

**ARM® ARM926EJ-S**  
**32-bit Microprocessor**

**NuMaker NuWicam**  
**User Guide**

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## 1 OVERVIEW

With the rapid growth of wireless network technologies and bandwidth, the Wi-Fi audio and video streaming based products, such as Wi-Fi IP camera, video baby monitor, are getting popular. Nuvoton N329 series integrated the necessary functions Wi-Fi AV streaming application such as CMOS sensor interface, hardware video codec. These functions make the N329 series a cost effective solution for Wi-Fi A/V Streaming application. Moreover, the N329 stacks DRAM into a single package which can help the PCBA pass EMI and EMC testing easily.

## 2 INTRODUCTION

**NuMaker NuWicam**<sup>[1]</sup> is an open-source Wi-Fi camera module. It is based on Nuvoton's N32905R3DN video MPU. N32905R3DN provides a powerful JPEG codec for encoding. NuWicam firmware provides audio and video streams over RTP. The format of video stream is Motion-JPEG with VGA resolution by default. The format of audio stream is G.711-alaw. It also provides virtual COM software for UART connective. For example, mobile APP can read LM75 temperature sensor data from NuMaker UNO<sup>[3]</sup> board (or NuMaker-PFM-NUC472 board) or light on LEDs on NuMaker UNO board over Modbus RTU protocol. User also can modify configurations over HTTP. We wish the NuWicam can help you get A/V streams and do some data sampling between mobile devices and some low-end MCUs easily.

In this document, we will describe chapters as below:

- Board interface
- Firmware programming
- Player APP Installation
- Debug board driver Installation
- As UVC camera.

