MYD-SAM9G15/9G25 /9G35/9X25/9X35 User Manual

Version V1.6

Version History

Version Number	Description	Time
V1.0	Initial Version	2012.07.23
V1.1	(1) Modify JP6 description in chapter 2.4 (2) Modify program errors in chapter 4.8.2 (3) Modify program in chapter 4.9.1	2012.08.29
V1.2	Modify the description of serial port and SDCard in Table 2-1	2012.12.05
V1.3	modify the phenomenon explanation of usb_audio_looprec， add a rs485 sample program，add 7.0-inch screen support， correct the instructions of JP8 for MDK and Linux downloadadd, add two methods of u-boot compiling, screen calibration instructions, etc.)	2013.02.22
V1.4	modify the contact infomation)	2013.03.28
V1.5	add Qt support, modify the image path and the manually download picture of Linux; modify the SAMBA path in ” 4.3.1 Install download tool” and “5.3.1 Install Download Tool”	2013.04.24
V1.6	ARM cross-compiler tool upgrade to 2010 version	2013.06.24

Directory

Chapter 1 Product Overview

1.1 Product Description

MYIR has lunched MYD-SAM9X5 series boards which are based on Atmel AT91SAM9X5 series processor (AT91SAM9G15/25/35, AT91SAM9X25/35, based on the ARM926EJ-S kernel). Running at up to 400 MHz, MYD-SAM9X5 have 256MB NandFlash, 4MB DataFlash,128MB DDR2 SDRAM and supports Linux 2.6.39 as well as Android 2.3.5 operating system, which also provides relevant sources and have rich peripheral interfaces: High-speed USB2.0, Audio input, Audio output, LCD interface, CAN interface, 10/100Mbps Ethernet MAC, JTAG debug interface, Serial port and Micro SD card interface.

1.2 Product Preview

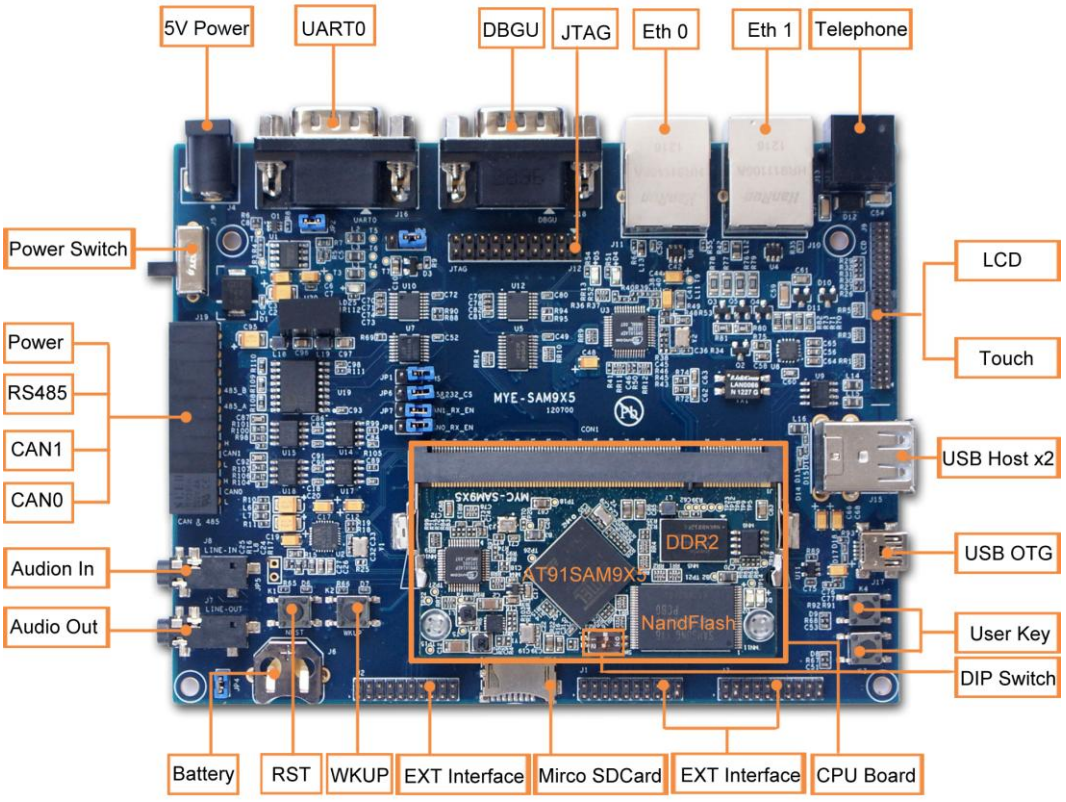


Figure 1-1

1.3 Product Features

Based on AT91SAM9X5 processor, MYD-SAM9X5 integrates all the chip functions and features. The main features are as follows:

- Extensive Peripherals for Connectivity

  Include Ethernet, USB2.0 Device, USART, SD Card and so on.

- High-performance Data Speedway

  Running at up to 400MHz, Atmel SAM9X5 series microprocessor has a high data bandwidth architecture based on 12-layer bus matrix.

- Next-generation Memory

  LPDDR/DDR2 support ensures supply and cost efficiency. In addition, these MPUS feature MLC/SLC NAND Flash support 24-bit error code correction.

- Low Power and Low System Cost

  In backup mode, power consumption is only 300uW/MHz at 400MHz operation and 8uA. 3.3V IOs eliminate the need for external level shifter, while 0.8mm ball pitch packages reduce PCB design complexity and cost.

The following simple lists the basic features of MYD-SAM9X5.

Electrical parameters

- Operating Temperature: -40℃~85℃
- Electrical Specifications: +5V power supply
- Mechanical Dimensions:
  - Base Board: 150 mm x 108 mm
  - CPU module: 86 mm x 68 mm

Processor

- AT91SAM9G15/G25/G35/X25/X35 (32 bits ARM RISC processor) runs at up to 400MHz
- 16KB Data Cache, 16KB Instruction Cache

Memory

- 32KB Chip SRAM, 64KB Chip ROM
- 256MB NandFlash, 4MB DataFlash
- A 128MB DDR2 SDRAM.

Audio and Video Interface

- An Audio 3.5mm Input Interface
- A Two-channel Audio 3.5mm Output Interface

LCD Touch-Screen Interface

- 24 True Color
- Resolution: Current 4.3-inch 480x272 and 7.0-inch 800x480, the highest can reach up to 1280 x 860

Note: Only MYD-SAM9G15、MYD-SAM9G35、MYD-SAM9X35 have graphical output function.

Transmission Interface

- Standard JTAG Interface
- Micro SD Card Interface
- Serial Ports
  - A DBGU Port (Debug Unit)
  - A USART0 (Shared With RS485)
- RS485 Interface sharing with USART0 can switch function by Jumper.
- Two CAN Interfaces (Only MYD-SAM9X25 and MYD-SAM9X35 have CAN Interface)
- 2 High-speed USB HOST Interfaces
- A Mini USB OTG Interface
- Ethernet MAC
  - MYD-SAM9G15 doesn't have Ethernet MAC
  - MYD-SAM9X25 has two Ethernet MAC (J10 and J11)
  - Others (MYD-SAM9G25、MYD-SAM9G35、MYD-SAM9X35) have only a Ethernet MAC.

LED Indicator

- A Power Indicator (CPU module: Red)

- A Users Light/System Heartbeat Light (CPU module: Blue)
- A Power Indicator (Base Board: Red)

1.4 Product Configuration

No	Name	Number	Note
1	MYD-SAM9X5 Development Board	1	Base Board+CPU module
2	1.5 Meters Crossover Cable	1	
3	1.5 Meters Mini USB 2.0 Cable	1	
4	5V/2A DC Power adapter	1	
5	Serial Cable	1	
6	Product DVD	1	Include Schematic (PDF), User Manual, Source Code, etc.
7	4.3/7.0 Inch LCD Touch Screen	1	optional

Chapter 2 Hardware Resource Introduction

2.1 CPU module+Base Board Resources Overview

SAM9x5 resources are shown in table2-1:

Name		9X25	9X35	9G15	9G25	9G35
Processor		AT91SAM9G15/9G25/9G35/9X25/9X35(ARM926EJ-S Core, frequency at up to 400MHz)				
Memory		128MB SDRAM				
Flash		256MB nandflash; 4MB serial dataflash				
EEPROM		64KB serial eeprom				
USB	USB HOST	2	2	2	2	2
	USB OTG	1	1	1	1	1
Audio	Audio Input	1	1	1	1	1
	Audio Output	1	1	1	1	1
Network	ETH Port	2	1	0	1	1
Serial	DBGU Serial	1	1	1	1	1
	UART0	1	1	1	1	1
JTAG	JTAG Interface	1	1	1	1	1
LCD	Support 4.3/7.0 Inch Touch Screen	0	1	1	0	1
RTC	Real Time Clock On Board and backup battery	1	1	1	1	1
Extended Interface	20 Pins User Extended Interface	3	3	3	3	3
Power	5V Power Input	1	1	1	1	1
SD Card	Micro SD	1	1	1	1	1
CAN	CAN Interface	2	2	0	0	0
RS485	RS485 Interface	1	1	1	1	1
Button	User Button	2	2	2	2	2
	System Button	2	2	2	2	2
Telephone Interface		1	1	1	1	1

Table 2-1

2.2 CPU module Introduction

2.2.1 CPU

The ARM926EJ-S processor features a Jazelle technology enhanced 32-bit RISC CPU, flexible size instruction and data caches, tightly coupled memory(TCM) interfaces and memory management unit(MMU). It also provides separate instruction and data AMBA AHB interfaces suitable for Multi-layer AHB based systems. The ARM926EJ-S processor implements the ARMv5TEJ instruction set which includes an enhanced 16x32-bit multiplier capable of single cycle MAC operations and 16-bit fixed point DSP instructions to enhance performance of many signal processing applications as well as supporting Thumb technology.

2.2.2 DDRAM

DDRAM chooses H5PS1G63JFR. Its characteristics are as follows:

- VDD=+1.8V±0.1V, VDDQ= +1.8V ±0.1V
- All inputs and outputs are compatible with SSTL_18 interface
- Auto refresh and self-refresh
- Organizational structure:8 blanks, Page size:2K,Bit wide:16bit,Total size: 64M x 16
- Programmable CAS latency 3, 4, 5and 6 supported
- Programmable additive latency 0, 1, 2, 3, 4 and 5 supported
- Programmable burst length 4/8 with nibble sequential and interleave mode
- Full strength driver option controlled by EMR
- Refresh Cycle
  - 0 C° ~ 85 C°: 7.8 us
  - 85 C° ~ 95 C°: 3.9 us

DDRAM circuit peripheral is shown in figure 2-1:

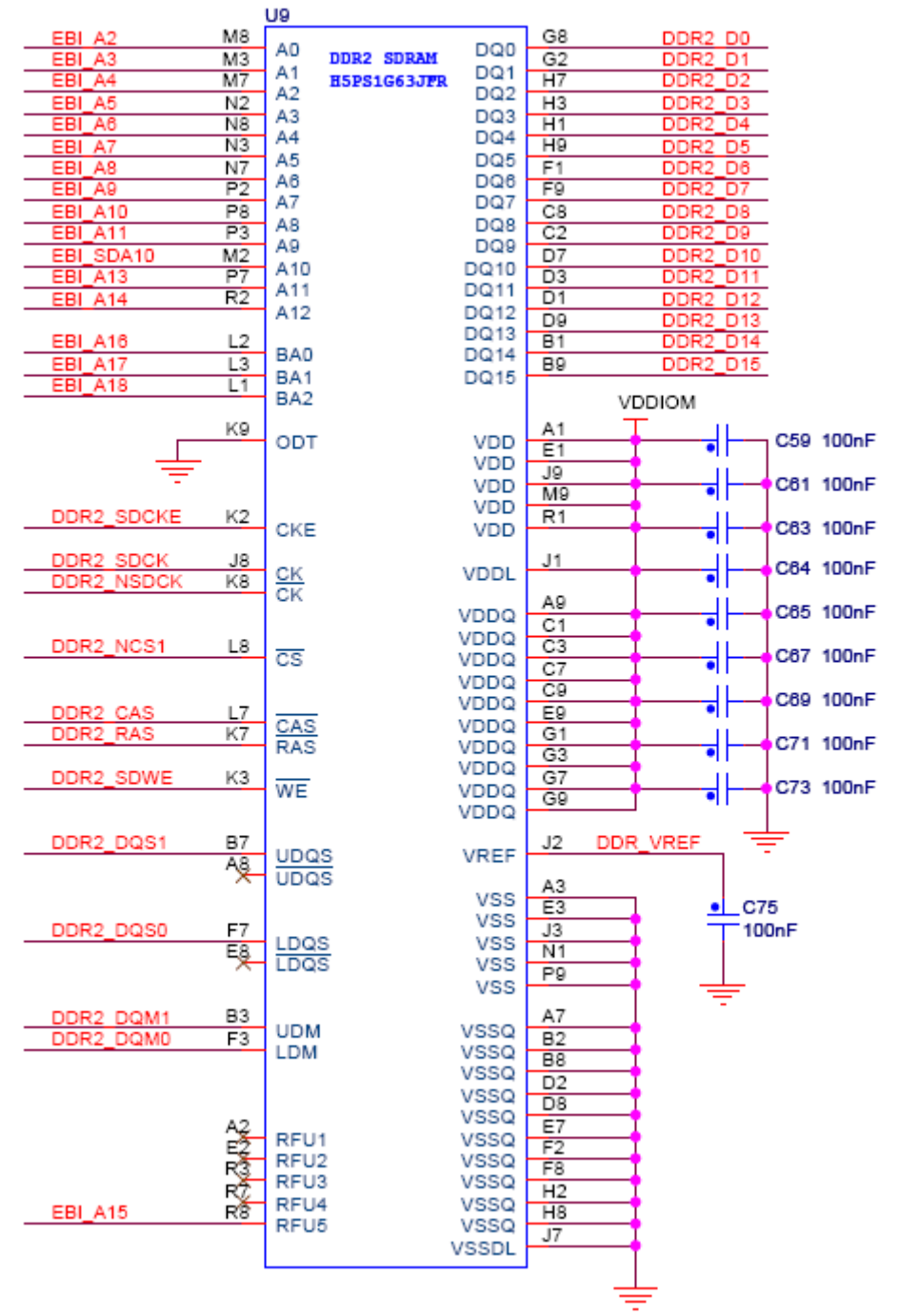


Figure 2-1

2.2.3 Clock Circuit

(1) Internal clock choose 12 MHz crystal. Clock Circuit is shown in figure 2-2:

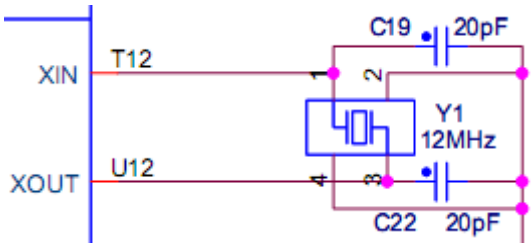


Figure 2-2

(2) RTC clock chooses 32.768 KHz crystals. Circuit is shown in figure 2-3:

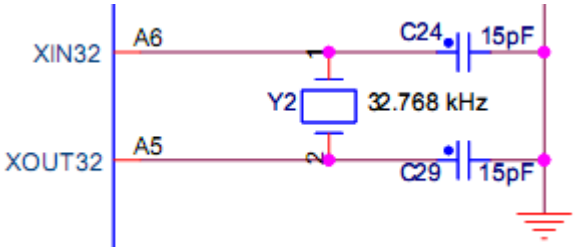


Figure 2-3

(3) RMII mode chooses 50MHz clock. Circuit is shown in figure 2-4:

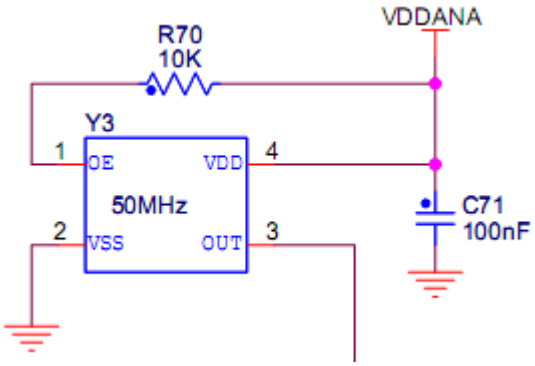


Figure 2-4

2.2.4 Serial DATAFLASH

DATAFLASH chooses AT25DF321. Its characteristics are as follows:

- Single 2.7V-3.6V Supply
- Serial Peripheral interface (SPI) Compatible
  - Support SPI Modes 0 and 3
- 70 MHz Maximum Clock Frequency
- Flexible, Uniform Erase Architecture
  - 4-Kbyte Blocks,32-Kbyte Blocks,64-Kbyte Blocks, Full Chip Erase
- Individual Sector Protection with Global Protect/Unprotect Feature
  - 64-Kbyte Physical Sectors

- Hardware Controlled Locking of Protected Sectors
- Flexible Programming
  - Byte/Page Program(1 to 256 Bytes)
- Automatic Checking and Reporting of Erase/Program Failures
- JEDEC Standard Manufacture and Device ID Read Methodology
- Low Power Dissipation
  - 7 mA Active Read Current (Typical)
  - 15 µA Deep Power-Down Current (Typical)
- Endurance:100,000 Program/Erase Cycles
- Data Retention: 20 Years
- Complies with Full industrial Temperature Range
- Industry Standard Green (Pb/Halide-free/RoHS Compliant) Package Options
  - 8-lead SOIC (200 mil wide)
  - 16-lead SOIC (300 mil wide)

Processor has two SPI. SPI0 controls data flash. Refer to figure 2-5:

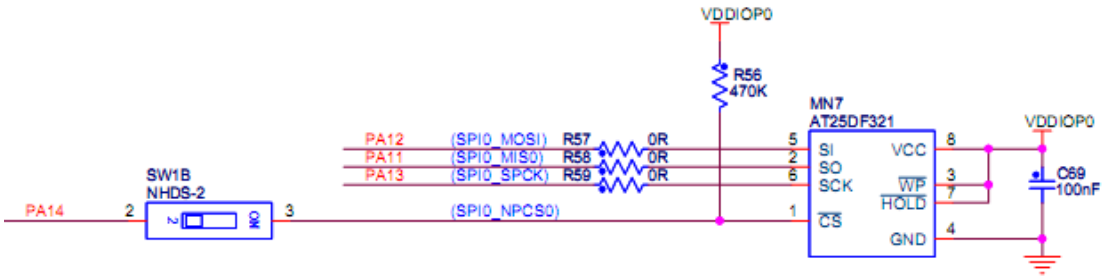


Figure 2-5

2.2.5 NANDFLASH

NANDFLASH chooses K9F2G08U0B. Its characteristics are as follows:

- Organization:
  - Page size: 2K + 64 Bytes
  - Block size: 128K + 4K Bytes (64 Pages)
  - Total size: 256M + 8M Bytes(2048 Blocks)
- Read Operation:

- Random Read: 25 us
- Serial Access: 25 ns

➢ Fast Write Cycle Time:

- Page Program time: 200 us(Typ)
- Block Erase Time: 1.5 ms (Typ)

➢ Power: 2.7V–3.6V

➢ Endurance: 100,000 Program/Erase Cycles

➢ Data Retention: 10 Years

➢ Automatic Program and Erase

➢ Hardware Data Protection

NANDFLASH circuit is shown in figure 2-6:

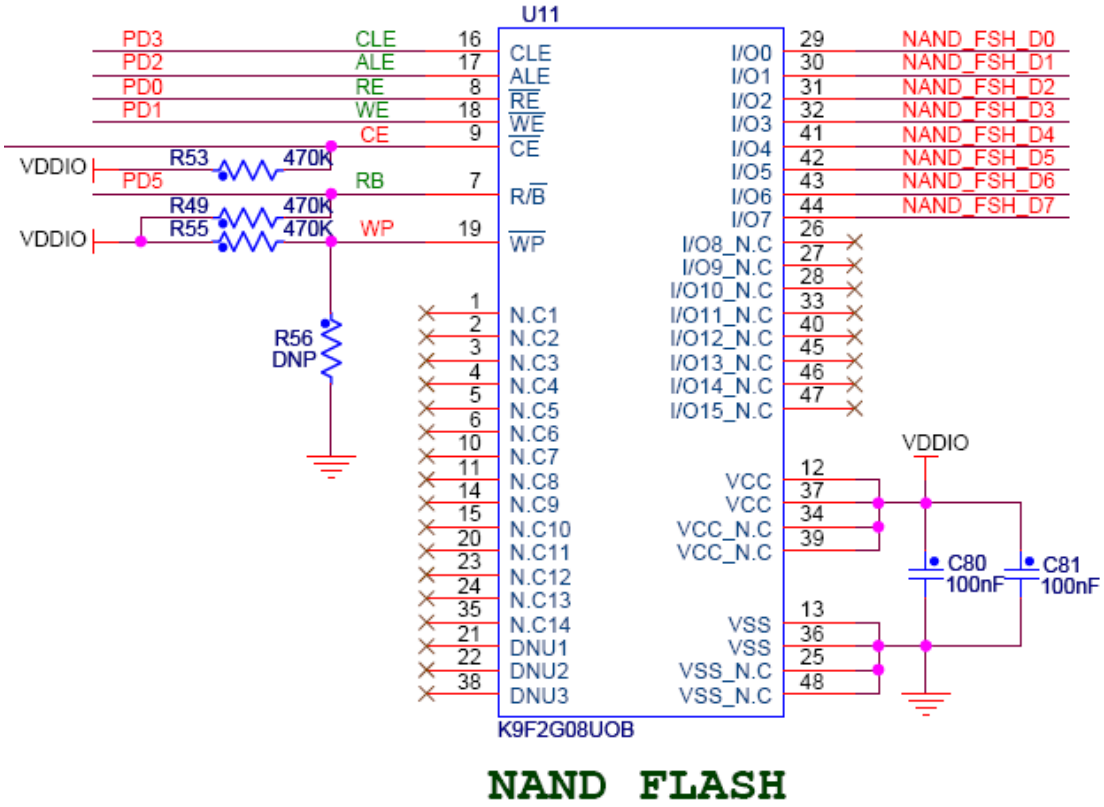


Figure 2-6

2.2.6 Serial EEPROM

Serial EEPROM chooses AT24C512B. Its characteristics are as follows:

- Low voltage and Standard voltage operation
  - 1.8V (Vcc=1.8V to 3.6V)
  - 2.5V (Vcc=2.5V to 5.5V)
- Internally organized 65,536 x 8
- Two-wire Serial interface
- Schmitt Triggers, Filtered input for Noise suppression
- Bidirectional Data Transfer Protocol
- 1 MHz (2.5V, 5.5V), 400KHz(1.8V)Compatibility
- Write Protect Pin for Hardware and Software Data Protection
- 128-byte Page Write Mode (Partial Page Writes Allowed)
- Self-timed Write Cycle (5 ms Max)
- High Reliability
  - Endurance: 1,000,000 Write Cycles
  - Data Retention: 40 years
- Lead-free/Halogen-free Devices
- 8-lead PDIP, 8-lead JEDEC SOIC, 8-lead TSSOP

  8-ball dBGA2, 8-lead Ultra-Thin Small Array (SAP) Packages

Serial EEPROM Circuit is shown in figure 2-7:

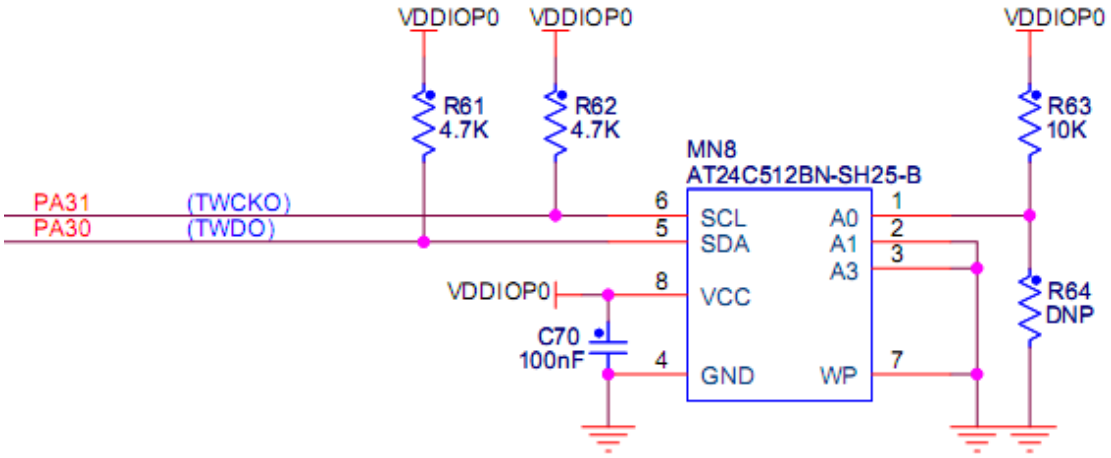


Figure 2-7

2.2.7 LED

System LED and User LED circuits are as shown in figure 2-8:

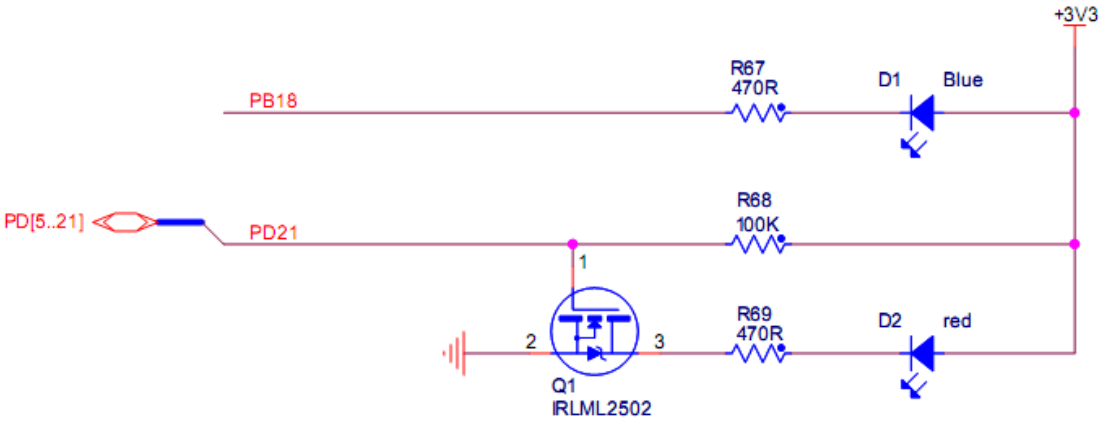


Figure 2-8

2.2.8 Encoding Switch Setting

Num	Function Description	
	ON	OFF
SW1	Enable Nandflash	Disable Nandflash
SW2	Enable Dataflash	Disable Dataflash

Table 2-2

2.3 Base Board Introduction

2.3.1 Universal Serial

Serial circuit is shown in figure 2-9:

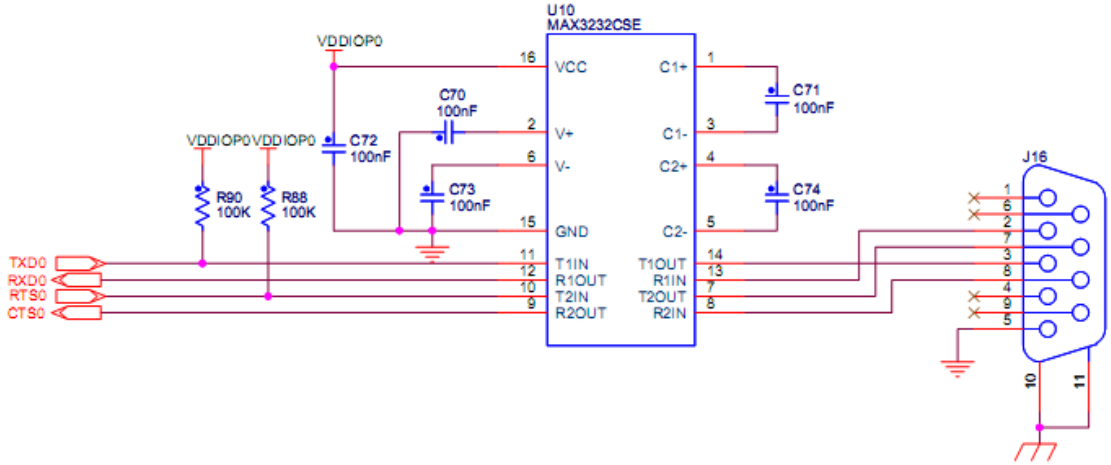


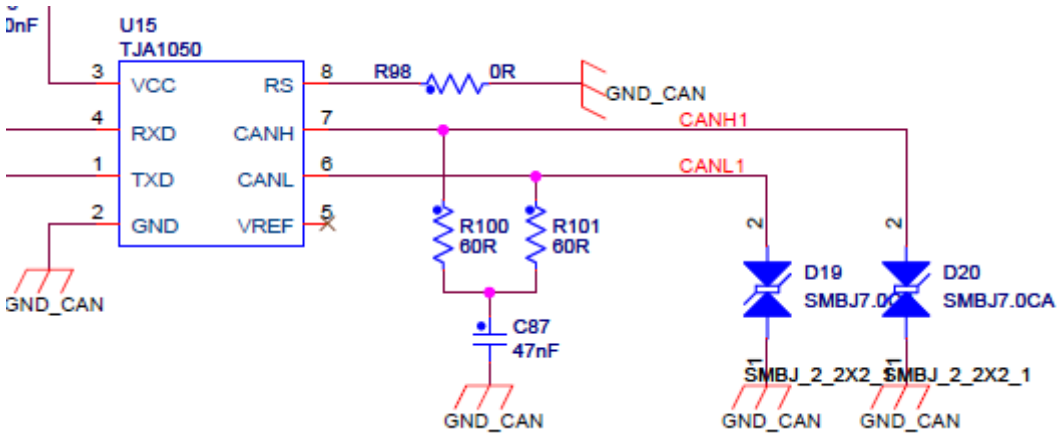
Figure 2-9

2.3.2 CAN BUS

SAM9X35 and SAM9X25 have two CAN interface which choose TJA1050 chip. Its characteristics are as follows:

- Fully compatible with the “ISO 11898” standard
- High speed (up to 1Mbaud)
- Very low ElectroMagnetic Emission (EME)
- Different receiver with wide common-mode range for high ElectroMagnetic Immunity (EMI)
- An unpowered node does not disturb the bus lines
- Transmit Data (TxD) dominant time-out function
- Silent mode in which the transmitter is disabled
- Bus Pins protected against transients in an automotive environment
- Input levels compatible with 3.3V and 5V devices
- Thermally protected
- Short-circuit proof to battery and to ground
- At least 110 nodes can be connected

CAN Bus circuit is shown in figure 2-10:



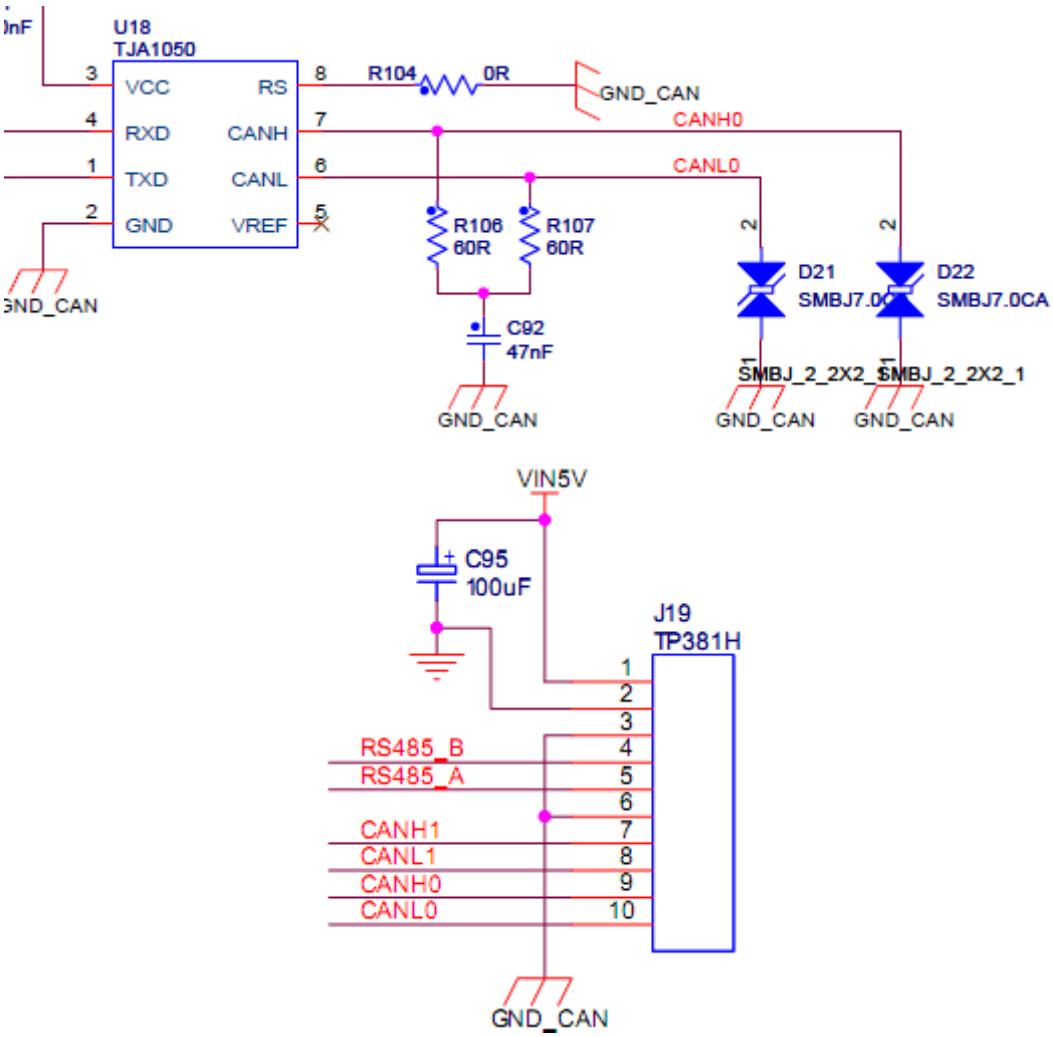


Figure 2-10

2.3.3 JTAG Interface

JTAG interface which has 20 pins is shown in figure 2-11:

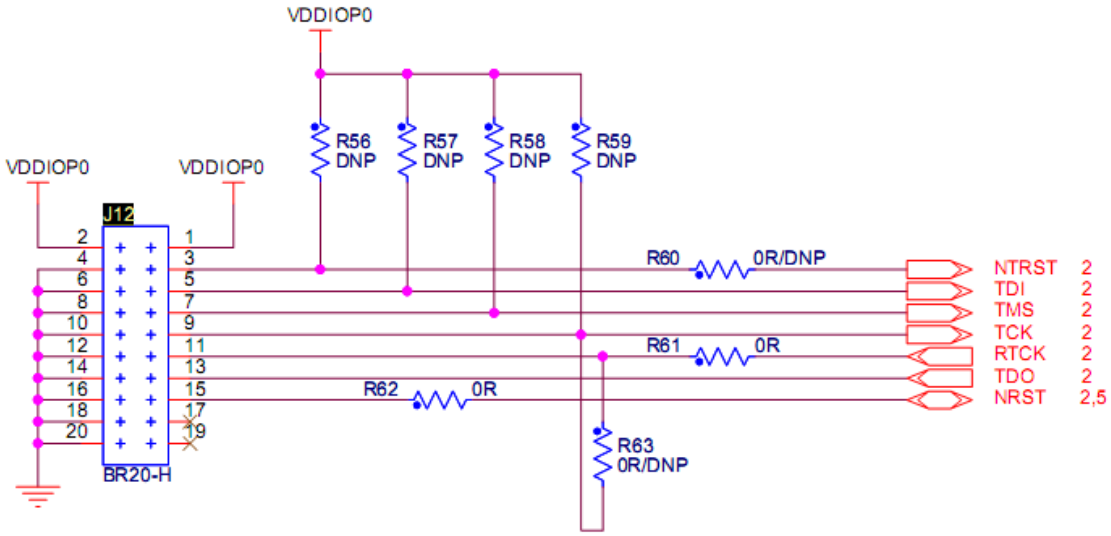


Figure 2-11

2.3.4 LCD Interface

LCD Hardware interface circuit is shown in figure 2-12:

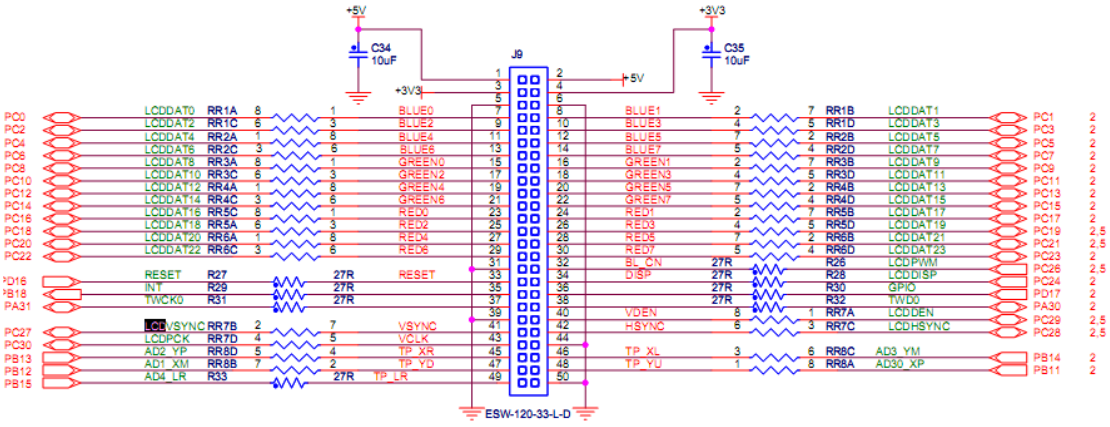
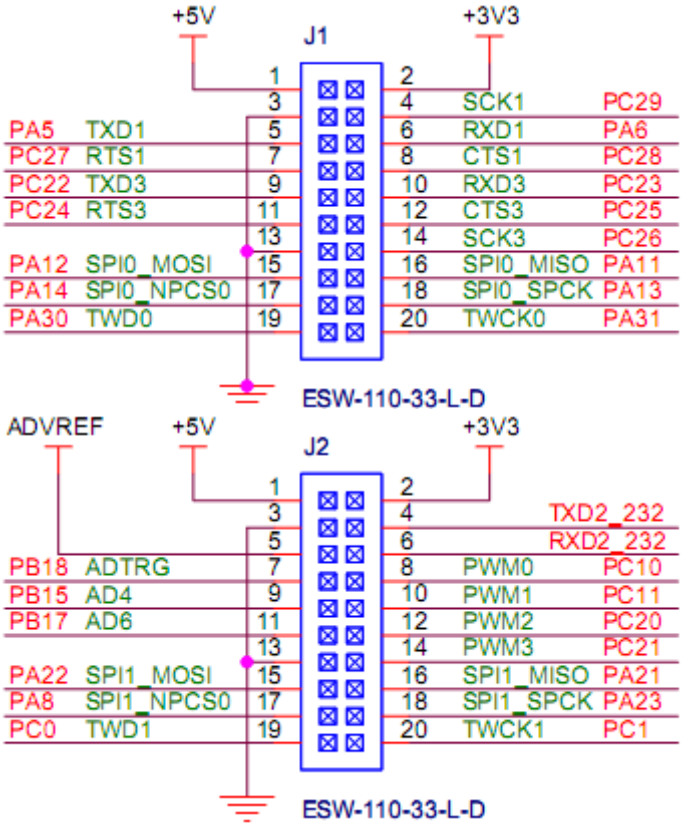


Figure 2-12

2.3.5 User Interface

User interface circuit is shown in figure 2-13:



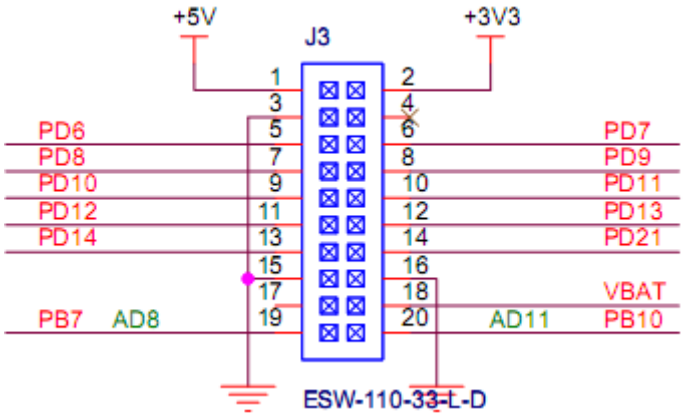


Figure 2-13

2.3.6 Audio Module WM8731

- Audio Performance
  - 97dB SNR (‘A' weighted @ 48kHz) ADC
  - 100dB SNR (‘A' weighted @ 48kHz) DAC
  - 1.42–3.6V Digital Supply Operation
  - 2.7–3.6V Analogue Supply Operation
- ADC and DAC Sampling Frequency: 8kHz–96kHz
- Selectable ADC High Pass Filter
- 2 or 3-Wire MPU Serial Control Interface
- Programmable Audio Data interface Modes
  - I^2S, Left, Right Justified or DSP
  - 16/20/24/32 bit Word Lengths
  - Master or Slave Clocking Mode
- Stereo sound output and input
- The output and input volume control
- Highly Efficient Headphone Driver
- Playback only 18mW
- Analog Pass Through Power only 9mW
- Available in 28-lead SSOP or 28-lead QFN package

WM8731 circuit is shown in figure 2-14:

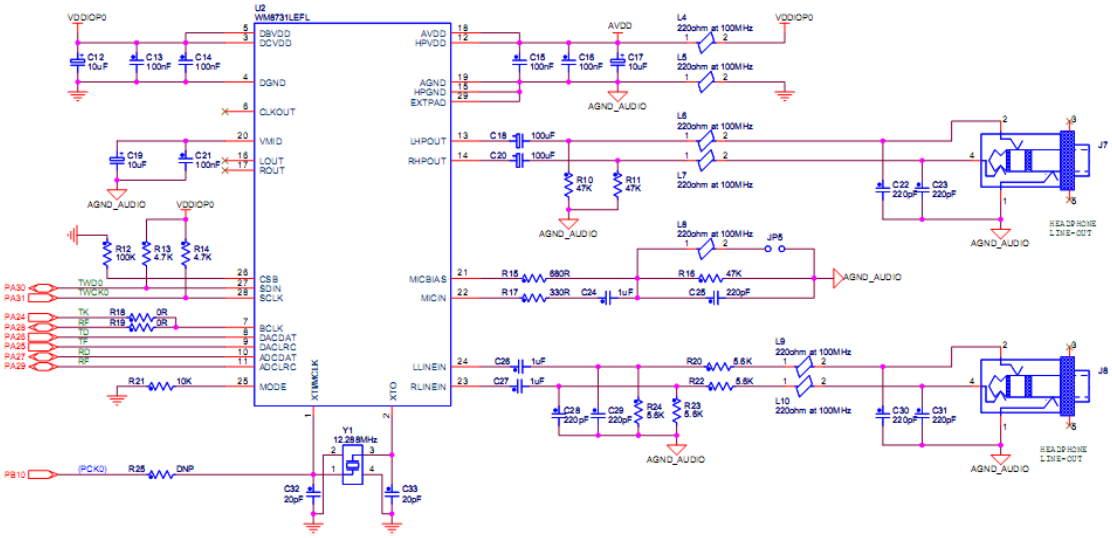


Figure 2-14

2.3.7 USB Module

(1) USB HOST mode chooses AIC1526. Its characteristics are as follows:

- 110mΩ (5V Input) High-Side MOSFE Switch
- 500mA Continuous Load Current per Channel
- 110μA Typical On-State Supply Current
- 1μA Typical Off-State Supply Current
- Current-Limit/Short Circuit Protection
- Thermal Shutdown Protection under Overcurrent Condition
- Under voltage Lockout Ensures that Switch is off at Start Up
- Output can be Forced Higher than Input(Off-State)
- Open-Drain Fault Flag
- Slow Turn ON and Fast Turn OFF
- Enable Active-High or Active-Low

USB HOST Interface circuit is shown in figure 2-15:

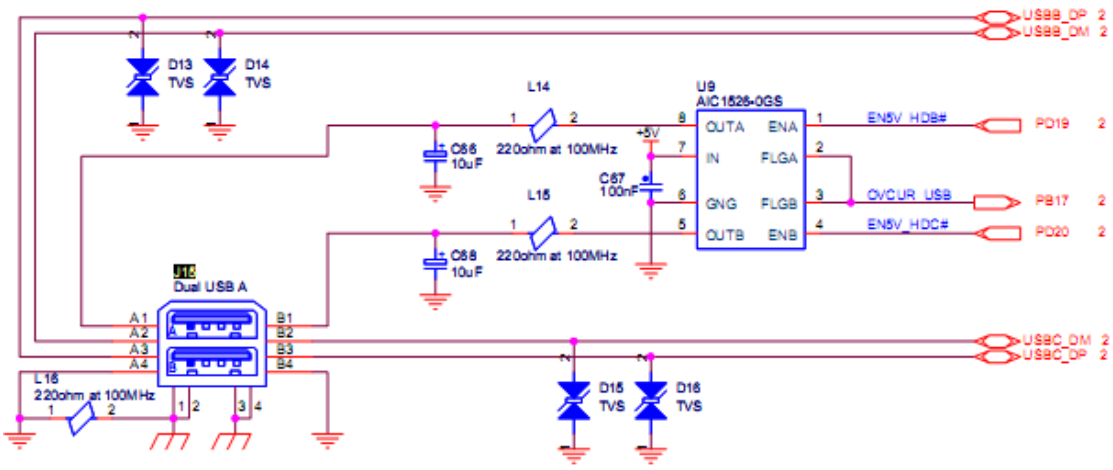


Figure 2-15

(2) USB OTG Mode chooses TPS2051BDBV. Its characteristics are as follows:

- 70-mΩ High-Side MOSFET
- 500 mA Continuous Current
- Thermal and short-Circuit Protection
- Accurate Current Limit(0.75A min, 1.25 A max)
- Operating Range:2.7V to 5.5V
- 0.6-ms Typical Rise Time
- Deglitched Fault Report
- Bidirectional Switch
- Ambient Temperature Range: –40°C to 85°C
- ESD Protection

USB OTG interface circuit is shown in figure 2-16:

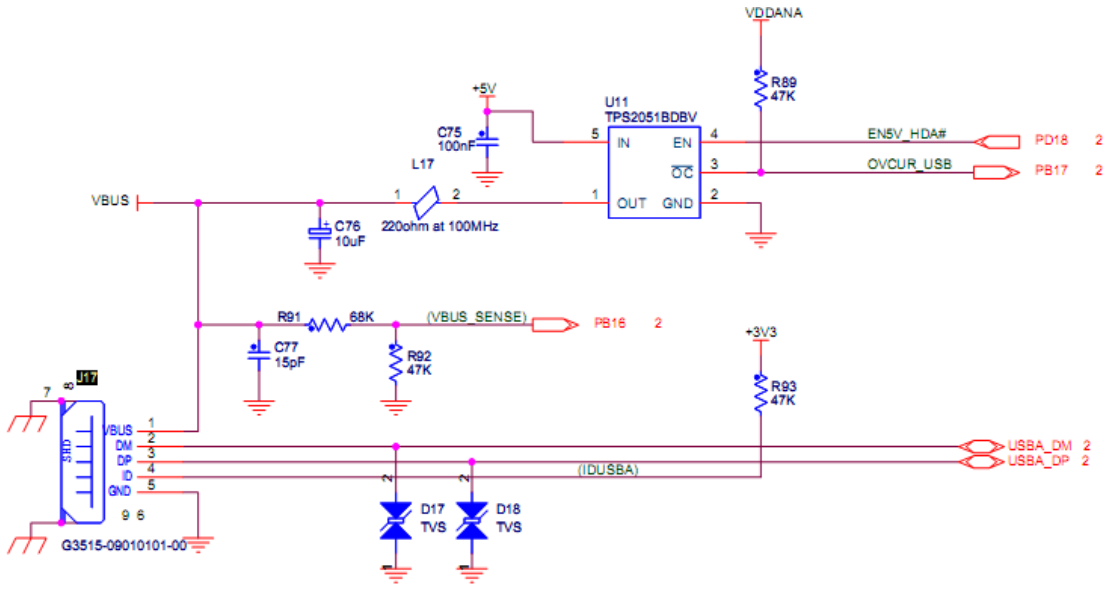

VDDANA
R89
47K
+5V
U11
TPS2051BDBV
C75
100nF
L17
IN
EN
OC
OUT
GND
EN5V_HDA#
OVCUR_USB
PD18
PB17
VBUS
C76
10uF
220ohm at 100MHz
R91
68K
(VBUS_SENSE)
PB16
C77
15pF
R92
47K
+3V3
R93
47K
J17
VBUS
DM
DP
ID
GND
USBA_DM
USBA_DP
(IDUSBA)
D17
TVS
D18
TVS
G3515-09010101-00

Figure 2-16

2.3.8 Telephone Interface

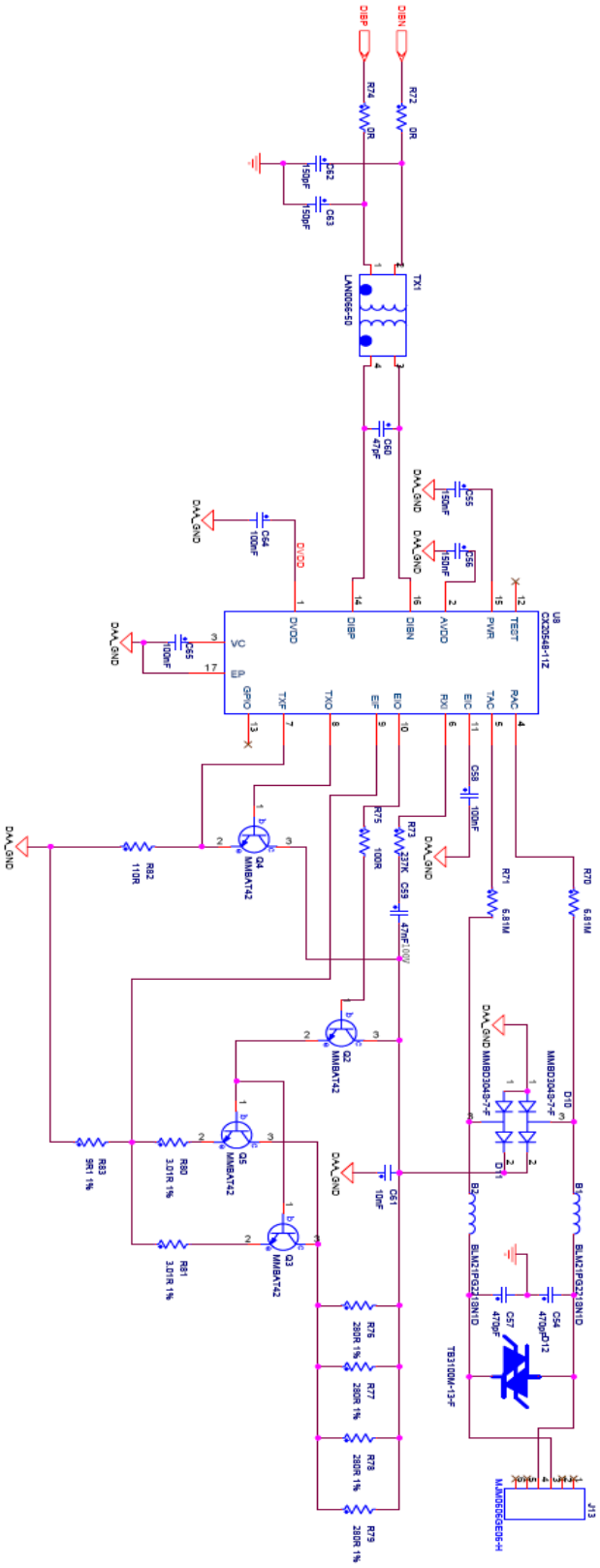


Figure 2-17

2.4 Jumper Setting

Num	Functional description	
	Connection	Disconnection
JP1	Boot from External Memory	Boot from Internal ROM (Default)
JP2	Force Power on	Normal Mode
JP3	1-2 Connect: ADC Reference voltage use analog power 3,3V(Defult) 2-3 Connect: ADC Reference voltage use regulated power 3.0V	
JP4	Backup Battery Support Power	Disconnect the Backup Battery Power Supply
JP6	Set USART0 as RS485 function and output from J19	Set USART0 as RS232 Function and Output from J16
JP7	Enable CAN1	Disable CAN1
JP8[1]	Enable CAN, then DBGU is Unavailable	Disable CAN0, then DBGU is available

Table 2-3

Note: [1] JP8 must be disconnected when downloading Program, otherwise PC can't recognize board.

