ARM® ARM926EJ-S

32-bit Microprocessor

NuMaker NuBlindCam
User Guide

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

www.nuvoton.com

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1 INTRODUCTION

NuMaker NuBlindCam is a solution to capture video and audio streams into one AVI file, and save the AVI file into SD card. It is based on Nuvoton's N32903 video MPU. N32903 provides a powerful JPEG codec for encoding. NuBlindCam firmware provides audio and video streams. The format of video stream is Motion-JPEG with VGA/HD(720P) resolution. The format of audio stream is PCM or IMAADPCM. N32903 could capture the video and audio streams into the AVI file, and save the AVI file into SD card. Arduino NuBlindCam sample NuMaker_NuBlindCam_Arduino_UNO.ino runs NuEdu UNO board to control N32903 board by using UART protocol.

In this document, we will describe chapters as below:

- Board Interface
- Firmware Programming
- Source code

2 BOARD INTERFACE

2.1 Board schematics of N32903

The N32903 demo board includes PCB NHS-55FA93-1-IN-1M1X and PCB NHS-55FA93-1-IN-1D1X. Figure 2-1 is the front view of N32903 board. Within the front view of PCB NHS-55FA93-1-IN-1D1X, there is one connector including 58 pins. While NuEdu UNO board connects N32903 board by using UART protocol. The pin 53 (GPD1) connects RX of NuEdu UNO, the pin 54 (GPD2) connects TX of NuEdu UNO, the pin 15 (VDD33) connects 3.3V of NuEdu UNO, the pin 16 (VSS) connects GND of NuEdu UNO.

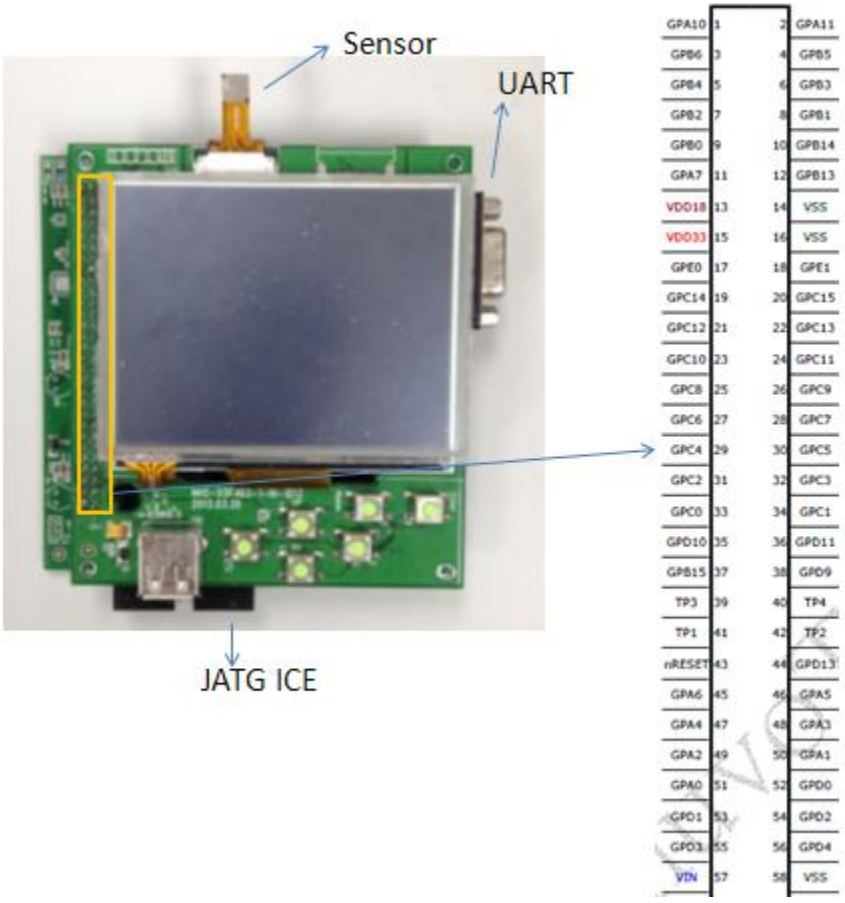


Figure 2-1 Front View of N32903 board.

