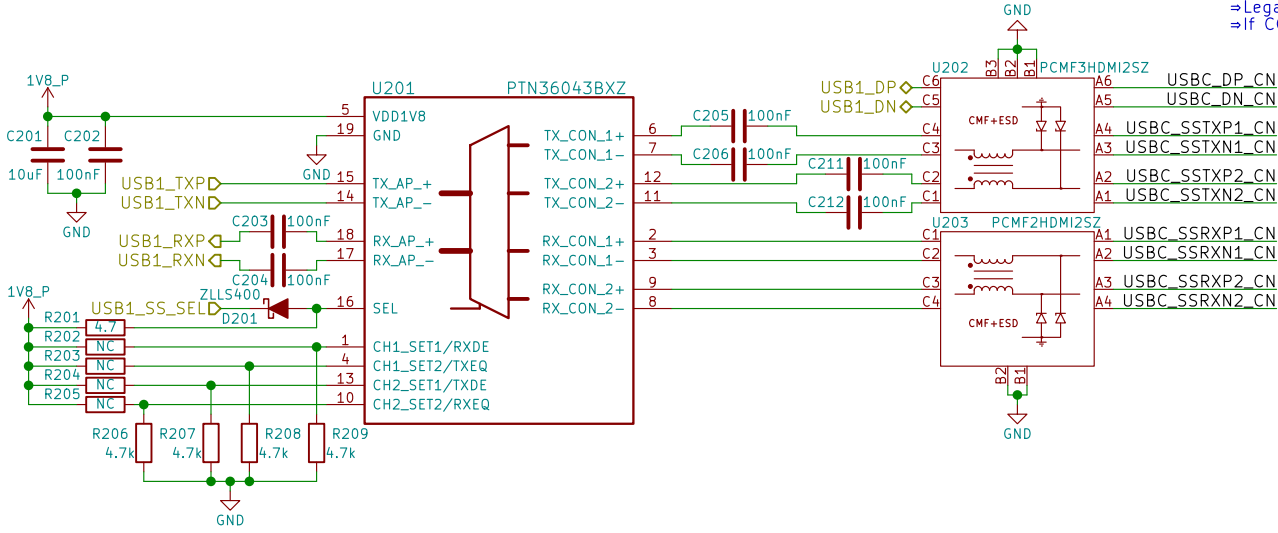
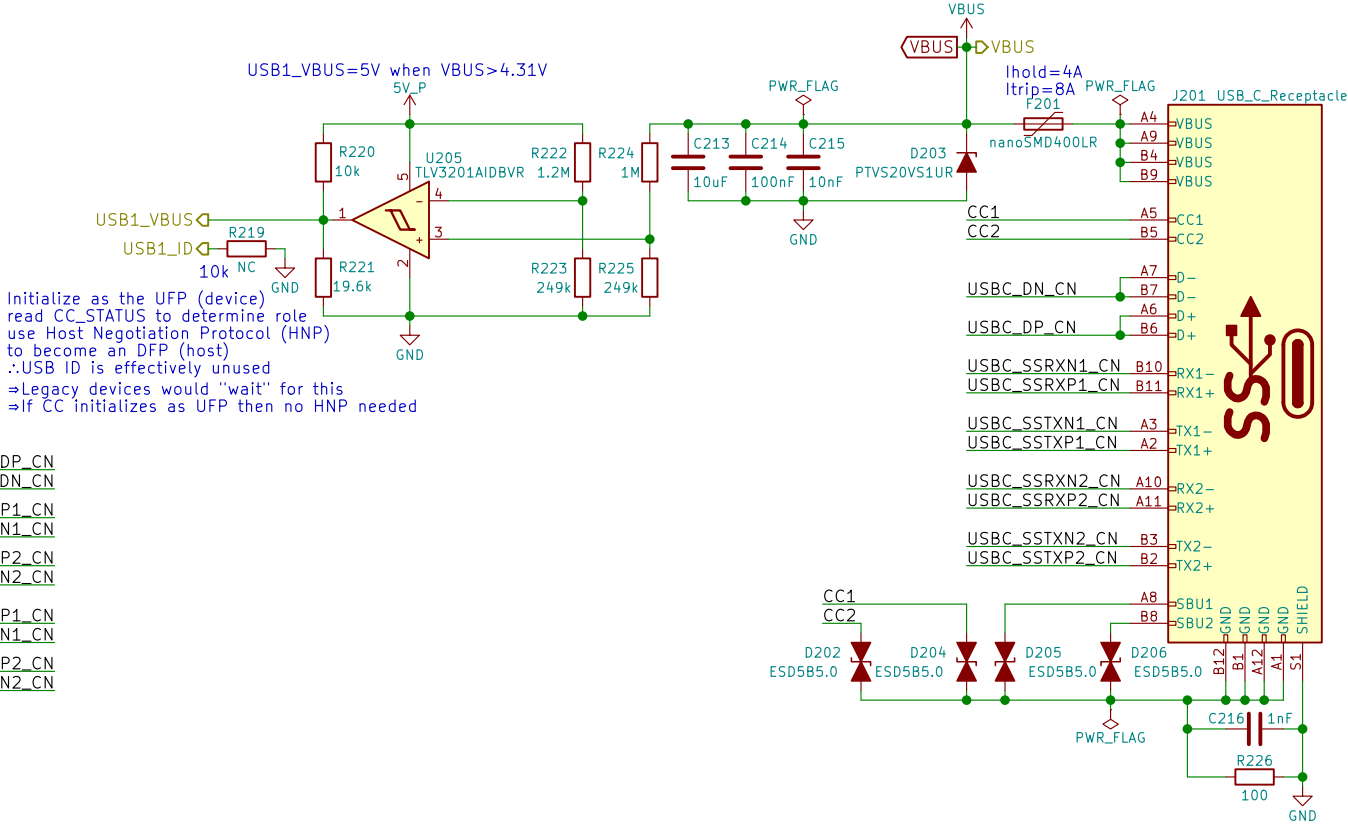
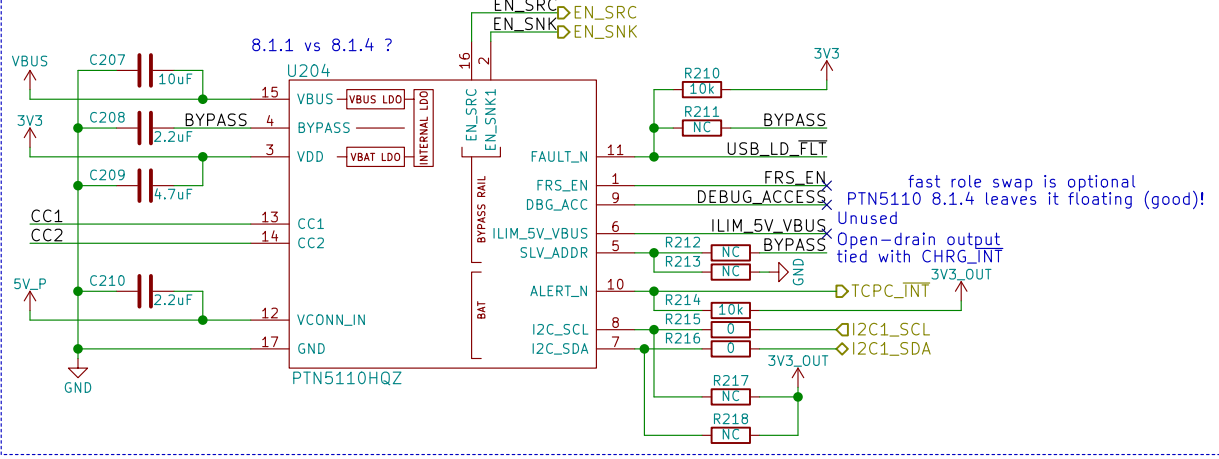


