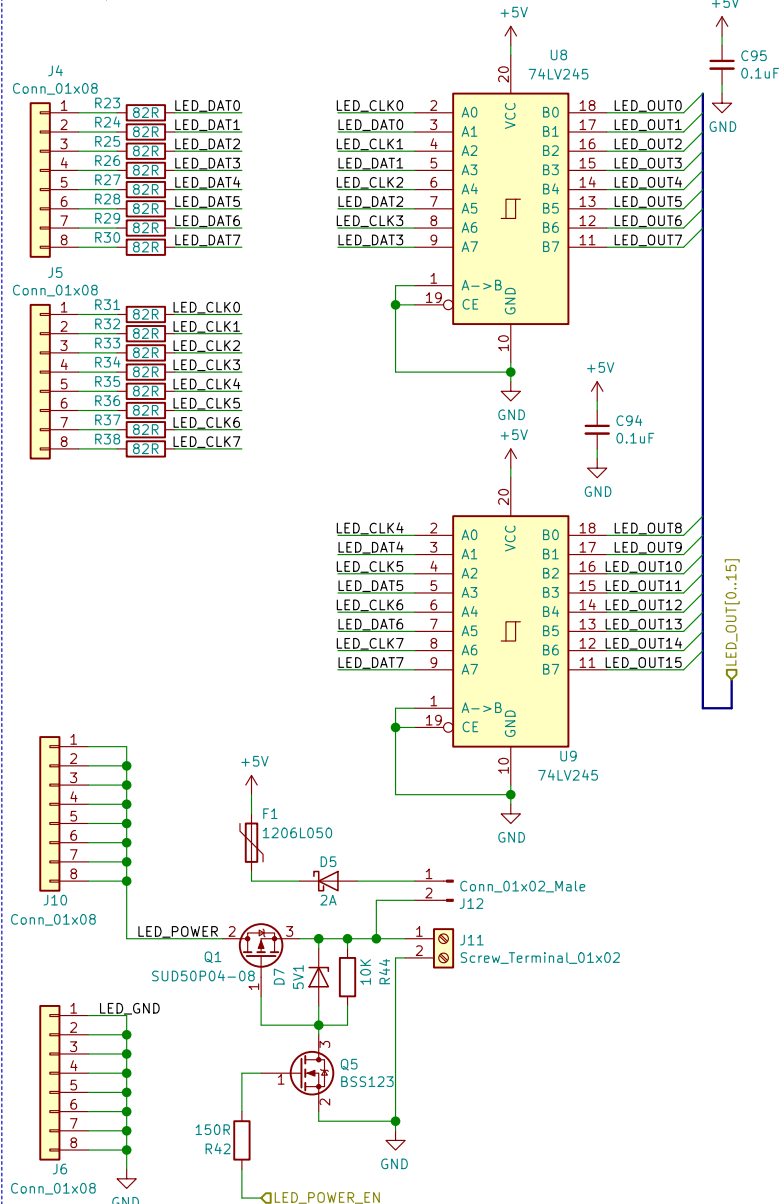
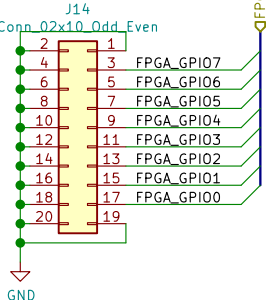
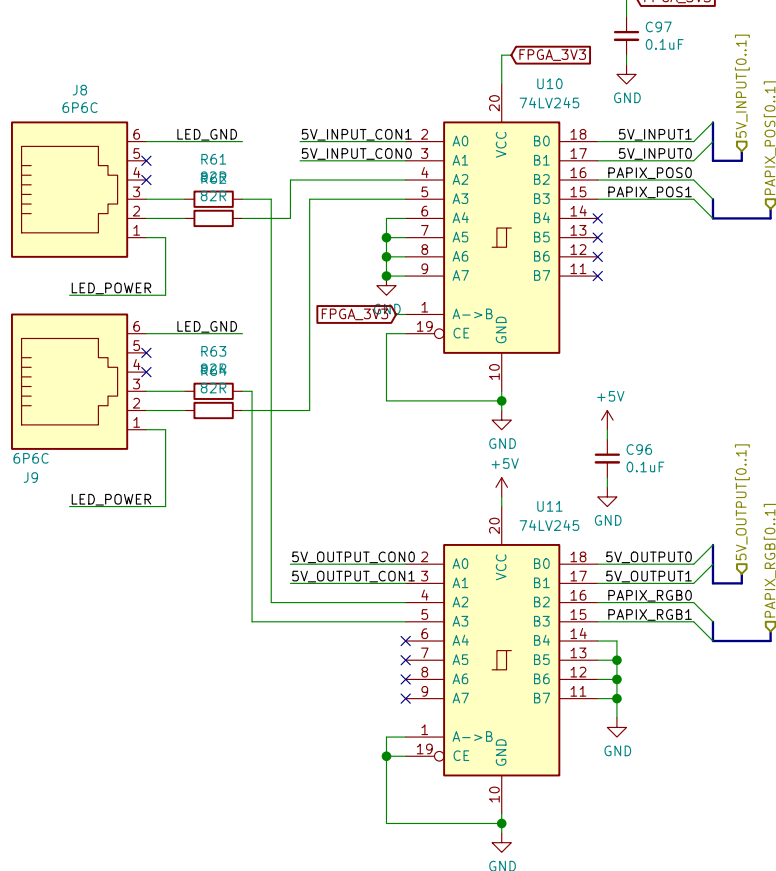


