HiMPP Startup Screen

User Guide

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About This Document

Purpose

This document provides the basic functions and U-boot command lines that are used to implement the startup screen function. Customers can configure the functions and command lines.

Related Versions

The following table lists the product versions related to this document.

| Product Name	Version
Hi3536	V100
Hi3521A	V100
Hi3520D	V300
Hi3531A	V100
Hi3531D	V100
Hi3521D	V100
Hi3536C	V100
Hi3536D	V100
Hi3520D	V400

Intended Audience

This document is intended for:

- Technical support engineers
- Software development engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows:

Symbol	Description
⚠ DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazard with a medium or low level of risk that, if not avoided, could result in minor or moderate injury.
⚠ CAUTION	Indicates a potentially hazardous situation, which if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
☞ TIP	Indicates a tip that may help you solve a problem or save time.
📖 NOTE	Provides additional information to emphasize or supplement important points of the main text.

Change History

Changes between document issues are cumulative. Therefore, the latest document issue contains all changes made in previous issues.

Issue 05 (2017-11-20)

This issue is the fifth official release, which incorporates the following changes:

The description in section 1.6 is modified.

In section 1.2, table 1-1 is modified.

Issue 04 (2017-09-08)

This issue is the fourth official release, which incorporates the following changes:

The description of the Hi3536D V100 is added.

Issue 03 (2017-04-10)

This issue is the third official release, which incorporates the following changes:

The description of the Hi3536C V100 is added.

Issue 02 (2017-01-10)

This issue is the second official release, which incorporates the following changes:

Chapter 1 Overview

The description in section 1.2 is updated.

Issue 01 (2016-05-25)

This issue is the first official release, which incorporates the following changes:

Chapter 1 Overview

The description in section 1.7 is updated.

Issue 00B05 (2015-10-10)

This issue is the fifth draft release, which incorporates the following changes:

The contents related to the Hi3531A are added.

Chapter 1 Overview

The description in section 1.6 is modified.

Issue 00B04 (2015-08-20)

This issue is the fourth draft release, which incorporates the following changes:

Chapter 1 Overview

In section 1.1, table 1-1 is modified.

The description in section 1.2 is modified.

The description in section 1.5 is modified.

Section 1.6 and section 1.7 are added.

Issue 00B03 (2015-06-09)

This issue is the third draft release, which incorporates the following changes:

Chapter 1 Overview

The description in section 1.1 is modified.

In section 1.2, startgx and stopgx are added, and table 1-1 is modified.

In section 1.3, startgx and stopgx are added.

The description in section 1.5 is modified.

Issue 00B02 (2015-05-11)

This issue is the second draft release, which incorporates the following changes:

The contents related to the Hi35121A are added.

Issue 00B01 (2015-03-02)

This issue is the first draft release.

Contents

Tables

1 Overview

1.1 New Functions

The U-boot code has the following new functions:

- Enables or disables the video output (VO) device in the U-boot environment. All the typical VO interfaces and timings are covered.

- Enables or disables the VO video layer in the U-boot environment.

- Enables or disables the VO graphics layer in the U-boot environment.

- Supports the output of YUV semi-planar420 pictures after JPEG hardware decoding in the U-boot environment and display of these pictures at the VO video layer.

- Supports the output of RGB pictures after JPEG software decoding in the U-boot environment and display of these pictures at the VO graphics layer.

- Supports JPEG hardware decoding by default.

📖 NOTE

This document uses the Hi3536 as an example. Unless otherwise specified, the contents of the Hi3536 also apply to the Hi3536C V100, Hi3531D V100, Hi3521D V100, Hi3520D V400, Hi3521A, Hi3531A, Hi3520D V300, and Hi3536D V100.

1.2 U-boot Command Lines

- startvo: starts the VO device.

