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

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

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Table of Contents

1 Overview 3

2 Introduction to NUTINY-SDK-Nano112..... 3

2.1 NuTiny-SDK-Nano112 System 4

2.1.1 Power Settings 4

2.1.2 Debug Connectors..... 4

2.1.3 ICE USB Connector 4

2.1.4 Extended Connectors 4

2.1.5 Buttons 4

2.1.6 Power Connectors 4

2.1.7 TNLCD Panel..... 4

2.2 Pin Assignment for Extended Connectors 5

2.3 NuTiny-SDK-Nano112 PCB Placement..... 7

3 Starting to Use NuTiny-SDK-Nano112 on the Keil uVision® IDE 8

3.1 Downloading and Installing Keil µVision® IDE Software 8

3.2 Downloading and Installing Nuvoton Nu-Link Driver 8

3.3 Hardware Setup..... 8

3.4 Example Program..... 8

4 Starting to Use NuTiny-SDK-Nano112 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 Example Program..... 10

5 Downloading NuMicro® Related Files from Nuvoton Website 12

5.1 Downloading NuMicro® Keil µVision® IDE Driver 12

5.2 Downloading NuMicro® IAR EWARM Driver 14

5.3 Downloading NuMicro® Nano102/112 Series BSP Software Library 16

6 NuTiny-SDK-Nano112 Schematics 18

6.1 Nu-Link-Me Schematic..... 18

6.2 NuTiny-EVB-Nano112 Schematic..... 19

6.3 GPIO for 100 Pin Schematic 20

6.4 NuTiny-EVB-TNLCD-Nano112 Schematic 21

7 REVISION HISTORY 22

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.

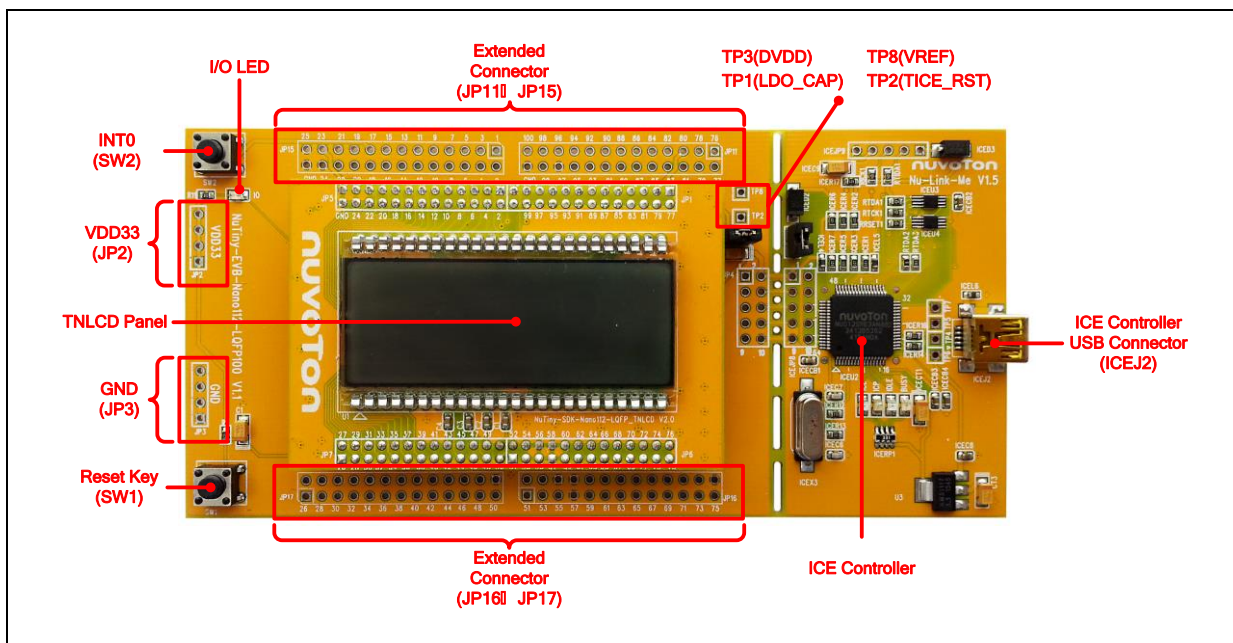


Figure 2-1 NuTiny-SDK-Nano112 (PCB Board)

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-TNLCD PCB placement.