USB-C Config Channel (CC) and PD Role Controller



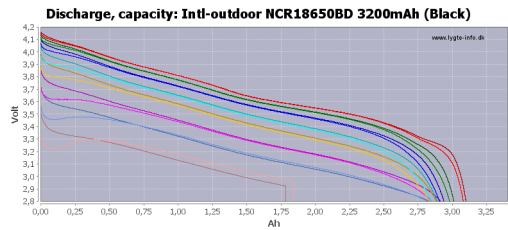
GNU GPLv3
Copyright 2018
Purism SPC

Sheet: /USB-C,
File: usb-c.sch

Title: USB Type C

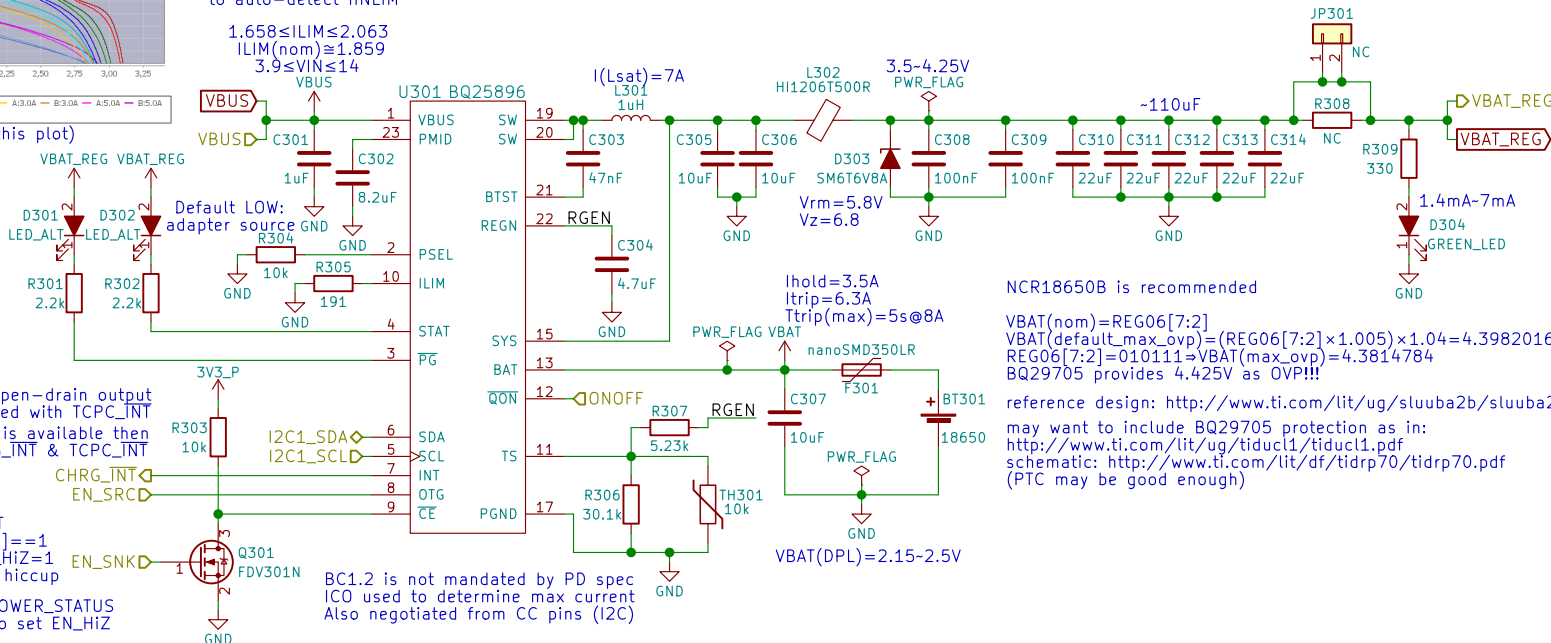
Size: A3	Date: 2018-05-18
KiCad E.D.A. kicad 4.0.7	

Rev: v0.1.0
Id: 2/21



(interpret RSO C% based on this plot)

```
use AUTO_DPDM_EN
to auto-detect IINLIM
```

$$\begin{aligned} 1.658 \leq ILIM \leq 2.063 \\ ILIM(nom) \cong 1.859 \\ 3.9 \leq VIN \leq 14 \end{aligned}$$


NCR18650B is recommended

VBAT(nom)=REG06[7:2]
VBAT(default_max_ovp)=(REG06[7:2]×1.005)×1.04=4.3982016V
REG06[7:2]=010111⇒VBAT(max_ovp)=4.3814784
BQ29705 provides 4.425V as OVP!!!

reference design: <http://www.ti.com/lit/ug/sluuba2b/sluuba2b.pdf>
 may want to include BQ29705 protection as in:
<http://www.ti.com/lit/ug/tiduc1/tiduc1.pdf>
 schematic: <http://www.ti.com/lit/df/tidrp70/tidrp70.pdf>
 (PTC may be good enough)

Reading PTN5110HQ's CC_STATUS and POWER_STATUS registers will tell TCPM (i.MX8M) when to set EN_HiZ

Also, reading PTN5110HQ's CC_STATUS and POWER_STATUS registers will tell TCCPM (i.MX8M) when to set OTG_CONFIG=1 (this will also happen when PTN5110HQ sets EN_SRC HIGH)

BC1.2 is not mandated by PD spec
ICO used to determine max current
Also negotiated from CC pins (I2C)

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Sheet: /Battery/
File: battery.sch

Title: Battery

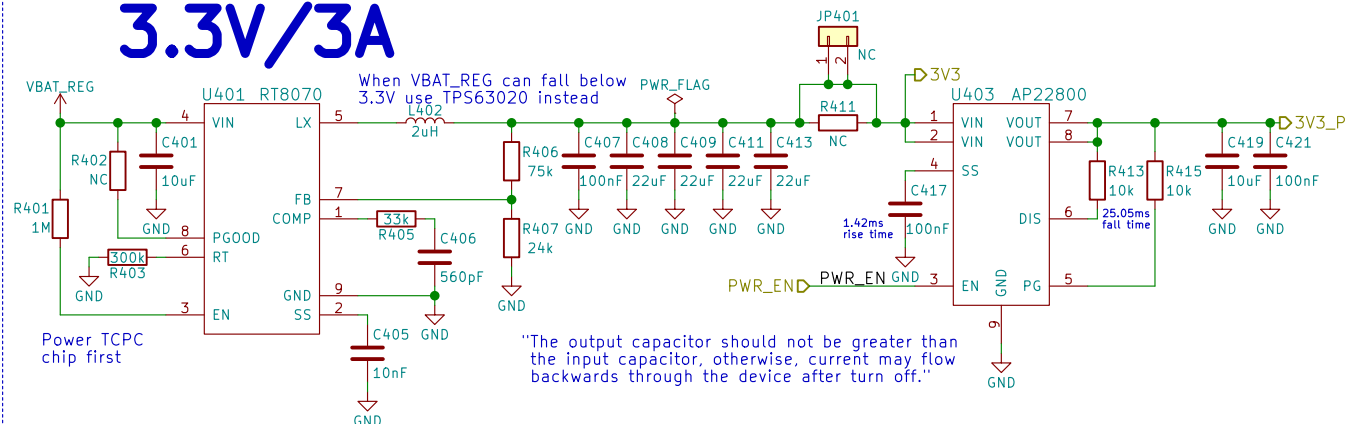
Size: A4	Date: 2018-05-18
----------	------------------

KiCad E.D.A. kicad 4.0.7

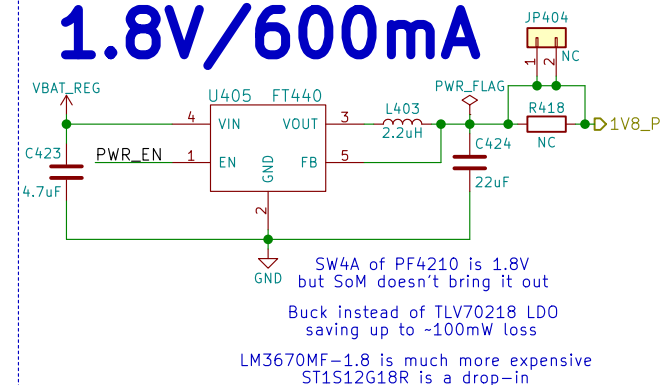
Rev: v0.1.0

Id: 3/21

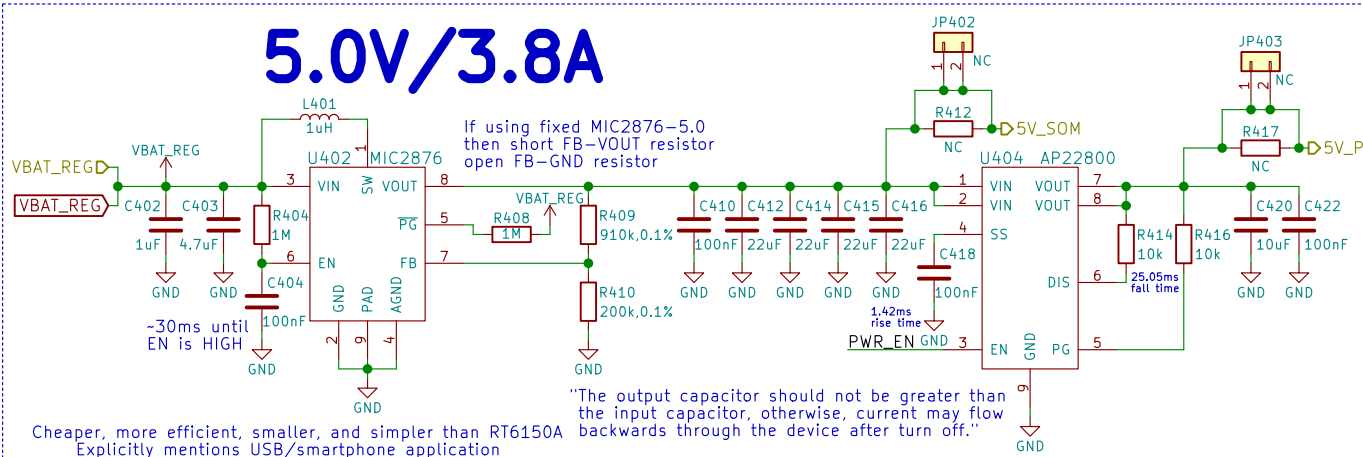
3.3V/3A



1.8V/600mA



5.0V/3.8A



TODO:
add parallel 100nF bulk caps!
& spread all over the power plane

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Sheet: /Power/
File: power.sch

