S5PV210 Android

SMDKV210 Android 2.3

Revision 1.0
Mar. 21, 2011

Release Note

SAMSUNG

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Samsung Electronics Co., Ltd.
San #24 Nongseo-Dong, Giheung-Gu
Yongin-City, Gyeonggi-Do, Korea 446-711

Home Page: *http://www.samsungsemi.com*

Printed in the Republic of Korea

Revision History

Revision No.	Date	Description	Author(s)
0.1	Jan 24, 2011	- Beta v0.1 release	Taewon Kang
0.2	Feb 28, 2011	- Beta v0.2 release	Taewon Kang
0.3	Mar 10, 2011	- Beta v0.3 release	Taewon Kang
1.0	Mar. 21, 2011	- RTM v1.0 release	Taewon Kang

Table of Contents

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List of Acronyms

Acronyms	Descriptions
AC link	Audio Controller Link
AC97	Audio codec '97
ADB	Android Debug Bridge
ADC	Analog-to-Digital Converter
ALSA	Advanced Linux Sound Architecture
APM	Advanced Power Management
ASL	Apache Software License
BCD	Binary-coded decimal
BSP	Board Support Package
CF	Compact Flash
DAC	Digital-to-Analog Converter
DMA	Direct Memory Access
DNW	Samsung Image Download Tool
DVFS	Dynamic Voltage and Frequency Scaling
EBI	External Bus Interface
EGL	Embedded Graphics Library
EINT	External Interrupt
EXIF	Exchangeable Image File Format
FIFO	First In, First Out
FIMC	Fully Interactive Mobile Camera
FIMD	Fully Interactive Mobile Display
FIMG	Fully Interactive Mobile Graphic
FRC	Frame Rate Control
GPIO	General purpose input/output
GPL	General Public License
GPL V2	General Public License Version2
HDMI	High-Definition Multimedia Interface
HS-MMC	High Speed MultiMediaCard
I2C	Inter-Integrated Circuit
IIS, I2S	Inter-IC-Sound
IOCTL	Input Output Control
IP	Intellectual Property
IrDA	Infrared Data Association
MFC	Multi Format Codec

MIPI	Mobile Industry Processor Interface
MMC	MultiMedia Card
MSB	Most-Significant Bit
MTD	Memory Technology Device
NTSC	National Television System Committee
OpenGL	OpenGL(Open Graphic Library)
OpenGL ES	OpenGL(Open Graphic Library) for Embedded Systems
OS	Operating System
PAL	Phase Alternation Line
PCLK	Peri Clock
PWM	Pulse Width Modulation
SMDK	Samsung Mobile Development Kit
SPDIF	Sony Philips Digital Interconnect Format
SPI	Serial Peripheral Interface
STN	Super-Twisted Nematic display
TFTP	Trivial File Transfer Protocol
UART	Universal Asynchronous Receiver and Transmitter
U-boot	Universal Boot Loader
UMS	USB Mass-Storage
USB OTG	USB(Universal Serial Bus) On-The-Go
V4L	Video for Linux
VFS	Virtual File System
WDT	Watchdog timer
YAFFS	Yet Another Flash File System

1 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the ANDROID-2.3 Gingerbread BSP RTM v1.0 release for SMDKV210-EVT1 that consists of U-boot v1.3.4, Linux kernel v2.6.35 and Android 2.3 Gingerbread platform.

1.2 SYSTEM REQUIREMENTS

No	Item Name	Description
1	Hardware Requirements	SMDKV210-EVT1 Board. Host Linux PC with Ubuntu 10.10(64-bit x86) or later. Windows PC with the Lauterbach'sTrace32 debugger (optional)
2	Software Requirements	Linux Kernel build environment, - Tool chain : arm-2009q3 Android 2.3 Gingerbread build environment - Git 1.5.4 or newer and the GNU Privacy Guard. - JDK 6.0 - flex, bison, gperf, libsdl-dev, libesd0-dev, libwxgtk2.6-dev (optional), build-essential, zip, curl, and Valgrind

2 RELEASE PACKAGES

- Uboot : android_uboot_smdkv210.tar.bz2
- Kernel : android_kernel_2.6.35_smdkv210.tar.bz2
- Gingerbread : android_gingerbread_smdkv210.tar.bz2

The following document describes how to compile the U-boot, Kernel and Android platform, how to flash the android images to SMDKV210 and how to make it boot

- SMDKV210_Android2.3_Installation_Guide v1.1.doc

3 FEATURES

3.1 U-BOOT FEATURES

- U-Boot v1.3.4 is used.

- Support for Android NAND booting

NAND device is supported as a booting storage by default.