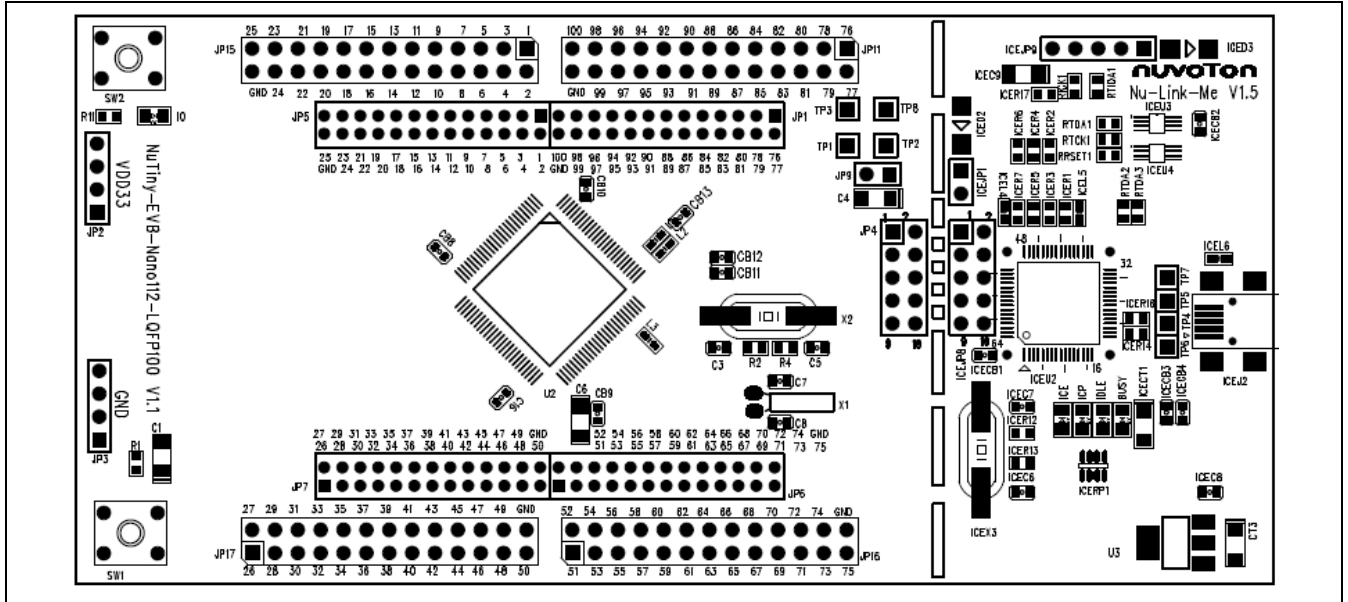


Figure 2-2 NuTiny-SDK-Nano112 PCB Placement

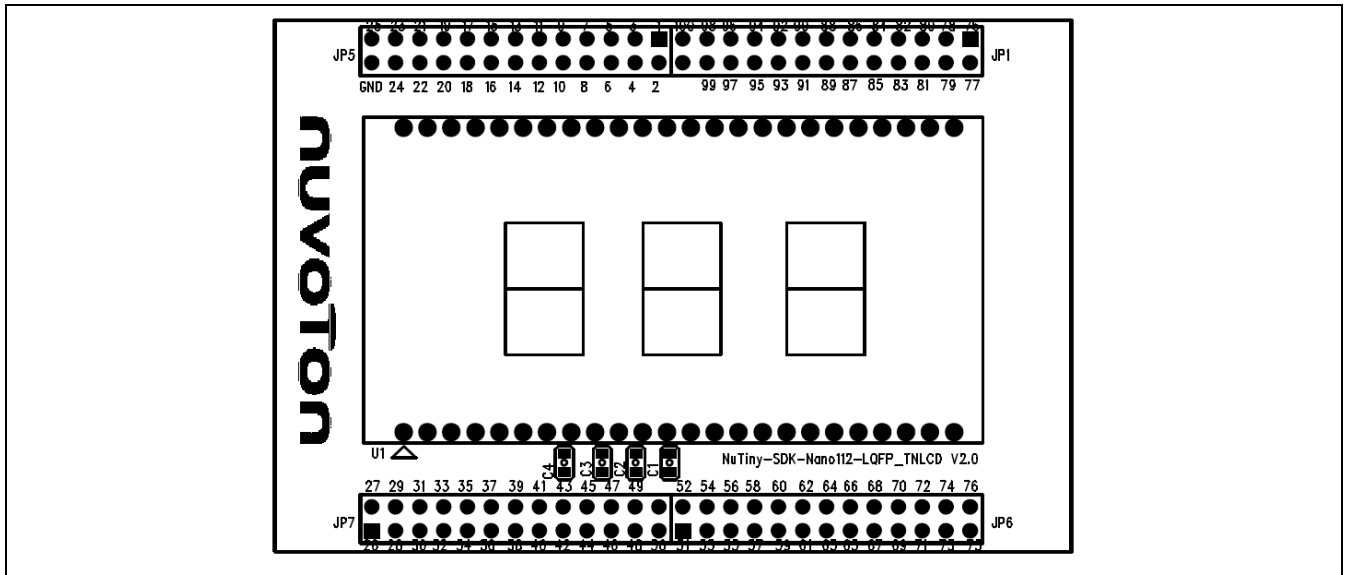


Figure 2-3 NuTiny-SDK-Nano112-TNLCD PCB Placement

