programming

IC Programming

Upgrade

In System Programming

Through -UART -USB -I2C -SPI -CAN -I/O

NuMicro M4 MCU NUC472

with Ethernet MAC

Events

Nuvoton Technology Hosts 32-bit Cortex™M4 Ether... 2014-05-02

2014Q1 Investor Conference 2014-04-24

News

Nuvoton Announces Monthly Revenue for May 2014 2014-06-06

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

User Feedback ↑ TOP

Step5

Download the NuMicro® Keil µVision® IDE driver.

5.2 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. Another 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 product matrix for ARM Cortex-M0 MCUs, including models like AU9110, M051, Nano100, Nano110, Nano112, NUC100, NUC120, NUC122, NUC123, NUC130, NUC140, NUC220, NUC230, NUC240, and AU9120*. The matrix is categorized by application (Industrial Control, Low Power, USB Application, Automotive Application, Audio Application) and memory size (64K, 32K, 16K). The website also includes sections for "Resources", "Online Support", "Featured Products", "Featured Videos", and "Featured Applications".

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 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

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.

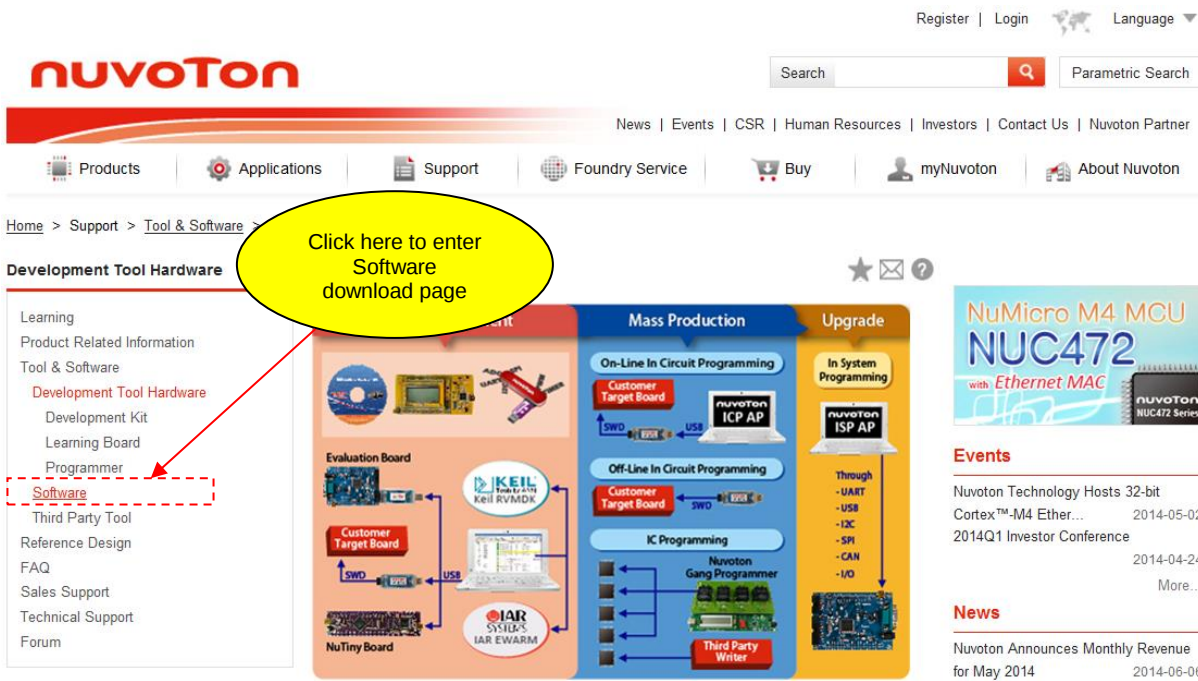
5.3 Downloading NuMicro® Nano102/112 Series BSP Software Library