Title: Power

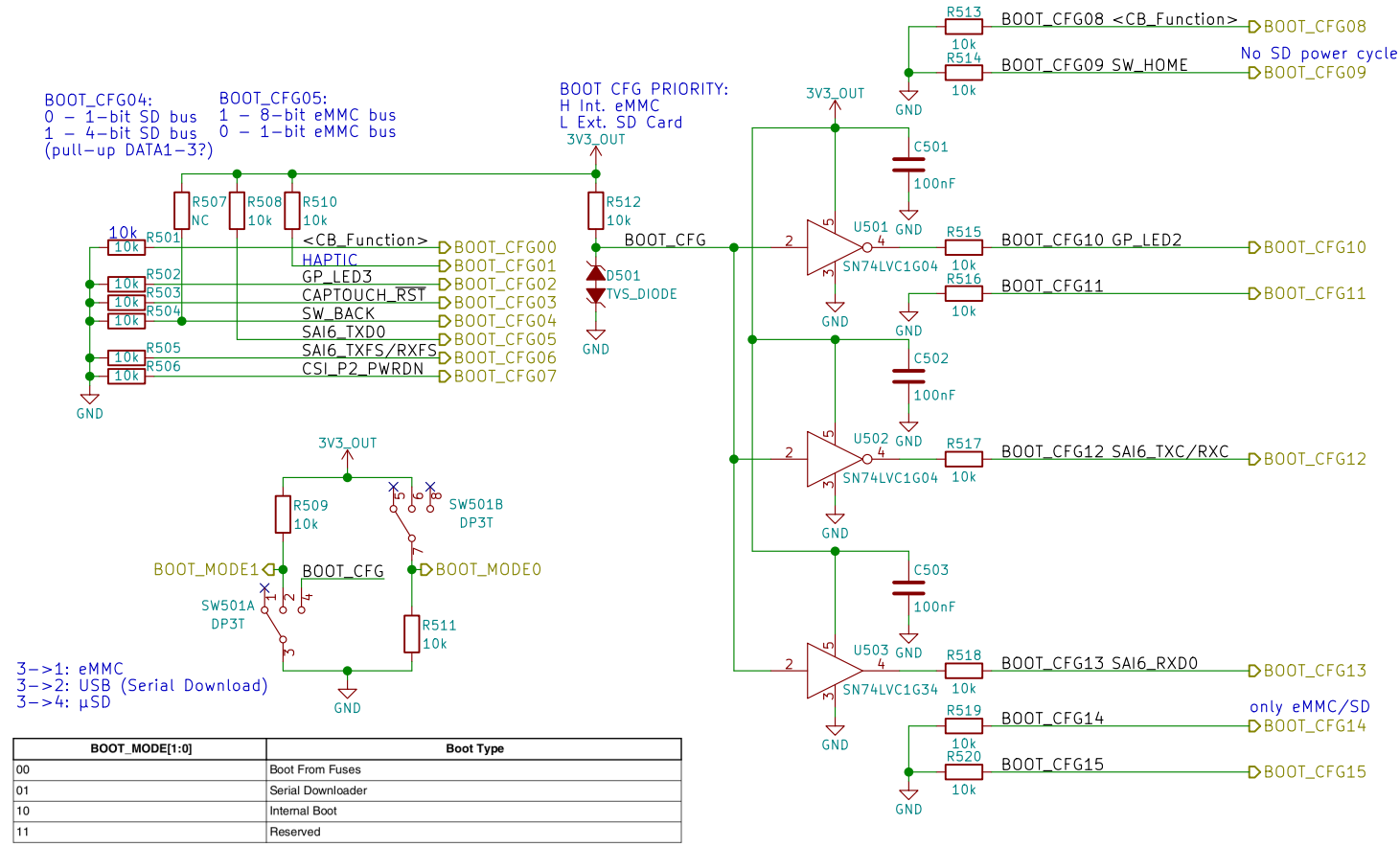
Size: A4 Date: 2018-05-18
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 4/21

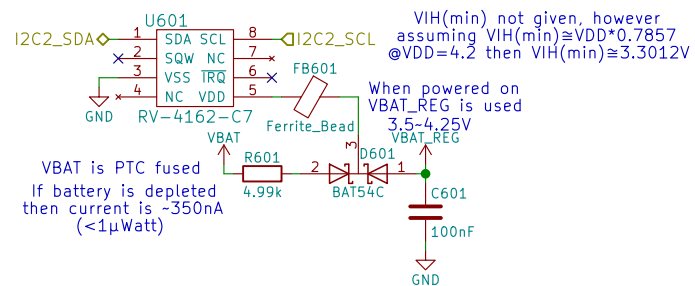
BOOT_CFG04: 0 - 1-bit SD bus
1 - 4-bit SD bus (pull-up DATA1-3?)

BOOT_CFG05: 1 - 8-bit eMMC bus
0 - 1-bit eMMC bus

BOOT CFG PRIORITY:
H Int. eMMC
L Ext. SD Card



BOOT_CFG[14:12]		Boot device			
001		SD/eSD			
010		MMC/eMMC			
011		NAND			
Fuse	Config	Definition	GPIO ¹	Shipped value	Settings
BOOT_CFG[11:10]	OEM	USDHC port selection	Yes	00	00 - USDHC-1 01 - USDHC-2 10 - USDHC-3 else - reserved



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Sheet: /RTC/
File: rtc.sch

Title: RTC

Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 6/21



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Sheet: /UART Debug/
File: uart.sch

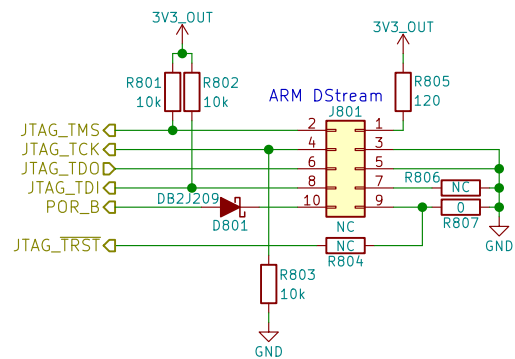
Title: UART Debug

Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 7/21



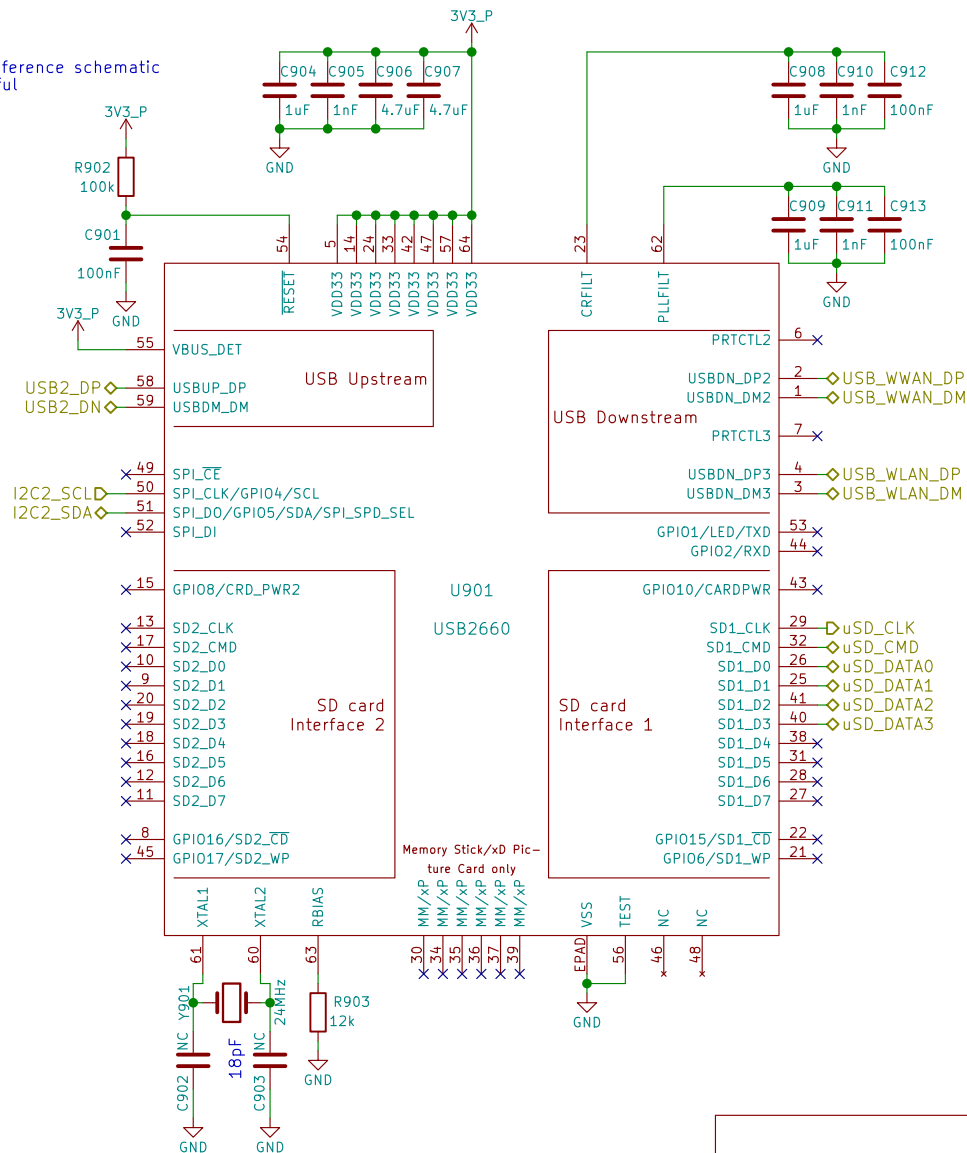
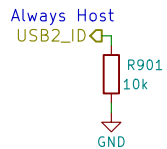
GNU GPLv3
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Purism SPC
Sheet: /JTAG/
File: jtag.sch

