ARM Cortex™-M0

32-BIT MICROCONTROLLER

Nu-LB-M051 User Manual

For NuMicro™ M051 Series

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For additional information or questions, please contact: Nuvoton Technology Corporation.

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1 Overview

Nu-LB-M051 is the specific development tool for NuMicro M051 series. Users can use Nu-LB-M051 to learn easily how to display information, store date, communicate with PC and interact with human through M051 series. Besides, it also integrates ICE controller called Nu-Link-Me and users do not need other additional ICE or debug equipments.

2 Nu-LB-M051 Introduction

Nu-LB-M051 uses the M0516LAN as the target microcontroller and includes rich functional blocks on board. Figure 2-1 is the positive and negative Nu-LB-M051. The positive Nu-LB-M051 includes main chip (M0516LAN), INT key, reset key, variable resistance, RGB LED, 8 LEDs, 128x64 Dot Matrix LCD and RS232 interface. The negative Nu-LB-M051 includes EEPROM, Flash and ICE controller called Nu-Link-Me.

Nu-LB-M051 is similar to other development boards. Users can use the functional blocks connected with M0516LAN to develop and verify applications to emulate the real behavior. The on board chip covers M051 series features. The Nu-LB-M051 can be a real system controller to design users' target systems.

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

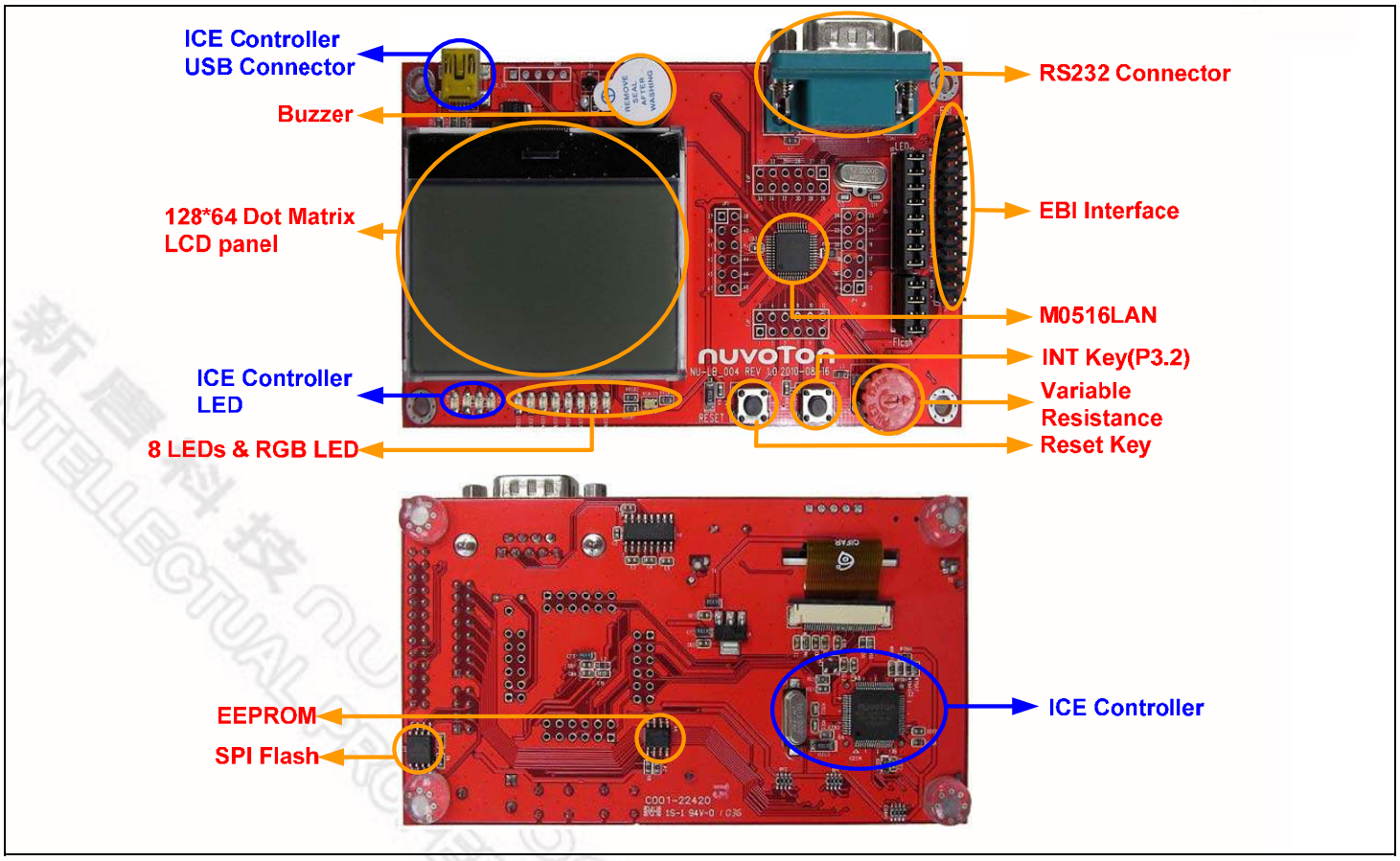

Figure 2-1 Nu-LB-M051

2.1 Functional Block of Nu -LB-M051

Nu-LB-M051 provides the rich functional blocks connected with M0516LAN to display information, communicate with PC, store data and interact with human. Users can follow the pin assignment at Table 2-1 to control every functional block.

