1T 8051

8-bit Microcontroller

Nuvoton 1T 8051-based Microcontroller NuTiny-SDK-N76E885 User Manual

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NUTINY-SDK-N76E885 USER MANUAL

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1 OVERVIEW

NuTiny-SDK-N76E885 is the specific development tool for 8-bit high performance 1T 8051-based microcontroller N76E885 series. User can use NuTiny-SDK-N76E885 to develop and verify the application program easily.

NuTiny-SDK-N76E885 includes two portions. One is NuTiny-EVB-N76E885 and the other is Nu-Link-Me. NuTiny-EVB-N76E885 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 N76E885 series is function compatible with the N76E616 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 N76E885 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 N76E885 benefits to meet a general purpose, home appliances, or motor control system accomplishment.

The N76E885 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 N76E885 series, the embedded program flash size is up to 18 Kbytes, SRAM is 256 bytes, and 256 Bytes of auxiliary RAM (XRAM). The N76E885 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 N76E885 series has many high-performance peripheral functions, such as 22.1184 MHz high-speed internal RC oscillator (trimmed to ±1% when VDD 5.0V, ±2% in all conditions), Up to 25 general purpose I/O pins and one input-only pin, 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 N76E885 series to reduce component count, board space and system cost.

Additionally, the N76E885 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 N76E885 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-N76E885 INTRODUCTION

NuTiny-SDK-N76E885 uses the N76E885AT28 as the target microcontroller. Figure 2-1 is NuTiny-SDK-N76E885 for the N76E885 series, the left portion is called NuTiny-EVB-N76E885 and the right portion is Debug Adaptor called Nu-Link-Me.

NuTiny-EVB-N76E885 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 N76E885 series features. The NuTiny-EVB-N76E885 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 N76E885AT28 UART0.
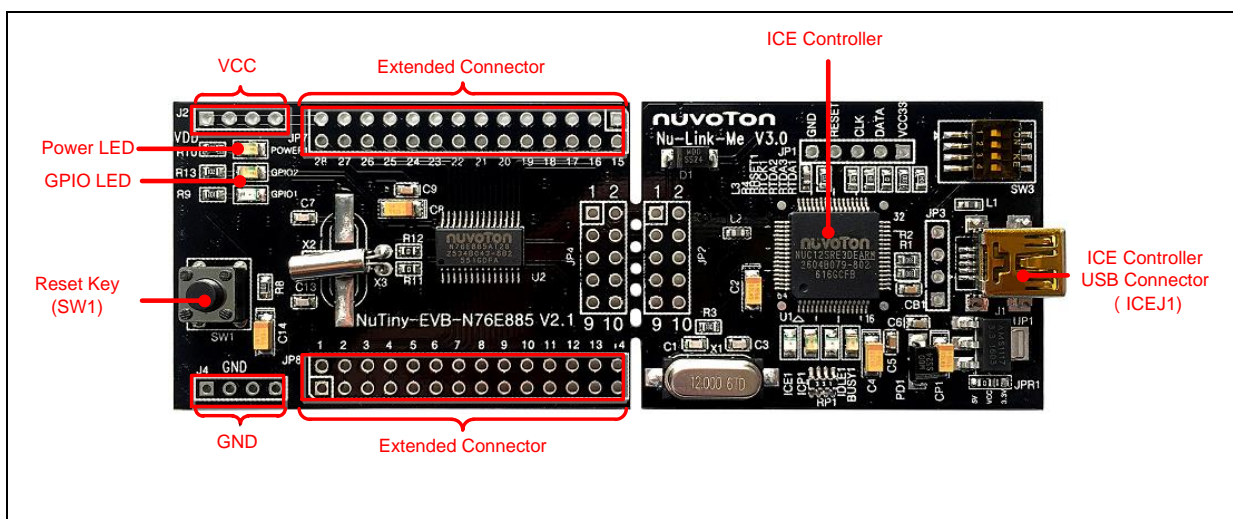

Figure 2-1 NuTiny-SDK-N76E885 (PCB Board)

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 N76E885AT28 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-N76E885 Power Setting and Connector