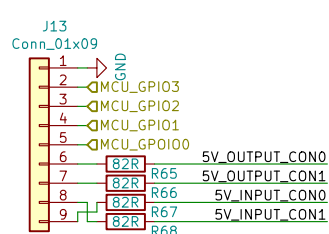
## LED Output



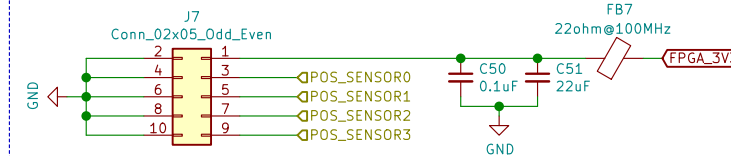
## PAPIX



## GPIO



## VIVE POS



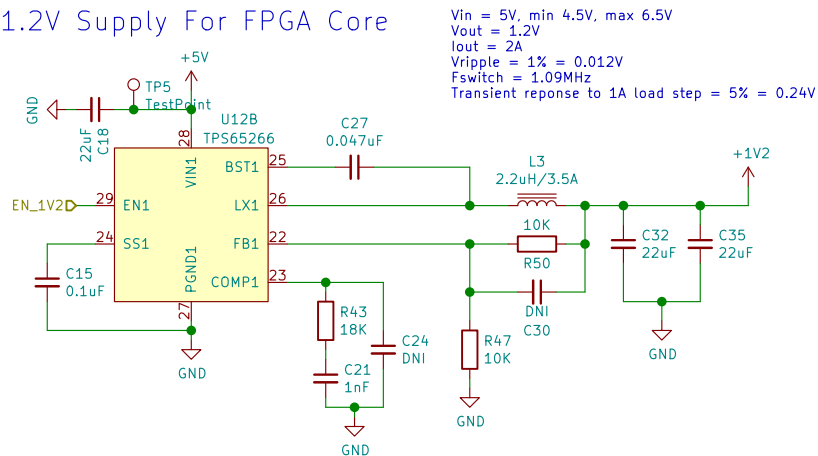
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File: hdmilight-v3-io.sch

### Title: HDMI Light V3 - I/O Interfaces

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## 1.2V Supply For FPGA Core



$$L = ((V_{in\_max} - V_{out}) / (I_{out} * LIR)) * (V_{out} / (V_{in\_max} * F_{switch}))$$

$$@2A \ L = ((6.5 - 1.2) / (2 * 0.2)) * (1.2 / (6.5 * 1090000)) = 2.2\mu H$$

$$I_{ripple} = ((V_{in\_max} - V_{out}) / L) * (V_{out} / (V_{in\_max} * F_{switch}))$$

$$@2.2\mu H \ I_{ripple} = ((6.5 - 1.2) / 0.0000022) * (1.2 / (6.5 * 1090000)) = 0.41A$$

$$\text{Min Cout for transient response} = (2 * \Delta I) / (F_{switch} * \Delta V_{out})$$

$$= (2 * 1) / (1090000 * 0.24) = 7.6\mu F$$

$$\text{Min Cout for ripple} = (1 / (8 * F_{switch})) * ((1 / V_{out\_ripple}) / I_{out\_ripple})$$

$$= (1 / (8 * 1090000)) * ((1 / 0.012) / 0.41) = 23.3\mu F$$

$$\text{Max ESR of Cout} = (V_{out\_ripple} / I_{out\_ripple}) = 0.012 / 0.41 = 29m\Omega$$

