

NK-NUC980 Quick Start Guide

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1 OVERVIEW

This document will provide a quick guide for BSP of Nuvoton NUC980 series chips. Users can realize what the NUC980 Non-OS BSP contains, use the NK-NUC980 quickly and understand the operation process of NuWriter and U-boot.

The NK-NUC980 is a development board based on an ARM® ARM926EJ-S microprocessor NUC980DF61YC which has very rich peripherals to help users easily to design-in their products or application systems.

The NK-NUC980 board uses NUC980DF61YC microprocessor run up to 300 MHz with built-in 64MB DDR2 memory, 16 KB I-cache, 16 KB D-cache and MMU, 16 KB embedded SRAM and 16.5 KB IBR (Internal Boot ROM) for system booting from USB, NAND flash, SD/eMMC and SPI Flash, All functions of the NUC980DF61YC are placed on the board, including peripheral interfaces such as memory (NAND, SPI, eMMC, SD), UART, IIS, Ethernet, USB (device, HOST), CMOS sensor, SIM card, CAN, JTAG and EBI. Users can use it to develop and verify applications to emulate the real behavior.

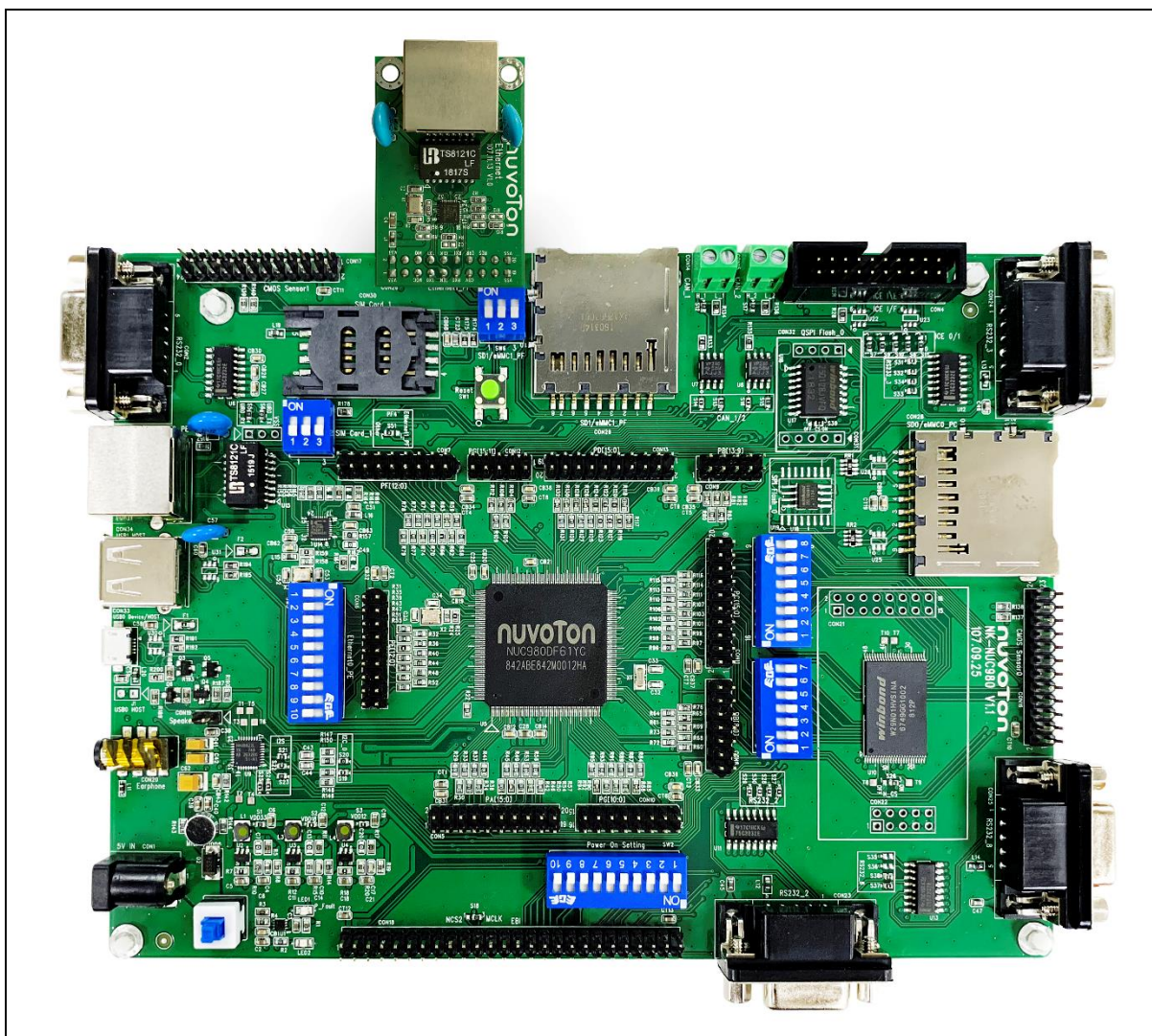


Figure 1-1 NK-NUC980 Board

2 NUC980 NON-OS BSP

This BSP supports Nuvoton NUC980 family processors. The NUC980 series targeted for general purpose 32-bit microprocessor embeds an outstanding CPU core ARM926EJ-S, a RISC processor designed by Advanced RISC Machines Ltd., runs up to 300 MHz, with 16 KB I-cache, 16 KB D-cache and MMU, 16KB embedded SRAM and 16.5 KB IBR (Internal Boot ROM) for booting from USB, NAND and SPI FLASH.

The NUC980 series integrates USB 2.0 HS HOST/Device controller with HS transceiver embedded, I2S I/F controller, SD/eMMC/NAND FLASH controller, PDMA and 8 channels 12-bit ADC controller. It also integrates UART, SPI/MICROWIRE, I2C, LIN, PWM, Timer, WDT/Windowed-WDT, GPIO, Smart Card I/F, 32.768 KHz XTL and RTC (Real Time Clock)

This Non-OS BSP includes following contents:

- NUC980 Non-OS drivers.
- Precompiled U-Boot images for different boot mode.
- Flash programming tool NuWriter, and its Windows driver.
- User manuals.

2.1 BSP directory structure

Non-OS BSP contains four directories. The content of each directory listed in the table below.

Directory Name	Content
BSP	Directory contains Non-OS driver, third party software and sample applications.
Documents	BSP related documents
Loader	Pre-compiled U-Boot image files.
Tools	Tool for programming NAND, SPI, eMMC or download image to DDR. And its Windows driver.

2.2 Non-OS BSP content

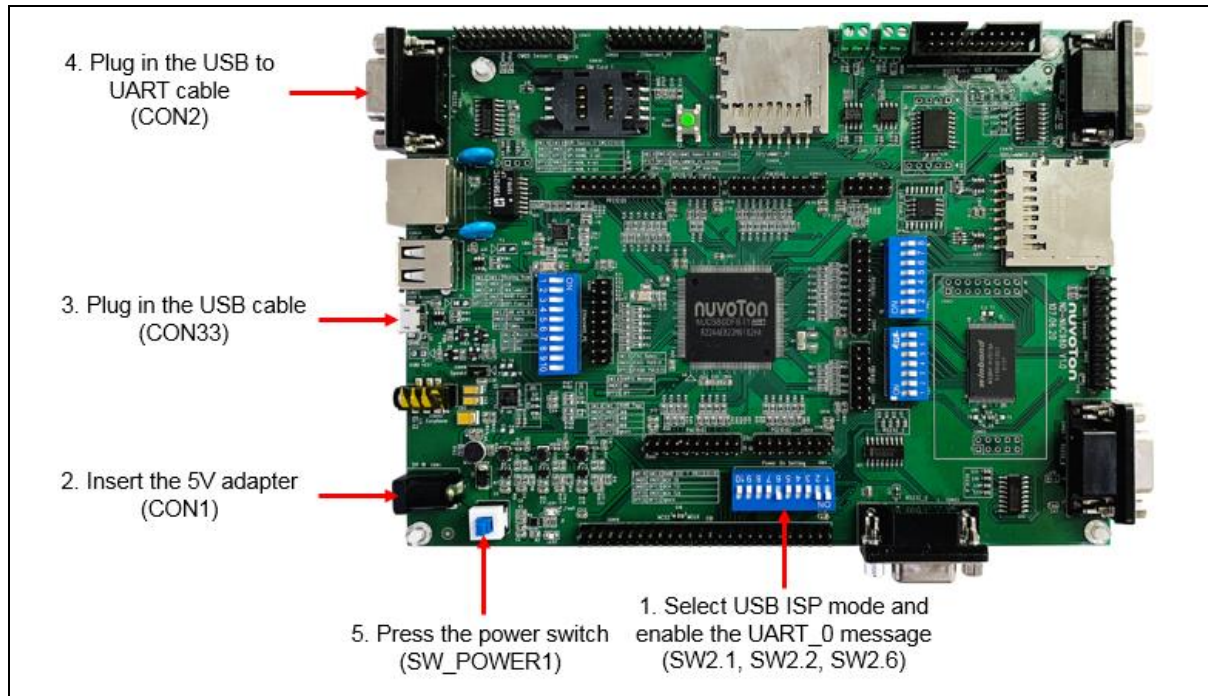
The file under BSP directory shows following content.