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.

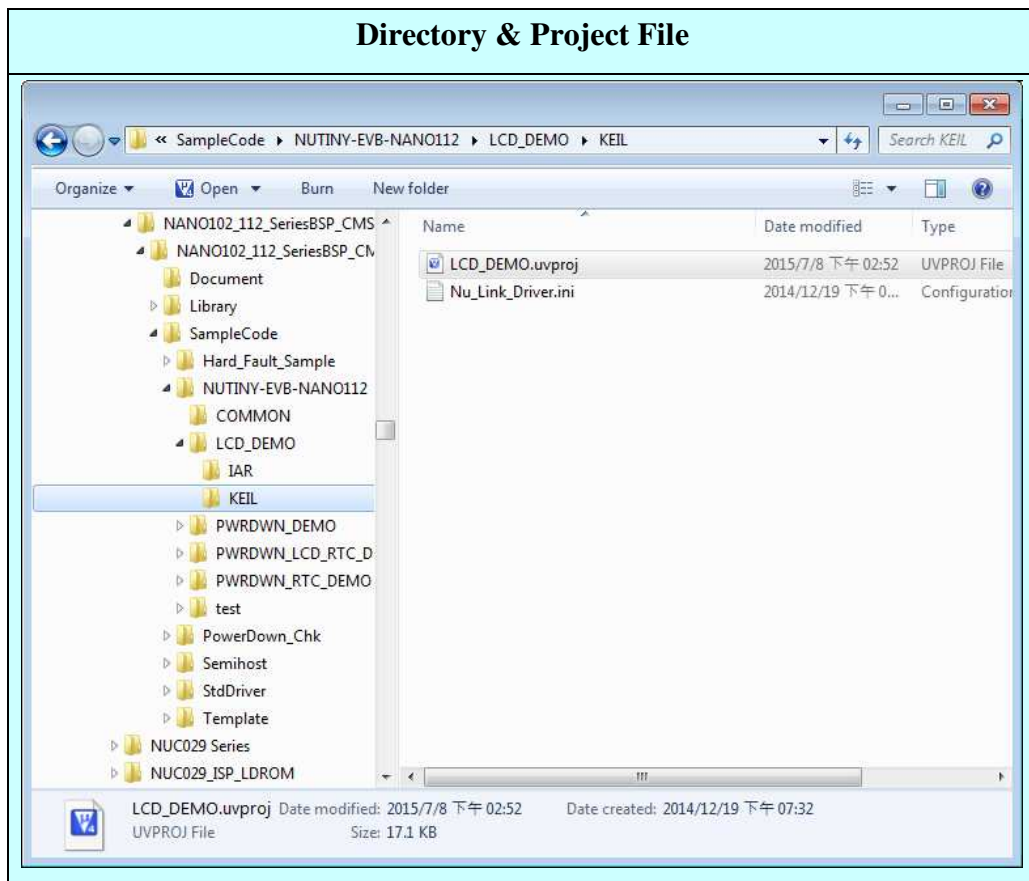










Figure 3-2 Keil Example Directory and Project File

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.