Functional Block	Pin assignment	Pin Function Description
ICE controller(Nu-Link-Me)	ICE_CLK ICE_DATA	SWD interface
Reset Key	/RST	Reset
INT Key	P3.2	INT0
Variable Resistance	P1.0	AIN0(ADC input)
Buzzer	P4.3	PWM3
GRB LED	P4.0 P4.1 P4.2	PWM0 PWM1 PWM2
8 LEDs	P2.0~P2.7	GPIO or PWM0~PWM7
EEPROM	P3.4 P3.5	I2C SDA I2C SCL
FLASH	P0.4 P0.7 P0.6 P0.5	SPISS1 SPICLK1 MISO_1 MOSI_1
Black Dot Matrix LCD Panel	P1.4 P1.7 P1.6 P1.5	SPISS0 SPICLK0 MISO_0(LCD Reset) MOSI_0
	P1.1	Background Enable/Disable
EBI Interface	P4.4 P4.5 P3.6 P3.7	/CS ALE /WR /RD
	P0.0~P0.7 P2.0~P2.7	AD0~AD7 AD8~AD15

Table 2-1 Functional Block for Nu-LB-M051

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2.2 Pin Assignment for Extended Connector

Nu-LB-M051 provides M0516LAN on board and the extended connector for LQFP-48 pin. Table 2-2 is the pin assignment for M0516LAN.

Pin No	Pin Name	Pin No	Pin Name
01	P1.5, MOSI_0, AIN5	25	P2.5, PWM5, AD13
02	P1.6, MISO_0, AIN6	26	P2.6, PWM6, AD14
03	P1.7, SPICLK0, AIN7	27	P2.7, PWM7, AD15
04	/RST	28	P4.4, /CS
05	P3.0, RXD	29	P4.5, ALE
06	AVSS	30	P4.6, ICE_CLK
07	P3.1, TXD	31	P4.7, ICE_DAT
08	P3.2, /INT0, STADC	32	P0.7, SPISCLK1, AD7
09	P3.3, /INT1, MCLK	33	P0.6, MISO_1, AD6
10	P3.4, T0, SDA	34	P0.5, MOSI_1, AD5
11	P3.5, T1, SCL	35	P0.4, SPISS1, AD4
12	P4.3, PWM3	36	P4.1, PWM1
13	P3.6, /WR, CKO	37	P0.3, RTS0, AD3
14	P3.7, /RD	38	P0.2, CTS0, AD2
15	XTAL2	39	P0.1, RTS1, AD1
16	XTAL1	40	P0.0, CTS1, AD0
17	VSS	41	VDD
18	LDO_CAP	42	AVDD
19	P2.0, PWM0, AD8	43	P1.0, T2, AIN0
20	P2.1, PWM1, AD9	44	P1.1, T3, AIN1
21	P2.2, PWM2, AD10	45	P1.2, RXD1, AIN2
22	P2.3, PWM3, AD11	46	P1.3, TXD1, AIN3
23	P2.4, PWM4, AD12	47	P1.4, SPISS0, AIN4
24	P4.0, PWM0	48	P4.2, PWM2

Table 2-2 Pin Assignment for M0516LAN

3 How to Start Nu-LB-M051 on the Keil µVision® IDE

3.1 Keil uVision® IDE Software Download and Install

Please visit the Keil company website (http://www.keil.com) to download the Keil µVision® IDE and install the RVMDK.

3.2 Nuvoton Nu-Link Driver Download and Install

Please visit the Nuvoton company NuMicro™ website (http://www.nuvoton.com/NuMicro) to download "NuMicro™ Keil µVision® IDE driver" file. Please refer to Chapter 6.1 for the detail download flow. When the Nu-Link driver has been well 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 as Figure 3-1

