Rockchip RK3588 User Guide eDP

文件标识：RK-YH-YF-303

发布版本：V1.0.1

日期：2022-07-13

文件密级：□绝密 □秘密 □内部资料 ■公开

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前言

文本主要介绍RK3588芯片eDP模块的软件配置与调试方法。

读者对象

本文档（本指南）主要适用于以下工程师：

技术支持工程师

软件开发工程师

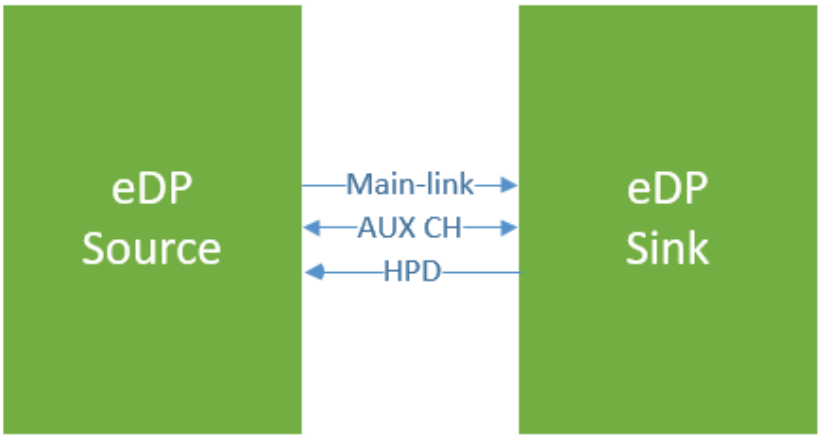
修订记录

版本号	作者	修改日期	修改说明
V1.0.0	闭伟勇	2022-01-14	初始发布
V1.0.1	闭伟勇	2022-07-13	内容更新

目录

Introduction

本文档主要描述RK3588芯片eDP模块的软件配置以及调试方法。



Feature

- DP v1.2
- eDP v1.3
- HDCP v1.3
- 1/2/4 lane
- 5.4/2.7/1.62 Gbps/lane
- Bi-directional auxiliary link with up to 1Mbps speed
- RGB 6/8/10 bit per component video format
- YCbCr 4:4:4, YCbCr 4:2:2 8/10 bit per component video format
- Support PSR
- Support audio

Driver

eDP Controller 驱动文件路径：

```
kernel:
drivers/gpu/drm/bridge/analogix/analogix_dp_core.c
drivers/gpu/drm/bridge/analogix/analogix_dp_core.h
drivers/gpu/drm/bridge/analogix/analogix_dp_reg.c
drivers/gpu/drm/bridge/analogix/analogix_dp_reg.h
drivers/gpu/drm/rockchip/analogix_dp-rockchip.c
include/drm/bridge/analogix_dp.h

u-boot:
drivers/video/drm/analogix_dp.c
drivers/video/drm/analogix_dp.h
drivers/video/drm/analogix_dp_reg.c
```

eDP PHY 驱动文件路径：

```
kernel:
drivers/phy/rockchip/phy-rockchip-samsung-hdptx.c

u-boot:
drivers/phy/phy-rockchip-samsung-hdptx.c
```

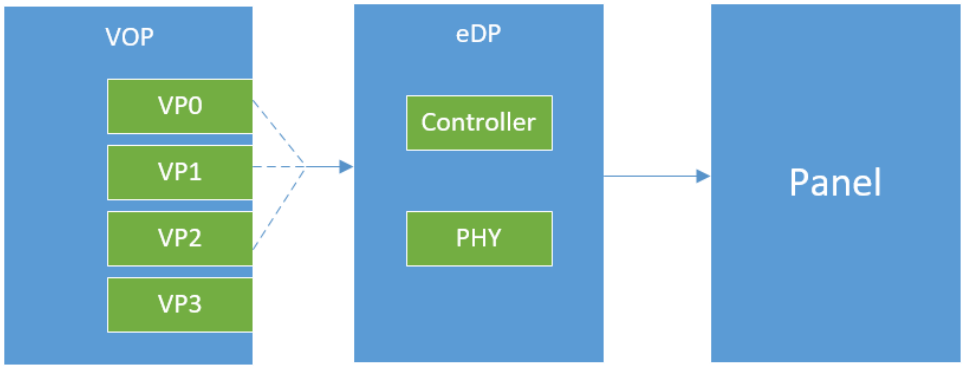
eDP Panel 驱动文件路径：

```
kernel:
drivers/gpu/drm/panel/panel-simple.c

u-boot:
drivers/video/drm/rockchip_panel.c
```

