1T 8051

8-bit Microcontroller

Nuvoton 1T 8051-based Microcontroller NuTiny-SDK-N76E616 User Manual

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www.nuvoton.com

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1 OVERVIEW

NuTiny-SDK-N76E616 is the specific development tool for 8-bit high performance 1T 8051-based microcontroller N76E616 series. User can use NuTiny-SDK-N76E616 to develop and verify the application program easily.

NuTiny-SDK-N76E616 includes two portions. One is NuTiny-EVB-N76E616 and the other is Nu-Link-Me. NuTiny-EVB-N76E616 is the evaluation board and Nu-Link-Me is its Debug Adaptor. Thus, user does not need other additional ICE or debug equipment.

The Nuvoton 1T 8051-based microcontroller N76E616 series is function compatible with the N76E003 and N76E885 series, the 8-bit high performance 1T 8051-based microcontroller. The instruction set is fully compatible with the standard 80C51 and performance enhanced. The N76E616 series can bridge the gap and replace the cost equivalent to traditional 4T, 6T and 12T 8-bit microcontroller by 1T 8-bit high performance and rich functions. With high performance CPU core and rich well-designed peripherals, the N76E616 benefits to meet a general purpose, home appliances, or motor control system accomplishment.

The N76E616 series can run up to 16 MHz, and operate at a wide voltage range of 2.4V ~ 5.5V and temperature range of -40℃ ~ +105℃. For the N76E616 series, the embedded program flash size is up to 18 Kbytes, SRAM is 256 bytes, and 256 Bytes of auxiliary RAM (XRAM). The N76E616 series also offers size configurable 4K/3K/2K/1K/0K bytes flash of LDROM for the ISP, which provides flexibility to user developed Boot Code.

The N76E616 series has many high-performance peripheral functions, such as 11.0592 MHz high-speed internal RC oscillator (trimmed to ±1% VDD = 5.0 V, TA = 25 ℃ , ±5% in all conditions), I/O port with up to 18 pins, four 16-bit timers, two full-duplex UARTs ports with frame error detection and automatic address recognition, one SPI interface, one I^2C interface, up to five enhanced 16-bit PWM output channels, 8 channels 12-bit ADC, Watchdog Timer, Self Wake-up Timer, and a Brown-out Detector. The peripherals are equipped with 18 sources with 4-level-priority interrupts capability. All these peripherals have been incorporated into the N76E616 series to reduce component count, board space and system cost.

Additionally, the N76E616 series is equipped with ISP (In-System Programming) and ICP (In-Circuit Programming) functions, which allow the user to update the program memory without removing the chip from the actual end product. The N76E616 series also supports In-Application-Programming (IAP) function, user switches the code executing without the chip reset after the embedded flash updated.

2 NUTINY-SDK-N76E616 INTRODUCTION

NuTiny-SDK-N76E616 uses the N76E616AL48 as the target microcontroller. Figure 2-1 is NuTiny-SDK-N76E616 for the N76E616 series, the left portion is called NuTiny-EVB-N76E616 and the right portion is Debug Adaptor called Nu-Link-Me.

NuTiny-EVB-N76E616 is similar to other development boards. User can use it to develop and verify applications to emulate the real behavior. The on-board chip covers N76E616 series features. The NuTiny-EVB-N76E616 can be a real system controller to design user's target systems.

Nu-Link-Me is a Debug Adaptor. The Nu-Link-Me Debug Adaptor connects your PC's USB port to the user's target system (via Serial Wired Debug Port) and allows user to program and debug embedded programs on the target hardware. To use Nu-Link-Me Debug adaptor with Keil, please refer to "Nuvoton Nu-Link debug adapter user manual" in detail. This document will be stored in the local hard disk when user installs each driver. Nu-Link-Me also supports virtual COM port function. User can use Nu-Link-Me as a USB to UART virtual COM port, which connects to on-board N76E616AT20 UART0.