2.2.1 Power Setting

- J1: USB port in Nu-Link-Me
- JPR1: VCC33 or VCC5 Voltage connector in NuTiny-EVB-N76E885

Model	JPR1	J1USB port	JP7 & JP9 VCC33	MCU Voltage
Model 1	**Select VCC33 (default) orVCC5**	**Connect to PC**	**DC 3.3V output**	**DC 3.3V**
Model 2	**X**	**X**	**DC 2.4 V ~ 5.5 V Input**	**Voltage by JP7 & JP9 input**

2.2.2 Debug Connector

● JP4: Connector in target board (NuTiny-EVB-N76E885) for connecting with Nuvoton ICE adaptor (Nu-Link-Me)
● JP7: Connector in ICE adaptor (Nu-Link-Me) for connecting with a target board (for example NuTiny-EVB-N76E885)

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

● JP7 and JP8: Show all chip pins in NuTiny-EVB-N76E885

2.2.5 Reset Button

● SW1: Reset button in NuTiny-EVB-N76E885

2.2.6 Power Connector

● J2: VCC connector in NuTiny-EVB-N76E885
● J4: GND connector in NuTiny-EVB-N76E885

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-N76E885 provides N76E885AT28 on board and the extended connector for TSSOP-20 pin. Table 2-1 is the pin assignment for N76E885AT28.

Pin No	Pin Function	Pin No	Pin Function
01	GND	15	P3.4
02	P1.0/X$_{IN}$/PWM0	16	P3.5
03	P1.1/X$_{OUT}$/PWM1	17	P3.6
04	P1.2/$\overline{RST}$	18	P3.7
05	P2.0/AIN9/IC0/T0/RXD	19	P2.6/AIN8/PWM7/CLO
06	P2.1/IC1/T1/MOSI	20	P0.7/AIN7/PWM6
07	P2.2/IC2/MISO	21	P0.6/AIN6/PWM5/SCL
08	P2.3/SDA/FB/STADC	22	P0.5/AIN5/PWM4/SPCLK
09	P2.4/RXD_1	23	P0.4/AIN4/$\overline{SS}$
10	P2.5/TXD_1	24	P0.3/AIN3/PWM3/TXD
11	P3.0	25	P0.2/AIN2/PWM2
12	P3.1	26	P0.1/AIN1/$\overline{INT1}$/ICPCK/OCDCK
13	P3.2	27	P0.0/AIN0/VREF/$\overline{INT0}$/ICPDA/OCDDA
14	P3.3	28	VDD

Table 2-1 Pin Assignment for N76E885AT28

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3   HOW TO START NUTINY-SDK-N76E885 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 "*Nu-Link_Keil_Driver*" file. Please refer to section 5.1 for the detailed download flow. After the Nu-Link driver is downloaded, please unzip the file for example execute the "*Nu-Link_Keil_Driver 2.03.6674*" to install the driver.