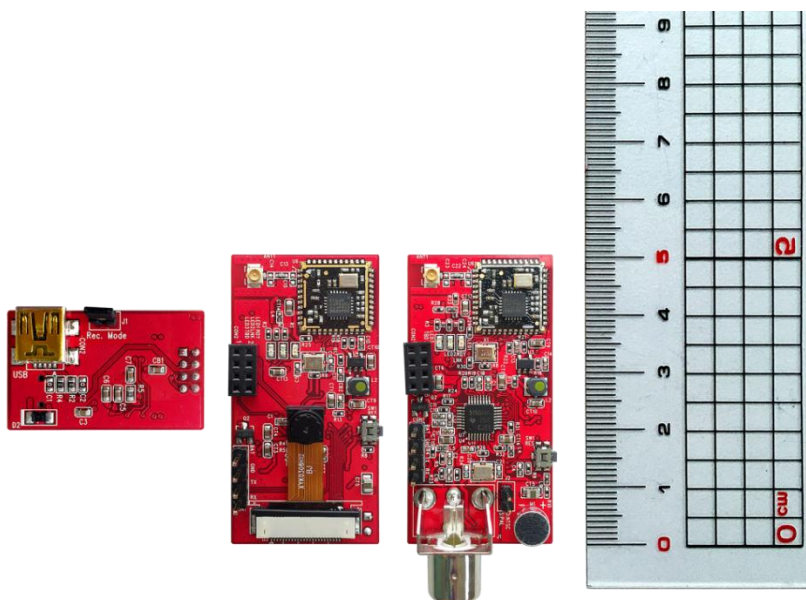


Figure 2-1 NuWicam debug and main boards <sup>[2]</sup>

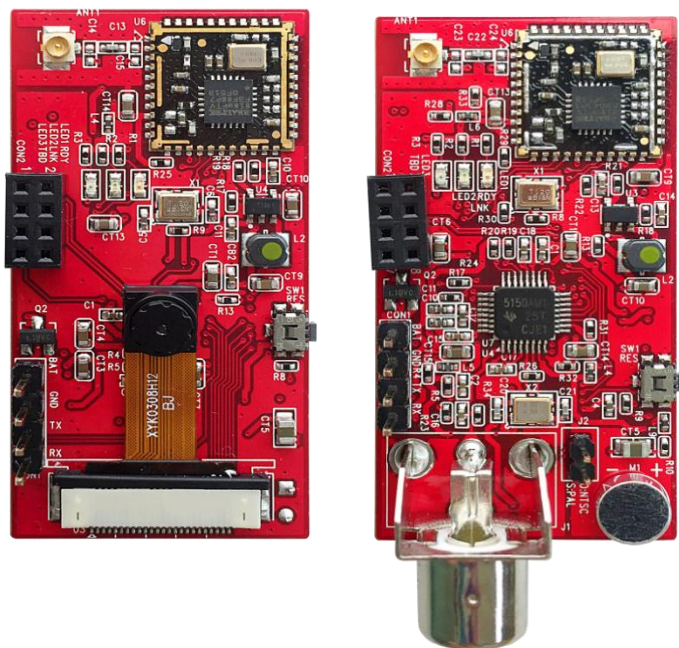
[1] NuWicam is short for NuMaker NuWicam.

[2] The figure is shown NuWicam-debug, NuWicam-GC0308 and NuWicam-TVP main board.

[3] The NuMaker UNO board is the same with NuEdu UNO.

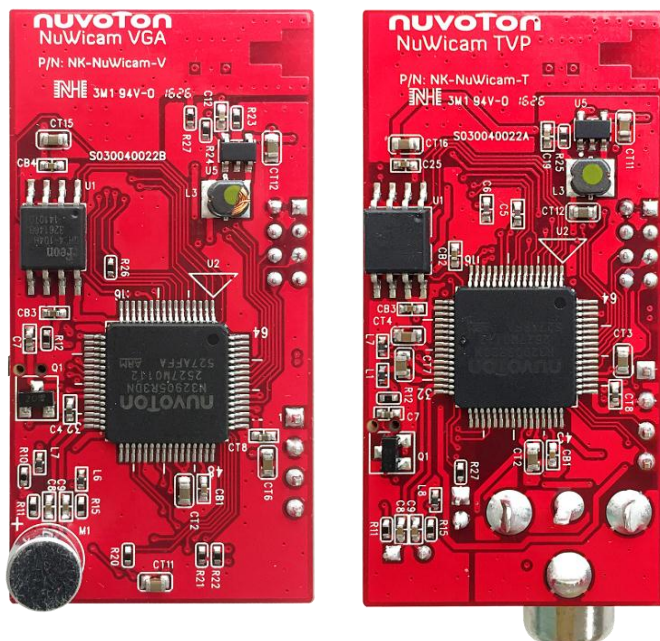
### 3 BOARD INTERFACES

Below figures are shown every interface and main components on NuWicam debug and main board.



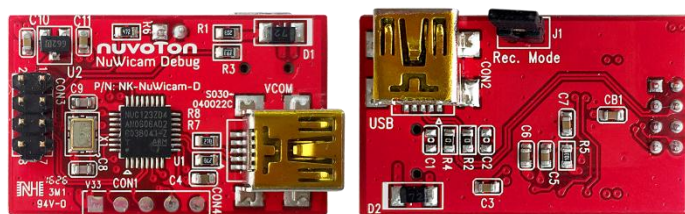
- (1) **SW1**: Reset button.
- (2) **ANT1**: 2.4G Wi-Fi antenna.
- (3) **U3**: CMOS sensor connector.
- (4) **J1**: CCTV camera input
- (5) **CON1**: UART communication port.
- (6) **CON2**: Debug board connector.
- (7) **U6**: RTL8189FTV Wi-Fi module.
- (8) **U7**: TVP decoder.
- (9) **M1**: Microphone.
- (10) **LED1**: Ready.
- (11) **LED2**: LINK.
- (12) **LED3**: Reserve.

Figure 3-1 Main components of NuWicam main board (Top view)



- (1) **U1**: 8MB SPI NOR flash.
- (2) **U2**: N32905R3DN chipset.
- (3) **M1**: Microphone.