Title: JTAG

Size: A4 Date: 2018-05-18
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 8/21

TODO:
Compare analog components with Microchip reference schematic
Check if I2C connection is necessary and useful



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Sheet: /USB Hub + SDIO Bridge/
File: usb_hub_sdio.sch

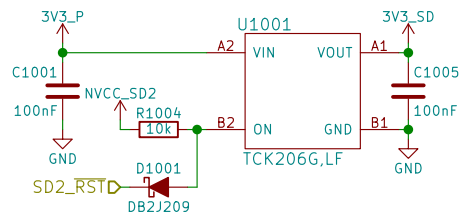
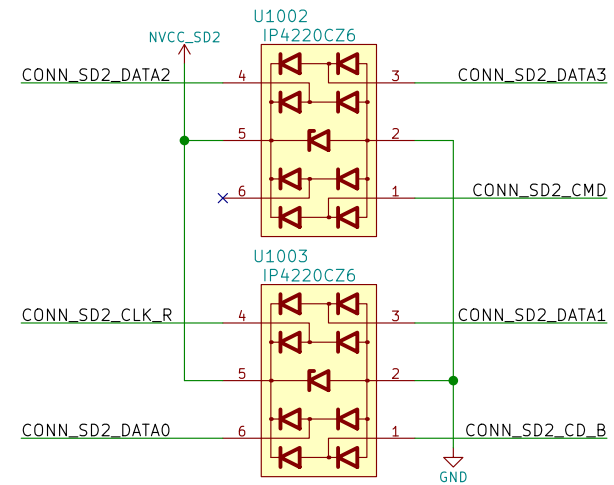
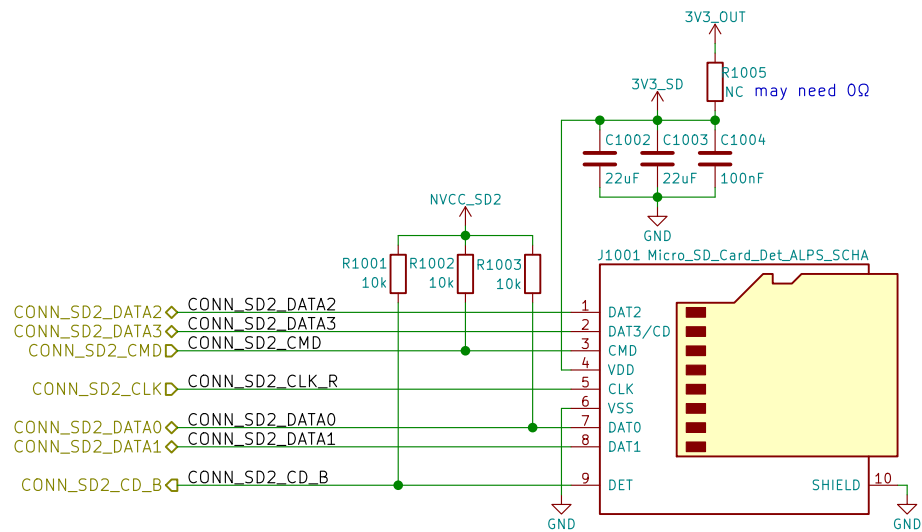
Title:

Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 9/21



GNU GPLv3

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Purism SPC

Sheet: /uSD Card/

File: sd.sch

Title: uSD Card

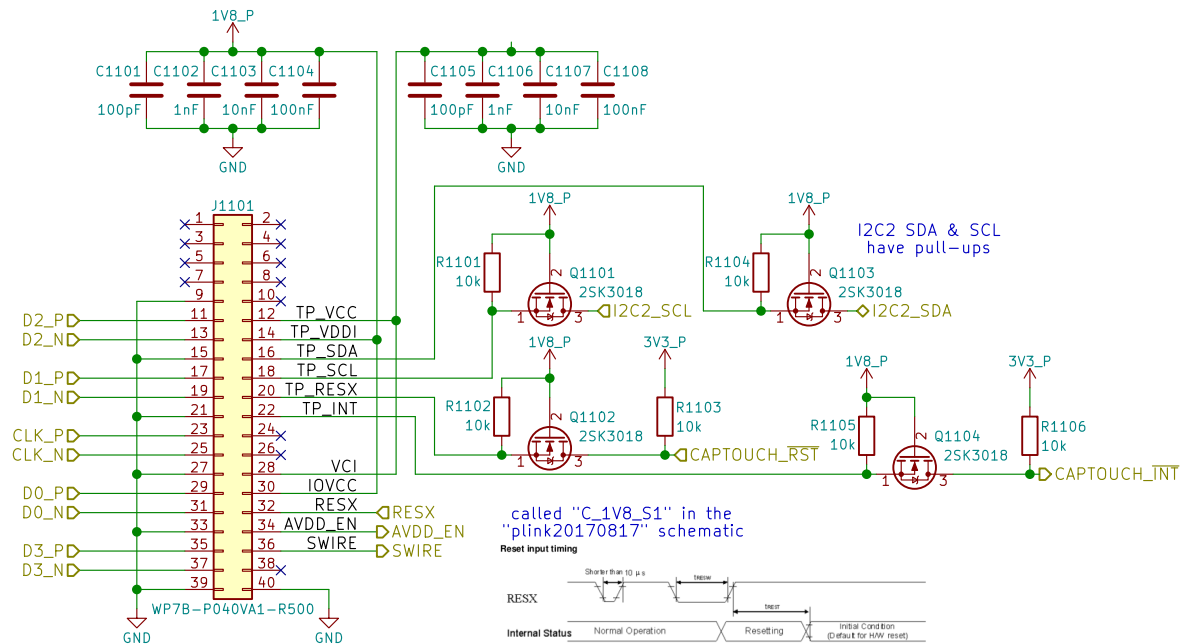
Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 10/21

TODO:
ensure power sequence is satisfied
based on the display used



TODO: low power state signal??

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Sheet: /MIPI DSI/
File: mipi_dsi.sch