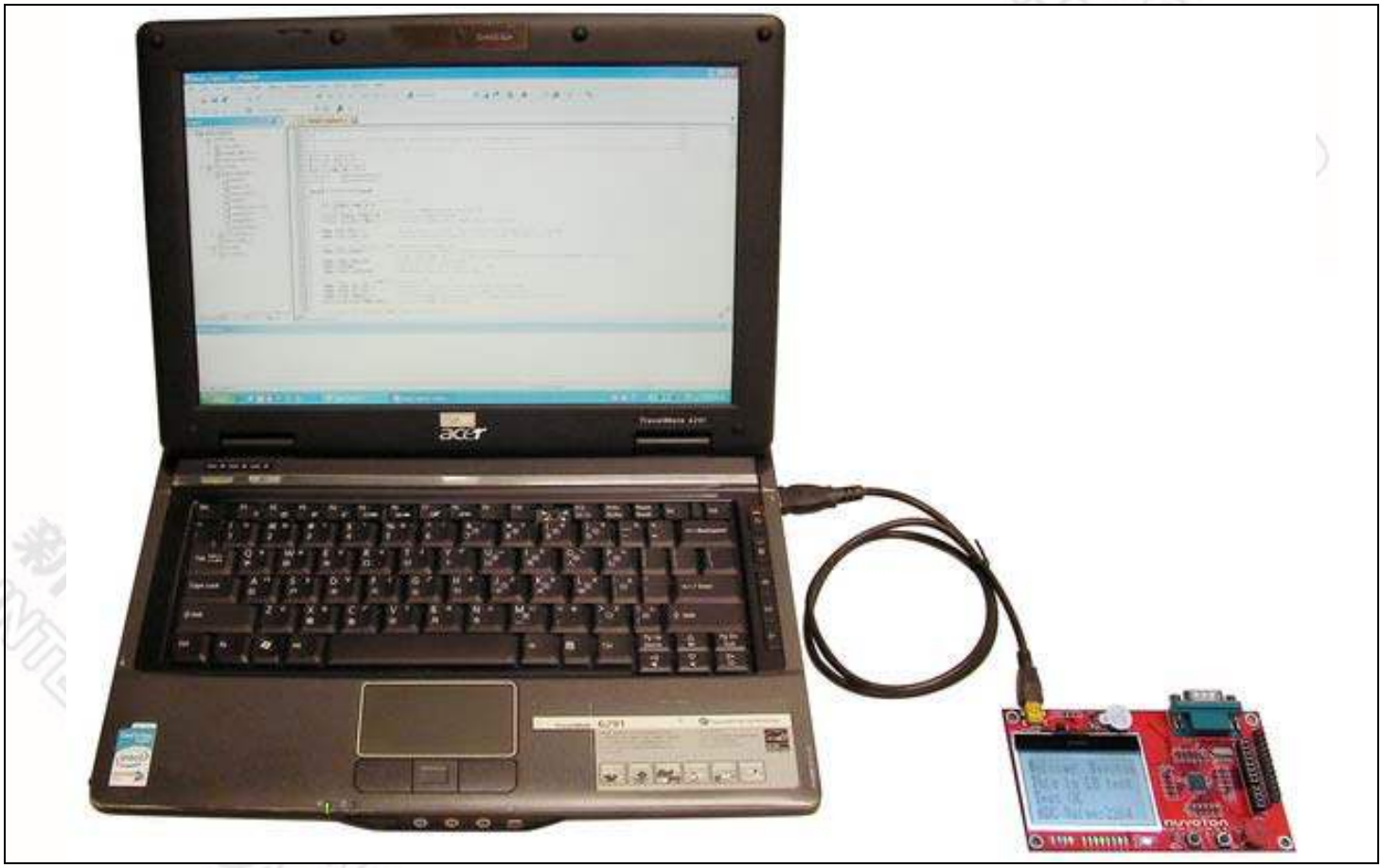

Figure 3-1 Nu-LB-M051 Hardware Setup

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3.4 Smpl_StartKit Example Program

This example demonstrates the ease of downloading and debugging an application on a Nu-LB-M051 board.
It can be found on Figure 3-2 list directory and downloaded from Nuvoton NuMicro™ website following on Chapter 6.3.

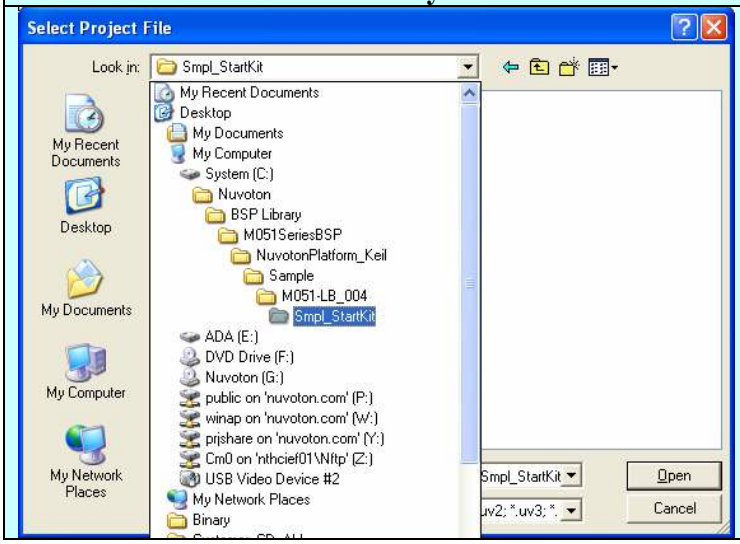
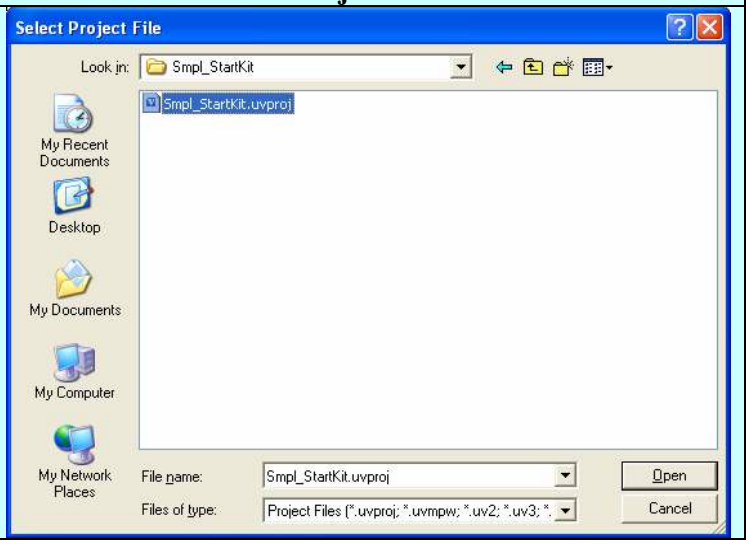
Directory	Project File
	

Figure 3-2 Smpl_StartKit Example Directory

To use this example:
The LCD will display the result of ADC on the Nu-LB-M051 board.

