RK3288 IO Domain Configuration Developer Guide

ID: RK-SM-YF-907

Release Version: V1.0.0

Release Date: 2021-05-15

Security Level: □Top-Secret □Secret □Internal ■Public

Rockchip Electronics Co., Ltd.

No.18 Building, A District, No.89, software Boulevard Fuzhou, Fujian,PRC

Website: www.rock-chips.com

Customer service Tel: +86-4007-700-590

Customer service Fax: +86-591-83951833

Customer service e-Mail: fae@rock-chips.com

Preface

Overview

The IO level of the controller's power domain must be matched with the IO level of the connected peripheral chip, and the voltage configuration of the software must be consistent with the voltage of the hardware. Otherwise, it may cause IO damage at worst.

This document mainly introduce the ways to configure IO power domain of RK3288 Linux SDK platform, aiming to help developers to configure IO power domain correctly.

Product Version

Chipset	System Version
RK3288	Linux 4.4, Linux 4.19

Intended Audience

This document (this guide) is mainly intended for:

- Technical support engineers
- Software development engineers
- Hardware development engineers

Revision History

Version	Author	Date	Change Description
V1.0.0	Caesar Wang	2021-05-15	Initial version

Contents

1. Step 1: Obtain the Hardware Schematic Diagram and Check the Design of the Hardware Power Supply

It will take RK_EVB_RK3288_LPDDR3P232SD6_V10_20171012 EVB as an example to introduce in this document.

Hardware schematic diagram is: RK_EVB_RK3288_LPDDR3P232SD6_V10_20171012.pdf.

Power solution: checking from the hardware schematic, the power solution of the **RK_EVB_RK3288_LPDDR3P232SD6_V10_20171012 EVB** is with a PMU (RK808-B).

2. Step 2: Find the Corresponding Kernel dts Configuration File

From the first step, it can be seen that the hardware power supply design of the EVB is with a PMU , and the corresponding kernel dts configuration file is located in:

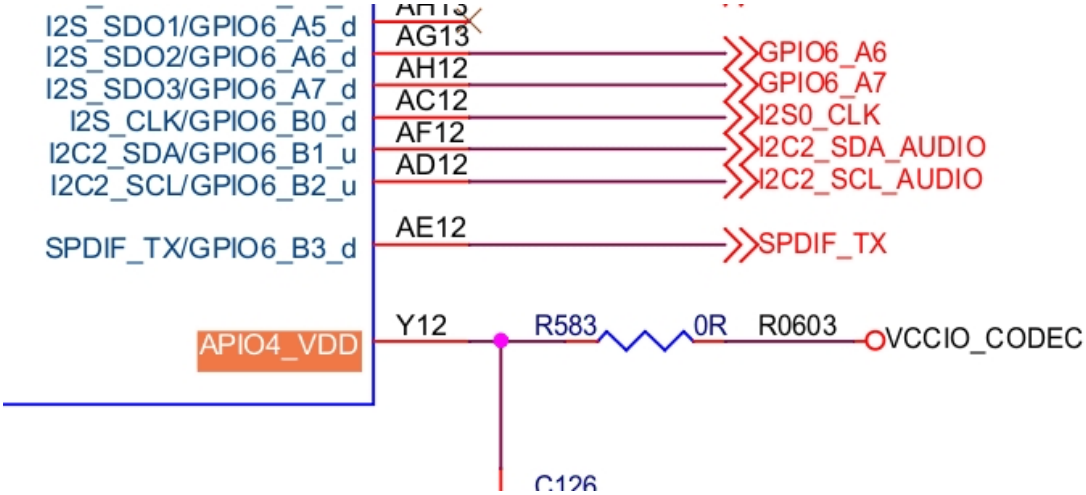
arch/arm/boot/dts/rk3288-evb.dtsi (The solution discussed in this document)

3. Step 3: Modify the Power Domain Configuration Node pmu_io_domains of the Kernel dts

```
&io_domains {
        status = "okay";
        audio-supply = <&vcc_io>;
        bb-supply = <&vcc_io>;
        dvp-supply = <&vcc18_dvp>;
        flash0-supply = <&vcc_18>;
        flash1-supply = <&vcc_io>;
        gpio30-supply = <&vcc_io>;
        gpio1830 = <&vcc_io>;
        lcdc-supply = <&vcc_lcd>;
        sdcard-supply = <&vccio_sd>;
        wifi-supply = <&vcc_wl>;
};
```

Take **APIO4_VDD** for example, firstly, check the hardware schematic diagram to confirm the configuration of the APIO4 power domain (APIO4_VDD) as shown in the below figure.

From the figure, you will find that the power supply of APIO4_VDD is VCCIO_CODEC (that is 3.3V)



4. Step 4: Check the Current Firmware IO Domain Configuration from SDK

Command: `./build.sh info`

```
PLEASE CHECK BOARD GPIO POWER DOMAIN CONFIGURATION !!!!!
<<< ESPECIALLY Wi-Fi/Flash/Ethernet IO power domain >>> !!!!!
Check Node [pmu_io_domains] in the file: /home/wxt/linux-develop/rk3288/kernel/arch/arm/boot/dts/rk3288-evb-rk808-linux.dts

请再次确认板级的电源域配置！！！！！！
<<< 特别是Wi-Fi, FLASH, 以太网这几路IO电源的配置 >>> ！！！！！
检查内核文件 /home/wxt/linux-develop/rk3288/kernel/arch/arm/boot/dts/rk3288-evb-rk808-linux.dts 的节点 [pmu_io_domains]


sdcard-supply
regulator-min-microvolt =  1800mV
regulator-max-microvolt =  3300mV


wifi-supply
regulator-min-microvolt =  1800mV
regulator-max-microvolt =  3300mV


audio-supply
regulator-min-microvolt =  3300mV
regulator-max-microvolt =  3300mV


bb-supply
regulator-min-microvolt =  3300mV
regulator-max-microvolt =  3300mV
```

5. Step 5: Confirm Whether the Register Value is Correct after Flashing the Firmware

Take **RK3288** as an example, get GRF_IO_VSEL register (0xFF770380) from the manual, it is shown as follows:

GRF_IO_VSEL
Address: Operational Base + offset (0x0380)
IO voltage select

Bit	Attr	Reset Value	Description
31:16	RW	0x0000	write_enable bit0~15 write enable When bit 16=1, bit 0 can be written by software . When bit 16=0, bit 0 cannot be written by software; When bit 17=1, bit 1 can be written by software . When bit 17=0, bit 1 cannot be written by software; ..... When bit 31=1, bit 15 can be written by software . When bit 31=0, bit 15 cannot be written by software;
15:10	RO	0x0	reserved

Bit	Attr	Reset Value	Description
9	RW	0x0	gpio1830_v18sel GPIO1830 IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
8	RW	0x0	gpio30_v18sel GPIO30 IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
7	RW	0x0	sdcard_v18sel SDCARD IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
6	RW	0x0	audio_v18sel AUDIO IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
5	RW	0x0	bb_v18sel BB IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
4	RW	0x0	wifi_v18sel WIFI IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
3	RW	0x0	flash1_v18sel FLASH1 IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
2	RW	0x1	flash0_v18sel FLASH0 IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
1	RW	0x0	dvp_v18sel DVP IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V
0	RW	0x0	lcdc_v18sel LCDC IO domain 1.8V voltage selection 1'b0: 3.3V 1'b1: 1.8V


```
# io -r -4 0xFF770380
ff770380:  00000016
```