element14

CAM8200-U

A USB 5M Camera Solution for Atmel SAMA5D4 Xplained

By

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Version 1

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DISCLAIMER

This product is intended to be used for **ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY** and is not considered by element14 to be a finished end product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards.

The goods being provided are not intended to be complete in terms of required design and/or manufacturing related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards.

Revision History:

Version	Date	Description
1.0	13/03/2015	Original Version

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1. Overview

CAM8200-U is a new 5-megapixel USB camera module designed by Embest Technology and featured with automatic focus, white balance, exposure control and gain control. It is currently compatible with Atmel SAMA5D4-XULT and Freescale i.MX 6 processors-based evaluation boards from Embest including RIoTboard and MarS Board. CAM8200-U can also work with PCs installed with Windows 2000\Windows XP\Windows 7 system (the driver required will be installed automatically under Windows systems). CAM8200-U implements image capture by working with an evaluation board to which the module is connected through a mini USB cable.

1.1 Product Features:

- Product Dimensions: 43mm×43mm×5.88mm
- Operating Temperature: -20 ℃ ~ 70 ℃
- Operating Temperature for Stable Imaging: 0 ℃ ~ 50 ℃
- Focus: Auto
- Object Distance: 30cm ~∞
- Resolution: 600LW/PH (Center)
- Interface: USB 2.0
- Power Consumption: 150mW (VGA), 200 mW (QSXGA)
- Active Array Size: 2592×1944
- Pixel Size: 1.4μm×1.4μm
- Max Frame Rate: 15 fps (QSXGA)
- AGC/AEC/White Balance: Auto
- Compatible Boards: SAMA5D4-XULT, MarS Board, RIoTboard (can also work with a PC installed with Windows 2000\Windows XP\Windows 7)

1.2 Packing List

- CAM8200 Module×1
- Mini USB Cable×1 (Mini type B male to USB2.0 type A male)

1.3 Interface Definitions

Below are the lists the pin definitions of the OTG interface on CAM8200-U:

USB OTG interface pins

Pins	Definitions	Descriptions
1	VBUS	+5V
2	DN	USB Data-
3	DP	USB Data+
4	ID	USB ID
5	GND	GND

Figure 1-1 OTG interface of CAM8200-U

1.4 Hardware Connections

This section contains a list of hardware required and will introduce how to connect them together.

Hardware Required:

- Target board (SAMA5D4-XULT)
- CAM8200-U Module
- SD card
- Mini USB Cable (UART8000-U)
- 5V power adapter
- 4.7 inch TFT-LCD module (LCD8000-43T-EX1)
- 7 inch TFT-LCD module (LCD8000-70T-EX1)

1. As shown in the following image, please use the Mini USB cable to connect CAM8200-U camera module to the USB interface of an evaluation board.