Figure 2-2 is the back view of PCB NHS-55FA93-1-IN-1M1X, there are 2 jumpers on the left-bottom. The left jumper is ND0 setting and controls the booting mode, up is for recovery mode, down is for normal mode. Before user would like to burn the binary files into the storage (SD/NAND/SPI) of N32903 by using the tools AutoWriter or TurboWriter, N32903 board is set the recovery mode to work. If N32903 board is not set the recovery mode, the tools AutoWriter or TurboWriter do not work.

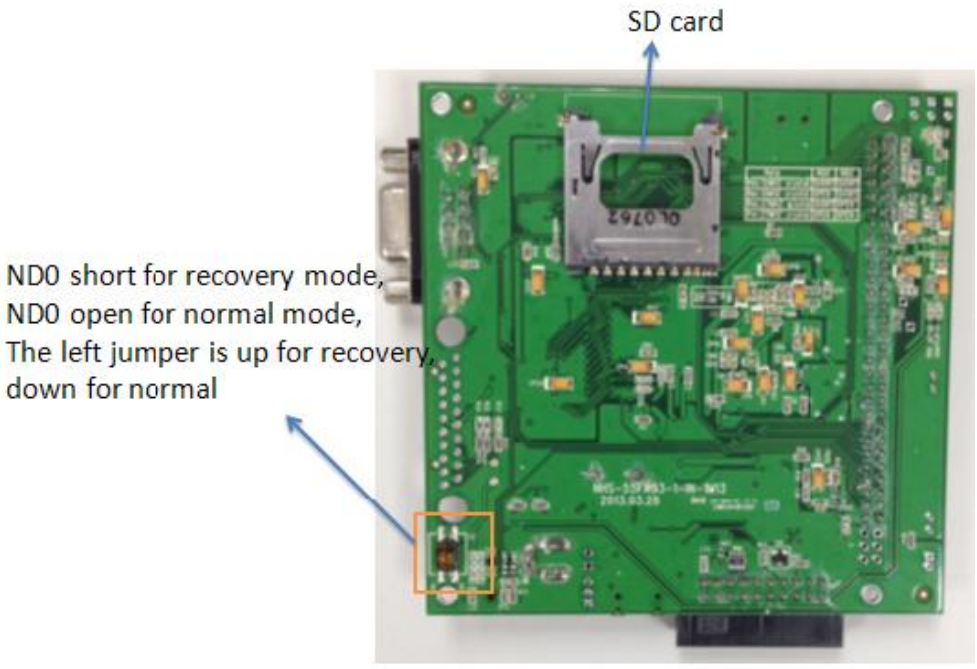


Figure 2-2 Back View of PCB NHS-55FA93-1-IN-1M1X

Figure 2-3 is the Front view of PCB NHS-55FA93-1-IN-1M1X, user could plug the 5V adapter in, and press the power on key to start the N32903 board. Before running the tools AutoWriter and TurboWriter, user must connect USB cable between USB device port and Windows.