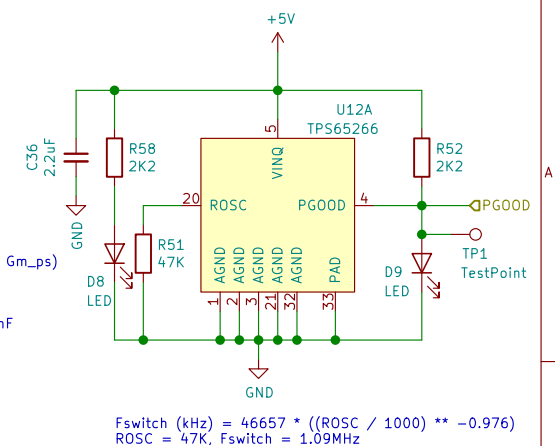
$$\text{Chosen Cout} = 2x \ 22\mu F, \text{ each with ESR below } 58m\Omega @ \ 1MHz$$

$$\text{Compensation resistor } R_c = (2 * \pi * (F_{switch} / 10) * V_{out} * C_{out}) / (G_{m\_ea} * V_{ref} * G_{m\_ps})$$

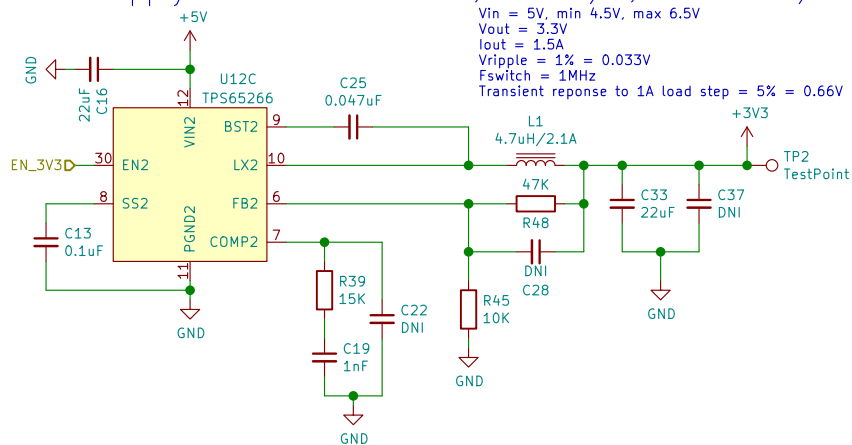
$$= (2 * \pi * 109000 * 1.2 * 0.000044) / (0.00029 * 0.6 * 10) = 21K$$

$$\text{Adjust to common value} = 22K$$

$$\text{Compensation capacitor } C_c = (R_{load} * C_{out}) / R_c = (0.5 * 0.000066) / 22000 = 1.5nF$$



## 3.3V Supply For Microcontroller, FPGA I/O, ADV7611 I/O



$$L = ((V_{in\_max} - V_{out}) / (I_{out} * LIR)) * (V_{out} / (V_{in\_max} * F_{switch}))$$

$$@1.5A \ L = ((6.5 - 3.3) / (1.5 * 0.2)) * (3.3 / (6.5 * 1090000)) = 5.0\mu H$$

$$I_{ripple} = ((V_{in\_max} - V_{out}) / L) * (V_{out} / (V_{in\_max} * F_{switch}))$$

$$@4.7\mu H \ I_{ripple} = ((6.5 - 3.3) / 0.0000047) * (3.3 / (6.5 * 1090000)) = 0.32A$$

$$\text{Min Cout for transient response} = (2 * \Delta I) / (F_{switch} * \Delta V_{out}) = (2 * 1) / (1090000 * 0.66) = 2.8\mu F$$

$$\text{Min Cout for ripple} = (1 / (8 * F_{switch})) * ((1 / V_{out\_ripple}) / I_{out\_ripple}) = (1 / (8 * 1090000)) * ((1 / 0.033) / 0.32) = 11\mu F$$