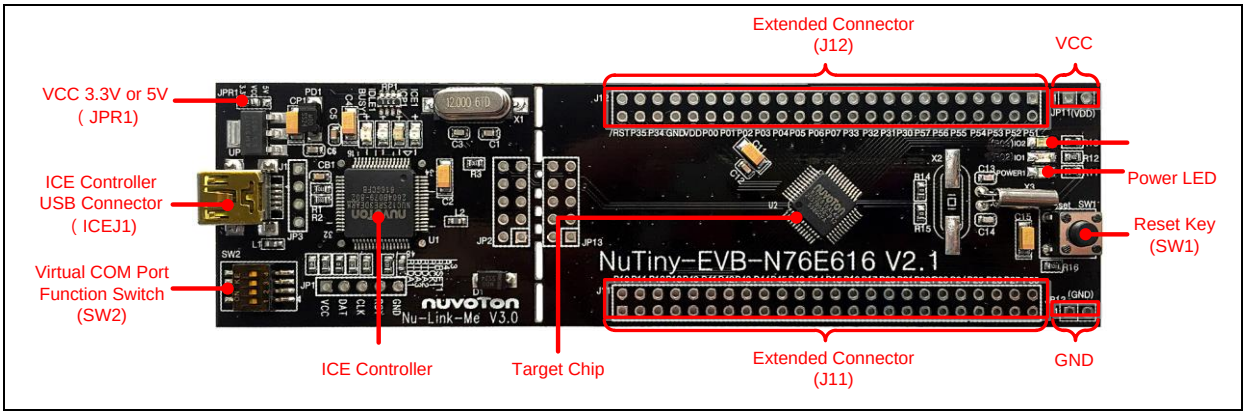


Figure 2-1 NuTiny-SDK-N76E616 (PCB Board)

2.1 Virtual COM Port Switch Description

The switch in Nu-Link-Me, SW3, determines that the virtual COM port function is enabled or disabled. When user turns on all of the positions of switch, the virtual COM port function will be enabled. By using virtual COM port function, user can access the USB device in the same way as it would access a standard COM port to N76E616AT20 UART0. To use this function, user needs to install "VCOM Driver" at first. User can get "VCOM Driver" from NuMicroDVD www.nuvoton.com\NuMicroDVD in folder "Software Utilities".

2.2 NuTiny-SDK-N76E616 Power Setting and Connector

2.2.1 Power Setting

- J1: USB port in Nu-Link-Me
- JP7 and JP9: VCC33 Voltage connector in NuTiny-EVB-N76E616

Model	JPR1	J1USB port	JP7 & JP9 VCC33	MCU Voltage
Model 1	**Select VCC33**	**Connect to PC**	**DC 3.3V output**	**DC 3.3V**

	(default)			
Model 2	**X**	**X**	**DC 2.4 V ~ 5.5 V Input**	**Voltage by JP7 & JP9 input**

2.2.2 Debug Connector

- JP13: Connector in target board (NuTiny-EVB-N76E616) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
- JP2: Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (for example NuTiny-EVB-N76E616)

2.2.3 ICE USB Connector

- J1: Mini USB Connector in Nu-Link-Me connected to a PC USB port

2.2.4 Extended Connector

- J11 and J12: Show all chip pins in NuTiny-EVB-N76E616

2.2.5 Reset Button

- SW1: Reset button in NuTiny-EVB-N76E616

2.2.6 Power Connector

- JP11: VCC connector in NuTiny-EVB-N76E616
- JP12: GND connector in NuTiny-EVB-N76E616

2.2.7 Virtual COM Port Function Switch

- SW3: Switch ON/OFF to enable or disable Nu-Link-Me virtual COM port function.

Function	Switch				Descriptions
	1	2	3	4	
Enable	ON	ON	ON	ON	Enable Nu-Link-Me virtual COM port function
Disable	OFF	OFF	OFF	OFF	Disable Nu-Link-Me virtual COM port function

2.3 Pin Assignment for Extended Connector

NuTiny-EVB-N76E616 provides N76E616AT20 on board and the extended connector for LQFP48 pin. Table 2-1 is the pin assignment for N76E616AL48.