  Parameters: device ID, interface type, and timing

  ```
  hisilicon # help startvo

  startvo - startvo  - open interface of vo device.

  - startvo [dev type sync]
  ```

  - <dev>: device ID. See Table 1-1.
  - <type>: interface type. See Table 1-1.
  - <sync>: timing type

  ```
  0(PAL),1(NTSC),2(960H_PAL),3(960H_NTSC),4(1080P24),5(1080P25),

  6(1080P30),7(720P50),8(720P60),9(1080I50),10(1080I60),11(1080P50),

  12(1080P60),13(576P50),14(480P60),15(640x480_60),16(800x600_60),

  17(1024x768_60),18(1280x1024_60),19(1366x768_60),20(1440x900_60),
  ```

```
21(1280x800_60),22(1680x1050_60),23(1920x2160_30),24(1600x1200_60),

25(1920x1200_60), 26(2560x1440_30), 27(2560x1440_60), 28(2560x1600_60),

29(3840x2160_25), 30(3840x2160_30), 31(3840x2160_50), 32(3840x2160_60)
```

- stopvo: stops the VO device.

  Parameter: device ID

  ```
  hisilicon # help stopvo

  stopvo - stopvo  - close interface of vo device.

  - stopvo [dev]
  ```

  − <dev>: device ID. See Table 1-1.

- startvl: enables the video layer.

  Parameters: video layer, picture address (after decoding), picture storage stride, and display position (x, y, w, h)

  ```
  hisilicon # help startvl

  startvl - startvl  - open video layer.

  - startvl [layer addr stride x y w h]
  ```

  − <layer>: video layer ID. See Table 1-1.

  − <addr>: picture address

  − <stride>: picture storage stride

  − <x,y,w,h>: display position

- stopvl: disables the video layer.

  Parameter: video layer

  ```
  hisilicon # help stopvl

  stopvl - stopvl  - close video layer.

  - stopvl [layer]
  ```

  − -<layer>: video layer ID. See Table 1-1.

- startgx: enables the graphics layer.

  Parameters: graphics layer, picture address (after decoding), picture storage stride, and display position (x, y, w, h)

  ```
  hisilicon # help startvl

  startgx - open graphics layer.

  - startgx [layer addr stride x y w h]
  ```

  − <layer>: graphics layer ID. See Table 1-1.

  − <addr>: picture address

  − <stride>: picture storage stride

  − <x,y,w,h>: display position

- stopgx: disables the graphics layer.

  Parameter: graphics layer

  ```
  hisilicon # help stopgx

  stopgx  - close graphics layer.

      - stopgx [layer]
  ```

  − <layer>: graphics layer ID. See Table 1-1.

- setvobg: sets the background color of the device.

  Parameter: graphics layer

  ```
  hisilicon # help setvobg
  setvobg - setvobg  - set vo background color.
  ```

  - setvobg [dev color]
  - <dev>: device ID. See Table 1-1.
  - <color>: rgb color space

- decjpg: starts JPEG decoding.

  Parameter: none. The environment variables **jpeg_addr**, **jpeg_size**, and **vobuf** (output after decoding) need to be set.

  jpeg_addr is the address for storing the JPG pictures to be decoded, **jpeg_size** is the size of decoded JPG pictures, and **vobuf** is the address for storing the decoded RGB pictures. For example:

  ```
  hisilicon #setenv jpeg_addr 0x90000000
  hisilicon #setenv jpeg_size 0xb85f9
  hisilicon #setenv vobuf 0x94000000
  ```