Title: MIPI DSI

Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

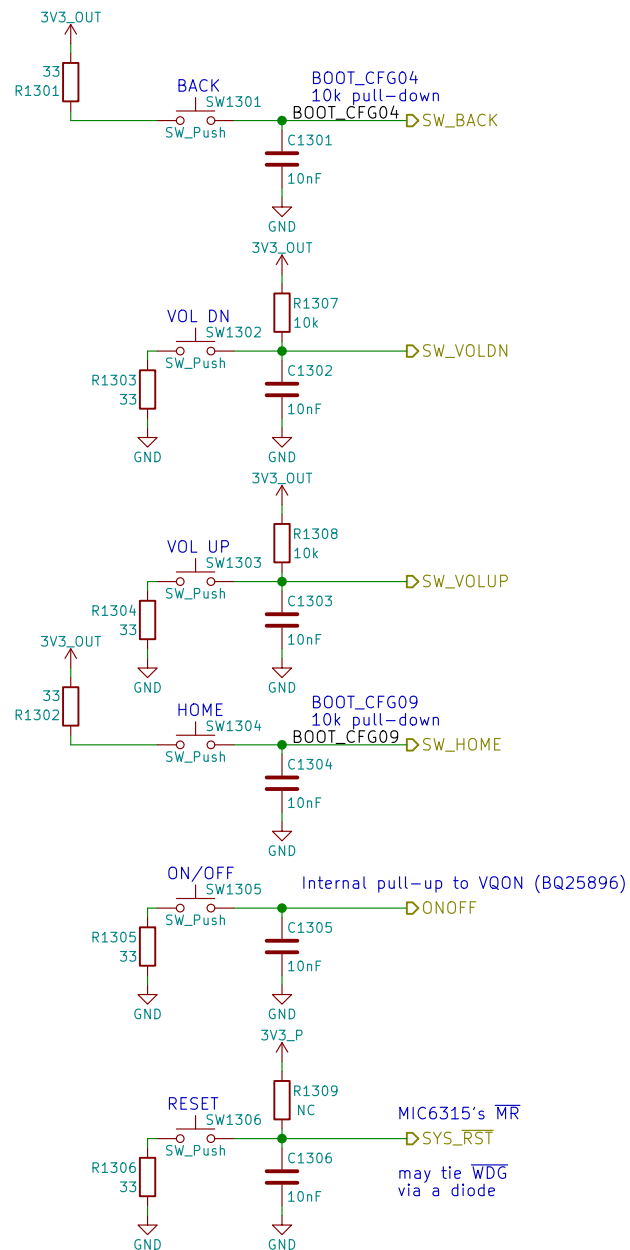
Rev: v0.1.0

Id: 11/21

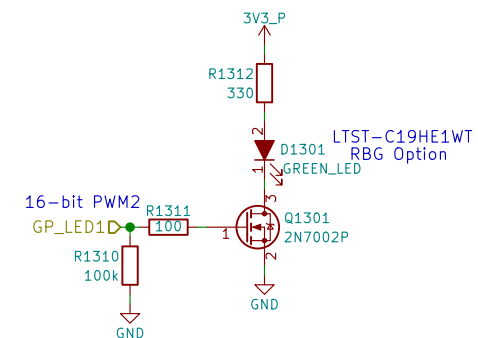
	1	2	3	4	5	6
A						
B						
C						
D						
	1	2	3	4	5	6

✕▷CSL_P1_DP0
✕▷CSL_P1_DN0
✕▷CSL_P1_DP1
✕▷CSL_P1_DN1
✕▷DSL_P1_DP2
✕▷CSL_P1_DN2
✕▷CSL_P1_DP3
✕▷CSL_P1_DN3
✕▷CSL_P1_CKP
✕▷CSL_P1_CKN

Sheet: /MIPI CSI/ File: mipi_csi.sch		
Title:		
Size: A4	Date:	Rev:
KiCad E.D.A. kicad 4.0.7		Id: 12/21



Use PWM2_PWMSAR to set the compare value (duty cycle)
 Use PWM2_PWMCR[15:4] to set the PRESCALER (frequency)
 Use PWM2_PWMPR to set the top of the counter (frequency)



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 Copyright 2018

Purism SPC

Sheet: /Buttons & LED/
 File: buttons_led.sch

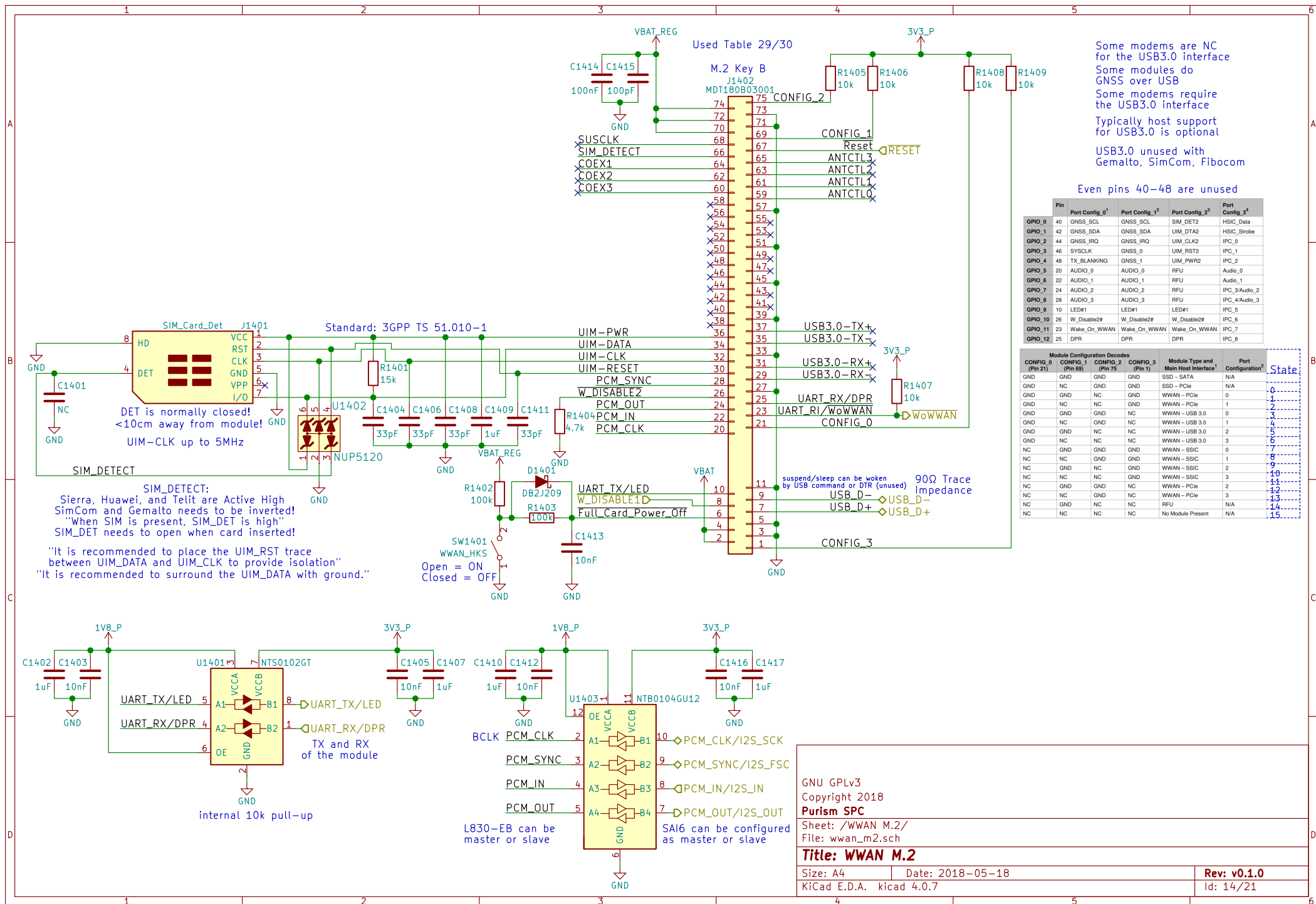
Title: Buttons & LED

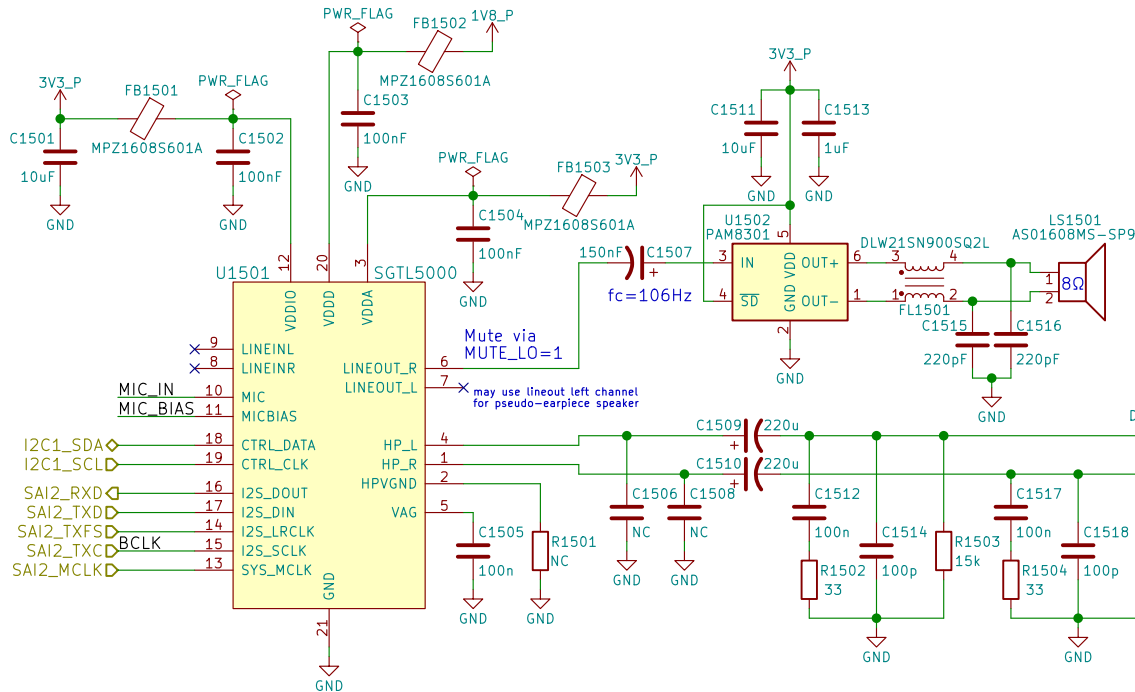
Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 13/21