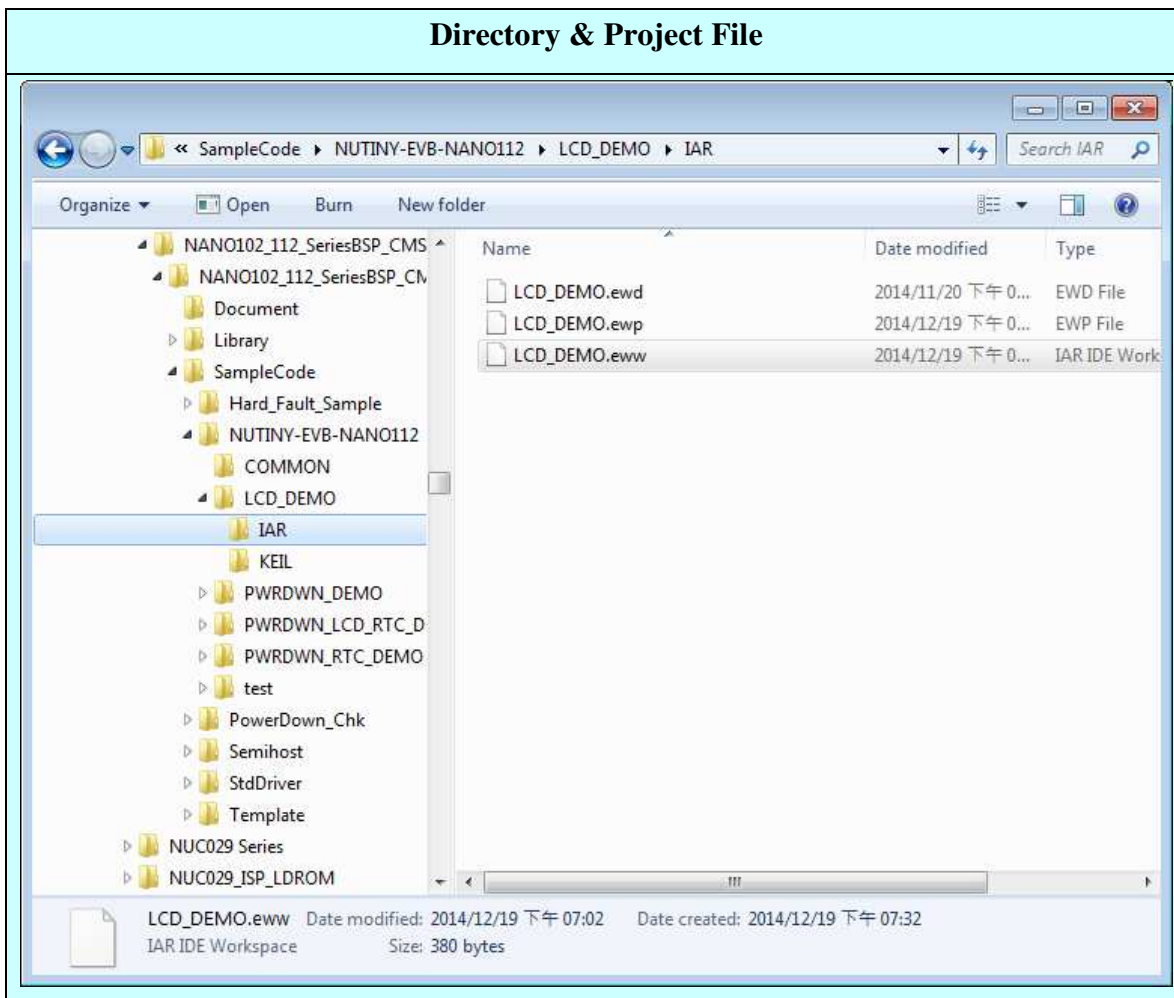








Figure 4-2 IAR Example Directory and Project File

To use this example:

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

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

5 DOWNLOADING NUMICRO[®] RELATED FILES FROM NUVOTON WEBSITE

5.1 Downloading NuMicro[®] Keil μ Vision[®] IDE Driver

Step1 Visit the Nuvoton NuMicro[®] website: <http://www.nuvoton.com/NuMicro>.

Step2

The screenshot shows the Nuvoton NuMicro website interface. A yellow oval labeled "2-1. Move to 'Support'" points to the "Support" link in the top navigation bar. A second yellow oval labeled "2-2. Click here to enter Tool & Software" points to the "Tool & Software" option in the dropdown menu that appears under "Support". The main content area features a product matrix with various microcontroller models (e.g., NUC100, Nano120, NUC220, NUC240, AU9110, M051, Nano102, Nano112, Mini51) plotted against memory size (16K, 32K, 64K) and application categories (Industrial Control, Low Power, USB Application, Automotive Application, Audio Application). A "Developing" label is present for the Mini51 series. The right sidebar includes sections for "Online Support" (with links to Online Training, Forum, and FAQ), "Featured Products" (listing M0516LDE, MINI54FDE, and NANO130KE3BN), "Featured Videos" (including "M0 Introduction(06:35)"), and "Featured Applications".