3.3   Hardware Setup

The hardware setup is shown as Figure 3-1
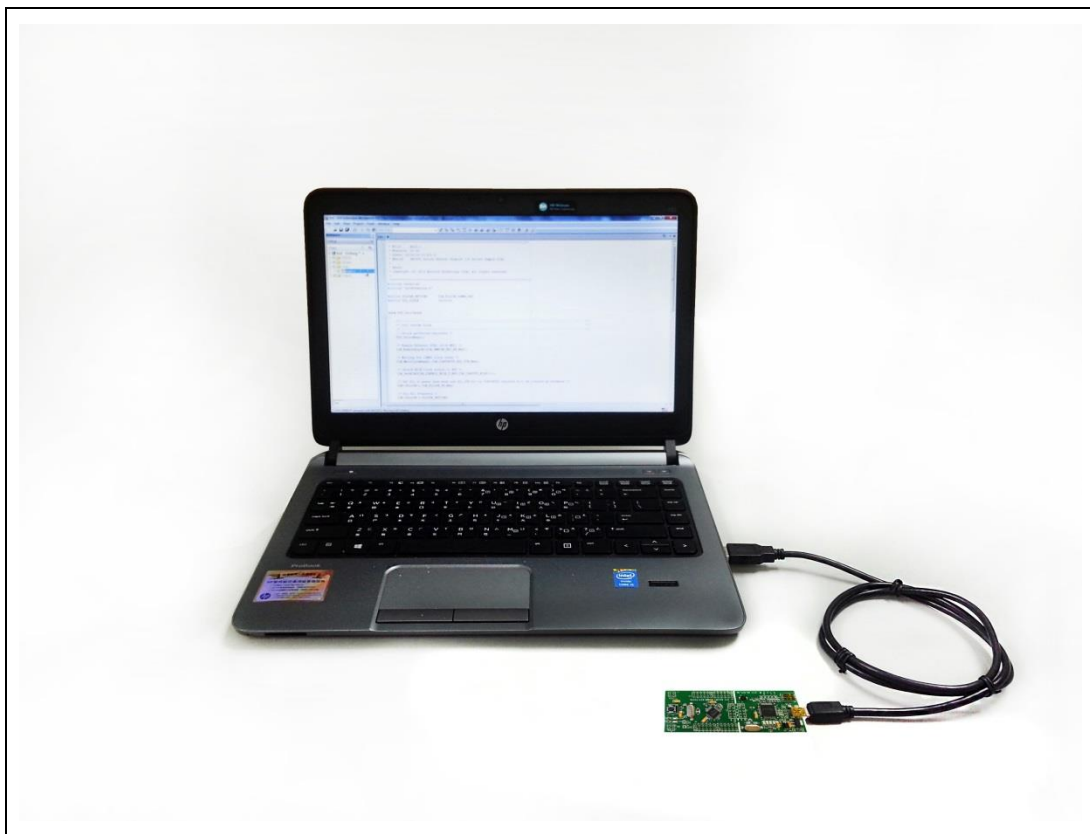
Figure 3-1 NuTiny-SDK-N76E885 Hardware Setup

3.4   Example Program

This example demonstrates the ease of downloading and debugging an application on a NuTiny-SDK-N76E885 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.
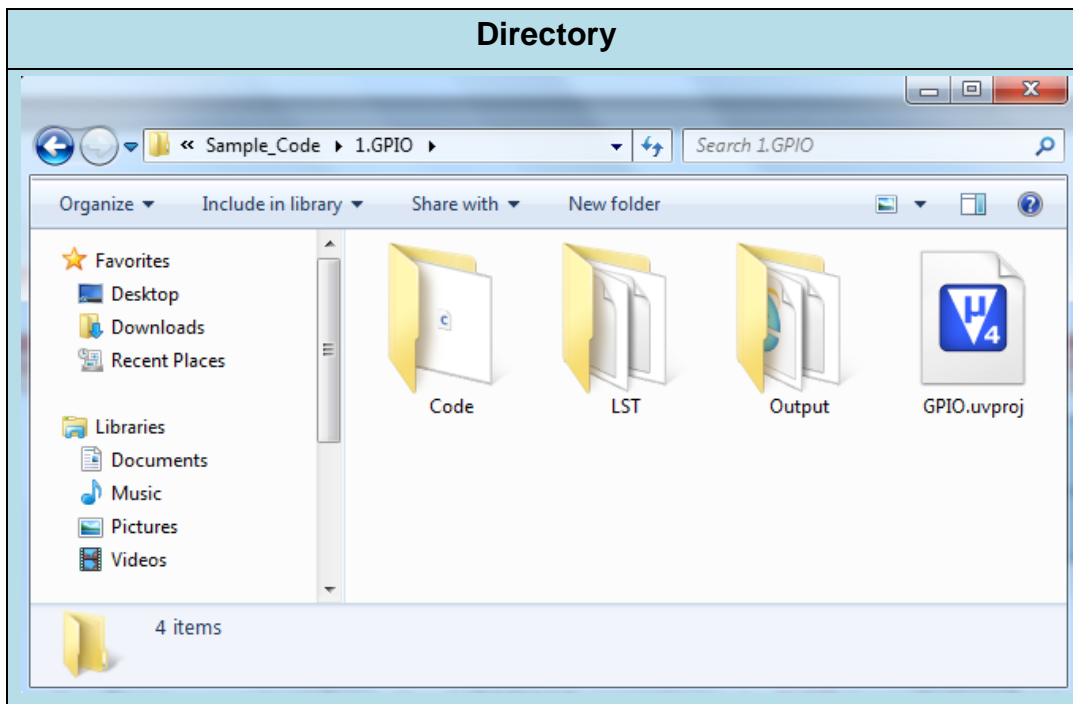
Figure 3-2 Example Directory