- **Start µVision®**
- **Project-Open**
  Open the Smpl_StartKit.uvproj project file
- **Project - Build**
  Compile and link the Smpl_StartKit 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
  - Reset the device
  - Run the application

4 How to Start Nu-LB-M051 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 and 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 to Chapter 6.2 for the detail 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 as Figure 4-1

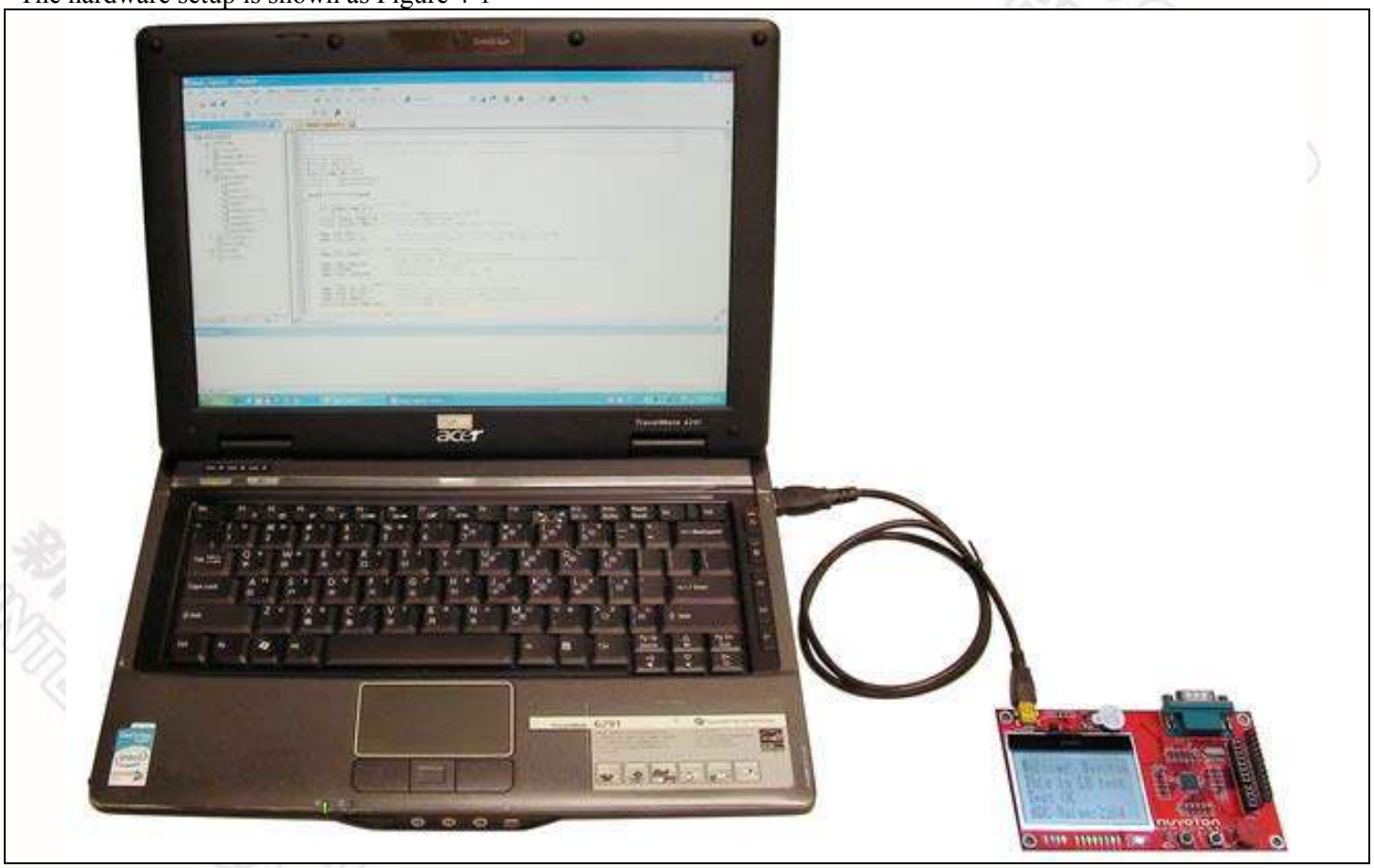


Figure 4-1 Nu-LB-M051 Hardware Setup

4.4 Smpl_StartKit Example Program

This example demonstrates the ease of downloading and debugging an application on a Nu-LB-M051 board.
It can be found on Figure 4-2 list directory and downloaded from Nuvoton NuMicro™ website following on Chapter 6.3.