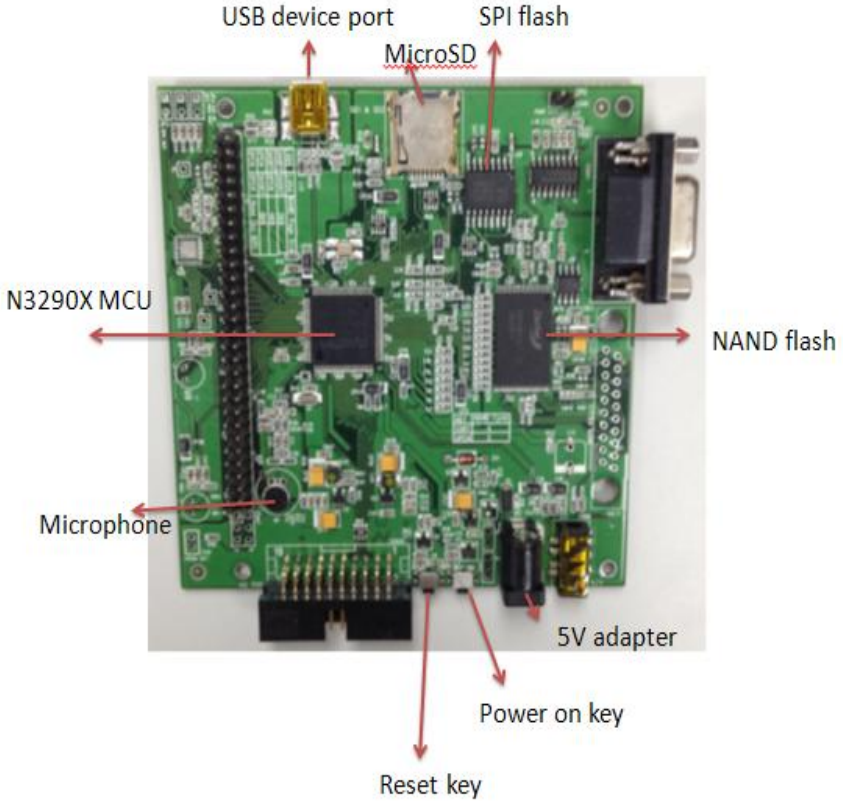


Figure 2-3 Front View of PCB NHS-55FA93-1-IN-1M1X

2.2 Board schematics of NuEdu UNO board

In order to do NuBlindcam, The setting of NuEdu UNO board should be shown in Figure 2-4.

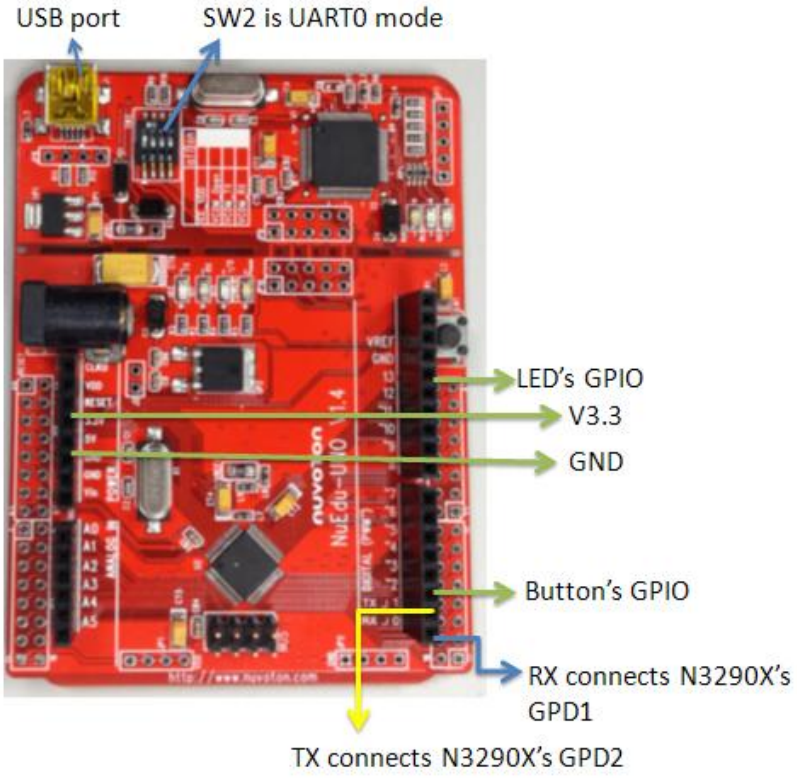


Figure 2-4 The Setting of NuEdu UNO board.