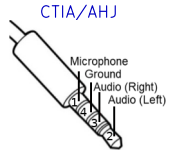
Reference:
http://www.52rd.com/S_txt/2011_3/TXT26685.htm
<http://www.sengpielaudio.com/calculator-transferfactor.htm>
[https://electronics.stackexchange.com/questions/31442/how-can-i-switch-this-audio-jack-using-its-own-mechanical-switches-without-crc-\(Ntt6-does-the-same\)](https://electronics.stackexchange.com/questions/31442/how-can-i-switch-this-audio-jack-using-its-own-mechanical-switches-without-crc-(Ntt6-does-the-same))
 +Zener diode to protect against ranges outside of $-0.9V$ to $3.3V$
 dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

"HP Output - 62.5mW max, 1.02kHz sine into 16Ω load at 3.3 V"
 $\Rightarrow (1V)^2 / (16\Omega) = 62.5mW$
 $\therefore V_{rms} = 1V \Rightarrow V_p(\text{amplitude}) = 1.414V$
 $\therefore I_{rms}(\text{max}) = 62.5mA$

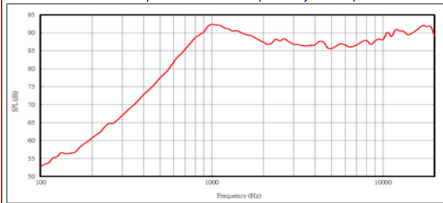
If HP_DET is HIGH for >100ms then HPs are present

S/E button on earbud headsets shorts the mic for key function

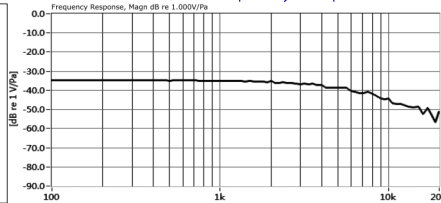
Could use FSA8008 to detect mic



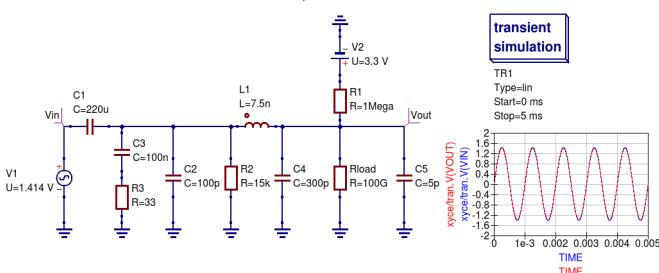
Built-In Speaker's Frequency Response:



Built-In Mic's Frequency Response:

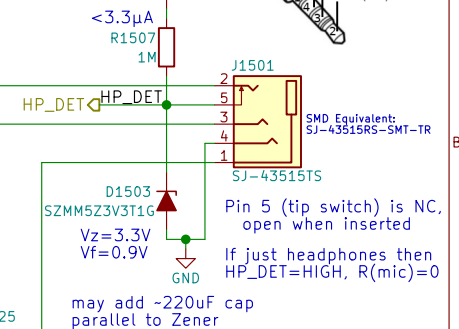


Simulation of HP_DET @ 1kHz output without HP jack inserted:

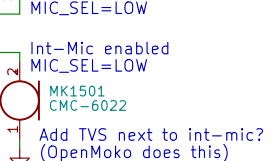


LCR Measurements:

Earbud Microphone: @1kHz	Headset Speaker: @1kHz	Earbud Speaker: @1kHz
$L_s = 3.844mH$	$L_s = 244.4\mu H$	$L_s = 25.2\mu H$
$L_p = 15.757H$	$L_p = 141.99mH$	$L_p = 311.0mH$
$C_s = 6.583\mu F$	$C_s = 103.6\mu F$	$C_s = 1.0mF$
$C_p = 1612.8pF$	$C_p = 178.77nF$	$C_p = 81.95nF$
$R_s = 1.5465k\Omega$	$R_s = 36.86\Omega$	$R_s = 17.030\Omega$
$R_p = 1.5478k\Omega$	$R_p = 36.86\Omega$	$R_p = 17.034\Omega$
$\theta = -0.8deg$	$\theta = -2.3deg$	$\theta = 0.5deg$



Ext-Mic enabled
MIC_SEL=LOW



$-37dB = 14.1254mV/Pa$
 \therefore mic produces 14.1254mVrms when exposed to a 1kHz tone of 94dB-SPL at the capsule (or 19.98mV amplitude)
 \Rightarrow 40dB gain would produce -2V amplitude (4Vpp, clipping)
 30dB gain would produce -0.632V amplitude (1.264Vpp)
 38.33dB gain would yield 3.3Vpp

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Sheet: /Audio/
 File: audio.sch

Title: Audio

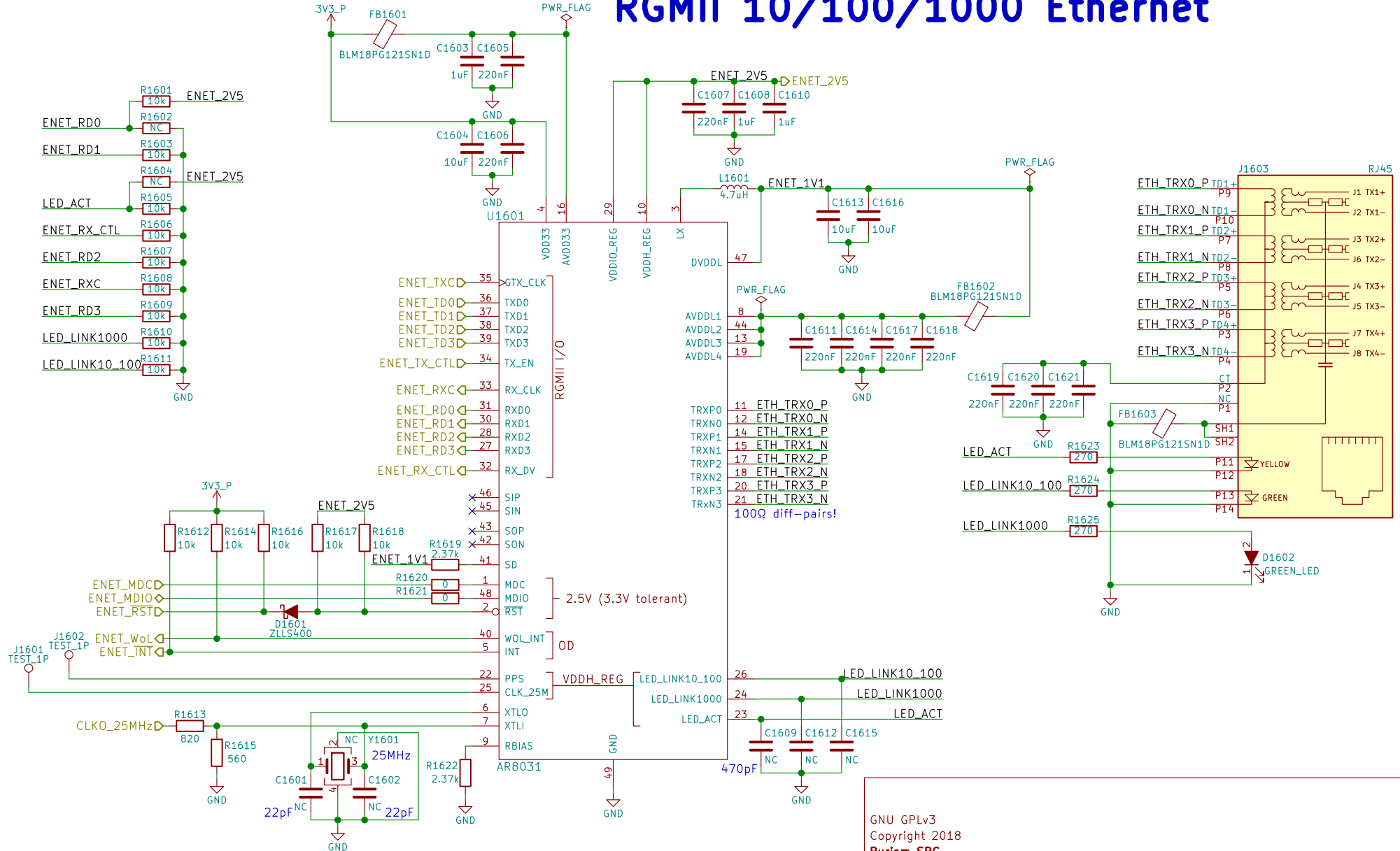
Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 15/21

RGMII 10/100/1000 Ethernet



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Purism SPC

Sheet: /Ethernet/

File: ethernet.sch

Title: Ethernet

Size: A4

Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 16/21

RS9116 NC:
RTS, CTS, BT_HOST_WAKE

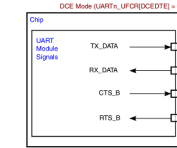
RS9116 datasheet says
no WIFI_WAKE
but the schematic has it

RedPine RS9116 MB0
Requires 5V on
Pin 54 for USB!