$$\text{Max ESR of Cout} = (V_{out\_ripple} / I_{out\_ripple}) = 0.033 / 0.32 = 103m\Omega$$

$$\text{Chosen Cout} = 1x \ 22\mu F \text{ with ESR below } 103m\Omega$$

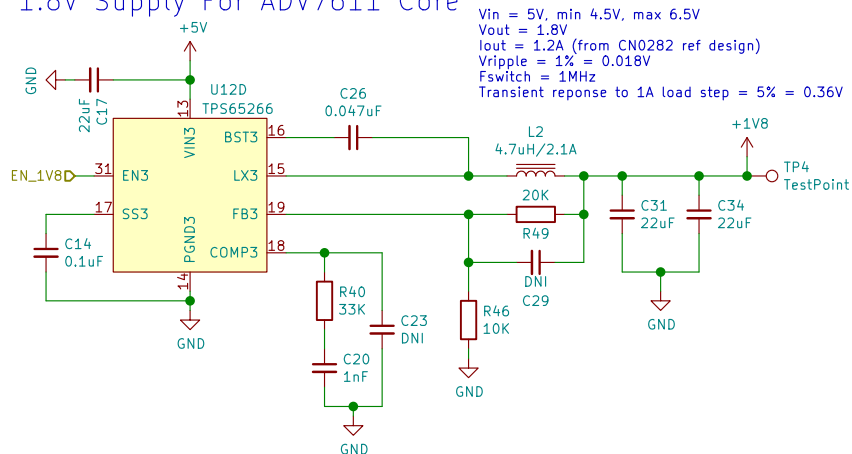
$$\text{Compensation resistor } R_c = (2 * \pi * (F_{switch} / 10) * V_{out} * C_{out}) / (G_{m\_ea} * V_{ref} * G_{m\_ps})$$

$$= (2 * \pi * 109000 * 3.3 * 0.000022) / (0.00029 * 0.6 * 10) = 29K$$

$$\text{Adjust to common value } 27K$$

$$\text{Compensation capacitor } C_c = (R_{load} * C_{out}) / R_c = (1 * 0.000022) / 27000 = 0.81nF$$

## 1.8V Supply For ADV7611 Core



$$L = ((V_{in\_max} - V_{out}) / (I_{out} * LIR)) * (V_{out} / (V_{in\_max} * F_{switch}))$$

$$@1.2A \ L = ((6.5 - 1.8) / (1.2 * 0.2)) * (1.8 / (6.5 * 1090000)) = 5.0\mu H$$

$$I_{ripple} = ((V_{in\_max} - V_{out}) / L) * (V_{out} / (V_{in\_max} * F_{switch}))$$

$$@4.7\mu H \ I_{ripple} = ((6.5 - 1.8) / 0.0000047) * (1.8 / (6.5 * 1090000)) = 0.25A$$

$$\text{Min Cout for transient response} = (2 * \Delta I) / (F_{switch} * \Delta V_{out}) = (2 * 1) / (1090000 * 0.36) = 5.1\mu F$$

$$\text{Min Cout for ripple} = (1 / (8 * F_{switch})) * ((1 / V_{out\_ripple}) / I_{out\_ripple}) = (1 / (8 * 1090000)) * ((1 / 0.018) / 0.25) = 25\mu F$$

$$\text{Max ESR of Cout} = (V_{out\_ripple} / I_{out\_ripple}) = 0.018 / 0.25 = 72m\Omega$$

$$\text{Chosen Cout} = 2x \ 22\mu F, \text{ each with ESR below } 144m\Omega$$

$$\text{Compensation resistor } R_c = (2 * \pi * (F_{switch} / 10) * V_{out} * C_{out}) / (G_{m\_ea} * V_{ref} * G_{m\_ps})$$

$$= (2 * \pi * 109000 * 1.8 * 0.000044) / (0.00029 * 0.6 * 10) = 31K$$

$$\text{Adjust to common value } 33K$$

$$\text{Compensation capacitor } C_c = (R_{load} * C_{out}) / R_c = (1 * 0.000044) / 33000 = 1.33nF$$