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- Forum

Click here to enter Software download page

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

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Click here to download

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 website interface. At the top, there is a navigation bar with links for Register, Login, and Language. Below this is a search bar and a Parametric Search option. The main navigation menu includes Products, Applications, Support, Foundry Service, Buy, myNuvoton, and About Nuvoton. A dropdown menu is open under the Support link, showing options like Learning, Product Related Information, Tool & Software, Reference Design, and FAQ. A yellow oval highlights the 'Support' link in the main navigation bar with the text "2-1. Move to 'Support'". Another yellow oval highlights the 'Tool & Software' link in the dropdown menu with the text "2-2. Click here to enter Tool & Software". The page content includes a breadcrumb trail (Home > Products > Microcontrollers > ARM Cortex-M0 MCUs), a list of ARM Cortex-M0 MCUs (AU9110 Audio Series, M051 Base Series, etc.), a Resources section (Application Note, Data Sheet, etc.), and a product matrix for different MCU series (NUC100, Nano120, NUC120, NUC230, NUC140, NUC130, M051, Nano102, Nano112, Mini51, etc.). A sidebar on the right features a featured product (NuMicro M4 MCU NUC472), Online Support options (Online Training, Forum, FAQ), Featured Products (M0516LDE, MINI54FDE, NANO130KE3BN), and Featured Videos (M0 Introduction(06:35)).

Step3

Click here to enter Software download page

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 Software & 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

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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

2-1. Move to "Support"

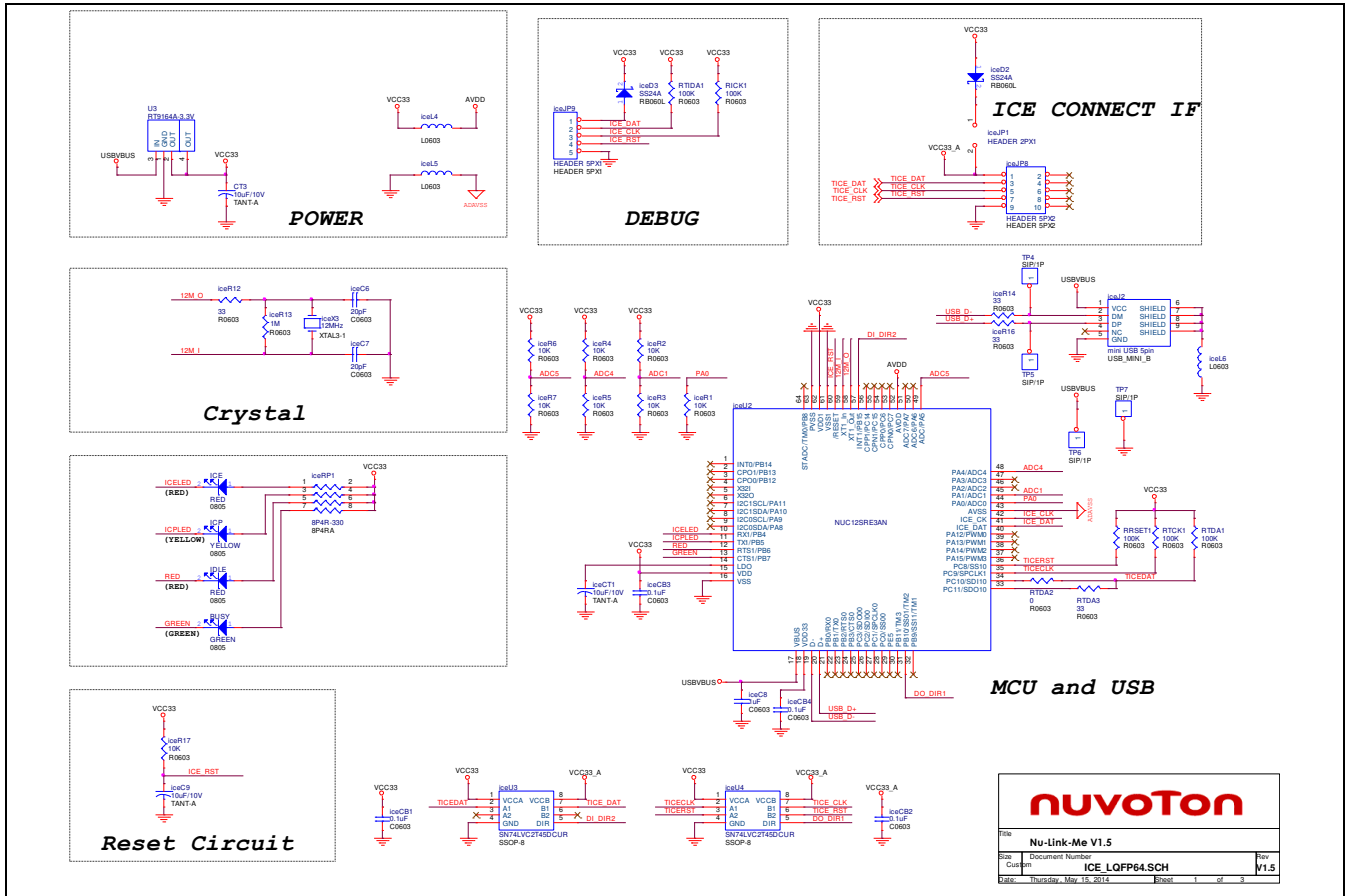
2-2. Click here to enter Tool & Software