Pin No	Pin Function	Pin No	Pin Function
01	P1.0/COM0	25	P5.1/SEG20
02	P1.1/COM1	26	P5.2/SEG21
03	P1.2/COM2	27	P5.3/SEG22
04	P1.3/$\overline{\text{INT1}}$/COM3	28	P5.4/SEG23
05	P4.0/SEG0/COM4	29	P5.5/SEG24
06	P4.1/SEG1/COM5	30	P5.6/RXD_1/SEG25
07	P4.2/SEG2	31	P5.7/TXD_1/SEG26
08	P4.3/SEG3	32	P3.0/T2DO1/SEG27
09	P4.4/SEG4	33	P3.1/T2DO2/SEG28
10	P4.5/SEG5	34	P3.2/Xin/SEG29
11	P4.6/SEG6	35	P3.3/Xout/SEG30
12	P1.4/T1/SEG7	36	P0.7/AIN7/CLO/SEG31
13	P1.5/T2AO1/SEG8	37	P0.6/AIN6
14	P1.6/T2AO2/SEG9	38	P0.5/AIN5
15	P1.7/T2BO1/SEG10	39	P0.4/AIN4
16	P2.0/T2BO2/SEG11	40	P0.3/AIN3
17	P2.1/RXD/SEG12	41	P0.2/AIN2
18	P2.2/TXD/SEG13	42	P0.1/AIN1/$\overline{\text{INT0}}$
19	P2.3/SDA/SEG14	43	P0.0/AIN0/T0
20	P2.4/SCL/SEG15	44	VDD
21	P2.5/SEG16	45	GND
22	P2.6/T2CO1/SEG17	46	P3.4/ICPDA/OCDDA
23	P2.7/T2CO2/SEG18	47	P3.5/ICPCK/OCDCK
24	P5.0/STADC/SEG19	48	P3.6/$\overline{\text{RST}}$

Table 2-1 Pin Assignment for N76E616AT20

2.4 NuTiny-SDK- N76E616 PCB Placement

User can refer to Figure 2-2 for the NuTiny-SDK-N76E616 PCB placements.

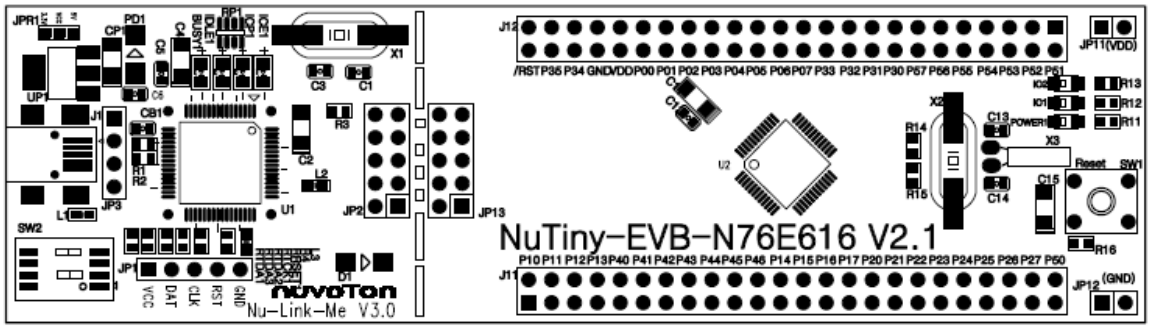


Figure 2-2 NuTiny-SDK-N76E616 PCB Placement

3 HOW TO START NUTINY-SDK-N76E616 ON THE KEIL C-51 µVISION® IDE

3.1 Downloading and Installing Keil C-51 µVision® IDE Software

Please connect to the Keil company website (http://www.keil.com) to download the Keil C-51 µVision® IDE and install the RVMDK.

3.2 Downloading and Installing Nuvoton Nu-Link Driver

Please connect to Nuvoton 8bit 8051 MCUs website (http://www.nuvoton.com/8bit-8051-mcus) to download the "*Nuvoton 8051 Keil uVision Driver*" file. Please refer to section 5.1 for the detailed download flow. After the Nu-Link driver is downloaded, please unzip the file and execute the "*Nuvoton_8051_Keil_uVision_Driver_v1.08.zip*" to install the driver.