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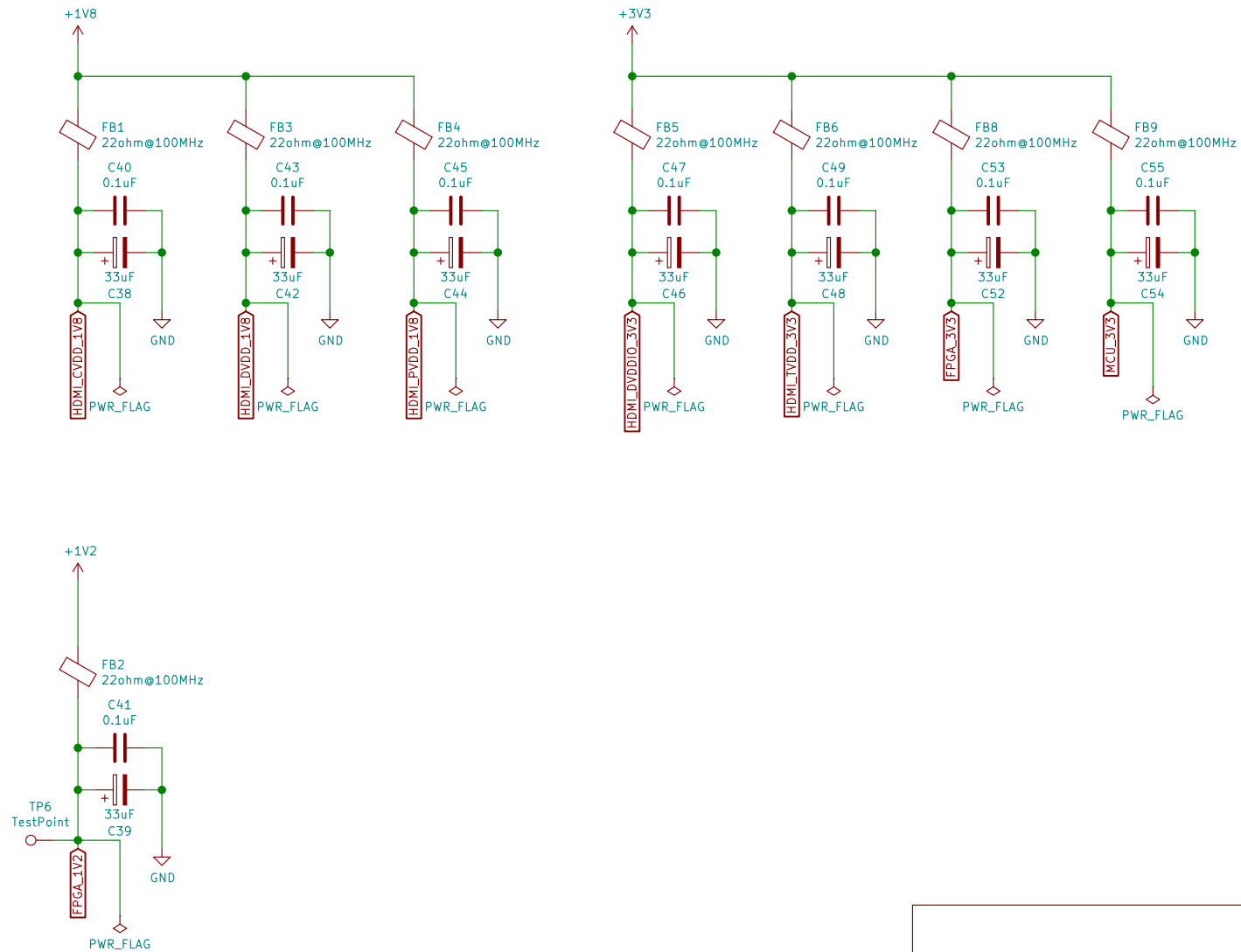
**Title: HDMI Light V3 – Voltage Regulator**