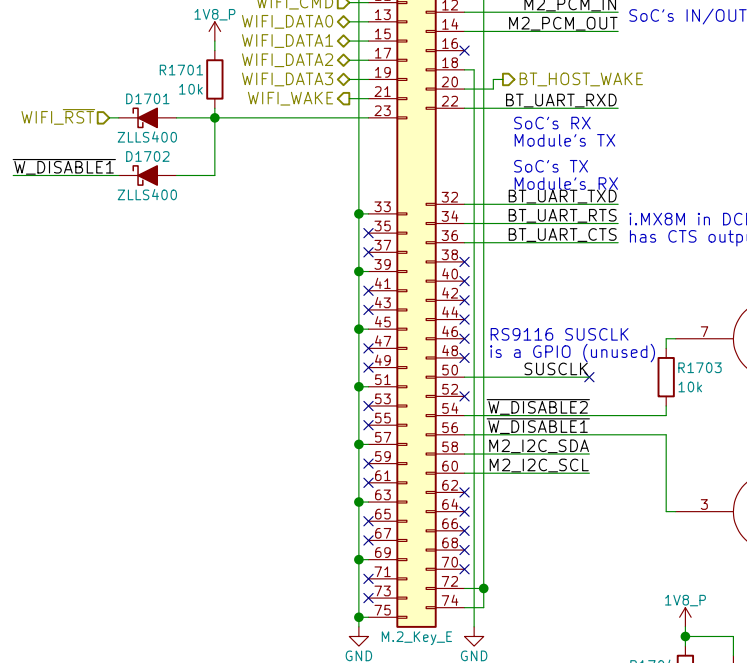
Module: Table 23
Socket: Table 46

6.2 M.2 Signal Directions

UARTn_UFCR[DCEDTE]=0 on POR



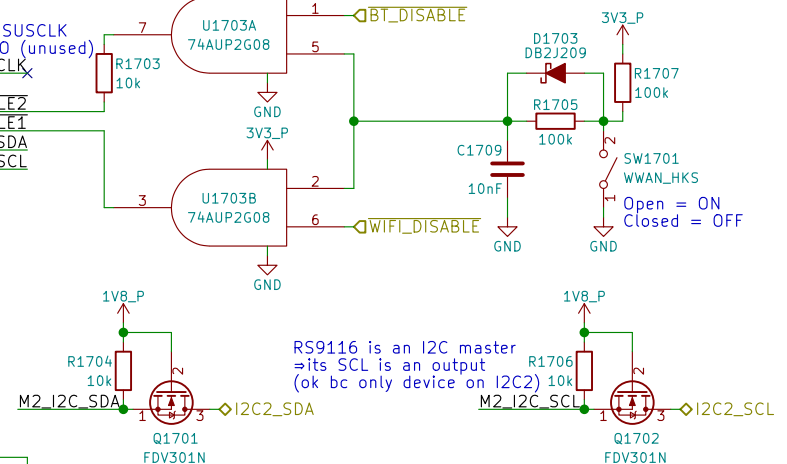
TX output
RX input
CTS output
RTS input
→ TX→RX
RX→TX
CTS→CTS
RTS→RTS



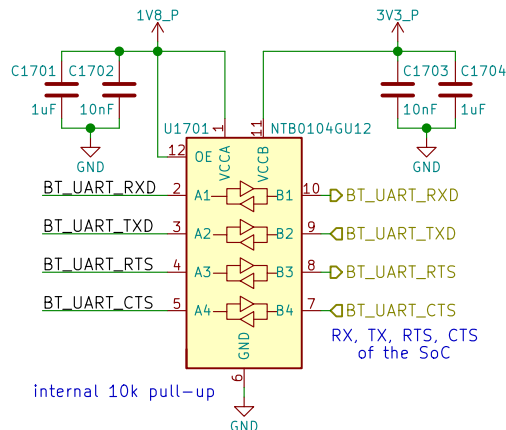
i.MX8M in DCE mode (POR state)
has CTS output, RTS input

Note:
Dual 2-input AND much more
available and cheaper than NOR

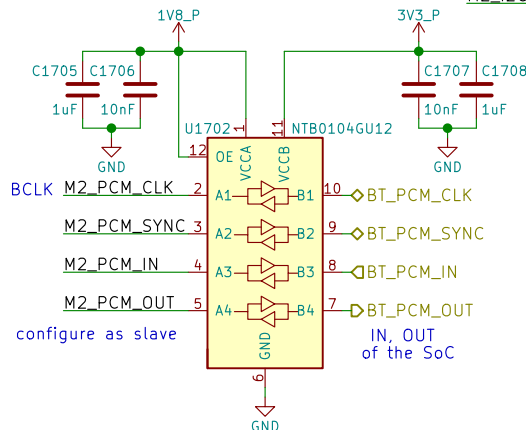
TODO:
Pin 54 on RS9116 is USB_VBUS Sink!!!



RS9116 is an I2C master
= its SCL is an output
(ok bc only device on I2C2)



internal 10k pull-up



configure as slave

IN, OUT
of the SoC

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Sheet: /WLAN+BT M.2/
File: wifi_bt_m2.sch

Title: WLAN+BT M.2

Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

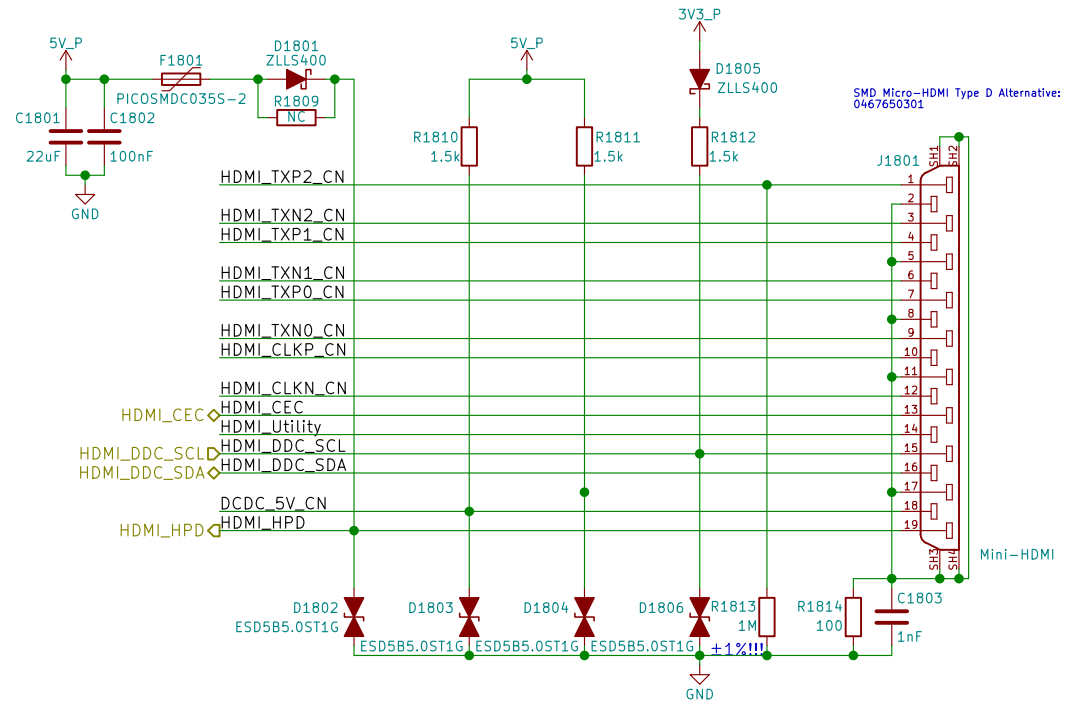
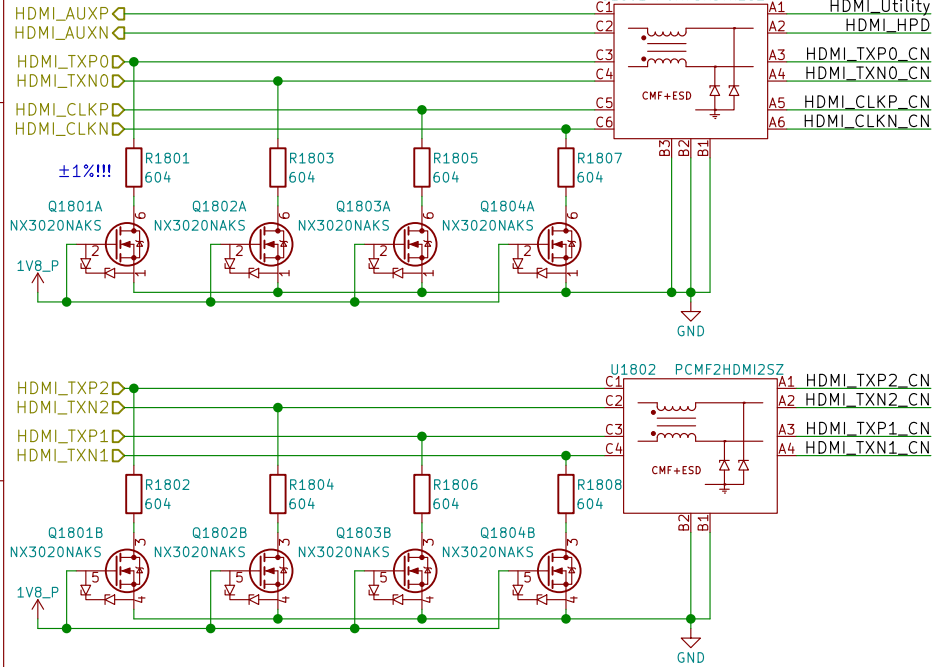
Rev: v0.1.0