3.3 Hardware Setup

The hardware setup is shown as Figure 3-1

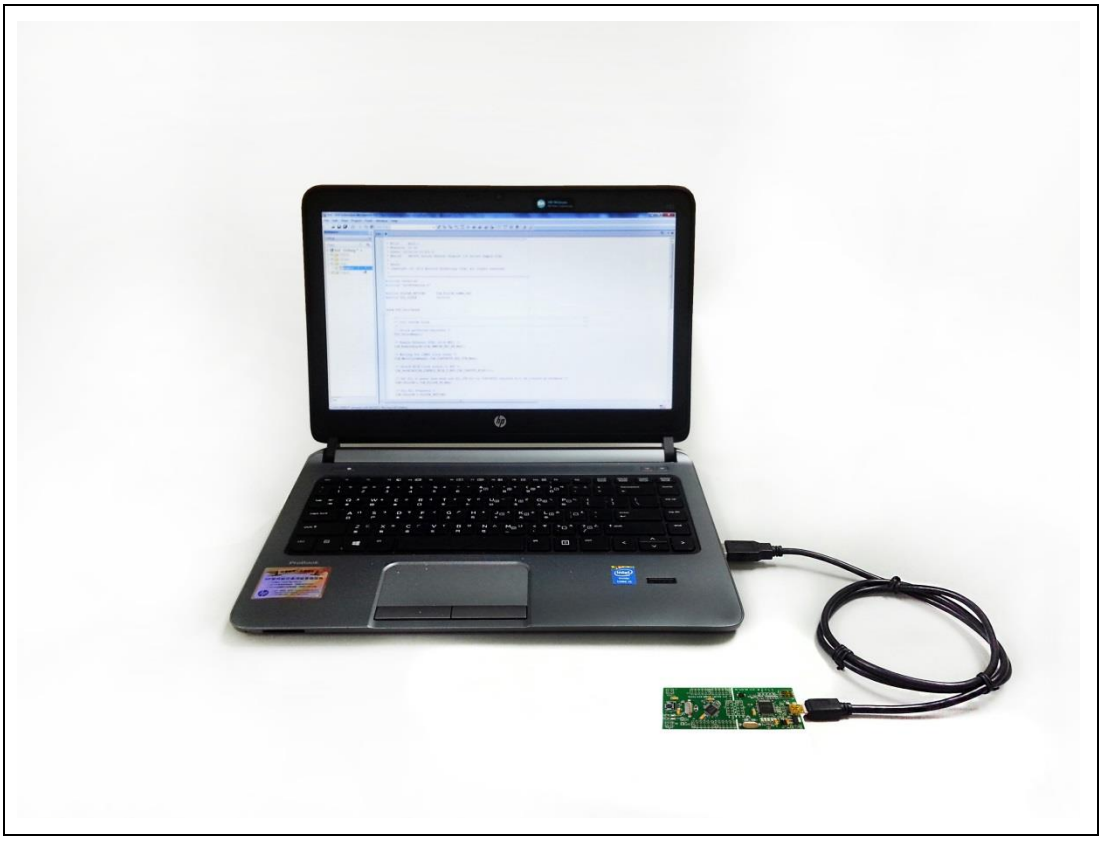


Figure 3-1 NuTiny-SDK-N76E616 Hardware Setup

3.4 Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-SDK-N76E616 board. It can be found on Figure 3-2 list directory and downloaded from Nuvoton 8bit 8051 MCUs website.

The example file can be found in the directory list shown in Figure 3-2.