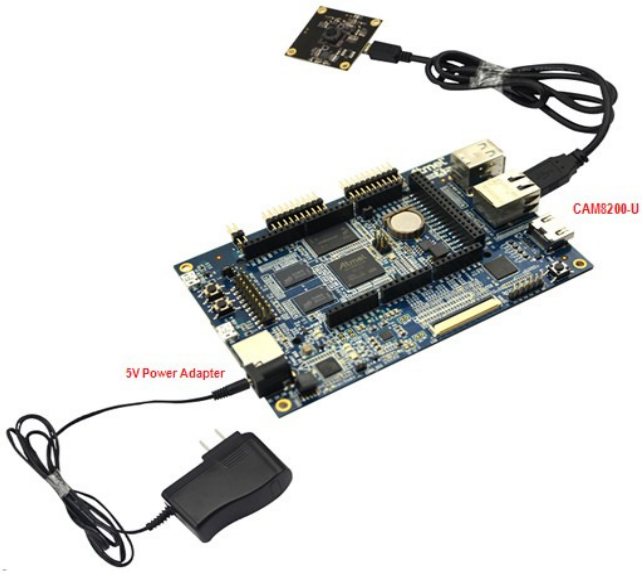
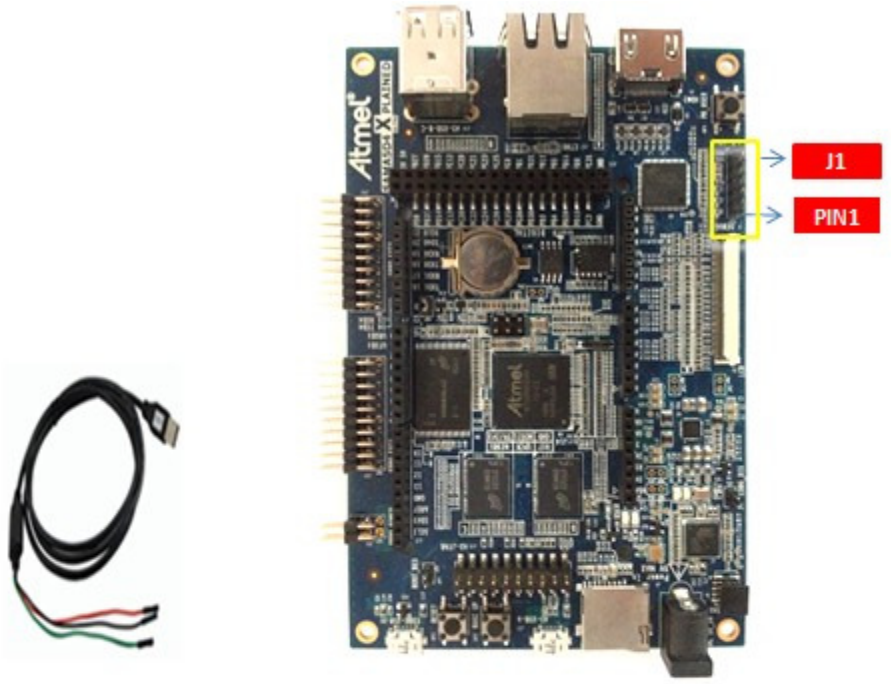


Figure 1-2 Hardware Connections 1

2. Connect an UART8000-U converter cable to the J1 pin header on SAMA5D4-XULT according to the illustration shown below, and then connect the other end of the cable to an USB interface of your PC.



UART8000-U		SAMA5D4-XULT	
Line	Signal	PIN	Signal
Black	GND	6	GND
Red	TXD	3	RXD
Green	RXD	2	TXD

Figure 1-3 Hardware Connections 2

Note:

📖 please refer to UART8000-U Quick start guide for information on software configurations.