3 FIRMWARE PROGRAMMING

In this chapter, we will step by step to guide you program NuBlinkCam function of N32903 board firmware using AutoWriter. We released the firmware for N32903 as shown the following figure.

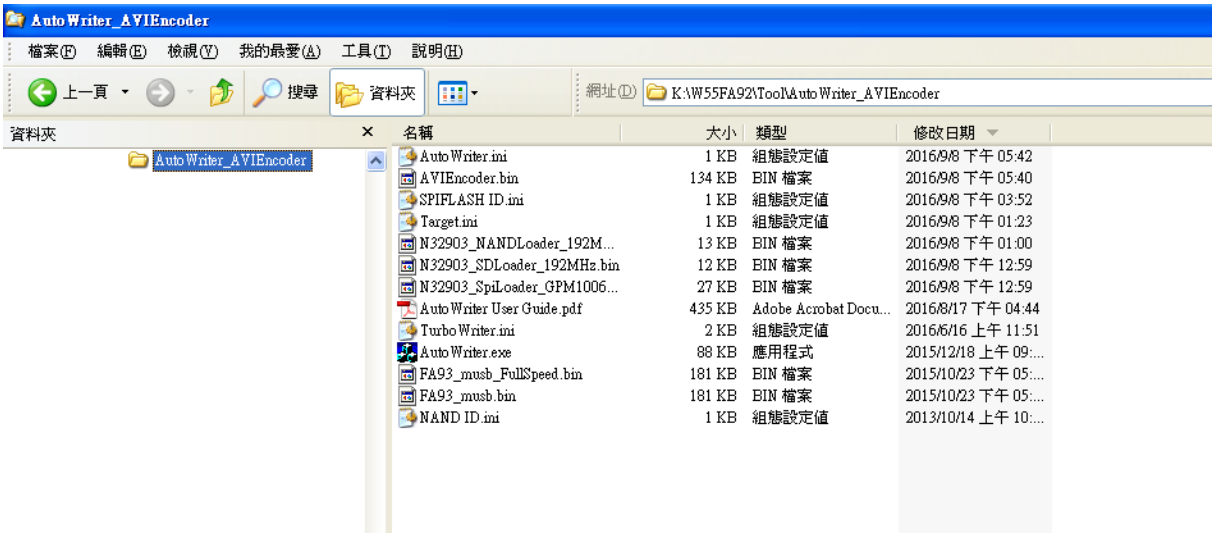


Figure 4-1 Firmware for NuBlindCam board

(1) running AutoWriter.exe execution, the UI of tool is shown as follows. **The 'Current Target' is SPI by default**. Please keep the setting and following below steps:

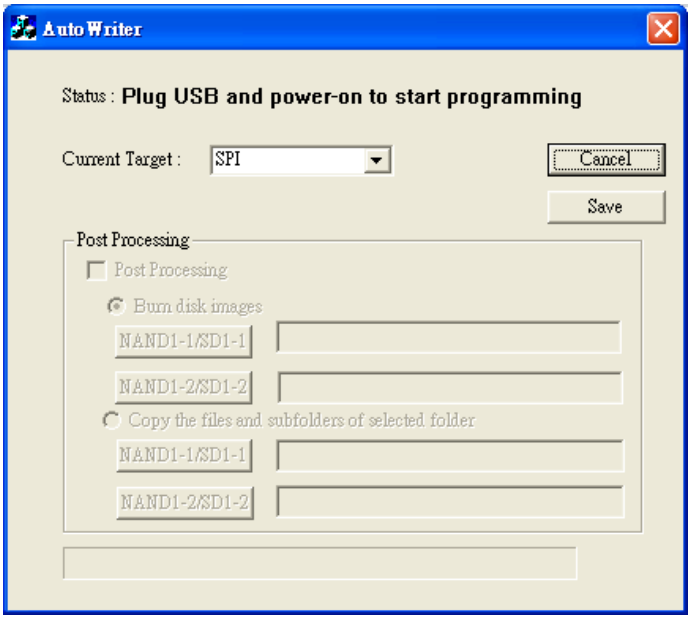


Figure 4-2 Current Target in SPI mode

(2) sets the N32903 board to be recovery mode as Figures 4-3, and plug USB cable into PC/NB.

