

RK3308B-S&RK3308H-S Software Compatibility Introduction

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Revision History

Version	Change Description
V1.0.0_20211016	Initial version

Contents

RK3308B-S&RK3308H-S Software Compatibility Introduction

1. Overview
2. Software Compatible Patch Packages
3. Software Key Modifications
4. Software Modification Points Verification
 - 4.1 The rkbin Software Repository Update Confirmation
 - 4.1.1 Confirmation of Boot Log Information
 - 4.2 CPU
 - 4.3 DDR
 - 4.4 CRU
 - 4.5 Codec
 - 4.6 TSADC
 - 4.7 OTP
 - 4.8 USB
5. Notices
 - 5.1 **IO Power Domain Configuration (Very Important)**
 - 5.2 **IO Driver Strength Difference (Very Important)**
 - 5.2.1 Difference Description
 - 5.2.2 Situations Requiring Modification
 - 5.2.3 Software Compatibility Solution
 - 5.2.4 Modification Example

1. Overview

The software of RK3308B & RK3308B-S are compatible, but customers have to pay attention to the modification points and notices in this document, and merge and verify the code patch. The modification points in this document also applicable to the compatibility of RK3308H & RK3308H-S.

Software compatibility refers to merging RK3308B-S&RK3308H-S software compatibility patch after finishing the modification of the hardware design differences(please refers to "RK3308 series S version chipset hardware design modification introduction), and the same firmware can be compatible with RK3308B and RK3308B- S chip, RK3308H and RK3308H-S chip.

2. Software Compatible Patch Packages

The corresponding software patch package will be released with this document synchronously. If the patch package is updated, it will be notified to customers via RK FAE email.

Software package	Version	Change Description
RK3308B-S&RK3308H-S_Compatible_Patch_V1.0.0_20211016	V1.0.0_20211016	Initial version

3. Software Key Modifications

Module	Modification Description	Impact of RK3308B-S & RK3308H-S if the patch is not merged
CPU	Design process update, frequency voltmeter adjustment, add RK3308B-S CPU frequency voltmeter	CPU working frequency and voltage abnormal
DDR	Design process update, driver update, add RK3308B-S DMC frequency voltmeter	Chip can't start, DDR works unstable
CRU	Remove useless DDR CLK configuration (ddr_stdbby_clk)	CRU initialization will be abnormal, RK3308B-S&RK3308H-S hve deleted the corresponding register (this function of RK3308B & RK3308H is not enabled)
Codec	ADC&DAC process update, the driver needs to be modified for compatibility	Codec audio part cannot work normally
TSADC	Design process update, driver needs to be compatible with modification	TSADC driver cannot read the temperature correctly, or the temperature value read will not change due to chip load changes and environmental temperature changes
OTP	Design process update, the related registers are modified, and the driver needs to be modified for compatibility	The OTP function cannot be used normally, which affects the security encryption function
USB	USB PHY process update, the driver needs to be modified for compatibility	USB function cannot be used normally
IO	Drive strength change	If the IO drive strength has been modified on the product, RK3308B-S&RK3308H-S should be adapted

4. Software Modification Points Verification

After the software patch is merged, it should focus on verifying the full function and stability test of the product with RK3308B-S&RK3308H-S chip. And confirm whether the same software version can be compatible with RK3308B&RK3308H chips. The following verification introduction are only applicable for RK3308B-S & RK3308H-S.

4.1 The rkbin Software Repository Update Confirmation

In order to be compatible with the RK3308B-S&RK3308H-S chip, the following important Binary files must be updated and double check the requirement version.

