Rockchip RK3588 User Guide DP

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前言

文本主要介绍RK3588芯片DP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

目录

Introduction

本文档主要描述RK3588芯片DP模块的软件配置以及调试方法。

Feature

- DisplayPort 1.4
- Main Link: 1/2/4 lanes
- 1Mbps AUX channel
- 8.1/5.4/2.7/1.62 Gbps/lane
- Type-C support（alternate mode）
- HDCP 2.2, HDCP 1.3
- Supports RGB, YCbCr4:4:4, YCbCr4:2:2, and YCbCr4:2:0 color formats
- Supports upto 10 bits per color component
- Support audio
- DSC, MST and eDP is not supported

Driver

DP Controller 驱动文件路径：

```
drivers/gpu/drm/rockchip/dw-dp.c
```

DP PHY 驱动文件路径：

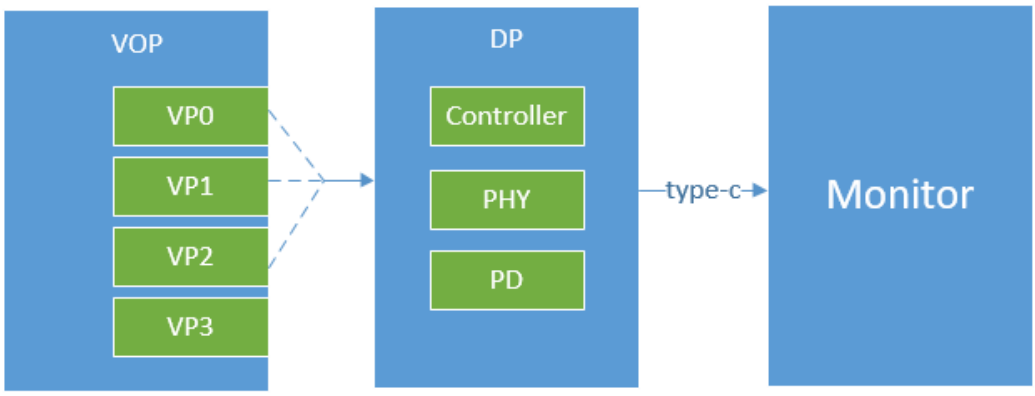
```
drivers/phy/rockchip/phy-rockchip-usbdp.c
```

DTS 参考配置文件路径：

```
arch/arm64/boot/dts/rockchip/rk3588-evb1-lp4.dtsi
arch/arm64/boot/dts/rockchip/rk3588-evb2-lp4.dtsi
arch/arm64/boot/dts/rockchip/rk3588-evb3-lp5.dtsi
```

dt-bindings

DP Alt Mode



Controller

```
&dp0 {
    status = "okay";
};

&dp0_in_vp2 {
    status = "okay";
};
```

PHY

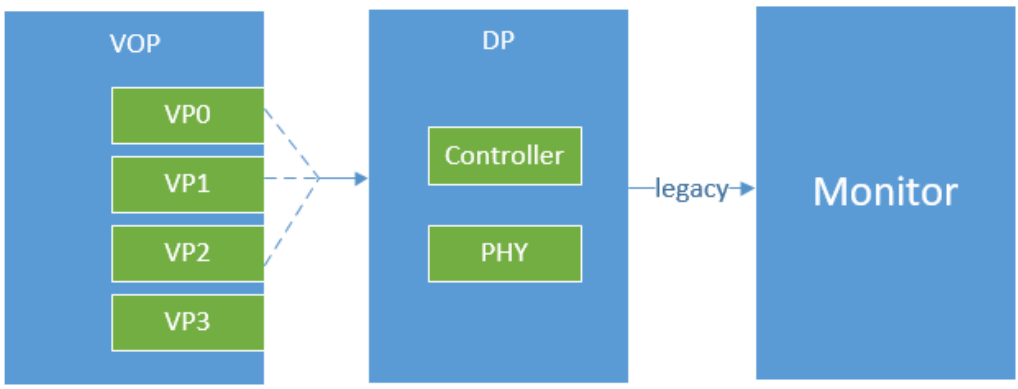
```
&usbdp_phy0 {
    orientation-switch;
    svid = <0xff01>;
    sbu1-dc-gpios = <&gpio4 RK_PA6 GPIO_ACTIVE_HIGH>;
    sbu2-dc-gpios = <&gpio4 RK_PA7 GPIO_ACTIVE_HIGH>;
    status = "okay";

    port {
        #address-cells = <1>;
        #size-cells = <0>;

        usbdp_phy0_orientation_switch: endpoint@0 {
            reg = <0>;
            remote-endpoint = <&usbc0_orien_sw>;
        };

        usbdp_phy0_dp_altmode_mux: endpoint@1 {
            reg = <1>;
            remote-endpoint = <&dp_altmode_mux>;
        };
    };
};
```