As one of the leading Microcontroller (MCU) companies in the world, Nuvoton provides the state-

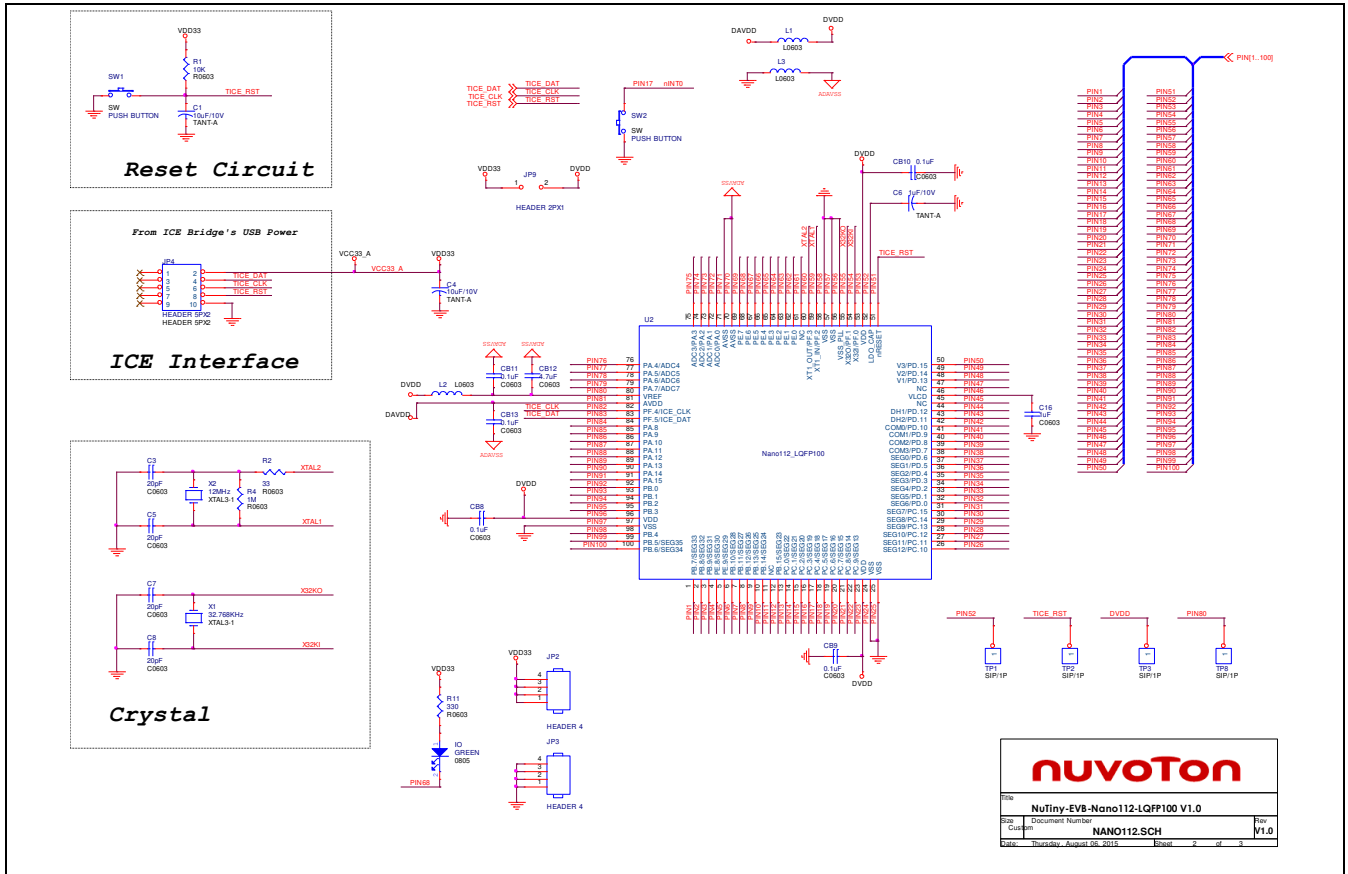
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<p>Step 4</p>	<p>Download the NuMicro® Nano102/112 Series CMSIS BSP.</p>