To use this example:

1. Open a project from the N76E885 sample code installation folder (default as C:\Nuvoton) using the following path：

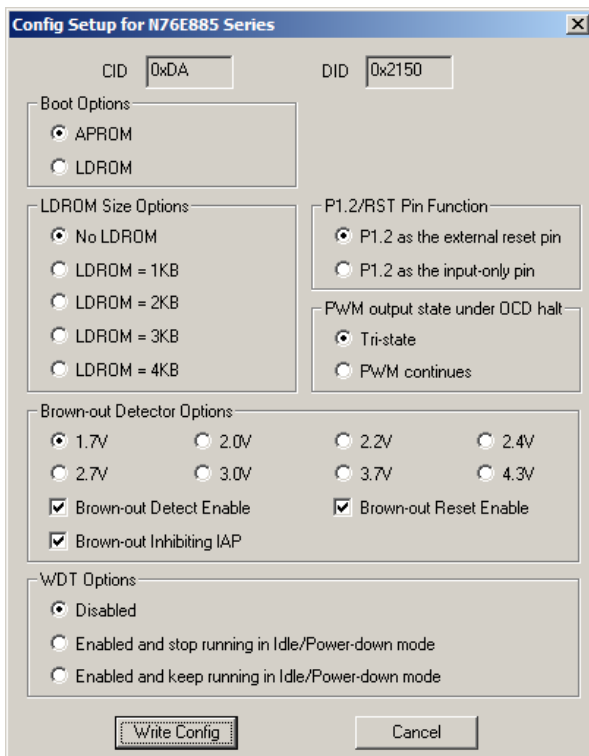   \N76E885_SampleCode_Keil_C51_V1.0\Sample_Code\1.GPIO