Chapter 3 MDK Routines

3.1 Overview

MDK examples are programs without operating system and its development tool is MDK-ARM 4.53. This chapter describes how to use and write test procedures, which is as follows:

(1) MDK development environment to be built and configured;

(2) MDK sample program debugged, compiled and downloaded;

(3) The test procedures introduce methods and phenomenon, including board start, DMA, ADC, LCD, Storage System, Ethernet and so on.

3.2 Preparation

(1) Install MDK-ARM (Version 4.53) development tool and license

(2) Prepare for MYD_SAM9X5 development board kits

MYD-SAM9X5 series development board includes:

- MYD-SAM9G15
- MYD-SAM9G25
- MYD-SAM9G35
- MYD-SAM9X25
- MYD-SAM9X35

3.2.1 Configure and Compile

Open test project and take getting-started for example. Firstly find 04-MDK_Source\01_getting-started\Project folder and double click project file (getting-started.uvproj), then configure project. Steps are as follows (Note: Generally, download program by default setting. Program is necessary to be checked and stetted

when it can't be compiled and downloaded):

(1) Select project and click right button, then select Option for target ‘MYD-SAM9X35’ or press Alt + F7. The Setting window is shown in figure 3-1:

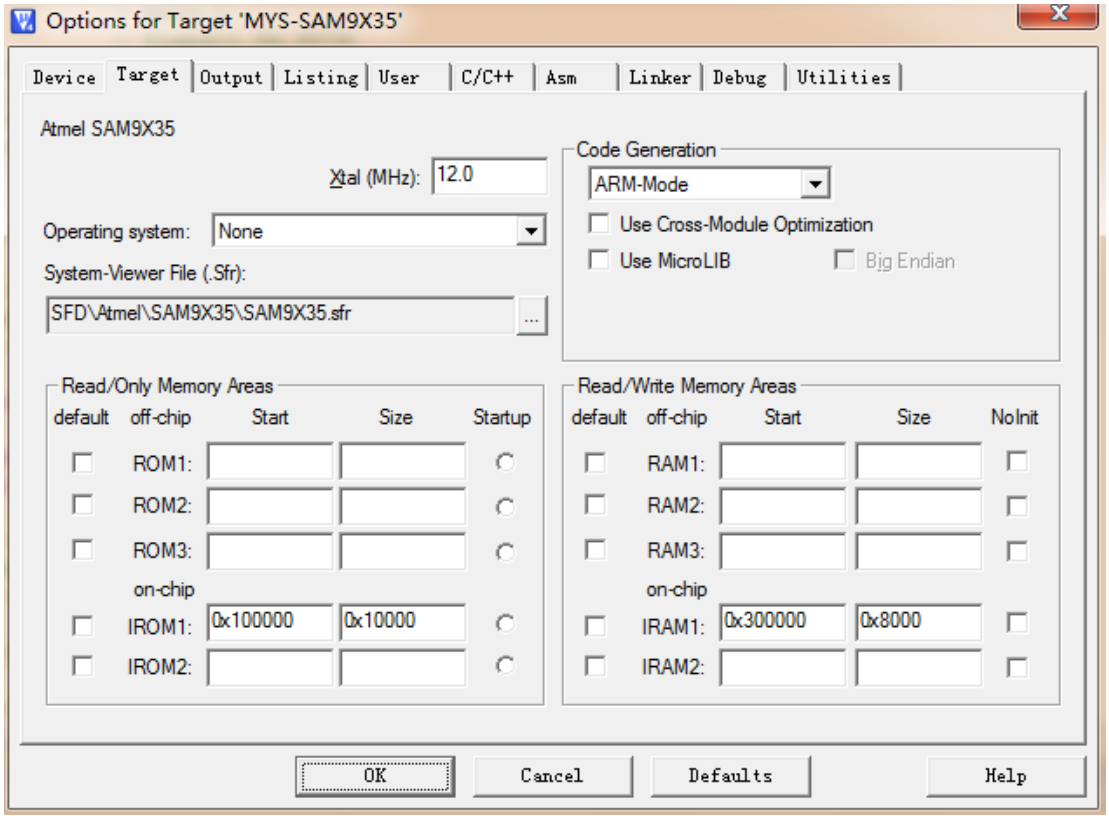


Figure 3-1

(2) Choose SAM9X35 in Device (Note: The modes are similar to SAM9X35). Steps are shown in figure 3-2:

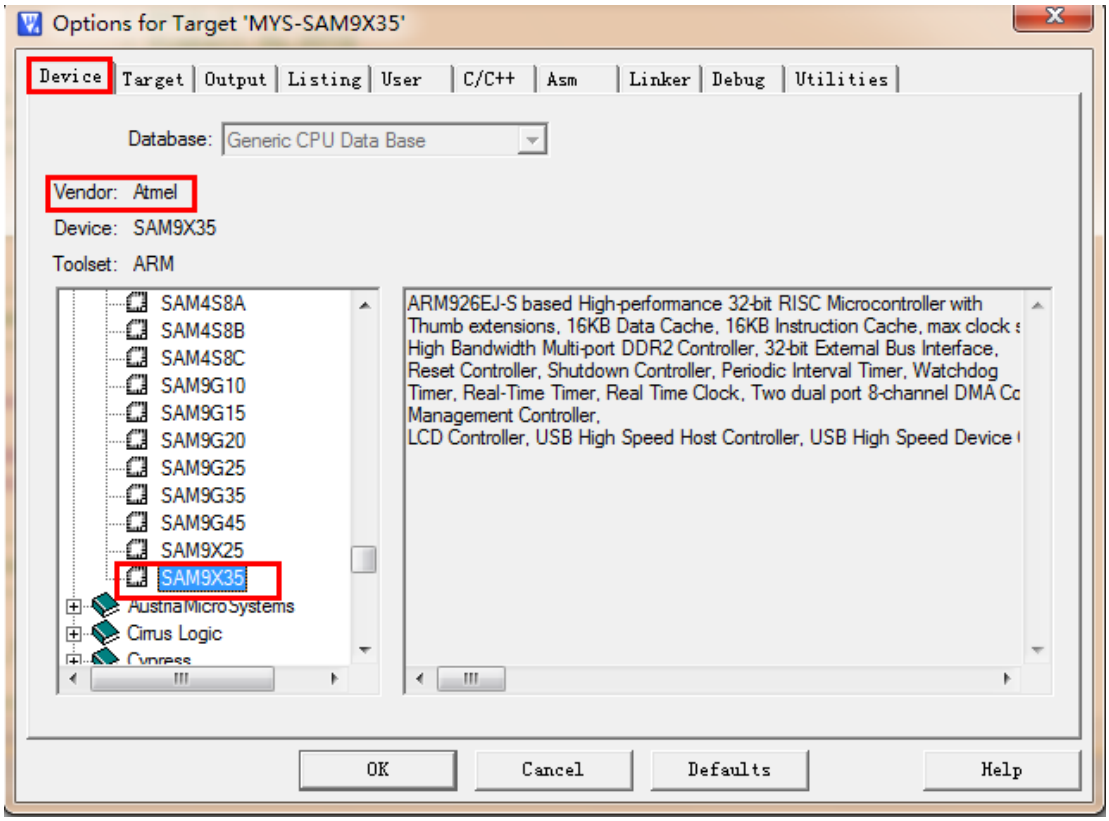


Figure 3-2

When default Configuration is completed, Target option will have a default configuration automatically. Refer to figure 3-1.

(3) Output options (include intermediate file). Refer to figure 3-3:

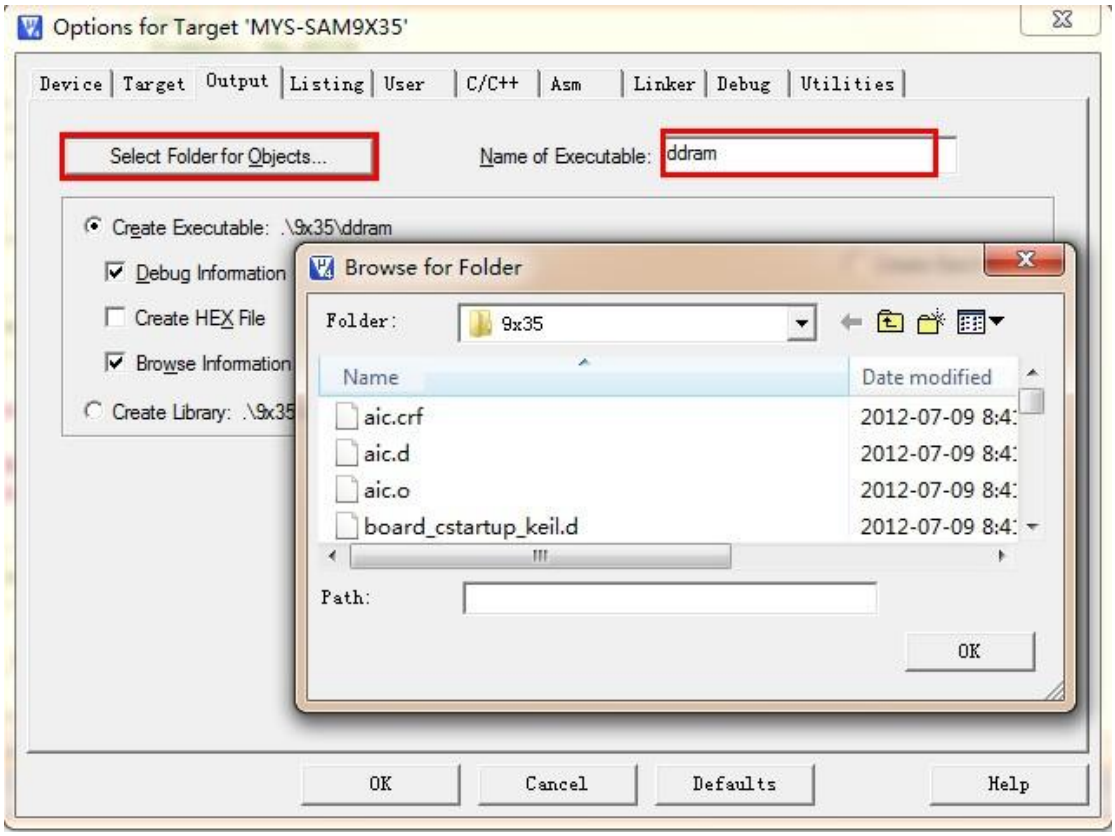


Figure 3-3

Click “Select Folder For Objects…” Popup a dialog box which can select storage path, click “OK”, and then user can define executable file name.

(4) The generated intermediate file folder can be selected in the listing tab. Refer to figure 3-4:

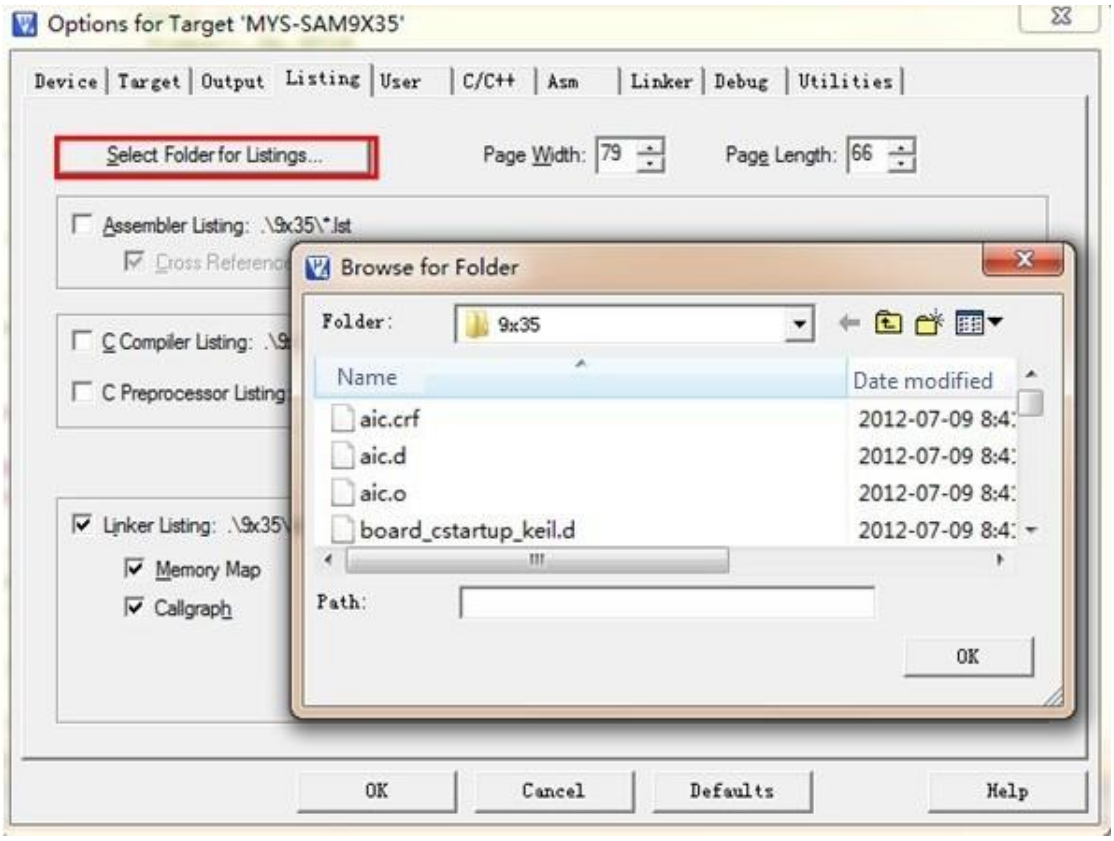


Figure 3-4

(5) User configuration is shown in figure 3-5:

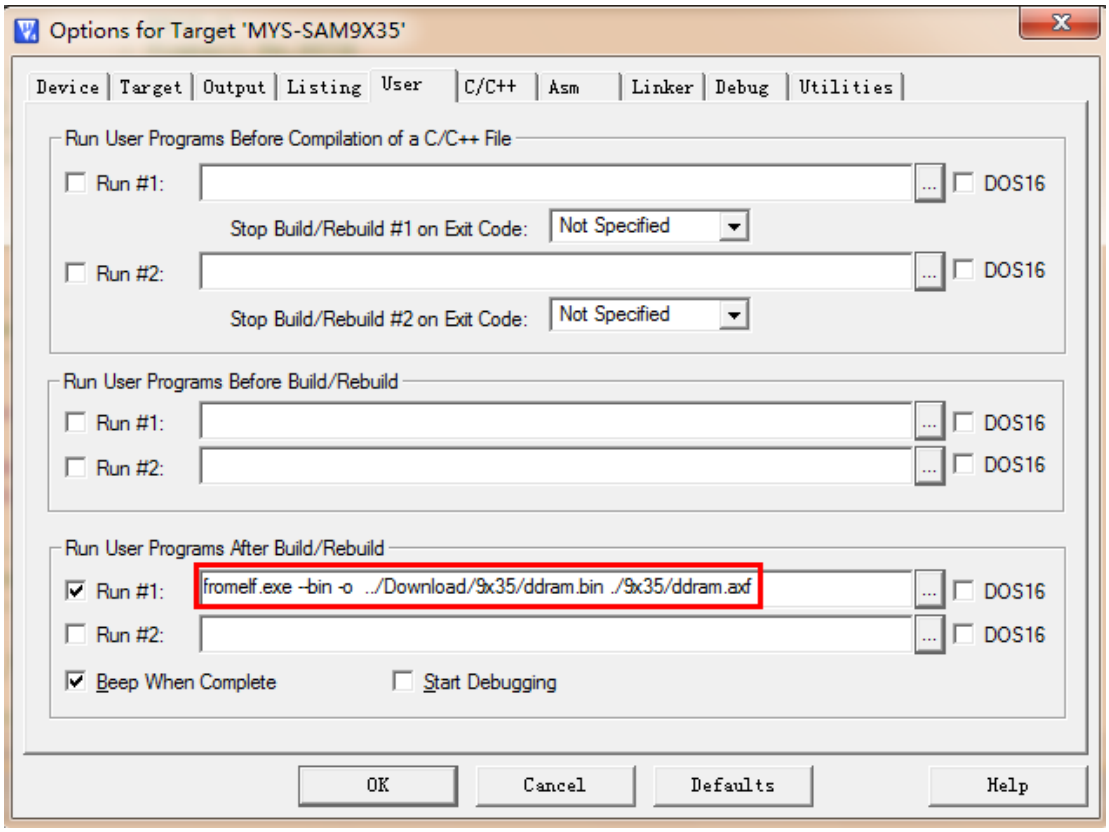


Figure 3-5

The command marked by red box specifies the storage path of generated executable file and user can modify it.

(6) C/C++ configuration, user can add or delete compile files path. Refer to figure 3-6:

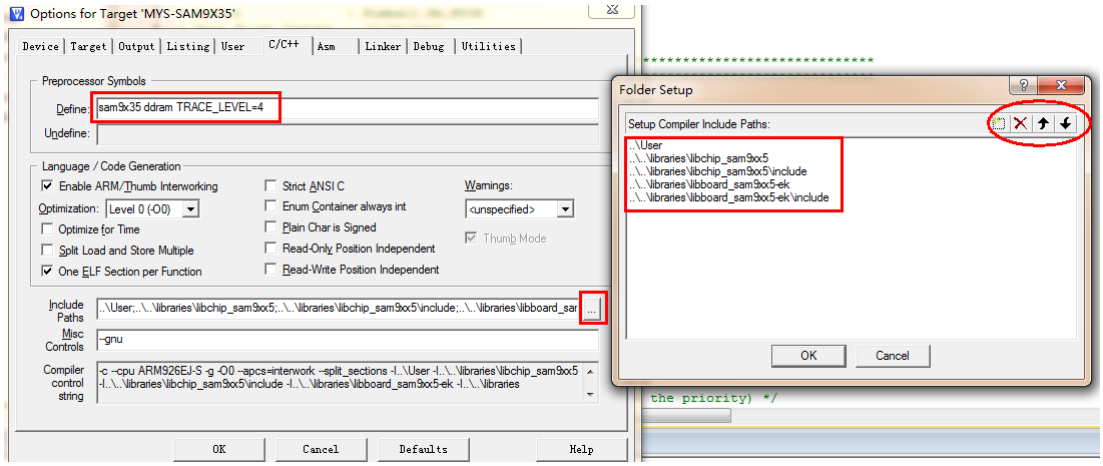


Figure 3-6

(7) Linker Configuration is shown in figure3-7:

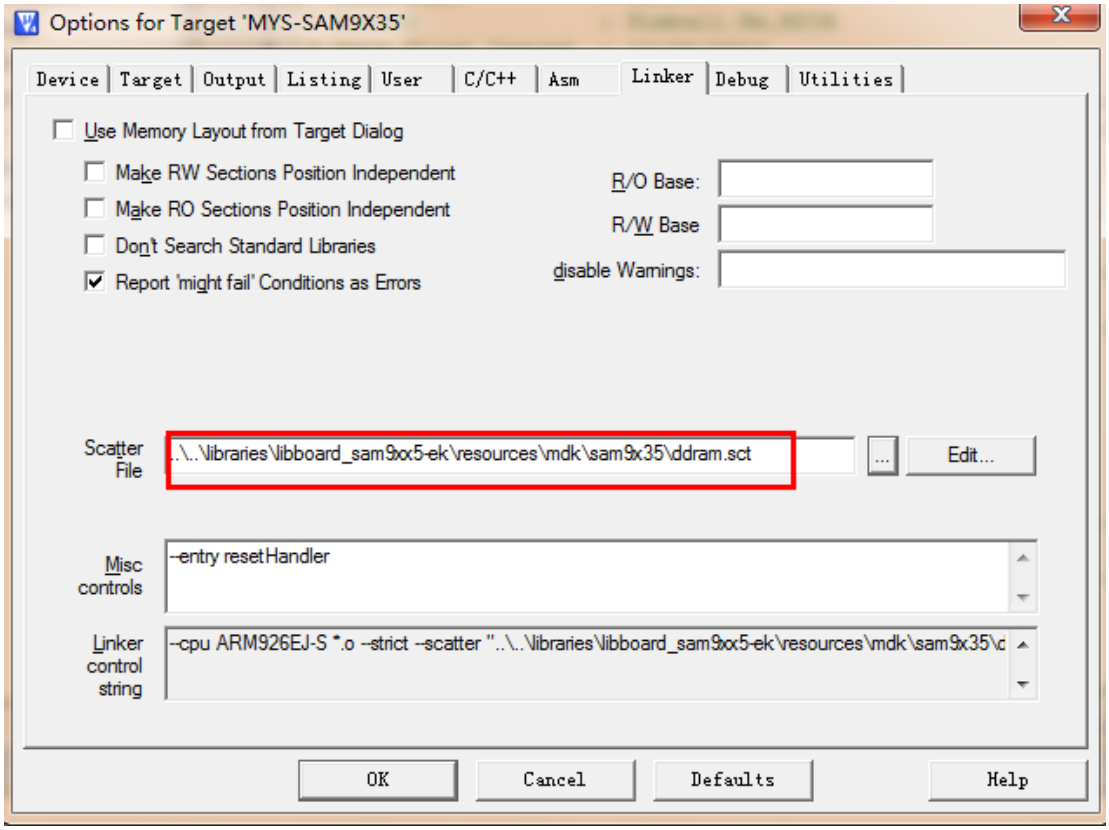


Figure 3-7 (1)

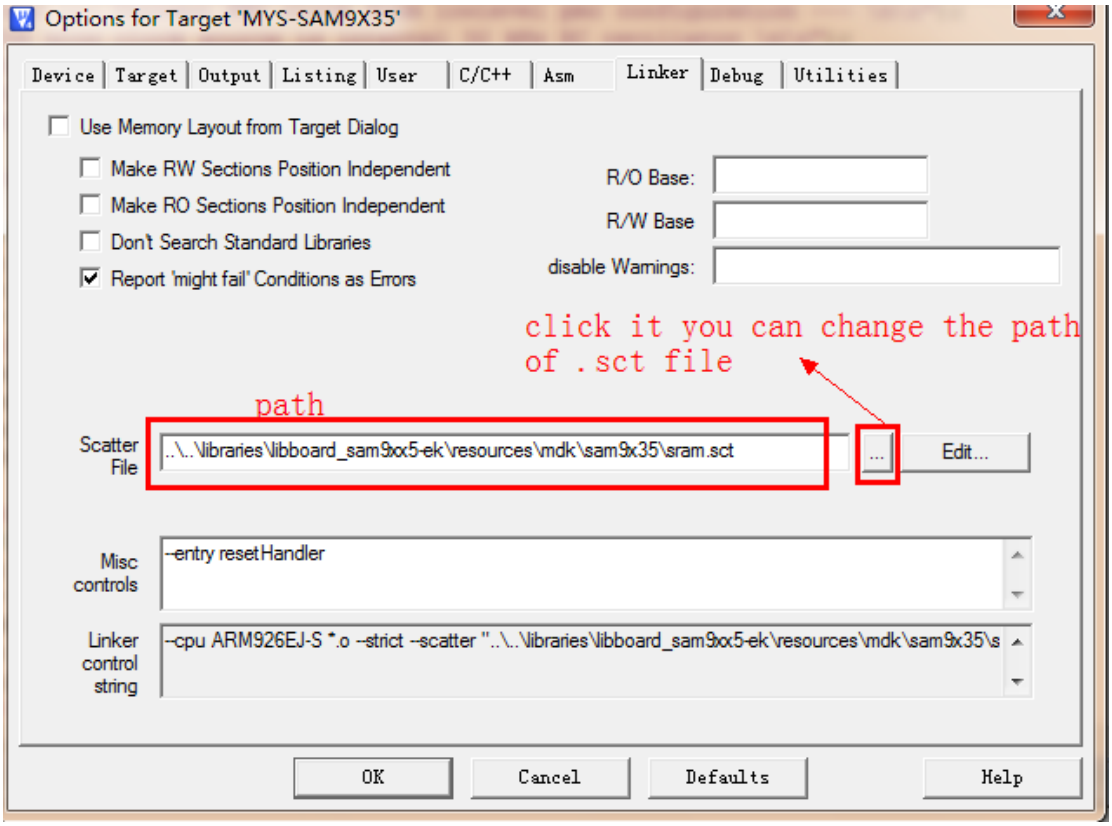


Figure 3-7 (2)

The Linker configuration of getting-started project is shown in figure 3-7(1) (generate ddram.bin, the most MDK routines generate ddram.bin) and the Linker configuration of pmc_clock_switching project is shown in figure 3-7(2) (generate sram.bin). Both select .sct file and just have a different name.

(8) Choose project->Rebuild all target files project, or click on shortcut icon to compile. The steps are shown in figure 3-8:

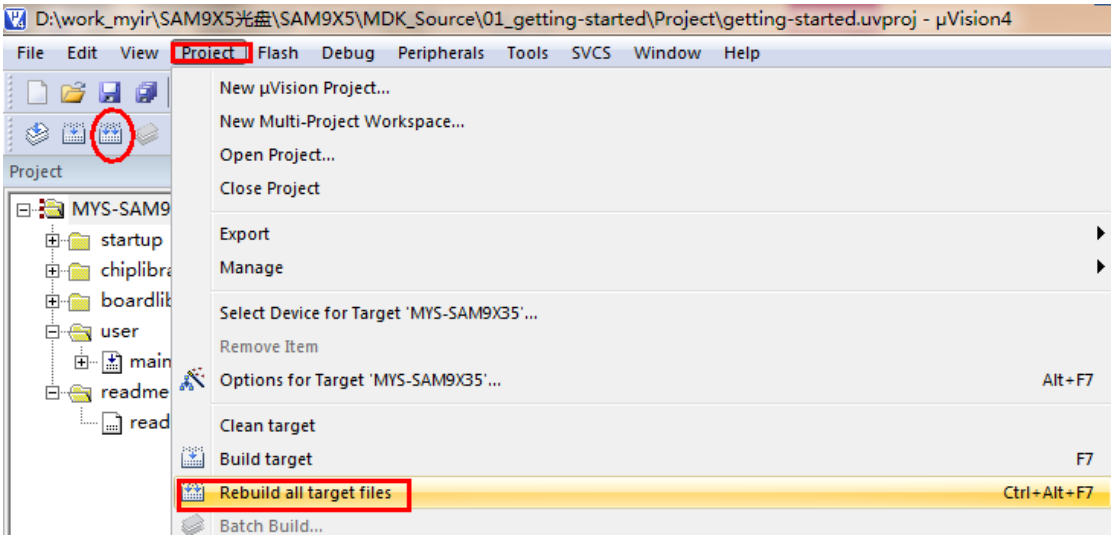


Figure 3-8

There will be executable bin file in the directory of output option, or can find a prompt of execute command. Refer to figure 3-9:

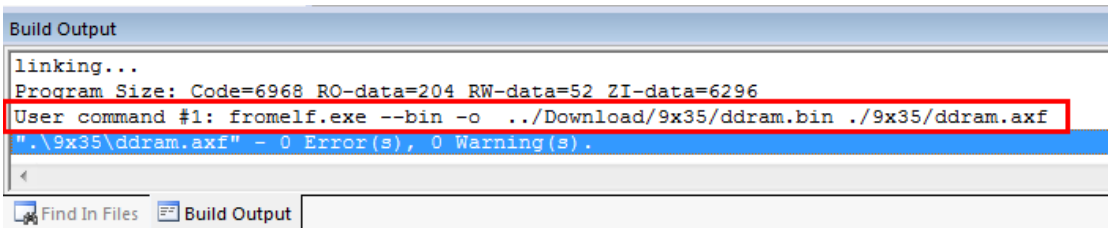


Figure 3-9

At this point, the configuration and compilation of MDK routine have been completed.

3.2.2 MDK Routine Debug

The following is MDK program configuration and it needs a hardware emulator ULink2 in advance. (If need it, please contact company to purchase it)

(1) After opening project file, open the setting dialog box and select Debug. Refer to figure 3-10:

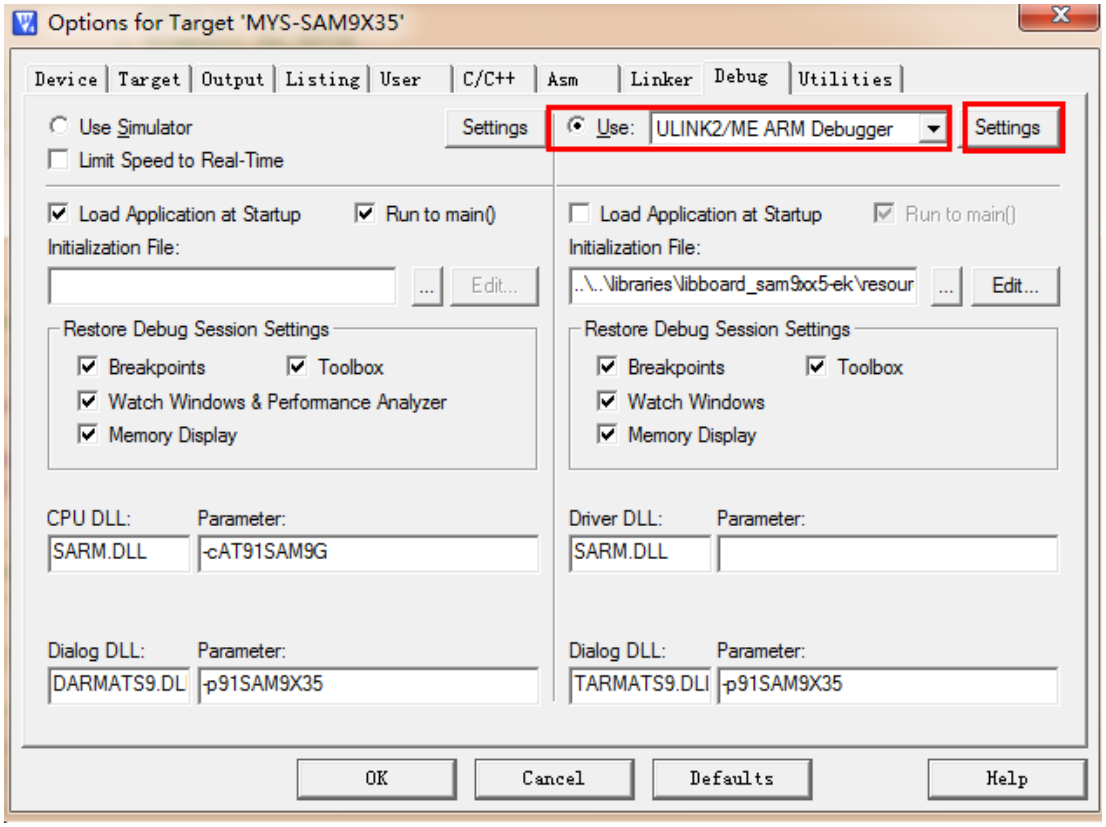


Figure 3-10

(2) Check hardware emulator ULink2

When connecting ULink2 to board, the indicator lights of RUN and COM change blue and then turn off, while the indicator lights change red and then remain the same. Thus, it indicates ULink2 is no problem.

(3) Clicking Setting in figure 3-10, there will be connection status of ULink2 and development board, as well as kernel identification. Refer to figure 3-11:

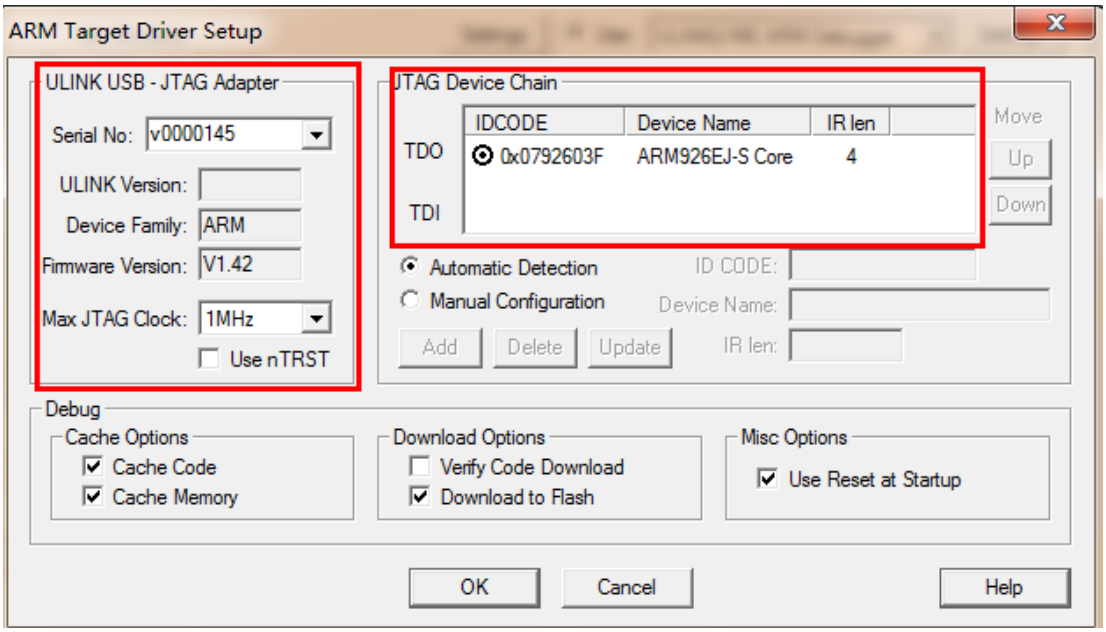


Figure 3-11

(4) Click Ctrl+F5 or shortcut icon, or select Debug->Start/Stop Debug Session to start debug. Refer to figure 3-12:

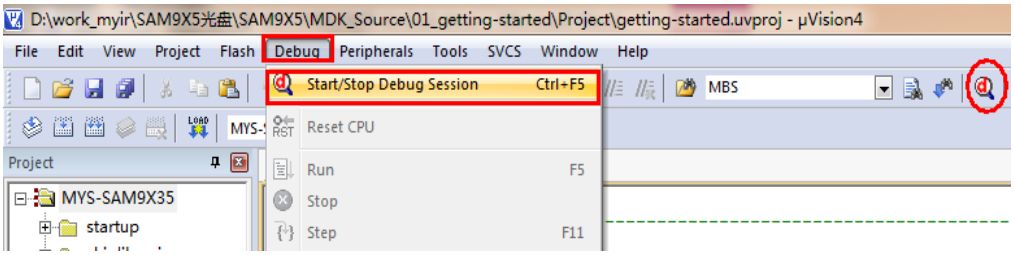


Figure 3-12

3.2.3 Super Terminal Configuration

Super Terminal Configuration

Opening super terminal configuration, configuration parameter is as follows:

Port: comX (Serial com1, then X is 1); Baud Rate: 115200; Data Bits: 8; Parity Bit: None; Stop Bit: 1

Note: if there are no special instructions, serial cable is connected to DBUG in MDK program test.

Download

(1) Install samba software (version 2.11 or above, the installation package in 03-Tools\SAM-BA file folder). If install samba (below version 2.11), uninstall it cleanly.

(2) Connect board to PC by mini USB and power on.

(3) TurnSW1, SW2 off (Note to disconnect the baseboard JP8 jump line, otherwise the computer will not recognize the development board), press NRST to reset board, and you will see tips of installing driver after a certain period of time. The device is shown in figure 3-13:

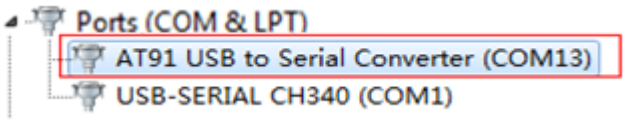


Figure 3-13

Note: Turn SW1 on to enable NANDFLASH; turn SW2 on to enable DATAFLASH. Turn SW1, SW2 off to let chip not boot from two medias,thus enabling to connect to USB.

If driver is not installed correctly, install it manually. Right click it to update driver software program (Note: the sample has been properly installed) and choose to install it manually. Refer to figure 3-14 and 3-18:

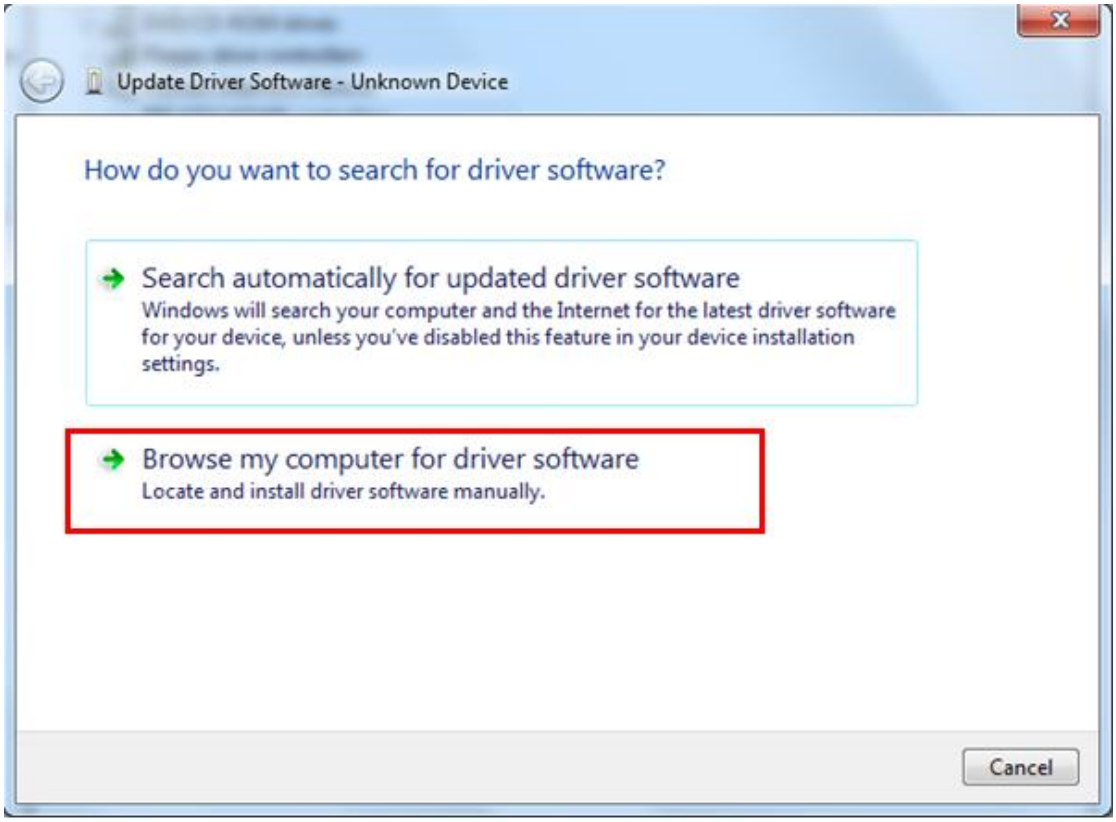


Figure 3-14

Choose to find and install driver software manually.