3. Connect an LCD module to LCD pin header on SAMA5D4-XULT according to the illustration as below.

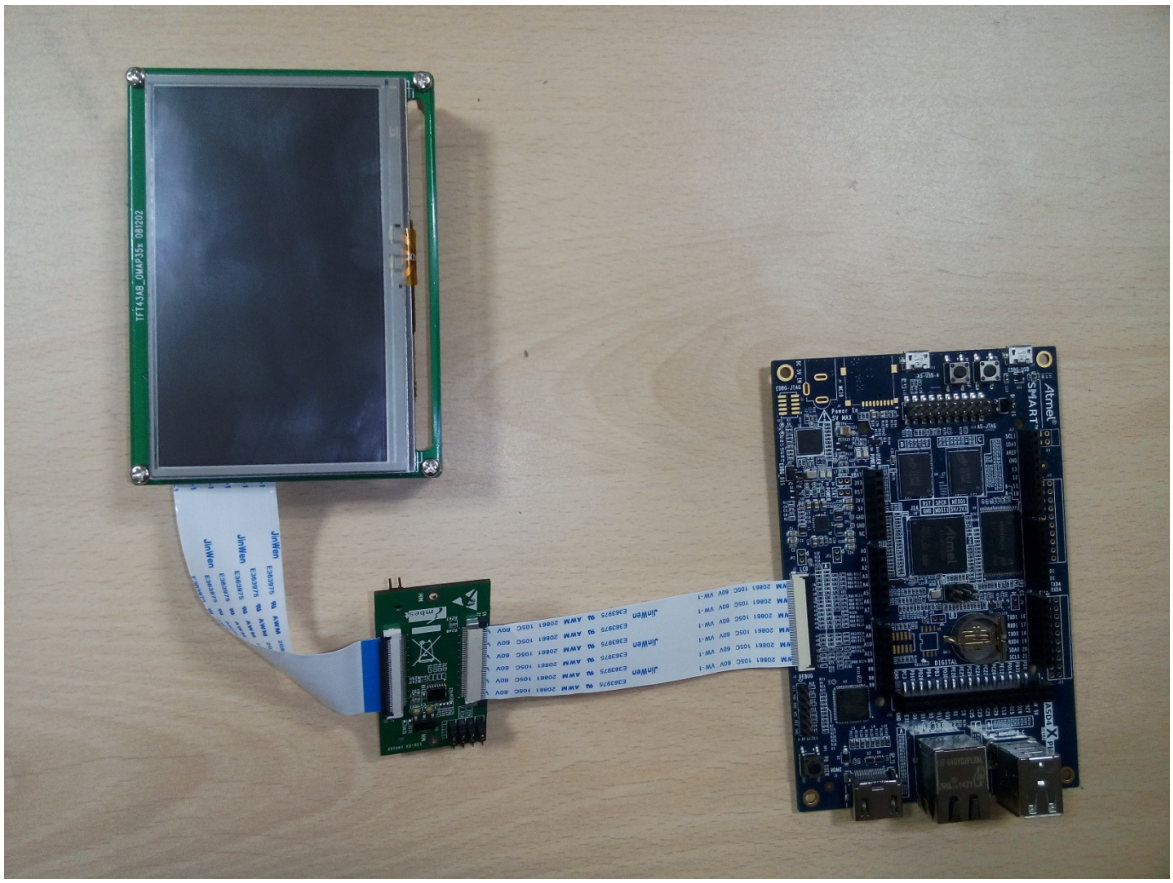


Figure 1-4 Hardware Connections 3

2. Compile and Run the Example Program

1. The example code requires a PC running Linux in order to cross-compile.
2. Download the toolchain from below link.

   https://releases.linaro.org/14.09/components/toolchain/binaries/gcc-linaro-arm-linux-gnueabihf-4.9-2014.09_linux.tar.bz2

   2.1 Extract the toolchain to home directories.

   $ tar -xvf arm-linux-gnueabihf-4.9-2014.09_linux.tar.bz2

   2.2 Write a shell script to create the toolchain.

   $ gedit toolchain.sh

   Encapsulate the below contents within the toolchain.sh file and save it.

```
export PATH=$PATH:/home/<user>/<path to bin directory of the downloaded toolchain>
export ARCH=arm
export CROSS_COMPILE=arm-linux-gnueabihf-
```

3. Enter to the following kernel:

   cd linux-at91

```
make distclean

make sama5d4_defconfig
```

   make menuconfig

   as the following kernel configs:

```
Device Drivers  --->

  Multimedia devices  --->

   [*]  Video capture adapters  --->

     [*]  V4L USB devices  --->

       <*>  USB Video Class (UVC)

        [*]  UVC input events device support
```

```
Graphics support   --->

        <*> Lowlevel video output switch controls

        <*> Support for frame buffer devices   --->

                <*>     AT91 HLCD Controller support

        Console display driver support   --->

                <*> Framebuffer Console support

                [*]     Map the console to the primary display device
```

Input the following commands to compile the kernel:

```
make –j4
```

You can find the file "zImage" on the directory of arch/arm/boot/, replace the zImage on the SD card.

4. Download the example code from http://www.element14.com/community/docs/DOC-68486#cdownloads and extract the files to convenient location.

5. From within the directory of the example program, run the toolchain.sh and compile the source code by executing the below simple steps:

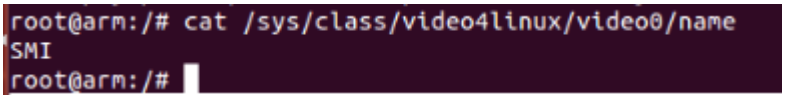
   $. toolchain.sh
   $ arm-linux-gnueabihf-gcc -o "Executable name" "Source file.c"

   Copy executable file into root partition of SD card

6. Connect the SAMA5D4 Xplained board to a PC using USB to serial debug cable and power-up the board by making appropriate jumper settings.