2. Execute "**GPIO.uvproj**"
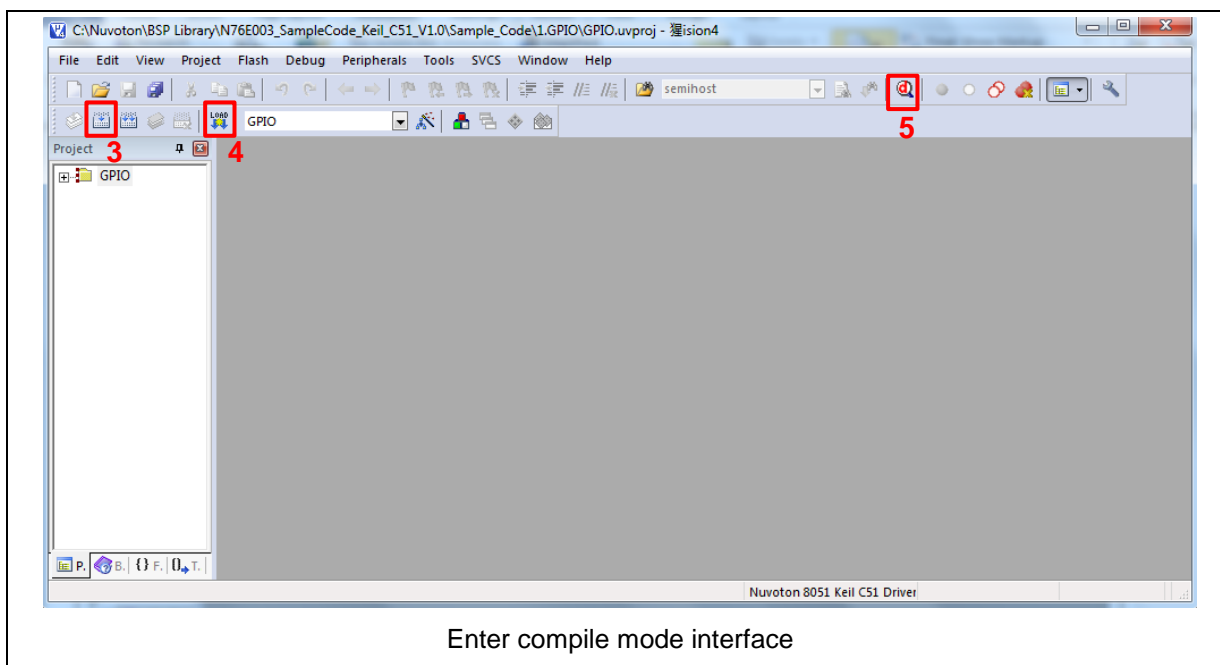
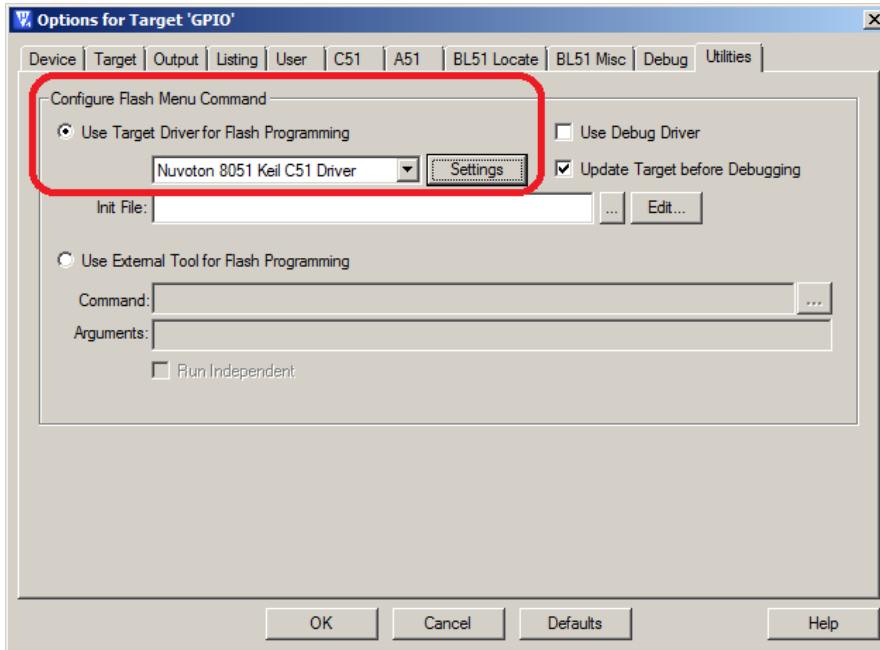Enter compile mode interface