Binary	Corresponding file	Version requirements
rk3308_ddr	rk3308_ddr_589MHz_uart2_m1_v2.05.bin rk3308_ddr_589MHz_uart4_m0_v2.05.bin rk3308_ddr_393MHz_uart4_m0_v2.05.bin rk3308_ddr_451MHz_uart2_m1_v2.05.bin rk3308_ddr_451MHz_uart4_m0_v2.05.bin rk3308_ddr_393MHz_uart2_m1_v2.05.bin	v2.05 or later version
rk3308_miniloader	rk3308_miniloader_v1.32.bin rk3308_miniloader_wo_ftl_v1.32.bin	v1.32 or later version
rk3308_usbplug	rk3308_usbplug_v1.32.bin rk3308_usbplug_wo_ftl_v1.32.bin	v1.32 or later version
rk3308_bl31	rk3308_bl31_aarch32_v2.24.elf rk3308_bl31_v2.24.elf	v2.24 or later version
rk3308_bl32	rk3308_bl32_v2.02	v2.02 or later version

If you use the tiny-bootloader repository to replace the rkbin repository, you can update the tiny-bootloader repository separately and refers to the patch package introduction for details.

4.1.1 Confirmation of Boot Log Information

1. rk3308_ddr

In the DDR initialization process of Loader, the version information V2.05 and CHIP ID will be printed.

```
DDR Version V2.05 20211014
CHIP ID = 0x0003308C
In
589MHz
DDR3
Col=10 Bank=3 Row=14 Size=256MB
OUT: sdram_init finish.
```

2. rk3308_miniloader&rk3308_usbplug

The version number 1.32 will be printed when Miniloader is loaded.

```
Boot1 Release Time: Oct 14 2021 09:58:10, version: 1.32
0xff0000a4:a14a
```

3. rk3308_bl31

When Trust is loading, it will print the commit number of bl31 source code: d5a5a89b7.

```
RunBL31 0x40000 @ 407165 us
INFO:     Preloader serial: 4
NOTICE:   BL31: v1.3(release):d5a5a89b7
NOTICE:   BL31: Built : 03:20:20, Oct 18 2021
```

4. rk3308_bl32

If the security solution is enabled, Trust.img has packed rk3308_bl32, At this time, the time stamp of compiling bl32 will be printed when booting: Sat Sep 18 03:45:00.

```
I/TC: OP-TEE version: 3.13.0-522-g2d3f7fedb #hisping.lin (gcc version 6.3.1 20170404
(Linaro GCC 6.3-2017.05)) #1 Sat Sep 18 03:45:00 UTC 2021 aarch64
I/TC: Primary CPU initializing
I/TC: Primary CPU switching to normal world boot
```

4.2 CPU

After entering the system, confirm whether the CPU frequency and voltage meter meets expectations.

```
# cat /sys/kernel/debug/opp/opp_summary
```

device	rate (Hz)	target (uV)	min (uV)	max (uV)

cpu0	408000000	850000	850000	1200000
	600000000	900000	900000	1200000
	816000000	1000000	1000000	1200000
	1008000000	1125000	1125000	1200000
	1104000000	1200000	1200000	1200000

4.3 DDR

Except for the printing of DDR Version during the Loader loading process, In the same way, confirm whether the DDR frequency and voltage meter meets expectations.

```
# cat /sys/kernel/debug/opp/opp_summary
```

device	rate (Hz)	target (uV)	min (uV)	max (uV)

platform-dmc	394000000	900000	900000	900000
	452000000	900000	900000	900000
	590000000	900000	900000	900000

4.4 CRU

RK3308B-S&RK3308H-S remove the useless DDR CLK configuration, you can confirm by checking whether the relevant configurations have been removed in the clk_summary node (clk_ddrphy4x_src, clk_ddrphy4x, clk_ddr_stdbby_div4, clk_ddrstdr_clk, clk_ddrstdr_clk, clk_ddrstdr_clk_mon_ddr_clk_mon_ddr_clk_periodr_clk).

```
# cat /sys/kernel/debug/clk/clk_summary | grep ddr
clk_ddr_mon_timer          0          0  24000000          0 0
clk_ddrphy4x_src          0          0 1179648000          0 0 #Without
this configuration
clk_ddrphy4x              0          0 1179648000          0 0 #Without this
configuration
clk_ddr_stdbby_div4       0          0  294912000          0 0 #Without
this configuration
sclk_ddrc                 1          1  589823999          0 0
pclk_ddr_stdbby           0          0 100000000          0 0
pclk_ddrphy               0          0 100000000          0 0
pclk_ddr_mon              0          0 100000000          0 0
pclk_ddr_upctl            0          0 100000000          0 0
pclk_ddr                  0          0 100000000          0 0
clk_ddrstdbby             0          0          0          0 0 #Without
this configuration
clk_ddr_msch_peribus      0          0          0          0 0 #Without
this configuration
clk_ddr_msch              0          0          0          0 0 #Without
this configuration
clk_ddr_upctrl            0          0          0          0 0 #Without
this configuration
clk_ddr_mon               0          0          0          0 0 #Without
this configuration
```