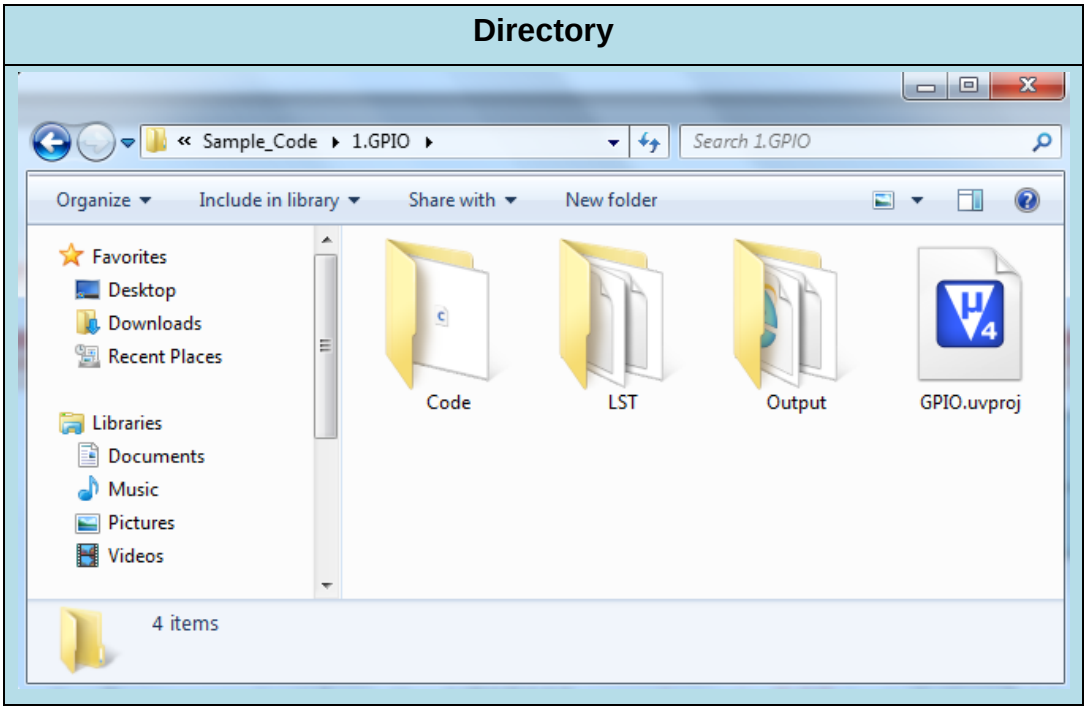


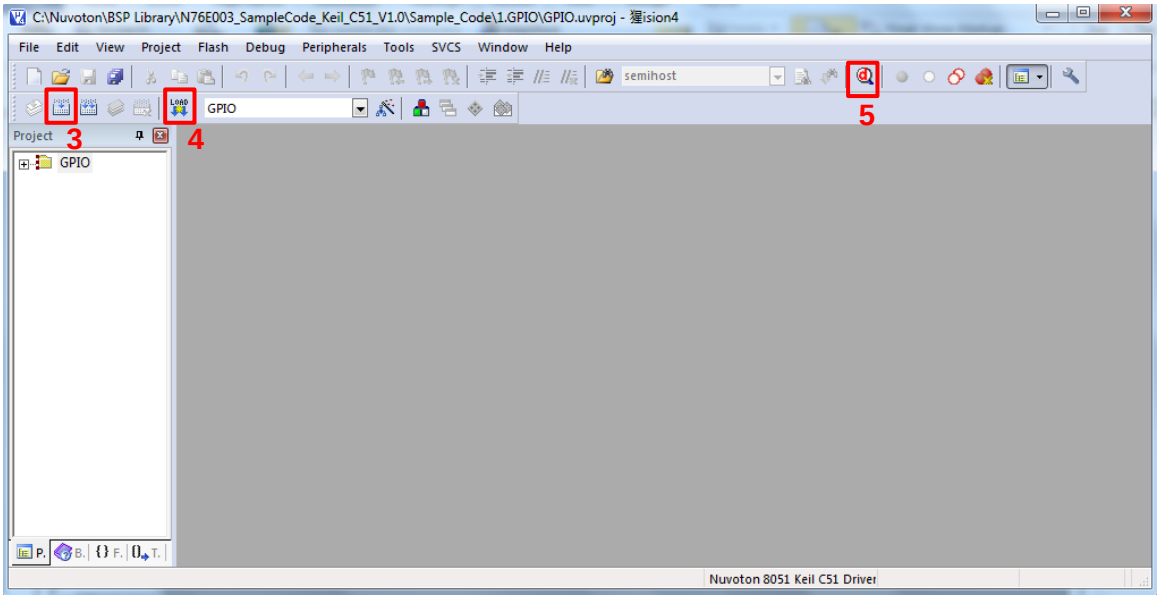
Figure 3-2 Example Directory

To use this example:

1. Open a project from the N76E616 sample code installation folder (default as C:\Nuvoton) using the following path：

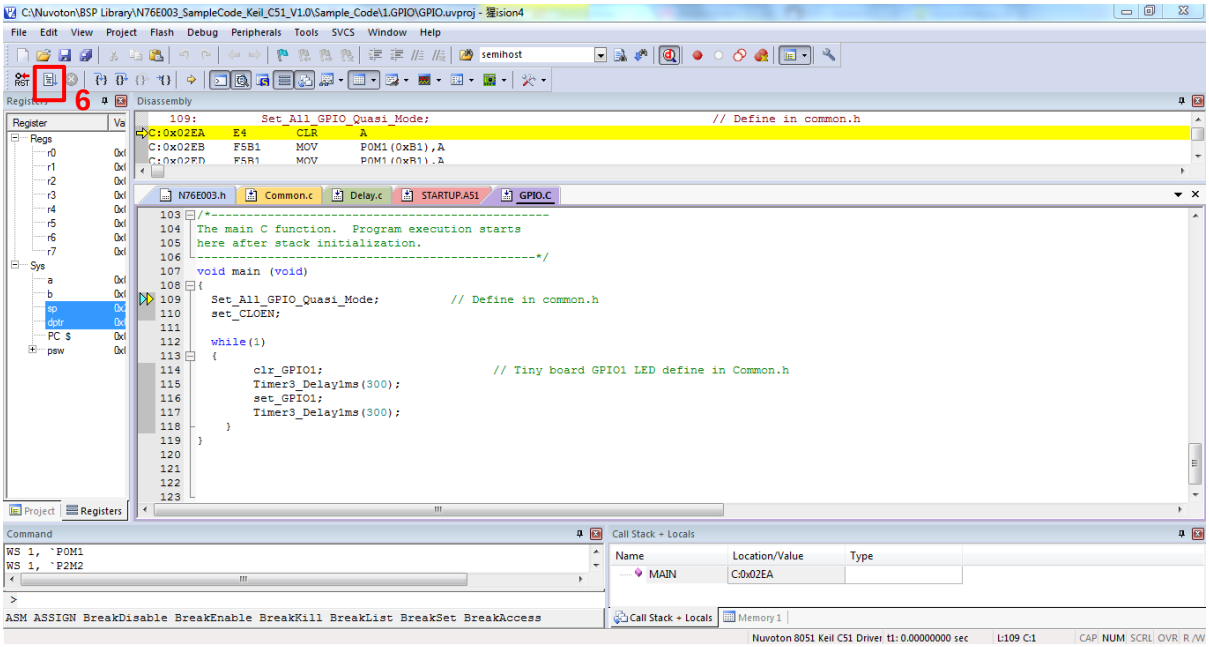
   \N76E616_SampleCode_Keil_C51_V1.0\Sample_Code\1.GPIO