Figure 3-2 Main components of NuWicam main board (Bottom view)



- (1) **U1**: NUC123 with VCOM function.
- (2) **CON3**: Main board connector.
- (3) **VCOM**: For terminal usage.
- (4) **USB**: For firmware burning usage.
- (5) **J1**: To enter recovery mode.

Figure 3-3 Main components of NuWicam debug board (Top/Bottom view)

## 4 FIRMWARE PROGRAMMING

In this chapter, we will step by step to guide you program NuWicam board firmware using AutoWriter. We released three versions firmware for NuWicam-GC0308, NuWicam-GM7150 and NuWicam-TVP5150 boards as shown figure. For expert, you can refer AutoWriter User Guide.pdf file in autowriter\_xxxxxxx folder for more usage.

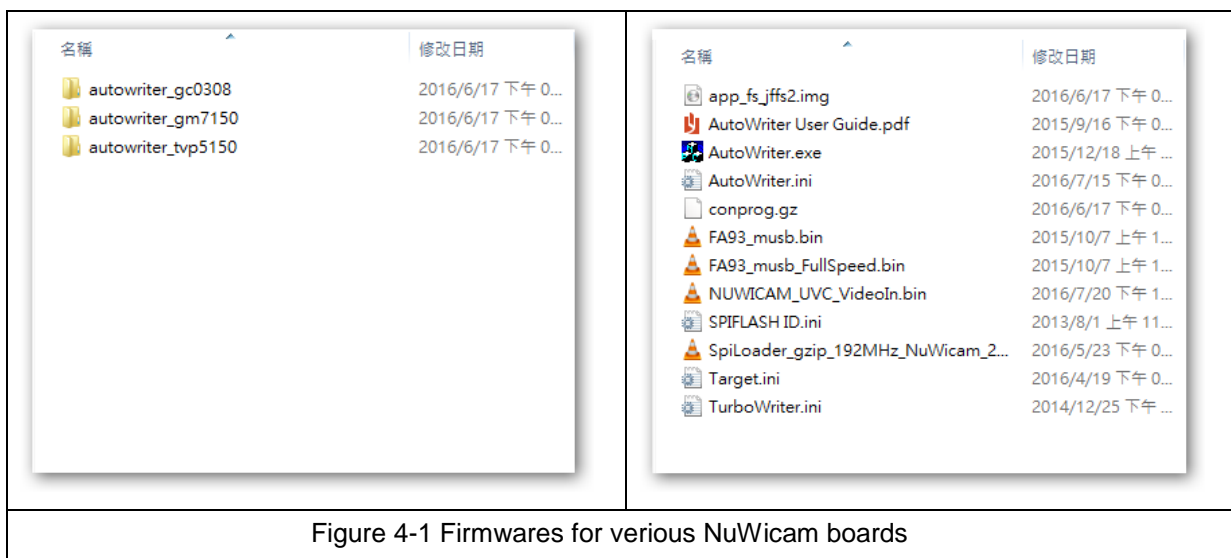


Figure 4-1 Firmwares for various NuWicam boards

After 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:

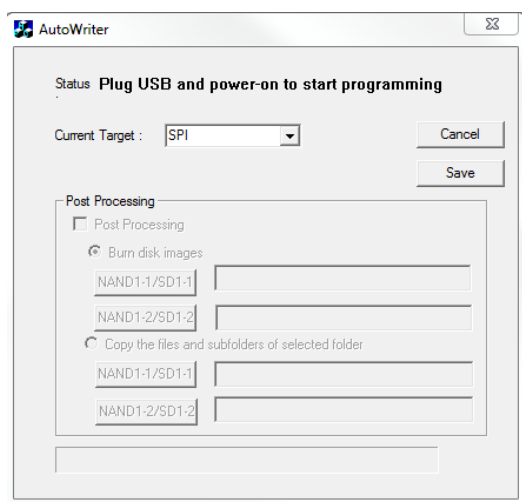


Figure 4-2 Current target in SPI mode



Figure 4-3 Boot setting in recovery mode

- (1) To short J1 switch with a jumper on NuWicam debug board **to enter 'Recovery Mode'**.
- (2) To mount NuWicam debug board to NuWicam main board's CON2 connector.
- (3) To plug in a USB line into micro USB port of NuWicam debug board.