4.5 Codec

During Kernel startup, when the Audio Codec driver is loaded, the version number will be printed: The acodec version is: c.

```
[ 0.682152] rk3308-acodec ff560000.acodec: Don't need pa-driv gpio
[ 0.682176] rk3308-acodec ff560000.acodec: De-pop as much as possible
[ 0.682326] The acodec version is: c
```

And the Codec recording and playback function should be verified to confirm whether the patch has been imported correctly.

4.6 TSADC

The correct temperature is read through TSADC, and the temperature value read will change when the load changes or the environmental temperature changes.

The temperature of the thermal node can be confirmed several times to see if the temperature can change.


```
# cat sys/class/thermal/thermal_zone0/temp
30700
# cat sys/class/thermal/thermal_zone0/temp
31100
```

4.7 OTP

For the update of the bl32 version, it can be confirmed by the bl32 version; in addition, for the update of kernel driver, it can be checked by whether the OTP node information can be accessed normally.

```
# hexdump /sys/bus/nvmem/devices/rockchip-otp0/nvmem
```

If the patch is not applied correctly, an abnormal error will be reported:

```
# hexdump /sys/bus/nvmem/devices/rockchip-otp0/nvmem
hexdump: /sys/bus/rockchip-otp ff210000.otp: timeout during ecc_enable
        /nvm[e m3/1d4e3ices/rockchip-otp0/nvmem: Connection timed out
.300124] rockchip-otp ff210000.otp: rockchip_otp_ecc_enable err
```

4.8 USB

Confirm whether the firmware after updating the patch can be burned normally. Whether the USB-related functions are normal after the system is started.

5. Notices

5.1 IO Power Domain Configuration (Very Important)

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. If the hardware IO level is connected to 1.8V, the voltage configuration of the software should be configured to 1.8V accordingly; If the hardware IO level is connected to 3.3V, and the voltage configuration of the software should also be 3.3V.

The configuration node of the IO power domain is generally in the board-level dtsti. The node information is as follows:

```

&io_domains {
    status = "okay";

    vccio0-supply = <&vcc_io>;
    vccio1-supply = <&vcc_io>;
    vccio2-supply = <&vcc_io>;
    vccio3-supply = <&vcc_io>;
    vccio4-supply = <&vcc_io>;
    vccio5-supply = <&vcc_io>;
};

```

The board-level dtsi in the RK3308 SDK (such as rk3308-evb-v1x.dtsi, rk3308b-evb-v10.dtsi, rk3308-voice-module-v1x-aarch32.dtsi) is configured according to the actual hardware power supply configuration of the EVB board. Many customers directly include the dtsi of the rk3308 evb in their board-level dts, at this time, **customers must pay special attention to check whether the IO power domain matches the current hardware.**

5.2 IO Driver Strength Difference (Very Important)

5.2.1 Difference Description

The IO drive strength of RK3308B-S&RK3308H-S is different from that of RK3308B&RK3308H. The released SDK and patch have made corresponding adaptations to RK hardware reference configuration, Mainly includes Ethernet, Wi-Fi, FLASH and TF cards.

5.2.2 Situations Requiring Modification

If there have been IO drive strength modifications on the RK3308B&RK3308H products before, and special attention should be paid to testing the current drive strength configuration to meet the product requirements of RK3308B-S&RK3308H-S. If not (if the signal test can not meet requirements, there may be a problem of the function), you have to adapt RK3308B-S&RK3308H-S according to the following methods, and adjust the corresponding drive strength.