2. Execute “**GPIO.uvproj**”



Enter compile mode interface

3.  Compiler
4.  Download the program code to Flash
5.  Enter / Exit Debug mode

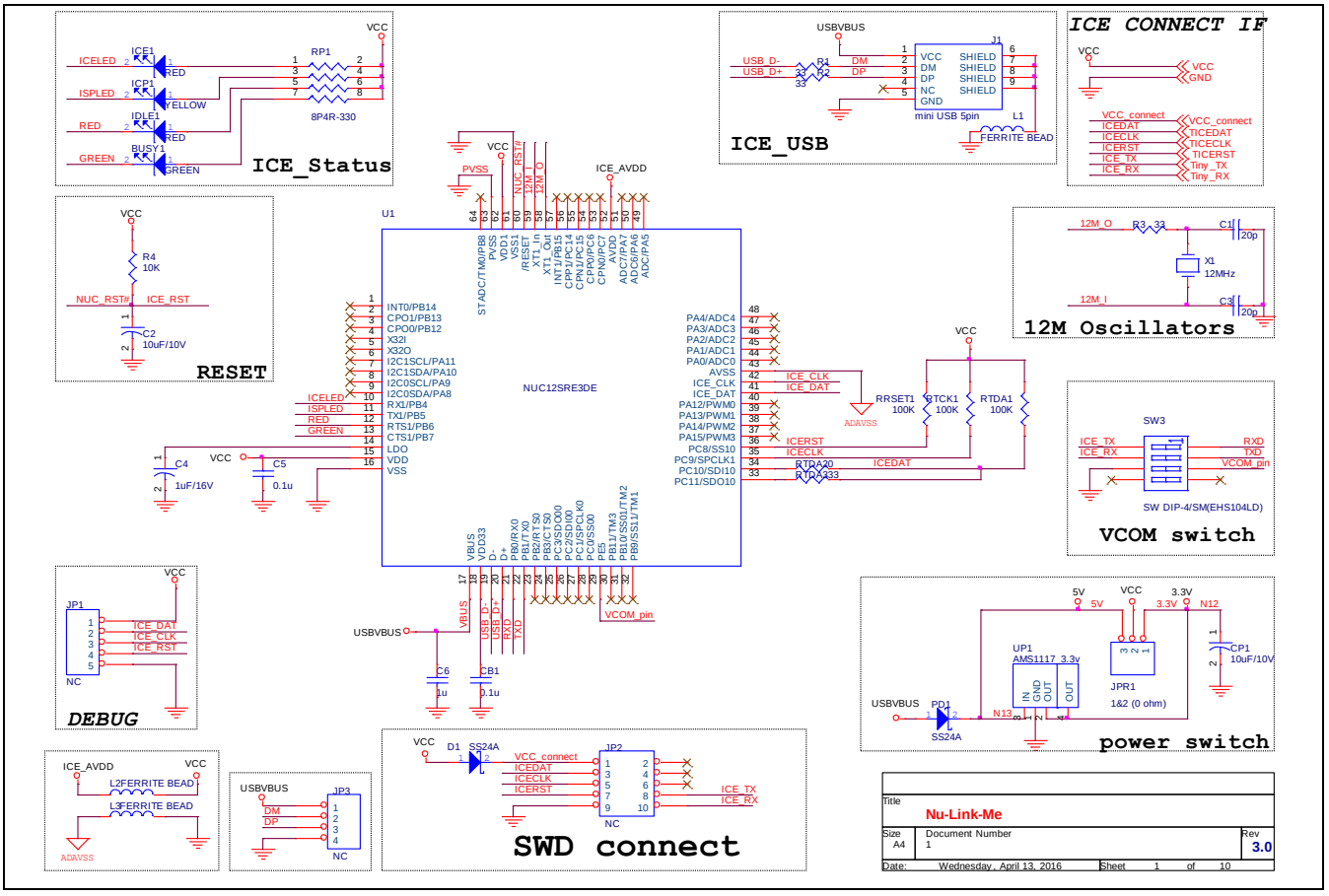