Notice: The micro USB port is for firmware programming, not VCOM USB port.

- (4) To plug in USB line into PC.
- (5) The AutoWriter utility will burn firmwares automatically.

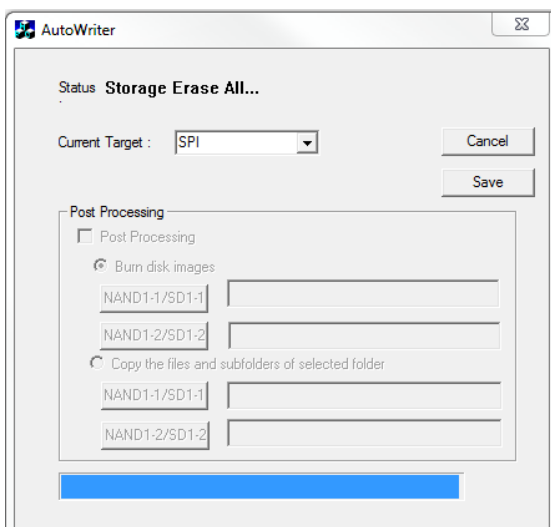


Figure 4-4 AutoWriter progressing

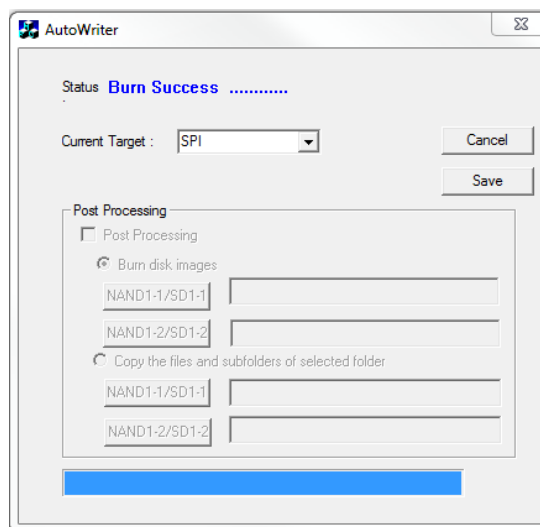


Figure 4-5 Programming done

- (6) After finishing firmware programming, the UI will show 'Burn Success .....'.
- (7) To Un-plug USB Line from PC.
- (8) To leave 'Recovery Mode' by removing J1 switch jumper on NuWicam debug board.
- (9) To plug in USB line into a power adapter is with USB port.
- (10) After that, you will see a heartbeat LED is lighted on RDY led of NuWicam main board.



## 5 PLAYER APP INSTALLATION

NuWicam player is an audio and video stream player is designed to connect NuWicam board. You can download APP on IOS APP store or Google Play. Below URLs are for more details.



For IOS OS:

URL: <https://itunes.apple.com/cn/app/nuwicam-player/id1114711093?mt=8>

For Android OS:

URL: <https://play.google.com/store/apps/details?id=com.nuvoton.nuwicam>

NuWicam player gives you:

- **Real-time audio and video streaming** - NuWicam player provides a movie window. It will get A/V stream from NuWicam automatically if your IOS or Android device is associated with NuWicam board successfully.
- **Flexible streaming adjustment and Wi-Fi network configuration** - you can adjust view resolution and Wi-Fi configuration.
- **Supervisory control and data acquisition** - You can get temperature sensor data and light on LEDs.

At first, you need associate to NuWicam's SSID, its SSID string is shown '**NuWicam\_XX-XX-XX-XX-XX-XX**' by default. Its password is '**12345678**'. Once associating with NuWicam board successfully, your IOS device will get an IP address by DHCP protocol.