5.2.3 Software Compatibility Solution

In order to better adapt the software of RK3308B&RK3308H and RK3308B-S&RK3308H-S, different drive currents need to be configured. The Pinctrl code is optimized and pcfgr-for-s is defined to configure different drive strengths (it is realized in rk3308bs-pinctrl.dtsi). The drive-strength attribute is the IO drive current configuration for RK3308B&RK3308H, and the drive-strength-s attribute is the IO drive current for RK3308B-S&RK3308H-S.

If RK3308B-S&RK3308H-S and RK3308B&RK3308H use the same drive strength, there is no need to modify it, and the drive-strength configuration is used by default.

```

/ {
    pcfgr-for-s {
        ...
        /* 12ma for rk3308 and 6ma for rk3308bs */
    }
}

```

```

pcfg_pull_none_12_6ma: pcf-g-pull-none-12-6ma {
    bias-disable;
    drive-strength = <12>;    // IO drive current configuration of
RK3308B&RK3308H
    drive-strength-s = <6>;    // IO drive current configuration of
RK3308B-S&RK3308H-S
};
pcfg_pull_up_12_6ma: pcf-g-pull-up-12-6ma {
    bias-pull-up;
    drive-strength = <12>;
    drive-strength-s = <6>;
};
pcfg_pull_down_12_6ma: pcf-g-pull-down-12-6ma {
    bias-pull-down;
    drive-strength = <12>;
    drive-strength-s = <6>;
};
...
};

```

5.2.4 Modification Example

Take the gmac m1 of RK3308B EVB board as an example, which is using RK3308B&RK3308H chip. According to the actual hardware confirmation, the drive strength of 12 mA is required, and the following pinctr configuration is modified and added.

```

gmac-m1 {
    rmiiml_pins: rmiiml-pins {
        rockchip,pins =
            /* mac_txen */
            <4 RK_PB7 2 &pcfg_pull_none_12ma>,
            /* mac_txd1 */
            <4 RK_PA5 2 &pcfg_pull_none_12ma>,
            /* mac_txd0 */
            <4 RK_PA4 2 &pcfg_pull_none_12ma>,
            /* mac_rxd0 */
            <4 RK_PA2 2 &pcfg_pull_none>,
            /* mac_rxd1 */
            <4 RK_PA3 2 &pcfg_pull_none>,
            /* mac_rxer */
            <4 RK_PA0 2 &pcfg_pull_none>,
            /* mac_rxdv */
            <4 RK_PA1 2 &pcfg_pull_none>,
            /* mac_mdio */
            <4 RK_PB6 2 &pcfg_pull_none>,
            /* mac_mdc */
            <4 RK_PB5 2 &pcfg_pull_none>;
    };
};

```

So, if using RK3308B-S&RK3308H-S currently, according to actual measurement, confirm that gmac-m1 IO of RK3308B-S&RK3308H-S chip only needs 6 mA drive current, please refer to the following modification.

```
gmac-m1 {
    rmiim1_pins: rmiim1-pins {
        rockchip,pins =
            /* mac_txen */
            <4 RK_PB7 2 &pcfg_pull_none_12_6ma>,
            /* mac_txd1 */
            <4 RK_PA5 2 &pcfg_pull_none_12_6ma>,
            /* mac_txd0 */
            <4 RK_PA4 2 &pcfg_pull_none_12_6ma>,
            /* mac_rxd0 */
            <4 RK_PA2 2 &pcfg_pull_none>,
            /* mac_rxd1 */
            <4 RK_PA3 2 &pcfg_pull_none>,
            /* mac_rxer */
            <4 RK_PA0 2 &pcfg_pull_none>,
            /* mac_rxdv */
            <4 RK_PA1 2 &pcfg_pull_none>,
            /* mac_mdio */
            <4 RK_PB6 2 &pcfg_pull_none>,
            /* mac_mdc */
            <4 RK_PB5 2 &pcfg_pull_none>;
    };
};
```