Directory Name	Content
Driver	NUC980 peripheral drivers. Please refer to NUC980 Non-OS BSP Driver Reference Guide.chm under Documents directory for the usage of driver APIs.
Library	NUC980 libraries, including USB Host and smartcard.
SampleCode	Driver sample application.
Script	Link script and debug initialization file for Keil.
ThirdParty	Third party software. Including FATFS, yaffs2 file system and LwIP network protocol stack.

For detailed Non-OS BSP develop environment, please refer to “**NUC980 Non-OS BSP User Manual**” in the “Documents” directory.

3 QUICK STARTING TO USE NK-NUC980

This chapter will help users easily to use NK-NUC980 step by step.



1. Select USB ISP mode and enable the UART_0 message

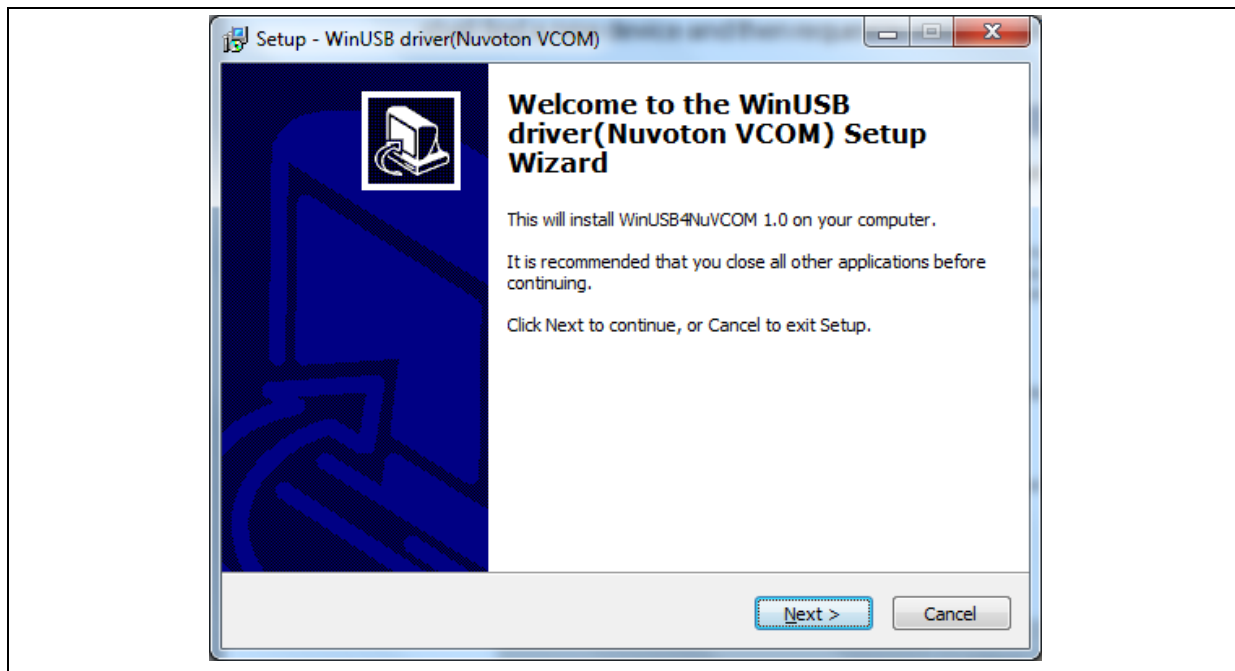
NK-NUC980 provides jumpers (SW2) to select boot-up conditions. Select USB ISP mode and enable the UART_0 message. The statuses of SW2.1, SW2.2, SW2.6 are ON.

2. Insert the 5V adapter (CON1)

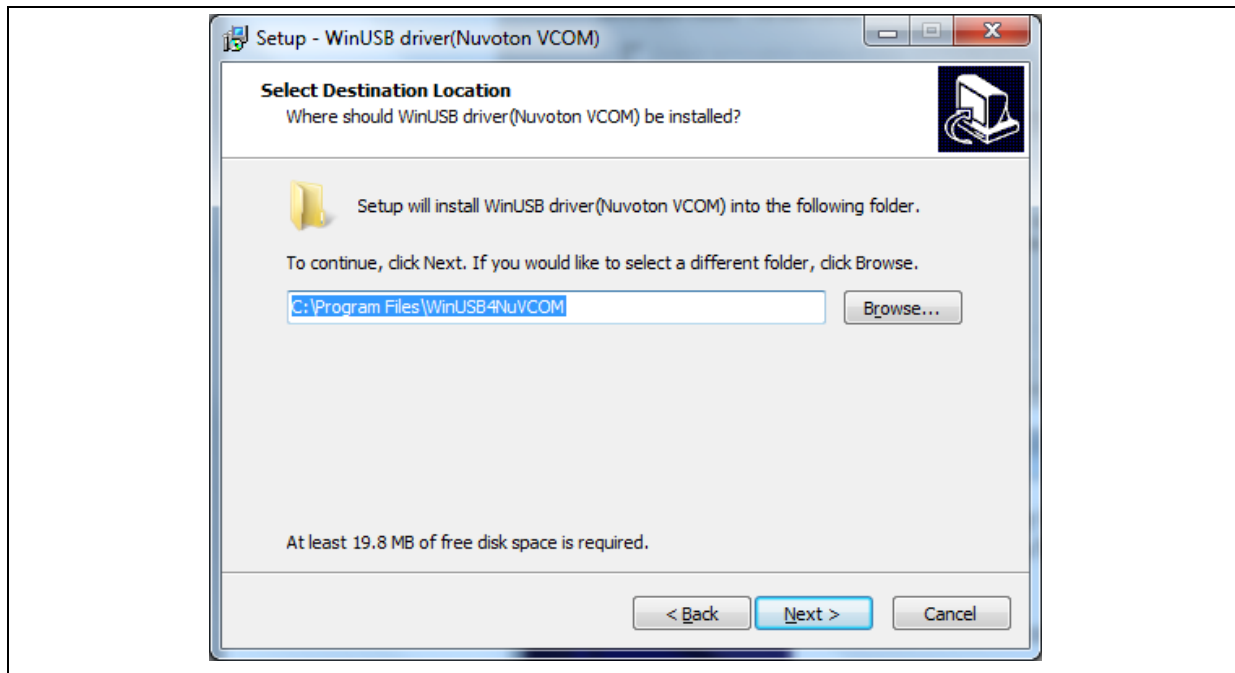
3. Plug in the USB cable (CON33)

The burning tool requires a NuWriter driver to be installed on PC first. Please follow the steps below to install the driver.

Run the “WinUSB4NuVCOM.exe” before the USB cable is plugged in. The “WinUSB4NuVCOM.exe” can be found in the “Tool” directory. Power on the NUC980 Series MPU EVB and plug the USB cable into PC, the Windows shall find a new device and then request to install its driver.