- Support for Android SD card booting

The SD card is supported as a booting storage. Ext4 file system is available on the SD card.

- Support for Fastboot

Fastboot is supported for fusing android images to NAND or an SD card on SMDKV210 using an USB connection or an SD card.

3.2 LINUX KERNEL FEATURES

- Linux kernel 2.6.35 is used.

- Support for MFC

It supports MFC V5.0 (MFC F/W Version 26 Jan. 2011). It supports CODECs as follows :

- Decoding : H.263, H.264, MPEG4, VC-1, Xvid

- Encoding : H.263, H.264, MPEG4

If you want to know the performance in detail of each CODEC above, you can refer to the S5PV210 user's manual, but the bitrates for each CODEC can be little bit lower on Android than the V210 user manual.

- Support for G3D

3D device driver is used for 3D acceleration. 3D DDK v1.5 from Imaginations co. is used.

- Support for FIMC

FIMC device driver is used for camera capture and video rendering. This device driver supports V4L2 standard API and is fully verified with the S5K4EA camera module.

- Support for FIMG2D

FIMG2D device driver is used to accelerate the 2D operation. Currently, it is used to scale the frame buffer up for HDMI display.

- Support for FIMD

FIMD device driver supports the LCD display with common ioctls like FBIOGET_FSCREENINFO and FBIOGET_FSCREENINFO. Additionally, s3cfb_direct_ioctl is supported for the frame buffer control by other kernel modules. LTE480 WVGA(800x480) size LCD panel is fully verified.

- Support for TV sub system (VP, MIXER, HDMI)

TV sub system can support video stream out to HDMI and analog TV.

- Analog out: NTSC, PAL standard for CVBS

- HDMI out: 480p@60Hz, 576p@50Hz, 720p@60Hz, 1080i@60Hz, 1080p@30Hz

VP, MIXER, HDMI functions are fully verified. TV sub system supports V4L2 interface (User can set output type and video standard or on, off the each layer using V4L2 interface). TV H/W sub system supports one video layer and two graphic layers but Android Surface Manager uses one graphic layer and one video layer.

- Support for Keypad

Port 0 (8 row x 8 column) is used for the keypad on SMDKV210.

- Support for Touch

It supports the resistive touch device on LTE480 WVGA(800x480).

- Support for I2S and PCM

I2S transfers PCM raw data for playback and capture. I2S ALSA sound driver supports 44.1kHz sampling rate for playback and 8kHz sampling rate for capture. This release uses I2S master mode that means S5PV210 generates clock and drives external audio codec chip. The external audio codec driver for wm8580 on SMDKV210 is included. For playback, I2S internal FIFOs are filled with PCM raw data. GDMA transfers PCM raw data from memory to I2S FIFOs for normal playback. But iDMA transfers from internal memory of ASS(Audio Sub System) to I2S FIFOs to reduce power consumption for mp3 playback. It is called LP (Low Power) Audio Play.

- Support for AC97

AC97 ALSA sound driver is supported. AC97 controller in the S5PV210 supports the features of AC 97 version 2.0 specification. AC97 has independent channels for stereo PCM In and Out(16-bit stereo) and uses audio controller line to communicate with an external audio codec that supports AC 97 specification. In the SMDKV210 board, WM9713 external audio codec is adopted and AC97 hw interface port is combined with I2S1 and PCM1(selected by the interfacing Mux control). AC97 has 16-bit, 16 entry FIFOs per in/out channel. AC97 driver works on DMA-based operation and interrupt based operation.

- Support for SPDIF

SPDIF is a set of specification for carrying digital audio signals over either optical or electrical cable. The name stands for Sony/Philips Digital Interconnect Format. SPDIF controller in the S5PV210 supports only TX interface that transfers linear PCM data up to 24-bit per sample support. In the SMDKV210 board, SPDIF controller has 2x24-bit buffers that are alternately filled with data.

- Support for SD/MMC

It supports SD standard host specification version 2.0 and MMC standard host specification version 4.3. The high-speed mode (~47Mhz) and 4bit bus-width mode are used. The DMA data transfer mode is used. Ext4 file system is supported.

- Support for I2C

There are 4 I2C channels. One channel for general purpose is used for the camera module and the audio codec. Another one is used for PMIC, the other two channels are dedicated for HDMI.

- Support for UART

Four UARTs with DMA-based or interrupt-based operation are supported. UART2 is used for the default console on the host PC.

- Support for USB OTG device

An android gadget that is composite driver only with ADB(Android Debug Bridge) and UMS(USB Mass Storage) is supported

- Support for Flash file system

Low level drivers for NAND within MTD sub system are supported. And YAFFS2 File System is supported.