DTS 参考配置文件路径：

```
kernel:
arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
arch/arm64/boot/dts/rockchip/rk3588-evb2-lp4-v10-edp2dp.dts
```

dt-bindings



NOTE: eDP的输入源可以选择VP0/VP1/VP2，优先选择VP2。

eDP

外设为Panel，不支持HPD

```
&edp0 {
    force-hpd;
    status = "okay";

    ports {
        port@1 {
            reg = <1>;

            edp0_out_panel: endpoint {
                remote-endpoint = <&panel_in_edp0>;
            };
        };
    };
};

&edp0_in_vp0 {
    status = "disabled";
};

&edp0_in_vp1 {
    status = "disabled";
};

&edp0_in_vp2 {
    status = "okay";
};
```

外设为Monitor，支持HPD

HPD FUNC

hdmim0_tx0_hpd (gpio1_a5)

hdmim1_tx0_hpd (gpio3_d4)

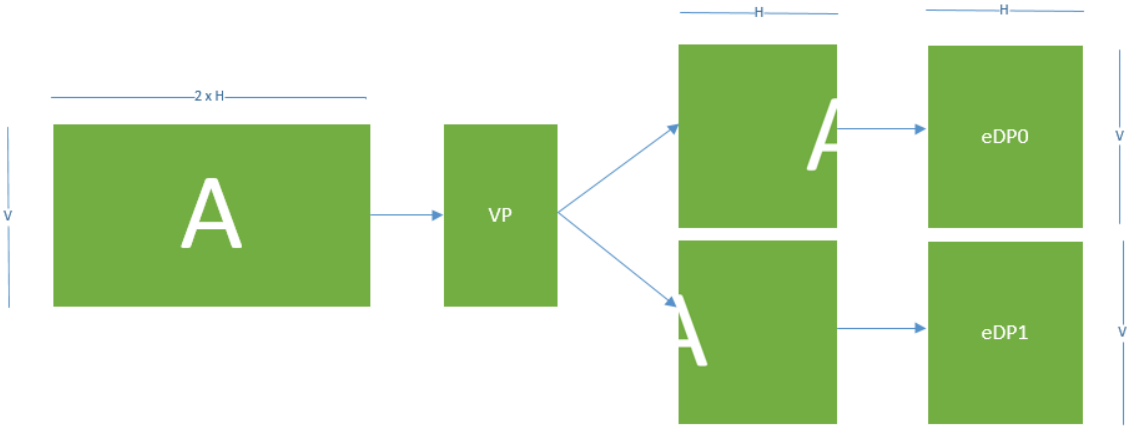
```
&edp0 {
```

```
    pinctrl-names = "default";
    pinctrl-0 = <&hdmim0_tx0_hpd>;
    status = "okay";
};

&edp0_in_vp0 {
    status = "disabled";
};

&edp0_in_vp1 {
    status = "disabled";
};

&edp0_in_vp2 {
    status = "okay";
};
```

HPD GPIO

```
&edp0 {
    pinctrl-names = "default";
    pinctrl-0 = <&edp0_hpd>;
    hpd-gpios = <&gpio1 RK_PA5 GPIO_ACTIVE_HIGH>;
    status = "okay";
};

&pinctrl {
    edp {
        edp0_hpd: edp0-hpd {
            rockchip,pins = <1 RK_PA5 0 &pcfg_pull_none>;
        };
    };
};

&edp0_in_vp0 {
    status = "disabled";
};

&edp0_in_vp1 {
    status = "disabled";
};

&edp0_in_vp2 {
    status = "okay";
};
```

Split-mode




```
diff --git a/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
b/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
index 8eb4fcf75aae..7b92b00d3759 100644
--- a/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
+++ b/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
@@ -223,6 +223,7 @@
 };

 &edp0 {
+       split-mode;
        force-hpd;
        status = "okay";
```

NOTE: split-mode要求edp0和edp1的timing完全一样，最好是两个一样的屏。

PHY

```
&hdptxphy0 {
    status = "okay";
};

&hdptxphy_hdmi0 {
    status = "disabled";
};
```