Step 1

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

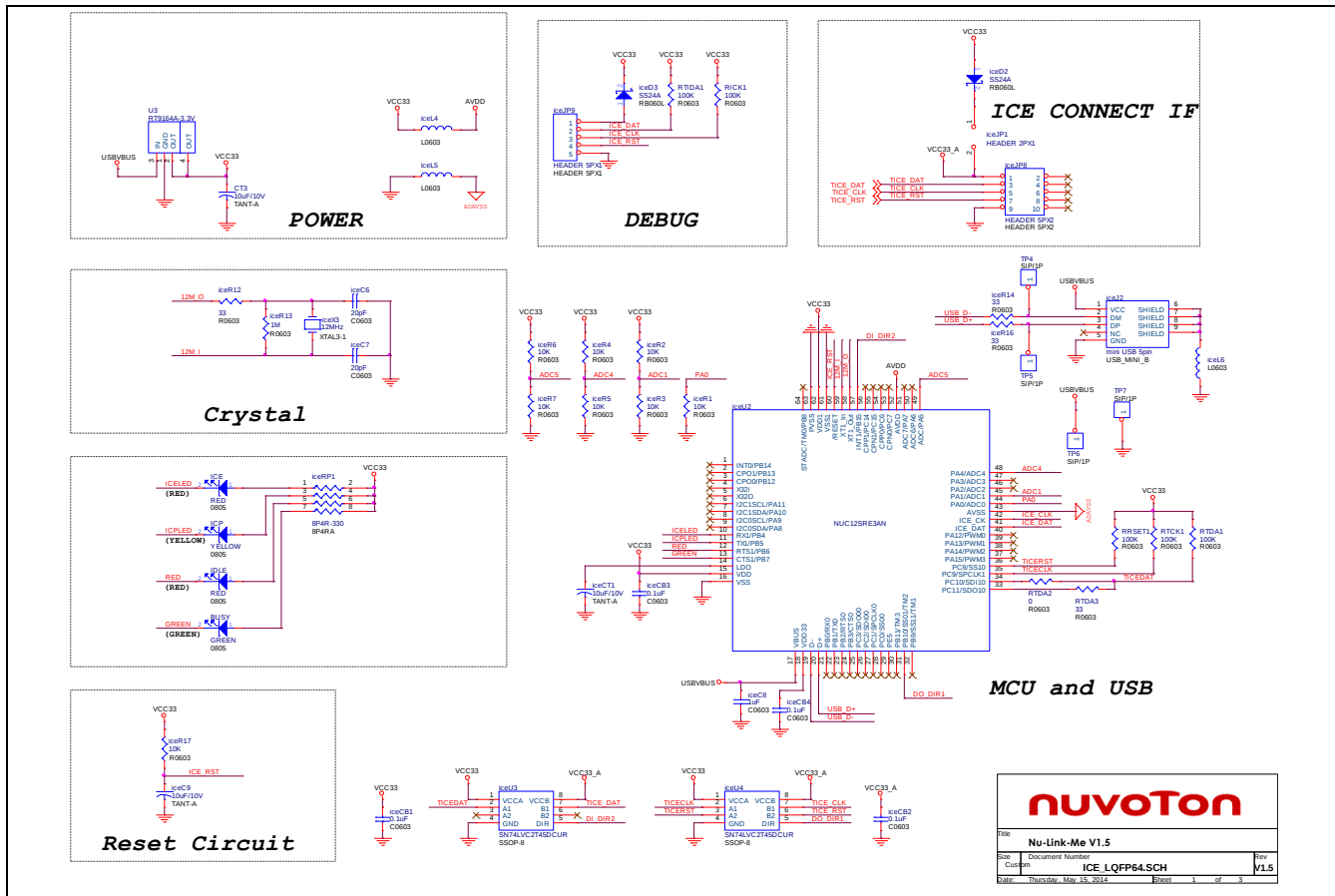
Step 2

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 also present. The main content area displays a list of ARM Cortex™-M0 MCUs, including AU9110 Audio Series, M051 Base Series, NUC130, NUC140/240 Connectivity Series, Nano100/102 Base Series, Nano110/112 LCD Series, Nano120 USB Series, and Nano130 Advanced Series. A "Resources" section lists various documents like Application Note, Data Sheet, Development Tool, Online Training, Product Brief, Software, Technical Reference Manual, and User Guide. 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 matrix, plotting MCUs against memory size (16K, 32K, 64K) and application type (Industrial Control, Low Power, USB Application, Automotive Application, Audio Application). The matrix includes models like Mini51, M051, Nano100, Nano110, Nano102, Nano112, NUC100, NUC120, NUC122, NUC123, NUC220, NUC230, NUC240, and AU9120*.