Table 1-1 Chip differences

Chip	Device	Graphic Layer	Video Layer	Interface Type	Interface Sync
Hi3536	[0, 2]	{0, 1, 2}	{0, 1, 3} The Hi3536 does not support display at the PIP layer.	1 (CVBS), 4 (VGA), 32 (HDMI), 16 (BT.1120) Support multiple types such as 36 (VGA|HDMI)	[0, 32]
Hi3521A	[0, 1]	{0, 1}	{0, 2} The Hi3521A does not support display at the PIP layer.	1 (CVBS), 4 (VGA), 32 (HDMI) Support multiple types such as 36 (VGA|HDMI)	[0, 24]
Hi3531A	[0, 2]	{0,1,2}	{0, 1, 3} The Hi3531A does not support display at the PIP layer.	1(CVBS),4(VGA), 32(HDMI),16(BT1120); support multi type eg: 36(VGA|HDMI)	[0, 30]
Hi3531D V100	[0, 2]	{0,1,2}	{0, 1, 3} The Hi3531D V100 does not support display at the PIP layer.	1(CVBS),4(VGA), 32(HDMI),16(BT1120); support multi type eg: 36(VGA|HDMI)	[0, 32]
Hi3521D V100/Hi 3520D V400	[0, 2]	{0,1,2}	{0, 1, 3} The Hi3521D V100 does not support display at the PIP layer.	1(CVBS),4(VGA), 32(HDMI); support multi type eg: 36(VGA|HDMI)	[0, 30]
Hi3536C V100	[0, 2]	{0,1,2}	{0, 1, 3} The Hi3536C V100	1(CVBS),4(VGA), 32(HDMI);	[0, 30]

Chip	Device	Graphic Layer	Video Layer	Interface Type	Interface Sync
			does not support display at the PIP layer.	support multi type eg: 36(VGA|HDMI)	
Hi3536D V100	0	0	0 The Hi3536D V100 does not support display at the PIP layer.	4(VGA), 32(HDMI); support multi type eg: 36(VGA|HDMI)	[4, 25]. VO_OUTPUT_ 1920x2160_30 is excluded.

1.3 U-boot Functions

The following functions are provided for encoding under the U-boot:

- startvo

  `int start_vo(unsigned int dev, unsigned int type, unsigned int sync);`

📖 **NOTE**

Only the devices with the device IDs listed in Table 1-1 are supported.

- stopvo

  `int stop_vo(unsigned int dev);`

- strartvl

  `int start_videolayer (unsigned int layer, unsigned addr, unsigned int strd,`

  `unsigned int x, unsigned int y, unsigned int w, unsigned int h);`

📖 **NOTE**

- The JPEG decoder performs decoding by using hardware. The output format is fixed at semi-planar420.
- **strd** can be obtained from the decoded JPEG picture. In addition, the picture stride (namely, linebytes) is displayed when the decjpg function is called.
- The stride must be 64-byte-aligned; otherwise, picture display errors may occur.
- **addr** indicates the address of the decoded picture and can be obtained from the **vobuf** parameter. When the decoded picture is displayed at the video layer, the address of the Y component is **addr** by default. The address of the C component is calculated as follows: c_addr = addr + stride x h.
- Progressive streams cannot be decoded by hardware.

- stopvl

  `int stop_videolayer(unsigned int layer);`

- strartgx

  `int start_gx(unsigned int layer, unsigned addr, unsigned int strd, unsigned`

  `int x, unsigned int y, unsigned int w, unsigned int h);`

📖 **NOTE**

- strd can be obtained from the decoded JPEG picture. In addition, the picture stride (namely, linebytes) is displayed when the decjpg function is called.
- The stride must be 16-byte-aligned; otherwise, picture display errors may occur.

- **addr** indicates the address of the decoded picture and can be obtained from the **vobuf** parameter.
- Progressive streams cannot be decoded by software.

- stopgx

  ```
  int stop_gx(unsigned int layer);
  ```

- setvobg

  ```
  int set_vobg(unsigned int dev, unsigned int rgb);
  ```

📖 **NOTE**

- Calling this function takes effect only before startvo is called. If you call this function after calling startvo, the calling operation takes effect when startvo is called again.
- It is recommended that the RGB color format be set to 0xRRGGBB, which makes pictures clearer.