Figure 5-1 IOS Wi-Fi configuration for NuWicam connection

After associating with NuWicam device, you can execute NuWicam player APP. In Live page, you can play real-time A/V streaming in fully screen and get LED status and temperature sensor data from another NuEdu board.

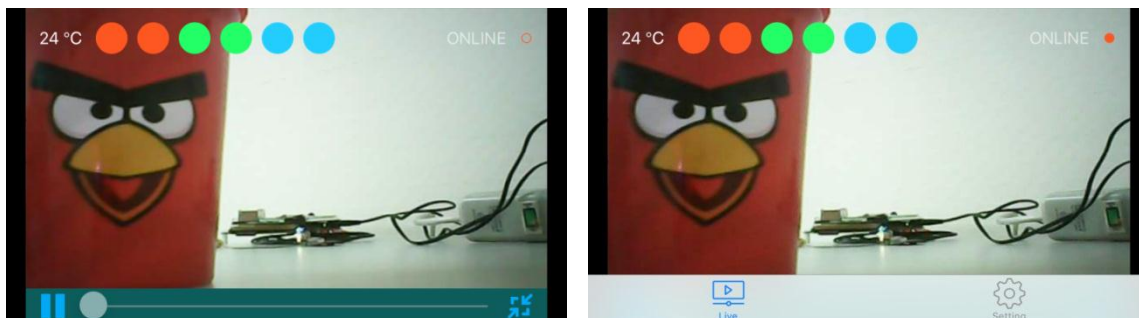


Figure 5-2 NuWicam player screenshots

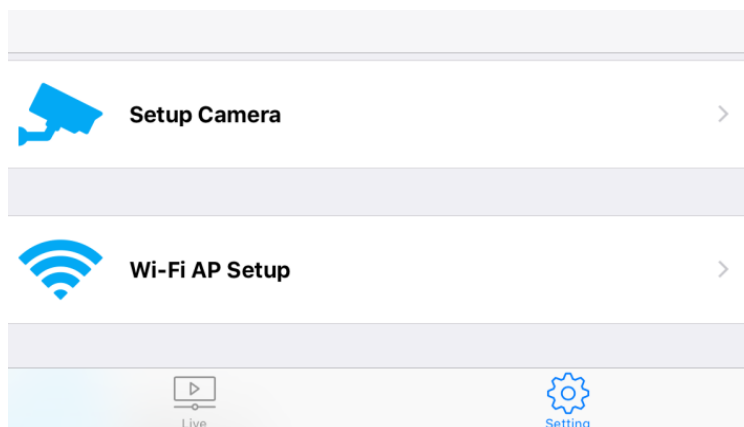


Figure 5-3 Setting pages

In Setting page, it has 2 items - Setup Camera and Wi-Fi AP Setup. In Setup Camera item, you can specify this camera name, MRL, Resolution and streaming bitrate. After modifying these stream parameters, please remember to click 'Restart Stream' button to restart NuWicam stream subsystem.

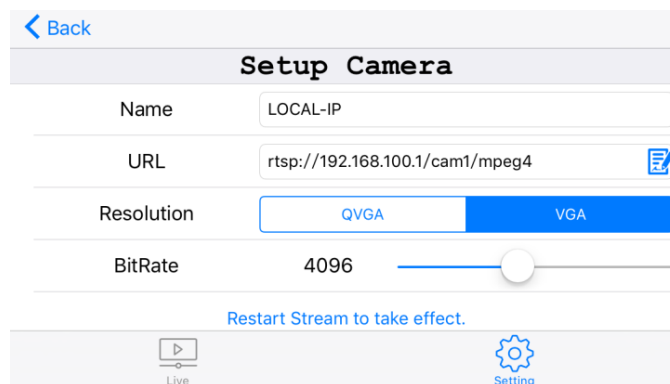


Figure 5-4 Setup camera page

In Wi-Fi AP Setup item, you can specify prefix name of SSID, Wi-Fi password. After you modifying these stream parameters, please remember to click 'Restart Wi-Fi' button to restart NuWicam Wi-Fi networking subsystem and re-associating with NuWicam's SSID you preferred.