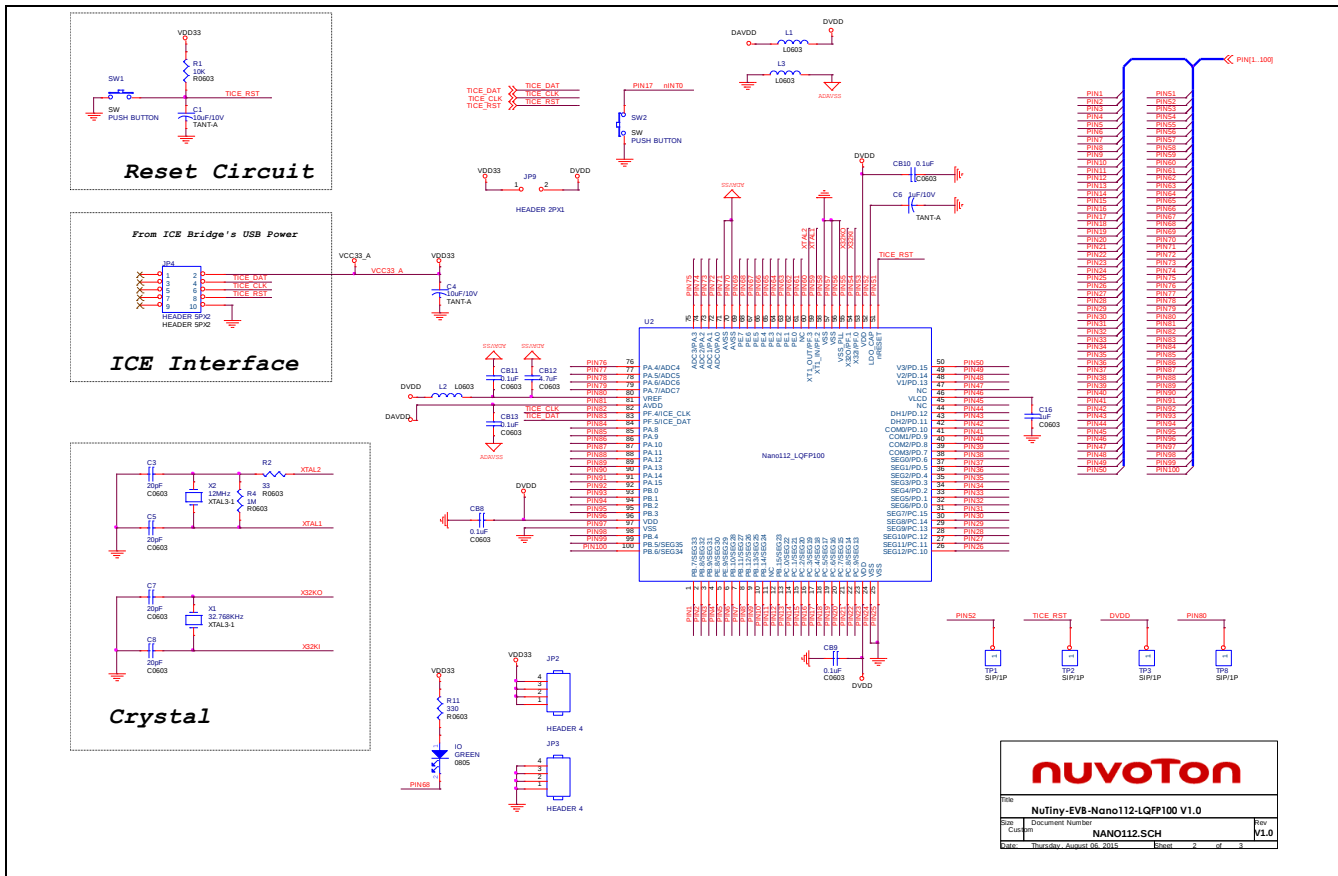
Step 3	 The screenshot shows the NuvoTon website's 'Tool & Software' page. The left sidebar contains a list of links: Learning, Product Related Information, Tool & Software, Development Tool Hardware, Development Kit, Learning Board, Programmer, Software (highlighted with a red dashed box and a yellow callout bubble), Third Party Tool, Reference Design, FAQ, Sales Support, Technical Support, and Forum. 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). A yellow callout bubble with the text 'Click here to enter Software download page' points to the 'Software' link in the sidebar.
Step 4	Download the NuMicro® Nano102/112 Series CMSIS BSP.