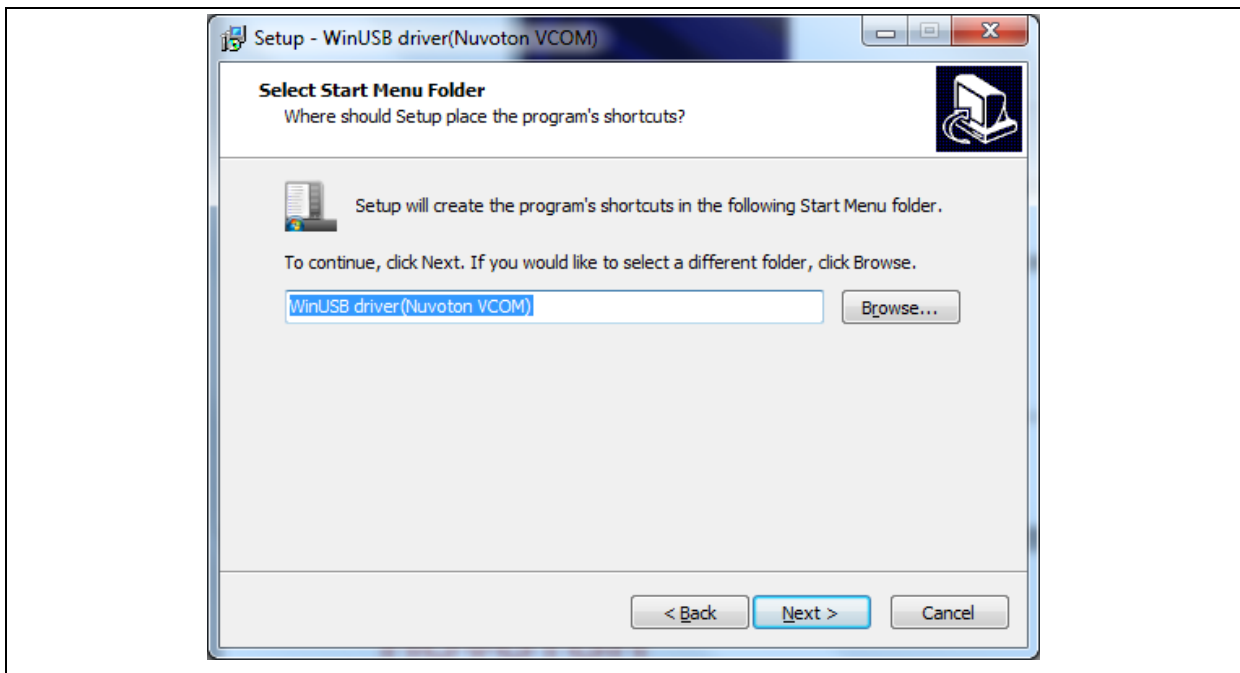


Click **"Next"**. The software installation will ask you how to install the driver.

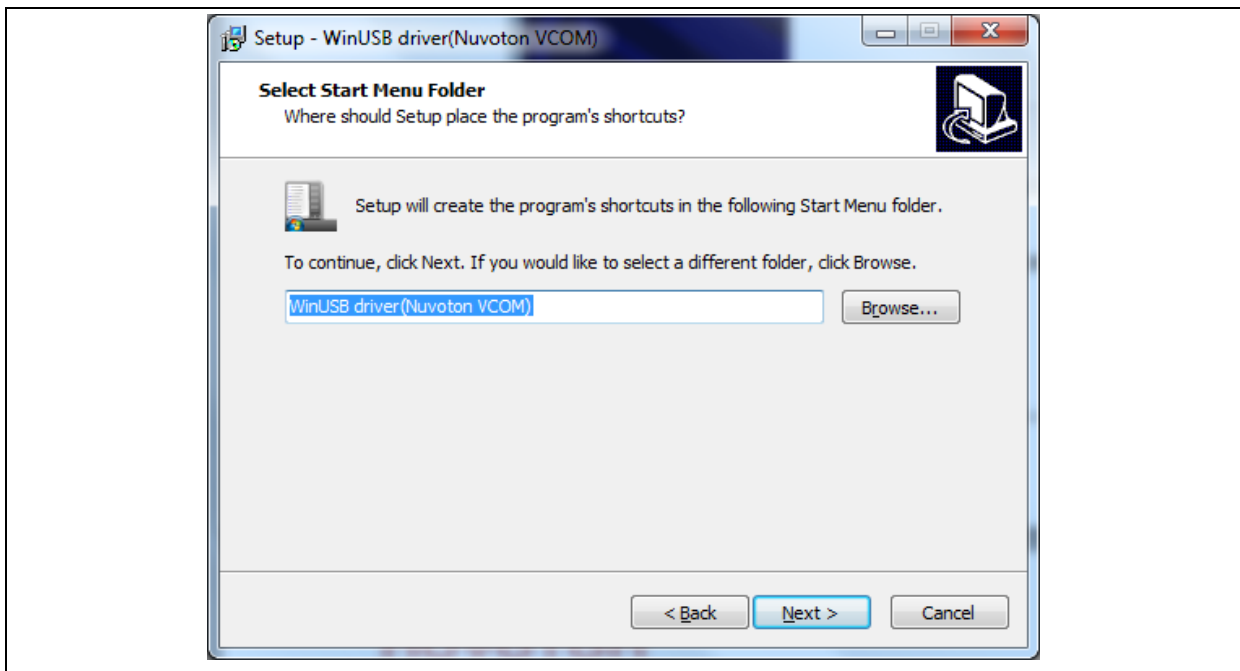


Select "setup path" to specific location (Advanced), and then click **"Next"**. The installation software will ask you the option.

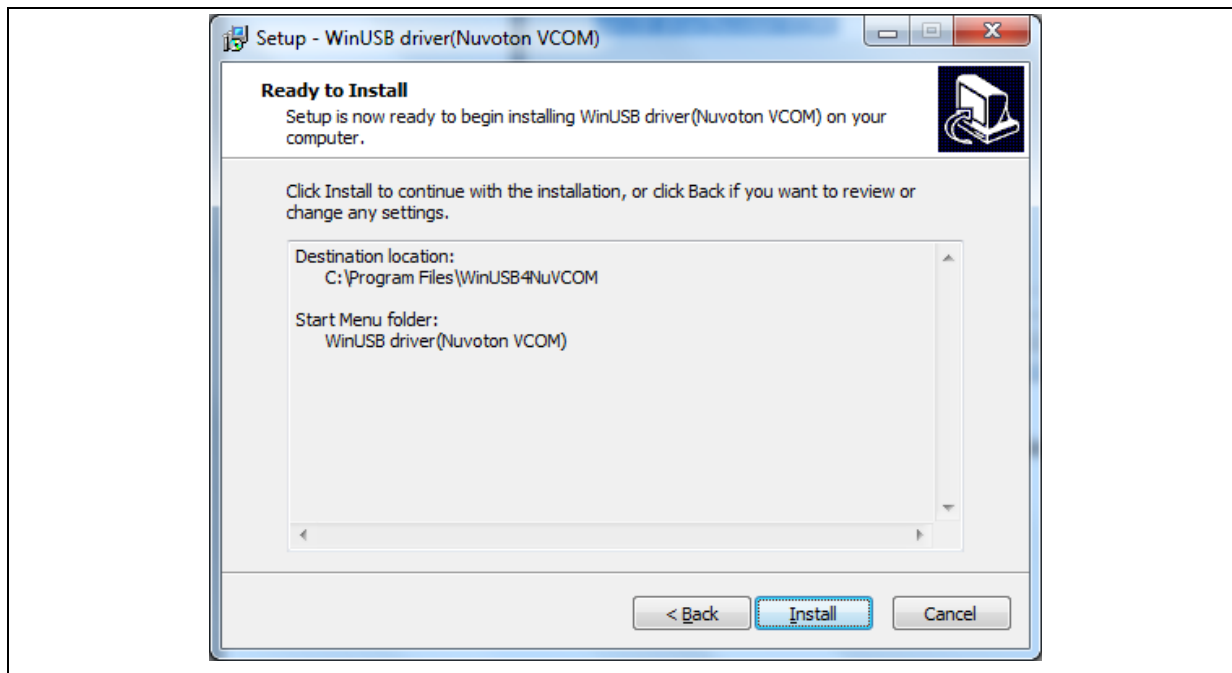
Click **"Next"**. As follows.