Figure 5-5 Wi-Fi access point setup page

In APP version item, it shows NuWicam APP version for your information.

Figure 5-6 NuWicam player version inforatmion

6    DEBUG BOARD DRIVER INSTALLATION

**NuWicam debug board** provides a NUC123 VCOM function. In this chapter, we will guide VCOM driver installation step by step. After connecting with NUC123 VCOM port, you will get an unknown device notice.




Name	Date modified	Type	Size
 nuvotoncdc.cat	2015/7/3 上午 09:41	Security Catalog	8 KB
 NuvotonCDC.inf	2015/7/3 上午 09:41	Setup Information	2 KB
 readme.txt	2015/7/3 上午 09:41	Text Document	1 KB

Figure 6–1 NUC123 VCOM driver for window platform

On this unknown device item, click right button of mouse to install the driver.

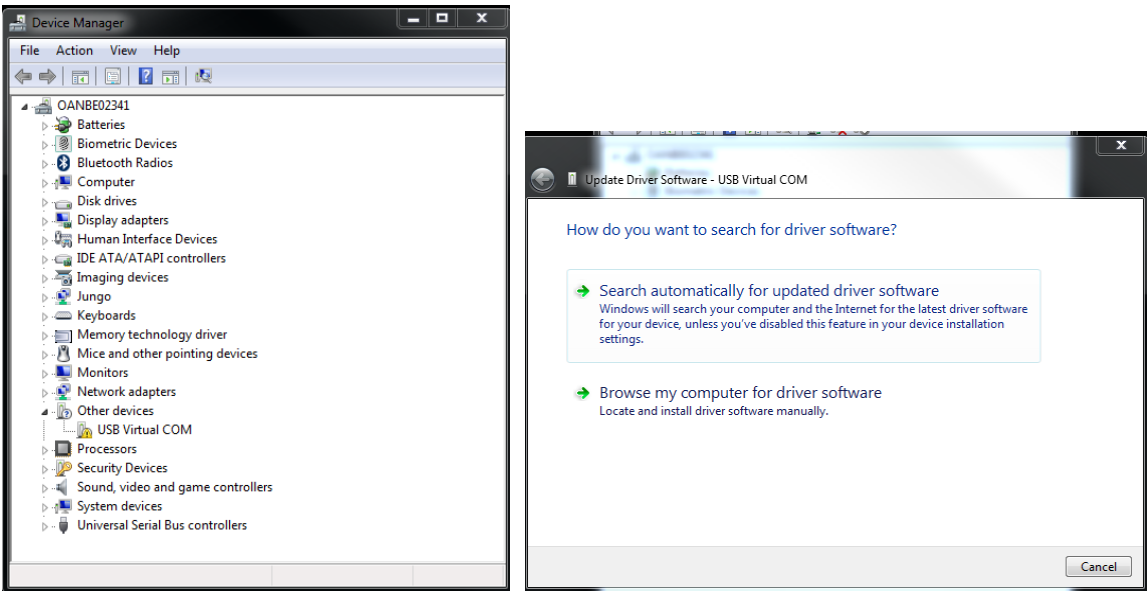


Figure 6–2 Unknown device and installing driver