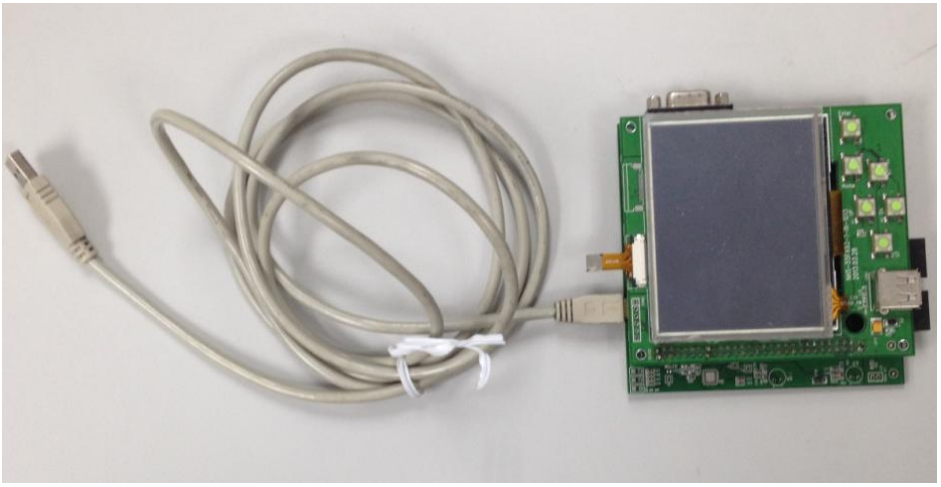
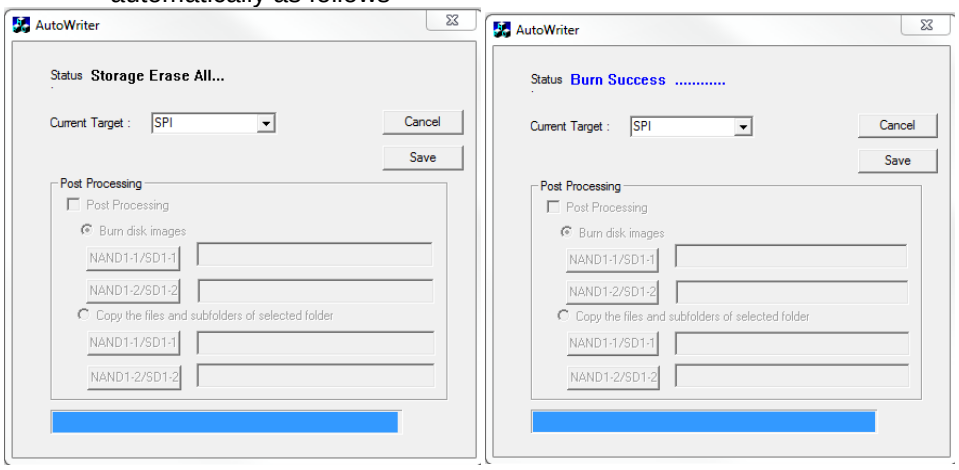


Figure 4-3 Booting setting in recovery mode

(3) Start the N32903 NuBlindCam board, the tool AutoWriter will burn the firmware automatically as follows



(4) After finishing firmware programming, the UI will show 'Burn Success ….. '.
(5) To Un-plug USB Line from PC.
(6) To leave 'Recovery Mode' and set 'Normal mode' by setting ND0 of Back View of PCB NHS-55FA93-1-IN-1M1X.
(7) Connect NuEdu UNO board and N32903 NuBlindCam board by UART protocol. When the program is running, user presses down the button and LED flashes. LED flashes one time and release the button, it means to input 1 to UART log, and later LED flashes 3 times to acknowledge. What times does LED flash and release the button ? it means input the specified times to UART log, and later LED flashes 3 times to acknowledage. If the acknowledage does not display, the input of UART log must fail. User will see the result from the UART log of N32903 board.