Enter Debug mode interface

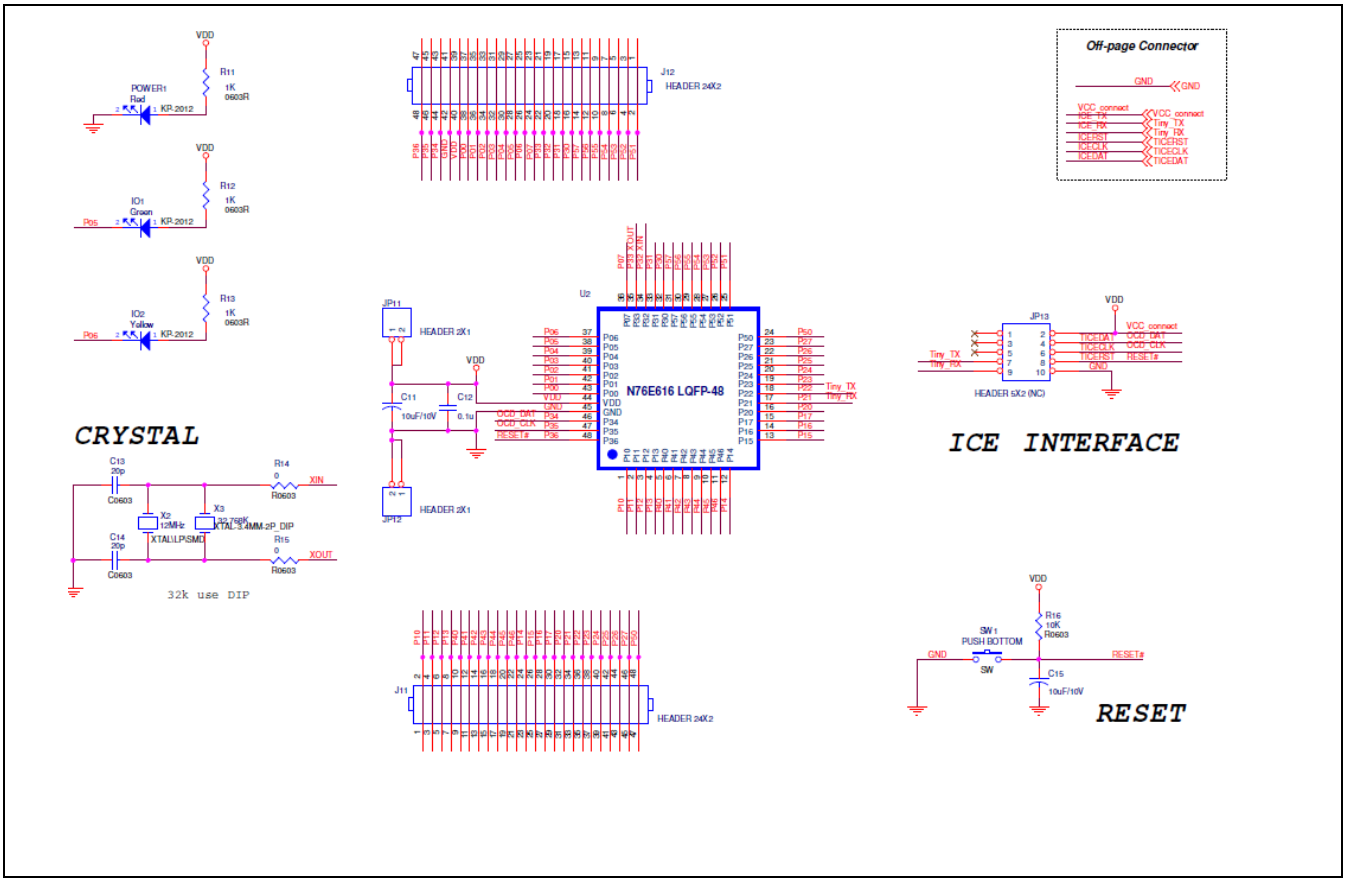
6.  Execute the program
7. The I/O LED on the NuTiny-EVB-N76E616 board will be toggled on.