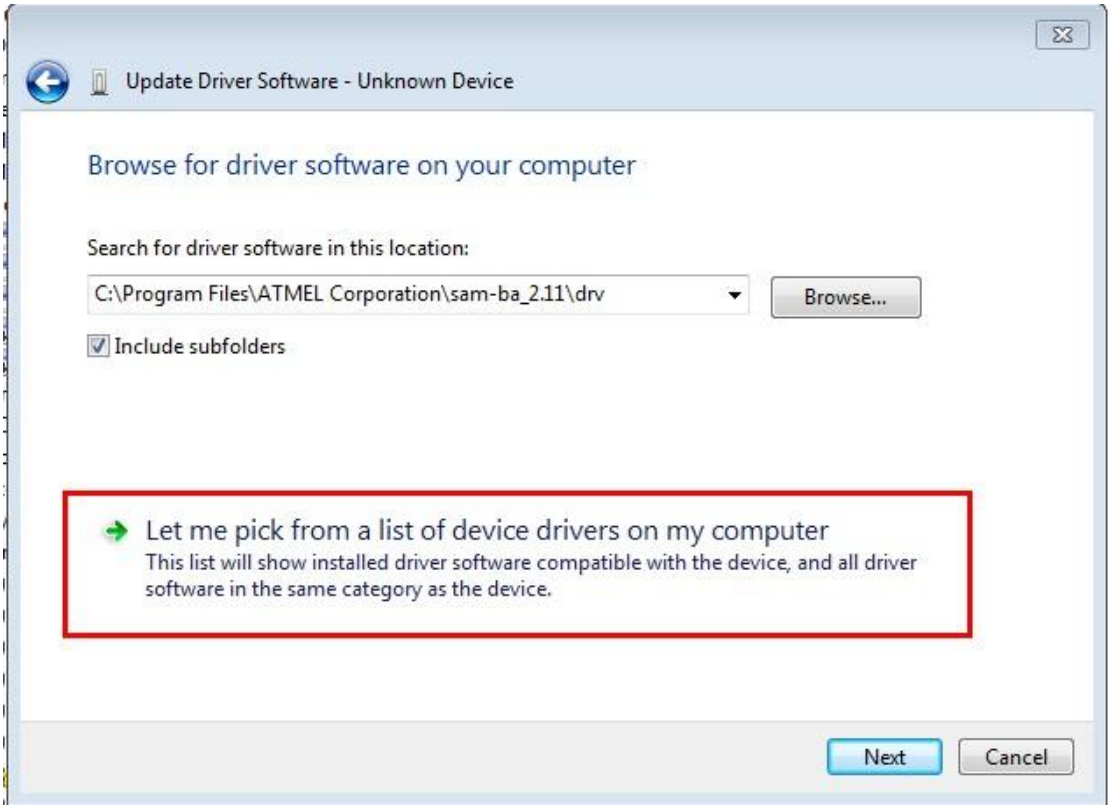


Figure 3-15

Click on red box to enter driver list. Refer to figure 3-16:

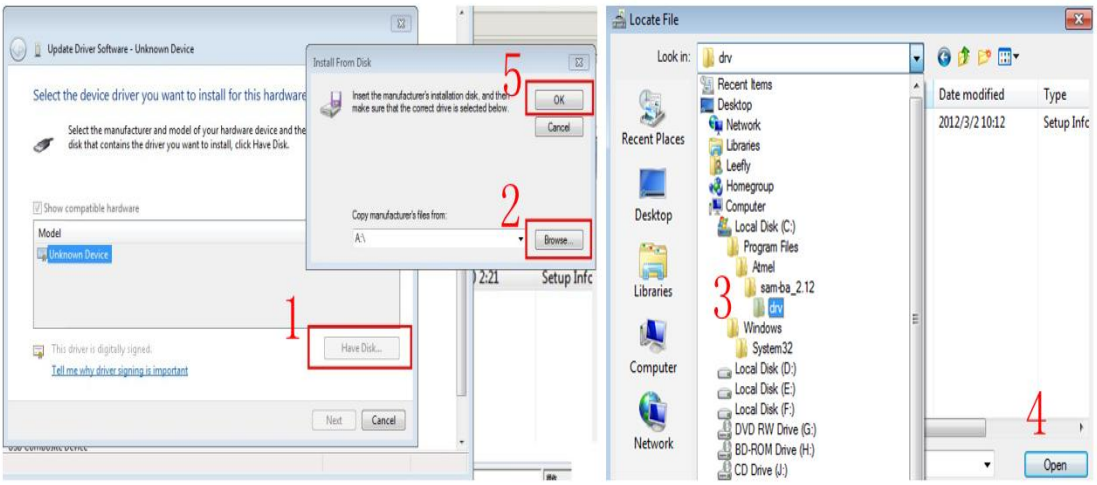


Figure 3-16

Click “OK” to install driver. Refer to figure 3-17. When installation is finished, it can be seen in figure 3-18:

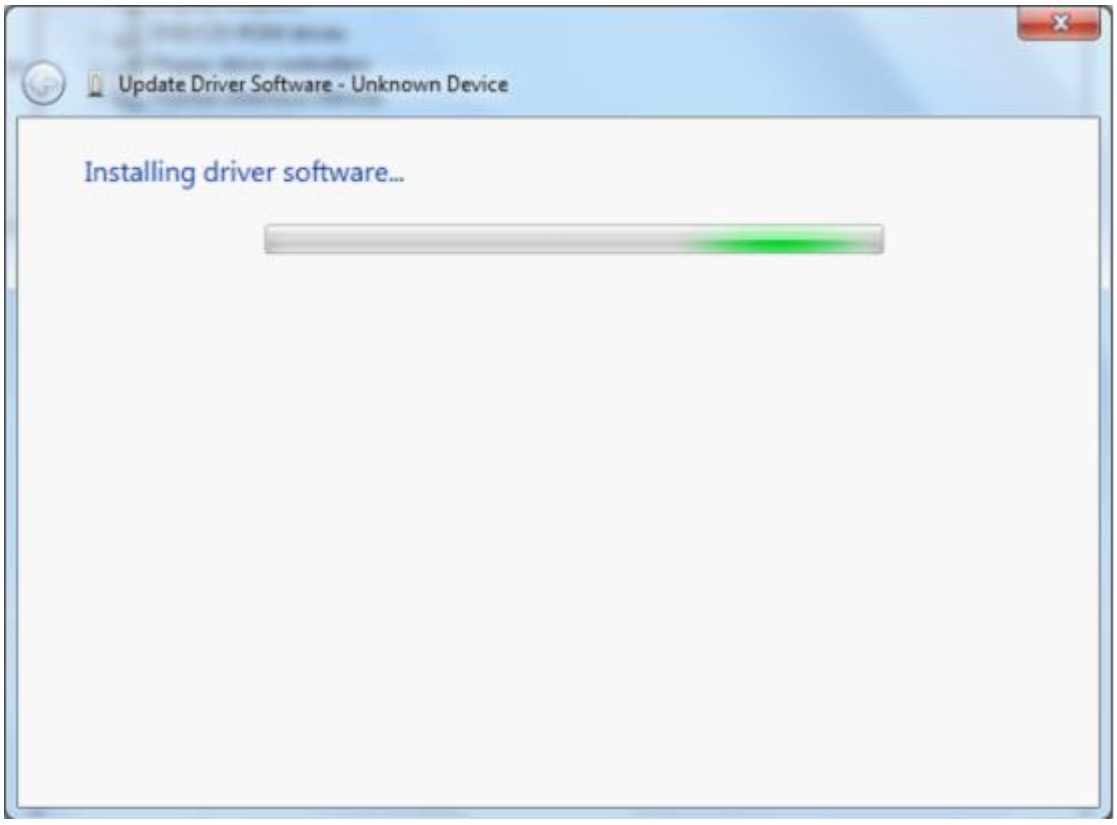


Figure 3-17

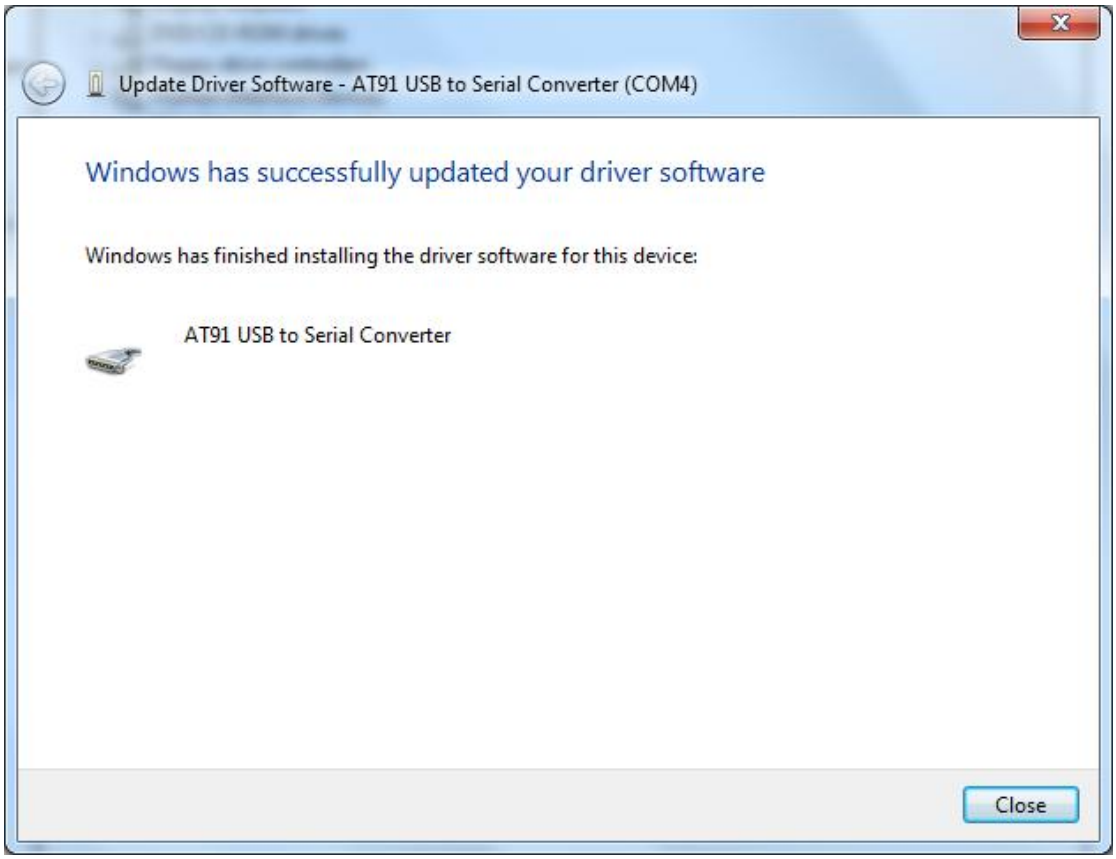


Figure 3-18

After installing samba driver, download program into board. There are two ways: download automatically and manually. The below will describe it in detail.

3.2.4 Manual Download

Getting started program introduces download process. Firstly turn on SW1, SW2 (Note to disconnect the baseboard JP8 jump line, otherwise the computer will not recognize the development board) and press NRST to reset board. Then open samba software, its startup interface is shown in figure 3-19:

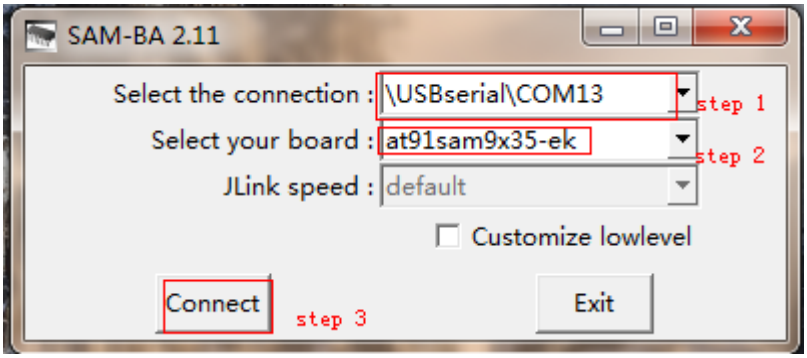


Figure 3-19

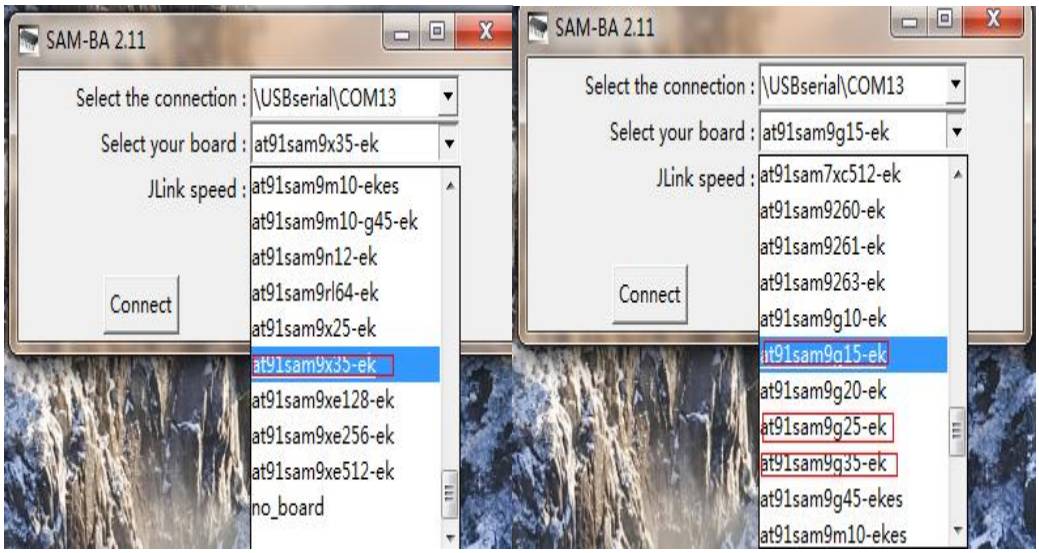


Figure 3-20

Refer to figure 3-19, the operation is mainly to choose right board model (Note: this example use MYD-SAMX35 board, so we select at91sam9x35-ek. If choosing other MYD-SAM9X5 series, it needs to select the corresponding model. Refer to figure 3-20). The main interface is shown after clicking “Connect” in figure 3-21:

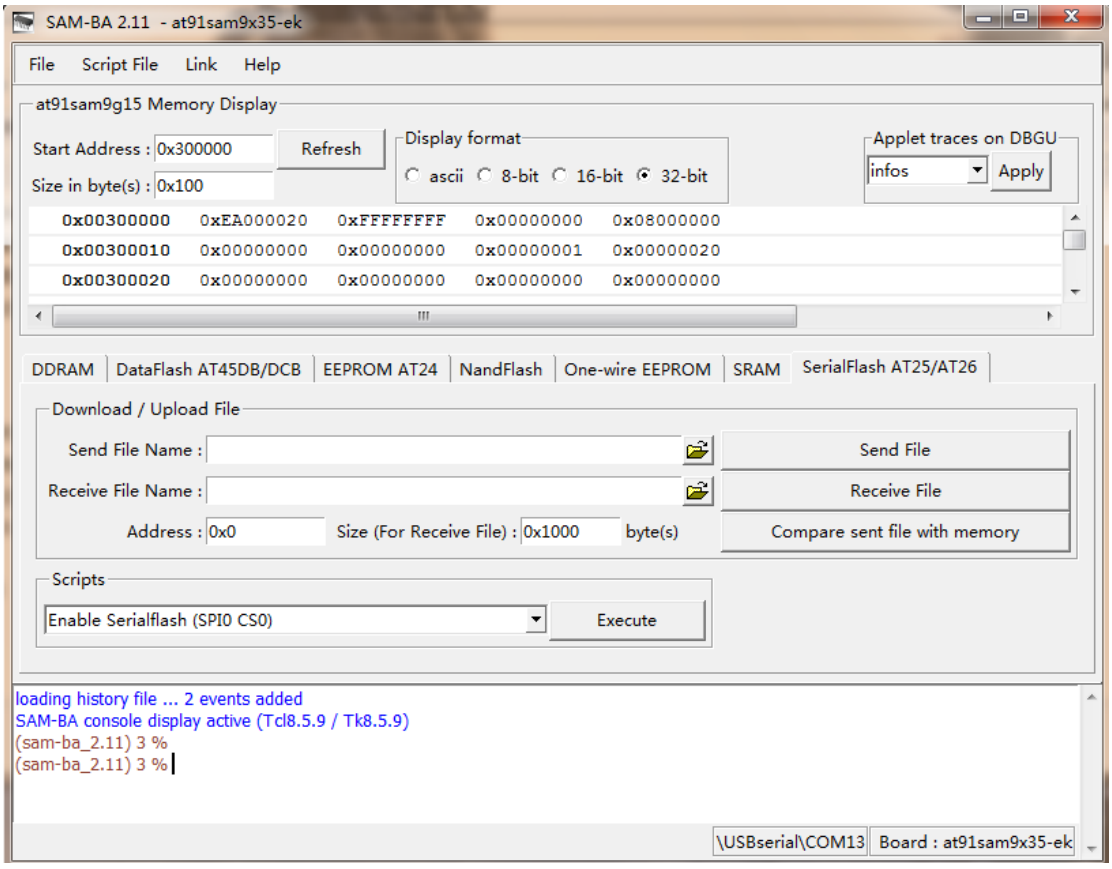


Figure 3-21

After entering the main interface, turn SW2 on, Refer to figure 3-22. Firstly choose

SerialFlash AT25/AT26, then set the script as Enable SerialFlash, lastly perform "Execute":

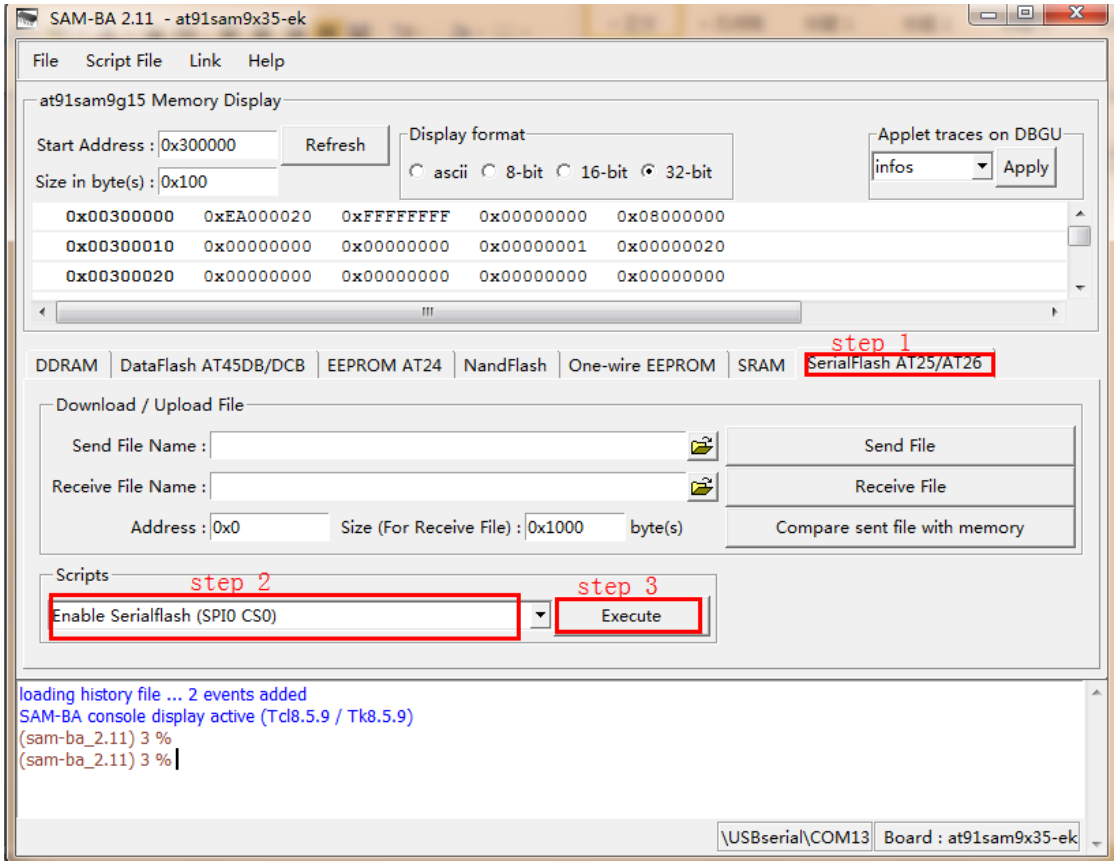


Figure 3-22

After enabling dataflash, appear "(sam-ba_2.11) 3 % SERIALFLASH::Init 0" and download dataflashboot.bin. (Location: 04-MDK_Source\01_getting-started\Download\9x35). Specific operation is shown in figure 3-23:

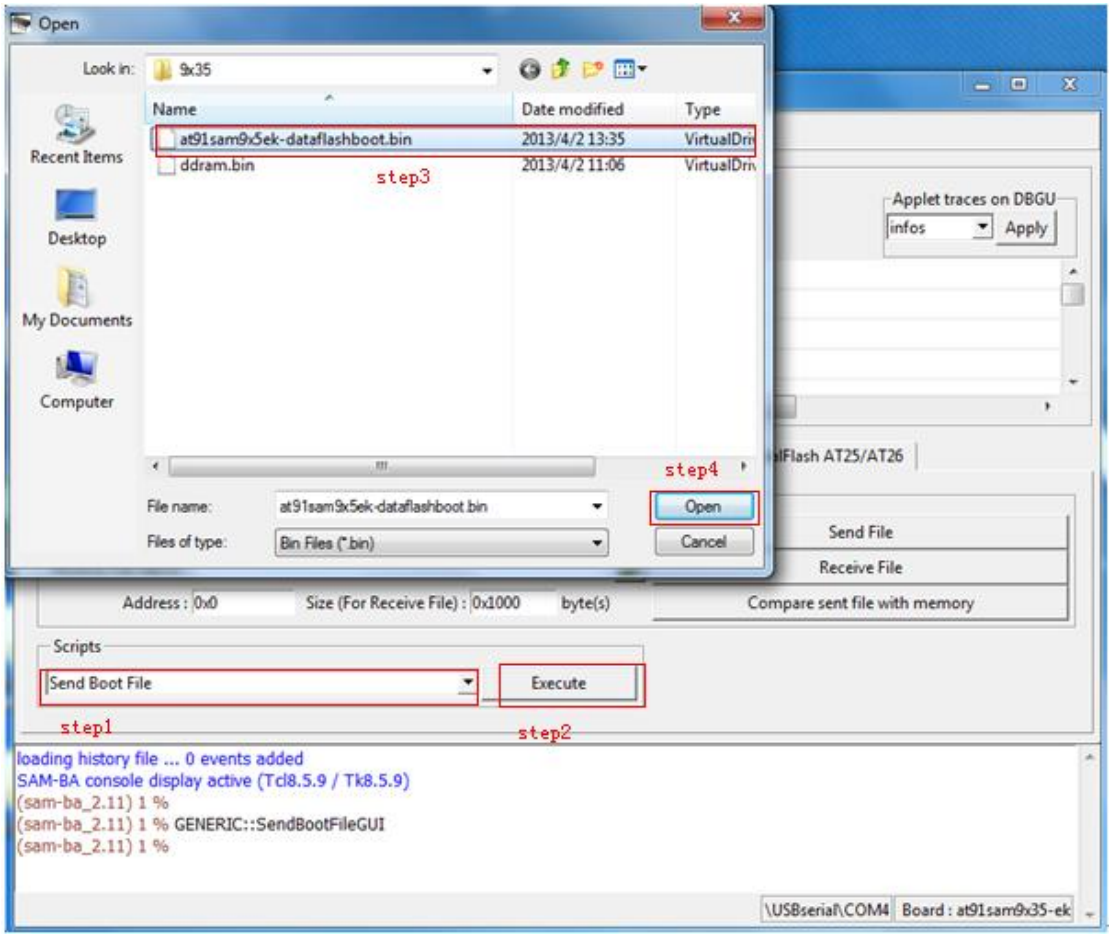


Figure 3-23

After downloading dataflashboot file, then download ddram.bin. Specific operation is shown in figure 3-24:

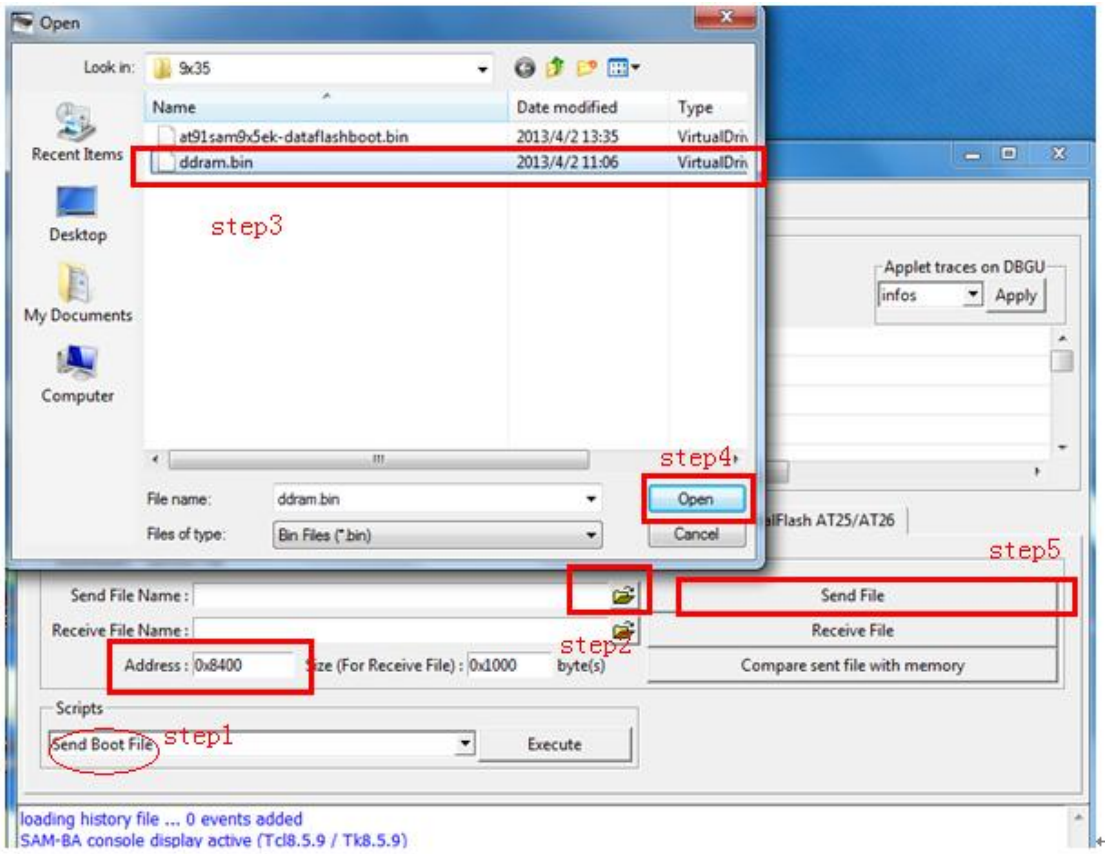


Figure 3-24

Note: Scripts item without changes are the same as provious step.

Lastly after sending ddram.bin, pressing NRST to reset board (firstly open terminal and configure parameters referring to chapter 3.2.3), there will be terminal information and two lights flash alternately. When firstly press character ‘1’, only red light on. And then press “1”, two lights flash alternately.

The above description is that the whole processes of manual download.

3.2.5 Automatic Download

The example of getting started describes operation and automatic download. (Location: 04-MDK_Source\01_getting-started\Download\9x35). Directory files are shown in figure 3-25:

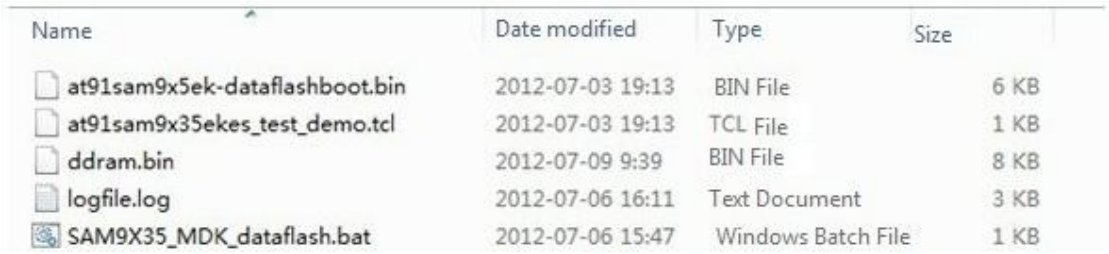


Figure 3-25

Firstly click right and edit SAM9X35_MDK_dataflash.bat, then COM port modified is shown in figure 3-26:

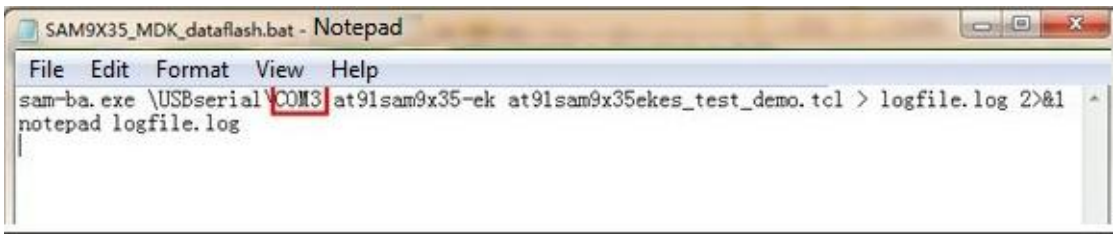


Figure 3-26

Native port is COM13, so change COM3 to COM13 (if don't know which prots to use, please refer to chapter 3.2.3) and save it. Note: the other doesn't change.

Then turn SW1, SW2 off (Note to disconnect the baseboard JP8 jump line, otherwise the computer will not recognize the development board), press NRST to reset board. After reset it, turn SW2 on and double click SAM9X35_MDK_dataflash.bat, then start to download program automatically. It will pop up a "logfile" which records steps and information. (Information is recorded if download fails).

After downloading program and pressing K1 to reset board, program starts to run. At this point, the process of automatic download has ended. The effective of automatic download and manual download is the same, so it is recommended to use the automatic download which can save time.

3.3 MDK Routine Introduction

MDK sample programs are rich which cover board test and use.

Special Note: As to download steps and terminal configuration, please refer to chapter 3.2. The following programs are no longer describing how to download and configure terminal. Program test requires relevant preparatory work.

3.3.1 getting-started

- **Purpose**

  This example demonstrates chip startup sequence and core peripherals.

- **Functional description**

  This program makes two LEDs blink at a fixed rate, then type “1” or “2” to control LEDs.

- **Procedures**

  Download program into board, press NRSRT to observe relevant terminal information. Typing “1” in terminal make LED1 stop & restart blinking, there will be “1 2” or all “2” in terminal; Typing “2” in terminal make LED2 stop & restart blinking, there will be “1 2”or all “1” in terminal.

- **Phenomenon Indicates**

  Terminal information:

```
-- Getting Started Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  9 2012 11:13:49 --
Configure PIT
                Configure TC.
Configure LED PIOs.
No push buttons, uses DBG key 1 & 2 instead.
Press 1 to Start/Stop the blue LED D1 blinking.
Press 2 to Start/Stop the green LED D2 blinking.
1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2
2 2 1 2 2 1 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2 2 1 2 2 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2
1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2
1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2
2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2
```

3.3.2 adc_adc10

- **Purpose**

  This example demonstrates ADC peripheral.

- **Functional description**

  This example is aimed to demonstrate ADC with/without DMA. When working with

DMA, it works as a big size buffer for ADC peripherals, the data will be stored immediately without interfering with processor. Steps:

- Initialize ADC with expected parameters
- Configure and enable interrupt for ADC
- Enable DMA reception
- Checking the last converted channel in ADC interrupt handler if DMA is not used

➢ **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. Typing “d” in terminal enable/disable DMA; character “s” changes mode channel; Figures 0-3, respectively, represent 4 trigger modes; three dates respectively show three AD sampling data values.

➢ **Phenomenon Indicates**

Terminal information:

```
-- ADC12 Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  9 2012 13:34:14 --
================================
- d: DMA Enable/Disable
- s: Channel sequence switch
- 0, 1,  2,          3: TRIGGER mode:
   SW EXT Periodic Continuous
   Refresh slow --> fast ....
================================
= DMA: Enabled; Trigger mode: 0
= Sequence: 09 00 02
================================
Vols(mV): #09:3300 #00:3300 #02:3232
================================
- d: DMA Enable/Disable
- s: Channel sequence switch
- 0, 1,  2,          3: TRIGGER mode:
   SW EXT Periodic Continuous
   Refresh slow --> fast ....
================================
= DMA: Disabled; Trigger mode: 0
= Sequence: 09 00 02
================================
Vols(mV): #09:3300 #00:3300 #02:3232
```

3.3.3 adc_touchscreen

- **Purpose**

  This example demonstrates touchscreen events..

- **Functional description**

  This example firstly initializes LCD and touchscreen controller. Then let user do calibration. After calibration is done, the pen positions and pressure will be outputted in terminal by touching LCD.

- **Procedures**

  The package can only be used with MYD-SAM9G15/G35/X35.

  Download program into board, press NRSRT to observe relevant terminal information. Touching the dots on the LCD to calibrate touchscreen, the calibration results will be outputted in terminal and LCD. Touching LCD, the pen position will be outputted in terminal. If it isn't calibrated ok and calibrate it again until it succeed.

- **Phenomenon Indicates**

  Terminal information:

```
-- ADC_Touchscreen Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  9 2012 14:52:50 --
-I- I cache is already enabled.
-I- P0: (154,872)
-I- P1: (916,388)
-I- P2: (958,227)
-I- P3: (167,217)
-I- Slope: 2070, -1916
-I- TP: 542, 469 -> 239, 242
-W- X 239, Y 242; Diff -1, 106
-E- Error too big ! Retry...
-I- P0: (156,782)
-I- P1: (940,876)
-I- P2: (957,366)
-I- P3: (172,219)
-I- Slope: 2091, -2520
-I- TP: 548, 438 -> 239, 166
-I- Calibration successful !

Pressed(236,192,10219)
```

```
Move     (236,192,10219)
Release(236,192)

Pressed(177,145, 4147)
Move     (213,179, 3087)
Release(213,179)
```

3.3.4 can

- **Purpose**

  The CAN example demonstrates CAN peripheral.

- **Functional description**

  This example is aimed to demonstrate CAN. Test the following CAN operations:

  - Simple CAN test. CAN1 Mailbox 5 sends data to CAN0 Mailbox 1.
  - Messages to 1 Mailbox test. CAN1 Mailbox 5 and 6 send data, (6 goes first), CAN0 Mailbox 2 receives them, but last one is discarded.
  - Messages to 1 Mailbox test.CAN1 Mailbox 6 and 5 sends data in sequence, with ID 0x40 and 0x41 that both can accepted by CAN0 Mailbox 3. The last data overwrites previous one.
  - Remote data request test. CAN1 Mailbox 5 sends remote request to CAN0 Mailbox 4 to get response data.

- **Procedures**

  This example can be used in MYD-SAM9X25/ MYD-SAM9X35 board.

  Disconnect JP8 and connectPin7 (CAN1H) to Pin9 (CAN0L), Pin8 (CAN1L) to Pin10 (CAN0L), serial cable to UART0, press NRSRT to observe relevant terminal information.

- **Phenomenon Indicates**

```
-- CAN Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 16 2012 10:59:15 --
- Test start, DBGU not available now

-I- 0:   210000
- CAN0 Sync OK
-I- 1:   210000
- CAN1 Sync OK

-I- 0:20a00002
```

```
-I- 1:    a00060
-I- 0:20a00006
-I- 1:    a00060
-I- 1:40a00040
- CAN0.1: Simple test data received
- CAN0.2: Messages to 1 Mailbox received
-I- 0:    a0000e
- CAN0.3: Messages to 1 Mailbox(OVR) received
-I- 1:20a00060
-I- 0:    a0001e
- CAN1.5: Remote requested data received

-I- 1:20a00062
-I- 0:    a0007e
-I- 1:20a00066
-I- 0:    a0007e
-I- 0:40a0005e
- CAN1.1: Simple test data received
- CAN1.2: Messages to 1 Mailbox received
-I- 1:    a0006e
- CAN1.3: Messages to 1 Mailbox(OVR) received
-I- 0:20a0007e
-I- 1:    a0007e
- CAN0.5: Remote requested data received
-I- 0:    10007e
-I- 1:    10007e

- Press any key to test again
```

3.3.5 dma

- **Purpose**

  This example demonstrates Atmel's AT91SAM9X5 microcontrollers.

- **Functional description**

  This example demonstrates DMA data transfer. Switch multiple DMA buffers transfer by the corresponding buttons.

- **Procedures**

  Download program into board, press NRSRT to observe relevant terminal information. 0-9, A, B are transmission choices of DMA buffer. "S" starts transporting and displays

menu.

- **Phenomenon Indicates**

  Terminal information:

```
-- DMA Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  9 2012 16:01:08 --
Menu :
------
- 1-9, A, B: Programming DMAC for Multiple Buffer Transfers
      1: Single Buffer or Last buffer of a multiple buffer transfer
      2: Multi Buffer transfer with contiguous DADDR
      3: Multi Buffer transfer with contiguous SADDR
      4: Multi Buffer transfer with LLI support
      5: Multi Buffer transfer with DADDR reloaded
      6: Multi Buffer transfer with SADDR reloaded
      7: Multi Buffer transfer with BTSIZE reloaded and contiguous DADDR
      8: Multi Buffer transfer with BTSIZE reloaded and contiguous SADDR
      9: Automatic mode channel is stalling BTsize is reloaded
      A: Automatic mode BTSIZE, SADDR and DADDR reloaded
      B: Automatic mode BTSIZE, SADDR reloaded and DADDR contiguous
- s: Start DMA transfer
- h: Display this menu

Programming DMAC for Multiple Buffer Transfers in row 1
Programming DMAC for Multiple Buffer Transfers in row 2
Programming DMAC for Multiple Buffer Transfers in row 10
-I- Start DMA transfer
-I- The Source Buffer content before transfer
00  01  02  03  04  05  06  07  08  09  0a  0b  0c  0d  0e  0f
00  02  04  06  08  0a  0c  0e  10  12  14  16  18  1a  1c  1e
00  03  06  09  0c  0f  12  15  18  1b  1e  21  24  27  2a  2d
00  04  08  0c  10  14  18  1c  20  24  28  2c  30  34  38  3c

-I- The Destination Buffer content before transfer
5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a
5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a
5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a
5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a

-I- The Source Buffer content after transfer
00  01  02  03  04  05  06  07  08  09  0a  0b  0c  0d  0e  0f
00  02  04  06  08  0a  0c  0e  10  12  14  16  18  1a  1c  1e
00  03  06  09  0c  0f  12  15  18  1b  1e  21  24  27  2a  2d
```

```
00  04  08  0c  10  14  18  1c  20  24  28  2c  30  34  38  3c

-I- The Destination Buffer content after transfer
00  01  02  03  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a
5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a
5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a
5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a  5a
Done
```

3.3.6 lcd

- **Purpose**

This example demonstrates LCD Controller (LCDC) Note: here use 4.3-inch screen as an example)）.

- **Functional description**

This example configures LCDC for LCD to display and then draw test patterns on LCD.

- **Procedures**

This package can be used in MYD-SAM9G15/G35/X35.

Download program into board, press NRSRT to observe relevant terminal information. Then test pattern image is displayed on the LCD.

- **Phenomenon Indicates**

Terminal information:

```
-- LCD Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  9 2012 16:17:36 --
-I- I cache is already enabled.
- Test Pattern: 480 x 272 [80 x 68]
- Test Cursor: 32 x 32
- LCD ON
Show: 82,37 32x48 0
Show: 164,76 64x192 0
Show: 246,45 64x-192 0
Show: 328,6 -64x-192 0
Show: 410,31 -64x192 0
Show: 339,70 32x48 0
Show: 257,51 64x192 0
Show: 175,12 192x64 90
```

```
Show: 93,135 -192x64 90
Show: 11,80 64x192 180
Show: 70,42 192x64 270
Show: 152,165 192x-64 270
Show: 234,80 64x192 0
```

3.3.7 periph_protect

- **Purpose**

  This program demonstrates PIO controller behavior.

- **Functional description**

  This application shows protective mechanism of PIO controller. When the write-protection is enabled, any write attempt to write-protected registers is abortted. So register won't be modified. Besides, the write protect register save register offset address.

- **Procedures**

  Download program into board, press NRSRT to observe relevant terminal information. Typing "l" in terminal will into write-protect mode, while typing "U" will into unprotected mode.

- **Phenomenon Indicates**

  Terminal information:

```
-- Peripheral Protect Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  9 2012 16:42:32 --



Enter 'l' to enable Write Protect and enter 'u' to disable Write Protect.
Select the register to be written by a value(0x12345678).
  0 : PIO Enable Register          (0x0000)
  1 : PIO Disable Register         (0x0004)
  2 : PIO Output Enable Register           (0x0010)
  3 : PIO Output Disable Register          (0x0014)
  4 : PIO Input Filter Enable Register   (0x0020)
  5 : PIO Input Filter Disable Register (0x0024)
  6 : PIO Multi-driver Enable Register   (0x0050)
  7 : PIO Multi-driver Disable Register (0x0054)
  8 : PIO Pull Up Disable Register         (0x0060)
  9 : PIO Pull Up Enable Register          (0x0064)
a : PIO Peripheral ABCD Select Register 1        (0x0070)
```

```
    b : PIO Peripheral ABCD Select Register 2        (0x0074)
c : PIO Output Write Enable Register   (0x00A0)
    d : PIO Output Write Disable Register (0x00A4)
    e : PIO Pad Pull Down Disable Register           (0x0090)
    f : PIO Pad Pull Down Enable Register (0x0094)

The Write Protect is enabled.
Write protect violation is detected!
The offset of the write-protected register is 0x0070.
Write protect violation is detected!
The offset of the write-protected register is 0x0094.
The Write Protect is disabled.
No write protect violation is detected.
No write protect violation is detected.
```

3.3.8 pmc_clock_switching

- **Purpose**

  This example demonstrates switch system clock (PLLA, UPLL, SLCK, MAINCK).

- **Functional description**

  Upon startup, program configures PIOs for DBUG, PCK. DBUG baud rate is configured as 1200 bps. This example prints the current configuration and waiting input “” to switch system clock.

- **Procedures**

  This program is different with others. Firstly DBGU baud is configured as 1200 bps, while others don’t change. Secondly manual download has a little change, please accord to the following steps:

  Turn SW1, SW2 off, press NRST to reset board and open samba 2.11 software (The same as manual download in chapter 3.24). Then turn SW2 on, enable SerialFlash and download sram.bin file. Specific operation is shown in figure 3-27, 3-28:

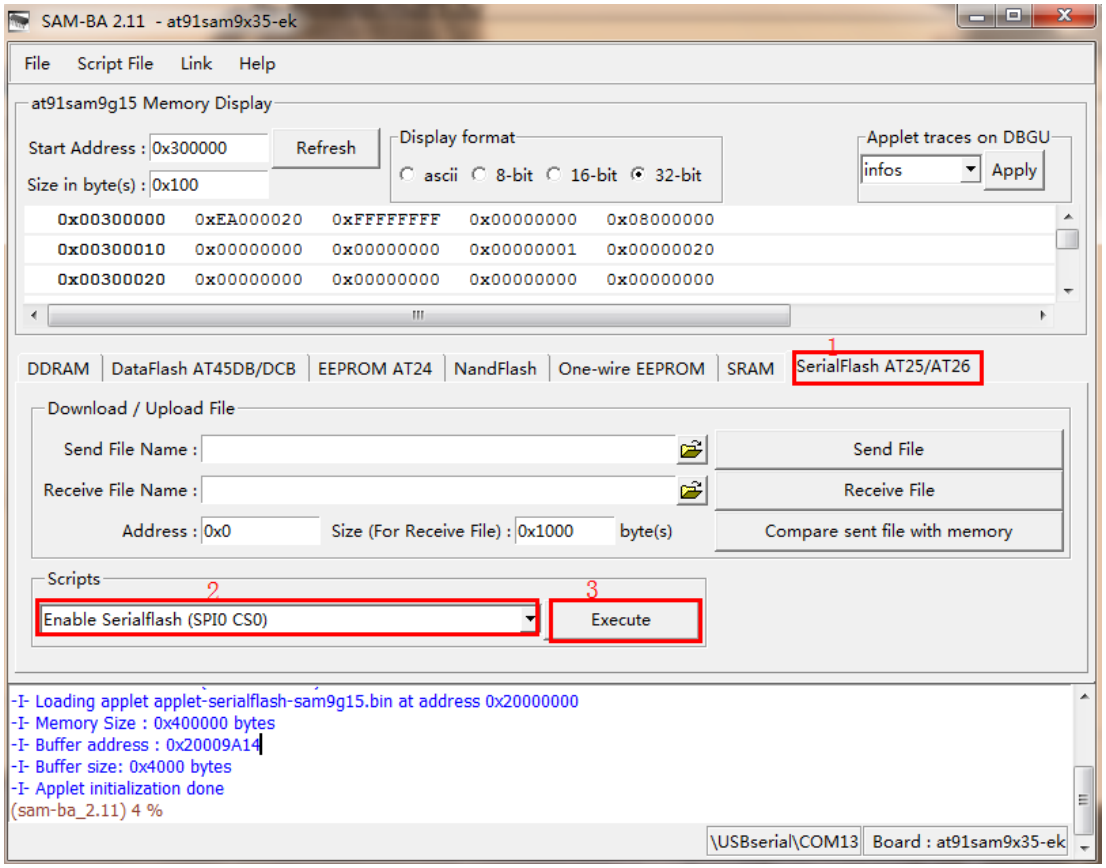

SAM-BA 2.11 - at91sam9x35-ek
File Script File Link Help
at91sam9g15 Memory Display
Start Address : 0x300000
Size in byte(s) : 0x100
Refresh
Display format
ascii 8-bit 16-bit 32-bit
Applet traces on DBGU
infos
Apply
0x00300000 0xEA000020 0xFFFFFFFF 0x00000000 0x08000000
0x00300010 0x00000000 0x00000000 0x00000001 0x00000020
0x00300020 0x00000000 0x00000000 0x00000000 0x00000000
DDRAM
DataFlash AT45DB/DCB
EEPROM AT24
NandFlash
One-wire EEPROM
SRAM
1
SerialFlash AT25/AT26
Download / Upload File
Send File Name :
Receive File Name :
Address : 0x0
Size (For Receive File) : 0x1000
byte(s)
Send File
Receive File
Compare sent file with memory
Scripts
2
Enable Serialflash (SPI0 CS0)
3
Execute
-I- Loading applet applet-serialflash-sam9g15.bin at address 0x20000000
-I- Memory Size : 0x400000 bytes
-I- Buffer address : 0x20009A14
-I- Buffer size: 0x4000 bytes
-I- Applet initialization done
(sam-ba_2.11) 4 %
\USBserial\COM13
Board : at91sam9x35-ek

Figure 3-27

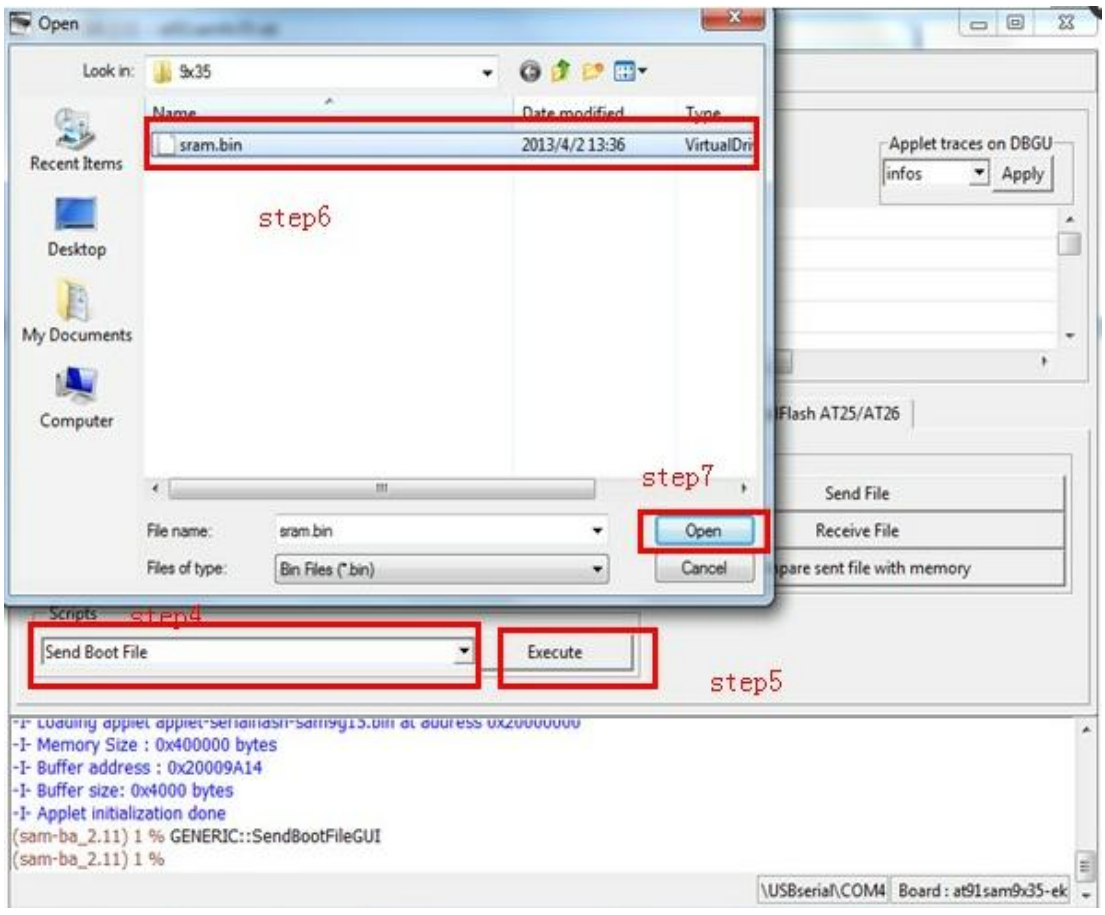

Open
Look in: 9x35
Recent Items
Desktop
My Documents
Computer
Name
Date modified
Type
sram.bin
2013/4/2 13:36
step6
step7
File name: sram.bin
Files of type: Bin Files (*.bin)
Open
Cancel
Scripts
step4
Send Boot File
Execute
step5
-I- Memory Size : 0x400000 bytes
-I- Buffer address : 0x20009A14
-I- Buffer size: 0x4000 bytes
-I- Applet initialization done
(sam-ba_2.11) 1 % GENERIC::SendBootFileGUI
(sam-ba_2.11) 1 %
\USBserial\COM4
Board : at91sam9x35-ek

Figure 3-28

Download program into board, press NRSRT to observe relevant terminal information, and switch system clock by prompt.