PD

```
&i2c2 {
    status = "okay";

    usbc0: fusb302@22 {
        compatible = "fcs,fusb302";
        reg = <0x22>;
        interrupt-parent = <&gpio3>;
        interrupts = <RK_PB4 IRQ_TYPE_LEVEL_LOW>;
        pinctrl-names = "default";
        pinctrl-0 = <&usbc0_int>;
        vbus-supply = <&vbus5v0_typec>;
        status = "okay";

        ports {
            #address-cells = <1>;
            #size-cells = <0>;

            port@0 {
                reg = <0>;

                usbc0_role_sw: endpoint@0 {
                    remote-endpoint = <&dwc3_0_role_switch>;
                };
            };
        };

        usb_con: connector {
            compatible = "usb-c-connector";
            label = "USB-C";
            data-role = "dual";
            power-role = "dual";
            try-power-role = "sink";
            op-sink-microwatt = <1000000>;
            sink-pdos = <PDO_FIXED(5000, 1000, PDO_FIXED_USB_COMM)>;
            source-pdos = <PDO_FIXED(5000, 3000, PDO_FIXED_USB_COMM)>;

            altmodes {
                #address-cells = <1>;
                #size-cells = <0>;

                altmode@0 {
                    reg = <0>;
                    svid = <0xff01>;
                    vdo = <0xffffffff>;
                };
            };

            ports {
                #address-cells = <1>;
                #size-cells = <0>;

                port@0 {
                    reg = <0>;
```

```
                    usbc0_orien_sw: endpoint {
                        remote-endpoint = <&usbdp_phy0_orientation_switch>;
                    };
                };

                port@1 {
                    reg = <1>;

                    dp_altmode_mux: endpoint {
                        remote-endpoint = <&usbdp_phy0_dp_altmode_mux>;
                    };
                };
            };
        };
    };
};
```

DP Legacy Mode



Controller

如果HPD是DP功能IO，按IOMUX配置；如果HPD不是DP功能IO，按GPIO配置。

HPD IOMUX

```
&dp1 {
    pinctrl-0 = <&dp1m2_pins>;
    pinctrl-names = "default";
    status = "okay";
};

&dp1_in_vp2 {
    status = "okay";
};
```

HPD GPIO

```
&dp1 {
    pinctrl-names = "default";
    pinctrl-0 = <&dp1_hpd>;
    hpd-gpios = <&gpio1 RK_PB5 GPIO_ACTIVE_HIGH>;
    status = "okay";
};
```

```
&dp1_in_vp2 {
    status = "okay";
};

&pinctrl {
    dp {
        dp1_hpd: dp1-hpd {
            rockchip,pins = <1 RK_PB5 RK_FUNC_GPIO &pcfg_pull_none>;
        };
    };
};
```

PHY

PHY lane	
0	TYPEC1_SSRX1
1	TYPEC1_SSTX1
2	TYPEC1_SSRX2
3	TYPEC1_SSTX2

2 lane

index表示dp lane x，value表示phy lane x.

```
&usbdp_phy1 {
    rockchip,dp-lane-mux = <2 3>;
    status = "okay";
};
```