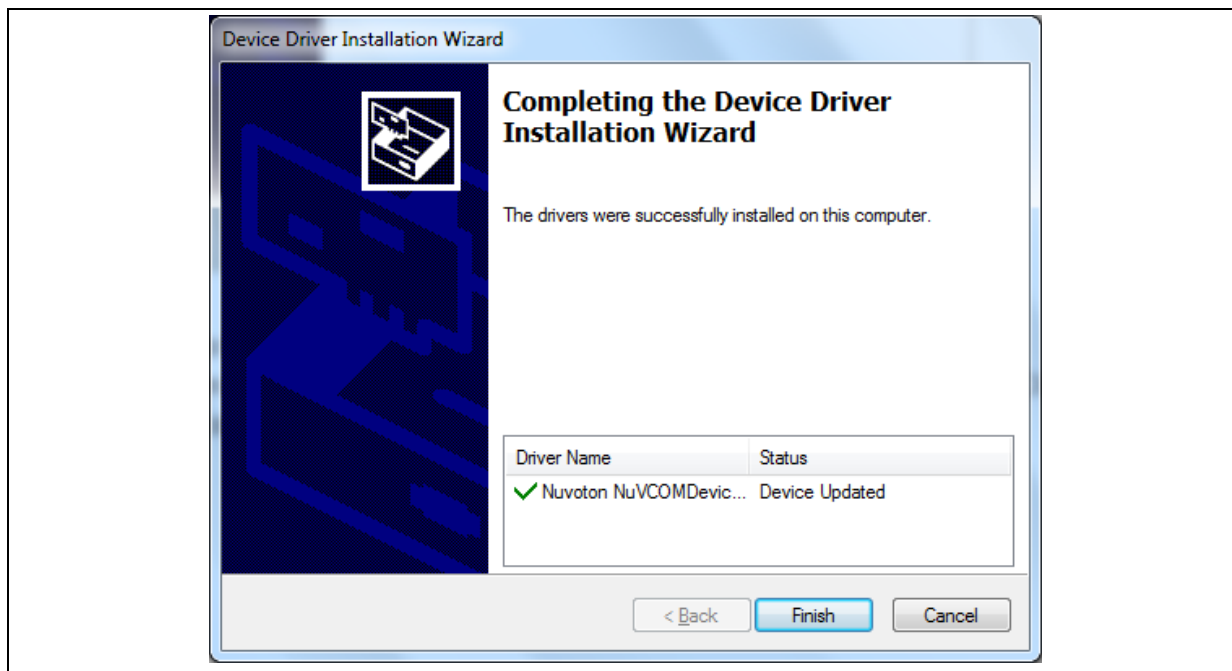
Click **"Next"**. As follows.



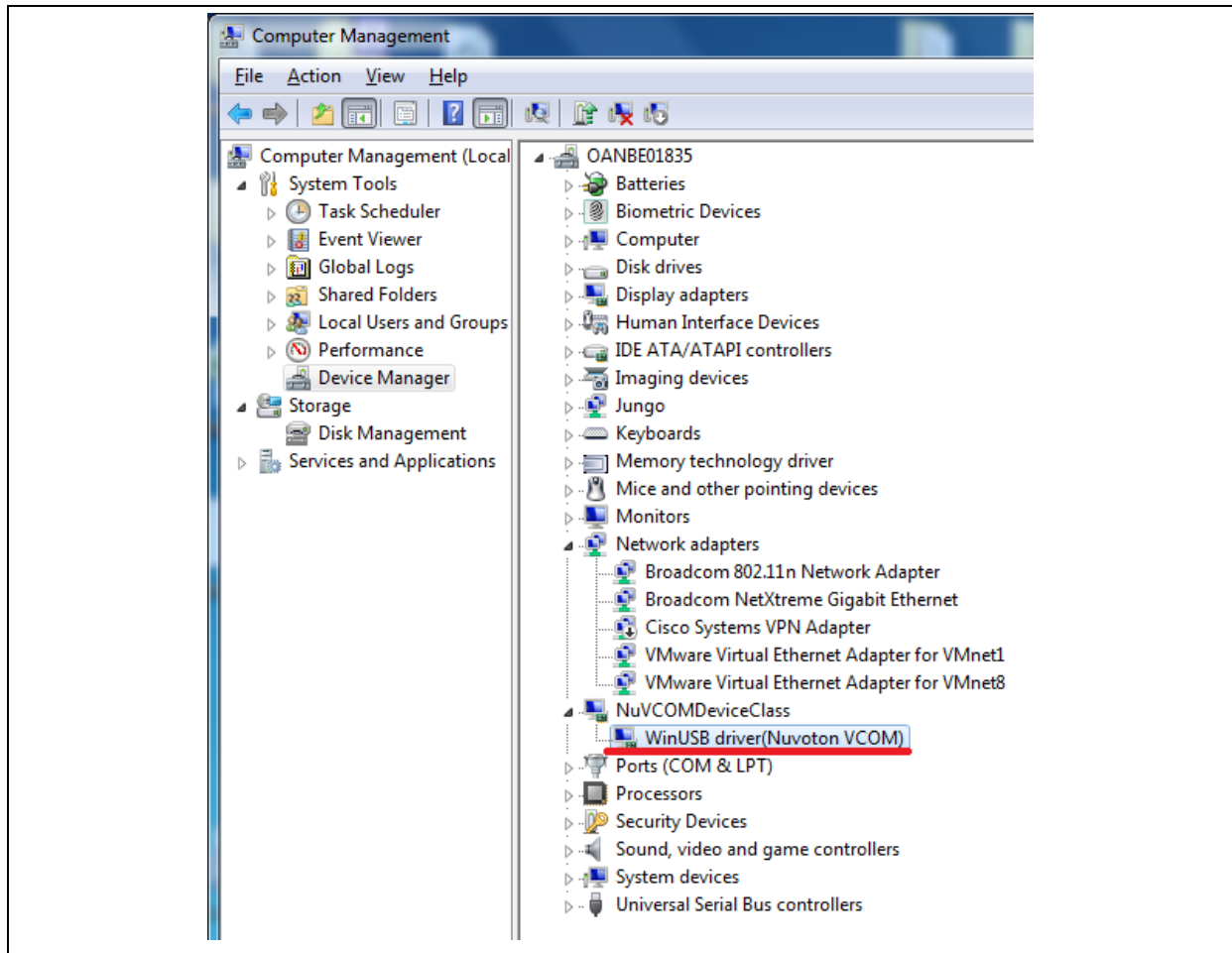
Click **"Install"**. As follows.



Click **"Finish"** to finish install driver. As follows.



If the installation is successful, a virtual COM port named **"WinUSB driver (Nuvoton VCOM)"** can be found by using "Device Manager" to check the ports devices.



4. Plug in the USB to UART cable (CON2)

Connect the RS232_0 DB9 female port (CON2) to the PC via USB to UART cable.

The PC will recognize the board as a USB composite device.

The USB serial port function is used to print some messages on PC API, such as SecureCRT, through the standard UART protocol to help user to debug program.

5. Press the power switch (SW_POWER1)

Open the Serial Port Terminal and Reset chip

After pressing the reset button (SW1), the chip will reprogram application and print out debug message on the terminal.

For detailed NK-NUC980 board introduction, please refer to “**NK-NUC980 User Manual**” in the “Documents” directory.

4 NUWRITER TOOL FOR NON-OS

NuWriter can download images to NAND flash, SPI flash, eMMC/SD, or DDR/SRAM while NUC980 is in USB ISP mode. This chapter will guide users to use this tool quickly and do the following four system boot-up conditions:

1. Boot from eMMC/SD device
2. Boot from SPI FLASH device
3. Boot from NAND-type Flash ROM device
4. USB ISP mode.

The NUC980 Series MPU EVB provides jumpers to select boot-up conditions. To select USB ISP mode, the statuses of SW2.1 and SW2.2 are ON. Other boot selects can refer to the following table:

Power-on setting	SW2.2	SW2.1
USB ISP	ON	ON
Boot from eMMC/SD	ON	OFF
Boot from NAND	OFF	ON
Boot from SPI	OFF	OFF

Power-on NUC980 Series MPU EVB, and then open the burning tool, “**NuWriter.exe**”, on the PC. Note that the tool cannot work if the “**WinUSB4NuVCOM**” driver is not found.

First, double click “**NuWriter.exe**” on PC. NuWriter will start and a window appears. Select target chip to NUC980 series and select DDR parameter to DDR initial files.

After select DDR parameter, click “**Continue**” to use NuWriter tool.