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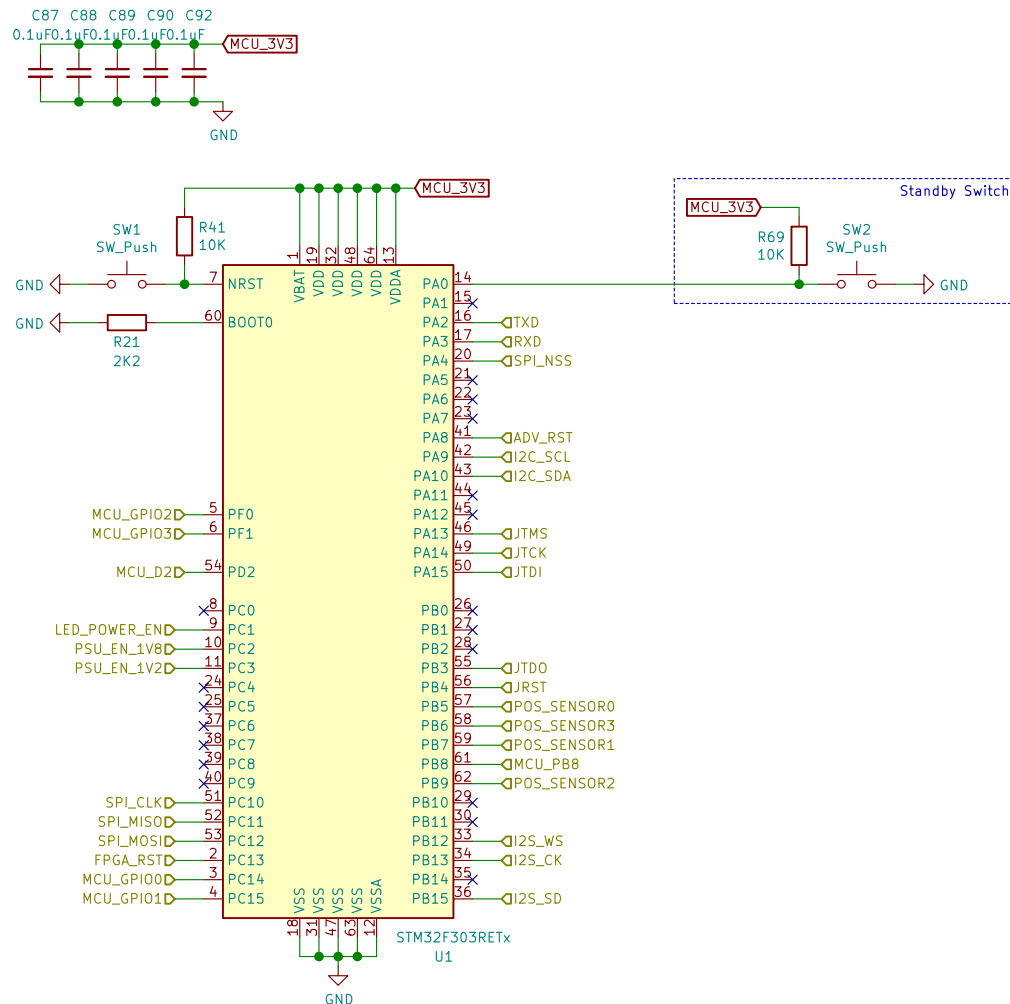


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File: hdmilight-v3-power-dist.sch

### Title: HDMI Light V3 - Power Distribution

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## Pin Assignments

ADV7611 I2C (via FPGA)  
42: PA9: I2C2\_SCL  
43: PA10: I2C2\_SDA

ADV7611 I2S  
33: PB12: I2S2\_WS (LRCLK)  
34: PB13: I2S2\_CK (SCLK)  
36: PB15: I2S2\_SD (AP)

FPGA SPI  
51: PC10: SPI3\_SCLK  
52: PC11: SPI3\_MISO  
53: PC12: SPI3\_MOSI

VIVE POS SENSORS  
56: PB4: TIM3\_CH1 (sensor 0)  
58: PB6: TIM4\_CH1 (sensor 3)  
59: PB7: TIM3\_CH4 (sensor 1)  
62: PB9: TIM4\_CH4 (sensor 2)

SERIAL  
16: PA2: USART2\_TX  
17: PA3: USART2\_RX

RESET  
41: PA8: ADV7611 (Open Drain)  
2: PC13: FPGA (Open Drain)

POWER ENABLE  
9: PC1: LED  
10: PC2: ADV7611 1V8 (Open Drain)  
11: PC3: FPGA 1V2 (Open Drain)

JTAG  
46: PA13: JTMS  
49: PA14: JTCK  
50: PA15: JTDI  
55: PB3: JTDO

GPIO  
3: PC14: GPIO0  
4: PC15: GPIO1  
5: PF0: GPIO2 (5V Tolerant)  
6: PF1: GPIO3 (5V Tolerant)