4 NUTINY-EVB-N76E616 SCHEMATIC

4.1 Nu-Link-Me Schematic

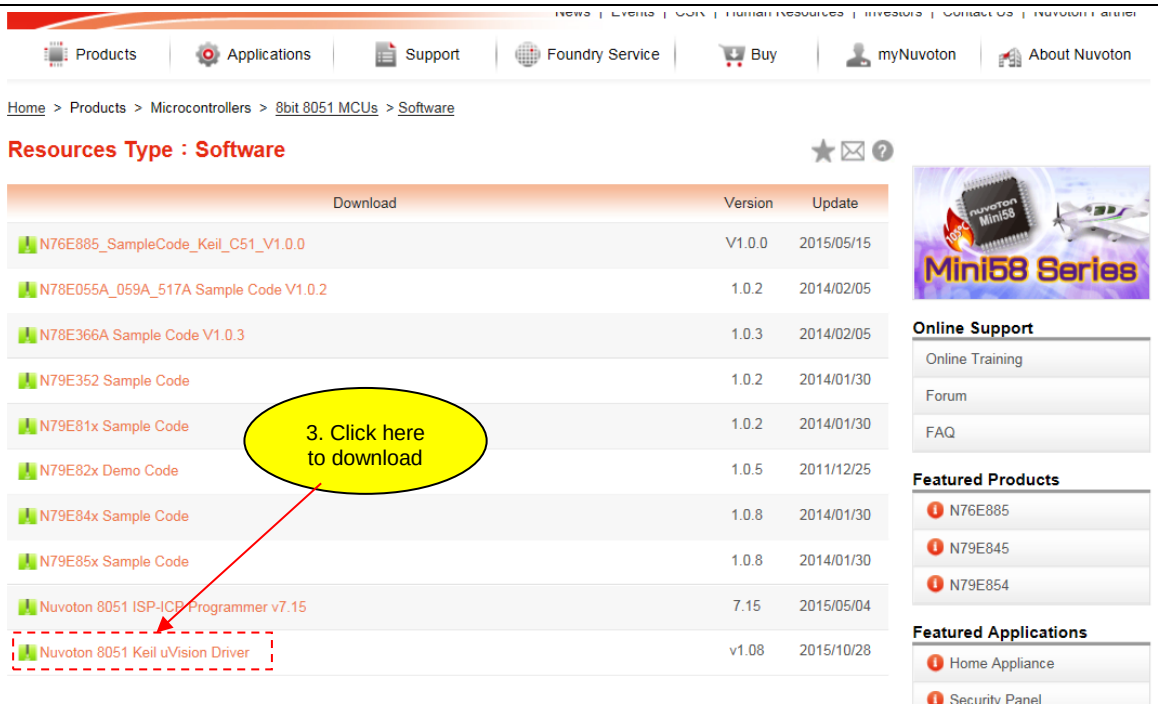


4.2 NuTiny-SDK-N76E616 Schematic



5 DOWNLOADING NUVOTON 8BIT 8051 MCUS RELATED FILES FROM NUVOTON WEBSITE

5.1 Downloading Nuvoton Keil C-51 µVision® IDE Driver

Step1	Visit the Nuvoton 8bit 8051 MCUs website: **http://www.nuvoton.com/8bit-8051-mcus**
Step2	
Step3	
Step4	Download the Nuvoton_8051_Keil_uVision_Driver_v1.08

5.2 Downloading Nuvoton 8bit 8051 MCUs N76E616 Series Sample Code

Step1	Visit the Nuvoton 8bit 8051 MCUs website: http://www.nuvoton.com/8bit-8051-mcus
Step2	
Step3	Download the N76E616_SampleCode_Keil_C51_V1.0

6 REVISION HISTORY

Date	Revision	Description
2017.04.9	1.00	1. Preliminary version.

Important Notice

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