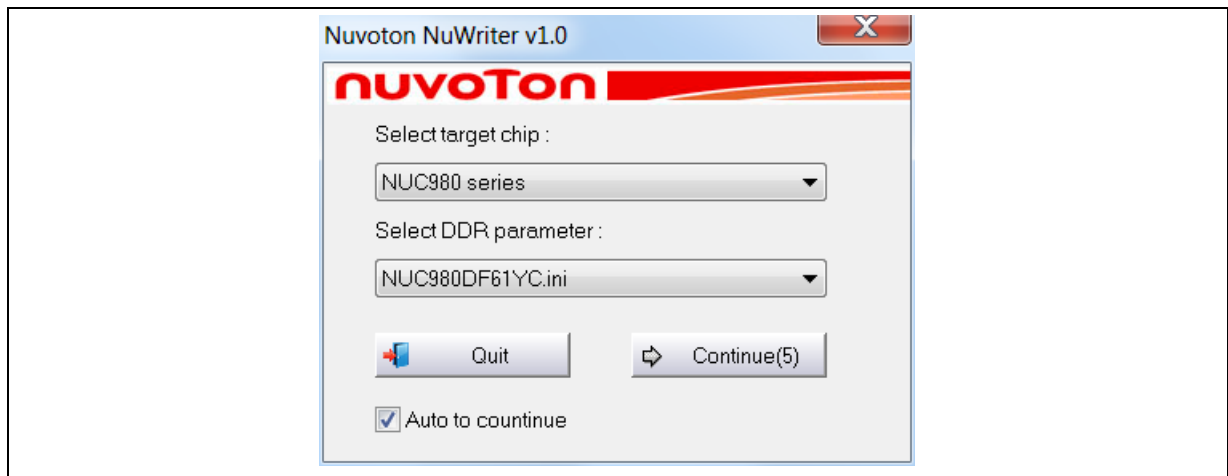


Figure 4-1 NuWriter – Set Chip/DDR

NuWriter provides 7 types to be downloaded images. This chapter will guide users to download images to DDR/SRAM, NAND, eMMC/SD and SPI NAND. If users want to download images to SPI, PACK or Mass Production, please refer to “**NUC980 NuWriter User Manual**” in the “Documents” directory.

4.1 DDR/SRAM Mode

4.1.1 Operation Steps

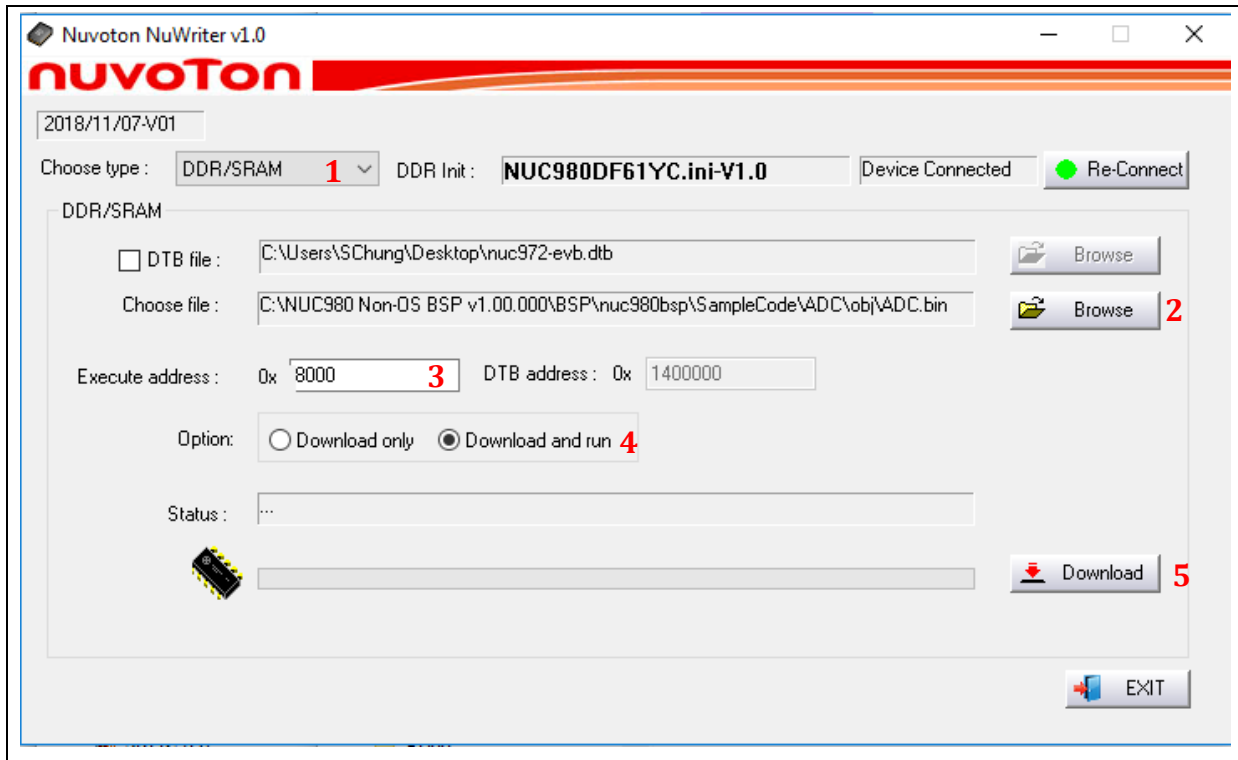


Figure 4-2 NuWriter – DDR/SDRAM mode

According to the figure above, The DDR/SRAM mode is used to download an image to DDR or SDRAM for debugging purpose. Follow the steps is listed below:

1. Select **"DDR/SRAM"**.
2. Browse the image.
3. Enter the image execution address. Note: Execution address between 0x00000000 ~ 0x01F00000 (31MB).
4. Select **"Download only"** or **"Download and run"**.
5. Click **"Download"**.

Users can find the image that Nuvoton provides in the "Loader" directory. In this directory, there are two images "u-boot-spl.bin" and "u-boot.bin" to be used. If users want to use their own application, they can use the bin file of application as Figure 4-3. Noticed that the execute address should be the same with the setting of the application. The application setting root is as Figure 4-4 (Project→Options for Target→Linker).