6 NUTINY-SDK-NANO112 SCHEMATICS

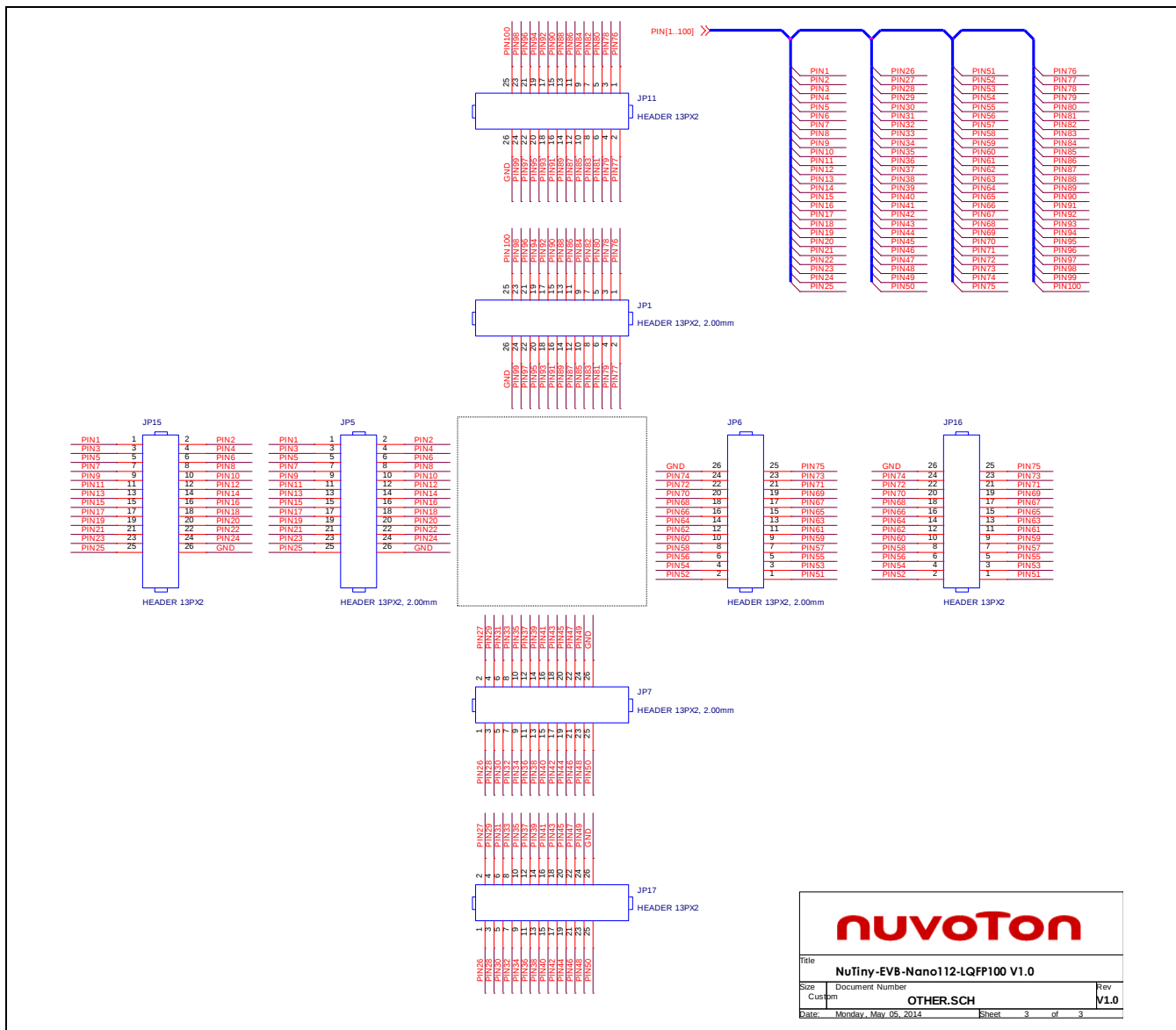
6.1 Nu-Link-Me Schematic



6.2 NuTiny-EVB-Nano112 Schematic

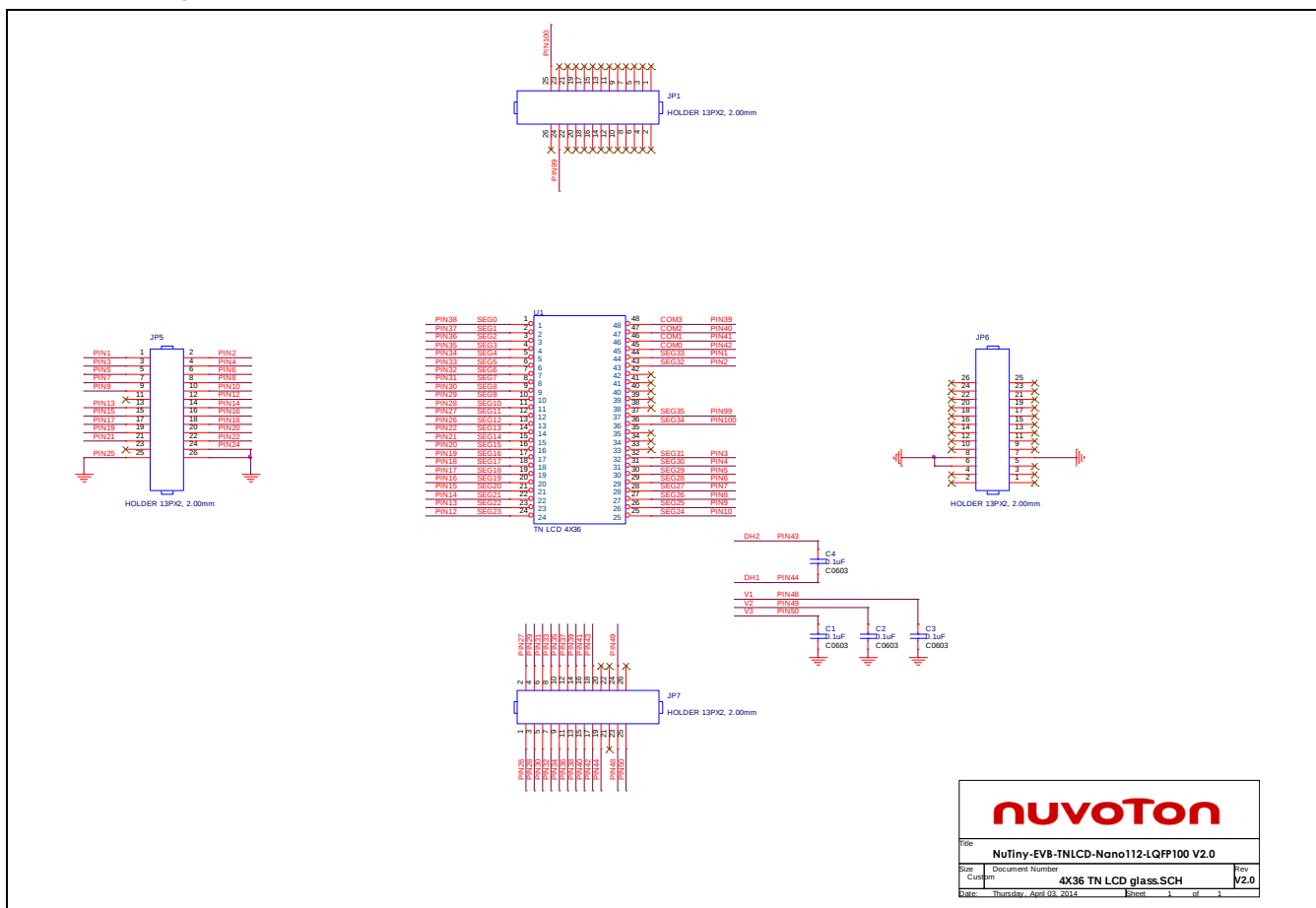


6.3 GPIO for 100 Pin Schematic



nuvoTon		
Title: NuTiny-EVB-Nano112-LQFP100 V1.0		
Size: Custom	Document Number: OTHER.SCH	Rev: V1.0
Date: Monday, May 05, 2014	Sheet: 3	of: 3

6.4 NuTiny-EVB-TNLCDC-Nano112 Schematic



nuvoTon

File			
NuTiny-EVB-TNLCDC-Nano112-LQFP100 V2.0			
Doc	Document Number		
Chg	Change	4X36 TN LCD glass.SCH	Rev
Date	Thursday, April 03, 2014	Page	1 of 1
			V2.0

7 REVISION HISTORY

Date	Revision	Description
2015.07.08	1.00	1. Preliminary version.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

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.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

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