- decjpg

  ```
  int load_jpeg(void);
  int jpeg_decode(void);
  ```

📖 **NOTE**

- **load_jpeg** is used to load pictures from the flash or other storage spaces to the memory.
- **jpeg_decode** is used to decode pictures and store the decoded pictures in the memory.
- When **load_jpeg** and **jpeg_decode** are called, the following three parameters are required: **jpeg_addr**, **jpeg_size**, and **vobuf**. **jpeg_addr** indicates the memory address for storing source pictures; **jpeg_size** indicates the picture size (in byte); **vobuf** indicates the address for storing decoded pictures, that is, the start display position at graphics layers.
- The decoding function can be customized. Ensure that the size, width, and height of the modified picture are consistent with those of the source picture.
- Due to the display restrictions at the video layer, the **startvo** command and the corresponding **startvl** command must be configured in sequence and between these two commands the **startvo** command with other parameters is not allowed to be inserted.

1.4 New Code or Modified Code

Only the basic functions relevant to the startup screen are provided. You can configure these functions (especially the decoding function) based on the actual applications.

```
Makefile
arch/arm/lib/cache-cp15.c
arch/arm/lib/mmu.s
include/hi35xx_vo.h
common/cmd_vo.c
common/cmd_dec.c
common/Makefile
drivers/vo/
Makfile vou.c  vou_coef.h vou_coef_org.c vou_coef_org.h vou_def.h vou_drv.c
vou_drv.h   vou_hal.c vou_hal.h vou_reg.h hi_type.h
drivers/dec/
Makfile hi_JpegDecode.c jpegd.c
Samples of Command Lines
```

1.5 Samples of Command Lines

This section describes how to set VGA 1080p@30 output for high-definition 0 (HD0) and CVBS PAL output for standard-definition (SD).

Note that the DDR download address varies according to the chip. (taking Hi3536 and Hi3521A as an example)

For the Hi3536, **jpeg_addr** is **0x43000000** and **vobuf** is **0x43800000**.

For the Hi3521A, **jpeg_addr** is **0x83000000** and **vobuf** is **0x83800000**.

- Configure JPEG decoding parameters.
  ```
  setenv jpeg_addr 0x43000000;

  setenv jpeg_size 0x2d822;

  setenv vobuf 0x43800000;

  saveenv
  ```

- Decode JPEG pictures and store the decoded pictures to the memory.
  ```
  decjpg
  ```

- Start the HD0 device.
  ```
  startvo 0 36 10
  ```

- Enable V0.
  ```
  startvl 0 0x43800000 768 0 0 720 576
  ```

- Start the SD device.
  ```
  startvo 2 1 0
  ```

- Enable V4.
  ```
  startvl 3 0x43800000 768 0 0 720 576
  ```

- Disable V0.
  ```
  stopvl 0
  ```

- Disable V4.
  ```
  stopvl 3
  ```

- Stop the HD0 device.
  ```
  stopvo 0
  ```

- Stop the SD device.
  ```
  stopvo 2
  ```

1.6 Software Decoding and Hardware Decoding

- The startup screen supports software decoding and hardware decoding under the U-boot. The picture is displayed at the graphics layer when the software decoding is used, and displayed at the video layer when the hardware decoding is used.

- When the software decoding is used, **hi_drv_jpeg_reg.h** under **product/hiosd/dec/** needs to be modified. To be specific, the macro definition **HARD_DEC** needs to be

deleted when the software decoding is used, and be added when the hardware decoding is used.

1.7 Precautions

- If the .ko drivers are loaded after the startup screen is displayed and the system starts running, the configuration of the **crgctrl.sh** script may be affected. In this case, you need only to comment out the configurations of the VOU and HDMI in the script.

- If the startup screen is displayed over the BT.1120 interface, you need to port the peripheral chip driver that implements BT.1120-to-HDMI adaptation.

- If the startup screen is displayed over the HDMI interface, after entering the system, you need to initialize and enable the HDMI interface, and then disable the HDMI interface to clear the configuration of the HDMI interface by the startup screen. After that, you can enable the HDMI interface according to the normal operation process. For details, see the examples in the Hi3536 VO sample.