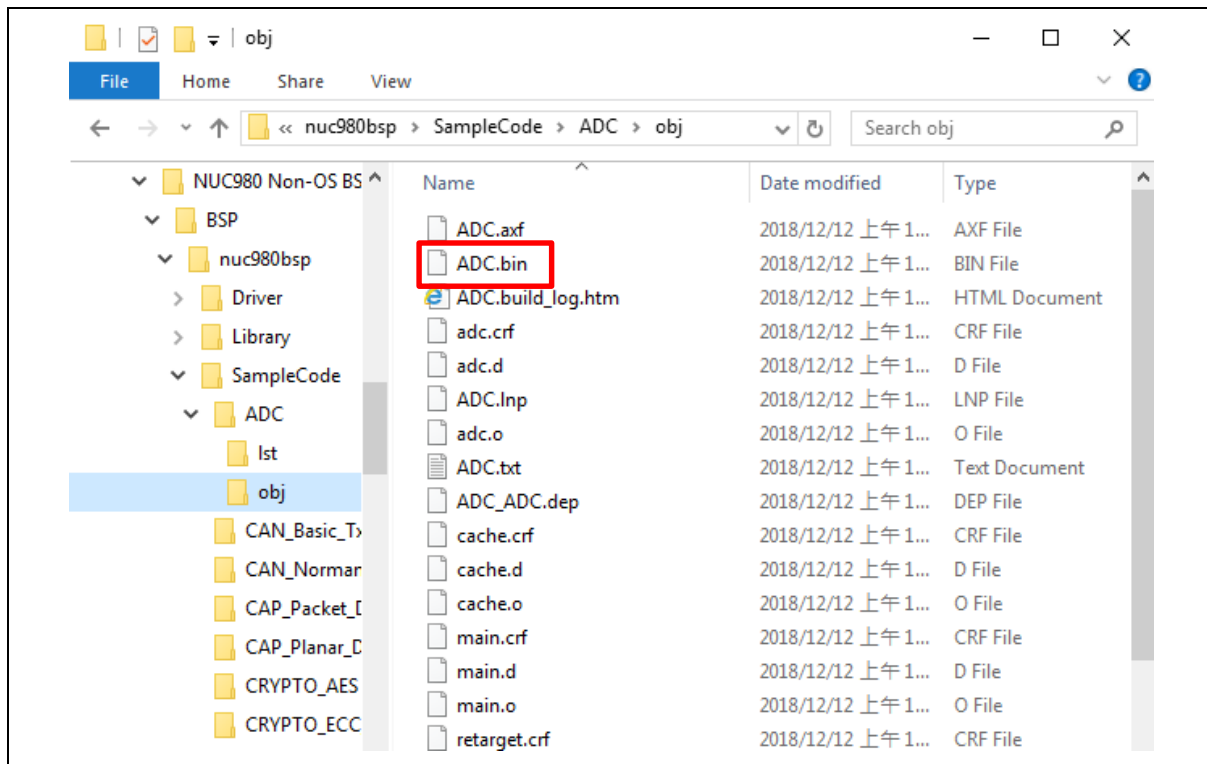


Figure 4-3 The image location – ADC as an example

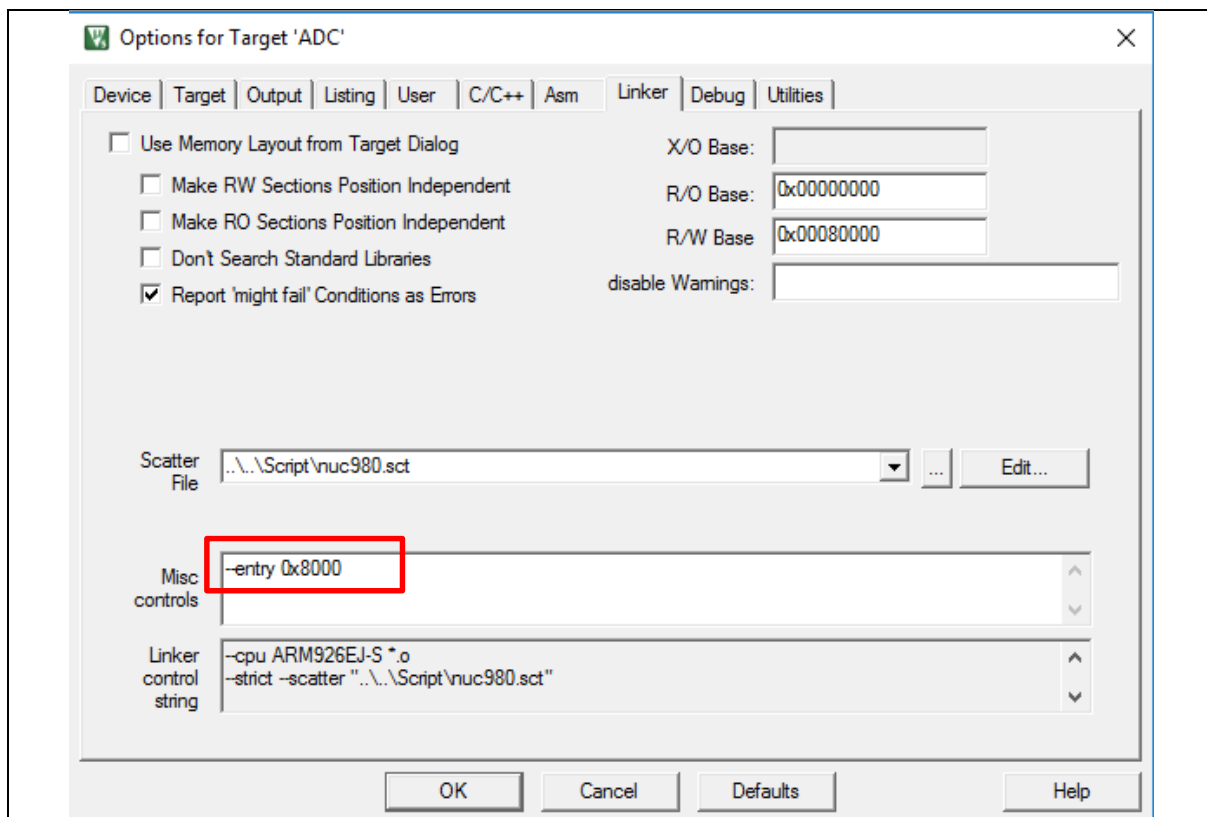


Figure 4-4 The execute address setting – ADC as an example

4.1.2 Boot from USB

The NUC980 Series MPU EVB provides jumpers to select boot-up conditions. To select USB ISP mode, the statuses of SW2.1 and SW2.2 are ON.

SW	Description (Status and Function)	GPIO pin of NUC980
SW2.2/ SW2.1	Boot Source Selection ON/ON = Boot from USB.	GPG1/GPG0
SW2.4	Watchdog Timer (WDT) Enabled/Disabled Selection ON = After power-on, WDT Disabled. OFF = after power-on WDT Enabled	GPG3
SW2.6	UART 0 Debug Message Output ON/OFF Selection ON = UART 0 debug message output ON.	GPG5

Users can watch the application message and the successful boot message from the UART_0 as follows.

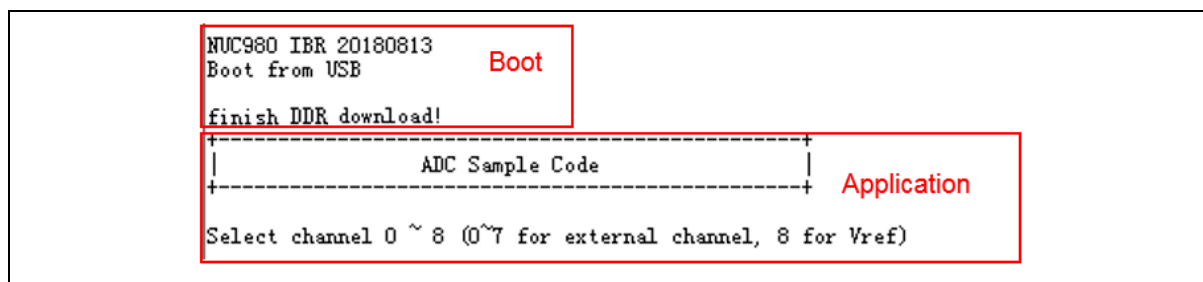


Figure 4-5 Application – ADC as an example, Message - Boot from USB

4.2 NAND Mode

This mode can write a new image to NAND flash and specify the type of the image. These types can be recognized by uboot or Linux. The Image type is set Loader, Data, Environment or Pack.

4.2.1 Operation Steps

4.2.1.1 Add a New Image

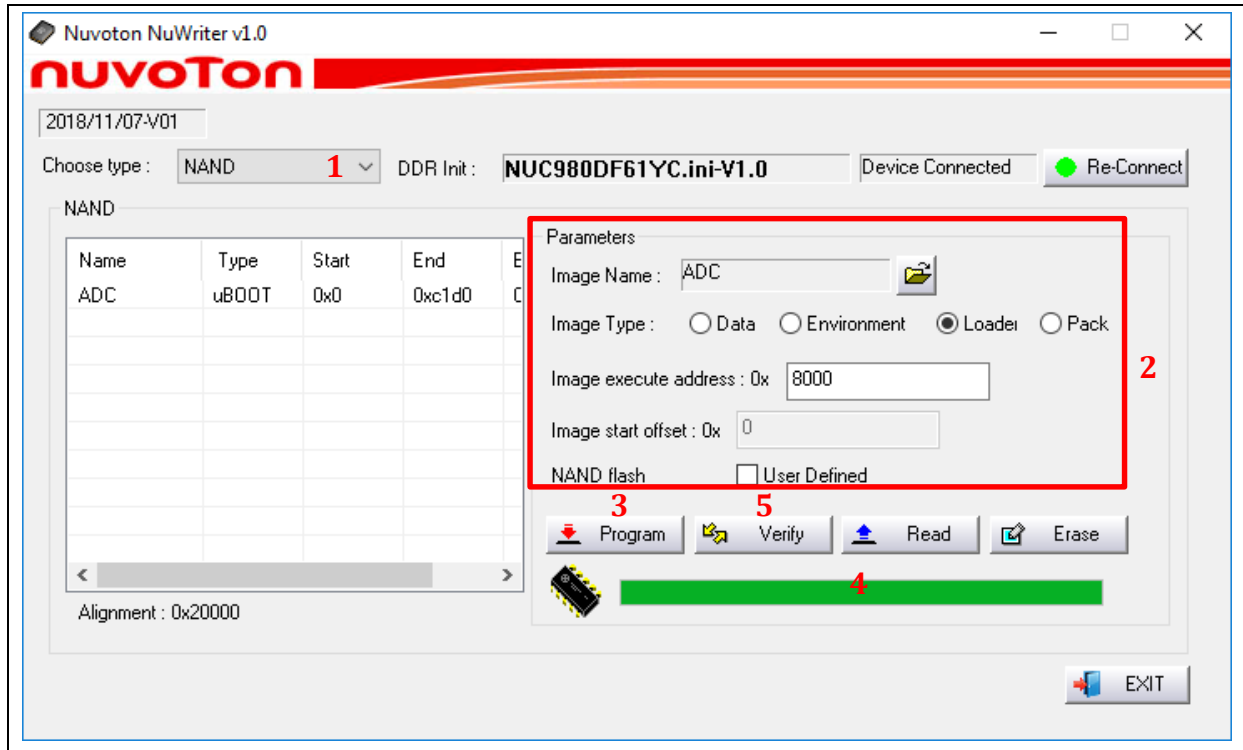


Figure 4-6 NAND – New Image for Loader

According to the figure above, follow the steps below to add a new image to NAND flash:

1. Select the "**NAND**" type, which will not list the pre-burned images in the NAND Flash ROM.
2. Fill in the image information :
 - Image Name : Browse the image file,
 - Image Type Select the image type (only one type can be selected)
 - Image execute address: Enter image execute address. Only is Loader Type is valid.
3. Click "Program".
4. Waiting for finishing progress bar.
5. After "Program" the image, click the "**Verify**" button to read back the image data to make sure the burning status.