UNUSED FPGA CONNECTIONS  
54: PD2  
57: PB5  
61: PB8

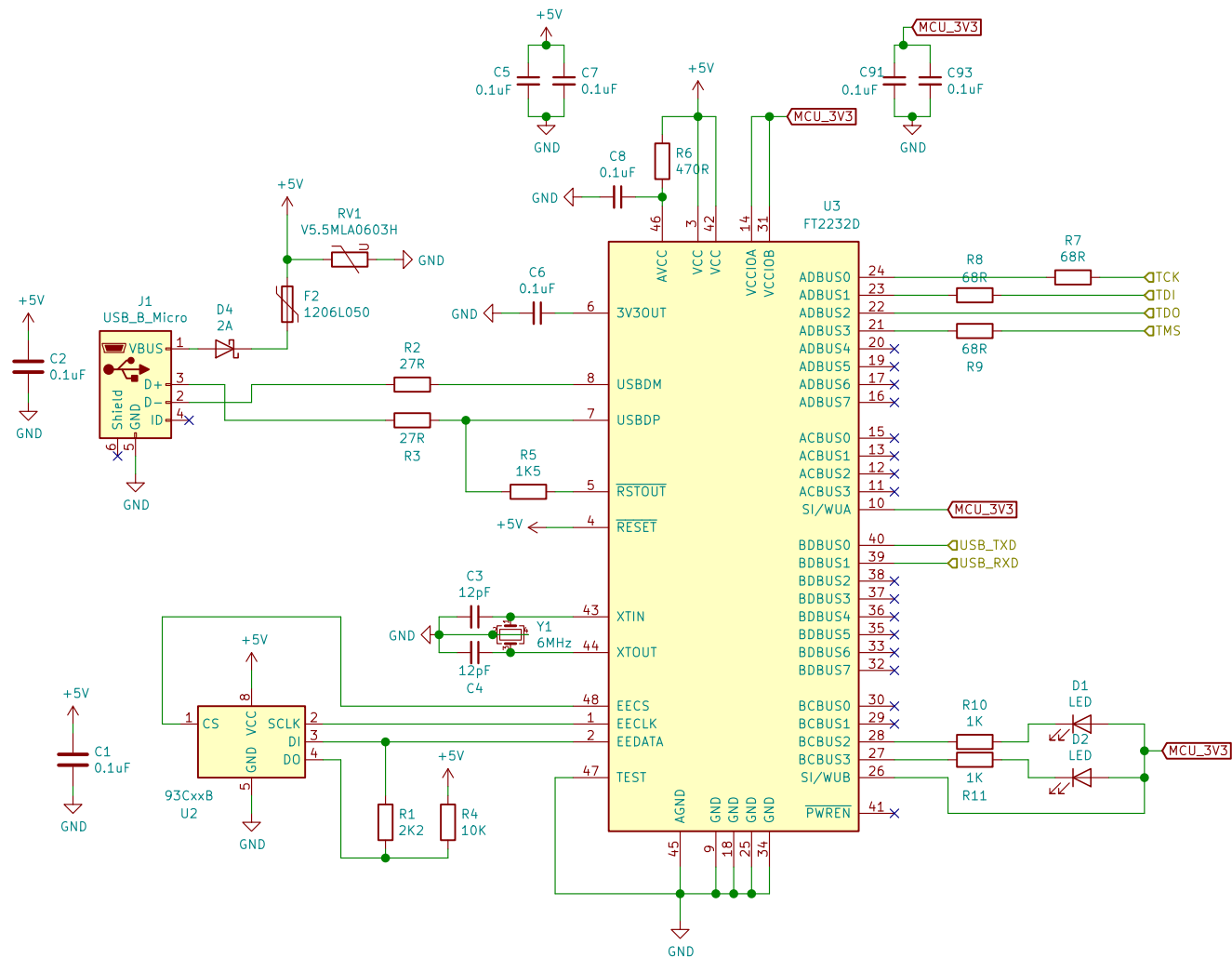
STANDBY SWITCH  
8: PA0: WKUP1

Sheet: /hdmilight-v3-microcontroller/  
File: hdmilight-v3-microcontroller.sch

## Title: HDMI Light V3 – Microcontroller

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File: hdmilight-v3-usb.sch

### Title: HDMI Light V3 - USB Interface

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