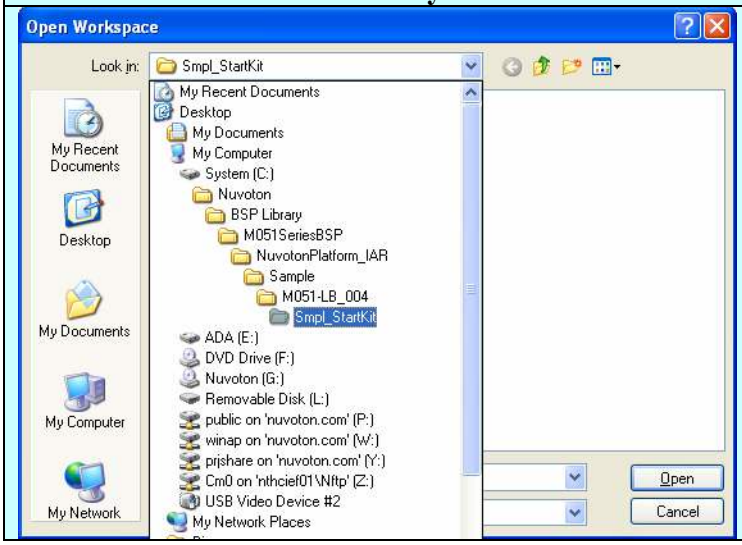
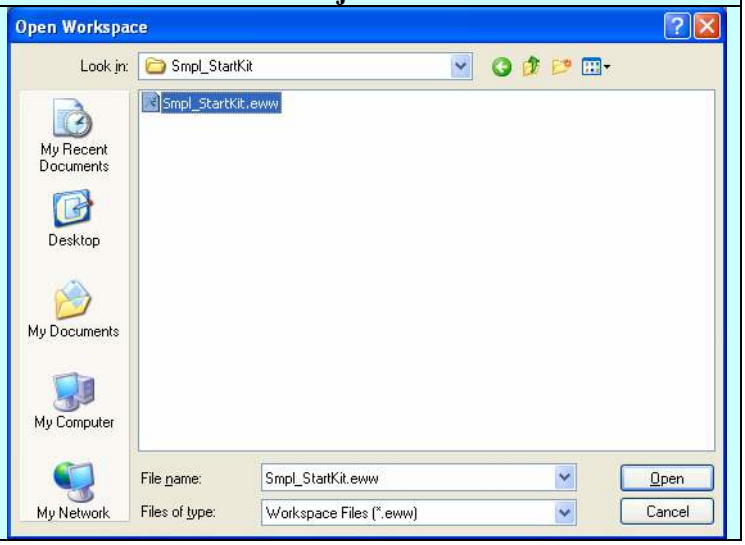
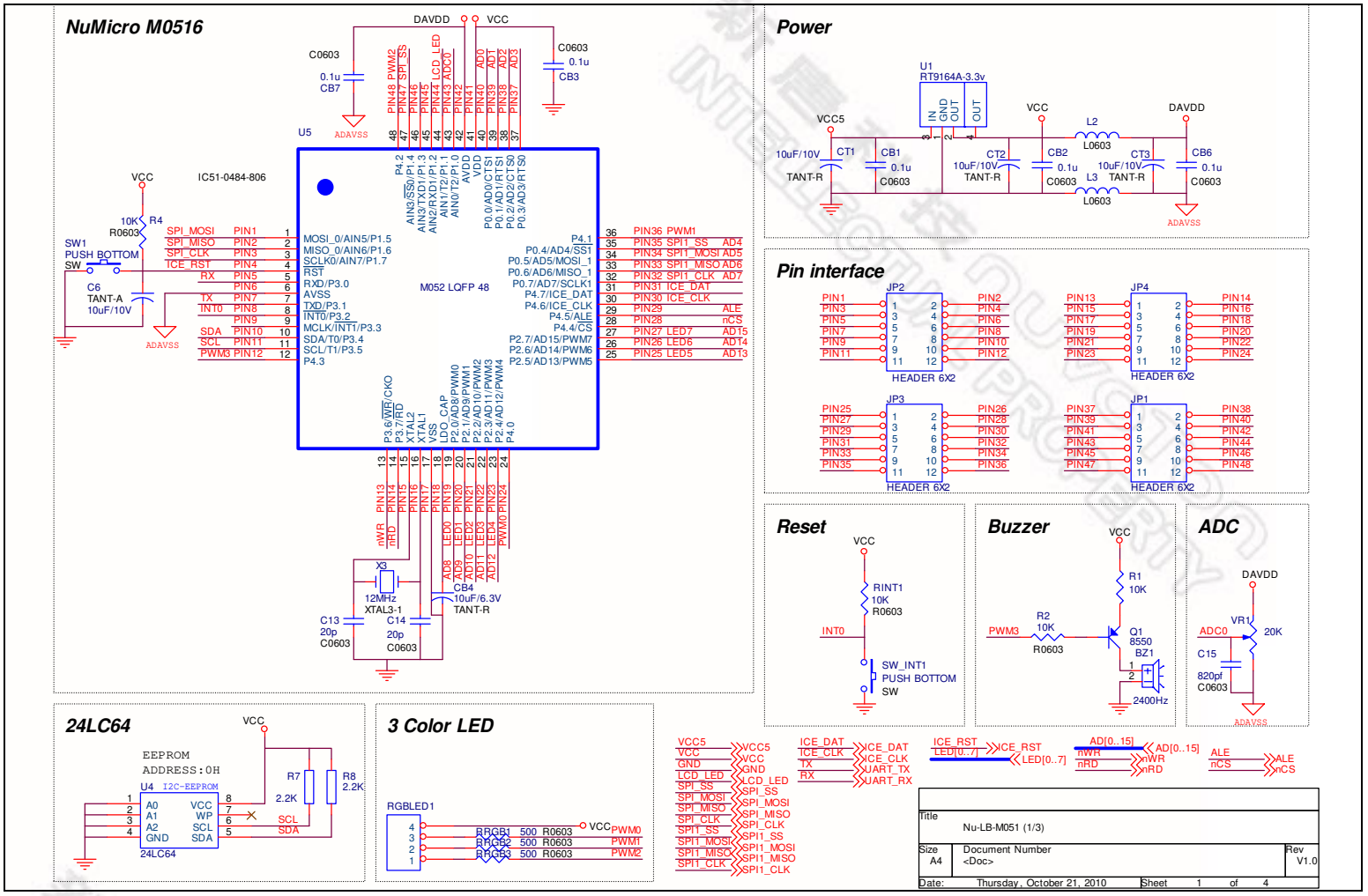
Directory	Project File
	