For example, booting the normal mode of the N32903 board, you will see UART log as follows. User runs Arduino code NuMaker_NuBlinkCam to press down the button. When the LED flashs 2 times, release the button and the input value of UART is 2. The program sets 2 to run the resolution HD. For the camera status, press down the button, user does not release the button until LED flashes 1 times. Then the program sets 1 to run normal photography. After running over 7 seconds, set 1 to stop record. The detailed status of UART log is shown as follows.

```
Init RTC....OK
DDR size: 32MB
SD Port0 Booting Success
Clock Skew
 DQSODS 0x1010
 CKDQSDS 0x888800
Code Executes at 0x00900000
W55FA93 SD Boot Loader entry (20131220).
sd init begin !!
sd init end !!
executing address = 0x0
Load file length 0x20188, execute address 0x0
Disable USB Transceiver
Disable ADC and LVR
Disable SPU and ADO
Disable USB phy
The code is for N32903
================================================================
Please use LCD HANNSTAR_HSD043I9W1
================================================================
================================================================
                                VideoIn library demo code
 [1] NT99050 demo - 640X480
 [2] NT99141 demo - 1280X720
================================================================
```

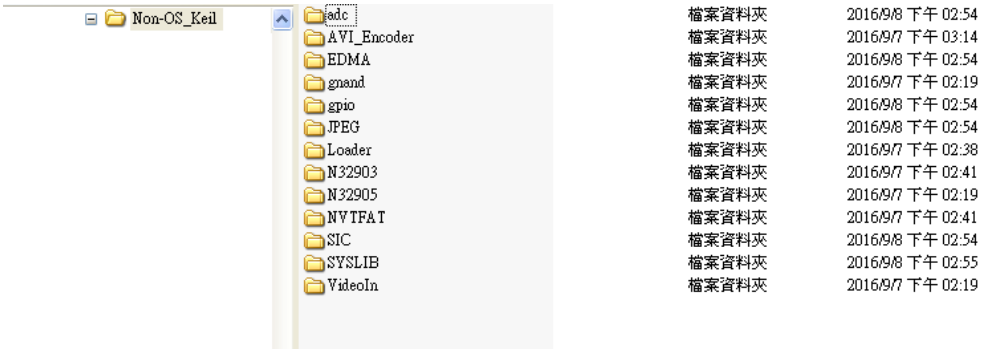
```
Start !
Resolution
 [1] QHD (640 x 360)
 [2] HD (1280 x 720)
 Select [2], HD

Camera status
 [1] Normal photography
 [2] Time lapse photography
 Select [1]
Start Record
Press 1 to stop, 2 to capture one image !
Initial SD NonOS Driver (20160602) for SD port 0
switch into high speed mode !!!
Sensor ID = 8
Device Slave Addr = 0x54
Detectd sensor id0=14 id1=10
encoded file = C:\smpl0001.avi
fsSetFileSize as 86 MB
fsSetFileSize take time ticks: 75
PLL clock = 184,363 KHz
Total divider = 9
DIV_N1, DIV_N0  = 3, 3
T=1.00  (Vid #20 - 20) (Audio #200)
T=2.05  (Vid #41 - 21) (Audio #0)
T=3.10  (Vid #62 - 21) (Audio #200)
T=4.15  (Vid #83 - 21) (Audio #0)
T=5.20  (Vid #104 - 21) (Audio #0)
T=6.25  (Vid #125 - 21) (Audio #0)
T=7.30  (Vid #146 - 21) (Audio #0)
Stop record
AVI record done.
```