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3. Compiler

4. Define Debug Tool as "Nuvoton 8051 Keil C51 Driver
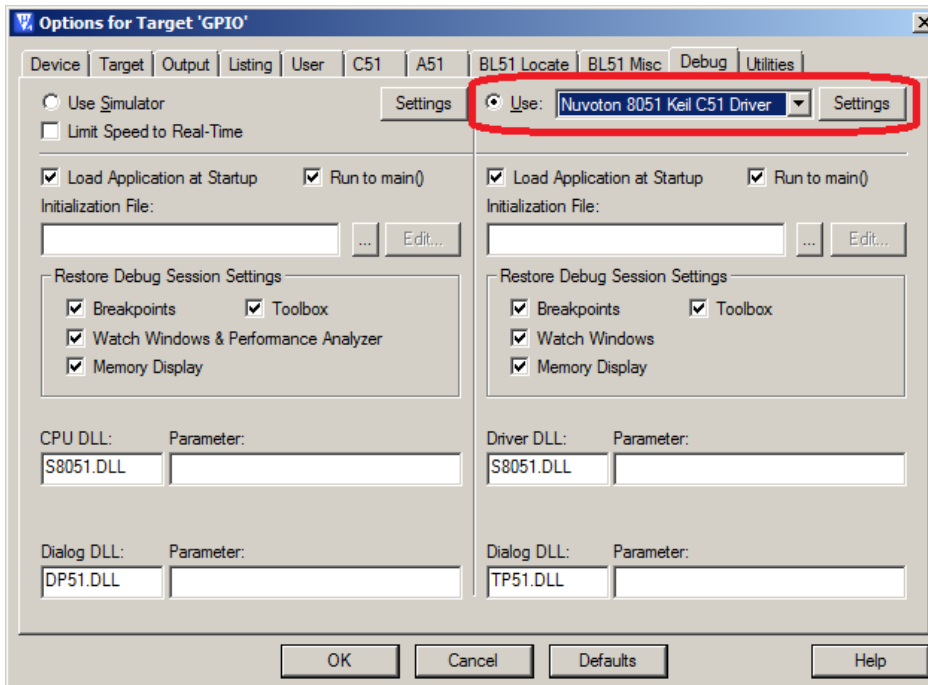
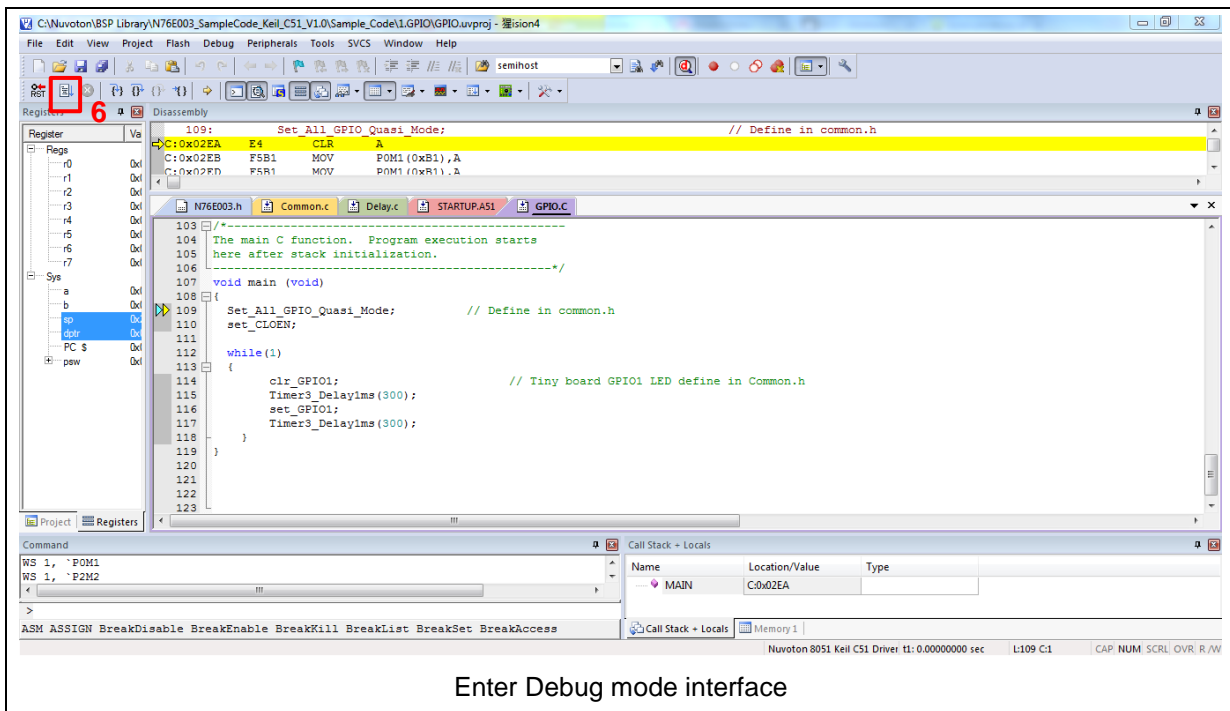Press "Setting" buttom to confirm the connect is correct as show following window for example:

5. Define Flash programming Tool as " Nuvoton 8051 Keil C51 Driver"

6. Download the program code to Flash

7. Enter / Exit Debug mode
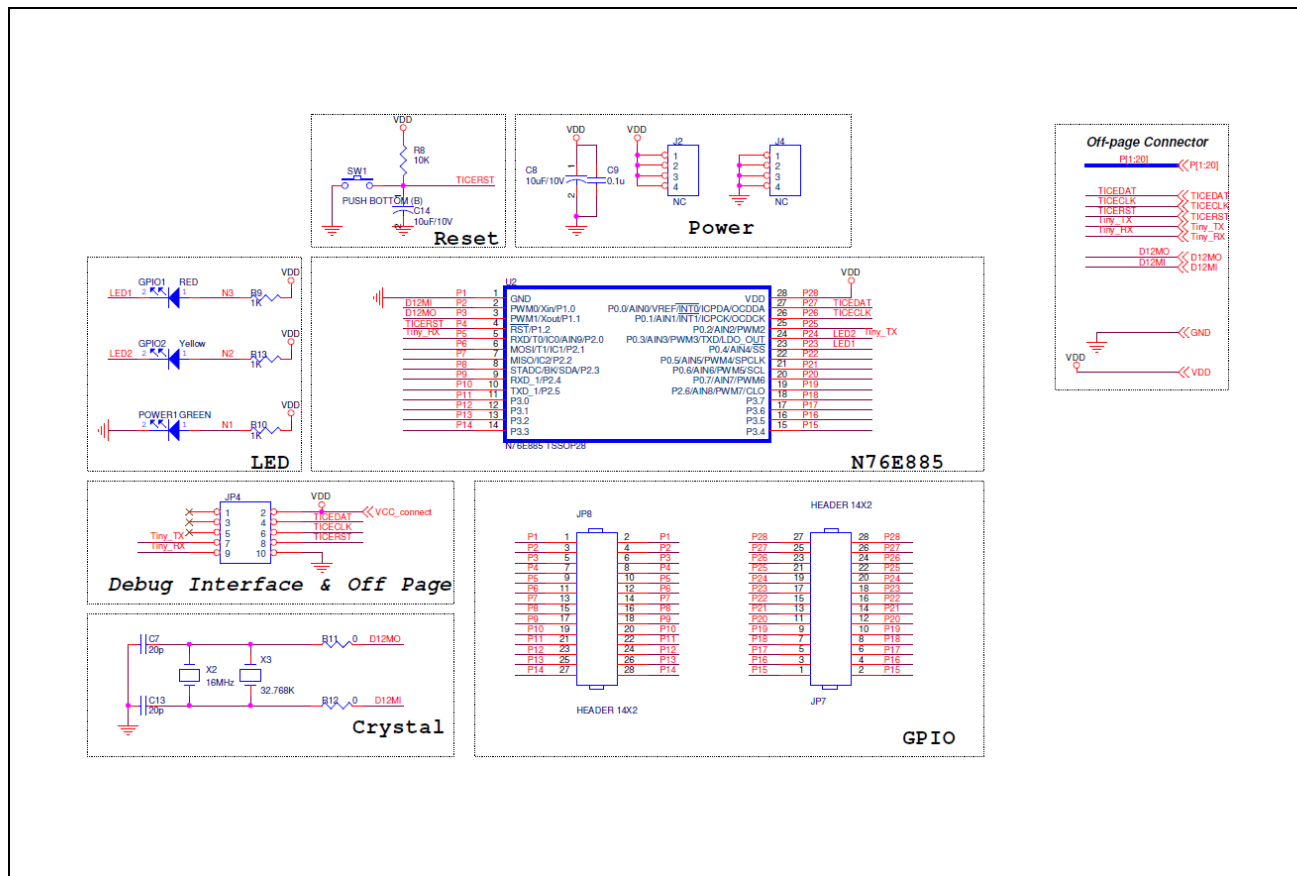

Enter Debug mode interface

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8.   Execute the program

9. The I/O LED on the NuTiny-EVB-N76E885 board will be toggled on.

4 NUTINY-EVB-N76E885 SCHEMATIC

4.1 Nu-Link-Me Schematic