- **Phenomenon Indicates**

Terminal information:

```
** Switch to 1200 bps for DBG **

-- PMC Clock Switching example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  6 2012 14:32:53 --

 --- Current PMC clock from lowlevel pmc configuration ---
he slow clock source is internal 32 kHz RC oscillator
PLLA clock is 800 MHz
PLLA clock is the source of Master clock
MCK Master Clock is prescaler output clock divided by 3

-I- Select main clock as the master clock
-I- Please measure the clock on PCK to make sure it is 12000000 Hz...
-I- Press ` to switch next clock configuration...

-I- Select PLLA clock as the master clock
-I- Please measure the clock on PCK to make sure it is 12500000 Hz...
-I- Press ` to switch next clock configuration...

-I- Select UTMI PLL clock as the master clock
-I- Please measure the clock on PCK to make sure it is 7500000 Hz...
-I- Press ` to switch next clock configuration...

-I- Switch the XTAL 32K crystal oscillator to be the source of the slow clock
-I- Please measure the clock on PCK to make sure it is 32768 Hz...
-I- Debuging in EWARM IAR C_SPY, the JLINK will disconnect on some PC!
-I- Press ` to switch next clock configuration...
```

3.3.9 pwm

- **Purpose**

This example demonstrates PWM channel configuration.

- **Functional description**

Two PWM channels (channel #0, #1) are configured to generate two PWM signals.

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information.

(1) Connecting pin 7 in J2 to pin 8 in J2, blue LED start glowing repeatedly at f1

(2) Connecting pin 7 in J2 to pin 10 in J2, blue LED start glowing repeatedly at f2.

- **Phenomenon Indicates**

Two connection ways led LEDs flashing at different frequencies.

3.3.10 ssc_dma_audio

- **Purpose**

This example demonstrates output an audio stream by WM8731CODEC.

- **Functional description**

This example plays a pre-loaded WAN file into flash. The audio stream is outputted by WM873 SSC interface. Audio format:

Format: WAV

Sample rate: 48 kHz

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information:

```
-- ssc_dma_audio --
Menu :
------
x: Receive WAV f 閘 e with XModem Protocol
   X: Receive WAV file through DBGU
```

Input “x” in terminal

```
Transfer wav file with 1K XModem, Ctr+ D to cancel
```

Operation can be done in figure 3-29 and 3-30.

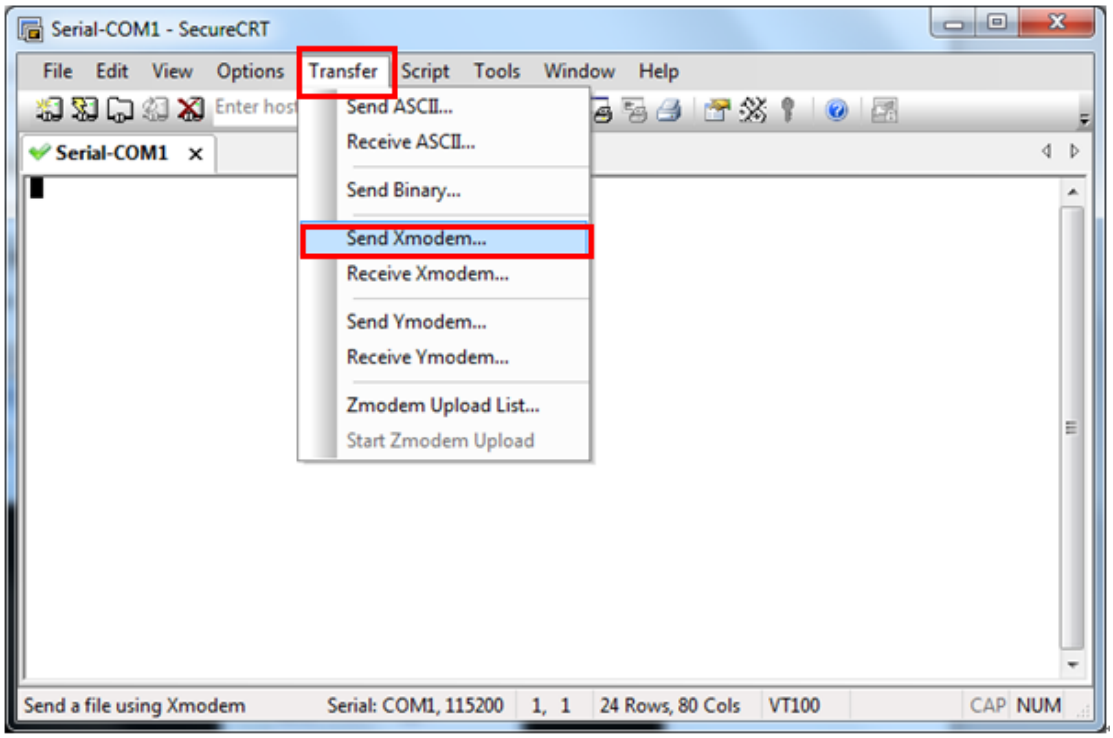


Figure 3-29

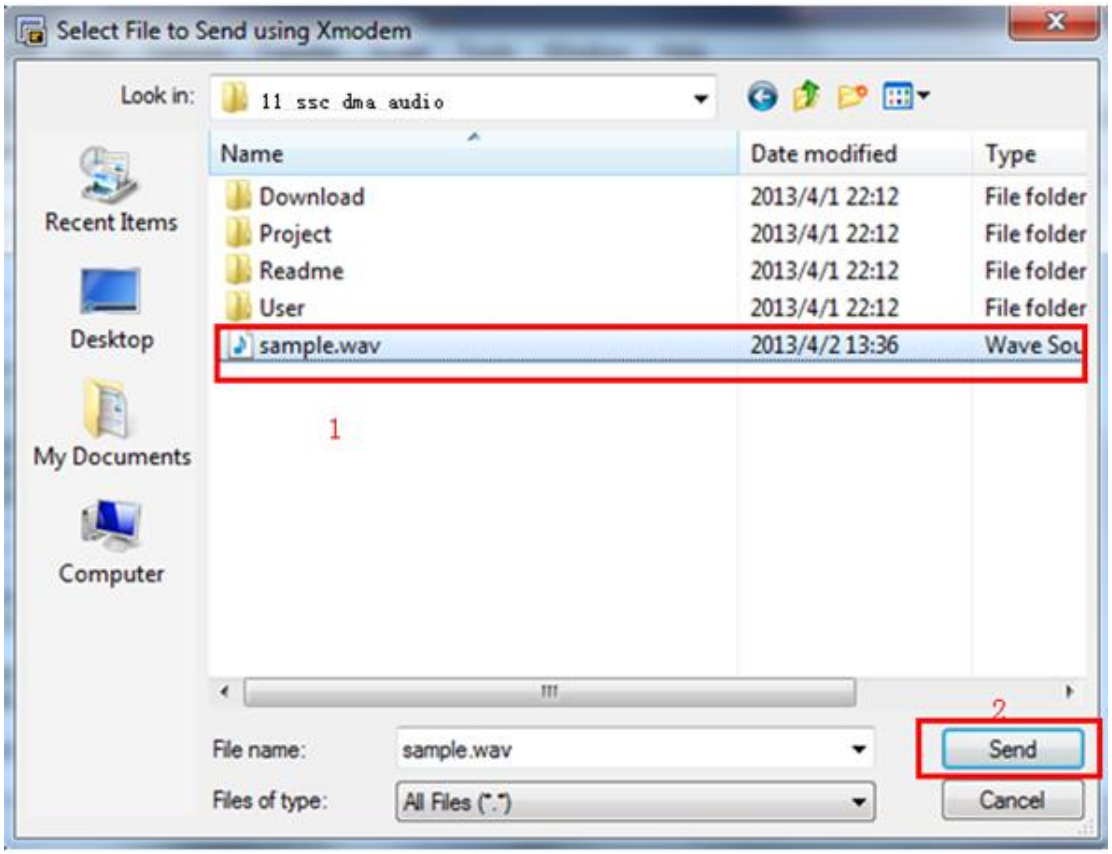


Figure 3-30

Starting xmodem transmission after clicking “OPEN”, press Ctrl+C to cancel transfer and wait end prompt:

```
100%        274 KB       5 KB/s 00:00:49          0 Errors
-- ssc_dma_audio --
Menu :
------
  W: Play the WAV file loaded
    I: Display the information of the WAV file
    x: Receive WAV file with XModem Protocol
    X: Receive WAV file through DBGU
```

Input 'W' to choose WAV file and "I" to output audio:

```
-- ssc_dma_audio --
Menu :
------
W: Play the WAV file loaded
I: Display the information of the WAV file
```

Pressing "W" mounts WAV audio and the terminal display:

```
-- ssc_dma_audio --
Menu:
------
      I: Display the information of the WAV file
    S: Stop playback
```

Pressing "I "outputs Audio:

```
-- WAV file @ 22000000
Wave file header information ------------------------------
   - Chunk ID              = 0x46464952
   - Chunk Size            = 281028
   - Format                = 0x45564157
   - SubChunk ID           = 0x20746D66
   - SubchunNRST Size      = 16
   - Audio Format          = 0x0001
   - Num. Channels         = 2
   - Sample Rate           = 48000
   - Byte Rate             = 192000
   - Block Align           = 4
   - Bits Per Sampl= 16
   - Subchunk2 ID          = 0x61746164
   - Subchunk2 Size        = 280992

-- Press any key to return to menu
```

- **Phenomenon Indicates**

  Terminal outputs information in detail and headphone outputs audio:

3.3.11 twi_eeprom

➢ **Purpose**

This example program demonstrates TWI peripheral accesses an external serial EEPROM chip.

➢ **Functional description**

This example is used to test EEPROM model.

➢ **Procedures**

Download program into board, press NRSRT to observe relevant terminal information:

➢ **Phenomenon Indicates：**

Terminal information:

```
-- TWI EEPROM Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 10 2012 16:46:29 --
-I- Filling page #0 with zeroes ...
-I- Filling page #1 with zeroes ...
-I- Read/write on page #0 (polling mode)
-I- 0 comparison error(s) found
-I- Read/write on page #1 (IRQ mode)
-I- Callback fired !
-I- Callback fired !
-I- 0 comparison error(s) found
```

3.3.12 usart_serial

➢ **Purpose**

This example demonstrates USART simulate DBUG.

➢ **Functional description**

On startup, the debug information is printed by DBGU port. USART0 will send back any character it receives from the HyperTerminal, as well as text file.

➢ **Procedures**

Download program into board, press NRSRT to observe relevant terminal information:

```
-- USART Serial Example 2.0 --
-- SAM9XX5-EK
```

```
-- Compiled: Jul 10 2012 17:08:53 --
-- Start to echo serial inputs --
```

Unplug the serial cable from DBUG (J18) and insert UART0 (J16). The terminal displays:

```
Start waiting data by using DMA:
```

(1) At this point, pressing the keyboard will echo the corresponding character:

```
Start waiting data by using DMA:
aa21dsdgfjhtcgfhdtrasrasssssssssssss
```

(2) Send a txt document. Build a text document and send it. Refer to figure 3-31and 3-32:

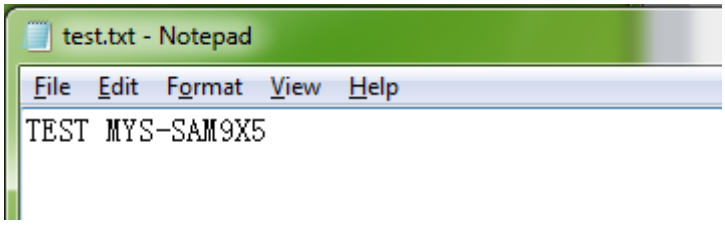


Figure 3-31

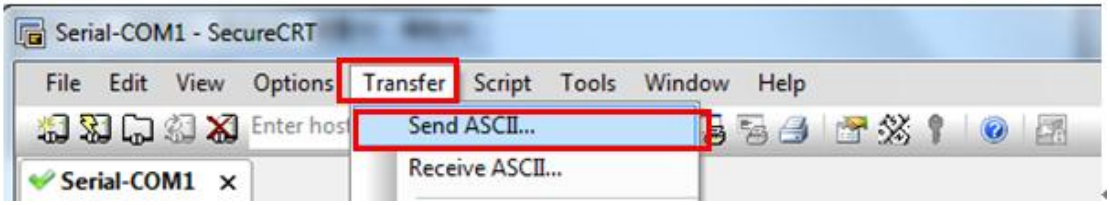


Figure 3-32

Terminal information:

```
 -- USART Serial Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 10 2012 17:08:53 --
-- Start to echo serial inputs --
Start waiting data by using DMA:

TEST MYD-SAM9X5!
```

- **Phenomenon Indicates**:

  The phenomenon is explained above.

3.3.13 emac0

- **Purpose**

  This example demonstrates Ethernet MAC (EMAC) and Ethernet transceiver.

- **Functional description**

Upon startup, configure board by default IP (192.168.2.115) and MAC address, test IP by ping command.

➢ **Procedures**

This example can be used in MYD-SAM9G25/G35/X25/X35 and requires Network port J11.

(1) Connect board to network or to PC by crosswire. Then set host IP 192.168.2.XX (Note: XX can't be 115).

(2) Download program into board, press NRSRT to observe relevant terminal information:

(3) Open a terminal application and type the following command line: ping 192.168.2.115.

➢ **Phenomenon Indicates**

Terminal information:

```
-- EMAC Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 11 2012 08:35:19 --
-- MAC 0:45:56:78:9a:bc
-- IP   192.168.2.115
-I- ** Valid PHY Found: 0
-I- AutoNegotiate complete
P: Link detected
```

Input the command in terminal: ping 192.168.2.115. Refer to figure 3-13:

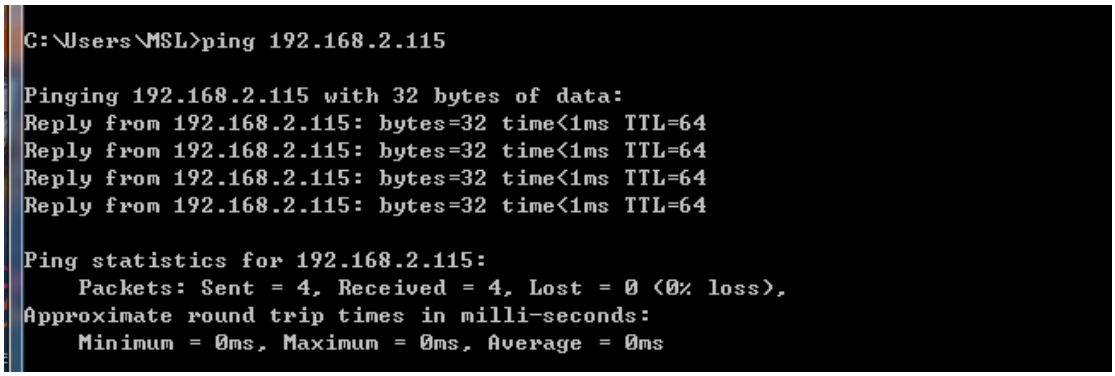


Figure 3-33

3.3.14 emac1

➢ **Purpose**

This example demonstrates Ethernet MAC (EMAC) and Ethernet transceiver.

➢ **Functional description**

Upon startup, configure board by a default IP (192.168.2.115) and MAC address, test IP by ping command.

➢ **Procedures**

The program can be used in MYD-SAM9X25 and requires Network port J11.

(1) Connect board to network or to PC by crosswire. Then set host IP 192.168.2.XX (Note: XX can't be 115).

(2) Download program into board, press NRSRT to observe relevant terminal information.

(3) Open terminal and type the following command line: ping 192.168.2.115.

➢ **Phenomenon Indicates**

Terminal information:

```
-- EMAC Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 25 2012 11:36:30 --
-- MAC 0:45:56:78:9a:bc
-- IP   192.168.2.115
-I- ** Valid PHY Found: 0
-I- AutoNegotiate complete
P: Link detected
```

Input the command in terminal: ping 192.168.2.115. Refer to figure 3-14:

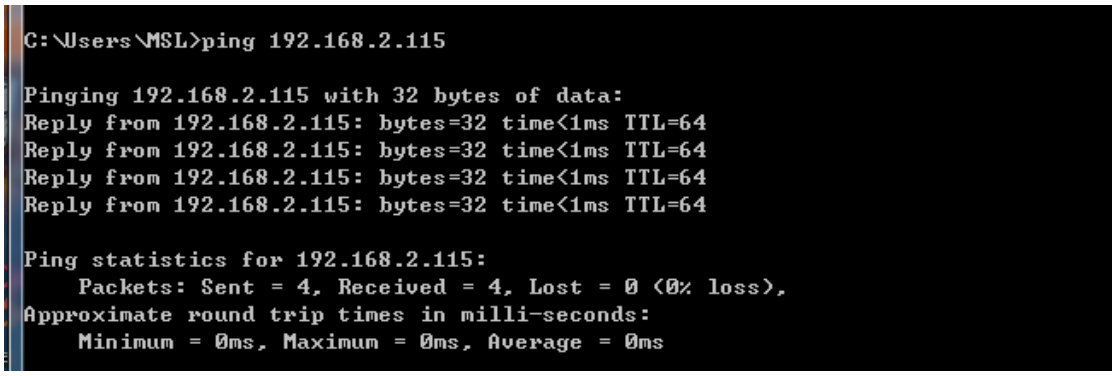


Figure 3-34

3.3.15 hsmci_multimedia_card

➢ **Purpose**

This example demonstrates HSMCI interface on SAM microcontrollers.

➢ **Functional description**

Open HyperTerminal before running this program, run this program, HyperTerminal

will print the test information which includes initialization and performance.

- **Procedures**

  Download program into board, press NRSRT to observe relevant terminal information, and then insert a SD card.

- **Phenomenon Indicates**

  Terminal information:

  Without insertting a SD card:

```
-- Basic MultiMedia Card Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 11 2012 09:09:37 --
-I- Cannot check if SD card is write-protected
```

  Insert a SD card:

```
=========================================
-I- SdMmcIdentify.Cmd5: 3
-I- SD MEM
-I- Card Type 2, CSD_STRUCTURE 0
-W- SD 4-bit mode
-I- HS Not Supported in SD Rev 0x0
-I- Set SD/MMC clock to 22222K
-I- SD/MMC card initialization successful
…
```

  Press Enter:

```
-!- MCK is 133MHz
-!- Buffer@2000b754,size 0x400000
# i,I     : Re-initialize card
# t       : Disk R/W/Verify test
# T       : Disk performance test
# p       : Change number of blocks in one access for test
# m       : Change MCI interface used
```

  Input the corresponding command for different operations. Input ‘t”:

```
=========================================
-!- Test code: 1.clr, 2.wr, 3.rd
-I- Testing block [783232 - 791423]…
```

3.3.16 hsmci_sdcard

- **Purpose**

  This example demonstrates HSMCI interface.

- **Functional description**

This example detects, initializes SD/MMC memory card, and performs R/W test on it.

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information.

When prompted that “Please insert a card”, start to initialize and test SD card.

- **Phenomenon Indicates**

Terminal information:

```
-- Basic HSMCI SD/MMC Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 11 2012 09:48:44 --
-I- Cannot check if SD card is write-protected
--


=========================================
-I- SdMmcIdentify.Cmd5: 3
-I- SD MEM
-I- Card Type 2, CSD_STRUCTURE 0
-W- SD 4-bit mode
-I- HS Not Supported in SD Rev 0x0
-I- Set SD/MMC clock to 22222K
…（Intermediate omit）
=========================================
-!- MCI 0, code: 1.clr, 2.wr, 3.rd
-I- Testing block [783232 - 791423]…
```

3.3.17 smc_nandflash

- **Purpose**

This example demonstrates s read/write data from/to nandflash SMC.

- **Functional description**

Configure interface between SMC NAND Flash, then test Nandflash.

- **Procedures**

Download program into board, turn SW1 on, press NRSRT to observe relevant terminal information.

- **Phenomenon Indicates**

Terminal information:

```
-- SMC NandFlash Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 11 2012 10:37:14 --
```

```
-I- Nandflash ID is 0x9580DA2C
Menu :
------
- i: Dump Nand flash information
- d: Enable or disable DMA
- r: Performance test (Raw without ECC)
- s: Performance test (Software ECC)
- p: Performance test (PMECC)
- h: Display this menu
```

Input “I”:

```
-I- Size of the whole device in bytes : 0x10000000
-I- Size in bytes of one single block of a device : 0x20000
-I- Number of blocks in the entire device : 0x800
-I- Size of the data area of a page in bytes : 0x800
-I- Number of pages in one block : 0x40
```

Input “d”:

```
-I- Initialize DMA done.
-I- Disable DMA done.
-I- Initialize DMA done.
-I- Disable DMA done
```

Input “r”:

```
-I- Erase block 10
-I- Write block 10
-I- Raw block write speed 4228K/s
-I- Read block 10
-I- Raw block Read speed 6553K/s
Menu :
------
- i: Dump Nand flash information
- d: Enable or disable DMA
- r: Performance test (Raw without ECC)
- s: Performance test (Software ECC)
- p: Performance test (PMECC)
- h: Display this menu
```

Input “s”:

```
-I- Disable PMECC using Software ECC.
-I- Erase block 10
-I- Write block 10
-I- Raw block write speed 1506K/s
-I- Read block 10
-I- Raw block Read speed 1899K/s
Menu :
```

```
------
- i: Dump Nand flash information
- d: Enable or disable DMA
- r: Performance test (Raw without ECC)
- s: Performance test (Software ECC)
- p: Performance test (PMECC)
- h: Display this menu
```

Input “p”:

```
-I- Initialize PMECC.
-I- Erase block 10
-I- Write block 10
-I- Raw block write speed 3542K/s
-I- Read block 10
-I- Raw block Read speed 5041K/s
Menu :
------
- i: Dump Nand flash information
- d: Enable or disable DMA
- r: Performance test (Raw without ECC)
- s: Performance test (Software ECC)
- p: Performance test (PMECC)
- h: Display this menu
```

Inputting “h” will display menu.

3.3.18 spi_serialflash

- **Purpose**

This example demonstrates set up SPI and read/write serial data flash.

- **Functional description**

This example tests serial data flash by erasing/writing each pages, and read/write bandwidth.

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. (Note: Turn SW2 on)

- **Phenomenon Indicates**

Terminal information:

```
-- SPI with Serialflash Example 2.0 --
-- SAM9XX5-EK
```

```
-- Compiled: Jul 11 2012 11:02:31 --
DMA driver initialized with IRQ
SPI and AT25 drivers initialized
ID read: 471f
AT25DF321 serial flash detected
Flash unprotected
Chip is being erased...
```

After a certain period of time:

```
Checking erase ...
Checking page #16383
Erase successful.
Programming a walking 1 on all pages ...
Programming page #16383
Walking 1 test successful.
```

3.3.19 usb_audio_looprec

- **Purpose**

This example demonstrates UDP and DACC on AT91SAM microcontrollers, as well as USB framework.

- **Functional description**

Input loop back sound to a simulated USB Desktop Speaker, connect board to host by USB cable, and then play music, the audio stream is sent to board. At the same time, the audio stream received is also sent back to host for recording.

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information, connect PC by USB cable, the host reports a new USB device attachment.

- **Phenomenon Indicates**

Start board, the host will report a new USB device attachment and install it automatically. “USB Audio Device” appears in hardware device list. Refer to figure 3-35:

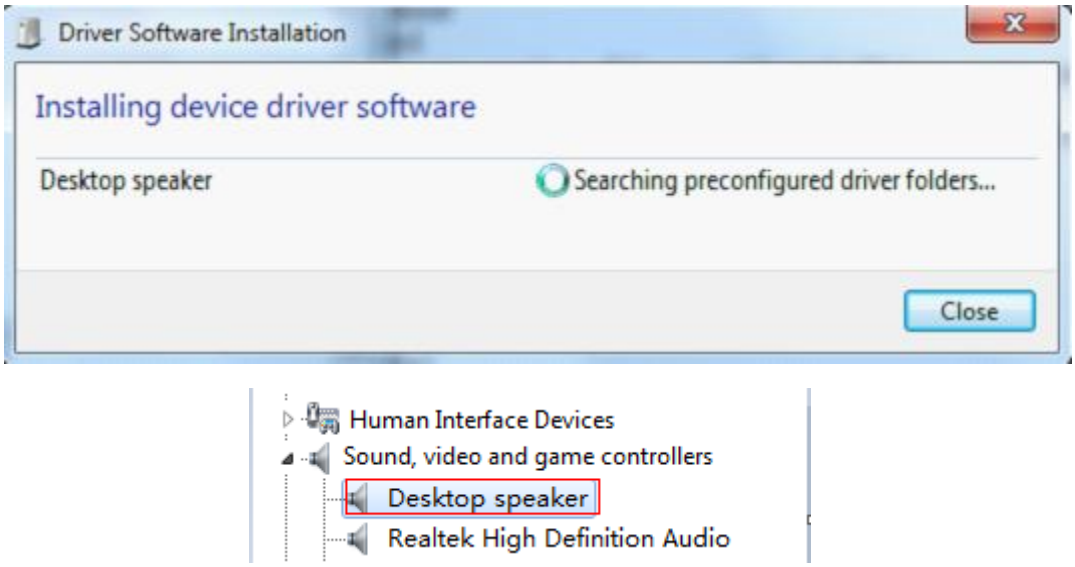


Figure 3-35

Terminal information:

```
-- USB Device Audio LoopREC Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 13 2012 10:02:27 --
USBD_Init
```

3.3.20 usb_cdc_serial

- **Purpose**

This example demonstrates USB Device Port (UDP) and USART interface on AT91SAM microcontrollers, as well as USB Framework.

- **Functional description**

This demo simulates a USB to RS-232 Serial Port Converter

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information, host will report a new USB device attachment (Note: it may be not appeared in some computers). There will be additional serial port after installing driver.

- **Phenomenon Indicates**:

There will be device in the figure 3-26:

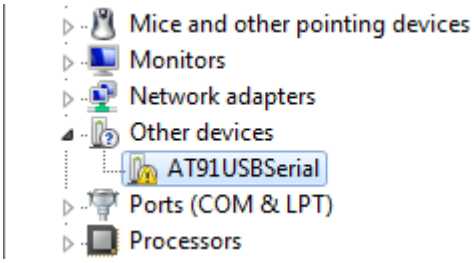


Figure 3-36

Updating driver (location: 04_MDK_Source\libraries\usb\device), there will be additional “AT91 USB to Serial Converter (COM18)” in the device. Refer to figure 3-37:

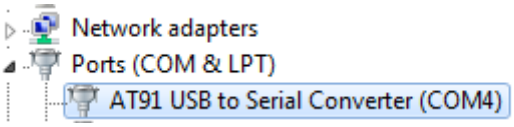


Figure 3-37

Terminal information:

```
USB Device CDC Serial Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 11 2012 11:44:04 --
-I- CDCDSerial_Initialize
-I- CDCDSerialPort_Initialize
USBD_Init
-- ESC to Enable/Disable ECHO on cdc serial --
-- TAB to Enable/Disable DEBUG log output     --
-I- VBus configuration
-I- conn
```

3.3.21 usb_core

- **Purpose**

  This example demonstrates UD interface on AT91SAM microcontroller.

- **Functional description**

  Connect PC by USB cable, and host will notice USB device attachment.

- **Procedures**

  Download program into board, press NRSRT to observe relevant terminal information, connect to PC by USB cable, the host reports a new USB device attachment. (Note: some computers maybe not report it). The device manger is shown in figure 3-38:

- **Phenomenon Indicates**

  New hardware USB device can be found in device manger. Refer to figure 3-38:

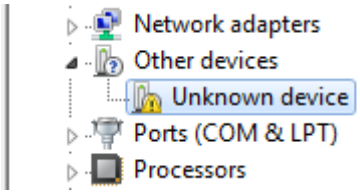


Figure 3-38

Specially Note: the left is the test result of Winows7 system while the right is the test result of Windows XP system.

Terminal information:

```
        USB Device Core Project 2.0 --
    -- SAM9XX5-EK
    -- Compiled: Jul 13 2012 09:06:43 --
    -I- USB initialization
    USBD_Init
    -I- Connecting device
    -I- VBus configuration
    -I- conn
    Rsm Susp Rsm Std gDesc Dev Std sAddr SetAddr(5) Std gDesc Dev Std gDesc Cfg Std gDesc Cfg Std gDesc Cfg
```

3.3.22 usb_hid_keyboard

➢ **Purpose**

This example demonstrates UDP and PIO interface on AT91SAM microcontrollers, USB Framework that is used for USB driver such as USB HID.

➢ **Functional description**

This example simulates a simple keyboard. Connect to host by USB cable, host reports a new hardware attachment. Refer to figure 3-39:

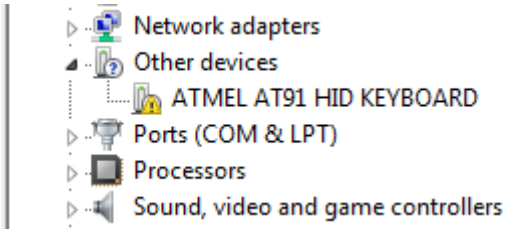


Figure 3-39

After installing driver, new USB Device appears in the hardware device list. As shown in figure 3-40:

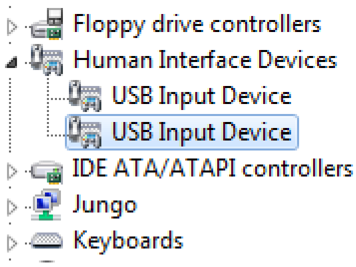


Figure 3-40

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information, PC reports new device and installs it automatically. After installing it, a new USB device is added to human input device in the device manger.

- **Phenomenon Indicates**

A new USB device is added in device manger. Refer to figure 3-39:

Terminal information:

```
  USB Device HID Keyboard Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 13 2012 10:33:42 --
-- : DBG key 1 2 used as buttons
-- : 1st press to push, 2nd press to release
-I- HIDDFunction_Initialize
USBD_Init
-I- VBus configuration
-I- conn
```

Typing “1” make terminal print character “a” continuously, while typing ”1” again make terminal stop printing character “a”.

```
-I- Key 0 pressed
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa-I- Key 0 released
-I- Key 0 pressed
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa-I- Key 0 released
-I- Key 0 pressed
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaa-I- Key 0 released
```

3.3.23 usb_hid_mouse

- **Purpose**

This Example demonstrates UDP and PIO interface on AT91SAM microcontrollers, as well as USB Framework.

➢ **Functional description**

This example achieves the function that the USB model control mouse. Connect host by USB cable, the host report a new device attachment. Then control cursor by pressing “w s a d”.

➢ **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. The host reports a new device and installs it automatically and there will be new device in device manger. Pressing “w a s d” (respectively represent: up, down, left, right) can move host cursor (Note: cursor is in terminal window).

➢ **Phenomenon Indicates**

New USB device can be found in device manger. Refer to figure 3-41:

Figure 3-41

Terminal information:

```
USB Device HID Mouse Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 13 2012 10:52:08 --
-- Press W S A D to move cursor
-I- HIDDFunction_Initialize
USBD_Init
-I- VBus configuration
-I- conn
```

3.3.24 usb_hid_msd

➢ **Purpose**

This example demonstrates USB Device Port (UDP) interface and other interfaces, as well as USB Framework.

➢ **Functional description**

This example simulates a USB composite device and Keyboard. Connect to host by USB cable, and host will notice USB device attachment. After installing it, there is a 10M removable disk.

➢ **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. Connect to host by USB cable, and host will notice USB device attachment. After installing it, there is a 10M removable disk.

➢ **Phenomenon Indicates**

After starting board, new USB device can be found in the device manger. Refer to figure 3-42:

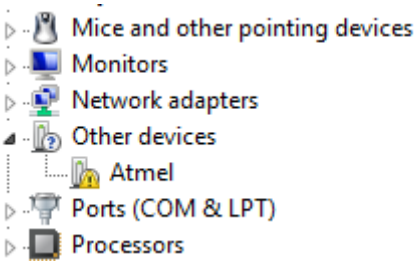


Figure 3-42

After installing driver, there will pop up a dialog box that whether to format disk. Refer to figure 3-43:

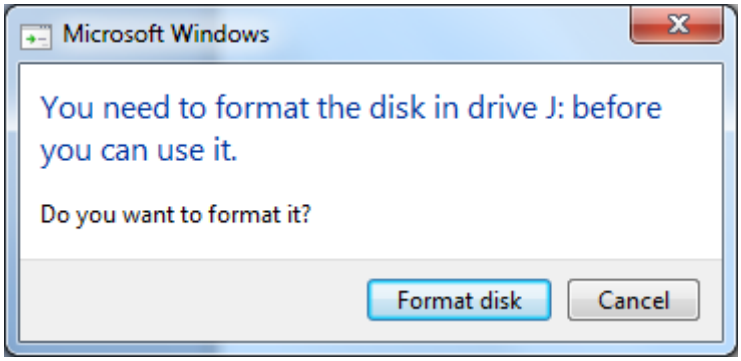


Figure 3-43

Choose to format disk and pop up dialog of formatting removable disk. Refer to figure 3-44:

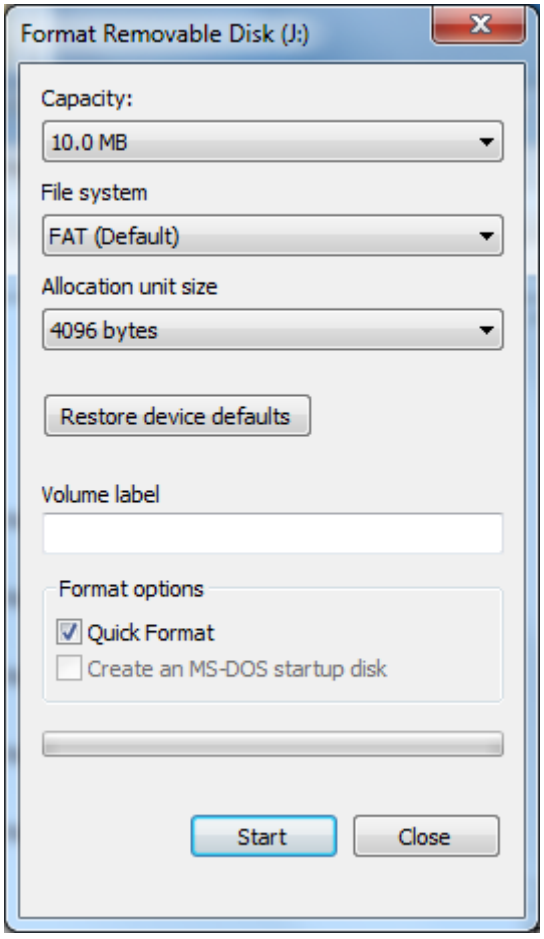


Figure 3-44

After formatting it, there is a 10M removable disk. Refer to figure 3-45:

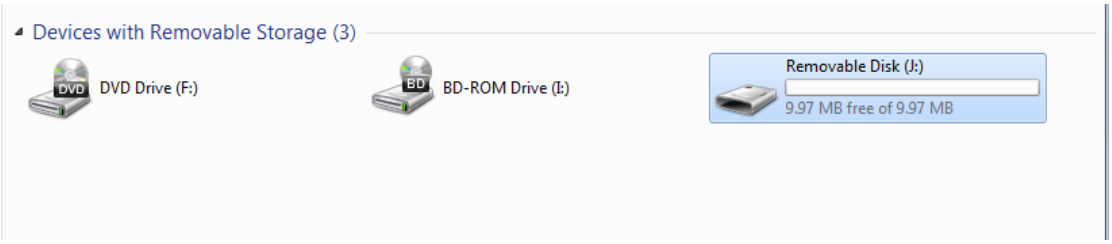


Figure 3-45

Terminal information:

```
USB HIDMSD Device Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 13 2012 11:03:53 --
-- : DBG key 1 2 used as buttons
-- : 1st press to push, 2nd press to release
-I- LUN init
RamDisk @ 22000000, size 10485760
-I- RAM Disk init
-I- LUN init
-I- LUN: blkSize 1, size 20480
-I- HIDDFunction_Initialize
-I- MSDFun init
MSDReset USBD_Init
-I- VBus configuration
-I- conn
------------------------------
Inquiry Sending
Inquiry Sent Cplt
SendCSW ok
------------------------------
Inquiry Sending
Inquiry Sent Cplt
SendCSW ok
------------------------------
-W- MSDD_ProcessCommand: Unknown cmd 0x23
StaIN Cplt StallIn WaitHALNewReq Kbd T
SendCSW ok
------------------------------
ReqSense
ReqSense Cplt
SendCSW ok
------------------------------
.....（More information is not a comprehensive display）
```

3.3.25 usb_hid_transfer

- **Purpose**

This example demonstrates UDP and PIO interface on AT91SAM microcontrollers, as well as USB Framework that is used for USB drivers such as HID.

➢ **Functional description**

This example simulates a customized HID device that includes customized data stream of LEDs and buttons. Connect to host by USB cable, and host will report a new device attachment.

➢ **Procedures**

(1) Download program into board, press NRSRT to observe relevant terminal information.

(2) Connect to PC by USB cable, the LED blinks. Open hidTest.exe (Location: 04_MDK_Source\25_usb_hid_transfer\hidTest.exe) to test new device information

(3) Find HID Device whose VID is 03EB and PID is 6201, select item type and item to see its attributes.

(4) Type what you want to send in output edit box, terminal data displays information.

➢ **Phenomenon Indicates**:

After starting board, host will report a new device attachment and install driver automatically. Refer to figure 3-46:

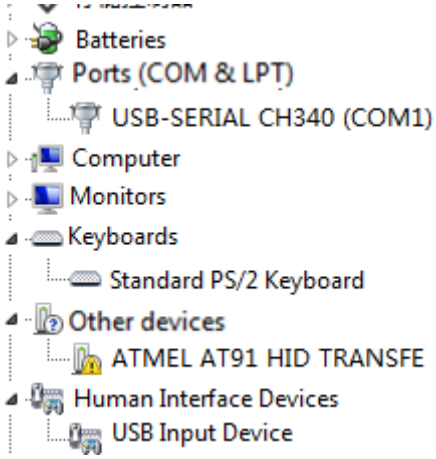


Figure 3-46

After installing driver, new USB device and HID-compliant device are added to human input device. Refer to figure 3-47:

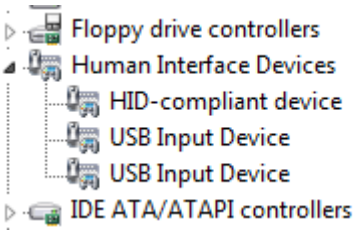


Figure 3-47

Open software (04_MDK_Source\25_usb_hid_transfer\hidTest.exe) and click “Read” to read HID ID. Clicking LED1, LED2 respectively control blue light and red light. Refer to figure 3-48:

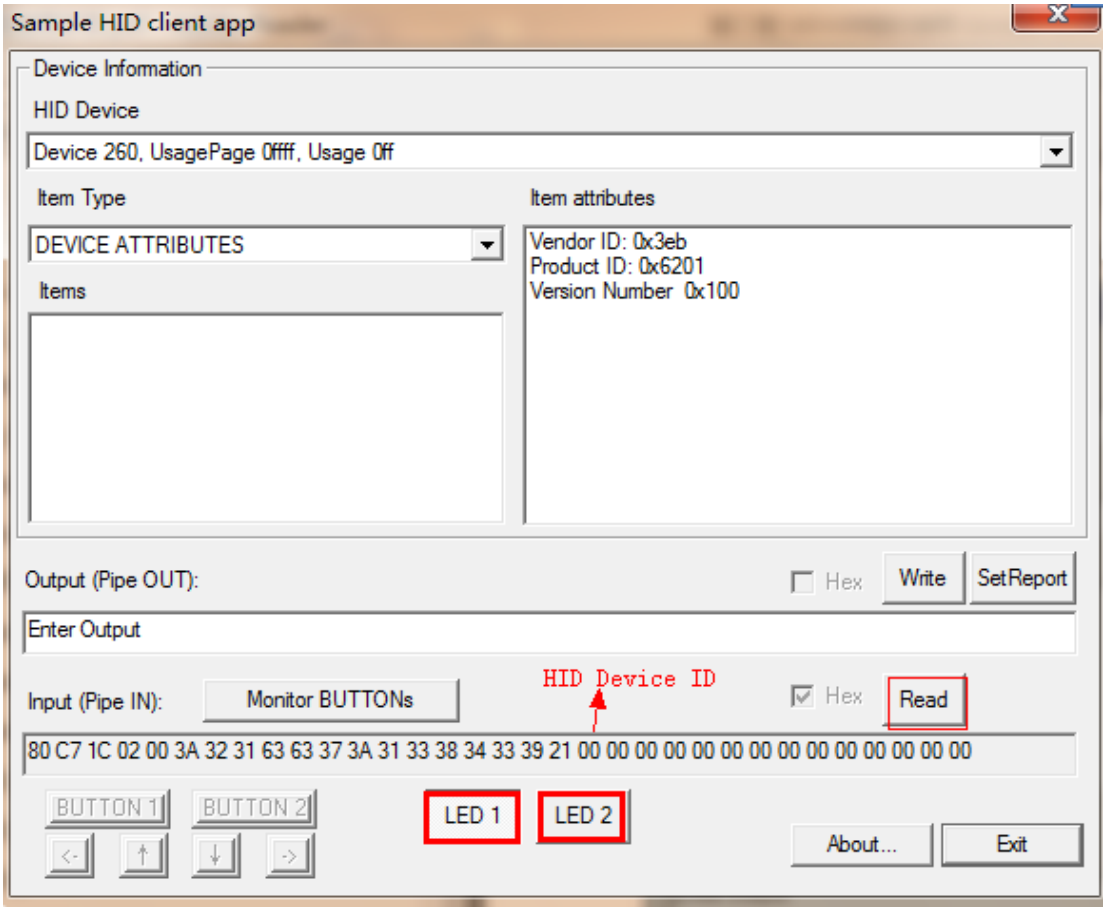


Figure 3-48

Terminal information:

```
USB Device HID Transfer Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 13 2012 11:20:38 --
-- : DBG key 1 2 used as buttons
-- : 1st press to push, 2nd press to release
-I- HIDDFunction_Initialize
USBD_Init
-I- VBus configuration
-I- conn
81 4f 00 20 00 00 00 00
  00 00 00 00 00 00 00 00
  00 00 00 00 00 00 00 05
  00 00 00 00 00 00 00 01
```

```
Data In(32):
 83 4f 00 20 00 00 00 00
 00 00 00 00 00 00 00 00
 00 00 00 00 00 00 00 05
 00 00 00 00 00 00 00 01
Data In(32):
 82 4f 00 20 00 00 00 00
 00 00 00 00 00 00 00 00
 00 00 00 00 00 00 00 05
 00 00 00 00 00 00 00 01
Data In(32):
 83 4f 00 20 00 00 00 00
 00 00 00 00 00 00 00 00
 00 00 00 00 00 00 00 05
 00 00 00 00 00 00 00 01
```

3.3.26 usb_iad_cdc_cdc

- **Purpose**

This example demonstrates UDP interface and other interfaces, USB Framework that is used for USB drivers such as USB CDC, as well as combination between two USB and single composite device (such as Dual CDC port).

- **Functional description**

This example simulates USB to RS-232 Serial Port Converter. Connect to host by USB cable, and host will notice USB device attachment.

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. When connecting to PC by USB cable, LED blinks and host reports a new USB device attachment. Send data to port and observe it in other HyperTerminal connected to USART or USB.