Id: 17/21

HD3SS460 can be used for DP over USB-C

Layout Note:
May need swap some signals
due to micro-HDMI pinout diff
depending on pin location/routing

100Q diff pairs



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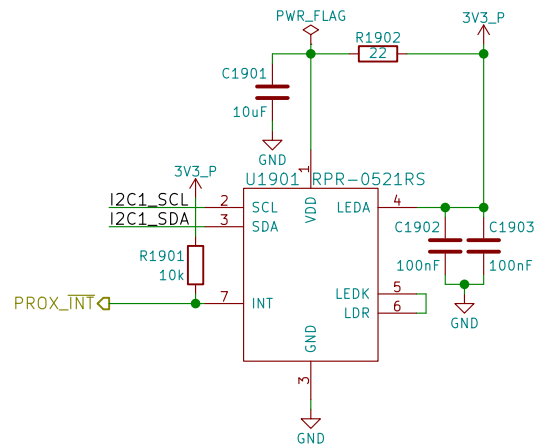
Sheet: /HDMI/
File: hdmi.sch

Title: HDMI

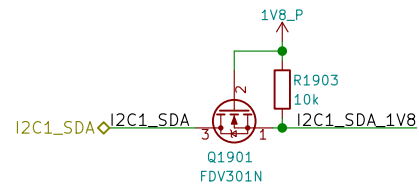
Size: A4 Date: 2018-05-18
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 18/21

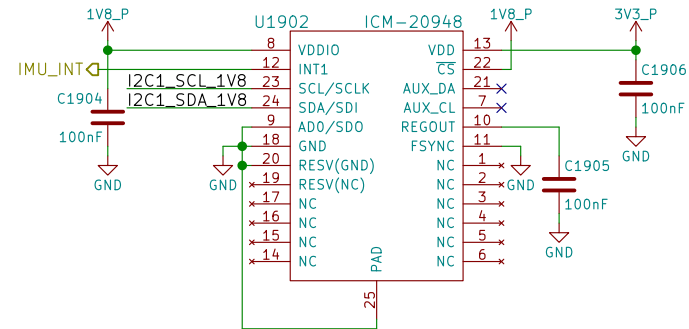
Proximity & Ambient Light



Reference:
<http://www.rohm.com/web/global/sensor-shield-support/ps-als-sensor>



9-Axis IMU



Reference:
<https://store.invensense.com/datasheets/invensense/AN-IVS-0001EVB-00%20v1%202.pdf>

AD0 sets the slave address's LSB (110100X)

INT1_ACTL sets if IMU_INT is active-high or active-low

"FSYNC - Connect to GND if unused"

I2C's VIH=1.8V

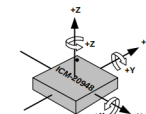


Figure 12. Orientation of Axes of Sensitivity and Polarity of Rotation

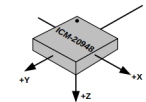


Figure 13. Orientation of Axes of Sensitivity for Magnetometer

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Sheet: /Sensors/
 File: sensors.sch

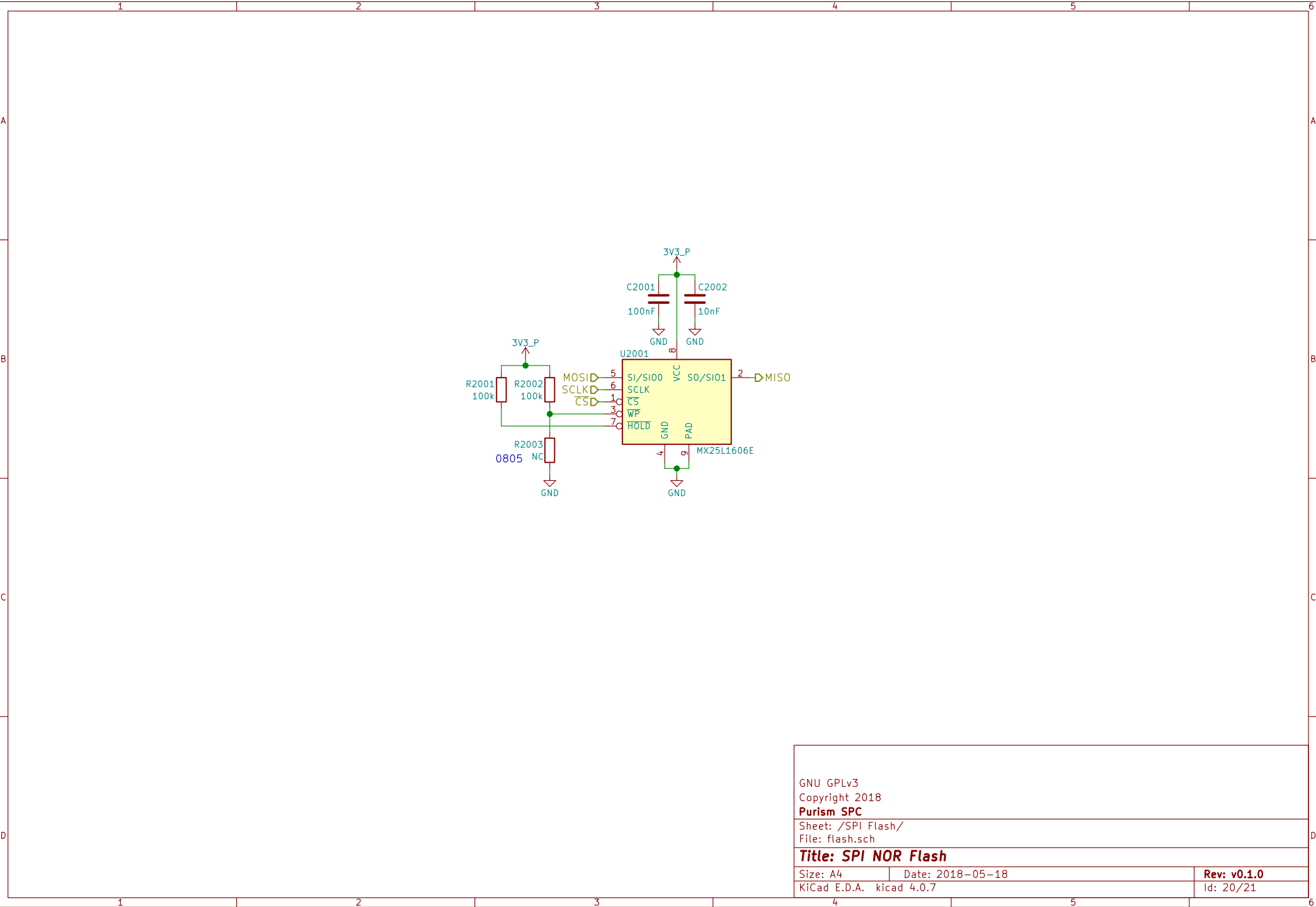
Title: Sensors

Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 19/21



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Purism SPC

Sheet: /SPI Flash/

File: flash.sch

Title: SPI NOR Flash

Size: A4

Date: 2018-05-18

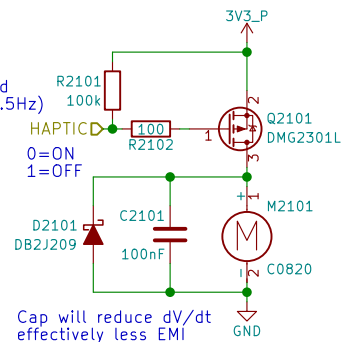
Rev: v0.1.0

KiCad E.D.A. kicad 4.0.7

Id: 20/21

PWM pins occupied:
 GPIO1_I001 - DSI (DSI_BL_PWM??)
 GPIO1_I013 - LED
 GPIO1_I014 - Ethernet (CLKO_25MHz)
 GPIO1_I015 - CSI (CLKO2)

PWM needed?
 Only needs to be toggled
 ON 1 sec, OFF 1 sec (0.5Hz)
 Can MUX as either
 GPIO or PWM2
 swapping with LED



When the motor is off
 both terminals are at GND

Motor will have wire leads
 with a 2-pin Molex or JST
 connector installed (by request)!

Motor Connector:
https://lcsc.com/product-detail/1-25T-Connectors_1-25T-1-2AW_C10832.html

Alibaba Alternative Motor:
https://www.alibaba.com/product-detail/Coin-motor-vibration-dc-motor-cellphone_1994583657.html?spm=a2700.8443308.0.0.5aa13e5f1wxHgs

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Purism SPC

Sheet: /Haptic Motor/
 File: haptic.sch

Title: Haptic/Vibration Motor

Size: A4 Date: 2018-05-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 21/21