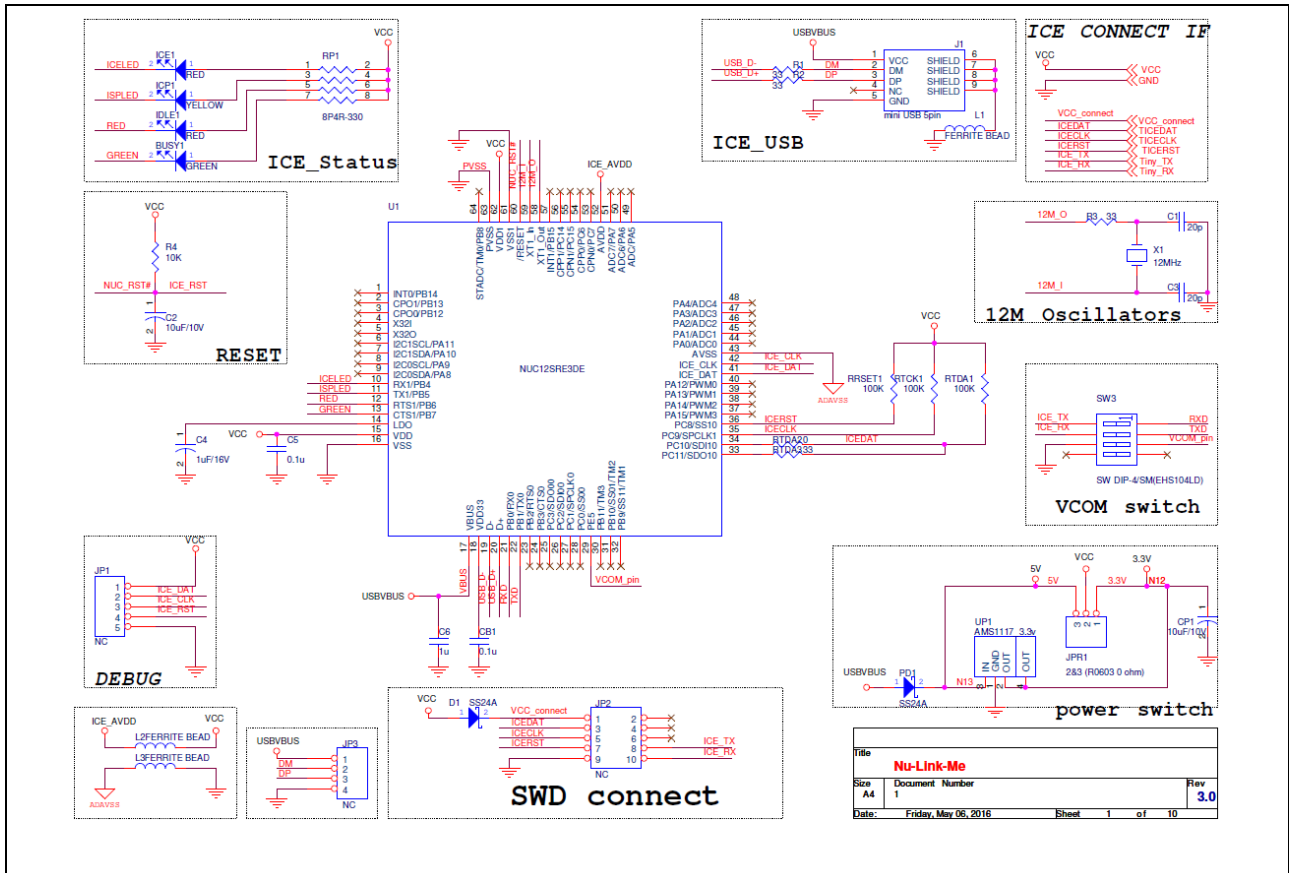
4.2 NuTiny-SDK-N76E885 Schematic

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 N76E885 Series Sample Code

Step1	Visit the Nuvoton 8bit 8051 MCUs website: http://www.nuvoton.com/8bit-8051-mcus
Step2	
Step3	Download the N76E885_SampleCode_Keil_C51_V1.0

6   REVISION HISTORY

Date	Revision	Description
2018.01.26	1.00	Initial Release

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