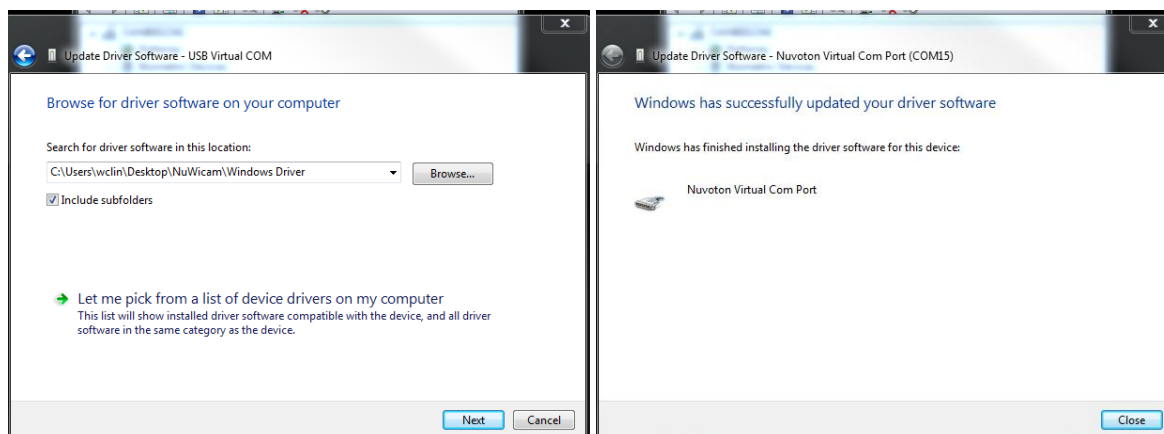


Figure 6-3 Select driver path and installed driver

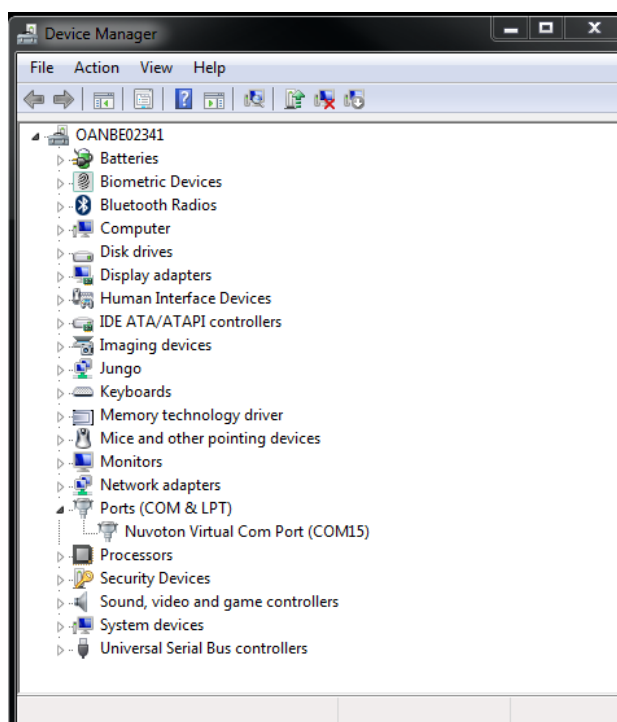


Figure 6-4 NUC123 VCOM - COM15 ready

## 7 AS UVC CAMERA

**NuWicam** also provides a simple USB video class(UVC) firmware. You can follow below steps to test function.

- (1) To remove J1 switch with a jumper on NuWicam debug board **to enter 'Normal Mode'**.
- (2) To mount NuWicam debug board to NuWicam main board's CON2 connector.
- (3) To plug in USB lines into '**USB**' ports of NuWicam debug board.
- (4) Press 'SW1' button to reset board.
- (5) Window will help to install UVC camera automatically. After UVC driver installation is done, you can see a 'NUWICAM USB UVC Device' in device manager window.
- (6) After that, open UVC capture utility to test UVC function. For example, you can use 'WebcamViewer' or 'AMCap'.