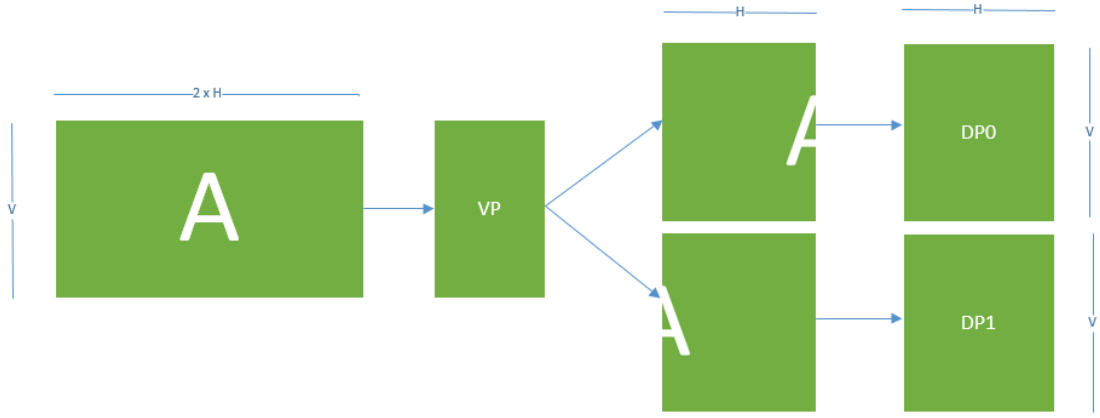
DP lane	PHY lane	
0	2	TYPEC1_SSRX2
1	3	TYPEC1_SSTX2

4 lane

```
&usbdp_phy1 {
    rockchip,dp-lane-mux = <0 1 2 3>;
    status = "okay";
};
```

DP lane	PHY lane	
0	0	TYPEC1_SSRX1
1	1	TYPEC1_SSTX1
2	2	TYPEC1_SSRX2
3	3	TYPEC1_SSTX2

Split Mode




```
diff --git a/arch/arm64/boot/dts/rockchip/rk3588-evb3-lp5.dtsi
b/arch/arm64/boot/dts/rockchip/rk3588-evb3-lp5.dtsi
index 271cfabff724..183c1c1dc712 100644
--- a/arch/arm64/boot/dts/rockchip/rk3588-evb3-lp5.dtsi
+++ b/arch/arm64/boot/dts/rockchip/rk3588-evb3-lp5.dtsi
@@ -208,6 +208,7 @@
 };

 &dp0 {
+       split-mode;
        status = "okay";
 };
```

NOTE: 使能物理分屏模式，只需要在作为左半屏的DP节点下加上split-mode属性。在该模式下，DP0和DP1的显示时序完全一样，所以DP0和DP1所接外设最好是两个一样的显示器。并且DP0或者DP1任意一路线缆拔掉，都会关闭显示路径，只有DP0和DP1同时连接，才会尝试使能显示路径。

调试手段

1、查看当前连接状态：

```
console:/ # cat /sys/class/drm/card0-DP-2/status
connected
```

2、查看可以支持的模式：

```
console:/ # cat /sys/class/drm/card0-DP-2/modes
3840x2160
3840x2160
3840x2160
2560x1440
2560x1440
2560x1440
1920x1080
1920x1080
1920x1080
1920x1080
1920x1080
1920x1080
```

```
1680x1050
1280x1024
1280x1024
1440x900
1280x960
1152x864
1280x720
1280x720
1280x720
1280x720
1024x768
1024x768
1024x768
1024x768
832x624
800x600
800x600
800x600
800x600
720x576
720x480
720x480
720x480
720x480
640x480
640x480
640x480
640x480
640x480
640x480
720x400
```

3、查看显示路径当前状态：

```
console:/ # cat /d/dri/0/summary
Video Port0: DISABLED
Video Port1: DISABLED
Video Port2: ACTIVE
    Connector: DP-2
        bus_format[200d]: YUYV10_1X20
        overlay_mode[1] output_mode[c] color_space[0]
    Display mode: 3840x2160p60
        clk[594000] real_clk[594000] type[40] flag[5]
        H: 3840 4016 4104 4400
        V: 2160 2168 2178 2250
    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[1] csc mode[1]
        zpos: 0
        src: pos[0, 0] rect[3840 x 2160]
        dst: pos[0, 0] rect[3840 x 2160]
        buf[0]: addr: 0x0000000000589c000 pitch: 15360 offset: 0
```