Noticed that the operation is under the situation:

If the code size is less than 1 block size, user can add the image as Loader. And if the Code size is greater than 1 block size, users need to use uBoot. For detailed to use uBoot to add the image, please refer to "**NUC980 NuWriter User Manual**" in the "Documents" directory.

4.2.2 Boot from NAND Flash

The NUC980 Series MPU EVB provides jumpers to select boot-up conditions. According to the following switches, users can boot from NAND flash and watch the successful boot message from UANRT_0 as belows.

SW	Description (Status and Function)	GPIO pin of NUC980
SW2.2/ SW2.1	Boot Source Selection OFF/ON = Boot from NAND Flash.	GPG1/GPG0
SW2.4	Watchdog Timer (WDT) Enabled/Disabled Selection ON = After power-on, WDT Disabled. OFF = after power-on WDT Enabled.	GPG3
SW2.6	UART 0 Debug Message Output ON/OFF Selection ON = UART 0 debug message output ON.	GPG5
SW2.8/SW2.7	NAND Flash Page Size selection ON/ON = NAND Flash page size is 2KB. ON/OFF = NAND Flash page size is 4KB. OFF/ON = NAND Flash page size is 8KB. OFF/ OFF = Ignore Power-On Setting.	GPG7/ GPG6
SW2.10/SW2.9	ECC type selection ON/ON = NO ECC ON/OFF = ECC is BCH T12 OFF/ON = ECC is BCH T24 OFF/OFF = Ignore power-on setting	GPG9/ GPG8
SW3/SW4	All On	

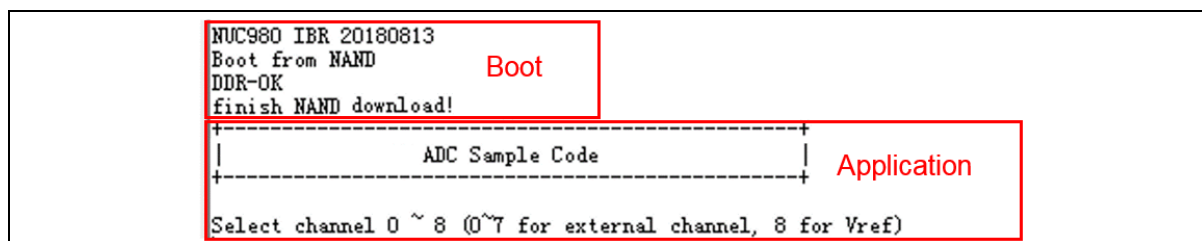


Figure 4-7 Application – ADC as an example, Message - Boot from NAND Flash

4.3 eMMC/SD Mode

This mode can write a new image to eMMC/SD and specify the type of the image. These types can be recognized by bootloader or Linux. The Image type is set Loader, Data, Environment or Pack.

4.3.1 Operation Steps

4.3.1.1 Add a New Image

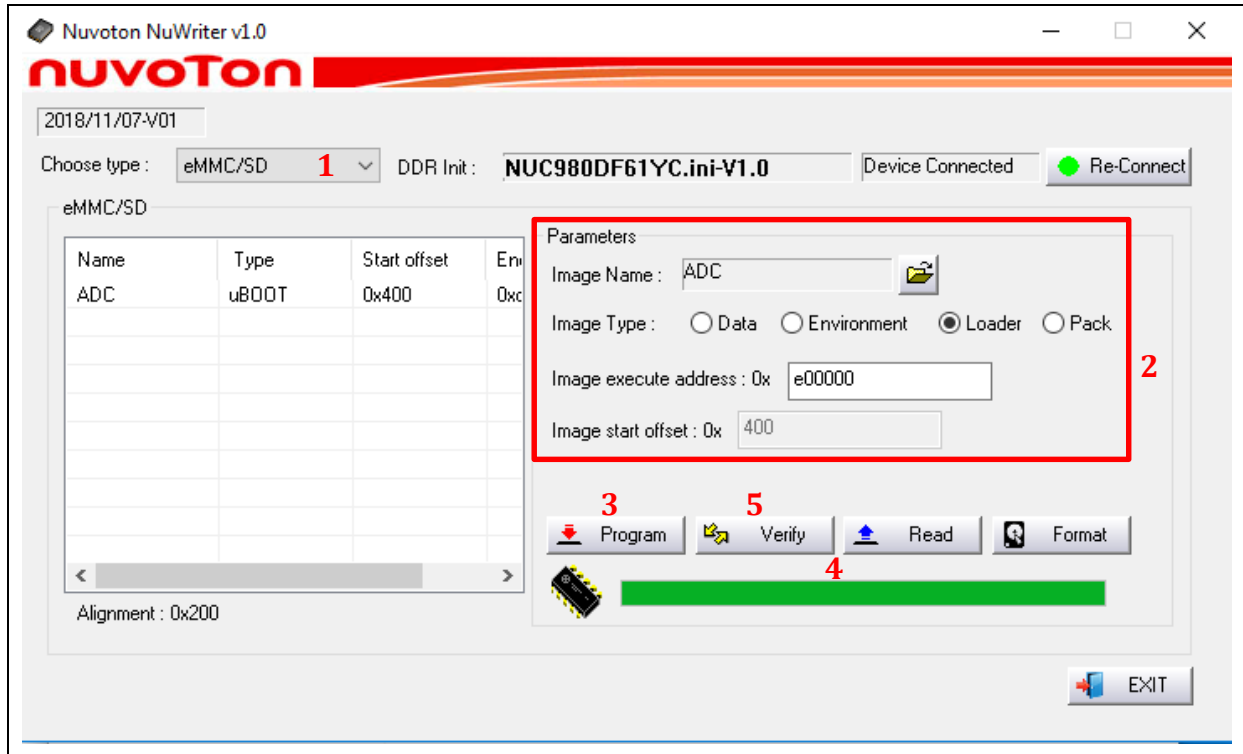


Figure 4-8 eMMC/SD– New Image

According to the figure above, follow the steps below to add a new image to eMMC/SD flash:

1. Select the “eMMC/SD” type, which will not list the pre-burned images in the eMMC/SD.
2. Fill in the image information :
 - Image Name: Browse the image file.
 - Image Type Select the image type. (only one type can be selected)
 - Image execute address: Enter image execute address. Only is Loader Type is valid.
 - Image start offset: Enter image start offset.
3. Click “Program”.
4. Waiting for finishing progress bar.
5. After “Program” the image, click the “Verify” button to read back the image data to make sure the burning status.

4.3.2 Boot from eMMC/SD

The NUC980 Series MPU EVB provides jumpers to select boot-up conditions. According to the following switches, users can boot from eMMC/SD and watch the successful boot message from UANRT_0 as belows.