NOTE: 因为hdptxphy是combo的，hdmi和edp功能二选一，所以需要确保对应hdptxphy_hdmi节点是disabled状态。

training table

可选属性，一般不需要配置，使用驱动默认参数。如果眼图不符合要求，可以配置以下属性，使用单一参数配置，调整相关参数使眼图达标。

```
&hdptxphy0 {
    /* Single Vdiff Training Table (optional) */
    training-table = /bits/ 8 <
        /* voltage swing 0, pre-emphasis 0->3 */
        0x0d 0x0a 0x04 0x06 0x00 0x04
        0x0d 0x0a 0x04 0x06 0x00 0x04
        0x0d 0x0a 0x04 0x06 0x00 0x04
        0x0d 0x0a 0x04 0x06 0x00 0x04
        /* voltage swing 1, pre-emphasis 0->2 */
```

```
        0x0d 0x0a 0x04 0x06 0x00 0x04
        0x0d 0x0a 0x04 0x06 0x00 0x04
        0x0d 0x0a 0x04 0x06 0x00 0x04
        /* voltage swing 2, pre-emphasis 0->1 */
        0x0d 0x0a 0x04 0x06 0x00 0x04
        0x0d 0x0a 0x04 0x06 0x00 0x04
        /* voltage swing 3, pre-emphasis 0 */
        0x0d 0x0a 0x04 0x06 0x00 0x04
    >;
    status = "okay";
};
```

第一列参数含义：

```
ln_tx_drv_lvl_ctrl
TX driver main-tap level (TX_AMP)
01101: max main-tap level(max swing)
...
00000: min main-tap level(min swing)
Others: N/A
```

第二列参数含义：

```
ln0_tx_drv_post_lvl_ctrl
TX driver de-emphasis level (TX_DE_EMP)
0000: min de-emphasis level
...
1110: max de-emphasis level
Others: N/A
```

lane polarity

可选属性，一般不需要配置。如果硬件设计上，LANEx的P/N极性需要反向，可以配置该属性。

```
&hdptxphy0 {
    lane-polarity-invert = <0 1 0 0>;
    status = "okay";
};
```

Panel

hardcode timing

```
/ {
    panel-edp0 {
        compatible = "simple-panel";
        backlight = <&backlight>;
        power-supply = <&vcc3v3_lcd_edp0>;
        prepare-delay-ms = <120>;
        enable-delay-ms = <120>;
        unprepare-delay-ms = <120>;
        disable-delay-ms = <120>;
        width-mm = <129>;
        height-mm = <171>;
```

```
        panel-timing {
            clock-frequency = <200000000>;
            hactive = <1536>;
            vactive = <2048>;
            hfront-porch = <12>;
            hsync-len = <16>;
            hback-porch = <48>;
            vfront-porch = <8>;
            vsync-len = <4>;
            vback-porch = <8>;
            hsync-active = <0>;
            vsync-active = <0>;
            de-active = <0>;
            pixelclk-active = <0>;
        };

        port {
            panel_in_edp0: endpoint {
                remote-endpoint = <&edp0_out_panel>;
            };
        };
    };
};
```

property	description	value
power-supply	Display panels require power to be supplied.	
enable-gpios	Specifier for a GPIO connected to the panel enable control signal.	
reset-gpios	Specifier for a GPIO connected to the panel reset control signal.	
bus-format	Pixel data format	**MEDIA_BUS_FMT_RGB888_1X24** / MEDIA_BUS_FMT_RGB666_1X24_CPADHI / MEDIA_BUS_FMT_RGB101010_1X30
bpc	Bits per color	**8**/6/10
width-mm	Physical width in mm	
height-mm	Physical height in mm	

edid timing

```
/ {
    panel-edp0 {
        compatible = "simple-panel";
        backlight = <&backlight>;
        power-supply = <&vcc3v3_lcd_edp0>;
```