Figure 4-2 Smpl_StartKit Example Directory

To use this example:
The LCD will display the result of ADC on the Nu-LB-M051 board.

- **Start IAR Embedded Workbench**
- **File-Open-Workspace**
  Open the Smpl_StartKit.eww workspace file
- **Project - Make**
  Compile and link the Smpl_StartKit 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 Nu-LB-M051 Schematic



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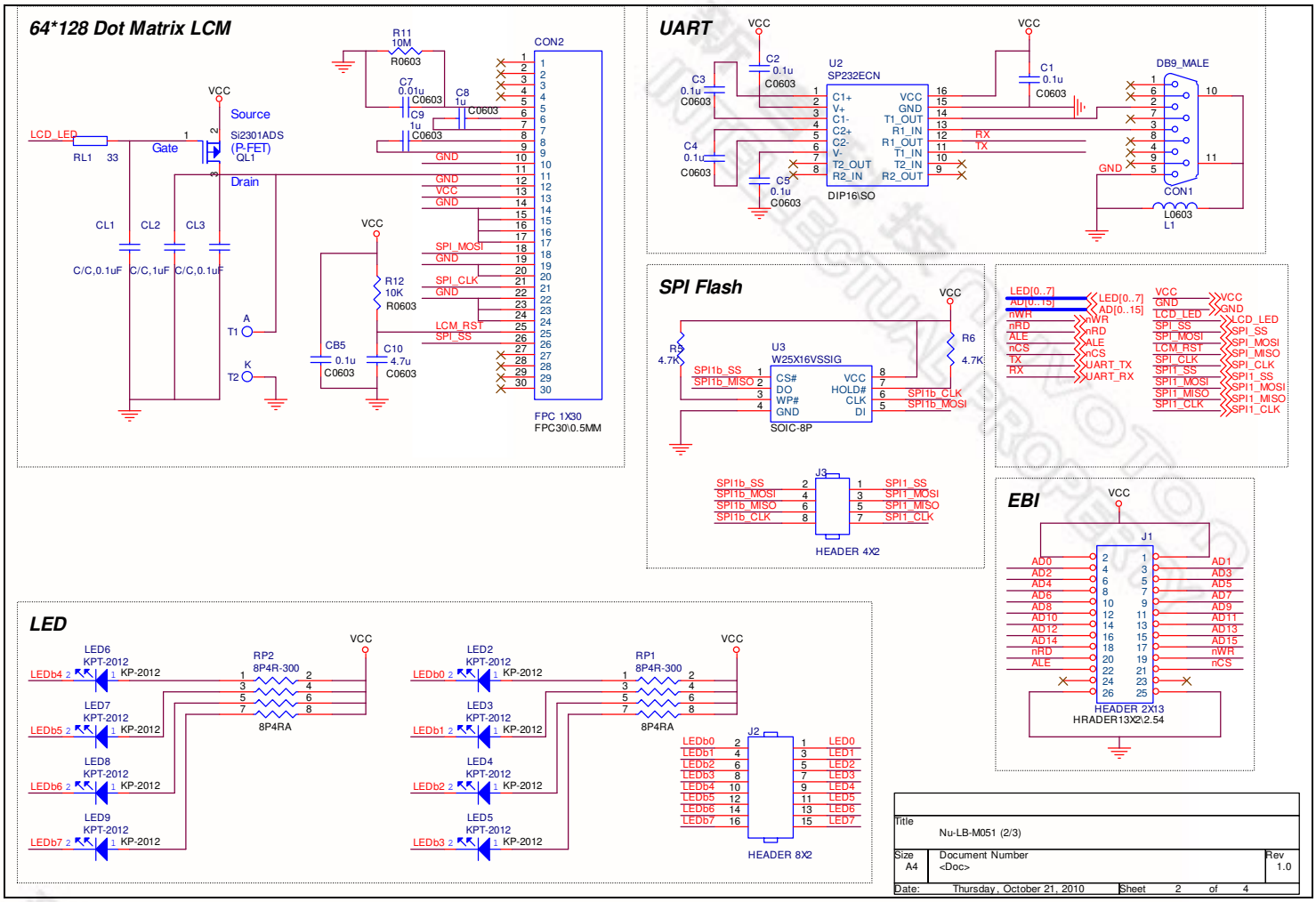