SW	Description (Status and Function)	GPIO pin of NUC980
SW2.2/ SW2.1	Boot Source Selection ON/OFF = Boot from SD/eMMC.	GPG1/GPG0
SW2.4	Watchdog Timer (WDT) Enabled/Disabled Selection ON = After power-on, WDT Disabled. OFF = after power-on WDT Enabled	GPG3
SW2.6	UART 0 Debug Message Output ON/OFF Selection ON = UART 0 debug message output ON.	GPG5
SW2.10/SW2.9	SD0/eMMC0 or SD1/eMMC1 selection OFF/OFF = SD0/eMMC0 (GPC group) used as the booting source. Others = SD1/eMMC1 (GPF group) used as the booting source.	GPG9/ GPG8
SW3/SW4	All OFF = The booting souce is SD0/eMMC0	
SW6/SW7	ON/OFF = The booting souce is SD1/eMMC1	

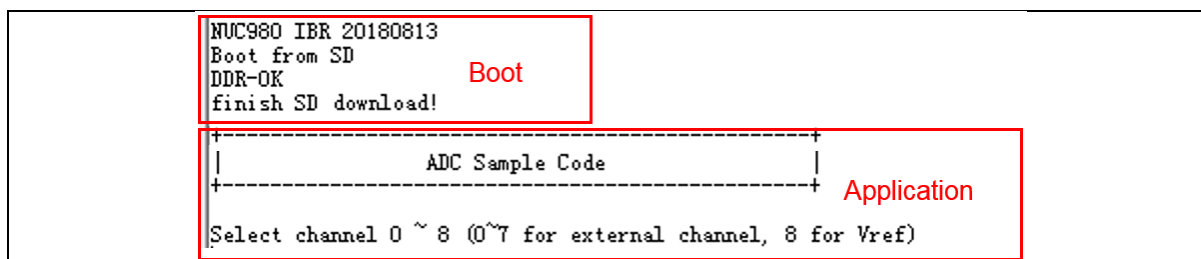


Figure 4-9 Application – ADC as an example, Message - Boot from eMMC/SD

4.4 SPI NAND Mode

This mode can write a new image to SPI NAND flash and specify the type of the image. These types can be recognized by uboot or Linux. The Image type is set Loader, Data, Environment or Pack.

4.4.1 Operation Steps

4.4.1.1 Add a New Image

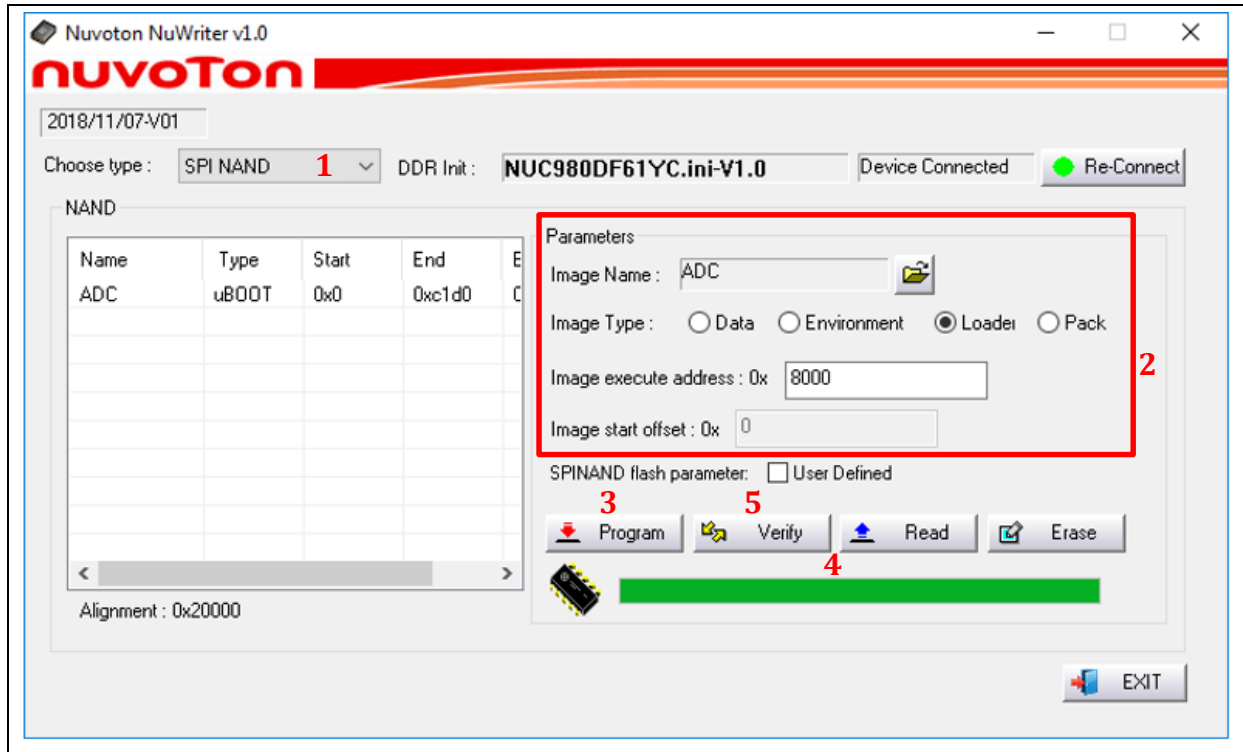


Figure 4-10 SPI NAND– New Image

According to the figure above, follow the steps below to add a new image to SPI NAND flash:

1. Select the “**SPI NAND**” type, which will not list the pre-burned images in the SPI NAND Flash ROM.
2. Fill in the image information :
 - Image Name : Browse the image file
 - Image Type Select the image type (only one type can be selected)
 - Image execute address: Enter image execute address. Only is Loader Type is valid.
 - Image start offset: Enter image start offset.
3. Click “Program”.
4. Waiting for finishing progress bar.
5. After “Program” the image, click the “**Verify**” button to read back the image data to make sure the burning status.

4.4.2 Boot from SPI Flash

The NUC980 Series MPU EVB provides jumpers to select boot-up conditions. According to the following switches, users can boot from SPI Flash and watch the successful boot message from UANRT_0.

SW	Description (Status and Function)	GPIO pin of NUC980
SW2.2/ SW2.1	Boot Source Selection OFF/OFF = Boot from SPI Flash.	GPG1/GPG0
SW2.4	Watchdog Timer (WDT) Enabled/Disabled Selection ON = After power-on, WDT Disabled. OFF = after power-on WDT Enabled	GPG3
SW2.6	UART 0 Debug Message Output ON/OFF Selection ON = UART 0 debug message output ON.	GPG5
SW2.10/SW2.9	SPI Flash type and data width selection ON/ON = SPI-NAND Flash with 1-bit mode. ON/OFF = SPI-NAND Flash with 4-bit mode. OFF/ON = SPI-NOR Flash with 4-bit mode. OFF/OFF = SPI-NOR Flash with 1-bit mode.	GPG9/ GPG8

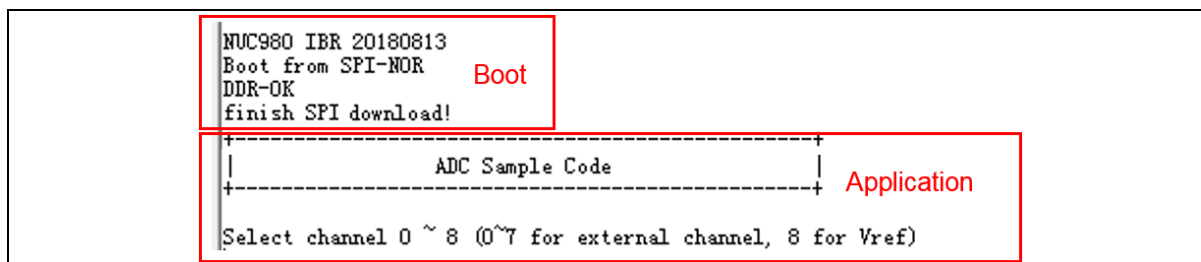


Figure 4-11 Application – ADC as an example, Message - Boot from SPI Flash

For more detailed NuWriter tool, please refer to “**NUC980 NuWriter User Manual**” in the “Documents” directory.

5 U-BOOT

The U-Boot utility is a multi-platform, open-source, universal boot-loader with comprehensive support for loading and managing boot images, such as the Linux kernel. It supports the following features:

- Network download: TFTP, BOOTP, DHCP
- Serial download: s-record, binary (via Kermit)
- Flash management: erase, read, update, yaffs2
- Flash types: SPI flash, NAND flash
- Memory utilities: dump, compare, copy, write
- Interactive shell: commands with scripting features

NUC980 U-Boot version is v2016.11. It is downloaded from <http://www.denx.de/wiki/U-Boot/SourceCode>

For detailed NK-NUC980 board introduction, please refer to “**NUC980 U-Boot v2016_11 User Manual**” in the “Documents” directory.

6 REVISION HISTORY

Date	Revision	Description
2019.01.28	1.00	Initial release

Important Notice

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