- **Phenomenon Indicates**

After starting board, the host will report a new device attachment and install driver automatically.

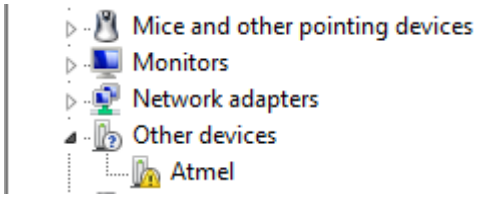


Figure 3-49

If driver is not installed successfully (in figure 3-49), install it manually (Loation: 04__ MDK_Source\libraries). The installation method can refer to chapter 3.23. If the installation is completed, there will be two new COM devices. Refer to figure 3-50:

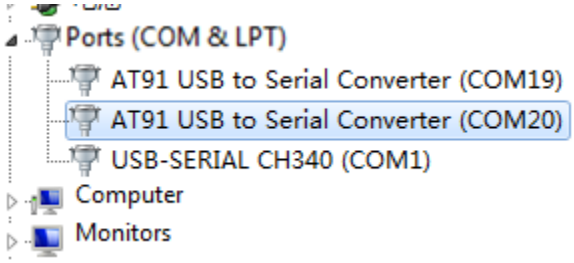


Figure 3-50

Terminal information:

```
USB Dual CDC Device Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 13 2012 11:43:44 --
-I- DUALCDCDDriver_Initialize
-I- CDCDSerialPort_Initialize
-I- CDCDSerialPort_Initialize
USBD_Init
-I- VBus configuration
-I- conn
```

3.3.27 usb_iad_cdc_hid

➢ **Purpose**

This example demonstrates USB Device Port (UDP) interface and other interfaces as well as USB Framework that is used for USB driver such as USB CDC, and combination between two USB and a single composite (such as CDC+HID).

➢ **Functional description**

This example simulates a USB composite device that has USB to Serial RS232 Converter and USB HID Keyboard functions. When connect to host by USB cable, host

will notice USB device attachment. After installing driver, device manger adds COM and keyboard devices.

➢ **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. When connect to PC by USB cable, the LED blinks and host reports a new USB device attachment. After installing driver, “AT91 USB to Serial Converter” and “HID keyboard Device” is added to device manger. Typing “1” make terminal continuously print “a”, while typing “1” again make terminal stop printing “a”.

➢ **Phenomenon Indicates**

After starting board, the host will report a new device attachment and install driver automatically. After installing driver, new device can be found in device manger. Refer to figure 3-51:

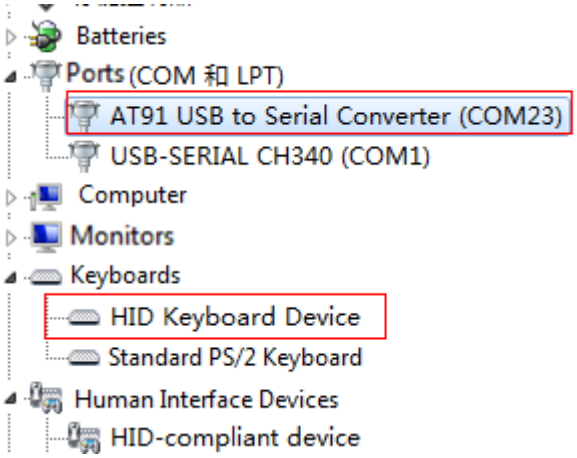


Figure 3-51

Note: If the driver is not installed successfully (in figure 3-49), install it manually (Loation: 04__MDK_Source\libraries). The installation method can refer to chapter 3.23.

Terminal information:

```
USB CDCHID Device Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 13 2012 14:15:47 --
-- : DBG key 1 2 used as buttons
-- : 1st press to push, 2nd press to release
-I- CDCDSerial_Initialize
-I- CDCDSerialPort_Initialize
-I- HIDDFunction_Initialize
USBD_Init
```

```
-I- VBus configuration
-I- conn
```

Typing “1” make terminal print “a” continuously, while typing “1” again make terminal stop outputting “a”.

```
-I- Key 0 pressed
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaa-I- Key 0 released
-I- Key 0 pressed
aaaaaaaaaaaaaaaaaaaaaaaa-I- Key 0 released
-I- Key 0 pressed
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa-I- Key 0 released
-I- Key 1 pressed
-I- Key 1 released
-I- Key 0 pressed
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa-I-
Key 0 released
```

3.3.28 usb_iad_cdc_msd

- **Purpose**

This example demonstrates UDP interface and other interfaces as well as USB Framework that is used for USB drivers such as USB CDC, and combination between two USB and one CDCMSD device (such as CDC+MSD).

- **Functional description**

This example simulates a USB composite device that integrates USB CDC Serial RS232 Converter function and USB Disk function. When connect to host by USB cable, host will notice USB device attachment. After installing the driver, there is a COM device and a 10M removable disk.

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. When connect to PC by USB cable, the LED blinks and host reports a new USB device attachment. After installing the driver, there will be AT91 USB to Serial Converter and ATMEL Mass Storage MSD USB Deice. PC will add a new added 10M removable disk which can be used as a common disk if it is formatted.

➢ **Phenomenon Indicates**

After starting board and installing driver, host will add a COM device. Refer to figure 3-52:

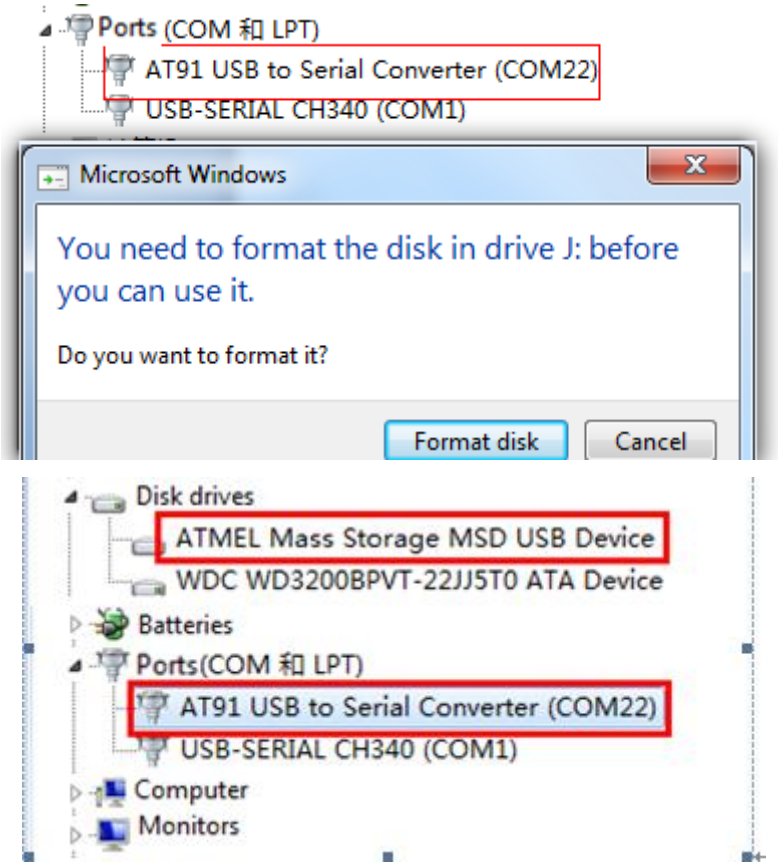


Figure 3-52

Terminal information:

```
-- USB CDCMSD Device Project 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul  6 2012 15:36:27 --
-I- LUN init
RamDisk @ 22000000, size 10485760
-I- RAM Disk init
-I- LUN init
-I- LUN: blkSize 1, size 20480
-I- CDCDSerial_Initialize
-I- CDCDSerialPort_Initialize
-I- MSDFun init
MSDReset USBD_Init
-I- VBus configuration
-I- conn
Rsm Susp Rsm NewReq Cdcf Msdf Std gDesc Dev NewReq Cdcf Msdf Std sAddr
SetAddr(5) NewReq Cdcf Msdf Std gDesc Dev NewReq Cdcf Msdf Std gDesc Cfg
```

NewReq Cdcf Msdf Std gDesc Str0 NewReq Cdcf Msdf Std gDesc Str1 NewReq Cdcf Msdf Std gDesc Dev NewReq Cdcf Msdf Std gDesc Cfg NewReq Cdcf Msdf Std gDesc Cfg NewReq Cdcf Msdf Std sCfg SetCfg(1) MSDFunCfg MSDReset -I- USB Connect

NewReq Cdcf Msdf Std gDesc Str1 NewReq Cdcf Msdf Std gDesc Str1 NewReq Cdcf Msdf Std gDesc Str1 NewReq Cdcf Msdf Std gDesc Str1 NewReq Cdcf Cdcs gLineCoding NewReq Cdcf Cdcs sControlLineState(0, 0) NewReq Cdcf Cdcs Msdf gMaxLun

---

Inquiry Sending

Inquiry Sent Cplt

SendCSW ok

Inquiry Sending

Inquiry Sent Cplt

SendCSW ok

（More information is not a comprehensive display）

3.3.29 usb_massstorage

- **Purpose**

This example demonstrates UDP as well as USB Framework that is used for USB drivers such as USB MSD.

- **Functional description**

This example simulates a 10M bytes USB disk. When connect to host by USB cable, board is as USB disk. If board with SDRAM, the disk can be up to 10M so that read/write speed can be tested. If there is no SDRAM but only internal flash, the disk is about 30K and only small file can be tested.

- **Procedures**

Download program into board, press NRSRT to observe relevant terminal information. When connect to PC by USB cable, the host reports a new USB device attachment and Disk installation. Then "ATMEL Mass Storage MSD USB Device appears in hardware device list and host pop up a dialog box that whether to format removable. As shown in figure 3-52:

- **Phenomenon Indicates**

The device manger adds a new device. Refer to figure 3-53:

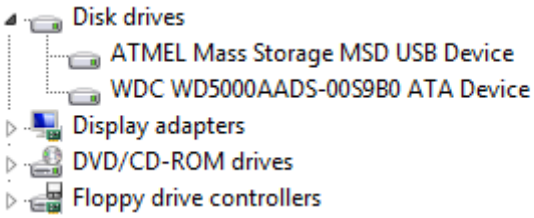


Figure 3-53

The host pops up a dialog box that whether to format the removable disk. Refer to figure 3-54 and 3-55:

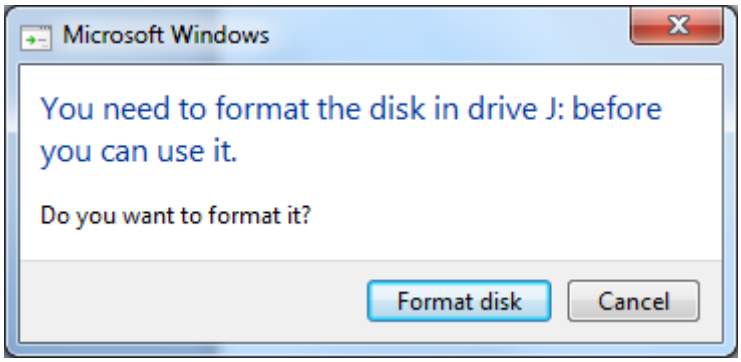


Figure 3-54

Figure 3-52 Before format

Figure 3-53 (Right) After format

Figure 3-55

Terminal information:

```
-- USB Device Mass Storage Example 2.0 --
-- SAM9XX5-EK
-- Compiled: Jul 11 2012 14:27:44 --
-I- LUN init
RamDisk @ 22000000, size 10485760
-I- RAM Disk init
-I- LUN init
-I- LUN: blkSize 1, size 20480
-I- MSDFun init
```

```
MSDReset USBD_Init
-I- VBus configuration
-I- conn
Rsm Susp Rsm NewReq Msdf Std gDesc Dev NewReq Msdf Std sAddr SetAddr(5) NewReq Msdf Std gDesc Dev NewReq Msdf Std gDesc Cfg NewReq Msdf Std gDesc Str3 NewReq Msdf Std gDesc Str0 NewReq Msdf Std gDesc Str2 NewReq Msdf Std gDesc Dev NewReq Msdf Std gDesc Cfg NewReq Msdf Std gDesc Cfg NewReq Msdf Std gDesc Str0 NewReq Msdf Std gDesc Str0 NewReq Msdf Std gDesc Str3 NewReq Msdf Std gDesc Str3 NewReq Msdf Std sCfg SetCfg(1) MSDFunCfg MSDReset NewReq Msdf gMaxLun
------------------------------
Inquiry Sending
Inquiry Sent Cplt
SendCSW ok
------------------------------
Inquiry Sending
Inquiry Sent Cplt
SendCSW ok
------------------------------
-W- MSDD_ProcessCommand: Unknown cmd 0x23
StaIN Cplt StallIn WaitHALNewReq Msdf ClrFeat Hlt Std cFeat Hlt T
SendCSW ok
…（Part is omitted）
```

Chapter 4 Linux System Guide

4.1 Outline

This chapter describes how to run Linux system and embedded Linux applications, the process of drive development in MYD-SAM9X5 development board. It includes the development environment to build, compile source code, image download and Linux application, driver example and Qt transplantation tutorials. The default startup is that NandFlash start the initial system. Product is Linux system at the factory and the NandFlash content distribution and some analysis are as bellows:

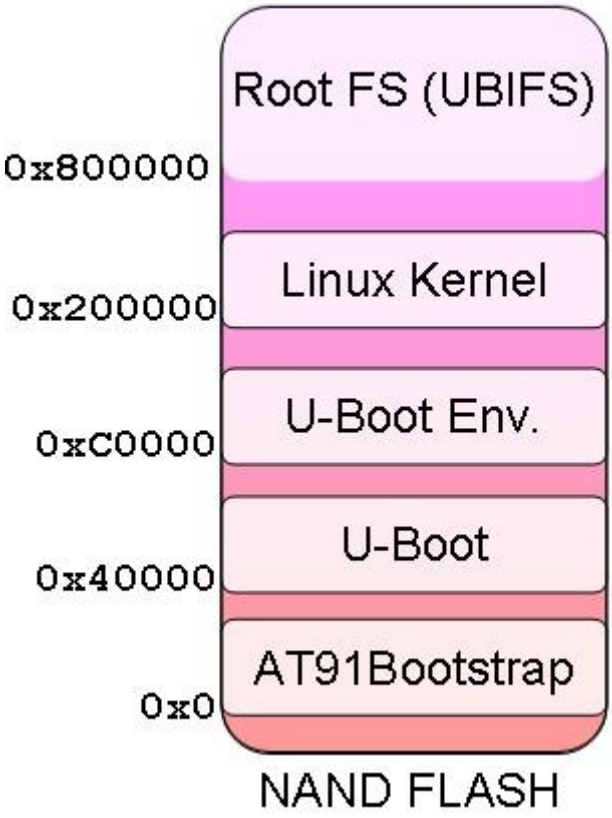


Figure 4-1

(1) BootStrap

After power on system, the first class boot program is copied automatically to internal SRAM and begins to implement by CPU. The main role is to initialize CPU and external RAM and u-boot is copied from NandFlash to external RAM, and then jump to u-boot entry

and start u-boot.

(2) u-boot

Secondary boot program, which is used for kernel image updates, load kernel and boot kernel starts.

(3) u-boot Env

Configure environment variables and provide u-boot running parameters, such as ip address, start a command, kernel boot parameters:

(4) Linux Kernel

Design Linux 2.6.39 kernel for MYD-SAM9X5

(5) Root FS

Angstrom-X11 GUI system file, Angstrom-Qt no desktop file system

4.2 Software Resources

Category	Name	Remark
Boot program	Boot Stram	First boot program
	u-boot	Secondary boot program
Linux kernel	Linux 2.6.39	Linux kernel only for MYD-SAM9X5 hardware
Device Drivers	USB Host	USB Host driver supports the mode of OHCI and EHCI transmission
	USB Device	USB Device Driver (Gadget)
	Ethernet	Ethernet driver
	MMC / SD	MMC/SD Card driver
	NandFlash	NandFlash/SmartMedia driver
	TWI(I2C)	I2C driver
	SPI	SPI driver
	AC97	AC97Audio driver
	LCD Controller	LCD driver, support 4.3 inch, 7 inch，10.2 inch
	RTC	RTC clock driver
	TouchScreen	4 -wire resistive touch screen driver

	PWM	PWM (pulse width modulation) driver
	UART	Serial port driver
	LED	LED driver, including GPIO LED PWM LED driver
System Files	Angstrom-X11	X11 file system with a graphical interface
	Angstrom-Qt	(no desktop file system of Qt library transplanted)

Table 4-1

4.3 Start Linux System

4.3.1 Install Download Tool

Here installing Atmel ISP download software, SAM-BA (requires version 2.11 above, the software's position in the disc is :03-Tools / SAM-BA), Note to uninstall samba v2.10 and the previous versions(SAM-BA software and development board USB drive) before the installing. If you need two or more versions of SAM-BA coexist, then the different versions of SAM-BA should use a different USB port on the PC.

4.3.2 Connect Board to PC

(1) Board (J17) will be connected to PC by micro USB cable and power on by USB.

(2)Turn SW1 1, 2 OFF, and disconnect jumper JP8, then restart board (the order is not reversed). Firstly, connect to board, it will be prompted to install board driver. Then select SAM-BA installation directory which can be installed as shown in figure 4-2:

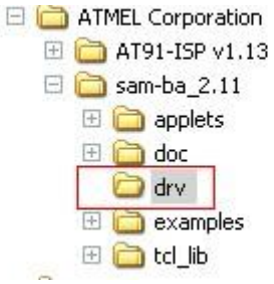


Figure 4-2

(3) If there is figure 4-3 in "my computer->properties->Management-> device manager-> port", which shows board driver has been installed.

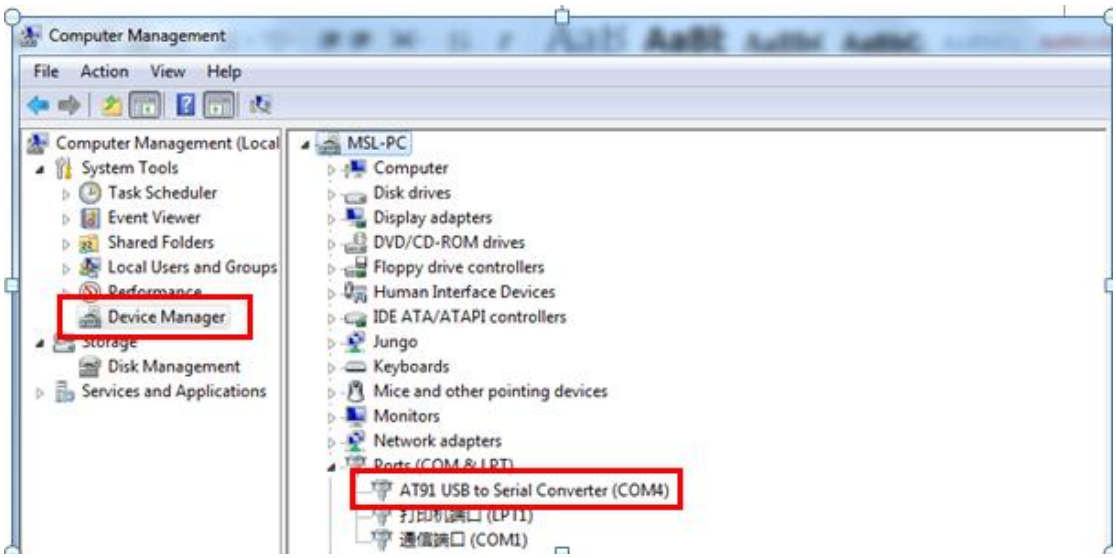


Figure 4-3

Here COM8 is machine connection port (determined by actual situation, here is COM8). SW1 switch is ON and switch 2 is kept OFF.

(4) Connect J18 to PC by serial cable, set up HyperTerminal: COM1, 115200, 8, none, 1. COM port number is set by actual situation.

4.3.3 Automatic Download

Note: (1).please pull out SD card before download, otherwise an error may occur. (2). Here to use the 4.3-inch screen's X11 image as an example. If you are using a different size screen or to download Qt image, please download the image under the corresponding directory

After complete chapter 4.3.1 and 4.3.2, open CD-ROM directory: \02-Images\Linux\4.3 LCD\X11, double-click at91sam9x5ek_demo_linux_nandflash.bat. Then SAM-BA will download Linux image automatically to board. Entire download process takes about three minutes. When pop logfile.log file automatically, reset board, there will be Linux start information.

Linux use, please refer to chapter 4.7.

4.3.4 Manual Download

Note: (1).please pull out SD card before download, otherwise an error may occur. (2). Here to use the 4.3-inch screen's X11 image as an example. If you are using a different size screen or to download Qt image, please download the image under the corresponding directory

Use SAM-BA to download Linux manually

(1) Complete chapter 4.3.1 and 4.3.2, turn switch SW1, SW2 off, restart board, and then turn SW1 on, open SAM-BA to set corresponding parameters. Connection is \the USBserial\COMXX (XX is each computer's COM port, choose it by actual situation, here selected COM8) board select at91sam9x35 -ek. And then click "Connect", specific settings and connected results are shown in figure 4-4, 4-5:

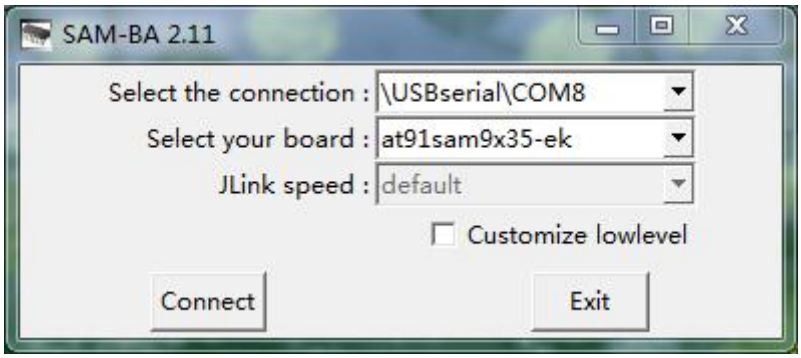


Figure 4-4

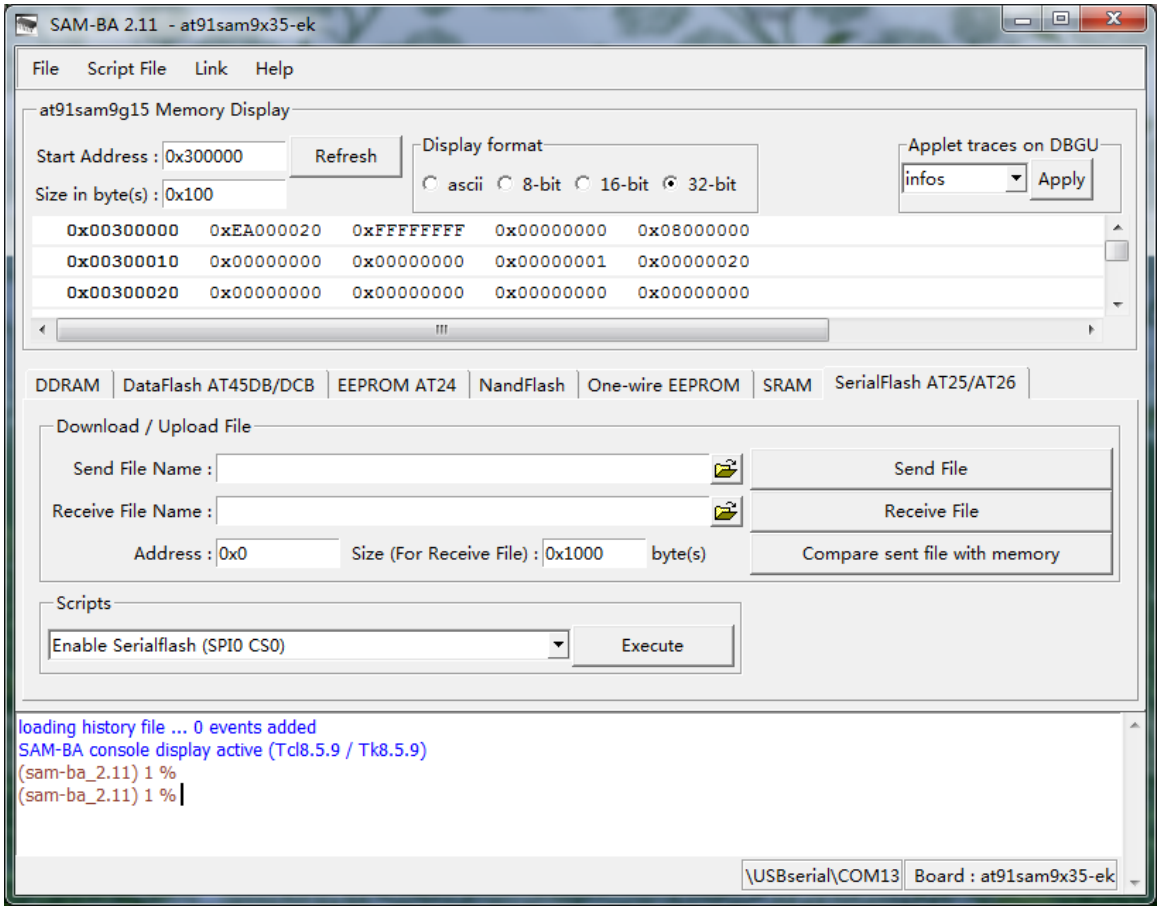

SAM-BA 2.11 - at91sam9x35-ek
File
Script File
Link
Help
at91sam9g15 Memory Display
Start Address : 0x300000
Size in byte(s) : 0x100
Refresh
Display format
ascii
8-bit
16-bit
32-bit
Applet traces on DBGU
infos
Apply
0x00300000 0xEA000020 0xFFFFFFFF 0x00000000 0x08000000
0x00300010 0x00000000 0x00000000 0x00000001 0x00000020
0x00300020 0x00000000 0x00000000 0x00000000 0x00000000
DDRAM
DataFlash AT45DB/DCB
EEPROM AT24
NandFlash
One-wire EEPROM
SRAM
SerialFlash AT25/AT26
Download / Upload File
Send File Name :
Receive File Name :
Address : 0x0
Size (For Receive File) : 0x1000
byte(s)
Send File
Receive File
Compare sent file with memory
Scripts
Enable Serialflash (SPI0 CS0)
Execute
loading history file ... 0 events added
SAM-BA console display active (Tcl8.5.9 / Tk8.5.9)
(sam-ba_2.11) 1 %
(sam-ba_2.11) 1 %
\USBserial\COM13
Board : at91sam9x35-ek

Figure 4-5

(2) Click NandFlash tab and execute Enable NandFlash Erase All, Enable OS PMECC parameters in Scripts tab (select an action and click next to "Execute" execution). When Execute Enable OS PMECC, Pop - up dialog box, click OK to use the default settings, the specific operation is as follows:

Select "Enable NandFlash" in Scripts tab, and then click "Execute" to Enable NandFlash. Refer to figure 4-6:

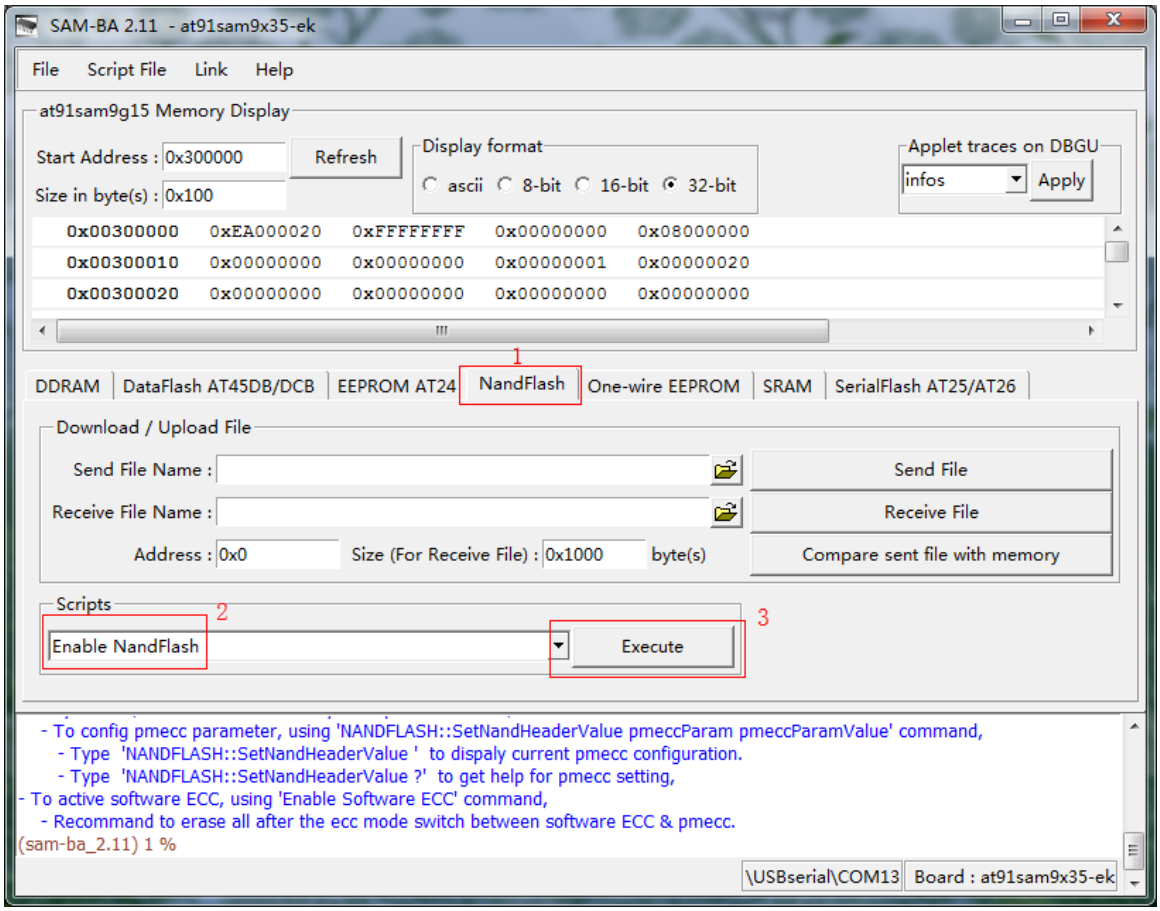


Figure 4-6

Select **"Enable OS PMECC parameters"** in Scripts tab and then click "**Execute**", click OK to use the default settings. Refer to figure 4-7:

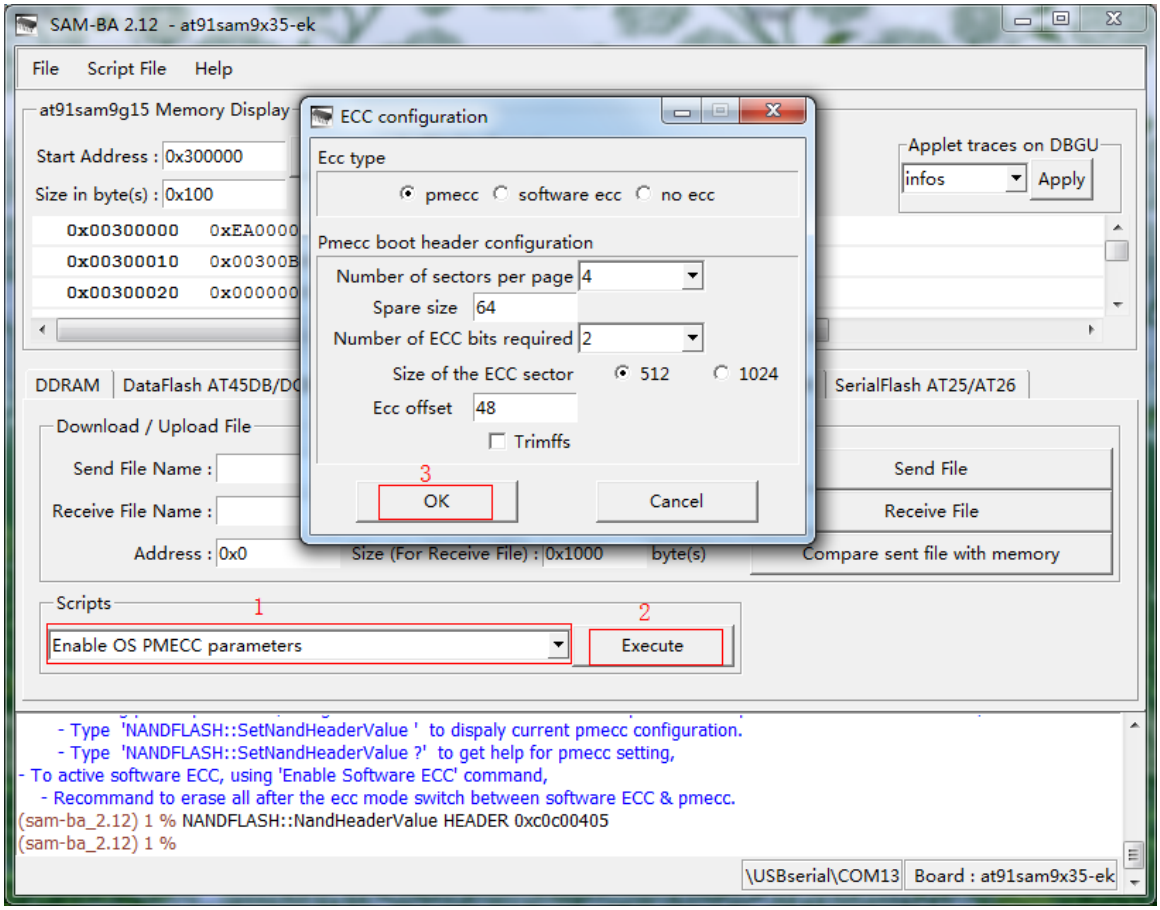


Figure 4-7

Select "Erase All" in Scripts tab, then click "Execute", format NandFlash. Refer to figure 4-8:

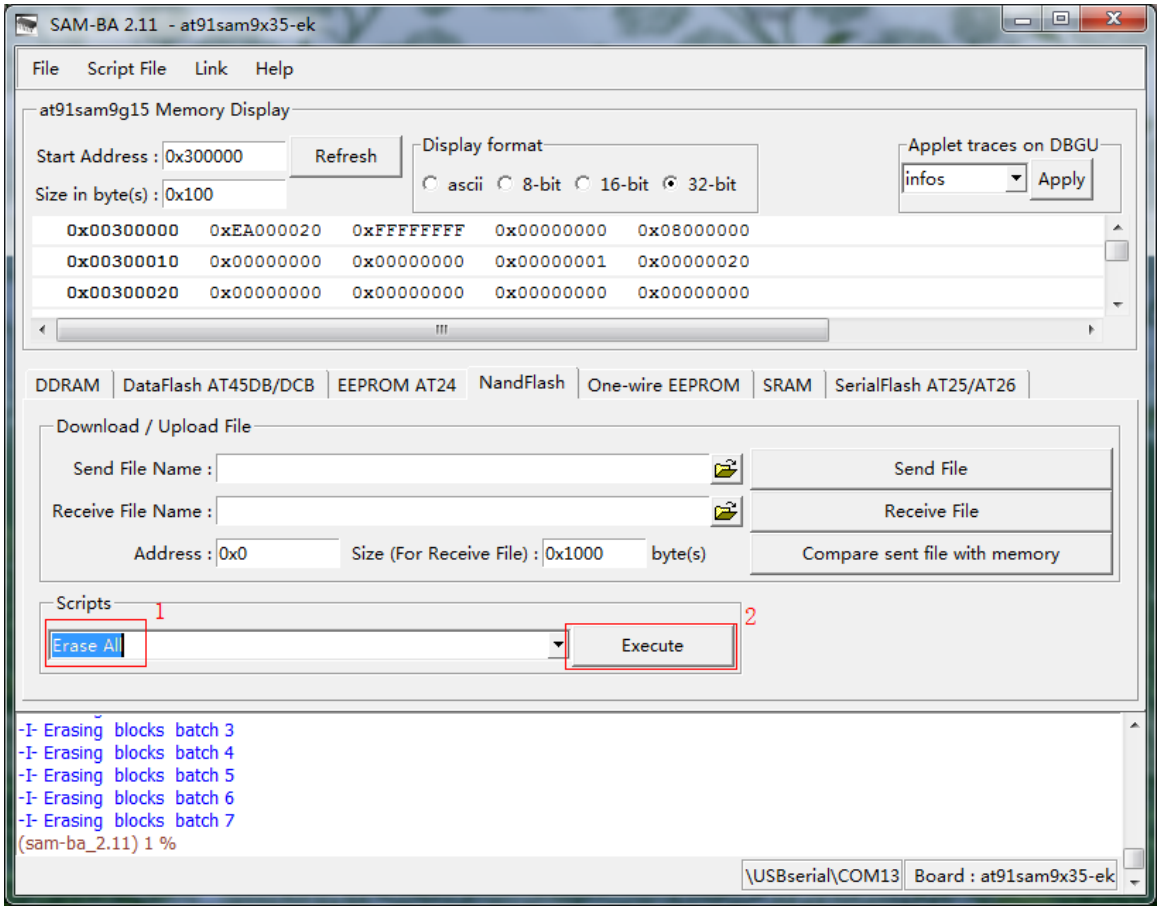


Figure 4-8

(3) Download at91sam9x5ek-nandflashboot-3.1.bin. Refer to figure 4-9 and 4-10:

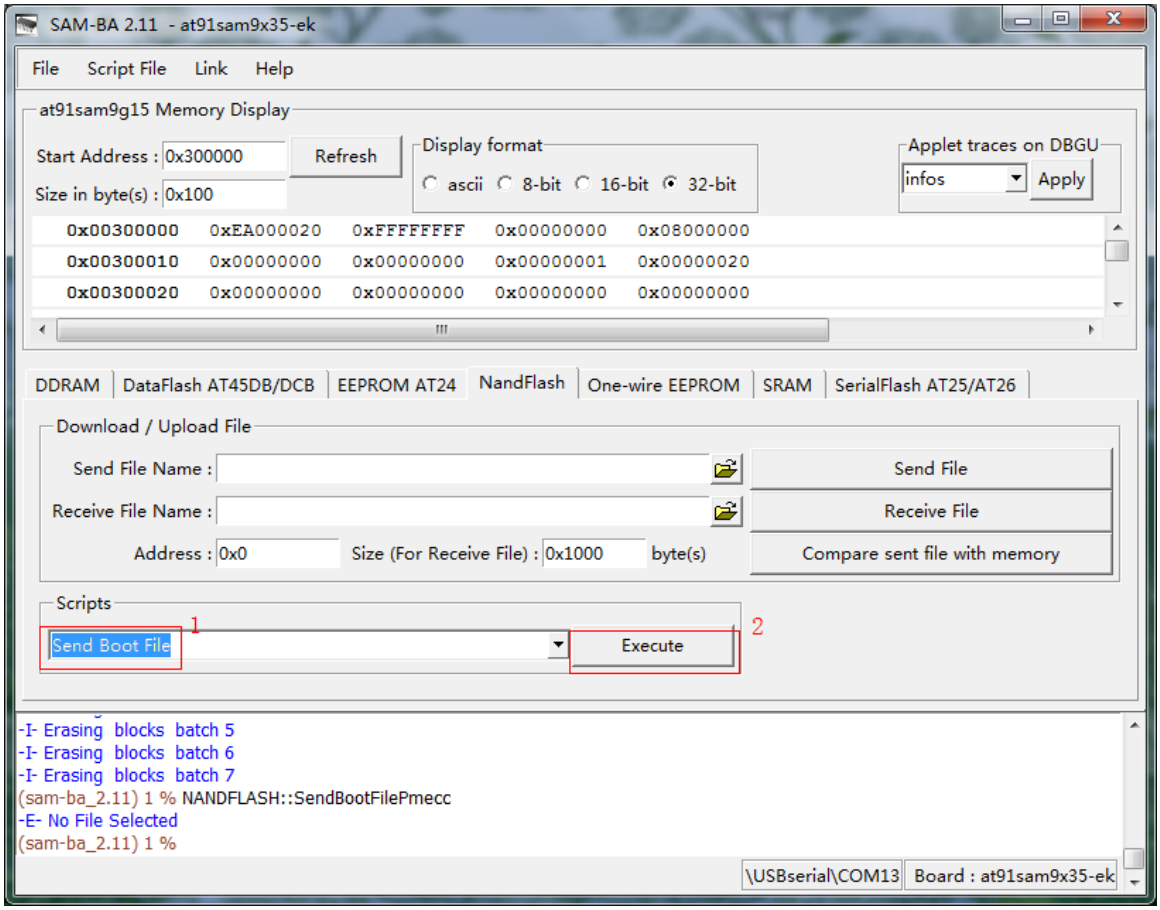

SAM-BA 2.11 - at91sam9x35-ek
File
Script File
Link
Help
at91sam9g15 Memory Display
Start Address : 0x300000
Size in byte(s) : 0x100
Refresh
Display format
ascii
8-bit
16-bit
32-bit
Applet traces on DBGU
infos
Apply
0x00300000 0xEA000020 0xFFFFFFFF 0x00000000 0x08000000
0x00300010 0x00000000 0x00000000 0x00000001 0x00000020
0x00300020 0x00000000 0x00000000 0x00000000 0x00000000
DDRAM
DataFlash AT45DB/DCB
EEPROM AT24
NandFlash
One-wire EEPROM
SRAM
SerialFlash AT25/AT26
Download / Upload File
Send File Name :
Receive File Name :
Address : 0x0
Size (For Receive File) : 0x1000
byte(s)
Send File
Receive File
Compare sent file with memory
Scripts
Send Boot File
1
Execute
2
-I- Erasing blocks batch 5
-I- Erasing blocks batch 6
-I- Erasing blocks batch 7
(sam-ba_2.11) 1 % NANDFLASH::SendBootFilePmecc
-E- No File Selected
(sam-ba_2.11) 1 %
\USBserial\COM13
Board : at91sam9x35-ek

Figure 4-9

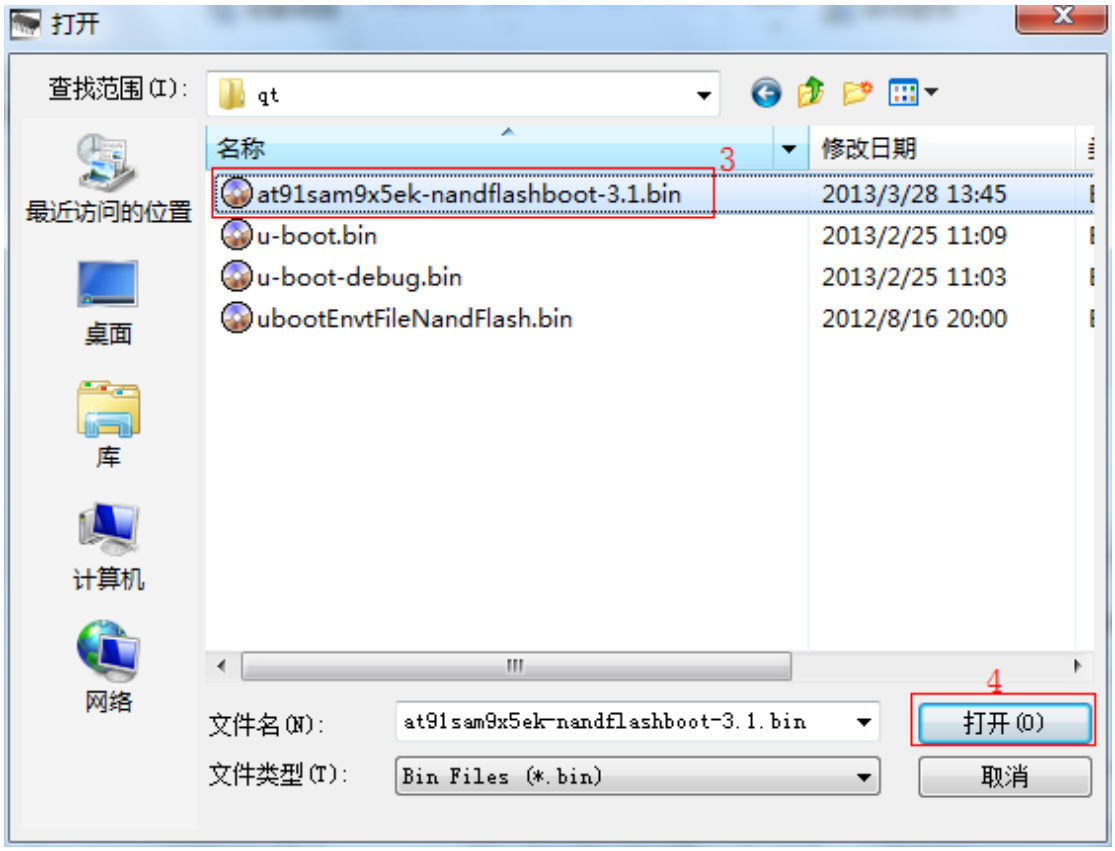

打开
查找范围(I):
qt
最近访问的位置
桌面
库
计算机
网络
名称
修改日期
3
at91sam9x5ek-nandflashboot-3.1.bin 2013/3/28 13:45
u-boot.bin 2013/2/25 11:09
u-boot-debug.bin 2013/2/25 11:03
ubootEnvtFileNandFlash.bin 2012/8/16 20:00
4
文件名(N):
at91sam9x5ek-nandflashboot-3.1.bin
打开(O)
文件类型(T):
Bin Files (*.bin)
取消

Figure 4-10

(4) Download u-boot.bin to 0x40000. Refer to figure 4-11:

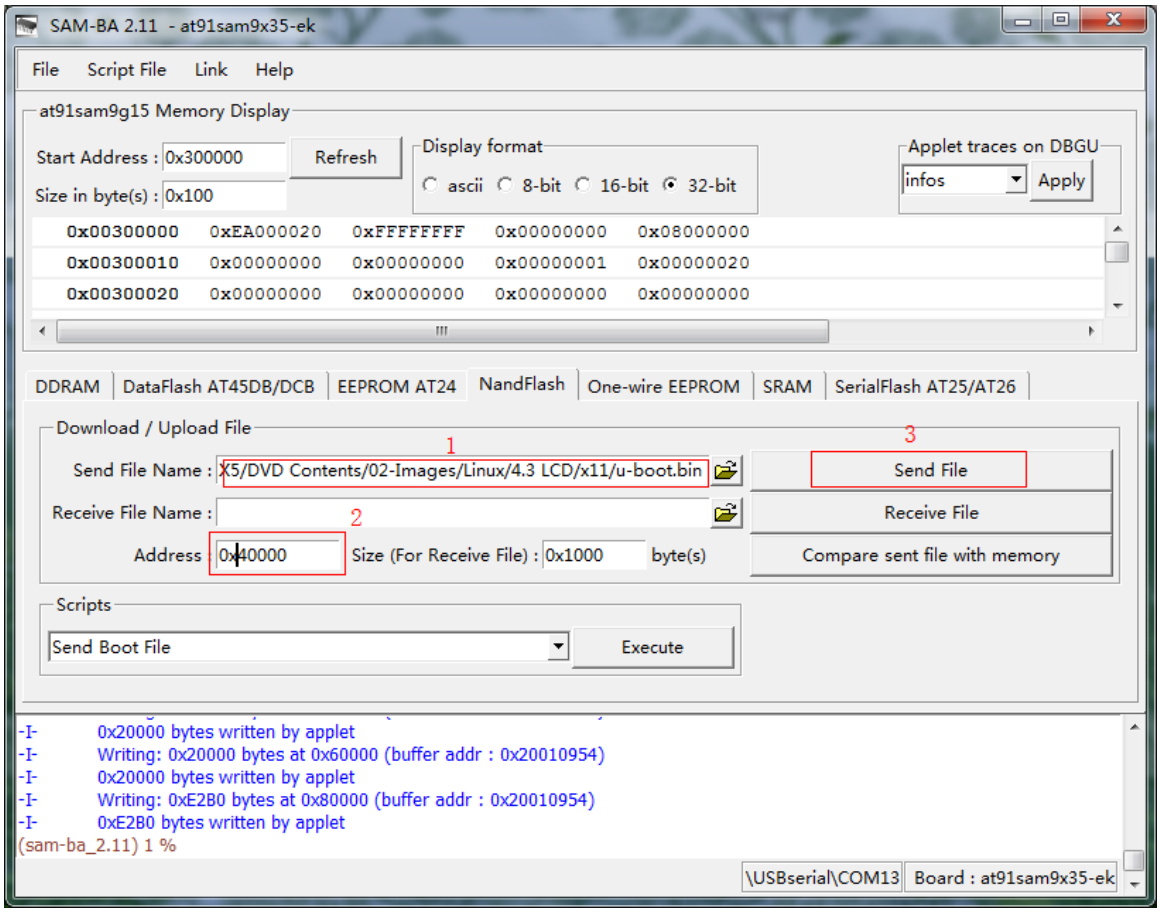


Figure 4-11

(5) Download ubootEnvtFileNandFlash.bin to 0xC0000. Refer to figure 4-12:

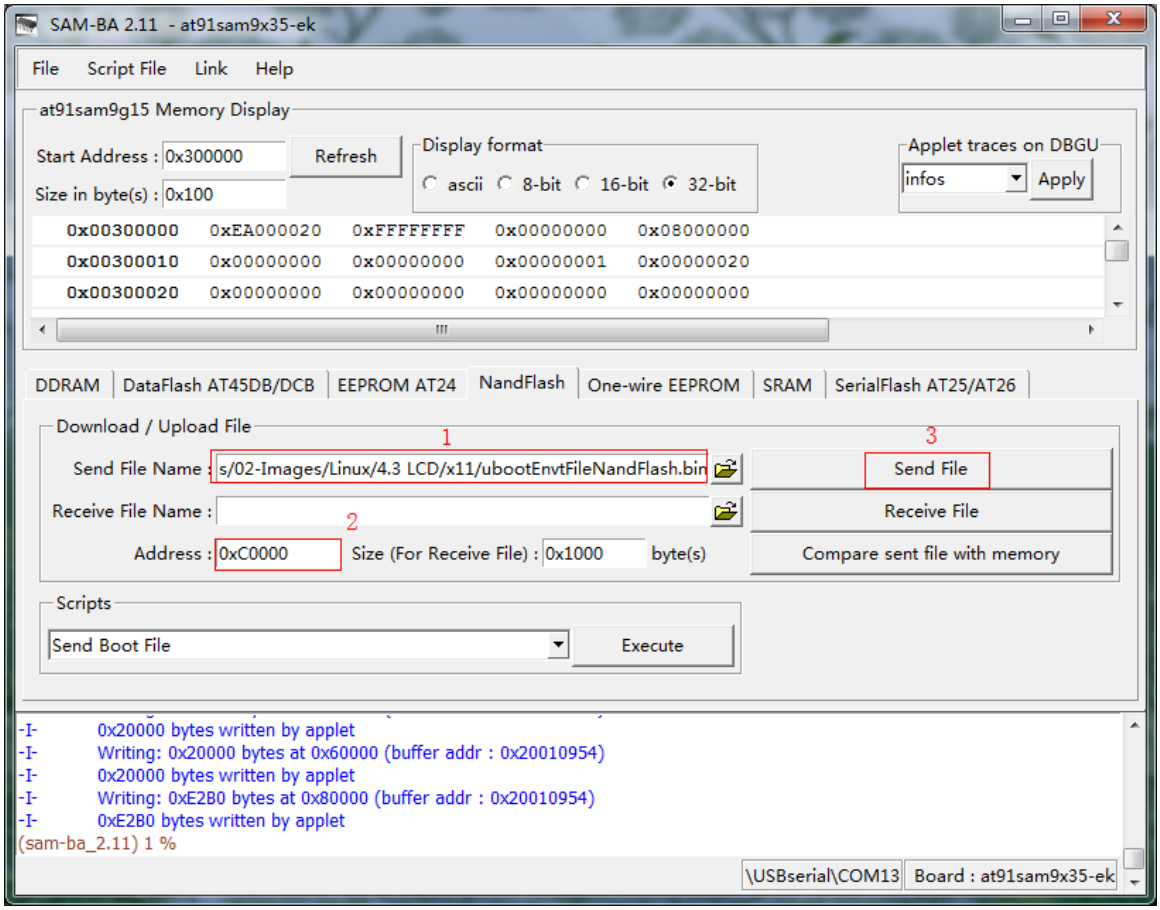


Figure 4-12

(6) Download Linux kernel uImage to 0x200000. Refer to figure 4-13:

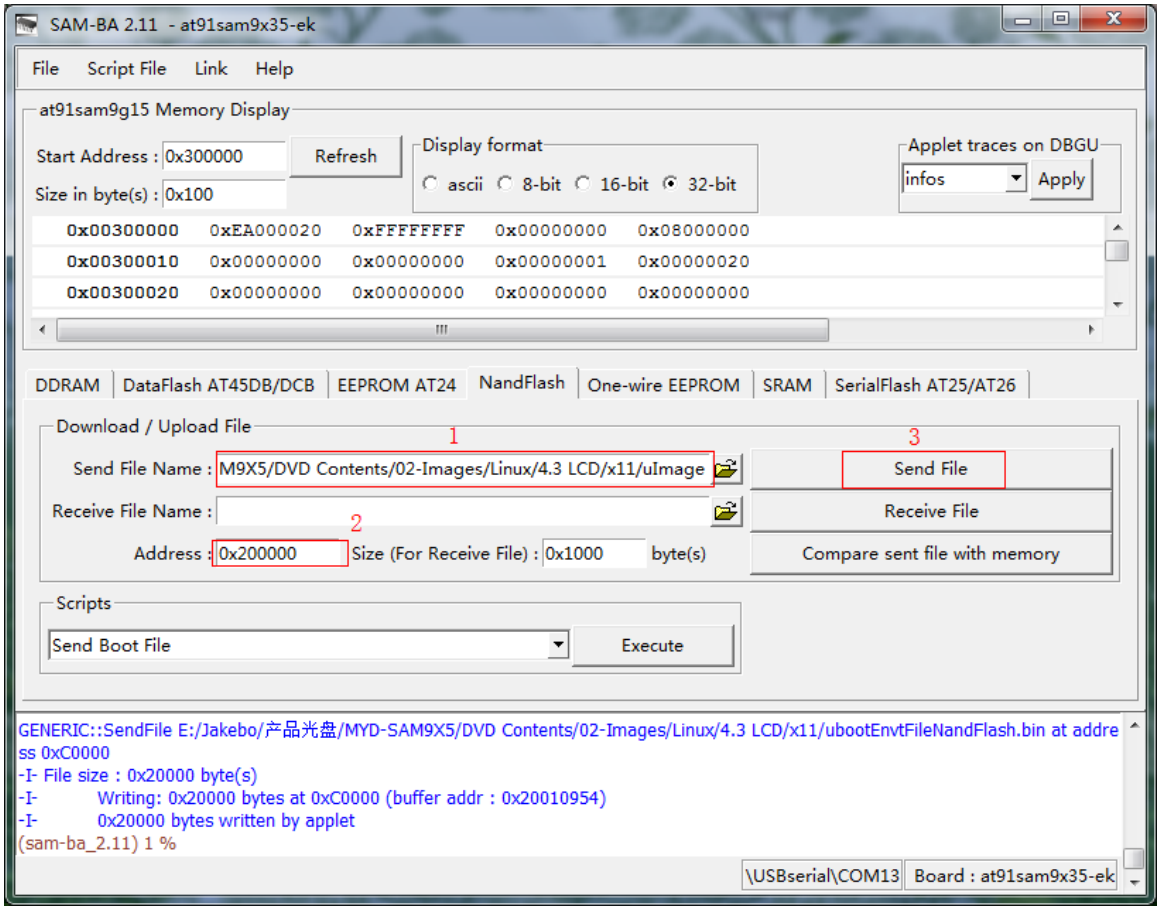


Figure 4-13

(7) Program system files

Angstrom-x11-at91sam9-image-eglibc-ipk-v20110624-at91sam9x5ek.rootfs.ub: address: 0x80000. Refer to figure 4-14:

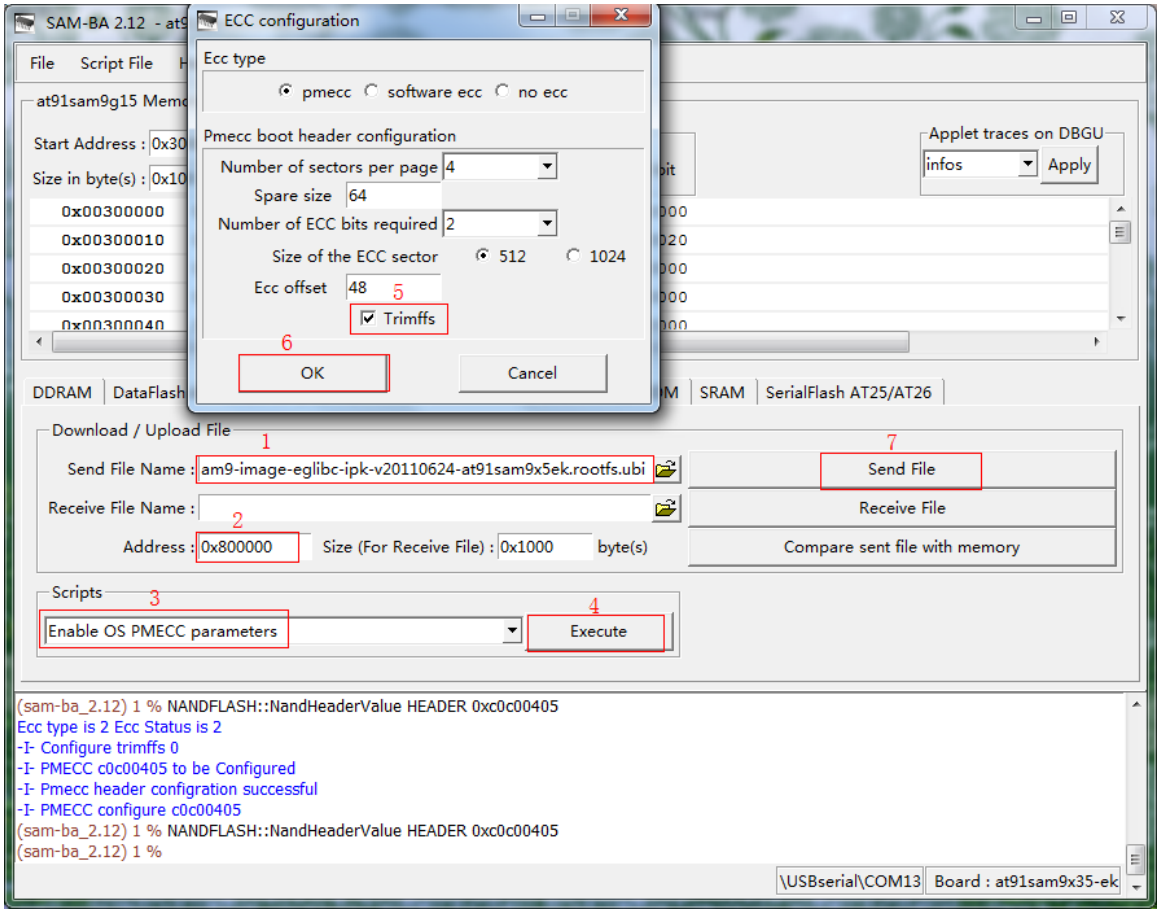


Figure 4-14

Note: Select Enable OS PMECC parameters, and click “Execute” to select Trimffst.

Finally, restart board to boot Linux system normally. Linux use, please refer to chapter 4.7.

4.4 Linux Development Environment Structure

The contents of this chapter, please refer to **"description VirtualBox 's Linux - based development environment to build pdf"**.

4.5 Installation and Compile

4.5.1 Create a Working Directory

```
# mkdir /home/MYIR_SAM9X5
# cd /home/MYIR_SAM9X5
```

Copy 05-Linux_Source folder in CD to /home/MYIR_SAM9X5:

```
# cp -r /media/cdrom/05-Linux_Source ./
```

4.5.2 Install Cross Compiler Tools

Decompress cross compiler tool to /usr/local directory

```
# sudo tar xvjf   \
05-Linux_Source/CrossTool/   \
arm-2010q1-202-arm-none-linux-gnueabi.tar.bz2 -C   /usr/local
```

4.5.3 Install AT91Bootstrap Source and Compile

(1) Install

```
# tar xvjf 05-Linux_Source/AT91Bootstrap/AT91Bootstrap-5series_1.2.tar.bz2
-C ./
```

(2) Compile

```
# cd AT91Bootstrap-5series_1.2
# make distclean
# make at91sam9x5nf_defconfig
# make CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
```

At91sam9x5ek-nandflashboot-3.1.bin in binary directory is AT91Bootstrap file.

AT91Bootstrap is a boot loader for ATMEL chip, which initialize necessary hardware (GPIO Clock, SDRAM, etc.), then copy uboot to SDRAM to run.

4.5.4 Install uboot Source and Compile

(1) Install

```
# cd 05-Linux_Source/U-Boot/
# tar xvjf u-boot-2010.06.tar.bz2
# cd u-boot-2010.06
```

(2) Compile the u-boot without debug function

u-boot.bin without debug will directly guild the system's starting and not detect the PC keyboard keys when the development borad starts. U-boot compiled by default without any modification has no debug function. Compiling command is as follows:

```
# make at91sam9x5ek_nandflash_config
# make CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
# ls
```

After compiling, the u-boot.bin without debug function will be generated under u-boot-linux directory.

(3) Compile the u-boot with debug function

U-boot operation mode can be immediately entered using u-boot-debug.bin by press the Space key or Enter key in the case of connecting serial port after the start of development borad. This mode can do tftp download, update the image, set u-boot environment variables, etc. .It will continue to guild the system when no key action is detected. As the u-boot with debug function will do a series of operations to initialize the network when the system starting, the startup speed will greatly slow down(ahout 10 to 15 seconds). So we strongly recommend to use the u-boot without debug function in actual product. Modifying the document of /u-boot-linux/include/configs/at91sam9x5ek.h is needed to pen debug function.:

① Modify CONFIG_BOOTDELAY to be 1 second in the 91th line. There will be 1 second's waiting for the input from the keyboard:

```
#define CONFIG_BOOTDELAY        0//1
```

Modify to:

```
#define CONFIG_BOOTDELAY        1
```

② Cancle the note to CONFIG_MACB in the 168th line, thereby opening the network support:

```
//#define CONFIG_MACB                   1
```

Modify to:

```
#define CONFIG_MACB                   1
```

③ Run the following command to compile

```
# make    distclean
# make    at91sam9x5ek_nandflash_config
# make    CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
# ls
```

After compiling, the u-boot.bin with debug function will be generated under u-boot-linux directory.

4.5.5 Install and Compile Linux kernel Source Code

(1) Install

```
# cd 05-Linux_Source/Linux_Kernel/
# tar xvjf linux-2.6.39.tar.bz2   -C   ./
# cd linux-2.6.39/
```

(2) Compile

Compile make_image.sh script in source root directory directly.

```
# sudo chmod a+x make_image.sh
# ./make_image.sh 4.3      (4.3 represent a 4.3 - inch screen)
```

Or execute the following command to compile:

```
# make ARCH=arm myir_MYD-SAM9X5_4.3lcd_defconfig
# make ARCH=arm uImage \
   CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
```

Note: make uImage command requires compile mkimage tool which has been installed, or use a command to install tool:

```
sudo apt-get install uboot-mkimage
```

After compile kernel, uImage file in arch /arm/boot/ directory is Linux image files that we need.

4.6 Make Linux File System

Angstrom-x11-at91sam9-image-eglibc-ipk-v20110624-at91sam9x5ek.rootfs.ubi can be made a simple formulation and revision in system file provided by CD. Here, take helloworld for an example, add an application to file system root directory, show the detailed steps of making file system.

4.6.1 Write a Demo Program helloworld

Firstly, write a simple program helloworld:

(1) Creat and compile helloworld.c

```
# vi helloworld.c
```

Enter the following in the helloworld.c, save and exit:

```
#include <stdio.h>
int main(int argc, char *argv[])
{
        int i;
        printf("========== Hello World ==========\n");
        printf("argc: %d\n", argc);
        for(i = 0; i < argc; i++)
        {
                printf("argv[%d]: %s\n", i, argv[i]);
        }
        return 0;
```

```
}
```

(2) Compile helloworld.c

Add cross-compiler tools path to PATH:

```
# export PATH=$PATH:/usr/local/arm-2010q1/bin/
```

Use the cross compiler tool to compile:

```
# arm-none-linux-gnueabi-gcc -o helloworld helloworld.c
```

Helloworld application is generated

4.6.2 Mount UBIFS File System

UBIFS is a new flash file system by nokia engineers under the help of Szeged University, which is considered the next generation of JFFS2 files system. UBIFS file system specifically for the large-capacity FLASH embedded mobile devices, mounting UBIFS file system must have mtd interface, while Ordinary PC usually has no mtd manage disk. So here needs nandsim simulator, simulate mtd device with a RAM space, then mount UBIFS file system. The concrete steps are as follows:

(1) Load UBIFS drive mtd driver

Enter the following command by turn:

```
# sudo modprobe nandsim first_id _byte=0xec second_id_byte=0xda
  third_id_byte=0x10 fourth_id_byte=0x95
```

It needs to pass a few parameters to load nandsim: first_id_byte, second_id_byte, third_id_byte and fourth_id_byte are ID for NANDFLASH of the simulated target. MYD-SAM9x5 use NANDFLASH of Samsung K9F2G08U0B. Four ID bytes can be found in datasheet:

0xec，0xda，0x10，0x95

If executed successfully, there will be mtd0 and mtd0r0 devices in /dev/directory:

```
# ls /dev/mtd*
/dev/mtd0   /dev/mtd0ro
```

(2) Erase mtd0 partition, the operation is as follows:

```
# sudo flash_eraseall /dev/mtd0
flash_eraseall has been replaced by `flash_erase <mtddev> 0 0`; please use it
Erasing 128 Kibyte @ ffe0000 -- 100 % complete
```

(3) Load Angstrom-x11-at91sam9-image-eglibc-ipk-v20110624-at91sam9x5ek.rootfs.ubi to new mtd0 partition. Here used dd command to load, as follows:

```
# sudo dd   \
if=Angstrom-x11-at91samg-image-eglibc-ipk-v20110624-at91sam9x5ek.rootfs.ubi \
of=/dev/mtd0
100864+0 records in
100864+0 records out
51642368 bytes (52 MB) copied, 0.323121 s, 160 MB/s
```

(4) Mount UBIFS system file

After completing the above step, load ubi modules and attach to mtd0, mount UBIFS file system like mounting ordinary mtd device.

Load ubi modules and attach to mtd0 equipment:

```
# sudo   modprobe   ubi   mtd=0,2048
```

Create a new mount point:

```
# mkdir fsmount
```

Mount it by the following command:

```
# sudo   mount   -t   ubifs   ubi0_0   fsmount/
# ls fsmount/
bin   boot   dev   etc   home   lib   media   mnt   proc   sbin   sys   tmp   usr   va
```

Now thate mount UBIFS file system is successful.

4.6.3 Modify UBIFS System Files

After mount UBIFS file system successfully, it can modify file contents, such as add, delete and modify files. It should add compiled demo program helloworld to system root directory. The operation is as follows:

```
# sudo cp helloworld fsmount/
# sync
# ls fsmount
bin boot dev etc helloworld home lib media   mnt   proc   sbin   sys   tmp   usr   var
```

4.6.4 Regenerate UBIFS System File

After modification, it needs to regenerate file system by mkfs.ubifs tool. Using the following command if not install mkfs.ubifs tools:

```
# sudo apt-get install mtd-utils
```

Enter the following command to generate a new UBIFS file system:

```
# sudo   mkfs.ubifs   -r   fsmount/   -m   2048   -e   126976   -c   2024   \
```

```
-o ubifs.img
```

mkfs.ubifs Parameter Description:

-r Establish the system file directory
-m Minimum I/O transfer unit size
-e Logical size of erase block
-c The largest number of erase logic blocks
-o Specify the output file

View smallest I/O transfer unit size and logical erase block size by the following command:

```
# ubinfo /dev/ubi0
ubi0
Volumes count:                           1
Logical eraseblock size:                 126976 bytes, 124.0 KiB
Total amount of logical eraseblocks:     2048 (260046848 bytes, 248.0 MiB)
Amount of available logical eraseblocks: 0 (0 bytes)
Maximum count of volumes                 128
Count of bad physical eraseblocks:       0
Count of reserved physical eraseblocks:  20
Current maximum erase counter value:     1
Minimum input/output unit size:          2048 bytes
Character device major/minor:            250:0
Present volumes:                         0
```

View erase block number by using the following command:

```
# ubinfo /dev/ubi0_0
Volume ID:   0 (on ubi0)
Type:        dynamic
Alignment:   1
Size:        2024 LEBs (256999424 bytes, 245.1 MiB)
State:       OK
Name:        rootfs
Character device major/minor: 250:1
```

Then use ubinize tool to generate fsimage.ubi file. Firstly, it needs to create configuration files of ubinize ubinize.cfg:

```
# vi ubinize.cfg
```

Enter the following, save and exit:

```
[ubifs]
mode=ubi
image=ubifs.img
vol_id=0
vol_size=64MiB
vol_type=dynamic
```

```
vol_name=rootfs
vol_flags=autoresize
vol_alignment=1
```

Enter the following command to generate final fsimage.ubi file:

```
# sudo ubinize -m 2048 -p 128KiB -o fsimage.ubi ubinize.cfg
```

Parameter description of ubinize:

-m The size of minimum input/output byte flash unit
-p The erase block size of FLASH physical
-o output file

Here is different mkfs.ubifs parameter, - p parameter represents the physical erase block size. UBI work in MTD layer, so it needs the MTD parameters, namely physical parameters. UBIFS work in UBI, so it needs the UBI parameters, namely the logic parameter. Now, UBI image has been saved in the ubi.img, which not only contains UBIFS information, but also contains UBI information.

After the completion, generated fsimage.ubi file can use the method described in chapter 4.3.4 to download to 0x800000.

Reset board and input root to login, there is added helloworld file in the root directory:

```
at91sam9x5ek login: root
root@at91sam9x5ek:~# cd /
root@at91sam9x5ek:/# ls
bin         etc         lib         proc        tmp
boot        helloworld  media       sbin        usr
dev         home        mnt         sys         var
```

Run helloworld, as follows:

```
root@at91sam9x5ek:/# ./helloword
========== Hello World ==========
argc: 1
argv[0]: ./helloword
```

4.7 Linux Use

After running Linux system, it can be operated by touch screen operation and carried out by terminal serial. Here's how to operate Linux, such as U disk, SD card mount terminal operation, network interface testing and how to play music.

4.7.1 Touch Screen Calibration

Note: MYD-SAM9X25 and the MYD-SAM9G25 board don't have touch screen.

Entering system will run calibration parameters configuration at the first time. If there is still a deviation after using the default calibration parameters, recalibrate the touch screen by the following steps:

(1) Open HyperTerminal (baud rate: 115200 Data bits: 8, Parity: None Stop bits: 1, data flow control: none). After start Linux, log in as root command:

```
at91sam9x5ek login: root
```

(2) Run the calibration procedure and click the five corresponding calibration points on the LCD screen. The calibration can be carried out:

```
root@at91sam9x5ek:~# ts_calibrate
xres = 480, yres = 272
Took 33 samples...
Top left : X =  804 Y =  178
Took 40 samples...
Top right : X =  790 Y =  953
Took 31 samples...
Bot right : X =  301 Y =  950
Took 34 samples...
Bot left : X =  306 Y =  172
Took 30 samples...
Center : X =  550 Y =  562
-33.023254 -0.004476 0.489318
330.122131 -0.348463 -0.004259
Calibration constants: -2164212 -293 32067 21634884 -22836 -279 65536
```

(3) After calibration is complete, it needs to restart system calibration to take effect. The operation is as follows:

```
root@at91sam9x5ek:~# sync
root@at91sam9x5ek:~# reboot
```

4.7.2 U disk Use

(1) Enter Linux by terminal, U disk is inserted to any of a USB host port, and you can see the following information in the HyperTerminal:

```
scsi0 : usb-storage 1-2:1.0
scsi 0:0:0:0: Direct-Access Kingston DT 101 G2 PMAP PQ: 0 ANSI: 0 CCS
sd 0:0:0:0: [sda] 7669824 512-byte logical blocks: (3.92 GB/3.65 GiB)
sd 0:0:0:0: [sda] Write Protect is off
sd 0:0:0:0: [sda] Assuming drive cache: write through
```

```
sd 0:0:0:0: [sda] Assuming drive cache: write through
sda: detected capacity change from 0 to 3926949888
sda: sda4
sd 0:0:0:0: [sda] Assuming drive cache: write through
sd 0:0:0:0: [sda] Attached SCSI removable disk
FAT: invalid media value (0x01)
VFS: Can't find a valid FAT filesystem on dev sda.
EXT2-fs (sda): error: can't find an ext2 filesystem on dev sda.
FAT: invalid media value (0x01)
VFS: Can't find a valid FAT filesystem on dev sda.
```

Note: The above orange error system attempting to mount a USB device sda fails, this error can be ignored. Because sda is not a valid partition, sda4 in red font above is an effective partition that we mount.

(2) The system will mount inserted U disk automatically, entering the following command to view U disk contents.

```
root@at91sam9x5ek:/# ls /media/sda4/
9x5??.rar          GHOSTXP.GHO        NTLDR              helloworld
????????.TXT       MYD-S5PV210        PETOOLS            rootfs.tar
BOOT               NTDETECT.COM       WXPE               sam-ba_2.11.exe
```

(3) Unplug U disk directly when the use is completed, system will uninstall automatically.

4.7.3 SD Card Use

(1) MicroSD card is plugged into MicroSD card interface, and system will mount automatically.

(2) When MicroSD card is inserted, HyperTerminal displays SD card information:

```
mmc0: host does not support reading read-only switch. assuming write-enable.
mmc0: new high speed SD card at address e624
mmcblk0: mmc0:e624 SU02G 1.84 GiB
mmcblk0: detected capacity change from 0 to 1977614336
mmcblk0: retrying using single block read
```

(3) View SD card contents:

```
root@at91sam9x5ek:/# ls /media/mmcblk0/
MyHeartWillGoOn.wav
```

(3) Pull out SD card directly, system will uninstall it automatically.

4.7.4 Play MP3 Music

Before playing music, connect headphones or stereo to J7. U disk storages an mp3 music and is inserted into USB interface.

play music in U disk by mplayer command in terminal:

```
root@at91sam9x5ek:/media/sda4# mplayer thelastone.mp3
```

At this point, it can hear music from headphones. Terminal prints information as shown below, enter Ctrl+C to end playing music:

```
MPlayer UNKNOWN-4.5.3 (C) 2000-2010 MPlayer Team
Playing thelastone.mp3.
Alignment trap: mplayer (1091) PC=0x002560a0 Instr=0xe1d130b0 Address=0x40a1c455 FSR 0x001
Alignment trap: mplayer (1091) PC=0x002560a0 Instr=0xe1d130b0 Address=0x40a1c455 FSR 0x001
Audio only file format detected.
Clip info:
 Title:
 Artist:
 Album:
 Year:
 Comment:
 Genre: Unknown
==========================================================
Forced audio codec: mad
Opening audio decoder: [libmad] libmad mpeg audio decoder
AUDIO: 44100 Hz, 2 ch, s16le, 224.0 kbit/15.87% (ratio: 28000->176400)
Selected audio codec: [mad] afm: libmad (libMAD MPEG layer 1-2-3)
==========================================================
AO: [alsa] 48000Hz 2ch s16le (2 bytes per sample)
Video: no video
Starting playback...
A:   1.5 (01.4) of 239.0 (03:59.0) 19.7%
```

4.7.5 Network Port Test

Note: MYD-SARM9G15 don’t support network, MYD-SAM9G25/G35/X35 supports a network port used to connect J11. MYD - SAM9X25 supports two Ethernet ports and it is used to connect J11 and J10.

Connect board to PC by crosswire or a switch or router by straight-through cable. Please note, the method using a crosswire c, if board access Internet, it requires PC has dual card. Connect network card 1 to board, network card 2 to network. And the network card1 and 2 are set to bridge pattern. The following test is the mode of crosswire and PC Dual LAN bridg.

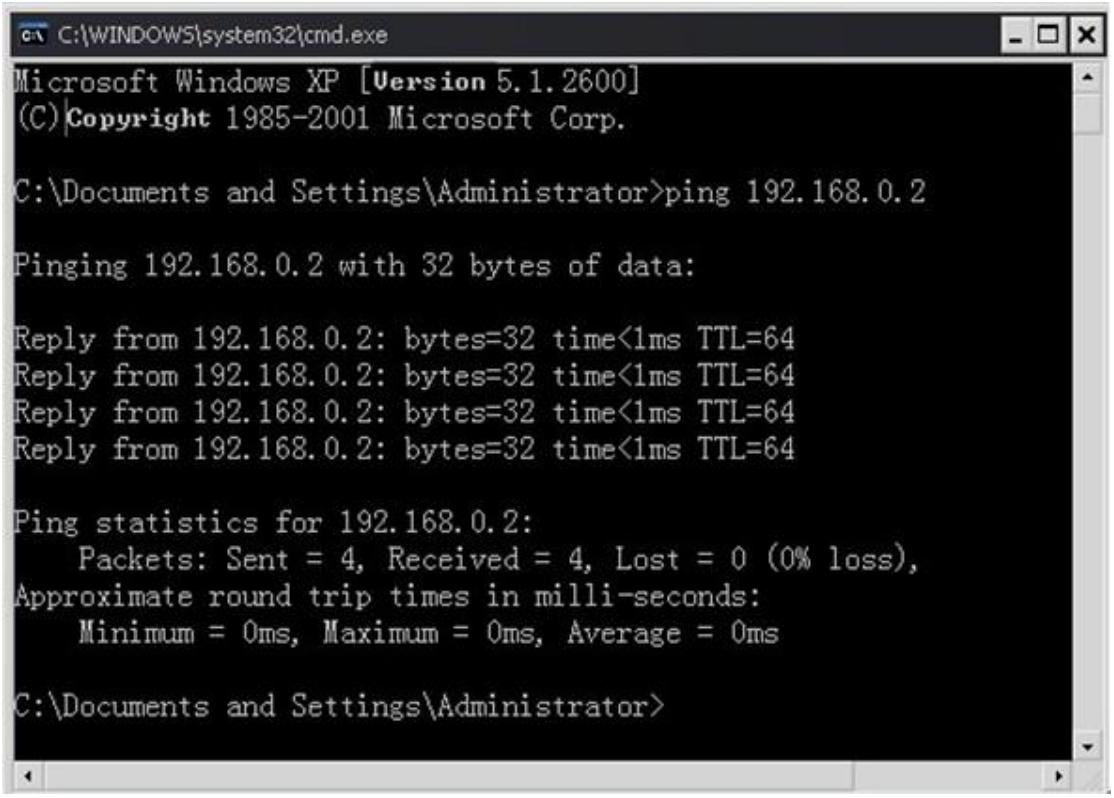
(1) In "Network Connections" window, select two network adapters, right-click and select "bridge" to bridge two network cards.

(2) Configure a current LAN IP address not occupied by other devices by HyperTerminal, in this case use address: 192.168.0.2:

```
root@at91sam9x5ek:/# ifconfig  eth0  192.168.0.2  up
```

(3) Test board to PC network by ping command (here host IP: 192.168.0.3).

Ping board:



Ping board:

```
root@at91sam9x5ek:~# ping 192.168.0.3
PING 192.168.0.3 (192.168.0.3): 56 data bytes
64 bytes from 192.168.0.3: seq=0 ttl=64 time=3.767 ms
64 bytes from 192.168.0.3: seq=1 ttl=64 time=0.458 ms
```

4.7.6 Telnet Test

(1) Configure IP address

```
root@at91sam9x5ek:/# ifconfig eth0 192.168.0.2 up
```

(2) Configure Gateway

Test connection with the gateway, as follows:

```
root@at91sam9x5ek:/ # ping 192.168.0.1
PING 192.168.0.1 (192.168.0.1): 56 data bytes
64 bytes from 192.168.0.1: seq=0 ttl=64 time=5.776 ms
64 bytes from 192.168.0.1: seq=1 ttl=64 time=0.484 ms
```

Set 192.168.0.1 as the default gateway:

```
root@at91sam9x5ek:/ # route  add  default  gw  192.168.0.1
```

Test connection with 202.112.17.137:

```
root@at91sam9x5ek:/ # ping  202.112.17.137
PING 202.112.17.137 (202.112.17.137): 56 data bytes
64 bytes from 202.112.17.137: seq=0 ttl=52 time=26.592 ms
64 bytes from 202.112.17.137: seq=1 ttl=52 time=25.140 ms
```

(3) Use telnet to access BBS forum:

root@at91sam9x5ek:/media# telnet 202.112.17.137

It shows telnet test is successful.

(4) Configure DNS server

View current DNS server address by ipconfig/all command, machine DNS is 202.103.24.68. Set target board's DNS (depend on the circumstances):

```
root@at91sam9x5ek:/# echo "nameserver 202.103.24.68" | tee /etc/resolv.conf
```

Ping www.baidu.com to test extranet access:

```
root@at91sam9x5ek:/# ping www.baidu.com
PING 119.75.217.56 (119.75.217.56): 56 data bytes
64 bytes from 119.75.217.56: seq=0 ttl=54 time=60.990 ms
64 bytes from 119.75.217.56: seq=1 ttl=54 time=59.644 ms
```

Access extranet successfully.

4.7.7 RTC Use

(1) Install button battery to board.

(2) System will set initial value at first start time, so it needs to set the time after system startup.

Note that, due to X11 system starts Scheduled Tasks service (atd), writing to hardware by hwclock command RTC will prompt the device is busy error, then stop atd service and start it after test.

Stop atd Service:

```
root@at91sam9x5ek:/# /etc/init.d/atd stop
```

Set system time:

```
root@at91sam9x5ek:/# date -s 2012.07.08-10:36:00 ; hwclock -w
Sun Jul  8 10:36:00 BST 2012
```

Query system time and hardware RTC time:

```
root@at91sam9x5ek:/# date
Sun Jul  8 10:37:13 BST 2012
root@at91sam9x5ek:/# hwclock -r
Sun Jul  8 10:36:22 2012  0.000000 seconds
```

Recovery atd service:

```
root@at91sam9x5ek:/# /etc/init.d/atd start
```

4.8 Linux Driver Development Examples

This chapter describes a simple character device driver development, achieving the function to control LED.

4.8.1 Hardware Schematic

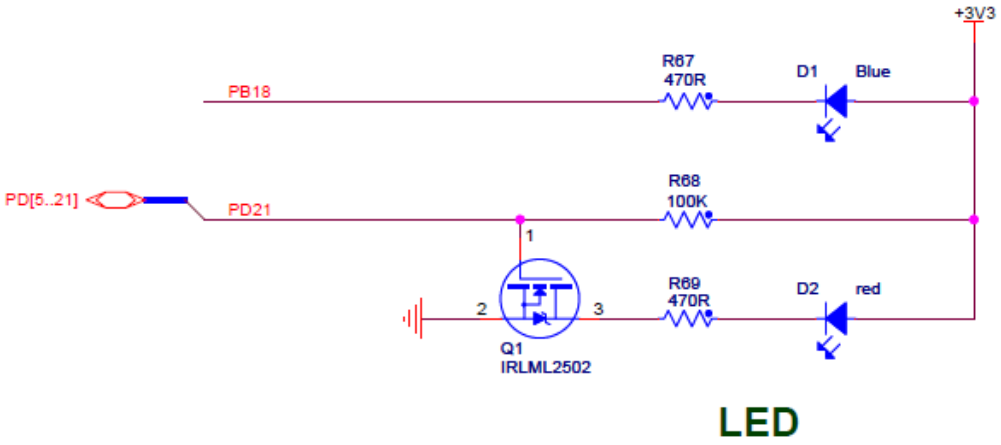


Figure 4-15

Use PD21 interface control D2 by IRLML2502. When it is high, LED turns on. Port PB18 control D1 directly. When it is low, LED turns on. Refer to figure 4-15:

4.8.2 Driver Source Code

(1) Create driver file in new kernel

Create drive files in driver/char/ directory:

```
# cd linux-2.6.39
# vi    drivers/char/ledtest.c
```

(2) Driver source code ledtest.c is as follows：

```
#include <linux/string.h>
#include <linux/cdev.h>
#include <linux/fs.h>
#include <mach/gpio.h>
#include <linux/device.h>

#define DEVICE_NAME       "MYS-SAM9X5-ledtest"
static int LED_Major = 0;
```

```
struct cdev cdev;

#define   LED_OFF         0
#define   LED_ON          1

static unsigned long led_table [] =
{
      AT91_PIN_PB18,   /**led_blue**/
      AT91_PIN_PD21,   /**led_red**/
};

static int MYS_SAM9X5_ledtest_open(struct inode *inode, struct file *file)
{
      printk("MYS-SAM9X5-ledtest Driver Open Called!\n");
      return 0;
}

static long MYS_SAM9X5_ledtest_ioctl(struct file *filp, unsigned int cmd, unsigned long
arg)
{
      if((cmd != 1 && cmd != 0) || (arg != 1 && arg != 0))
            return -1;

      switch(cmd)
      {
            case LED_ON:
                  if(arg)
                  {
                        at91_set_gpio_value(led_table[arg], 1);
                  }
                  else
                  {
                        at91_set_gpio_value(led_table[arg], 0);
                  }
                  break;
            case LED_OFF:
                  if(arg)
                  {
                        at91_set_gpio_value(led_table[arg], 0);
                  }
                  else
                  {
                        at91_set_gpio_value(led_table[arg], 1);
```

```
                }
                break;
        default:
                return -EINVAL;
    }
    return 0;
}

static int MYS_SAM9X5_ledtest_release(struct inode *inode, struct file *file)
{
    printk("MYS_SAM9X5_LED Driver Release Called!\n");
    return 0;
}

static struct file_operations MYS_SAM9X5_ledtest_fops =
{
    .owner          =   THIS_MODULE,
    .open           =   MYS_SAM9X5_ledtest_open,
    .release        =   MYS_SAM9X5_ledtest_release,
    .unlocked_ioctl =   MYS_SAM9X5_ledtest_ioctl,
};

static struct class *MYS_SAM9X5_ledtest_class = NULL;

static int __init MYS_SAM9X5_ledtest_init(void)
{
    int result,err;
    dev_t devno   =   MKDEV(LED_Major, 0);
    if (LED_Major)
    {
        result = register_chrdev_region(devno, 1, DEVICE_NAME);
        printk("Got the Major number by register_chrdev_region !\n ");
    }
    else
    {
        result = alloc_chrdev_region(&devno, 0, 1, DEVICE_NAME);
        LED_Major=MAJOR(devno);
        printk("Got the Major number by alloc_chrdev_region !\n");
    }

    if (result < 0)
    {
        printk(DEVICE_NAME " can't register major number\n");
        return result;
```

```
    }

    printk("register MYS_SAM9X5_ledtest Driver OK! Major = %d\n", LED_Major);
    cdev_init(&cdev,&MYS_SAM9X5_ledtest_fops);
    cdev.owner=THIS_MODULE;
    cdev.ops=&MYS_SAM9X5_ledtest_fops;
    err=cdev_add(&cdev, MKDEV(LED_Major, 0), 1);
    if (err)
    {
        printk("error %d adding led \n ", err);
        goto fail_cdev_add;
    }
    MYS_SAM9X5_ledtest_class = class_create(THIS_MODULE, DEVICE_NAME);
    if(IS_ERR(MYS_SAM9X5_ledtest_class))
    {
        printk("Err: failed in MYS_SAM9X5_ledtest class. \n");
        goto fail_create_class;
    }
    device_create(MYS_SAM9X5_ledtest_class, NULL, MKDEV(LED_Major, 0), NULL,
DEVICE_NAME);
    at91_set_gpio_output(AT91_PIN_PB18, 1);
    at91_set_gpio_output(AT91_PIN_PD21, 1);

    at91_set_deglitch(AT91_PIN_PB18, 1);
    at91_set_deglitch(AT91_PIN_PD21, 1);

    printk(DEVICE_NAME " initialized\n");

    return 0;

    fail_create_class:
    cdev_del(&cdev);
    fail_cdev_add:
    unregister_chrdev_region(devno, 1);

    return -1;
}
static void __exit MYS_SAM9X5_ledtest_exit(void)
{
    printk("MYS_SAM9X5 LED DRIVER MODULE EXIT\n");
    device_destroy(MYS_SAM9X5_ledtest_class, MKDEV(LED_Major, 0));
    class_destroy(MYS_SAM9X5_ledtest_class);
    cdev_del(&cdev);
    unregister_chrdev(LED_Major, DEVICE_NAME);
```

```
}
module_init(MYS_SAM9X5_ledtest_init);
module_exit(MYS_SAM9X5_ledtest_exit);

MODULE_LICENSE("GPL");
MODULE_AUTHOR("Alvin");
MODULE_DESCRIPTION("This is an example of MYS_SAM9X5_LEDTEST drivers");
MODULE_ALIAS("A simplest module.");
```

4.8.3 Compile the Driver

(1) Modify Kconfig and Makefile in driver/char/directory.

① Kconfig

Use vi to open Kconfig file:

```
# vi drivers/char/Kconfig
```

The last of document (before endmenu) plus the following:

```
config LEDTEST
    tristate "ledtest for MYD-SAM9X5"
    default n
    help
      this is a driver for MYD-SAM9X5
```

Then save it and exit.

② Makefile

Use vi editor to open Makefile:

```
# vi drivers/char/Makefile
```

At the end of file add the following:

```
obj-$(CONFIG_LEDTEST)                    += ledtest.o
```

Then save it and exit.