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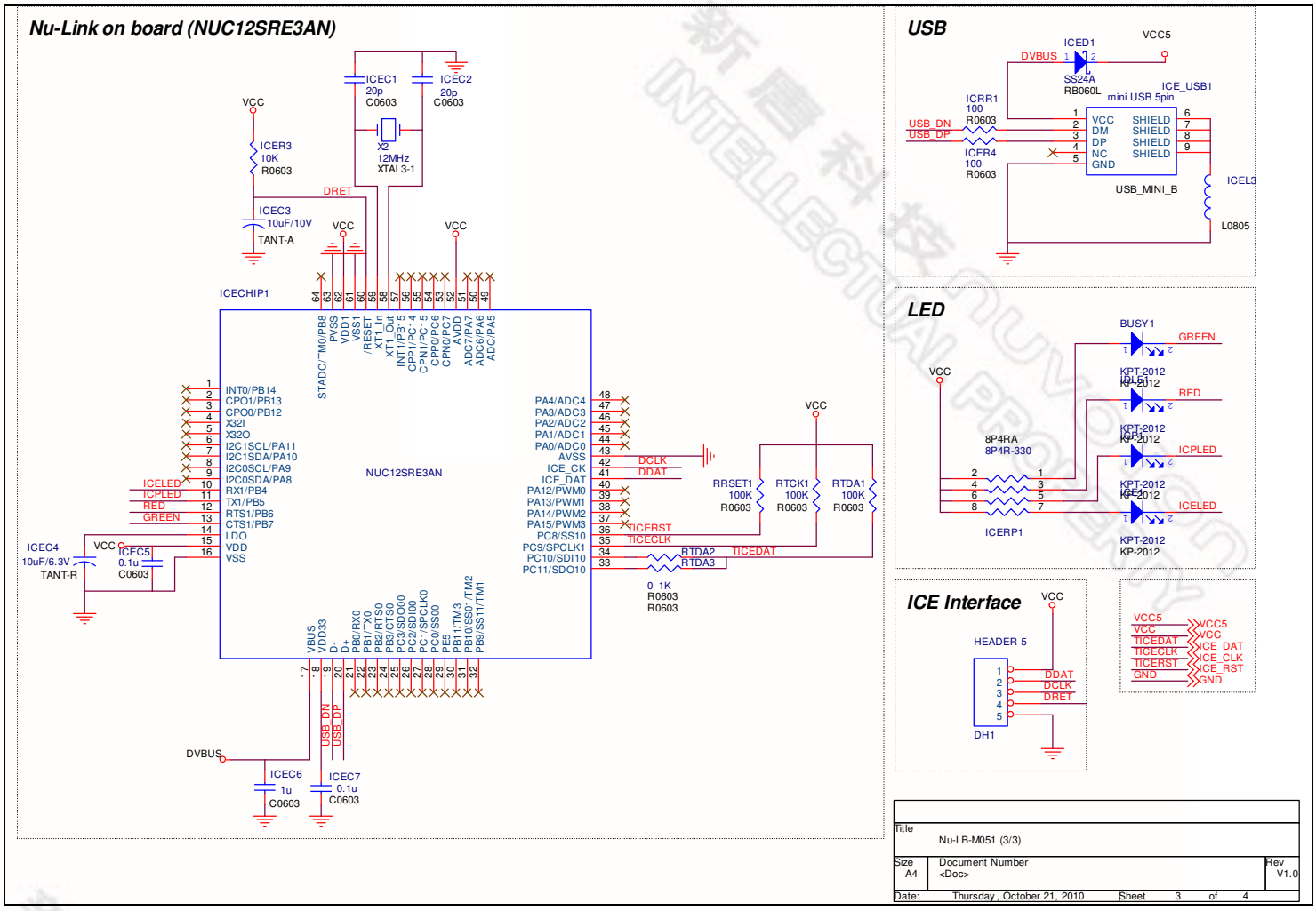

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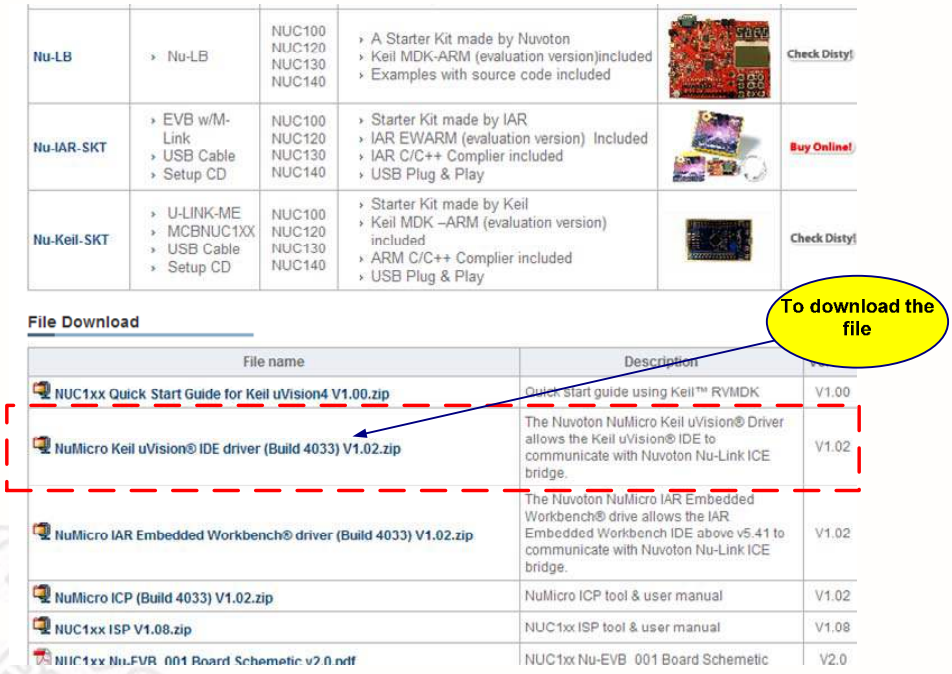
6 Download NuMicro™ Family Related Files from Nuvoton Company