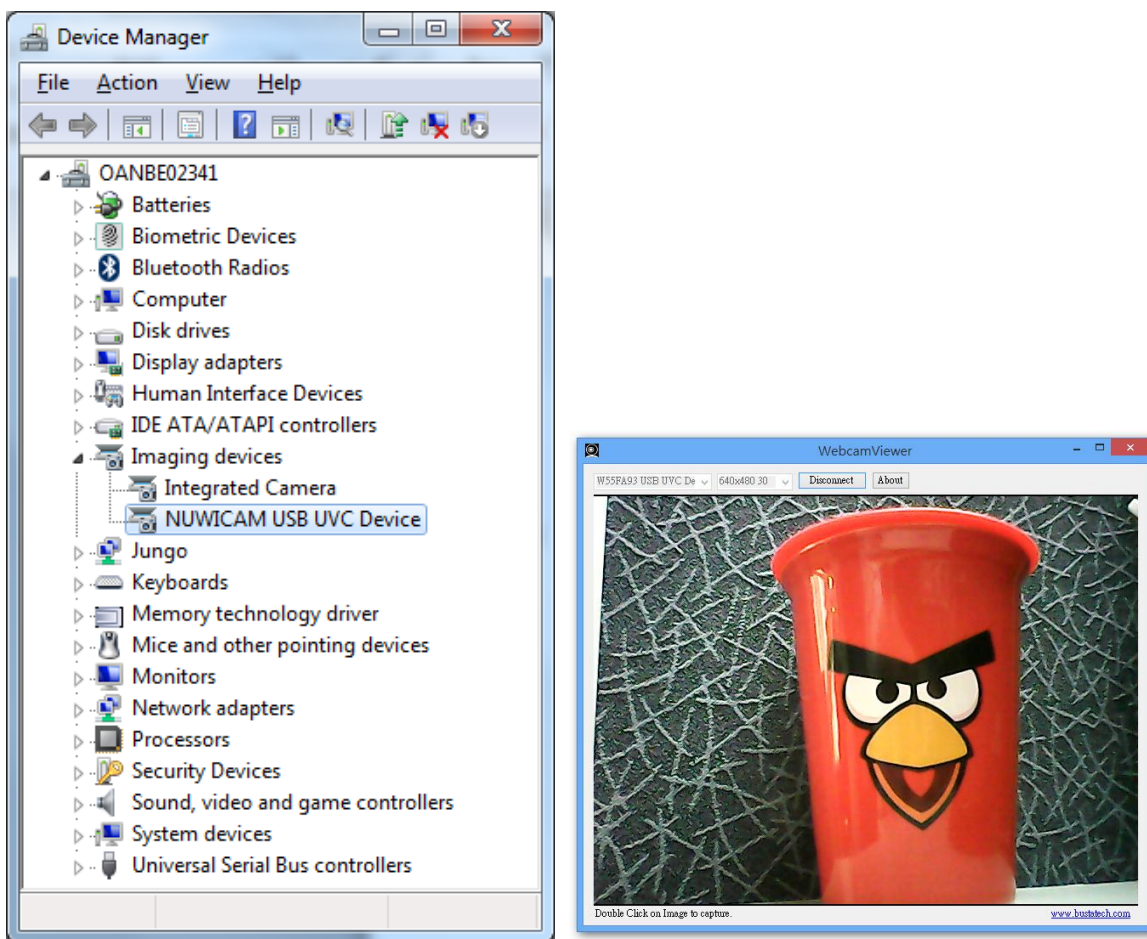


Figure 7-3 NuWicam UVC device information and snapshot

## 8 TROUBLESHOOT

### 1. Why I see horizontal banding phenomenon on NuWicam GC0308 board?

The root cause is difference of AC power frequency. Default setting of NuWicam is 60Hz, it is different with 50Hz. If you need to change to 50Hz, you can modify kernel configuration to 50Hz.

Please modify arch/arm/configs/nuwicam\_gc0308\_defconfig configuration file.

```
...  
CONFIG_FLICKER_60HZ_DEV1=y  
# CONFIG_FLICKER_50HZ_DEV1 is not set  
...
```

to

```
...  
# CONFIG_FLICKER_60HZ_DEV1 is not set  
CONFIG_FLICKER_50HZ_DEV1=y  
...
```

Then, rebuild the Linux kernel.



## 9 REVISION HISTORY

Date	Revision	Description
2016.07.31	1.00	1. Initially issued.
2016.08.17	1.01	2. Modify Nuduino to NuMaker UNO
2016.08.31	1.02	3. Add troubleshoot section.

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