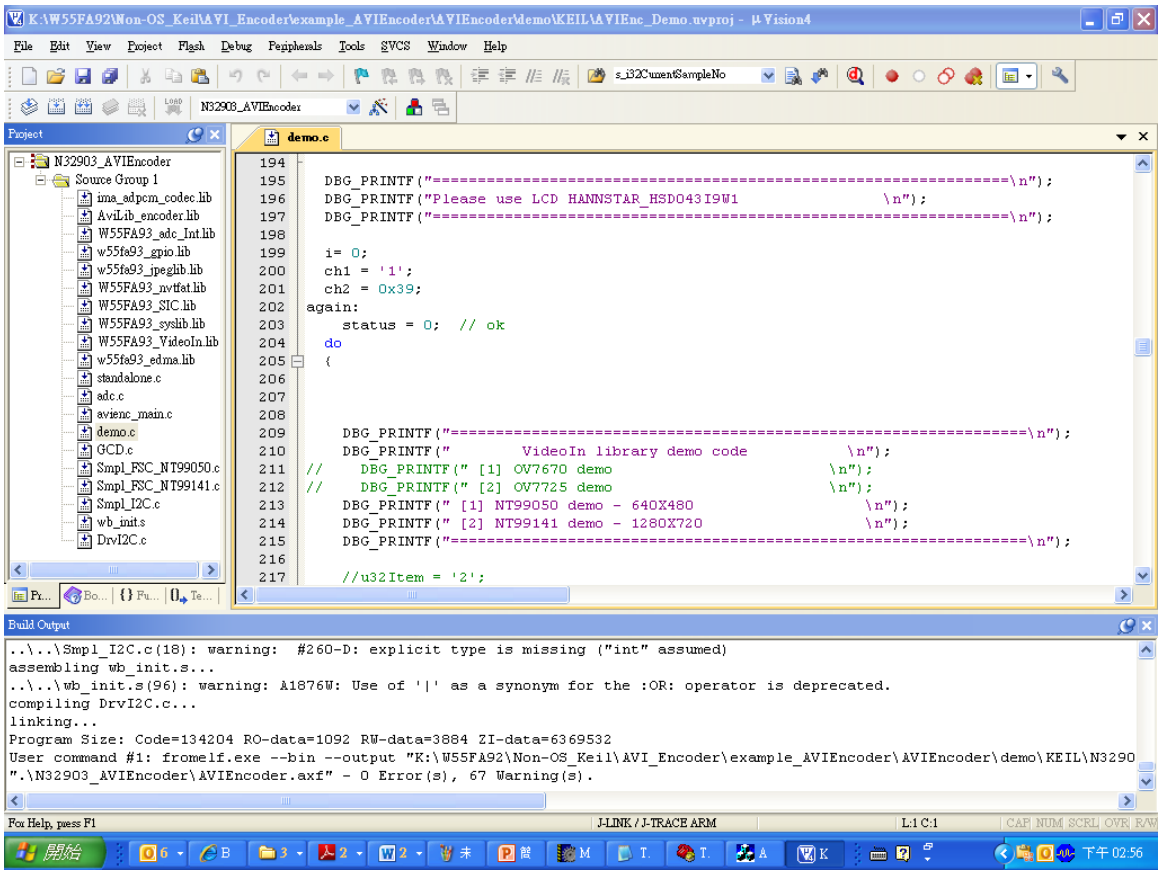
4 SOURCE CODE

The source code of NuBlindCam has versions Keil and ADS. Currently NuBlindCam runs under N32903 board, support the sensor NT99141 (HD, 1280x720, 20 FPS) and NT99050 (VGA, 30 FPS). N32903 has 8 MB, therefore the solution supports HD and VGA at the same time.

The source code of Non-OS Keil is shown as follows.



User could open the project AVIEnc_Demo.uvproj to build and export one binary file AVIEncoder.bin.



If user would like to change the sensor, you could run the example of the subfolder VideoIn to test the status of sensor, or contact Nuvoton for more information.

5 REVISION HISTORY

Date	Revision	Description
2016.09.12	1.00	1. Initially issued.

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