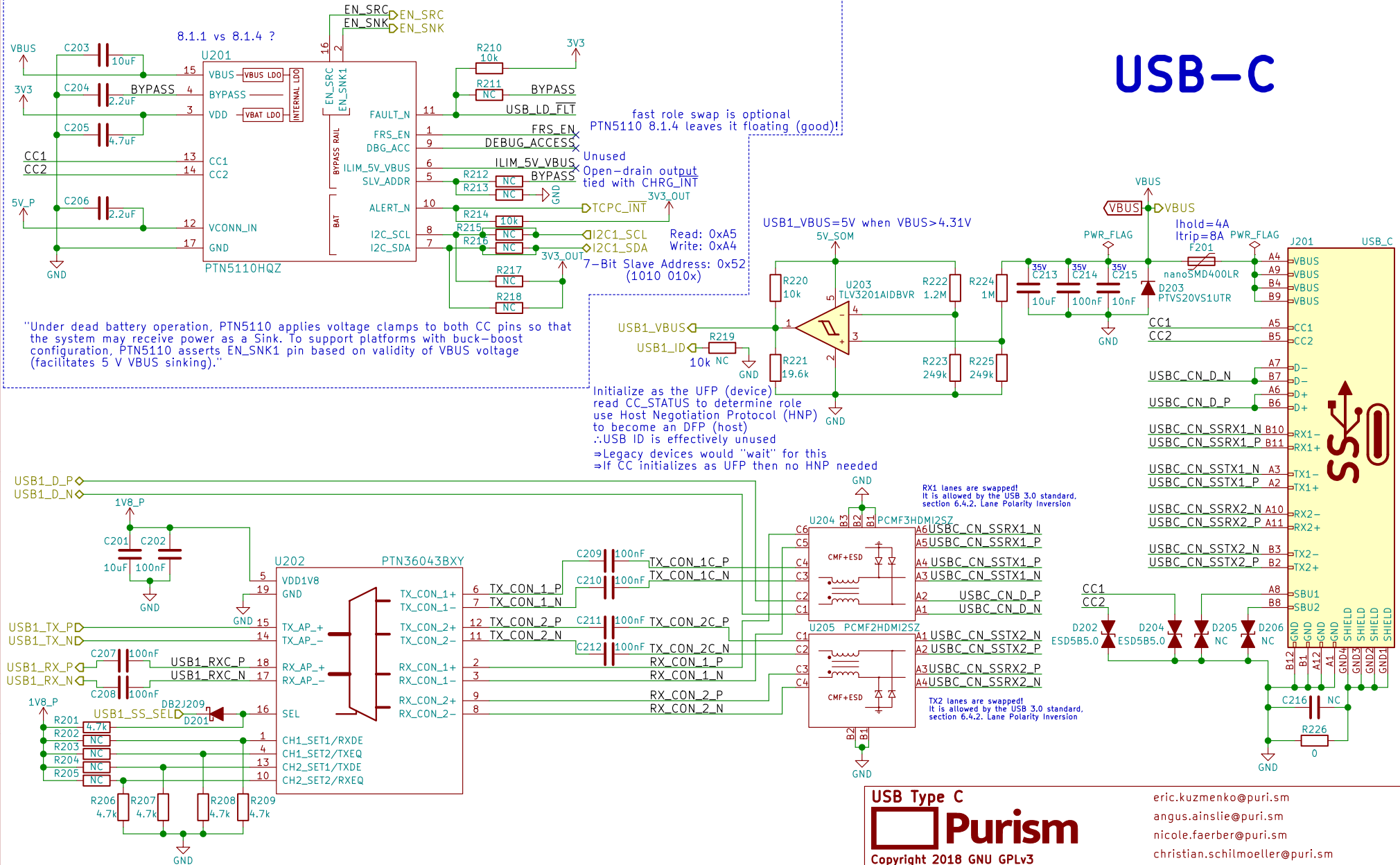




# USB-C TCPC - Config Channel (CC) and PD Role Controller

## USB-C



USB Type C

**Purism**

Copyright 2018 GNU GPLv3

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

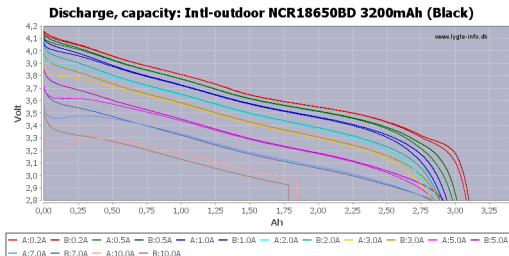
Size: A4 Date: 2018-07-17

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Rev: v0.1.0

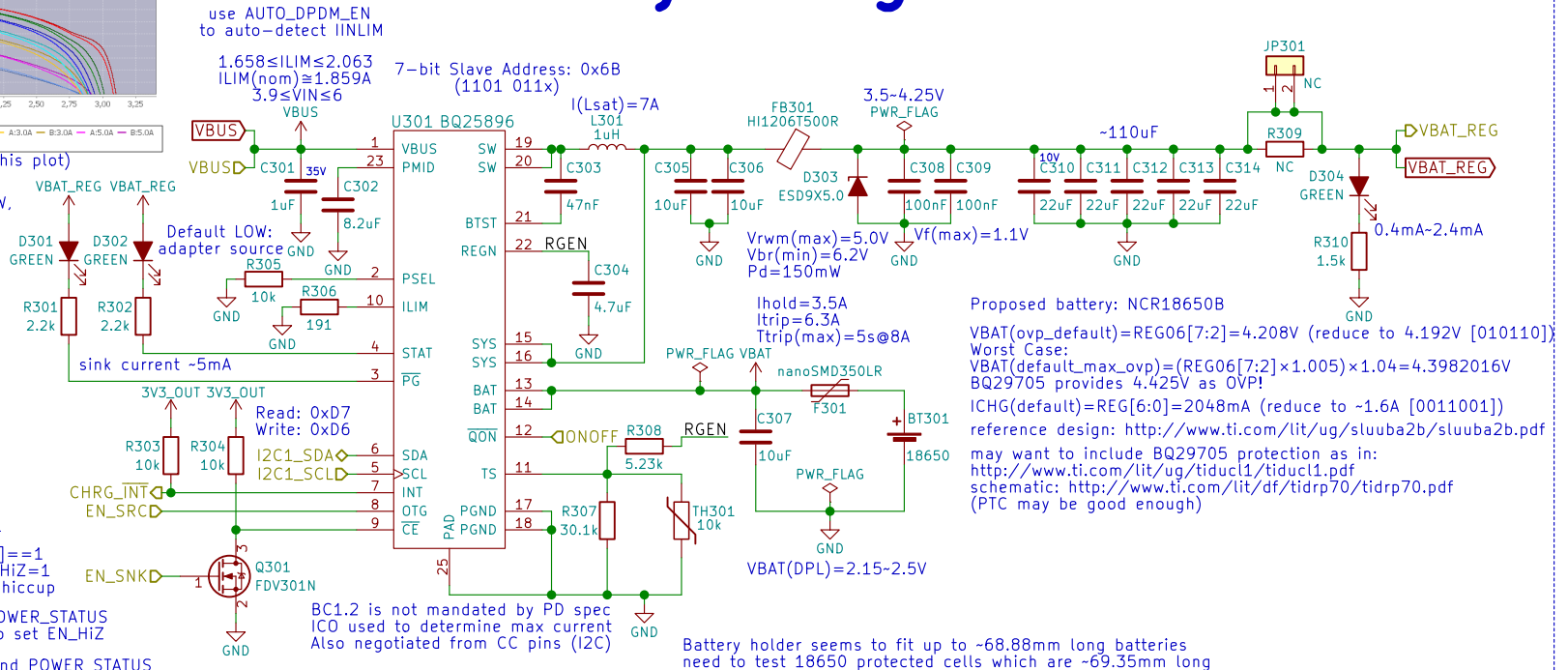
Id: 2/24

# Battery Charge Controller



(interpret RSOC% based on this plot)