6 NUTINY-SDK-NANO112 SCHEMATICS

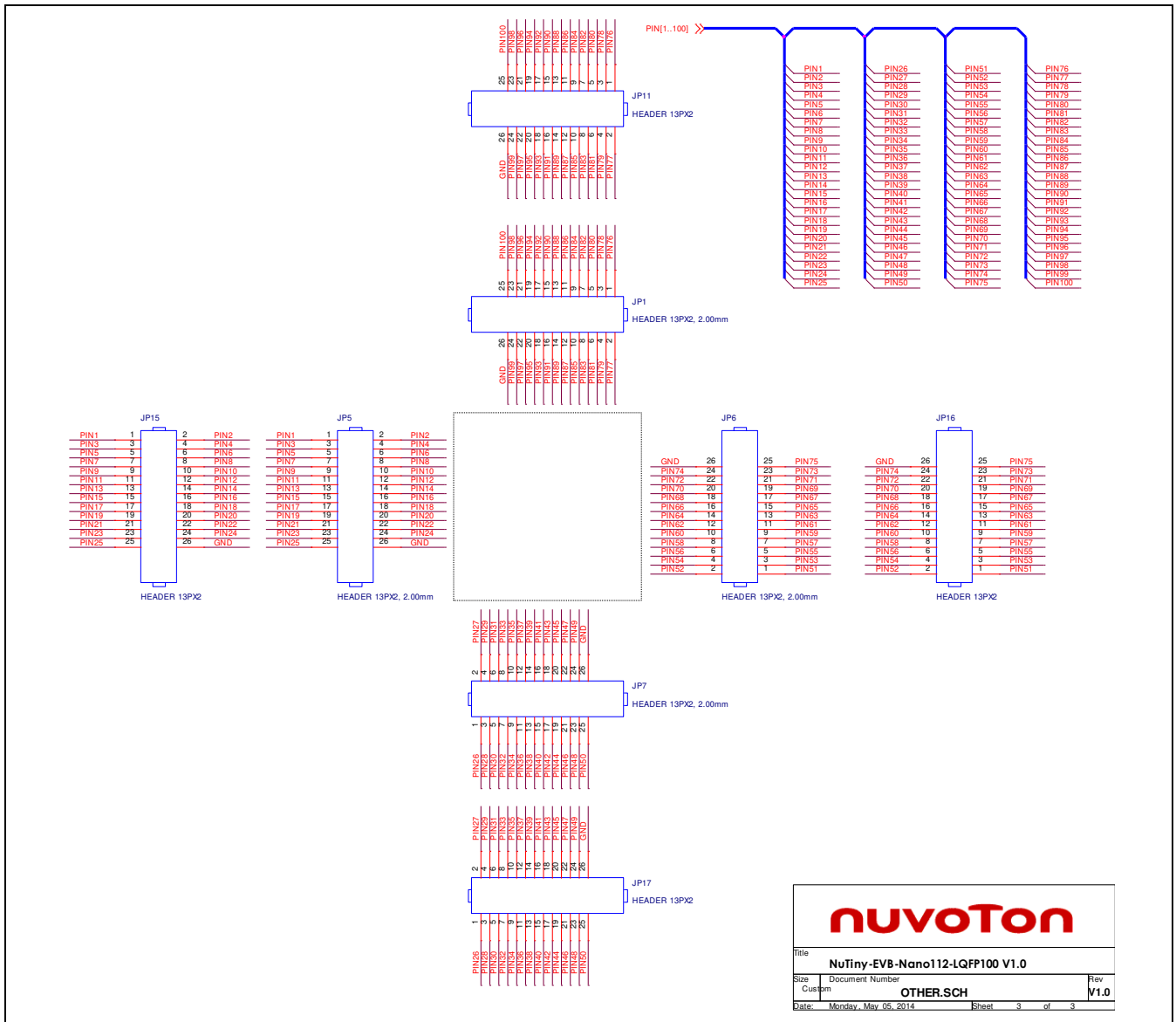
6.1 Nu-Link-Me Schematic



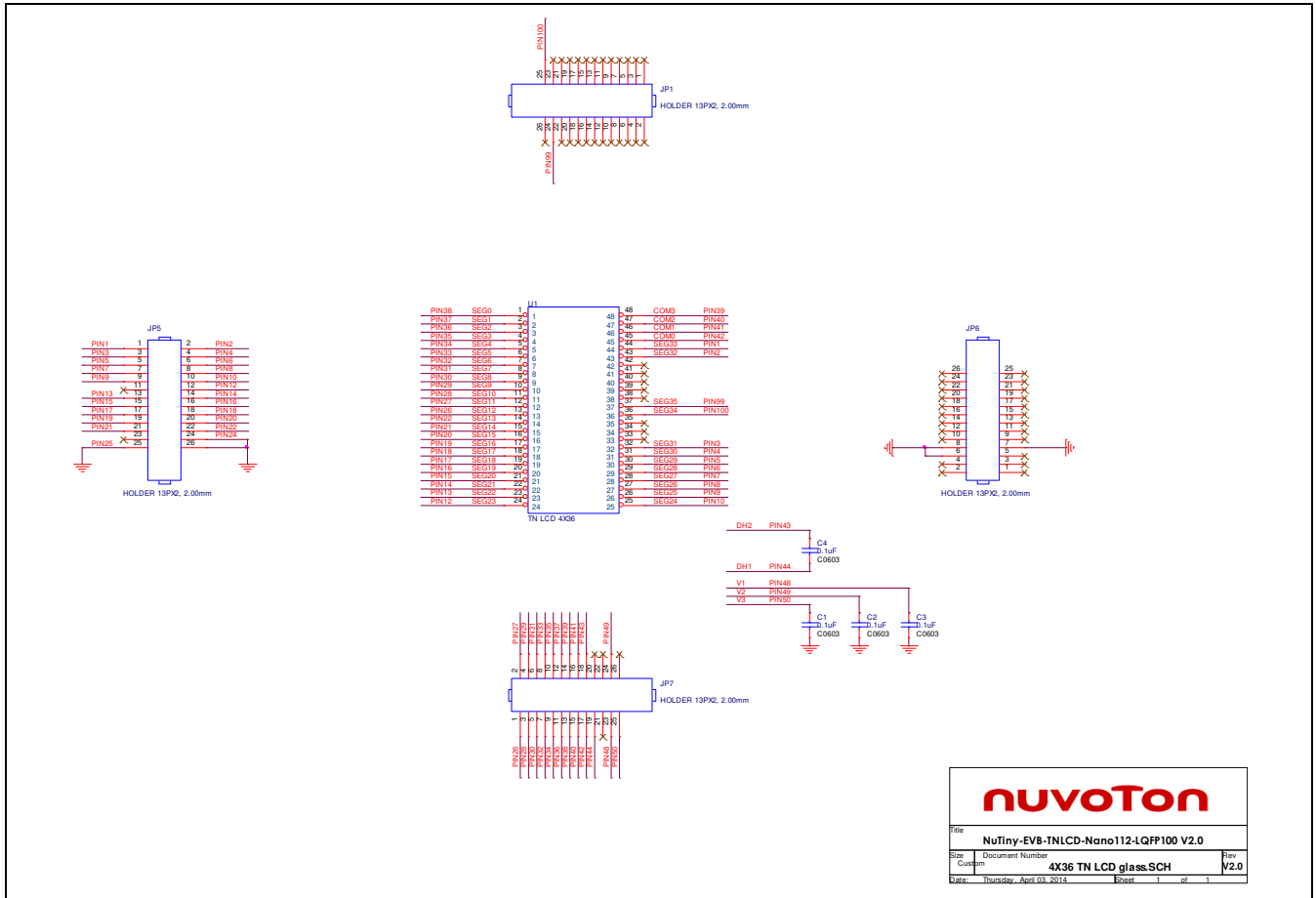
6.2 NuTiny-EVB-Nano112 Schematic



6.3 GPIO for 100 Pin Schematic



6.4 NuTiny-EVB-TNLCD-Nano112 Schematic



nuvoTon

File: NuTiny-EVB-TNLCD-Nano112-LQFP100 V2.0			
Size	Document Number	Revision	Rev
	4X36 TN LCD glass.SCH		V2.0
Date	Thursday, April 03, 2014	Page	1 of 1

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.

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