6.1 Download NuMicro™ Keil µVision® IDE driver

Step1	Visit the Nuvoton NuMicro™ website: **http://www.nuvoton.com/NuMicro**
Step2	
Step 3	
Step 4	Download the NuMicro Keil µVision® IDE driver

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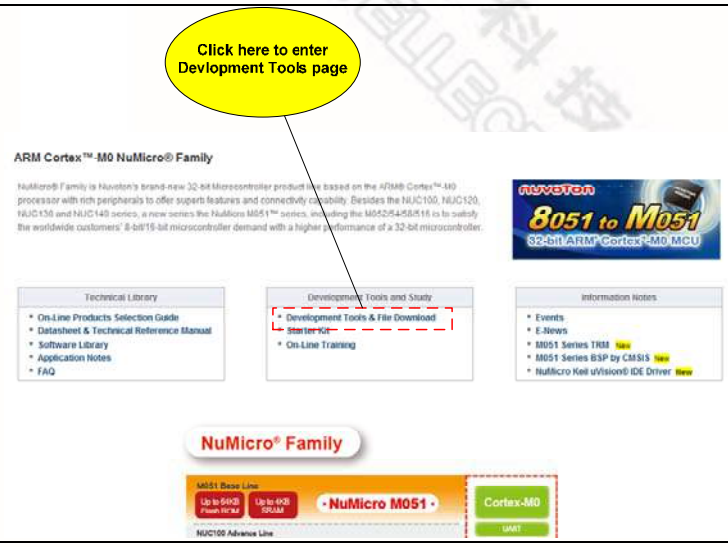
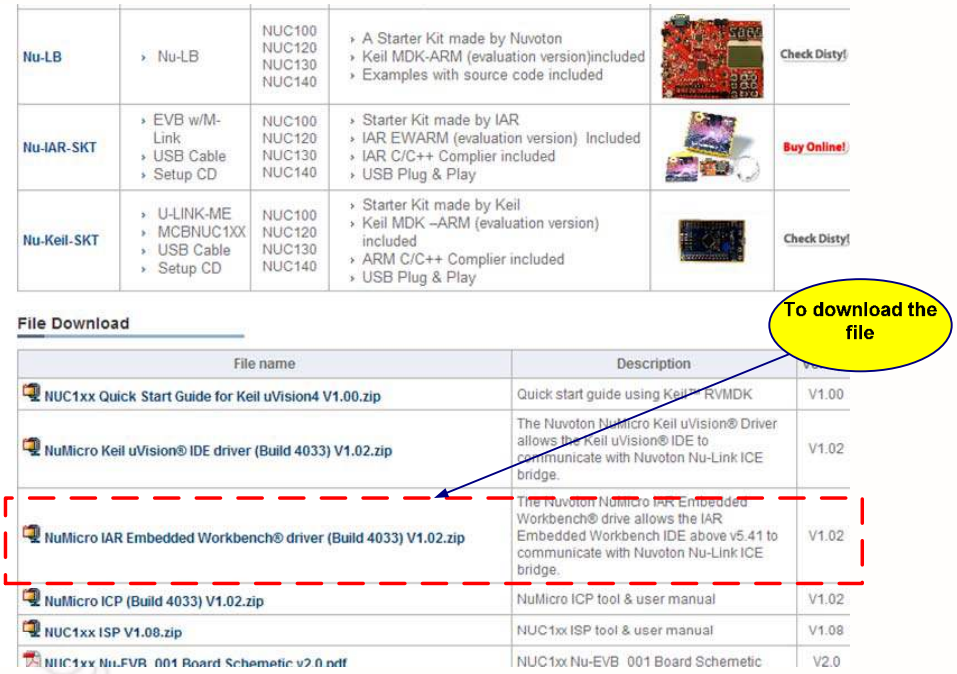
6.2 Download NuMicro™ IAR EWARM driver

Step1	Visit the Nuvoton NuMicro™ website: **http://www.nuvoton.com/NuMicro**
Step2	
Step 3	
Step 4	Download the NuMicro™ IAR Embedded Workbench® driver

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6.3 Download NuMicro™ M051 series BSP Software Library

Step1	Visit the Nuvoton NuMicro™ website: http://www.nuvoton.com/NuMicro
Step2	
Step 3	Download the NuMicro™ M051 series software library

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7 Revision History

Version	Date	Page	Description
1.0	Oct. 21, 2010	--	Initial Release