- Support for Power management

Suspend/resume is supported. Android platform enters to the suspend state by either the SW5 pressing or screen timeout by Settings Application. You can exit from the low-power states by both pressing jog switch (JOG1) and keypad (SW1,SW2,SW3,SW4 and SW5) on SMDKV210-EVT1 Board.

DVFS is not supported for DDR2 on SMDKV210. Power/clock gating is supported. Currently gating IP and domains are as follows.

	IP block	Used to android gingerbread BSP and gated IP	Not used to android gingerbread BSP and gated IP
clock gating	IP0	MDMA, PDMA0/1, IMEM, G3D, G2D, MFC, FIMC0/1/2, ROTATOR,	DMC0, DMC1, CSIS
	IP1	FIMD, DSIM, VP, MIXER, TVENC, HDMI, USBOTG, USBHOST, NANDXL, CFCON, NFCON,	SROMC
	IP2	SECSS, HSMMC0/1/2/3	SDM, CORESIGHT, MODEM, JTAG, TSI, VIC0/1/2/3, TZIC0/1/2/3
	IP3	SPDIF, AC97, I2S0/1/2, I2C0/2, I2C_HDMI_DDC, I2C_HDMI_PHY, SPI0/1/2, RTC, SYSTIMER, UART0/1/2/3, KEYIF, WDT, PWM, TSADC, PMC0/1/2	GPIO, SYSCON
	IP4	SECKEY	CHIP_ID, IEM_IEC, IEM_APC, TZPC0/1/2/3
	IP5	JPEG	
power gating	domains	6 domains (MFC, G3D, Audio Sub System, LCD, TV and CAM)	

[NOTE] The IPs that are not used in the Android Gingerbread BSP are gated at clock registering routine by default.

3.3 MODIFIED FEATURES IN ANDROID LIBS & HAL

- Android 2.3 Gingerbread is used.

For more information about Android 2.3 Gingerbread, please refer to Android 2.3 Platform (http://developer.android.com/sdk/android-2.3.html).

- Surface Manager

Overlay is supported and fully optimized for color space conversion, scaling and rotate. The rotate function is supported by the 3D library(OpenGL ES).

FIMD window 2 is used for UI display. FIMD Window 1 is used for VIDEO display.

Surface flinger also manages the HDMI output control.

- Media Framework - Stagefright

Only Stagefright is used as a media framework in Gingerbread. And, it supports 3gp and mp4 containers.

Samsung OMX(SEC-OMX) is implemented in /device/samsung/sec_mm/sec_omx. It consists of Samsung OMX Core, plugin codecs and components. It supports Samsung OMX Core and OMX components as follows :

- Decoding : H.263, H.264, MPEG4

- Encoding : H.263, H.264, MPEG4

A wmv decoder component is included for a reference. It means that it is not verified because no parser for wmv is available in stagefright.

BOARD_ENABLE_LASTFRAME_VIEW option in BoardConfig.mk is added. If it is set to true, the last frame can be displayed on the resume. It takes time to back up the last frame on suspend/resume and the system performance can be down. So the default is false.

The supported media formats on the Stagefright are following:

Features	Description	(Y/N)	Modules	File Type	Profiles	Details	Samsung OMX(SEC-OMX) Component
Codec-Video	Mpeg4	Y	Decoder	3GPP(.3gp), mp4(.mp4)	Simple, advanced simple profile	1080p, 30fps	OMX.SEC.MPEG4.Decoder
		Y	Encoder	3GPP(.3gp), mp4(.mp4)	Simple, advanced simple profile	1080p, 30fps	OMX.SEC.MPEG4.Encoder
	H.264	Y	Decoder	3GPP(.3gp), mp4(.mp4)	Baseline, main and high profile (upto 4.1)	1080p, 30fps	OMX.SEC.AVC.Decoder
		Y	Encoder	3GPP(.3gp), mp4(.mp4)	Baseline, main and high profile (upto 4.1)	1080p, 30fps	OMX.SEC.AVC.Encoder
	H.263	Y	Decoder	3GPP(.3gp), mp4(.mp4)	Profile level 3	1080p, 30fps	OMX.SEC.H263.Decoder
		Y	Encoder	3GPP(.3gp), mp4(.mp4)	Baseline	1080p, 30fps	OMX.SEC.H263.Encoder
	VC1	N	Decoder		upto Adv. Profile @ Level 2.0	1080p, 30fps	OMX.SEC.WMV.Decoder
	XVID	N	Decoder		Xvid streams	1080p, 30fps	OMX.SEC.MPEG4.Decoder

- OpenGL ES

It supports OpenGL ES 1.1/2.0 that is fully optimized with S5PV210. 3D library files for user space are distributed with the binary format and located in vender/samsung/smdkv210/proprietary.