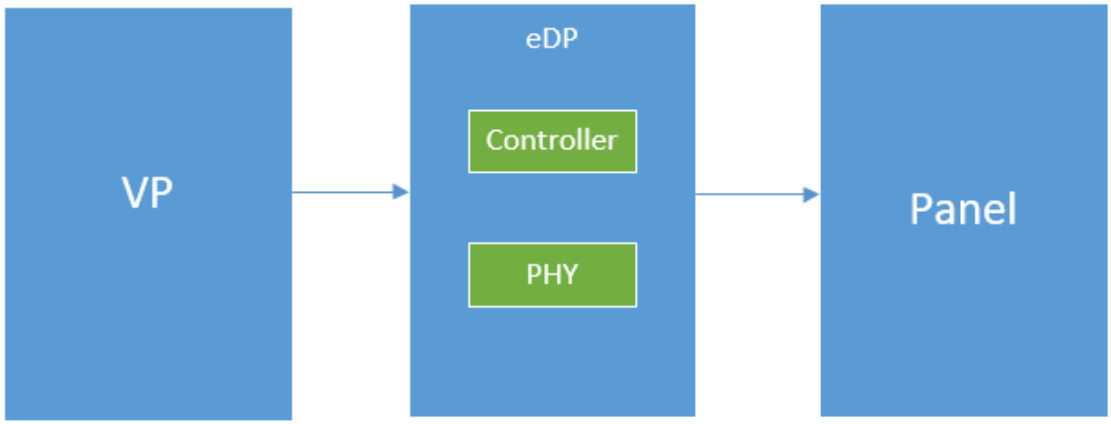
```
        prepare-delay-ms = <120>;
        enable-delay-ms = <120>;
        unprepare-delay-ms = <120>;
        disable-delay-ms = <120>;

        port {
            panel_in_edp0: endpoint {
                remote-endpoint = <&edp0_out_panel>;
            };
        };
    };
};
```

logo

```
&route_edp0 {
    connect = <&vp2_out_edp0>;
    status = "okay";
};
```

NOTE：调试的时候建议关闭，待调试完成，panel已经正常显示之后，再打开logo。

调试手段



1、确认当前连接状态：

```
console:/ # cat /sys/class/drm/card0-eDP-1/status
connected
```

如果status为disconnected，可能是hpd为low或者aux无法通信。

2、确认显示路径当前状态：

```
console:/ # cat /d/dri/0/summary
Video Port1: DISABLED
Video Port2: ACTIVE
    Connector: eDP-1
        bus_format[100a]: RGB888_1X24
        overlay_mode[0] output_mode[f] color_space[0]
    Display mode: 1536x2048p60
        clk[200000] real_clk[200000] type[48] flag[a]
```

```
        H: 1536 1548 1564 1612
        V: 2048 2056 2060 2068
    Cluster2-win0: ACTIVE
        win_id: 4
        format: AB24 little-endian (0x34324241)[AFBC] SDR[0] color_space[0]
glb_alpha[0xff]
        rotate: xmirror: 0 ymirror: 0 rotate_90: 0 rotate_270: 0
        csc: y2r[0] r2y[0] csc mode[0]
        zpos: 0
        src: pos[0, 0] rect[1536 x 2048]
        dst: pos[0, 0] rect[1536 x 2048]
        buf[0]: addr: 0x0000000001677000 pitch: 6144 offset: 0
```

3、使能panel自测模式

```
diff --git a/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
b/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
index a95bd09749db..4888d2aeadd2 100644
--- a/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
+++ b/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
@@ -223,6 +223,7 @@
 };

 &edp0 {
+       panel-self-test;
        force-hpd;
        status = "okay";
```

如果使能panel自测模式后，panel可以显示，那么说明panel已经正常工作，aux可以正常通信。

4、使能edp自测模式

```
diff --git a/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
b/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
index a95bd09749db..27c93ce92947 100644
--- a/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
+++ b/arch/arm64/boot/dts/rockchip/rk3588s-evb1-lp4x.dtsi
@@ -223,6 +223,7 @@
 };

 &edp0 {
+       analogix,video-bist-enable;
        force-hpd;
        status = "okay";
```

如果使能edp自测模式后，panel可以显示，那么说明panel已经正常工作，aux可以正常通信，edp主链路正常。

常见问题

1、backlight驱动probe失败

```
console:/ # dmesg | grep backlight
[    3.164274] pwm-backlight: probe of backlight failed with error -16
```

一般原因是backlight节点下的配置与其他模块存在资源冲突。

2、panel驱动probe失败

```
console:/ # dmesg | grep panel
[    3.156813] panel-simple panel-edp: failed to get enable GPIO: -16
[    3.156919] panel-simple: probe of panel-edp failed with error -16
```

一般原因是panel节点下的配置与其他模块存在资源冲突。

3、aux通信报错：

```
console:/ # dmesg | grep edp
[    3.236549] rockchip-dp fdec0000.edp: failed to read max link rate
[    3.260422] rockchip-dp fdec0000.edp: failed to read max link rate
[    3.284163] rockchip-dp fdec0000.edp: failed to read max link rate
```

该log说明通过AUX读取DPCD失败，一般是panel没有正常工作导致无应答，需要检查panel的供电。