(2) Configure driver as module to be compiled:

```
# make    ARCH=arm    menuconfig
```

Select Device Drivers --- > Character devices ---> the <M> ledtest for MYD - SAM9X5 in pop-up configuration table, then press M which is said as a module. Specific operating screenshot is in figure 4-16, figure 4-17 and figure 4-18:

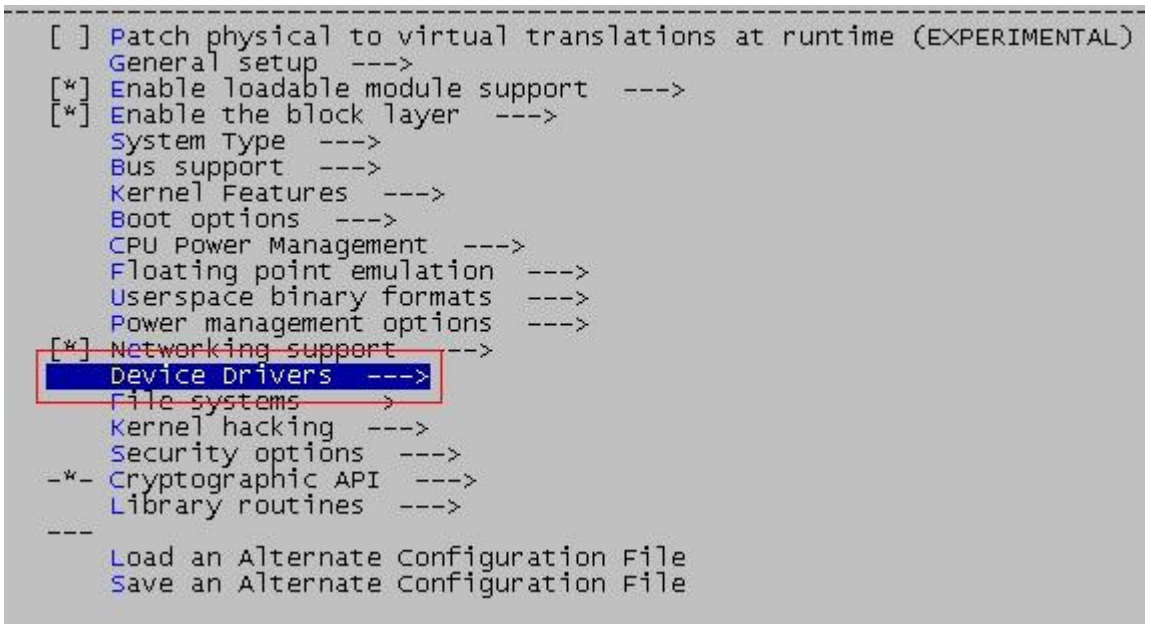


Figure 4-16

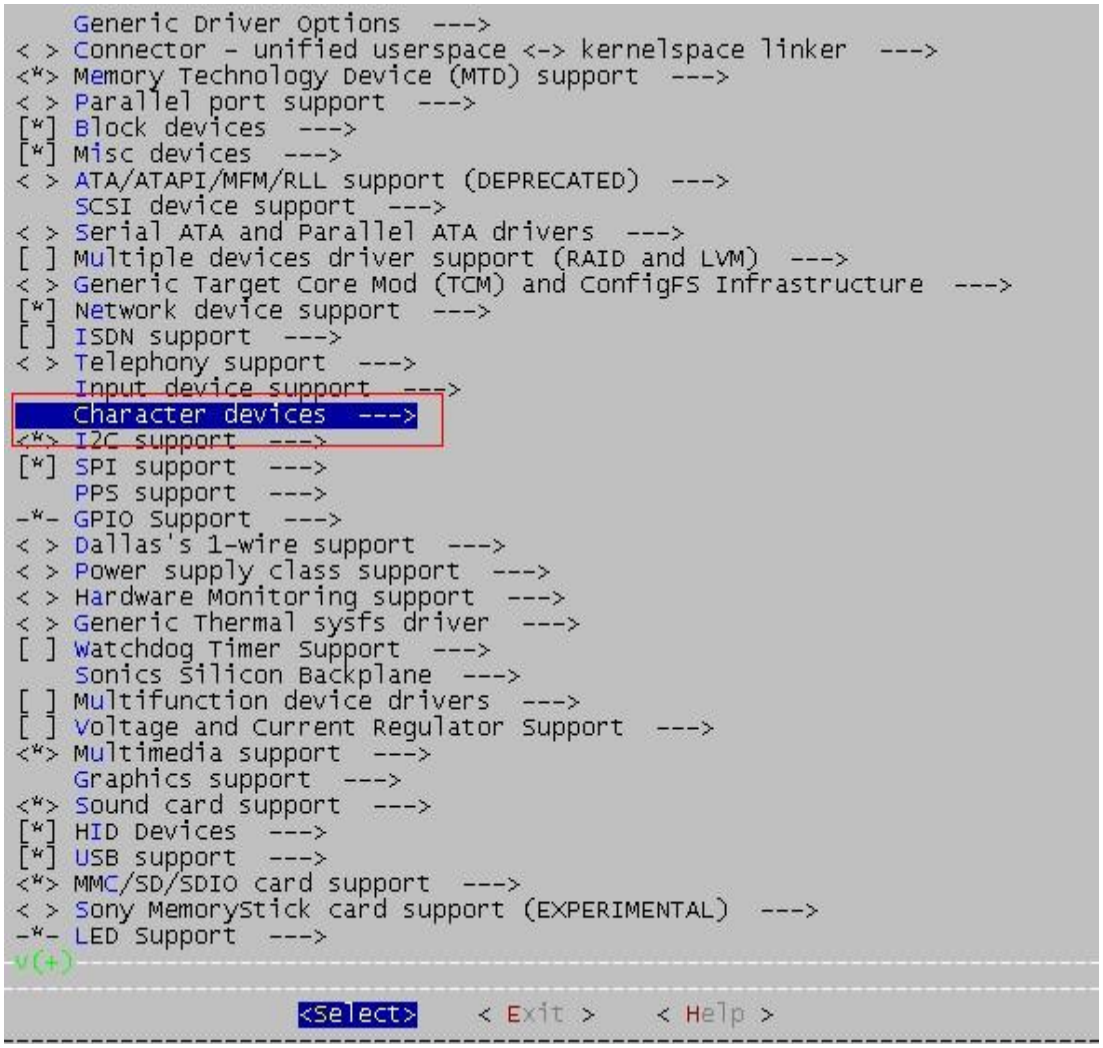


Figure 4-17

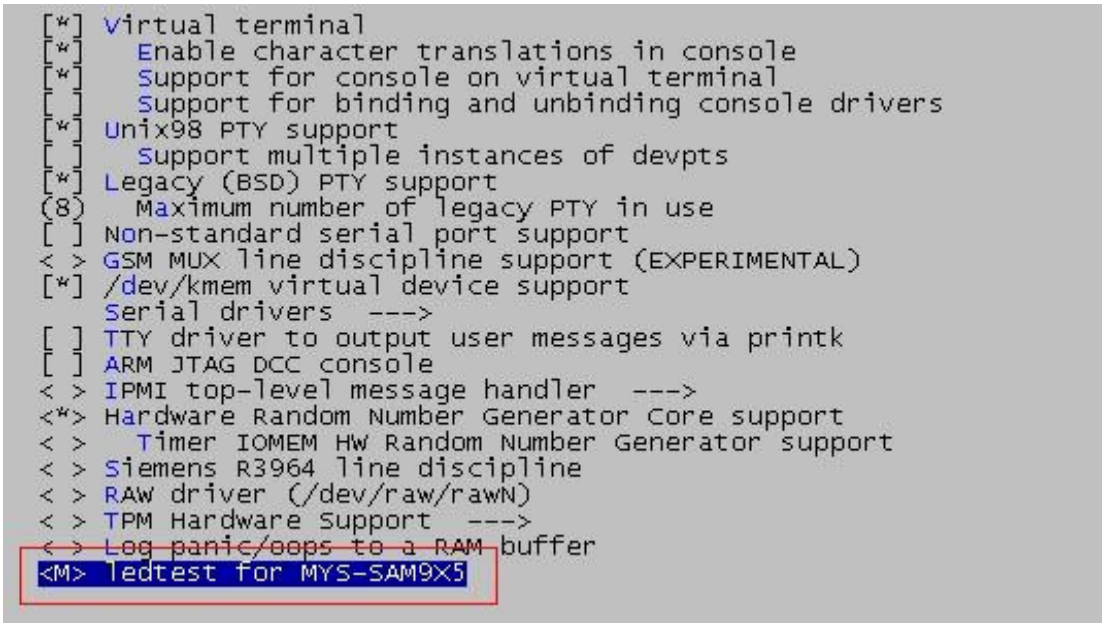


Figure 4-18

(3) Compile driver module

Operation as follows:

```
# touch drivers/char/ledtest.c
# make ARCH=arm modules \
 CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
```

After complete the compilation, it will generate driver file ledtest.ko in drivers/char/.

4.8.4 Doadload Driver into Board

ledtest.ko file compiled successfully is copied to SD card or U disk, which is loaded in the corresponding directory, specific actions are as follows:

(1) Cancel the trigger by other drivers.

```
root@at91sam9x5ek:/# cd /sys/class/leds/d1
root@at91sam9x5ek:/sys/class/leds/d1# echo none > trigger
root@at91sam9x5ek:/sys/class/leds/d1# cd ../d2
root@at91sam9x5ek:/sys/class/leds/d2# echo none > trigger
```

(2) load driver module into kernel

```
root@at91sam9x5ek:/# cd /media/sda4/MYD-SAM9X5
root@at91sam9x5ek:/media/sda4/MYD-SAM9X5# ls
ledtest.ko ledtest_app
root@at91sam9x5ek:/media/sda4/MYD-SAM9X5# insmod ledtest.ko
MYD_SAM9X5_LEDTEST DRIVER MODULE INIT
register MYD_SAM9X5_ledtest Driver OK! Major = 249
MYD-SAM9X5-ledtest initialized
```

At this point, LED driver has loaded into kernel successfully. In the next chapter, we will write a simple application to test the driver, verifying that the driver is working properly.

4.9 Application Development Instance

This chapter describes the upper layer of the Linux system application development, and a simple instance tells the application development process and driver invocation. Instance to achieve the function: when run application, board can control two bright LED and specific LED lights on or off is controlled by passed parameters.

4.9.1 Source Code Compilation

Create a new directory and a new ledtest_app.c file by vi editor in the directory or copy good file to current directory directly, the following for ledtest_app.c source:

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/ioctl.h>

#define LED_DEV "/dev/MYS-SAM9X5-ledtest"

int main(int argc, char **argv)
{
    int fd, ret, led_num, led_status;
    if (argc!=3 || sscanf(argv[1],"%d", &led_num)!=1
        || sscanf(argv[2],"%d", &led_status)!=1)
    {
        printf("\r\nPlease input correct parameters !\r\n\n");
        printf("usage:\r\n%s <led_num> <led_status>\r\n", argv[0]);
        printf("\r\nOptions:\r\n");
        printf("   led_num\t-   1 for red led, 0 for blue led.\r\n   led_status\t-   1 for ON, 0
for OFF.\r\n\n");
        exit(1);
    }
    if((led_status!=1 && led_status!=0) || (led_num!=0 && led_num!=1))
    {
        printf("\r\nError: The parameter value must be '0' or '1' !\r\n");
        printf("\r\nPlease try again !!! !\r\n\n");
        exit(1);
```

```
    }
    fd = open(LED_DEV, 0);
    if (fd < 0)
    {
        printf("\r\nFail to open device '%s'!\r\n\n", LED_DEV);
        exit(1);
    }

    ret = ioctl(fd, led_status, led_num);
    if(ret < 0)
    {
        printf("\r\nFail calling ioctl !\r\n\n");
    }

    close(fd);

    return 0;
}
```

4.9.2 Compile

Because only one of the source files compiled here, so it does not write Makefile, if more source file to be compiled, recommend to write Makdfile file, and so better able to manage these files.

Add the path of cross-compiler tools to PATH:

```
# export PATH=$PATH:/usr/local/arm-2010q1/bin/
```

Use the cross compiler tool to compile:

```
# arm-none-linux-gnueabi-gcc  -o  ledtest_app  ledtest_app.c
```

After the above operation, if no error is generated in the current directory, an executable file named ledtest_app will be generated.

4.9.3 Application Use

After compilation is completed, it will generate executable file ledtest_app copyed to development board by SD card or U disk, and then run file in terminal. Need to pass two parameters when running applications, parameters is used to control two bright LED, the first parameter controls LED (“0" is ON, the "1” is OFF). The second parameter controls

which LED lights ("0" is blue led, "1" is red led), the specific operation is as follows:

```
root@at91sam9x5ek:~# /media/sda4/ledtest_app 1    0
MYD-SAM9X5-ledtest Driver Open Called!
MYD_SAM9X5_LED Driver Release Calle
```

After the above operation, blue LED is off.

4.10 Qt Tutorial

This section describes the development methods and procedures for GUI application useing Qt in MYD-SAM9X5, including two parts. The first part describes how to use the Qt cross compiler tool chain provided by the CD-ROM, general Qt application development only need to use the CD-ROM supplied Qt cross tool chain. The second part describes how the Qt cross tool chain and associated library files be generated by compiling Qt-Embedded source code. Making one's own Qt development environment is only needed when the Qt library provided by the disc can not meet the needs of Qt development.)

Note: Here the image downloaded from 02-Images/Linux/4.3 LCD/Qt is taken as an example. Please refer to 4.3.4 for the specific automatically download procedure and 4.3.3 for the manually download. The PC environment is Ubuntu 10.04.

4.10.1 Qt Cross Tool Chain Use

General Qt development only need to use the CD-ROM supplied Qt cross tool chain. The image of the CD-ROM in 02-Images/Linux/4.3 LCD/Qt has already contained the Qt library corresponding to the tool chain, thus the Qt proguam complined from the tool chain can directly run on the board. Detailed configuration of the Qt cross tool chain provided by the CD-ROM is as follow:

Configuration	Value
Build	libs
Debug	no
Qt 3 compatibility	yes

QtDBus module	no
QtScriptTools module	yes
QtXmlPatterns module	no
Phonon module	no
SVG module	yes
WebKit module	yes
STL support	yes
PCH support	yes
MMX/3DNOW/SSE/SSE2	no/no/no/no
iWMMXt support	no
IPv6 support	yes
IPv6 ifname support	yes
getaddrinfo support	yes
getifaddrs support	yes
Accessibility	yes
NIS support	yes
CUPS support	no
Iconv support	no
Glib support	no
GStreamer support	no
Large File support	yes
GIF support	plugin
TIFF support	plugin (qt)
JPEG support	plugin (qt)
PNG support	yes (qt)
MNG support	plugin (qt)
zlib support	yes
Session management	no
Embedded support	arm

Freetype2 support	yes
Graphics (qt)	linuxfb multiscreen linuxfb
Graphics (plugin)	
Decorations (qt)	styled windows default
Decorations (plugin)	
Keyboard driver (qt)	tty usb
Keyboard driver (plugin)	
Mouse driver (qt)	pc linuxtp pc linuxtp tslib
Mouse driver (plugin)	
OpenGL support	no
SQLite support	qt (qt)
OpenSSL support	no

表 4-2

⑴ Install Qt cross compile tool to the system directory /usr/local/

Create Qt working directory qt-arm, copy Qt cross compile tool to this directory and decompression

```
$ cd ~
$ mkdir qt-arm
$ cd qt-arm
$ cp /media/cdrom/05-Linux_Source/Qt_Arm/Qt-4.5.3_Tslib-1.4.tar.gz ./
$ sudo tar xvzf Qt-4.5.3_Tslib-1.4.tar.gz -C /usr/local/
```

After decompression, two new directories Qt and tslib will appear in /usr/local . The Qt directory contains cross compile tool, library and header files. The tslib directory contains touch screen test procedures, libraries and configuration files

⑵ Set system environment variables

① If you have not add the path of arm-none-linux-gnueabi- to PATH, then you should do it first. The path of arm-none-linux-gnueabi- used in this article is /usr/local/arm-2010q1/bin ,you can use the follow command to add path:

```
$ export PATH=$PATH:/usr/local/arm-2010q1/bin
```

② Set Qt application development related environment variables

The decompressed file “setenv” contains the setting of environment variables, you

can use the follow commands to compelet setting:)

```
$ source  /usr/local/Qt/setenv
```

Or you can enter the settings manually:

```
$ export  PATH=$PATH:/usr/localQt/bin
$ export  LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/Qt/lib
```

⑶ Burn the image with Qt library

Burn the image in the directory of 02-Images/Linux/4.3 LCD/Qt in the CD-ROM referring to 4.3.4 for the automatically download procedure and 4.3.3 for the manually download. This image has already established Qt environment and contained all the needed libraries and function modules which are showed in table 4-2. If the function provided by image can't match the actual needs, please refer to next section "4.10.2 establish Qt development from source code" to configure our needed function module.

⑷ The compiling and running of Qt application program

There are several sample programs under the CD-ROM directory 05-Linux_Source/Qt_Arm/Qt_Examples/. Here we use masterdetail as an example to tell how to use Qt cross compile tool chain to compile Qt application program and run in the target board.

① Copy the sample program to Qt working directory qt-arm and decompress it

```
$ cd  ~/qt-arm
$ cp  /media/cdrom/05-Linux_Source/Qt_Arm/Qt_Examples/masterdetail.tar.gz  ./
$ tar  xvzf  masterdetail.tar.gz
$ cd  masterdetail
```

②Compile the Qt program (Before compiling, you should ensure that the Qt cross compile chain has been installed and you have already set the environment variables)

```
$ qmake
$ make
```

③ After executing the above command, copy the generated executable file "masterdetail" to development board to run:

```
# ls
masterdetail
# chmod  0777  masterdetail
# ./masterdetail  -qws
```

The result is shown below:

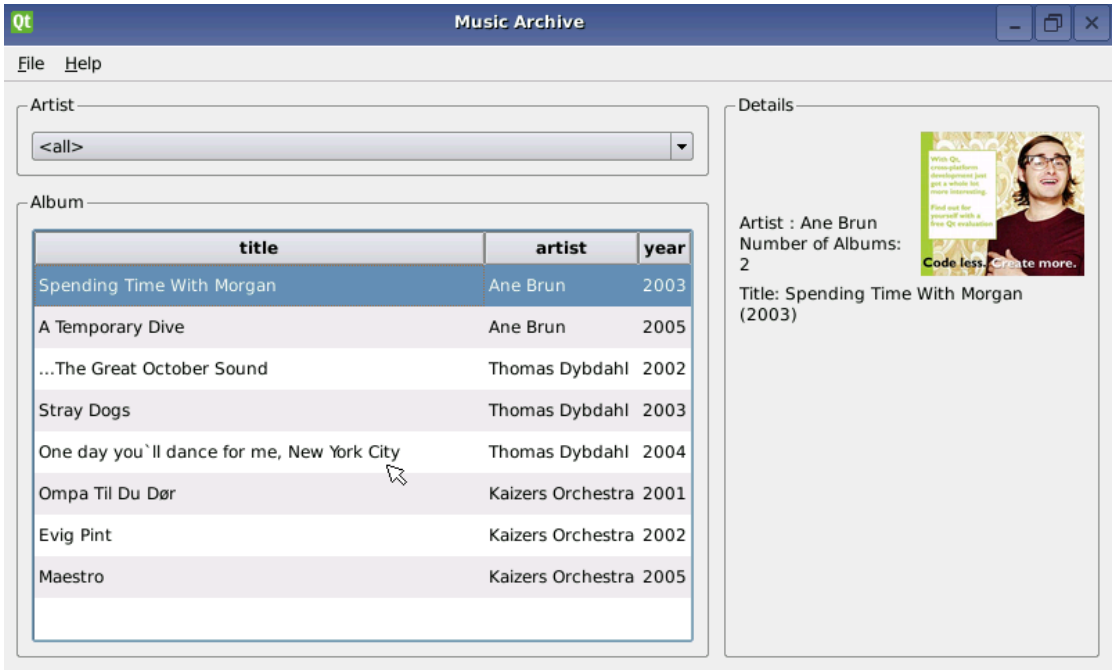


图 4-19

4.10.2 Establish Qt development environment by cross compiling the source code)

This section tell how the Qt cross tool chain and associated library files be generated by compiling Qt-Embedded source code.

Qt's source code and Tslib's source code are in the CD-ROM under the directory 05-Linux_Source/Qt_Arm/Qt_Source

⑴ Establish a working directory

```
$ cd  ~
$ mkdir  qt-arm
$ cd  qt-arm
```

⑵ Compile and install tslib

① Decompress:

```
$ cp  /media/cdrom/05-Linux_Source/tslib.tar.gz  ./
$ tar  xvzf  tslib.tar.gz
$ cd  tslib
```

② Compile and install:

If you have not add the path of arm-none-linux-gnueabi- to PATH, then you should do it first. The path of arm-none-linux-gnueabi- used in this article is

/usr/local/arm-2010q1/bin ,you can use the follow command to add path:

```
$ export PATH=$PATH:/usr/local/arm-2010q1/bin
```

Install the two tools automake and libtool firstly:

```
$ sudo apt-get install automake libtool
```

Configure tslib, you can set up the installation path yourself, here install it into / usr / local / tslib:

```
$ ./autogen.sh
$ ./configure CC=arm-none-linux-gnueabi-gcc CXX=arm-none-linux-gnueabi-g++ --prefix=/usr/local/tslib --host=arm-linux ac_cv_func_malloc_0_nonnull=yes
```

Compile and install:

```
$ make
$ sudo make install
```

⑵ Compile and install qt-embedded :

① Decompress:

In the working directory qt-arm, execute the following commands:

```
$ cp /media/cdrom/05-Linux_Source/qt-embedded-linux-opensource-src-4.5.3.tar.gz\
./
$ tar xvzf qt-embedded-linux-opensource-src-4.5.3.tar.gz
$ cd qt-embedded-linux-opensource-src-4.5.3
```

② Specifies the cross compiler:

Open mkspecs/qws/linux-arm-g++/qmake.conf：

```
$ vi mkspecs/qws/linux-arm-g++/qmake.conf
```

Open qmake.conf with vi, enter the following commands to replace all the arm-linux- with arm-none-linux-gnueabi-, then save and exit

```
%s/arm-linux-/arm-none-linux-gnueabi-/g
```

③ Configure Qt:

```
$ ./configure -prefix /usr/local/Qt -xplatform qws/linux-arm-g++ -release -opensource -qt-zlib -qt-libtiff -qt-libpng -qt-libmng -qt-libjpeg -make libs -nomake docs -embedded arm -little-endian -qt-freetype -depths 8,16,24 -qt-gfx-linuxfb -qt-kbd-usb -qt-mouse-pc -qt-mouse-linuxtp -qt-mouse-tslib -qt-sql-sqlite -qt3support -I/usr/local/tslib/include -L/usr/local/tslib/lib -confirm-license
```

You can run ./configure --help to view detailed description of parameters, configure the appropriate parameters according to the needs.

④ Compile and install:

```
$ make
```

```
$ sudo make install
```

⑤ Set the environment variables:

Run the following command in the current terminal:

```
$ export  PATH=$PATH:/usr/local/Qt/bin
$ export  LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/Qt/lib
```

Or add the above commands to /etcprofile file, so that the system will automatically set these environment variables when logging.

⑶ Transplant Qt to the development board

① Copy the library to the development board

After installing Qt, in order to solve the problem of symbolic links, you can first package, and then directly extracted it to the development board:

```
$ cd  /usr/local/Qt/
$ tar  -zcf  lib.tar.gz  lib
```

Copy the packaged compressed file lib.tar.gz to the development board, and then extract it to /usr/local/Qt:

```
# mkdir  -p  /usr/local/Qt
# tar  xzvf  lib.tar.gz  -C  /usr/local/Qt
```

② Set the environment variables of the development board

The setting of development board environment variables have been written to the /etc/setqtenv file, the environment variable's setting can be completed as long as execute the following command on the development board:

```
# sourch  /etc/setqtenv
```

Or you can manually enter the settings:

```
# export  QT_QWS_FONTDIR=/usr/local/Qt/lib/fonts
# export  QWS_MOUSE_PROTO=tslib:/dev/input/ touchscreen0
# export  LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/Qt/lib
```

⑷ The compiling and running of Qt application program

Please refer to 4.10.1-(4) Qt The compiling and running of Qt application program

Chapter 5 Android System Guide

5.1 Overview

Android is a Linux system based open source operating system, mainly used in portable devices. Android operating system originally developed by Andy Rubin development, initially mainly support mobile phone. In 2005 Android is acquainted by Google, formatting the open mobile phone alliance to improvement it, gradually extended to the tablet computer and other area. Since its first release Welcomed by the majority of consumers, Android's market shares around the world more than Symbian system for the first time in the first quarter of 2011, ranking first in the world. The data shows that in February 2012, Android accounted for 52.5% of the share of the global smartphone operating system market.

Android system is running based on Linux system, mainly made by Linux Kernel, system libraries, Dalvik virtual machine, application framework, and applications written mainly by JAVA. Its framework is as shown in figure 5-1:

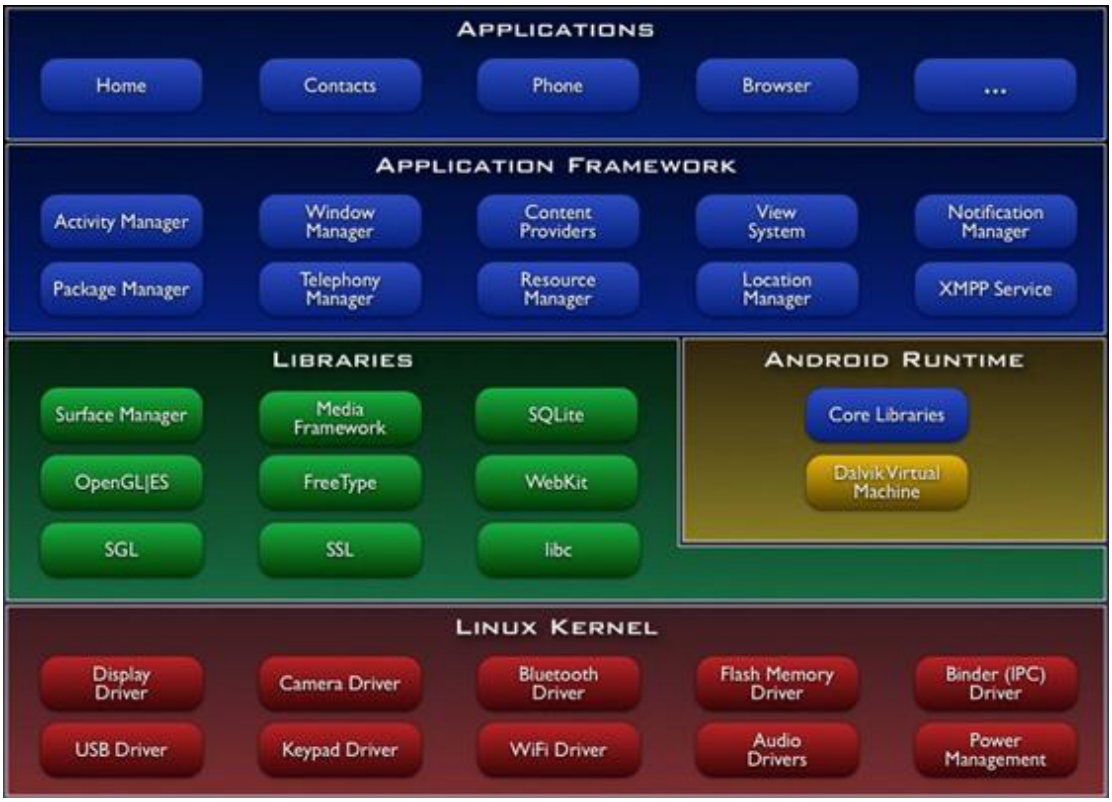


Figure 5-1

This chapter describes how to build and run Android 2.3.5 system in MYD-SAM9X5 platform, include the following main content:

(1) Build Android system

(2) Compile Android

(3) Android System use

5.2 Software Resources

Software resources are shown in table 5-1:

Category	Name	Note
Boot program	AT91Bootstrap	Use to guide Uboot
	Uboot	1.Support NandFlash Erase, read and write 2. Support network to download image 3. Support settings, save the environment variable 4. Support display, contrast, modify memory content 5. Support the bootm, bootargs settings
Linux Kernel	Linux 2.6.39	Develop Linux kernel for MYD-SAM9X5 hardware
Device Drivers	Network port driver	ETH0
	Serial port driver	USART0、DBGU
	USB	USB_HOST*2、USB_OTG
	SMD driver	Only provide hardware interface
	SD card driver	MicroSD、SDCard
	LCD+touch	LCD driver
	SPI driver	Provide source
	TWI driver	Two Wire Interface, that I2C
	DMA driver	Have been tested to provide the source
	GPIO driver	Have been tested to provide the source
System Files	Android System Files	Have been tested to provide binary image file

Table 5-1

5.3 Build Android System

This chapter describes how to use image to build Android system.

5.3.1 Install Download Tool

(1) Install Atmel ISP download software SAM-BA (2.11 or later, CD-ROM location: 03-Tools/SAM-BA/) Note: If install SAM-BA 2.10 and earlier versions, it needs to first uninstall the all (**SAM-BA and USB driver**). If need two or more SAM-BA version coexistence, different SAM-BA versions use different USB interface.

(2) Power on and connect board (J17) to PC by micro USB cable.

(3) Turn SW1, SW2 down, disconnect backplane jumper JP8, and then press NRST button reset board (the order is not reversed). Firstly connect, PC prompts to install driver, then can select the location to install SAM-BA installation directory, Refer to figure 5-2:

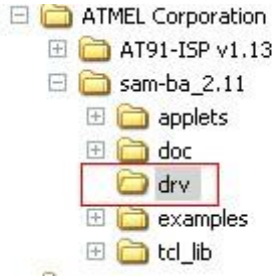


Figure 5-2

(4) If there is prompt in device manager in figure 5-3, it shows board driver has been installed.

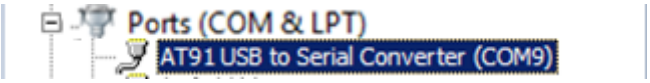


Figure 5-3

COM9 is connection port (determined by actual situation, here for COM9).

5.3.2 Connect Board and SAM-BA

(1) Install MYD-SAM9X5 USB driver

Please refer to 03-Tools\SAM-BA\the board driver install.pdf.

(2) Connect board. The specific steps are as follows:

① Connec board to PC by USB line

② Disconnect jumper JP8

③ dial switch 1,2 down.

④ Press NRST button to reset board and then switch1, 2 ON.

At this point, there will be USB equipment.

5.3.3 Automatic Download

Note:Here to use the 4.3-inch screen image as an example, if you are using a different screen sizes, please download the corresponding directory image.

Complete chapter 5.3.1 and 5.3.2, open the disk directory 02-Images/Android/4.3 LCD/ and edit at91sam9x5.bat file. Refer to figure 5-4:

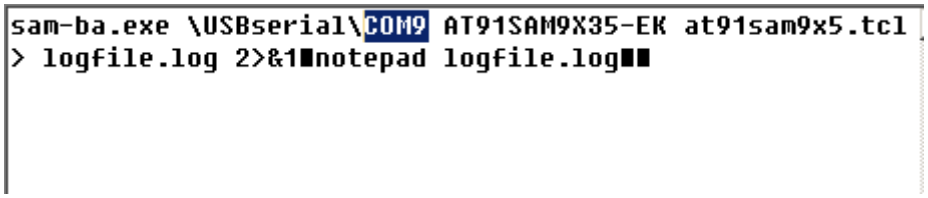


Figure 5-4

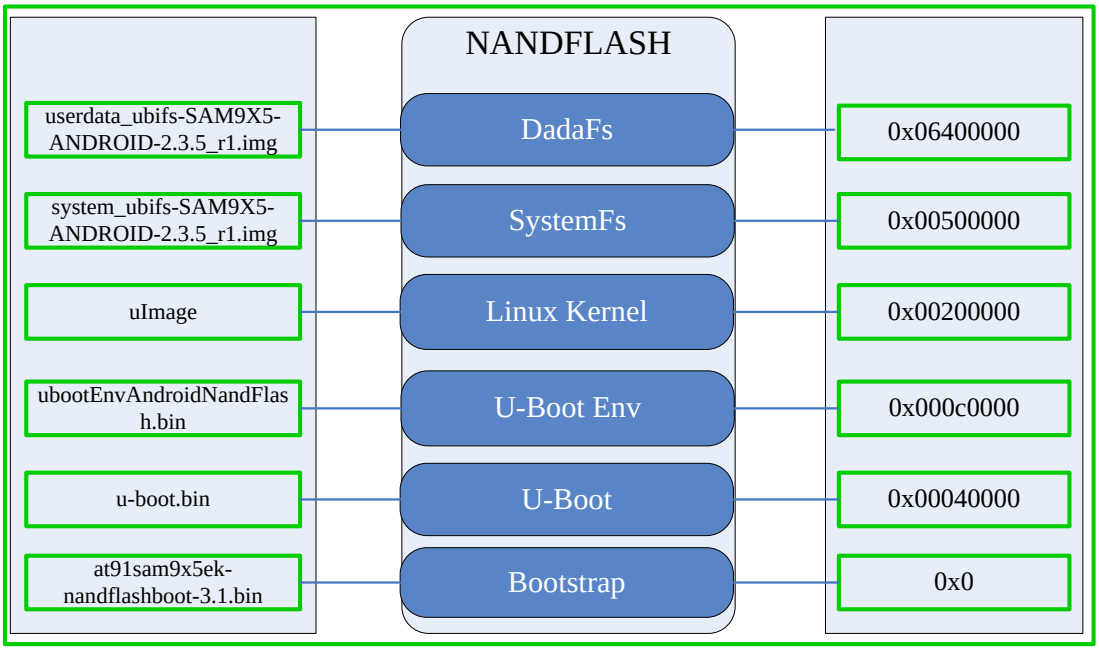
The original C0Mx changes correspondence connection port as COM9. Double-click at91sam9x5.bat, Android image begins to download board automatically, waiting 2-3 minutes, it will popup logfile.log file automatic which represents automatic writing is completed.

5.3.4 Manual Download

Note:Here to use the 4.3-inch screen image as an example, if you are using a different screen sizes, please download the corresponding directory image.

All image files used in this chapter can be found in the directory: 02-Images/Android/4.3 LCD/.

The NandFlash content of Android system is divided as shown in figure 5-5:



Fiugre 5-5

Download Linux by SAM-BA manually

(1) Complete chapter 5.3.1 and 5.3.2, double-click samba v2.11, there appears interface. Refer to figure 5-6:

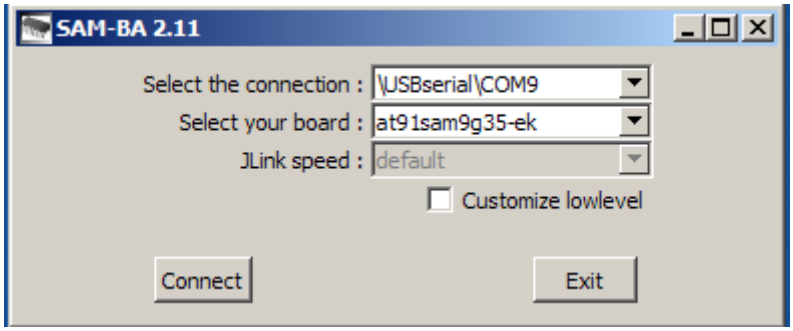


Figure 5-6

Click “Connect” to enter SAM-BA interface. Refer to figure 5-7:

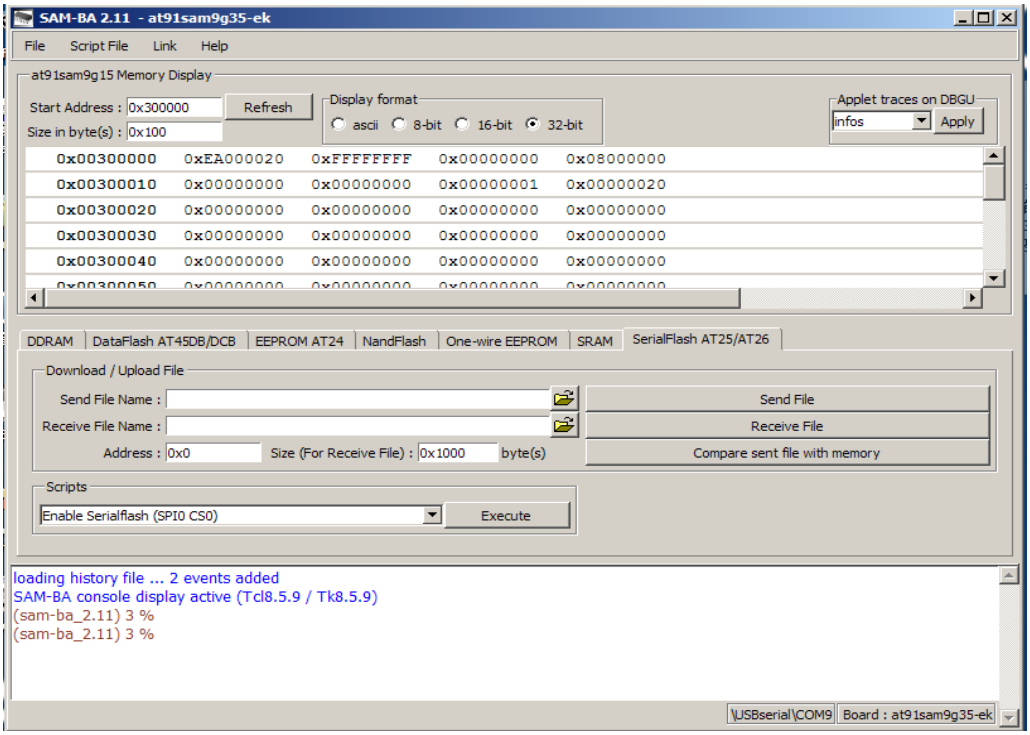


Figure 5-7

(2) Select NandFlash tab, Enable NandFlash in Scripts tab and then click “Execute”.

Refer to figure 5-8:

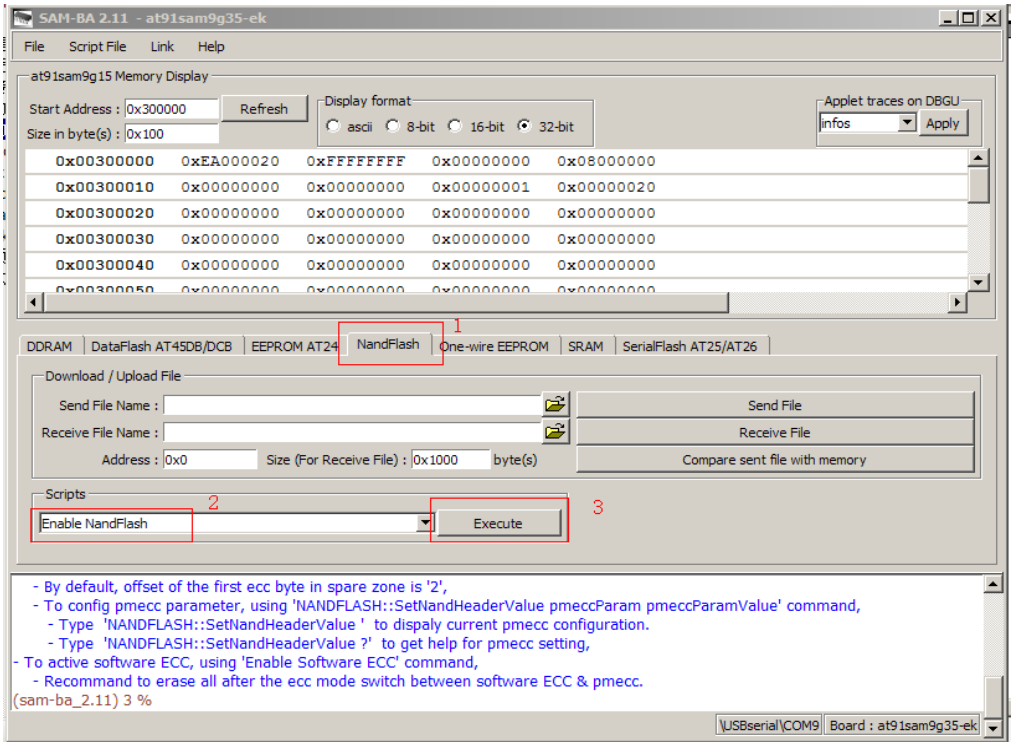


Figure 5-8

(3) Select Enable OS PMECC parameters in Scripts tab, then click Execute, using the default option, click “OK” directly (Note: there cannot check Trimffs). Refer to figure 5-9:

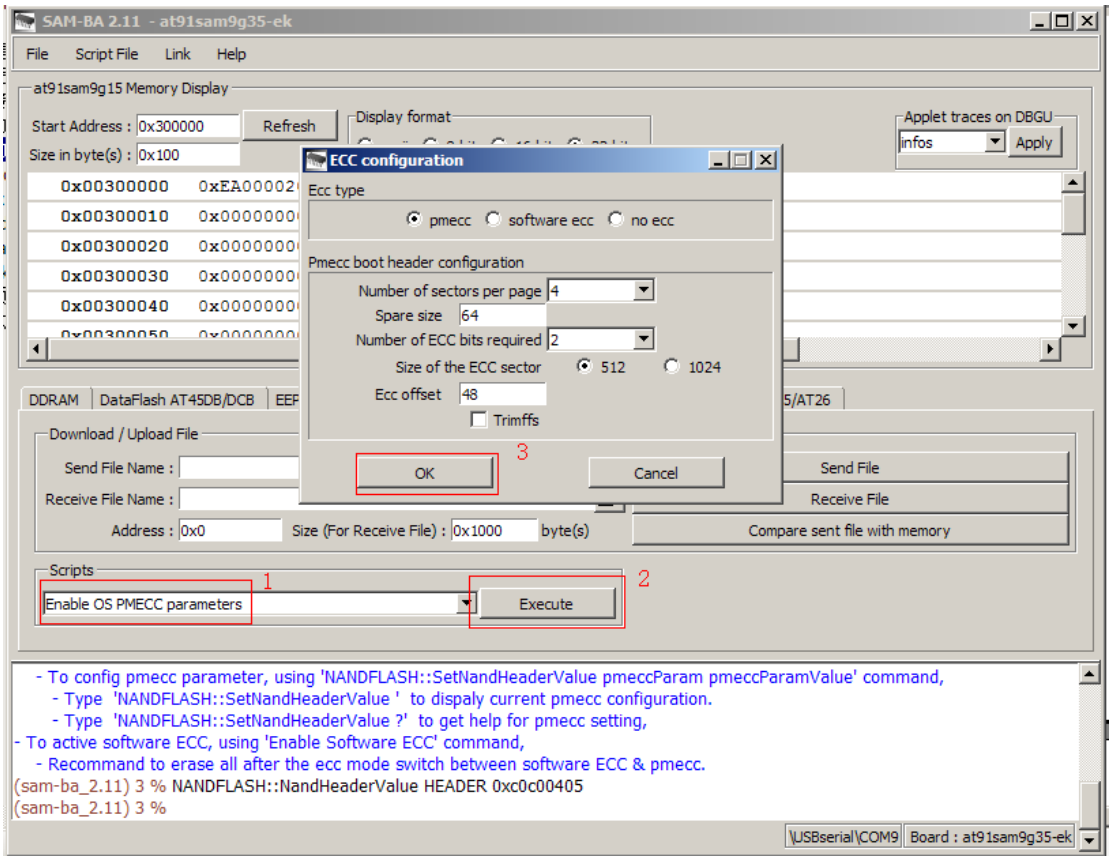


Figure 5-9

(4) Select Erase All in Scripts tab and then click Execute. Refer to figure 5-10:

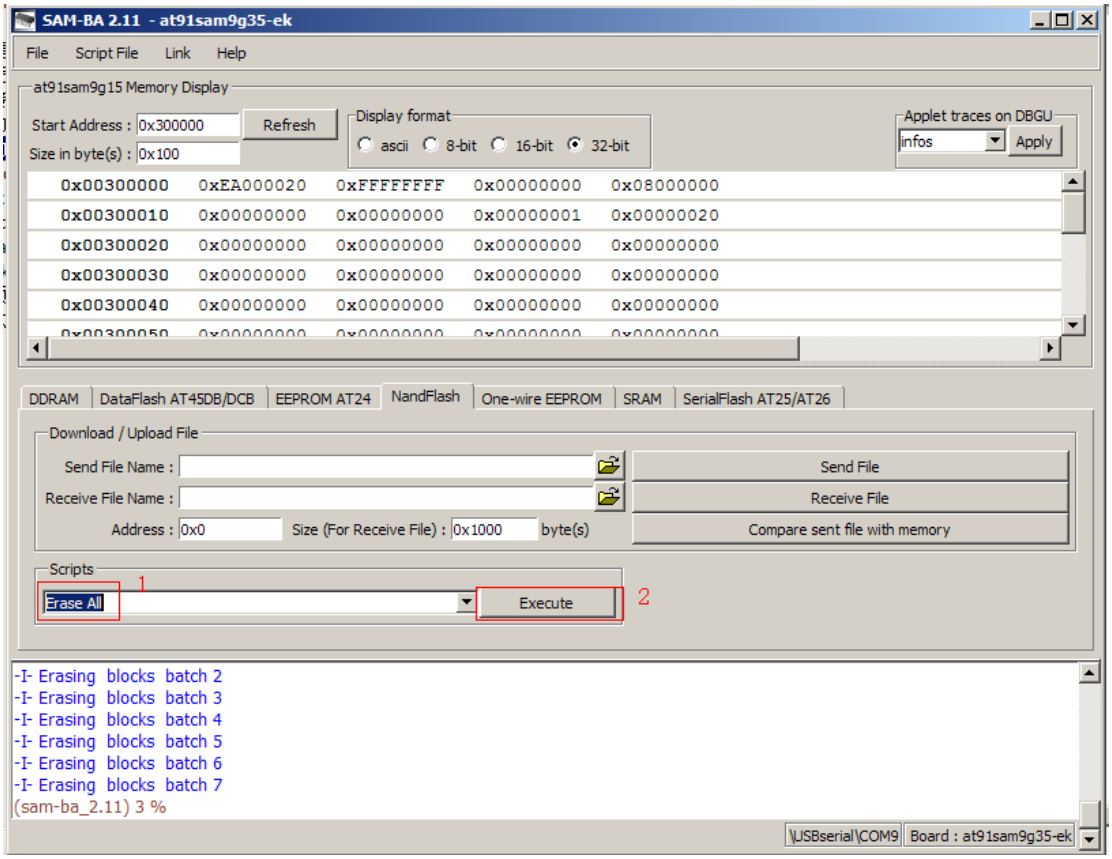


Figure 5-10

(5) Download at91sam9x5ek-nandflashboot-3.1.bin. Refer to figure 5-11, 5-12:

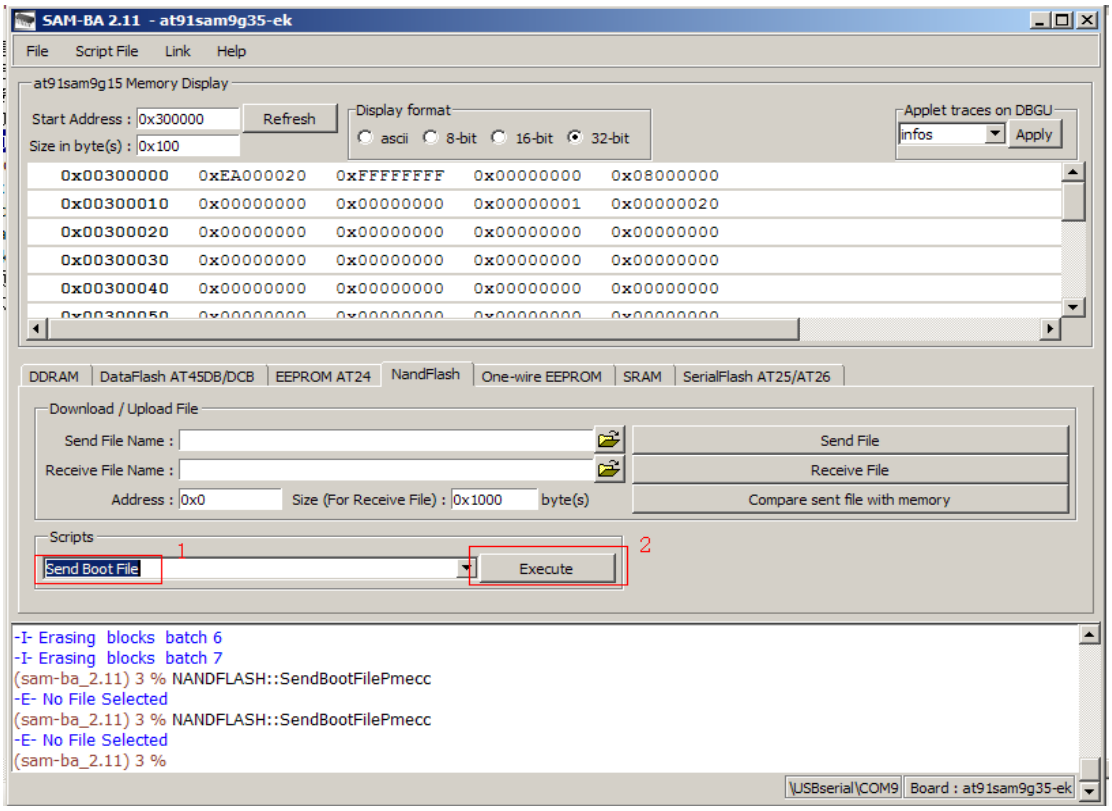


Figure 5-11

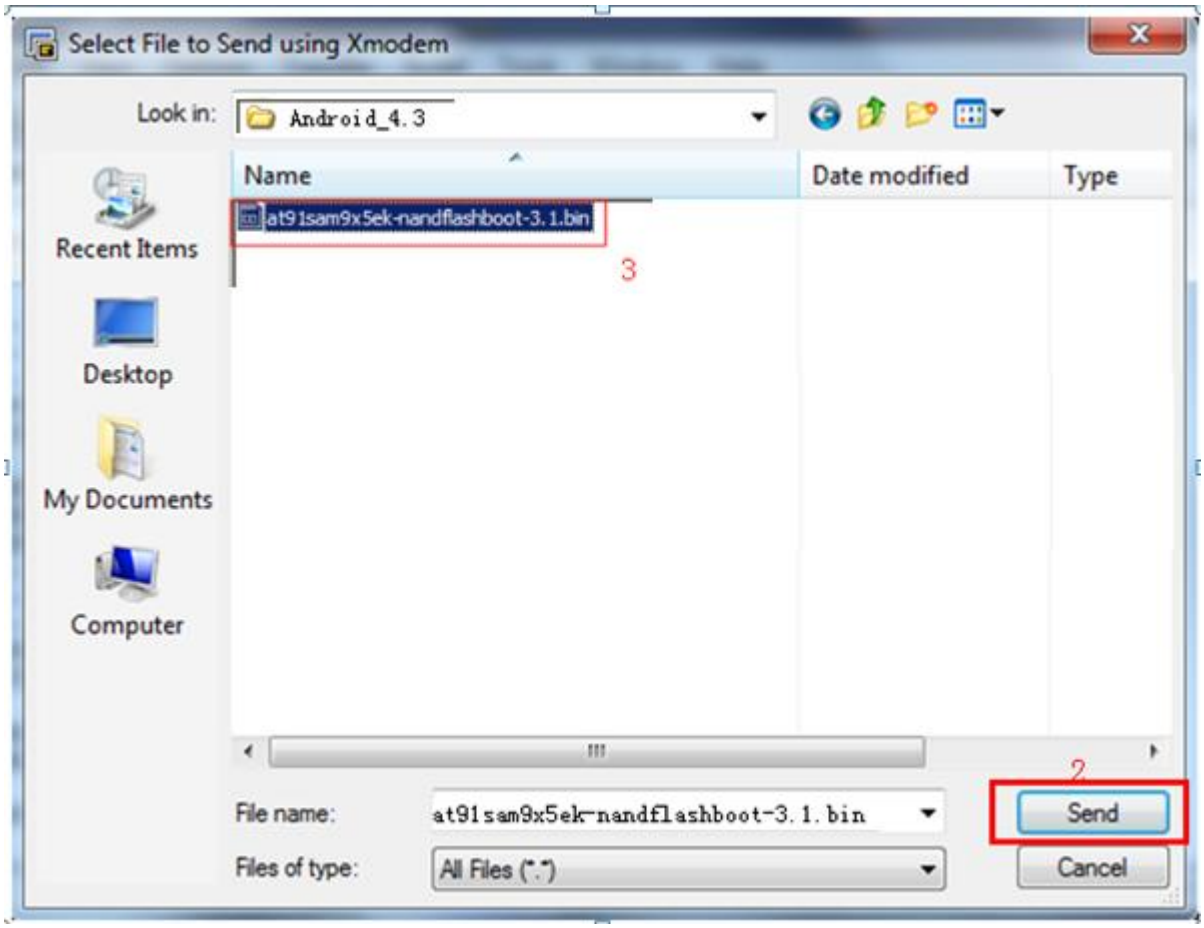


Figure 5-12

(6) Download u-boot.bin file to 0x40000 Department. Refer to figure 5-13:

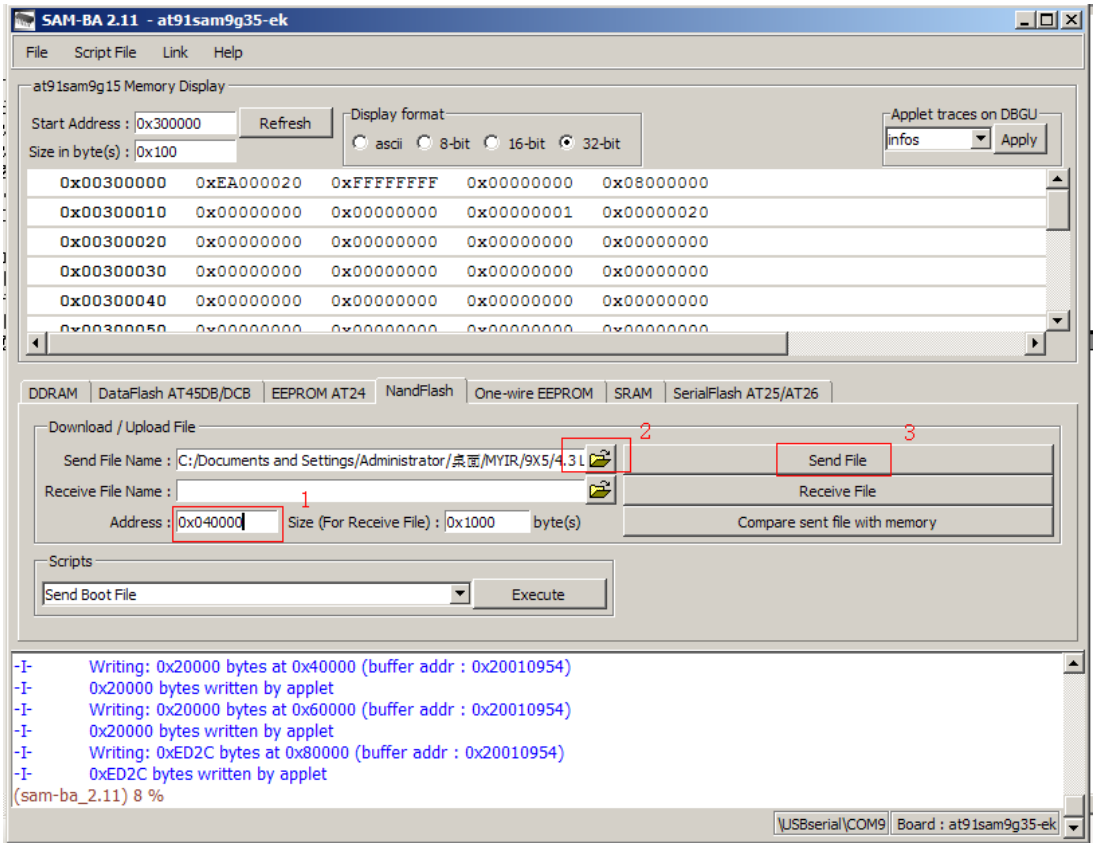


Figure 5-13

(7) Download ubootEnvAndroidNandFlash.bin to 0xc0000. Refer to figure 5-14:

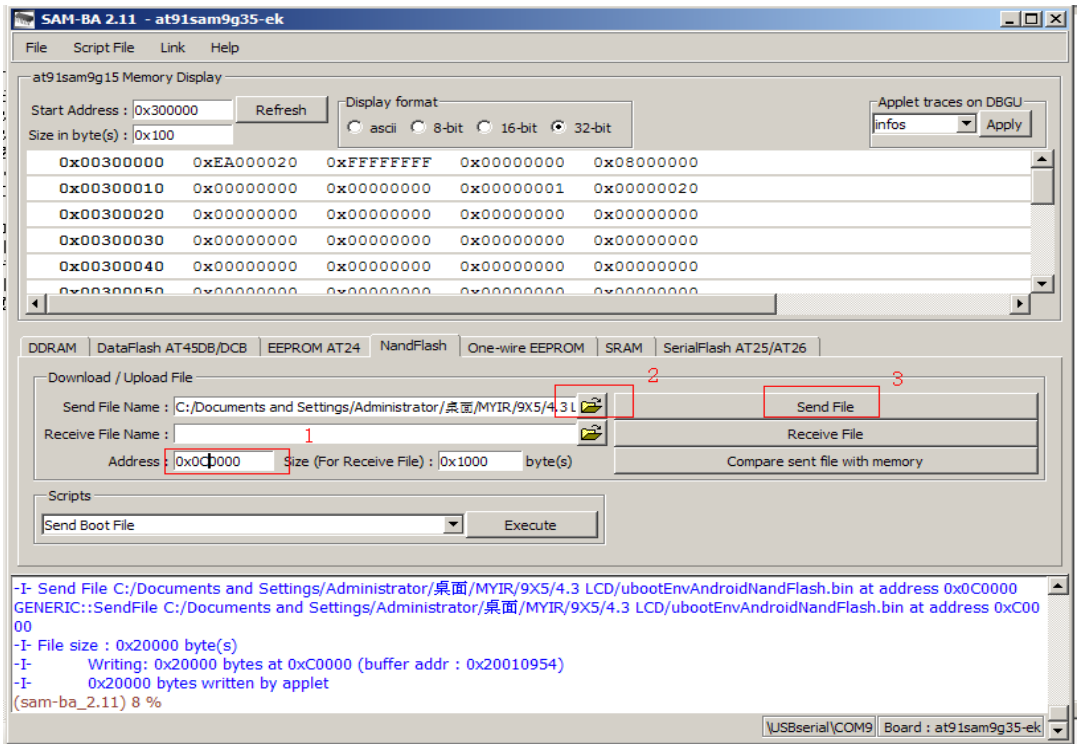


Figure 5-14

(8) Download Linux kernel uImage to 0x200000. Refer to figure 5-15:

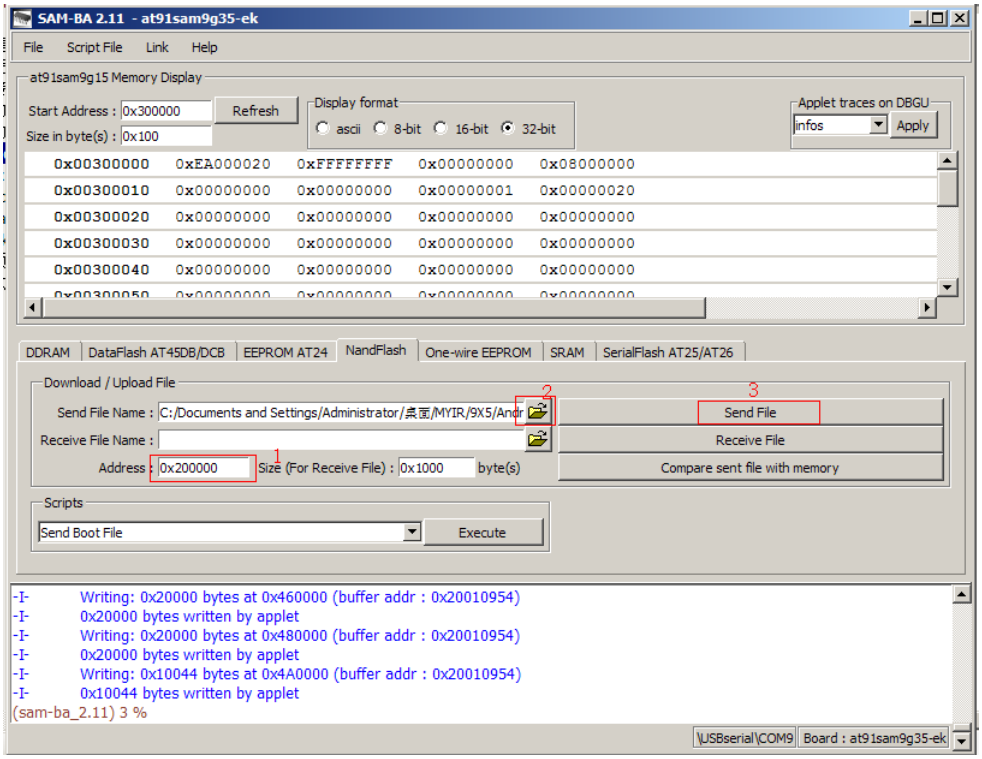


Figure 5-15

(9) Before download file system, first enable Trimffs (Note: be sure to check Trimffs).

Refer to figure 5-16:

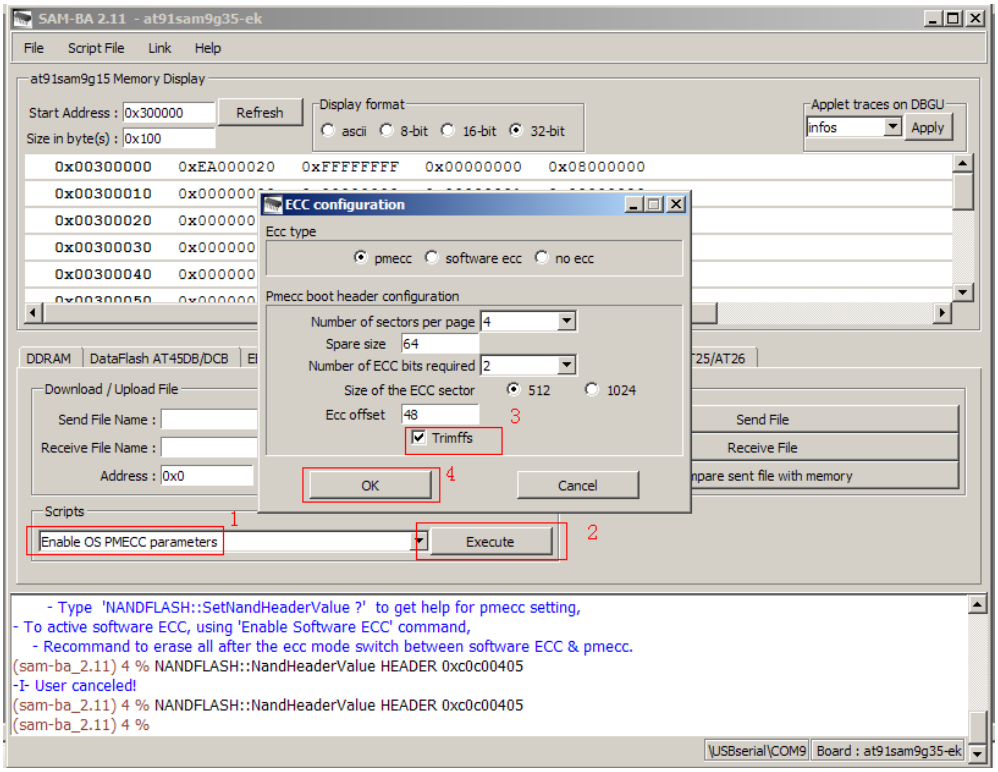


Figure 5-16

(10) Download system_ubifs-SAM9X5-ANDROID-2.3.5_r1.img to 0x500000. Refer to

figure 5-17:

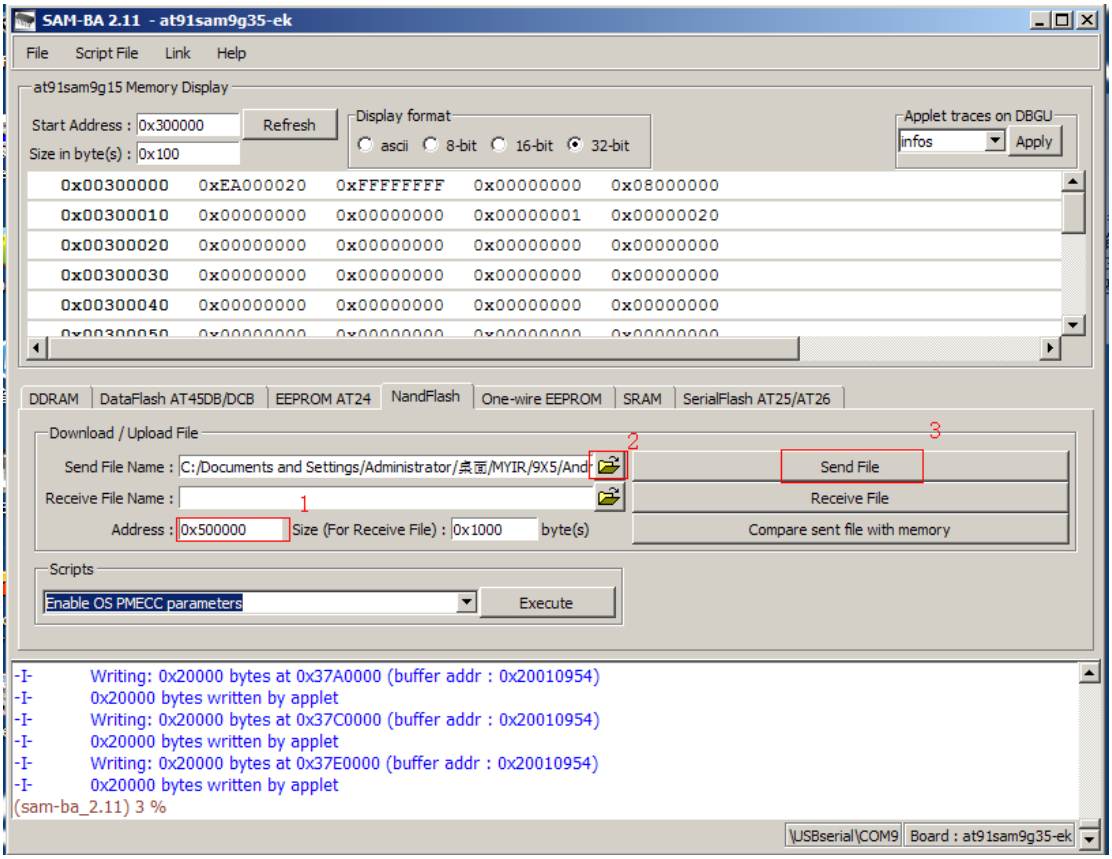


Figure 5-17

(11) Download userdata_ubifs-SAM9X5-ANDROID-2.3.5_r1.img to 0x6400000.

Refer to figure 5-18:

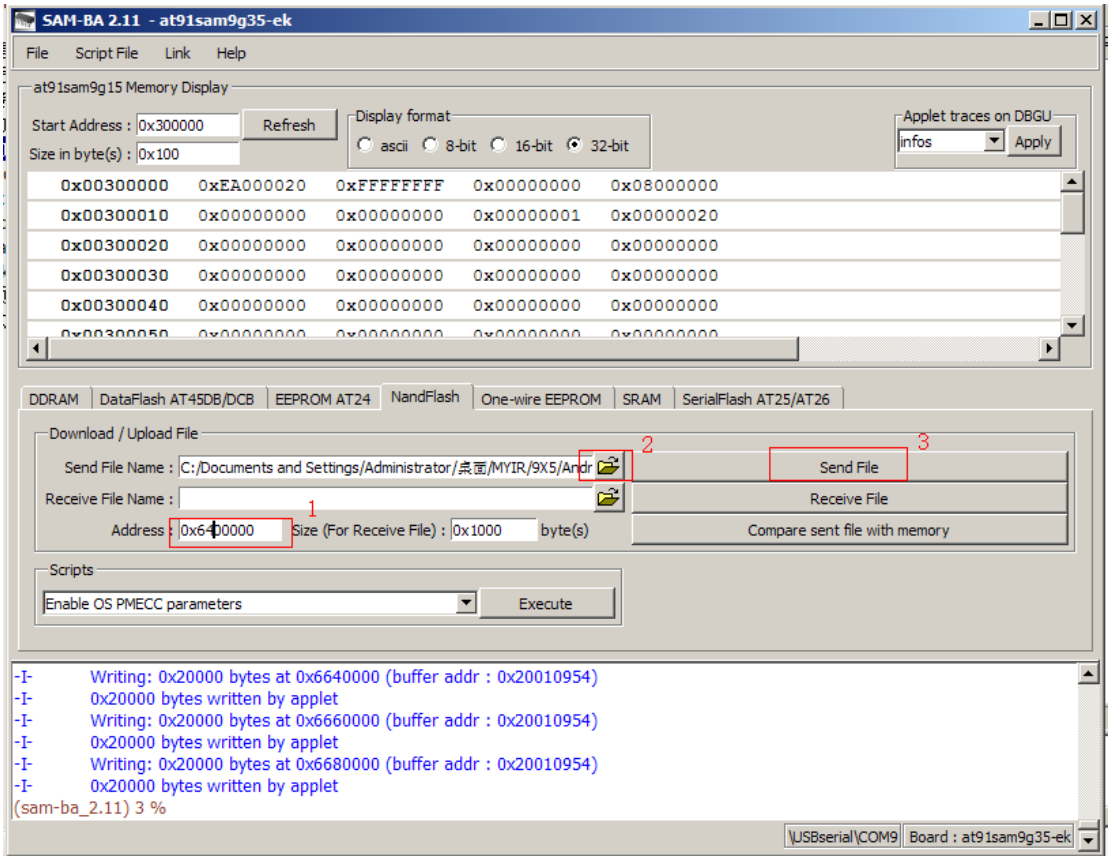


Figure 5-18

At this point, Android system image file download is completed, and press K1 key can restart Android system.

5.4 Compile Android System Files

This chapter will describe the compiled methods and steps of Android system files.

5.4.1 Android System Principle

(1) File description:

File	Description
at91sam9x5ek-nandflashboot-3.1.bin	Boot program Compiled by AT91Bootstrap source is used to start u-boot
u-boot.bin	The secondary boot for boot kernel
uImage	Linux kernel file compiled byLinux kernel source code
system_ubifs-SAM9X5-ANDROID-2.3.5_r1.img	Android file system (system files

	chapter)
userdata_ubifs-SAM9X5-ANDROID-2.3.5_r1.img	Android File Systems (user data portion)
at91sam9x5.tcl	Writing log file and view it by notebook
at91sam9x5ek_demo_android_nandflash.bat	Automatic programming tools (MS - DOS batch file, the manual programming process does not require this file)

Table 5-2

(2) The principle of the system

Power on, when system starts form nandflash, the start steps is as following:

① Fixed boot code in at91sam9x5 internal rom and copy a boot program at91sam9x5ek-nandflashboot-3.1.bin in nandflash to SRAM to run. Bootloader initializes hardware basically, such as setting CPU frequency, config running uration PIO, and then copy the secondary boot program uboot.bin to DDRAM and begin to implement.

② Secondary bootloader uboot is mainly responsible for boot Linux, including set Linux operating environment, Load Linux image file uImage, pass startup parameters to Linux, last boot Linux to start .

③ When boot Linux kernel, Android file system will be mounted automatically. At this point, Android system is booted.

5.4.2 Compile System Files

We know that Android system is running Linux-based system, so if build Android system, set up a Linux- based platform firstly.

Decompression cross compiler tool to /usr/local directory:

```
# tar xvjf   \
05-Linux_Source/CrossTool/ arm-2010q1-202-arm-none-linux-gnueabi.tar.bz2 \
-C /usr/local
```

(2) Compile AT91Bootstrap

```
# tar xjvf 05-Linux_Source/AT91Bootstrap/AT91Bootstrap-5series_1.2.tar.bz2
# cd AT91Bootstrap-5series_1.2
# make at91sam9x5nf_defconfig
# make CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
# cd binaries
```

In this directory, at91sam9x5ek-nandflashboot-3.1.bin is AT91Bootstrap.

(3) Compile u-boot

Note:U-boot compiled by default has no debug function, u-boot directly guild the kernel after starting without time-consuming operations such as configuring the network. Please refer to 4.5.4 compile u-boot for detailed description of u-boot compiling.

```
# tar xjvf 05-Linux_Source/U-Boot/u-boot-2010.06.tar.bz2
# cd u-boot-2010.06
# make at91sam9x5ek_nandflash_config
# make CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
```

There will be u-boot.bin in u-boot-2010.06 directory when compilation is complete.

(4) Compile Linux kernell used in Android system

Unzip Linux kernel to working directory:

```
# tar xvjf 06-Android_Source/Linux_Kernel_For_Android/linux-2.6.39.tar.bz2
# cd linux-2.6.39/
```

Configure file. (Select a different configuration file depending on the LCD size)

LCD Model	Profile
LCD_4.3	myir_MYD-SAM9X5_4.3LCD_Android_defconfig
LCD_7.0	myir_MYD-SAM9X5_7.0LCD_Android_defconfig
LCD_10.2	myir_MYD-SAM9X5_10.2LCD_Android_defconfig

According to actual screen size, select appropriate configuration files renamed as ".config ":

```
# cp arch/arm/configs/<configure file> .config
```

For example, 4.3 -inch LCD should execute the following command:

```
# cp arch/arm/configs/myir_MYD-SAM9X5_4.3LCD_Android_defconfig .config
```

Enter following command to compile Linux kernel:

```
# make ARCH=arm menuconfig (pops up formulate box directly and save out)
# make uImage ARCH=arm \
CROSS_COMPILE=/usr/local/arm-2010q1/bin/arm-none-linux-gnueabi-
```

Note: make uImage command requires compile environment installed uboot-mkimage tool; otherwise, use the following command to install tool:

```
# apt-get install uboot-mkimage
```

After compile kernel, uImage in directory arch/arm/boot/ is Linux kernel programming file.

5.5 Android System Use

5.5.1 USB Keyboard Test

Insert USB keyboard to J15, press the Num Lock key, when the lights in the upper-right corner turn green, it shows usb keyboard can be used.

5.5.2 Browse Picture Test

(1) Select "Gallery" icon, Gallery interface will pop up if insert SD card. Refer to figure 5-19:

Figure 5-19

(2) Select a picture folder. Refer to figure 5-20:

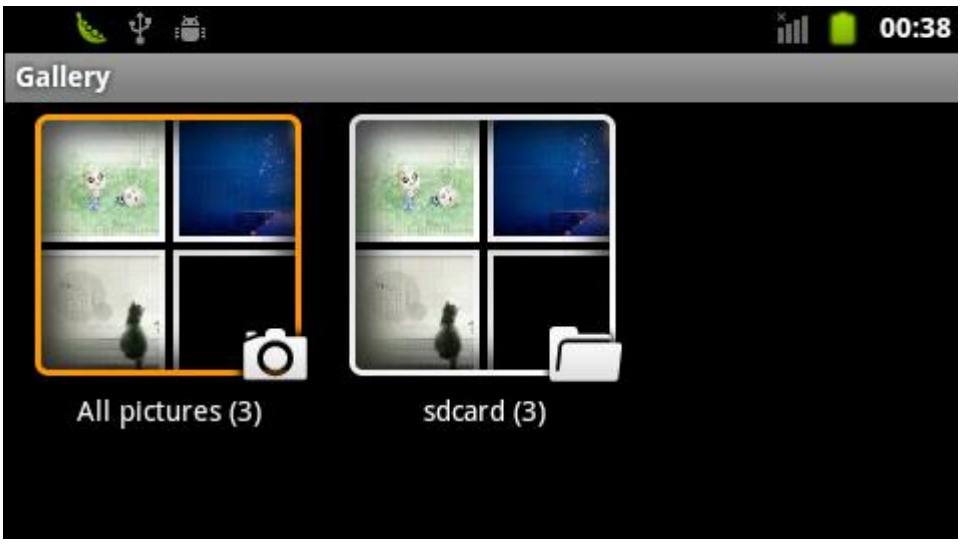


Figure 5-20

(3) View picture, the results are shown in figure 5-21:

Figure 5-21

5.5.3 Play Audio Test

(1)Select "Music" icon will pop up music player interface. Refer to figure 5-22:

Figure 5-22

(2) Select "Songs" option. Refer to figure 5-23:

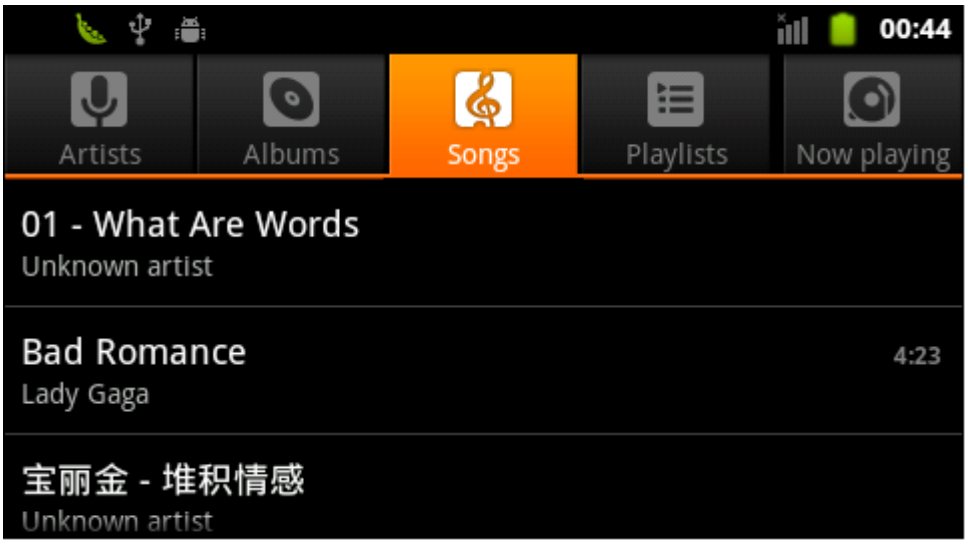


Figure 5-23

(3) Select a song to play. The effect is as shown in figure 5-24:

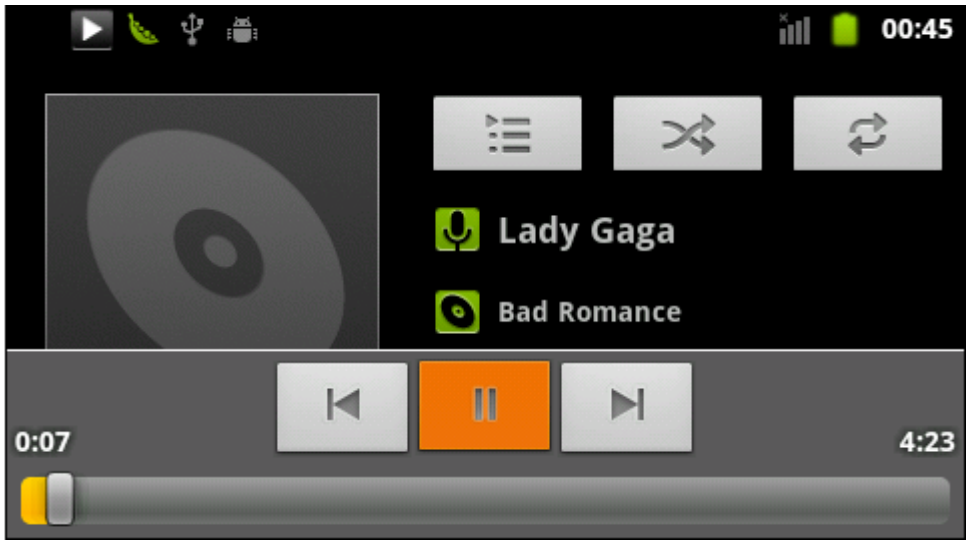
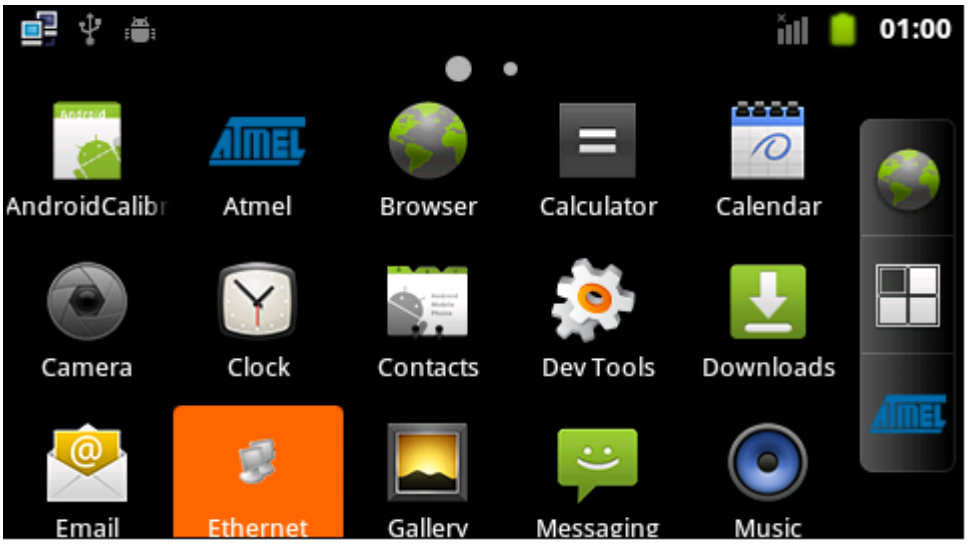


Figure 5-24

5.5.4 Ethernet Test

Note: Firstly, connect board to router by cable

(1) Enter interface and select icon "Ethenet". Refer to figure 5-25:



Fiugre 5-25

(2) Open Ethernet. Refer to figure 5-26:

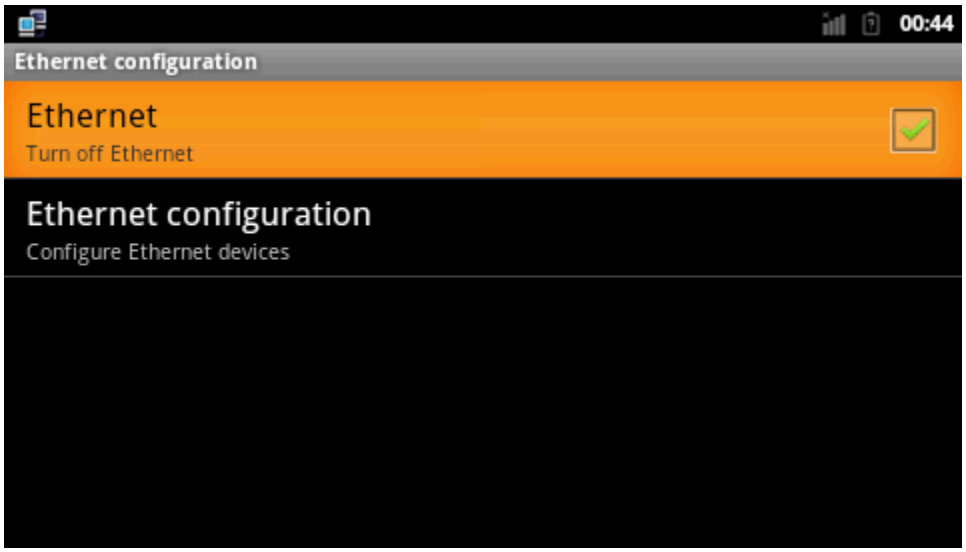


Figure 5-26

(3) Configure Ethernet. Refer to figure 5-27:

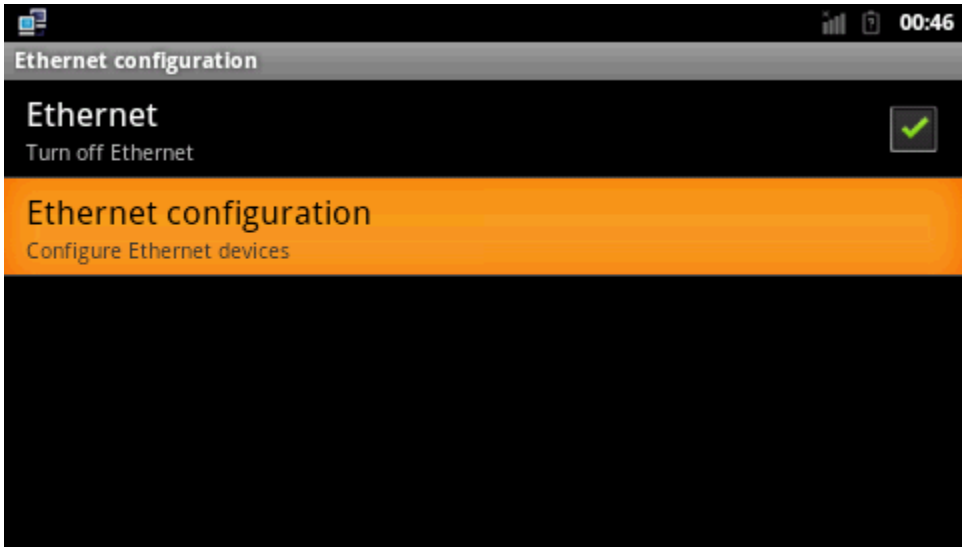


Figure 5-27

(4) Select "Dhcp" to obtain dynamic IP. Otherwise, select "Static IP" manually to set IP address, subnet mask, DNS server, default gateway. Refer to figure 5-28:

Figure 5-28

（5） After configuration is successful, input string: www.baidu.com. Refer to figure 5-29:

Figure 5-29

Appendix 1 FAQ

Q1: Report "Connection \USBserial\COMxx not found" (XX: port number, and according to the situation such as host machine is COM13, then XX is 13), pop up logfile file contents. As shown below:

```
-I- Waiting ...
-I- TCL platform : Windows NT
-I- SAM-BA 2.11    on : windows
-I- Retrieved arguments from command line :
-I- argv 0 : \USBserial\COM13
-I- argv 1 : at91sam9x35-ek
-I- argv 2 : at91sam9x35ekes_test_demo.tcl
-E- Connection \USBserial\COM13 not found
-E- Connection list : COM1
```

Analysis and Answers:

This problem occurs because samba connection cannot be found "\ USBserial \ COMxx", DIP switche SW1 and SW2 off in the control panel, disconnect JP8 jumper (CAN0_RX_EN), press NRST reset board , then turn SW2 on, and then start download.

Display logfile file as follows:

```
-I- Waiting ...
-I- TCL platform : Windows NT
-I- SAM-BA 2.11    on : windows
-I- Retrieved arguments from command line :
-I- argv 0 : \USBserial\COM3
-I- argv 1 : at91sam9x35-ek
-I- argv 2 : at91sam9x35ekes_test_demo.tcl
-E- Connection \USBserial\COM3 not found
-E- Connection list : {\USBserial\COM13} COM1
```

It indicates that port isn't right, as above -I - argv 0: \ USBserial \ COM3 " , but connections list is "-E-Connection list: {\ USBserial \ COM13} COM1 " which shows native port is COM13 not COM3 and it needs to modify COM port (Note: COM port is that your host use).

Q2: Prompt "Can't detect known device"

Analysis and Answers:

This phenomenon isn't dialing on the corresponding switch when enable Serialdataflash or Nandflash. Enable Serial dataflash without turning SW2 on, enable Nandflash without turning SW1 on (whether manual download or automatic download, it will have a prompt. Automatic download is recorded in logfile file).

Q3: Download system successfully, but can not start system.

Analysis and Answers:

If insert SD card to board, system may not start. For example, download LINUX system, if insert SD card to board, HyperTerminal display the following error message. Pulling out SD card can resolves the problem.

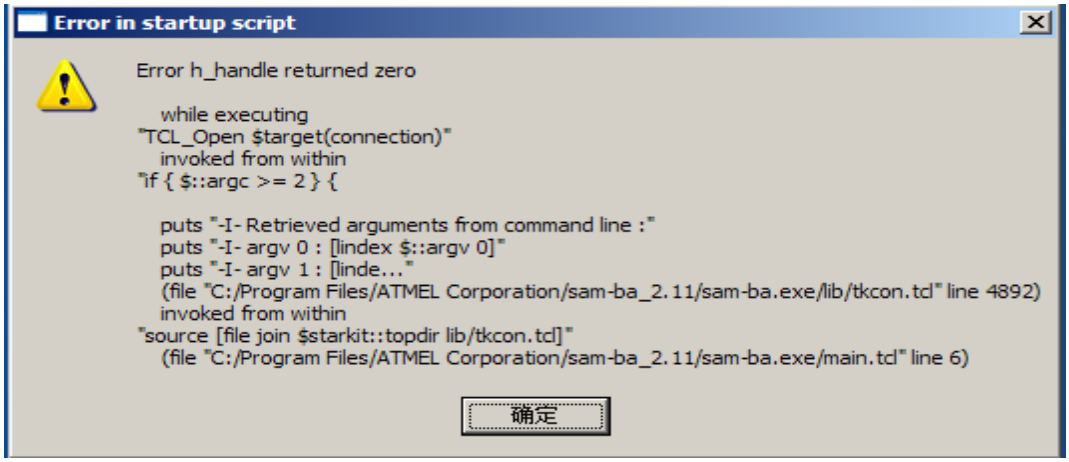
```
NAND read: device 0 offset 0x200000, size 0x250000
atmel_nand : one bit error on data. (data byte : b8, in page offset : 368, bit offset : 0x5)
atmel_nand : error corrected
atmel_nand : one bit error on data. (data byte : 71, in page offset : 1, bit offset : 0x5)
atmel_nand : error corrected
atmel_nand : one bit error on data. (data byte : f9, in page offset : 160, bit offset : 0x5)
atmel_nand : error corrected
atmel_nand : one bit error on data. (data byte : 60, in page offset : 437, bit offset : 0x5)
atmel_nand : error corrected
atmel_nand : one bit error on data. (data byte : 74, in page offset : 436, bit offset : 0x5)
atmel_nand : error corrected
atmel_nand : one bit error on data. (data byte : a0, in page offset : 340, bit offset : 0x5)
atmel_nand : error corrected
 2424832 bytes read: OK
## Booting kernel from Legacy Image at 22000000 ...
Bad Header Checksum
ERROR: can't get kernel image!
U-Boot>
```

Q4: Automatic download for a long time, HyperTerminal did not continue to output download information.

Analysis and Answers:

This may be stuck in automatic download process. It can end sam-ba.exe process in task manager and then restart download.

If start SAM-BA v2.11, Click Connect and pops up the following window when in automatic download:



It may be another SAM-BA is running. Stop SAM-BA in task manager, and then download it again.

Q5: MDK routines cannot debug online

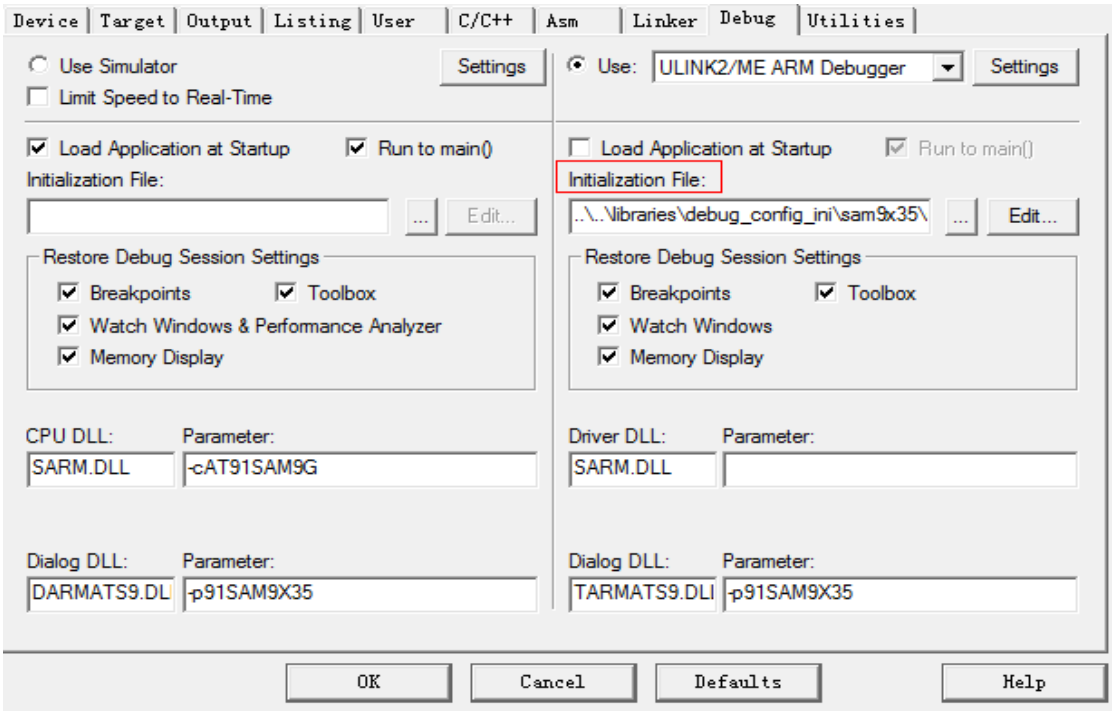
Analysis and Answers:

This problem occurs mainly caused by the following reasons:

(1) ULink2 connection or software does not recognize board

(2) Max JTAG Clock clock configuration is not right. In options menu "Options for target 'XXX' -> Debug-> 'ULINK2/ME Debugger' setting -> Max JTAG Clock", "Max JTAG Clock" should choose RTCK.

(3) Initialization File configuration has problem. In debug interface, as shown below location:



The following information that appears in the command window shows ddram.axf load fails:

```
------------------------------ DDRAM configuration done ------------------------------
_MapRAMAt0();                  //* Set the RAM memory at 0x00300000 & 0x0000 0000
Changing mapping: RAM mapped to 0//_InitRSTC();
LOAD ddram\\ddram.axf INCREMENTAL
_____^
*** error 56, line 414: cannot open file
PC = 0x20000000;
//g,main
```

Please restore Initialization File in corresponding engineering as InitializationFile.tlocation: 04- MDK_Source\libraries\debug_config_ini, select 9g15/9g25/9g35/9x25/9x35 configuration file and Initialization File in Debug tab directly.

Appendix 2 sales FAQ and technical support

How to buy

We accept paypal payment and bank wire transfer

1.Paypal payment

Please select the products add into shopping cart, the checkout web page will redirect to paypal.com for you payment. Shipment fee will calculated automatically by your location region.

2.Bank wire transfer

Pls email or fax us with products list you want, we will send you a pro-invoice with order value total, shipping cost and bank information.

Shipping details

Pls select the shipping area catalogue for you location. If you have carrier account to pay the shipment fee, please select "Freight collect" and email us the carrier account.

Please visit http://www.myirtech.com/support.asp for more details

Noted

1.The shipment will start in 3 biz days by Fedex Express, it usually take 7 days to reach regular cities or regions.

2.We will use DHL Express for West asia or middle east countries, it usually take 7 days to reach regular cities or regions.

3.The remote regions defined by Fedex/DHL may cause delay, 14 days in generally.

4.Some countries have strict import policy, we will help to make shipping invoice with you requirement, like invoice value, trade term, custom statements and H.S code etc. Please contact us with these shipment requirements if your country has strict custom affairs.

Support and maintains

MYIR provides 12 months warranty for hardware products if the defects or failures were not caused by wrong use.

Return steps for defective products

1. Please email or call us get a Return Merchandise Authorization (RMA) by providing purchase details and reasons for return (defective, incorrect etc).
2. MYIR will make a shipping invoice (list value total, item description etc) for you return request. China have strict limit on return products, so please use MYIR's shipping invoice to return items to avoid custom delay.

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