- Camera HAL

It supports preview, capture and camcording functions. It supports 640x480 for the camera preview. It supports 640x480 for the camera capture. But, This feature is according to CameraSensor Module.

JPG file is stored in the SD card. It supports camcording (video and audio) with 720x480 resolution by default, but it can support up to 1080p(1920x1080) resolution . H.264 (by default), H.263 and MPEG4 codecs for video and AMR codec for audio are supported. It supports 3gp file format to be stored in the SD card.

Dual camera is supported. It supports S5K4BA(ITU) camera(back) and S5K4EA(MIPI) camera(front) on SMDKV210.

- libAudio2

Libaudio2 is HAL interface for the Android audio system for Gingerbread. This HAL interface is based on ALSA. The codes are located in /device/samsung/proprietary. This is closely related ALSA sound drivers in the Kernel.

Libaudio2 also supports audio resample for audio recording. So, audio recording with 8KHz, 16KHz sampling rates are available with 44.1KHz playback at the same time. ALSA driver in the kernel uses only 44.1 KHz for recording and player, RecordingThread with the resampler in AudioFlinger resamples to 8KHz or 16KHz audio data from 44.1KHz audio data.

- LP Audio

LP Audio(Low Power Audio) is adopted. LP Audio uses IDLE2 power mode of S5PV210 to reduce the power consumption and extend the playback time of mp3 audio file. So, this feature is closely related kernel timer, clock scheme and power mode. LP Audio can be enabled/disabled by switch Kernel configuration. ASS(Audio Sub System) in the S5PV210 has internal SRAM to store decoded PCM data and uses its own internal DAM(iDMA) to transfer PCM data from internal SRAM to I2S0 FIFOs. That is to say using internal SRAM and iDMA is the key point to reduce power consumption. By the way, LP Audio technology supports only mp3 Audio Playback, not for Audio Recording.

3.4 ENHANCEMENTS AND BUG-FIXES

3.4.1 ENHANCEMENTS AND BUG-FIXES IN THIS RELEASE

- Power management (Only on S5PC110)

  When LP audio is running, the DVFS frequency is set to 800MHz to enhance the stability.

- SEC-OMX
- BOARD_ENABLE_LASTFRAME_VIEW option in BoardConfig.mk is added. If it is set to true, the last frame can be displayed on the resume. It takes time to back up the last frame on suspend/resume and the system performance can be down. So the default is false.

3.4.2 ENHANCEMENTS AND BUG-FIXES IN V0.2 RELEASE

- Libcopybit is included

  Copybit & Texturestream rendering is supported.

- SEC_OMX is updated

  Added H.264 decoder node to support Flash player 10.1.

  - It's name is "OMX.SEC.FP.AVC.Decoder.
  - It uses MFC cacheable I/O buffer.
  - OMX_SEC_COLOR_FormatNV12Tile is added.

  NV12T to YUV420 color converter update.
  - From C code to Neon code.

  Fix SEC-OMX for OpenMAX IL Conformance Test

  Video Encoding is updated.
  - support variable bit-rate.
  - support to change frame-rate.
  - support to generate I-frame.
  - support to set a period of I-frame.

  Fix frame drop bug when multi B-Frame decoding.

- MFC driver is updated

  MFC FW version(26 Jan. 2011) is used

  MFC buffer can be set as cacheable buffer with ioctl for Flash player.

  Fixed mfc mmap ioctl's mmap memory size computing error.

3.5 PLANED FEATURES IN THE NEXT RELEASE

These features are released in the next version :

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4 KNOWN ISSUES

- The leftmost (1st - 2nd column) pixels are corrupted in movie playing on HDMI TV.
- On booting, HDMI is reset to 480p. HDMI setting application has a bug that it doesn't reflect the correct setting value. It should be used just to set up the HDMI setting.
- The MP3 player may not respond for user inputs at a long LP audio playing over 24 hours, sometimes.
- HDMI display is not working properly when a camera module is attached on SMDKV210, because FIMC2 is used for the HDMI display and camcording.
- Certain 3D benchmark program such as Quadrant Advanced 1.1.6 can be incorrectly executed.
- Yaffs2 is not fully guaranteed for the mass production.
- LCD flickering can be happened on some LTE480WV modules due to the module problem with various SMDKV210 boards.
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5 TEST RESULT SUMMARY

- TBD