7. Make sure the CAM8200-U and LCD are connected to the target board

8. Check whether camera device is connected to /dev/videoX



9. Run the program into SAMA5D4 target board
   root@arm:~# cd /
   ./ use command given below for LCD Display testing

   4.3-inch LCD:

   ```
   ./luvc_test -c -f yuyv -s 320x240 -S /dev/video0
   ```

   7-inch LCD:

   ```
   ./luvc_test -c -f yuyv -s 1280x720 -S /dev/video0
   ```

10. Program will be running now and you can see image captured on LCD display as shown below.

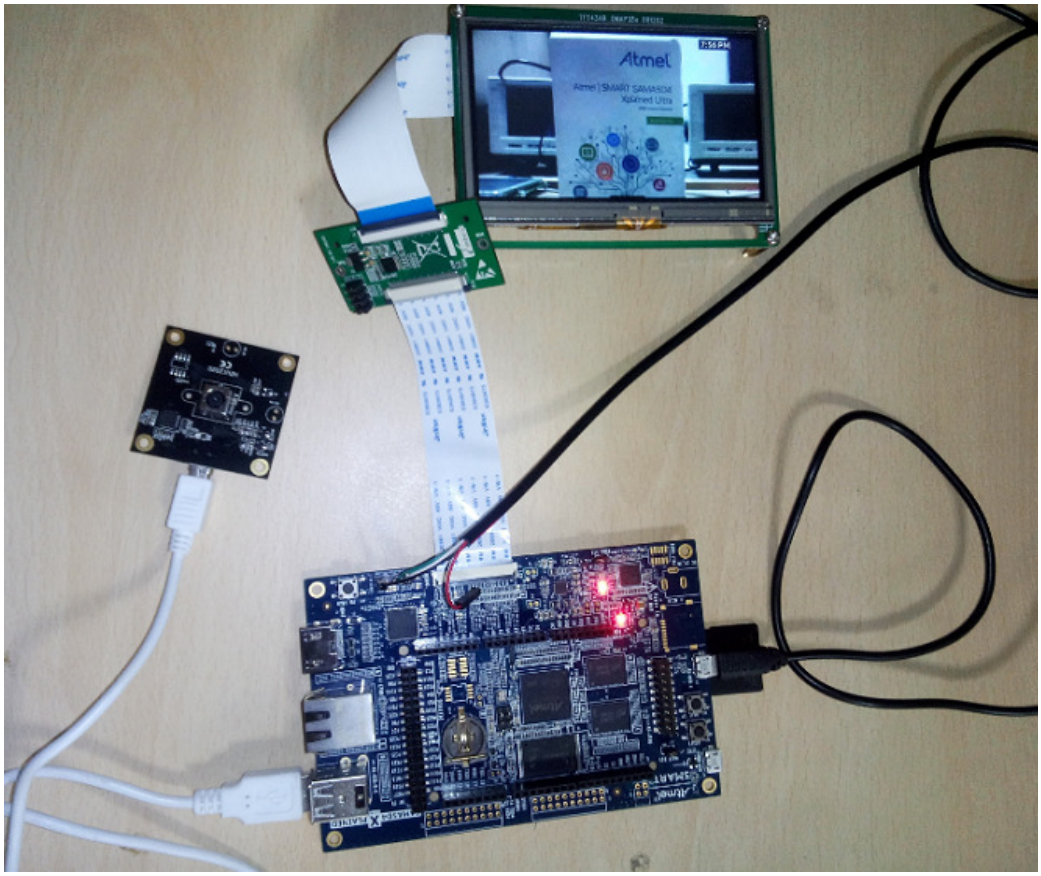


Figure 1-5 Testing Setup

11. Run the program into SAMA5D4 target board
    root@arm:~# cd /
    ./ use command given below for Photographed testing

    4.3-inch LCD:

    ```
    ./luvc_test -c -f yuyv -s 320x240 -c --skip 10 /dev/video0
    ```

    7-inch LCD:

    ```
    ./luvc_test -c -f yuyv -s 1280x720 -c --skip 10 /dev/video0
    ```

12. Program will be running now and capture.jpg or capture.raw will be generated on the directory /tmp/ of root partition of SD card.

The command "-skip 10" means skip 10 frames which can catch the image clearly.