Drawing ~320mA, or consuming  $\leq 1.152W$ , should give close to 10 hours going from 100% to 0% charge



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 TCPM (i.MX8M) when to set OTG\_CONFIG=1 (this will also happen when PTN5110HQ sets EN\_SRC HIGH)

Battery

**Purism**

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Sheet: /Battery/  
 File: battery.sch

Size: A4  
 KiCad E.D.A. kicad 5.0.0

Date: 2018-07-17

Rev: v0.1.0

Id: 3/24

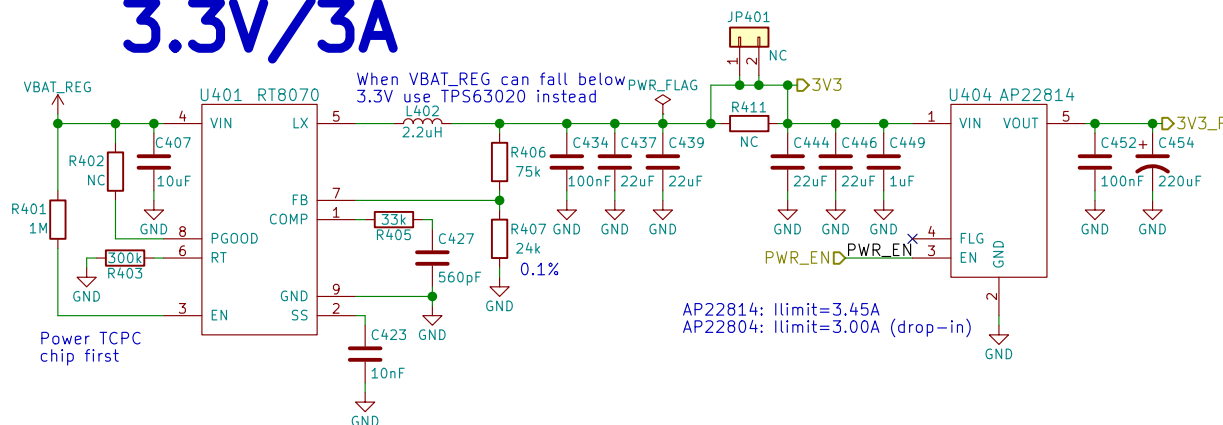
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

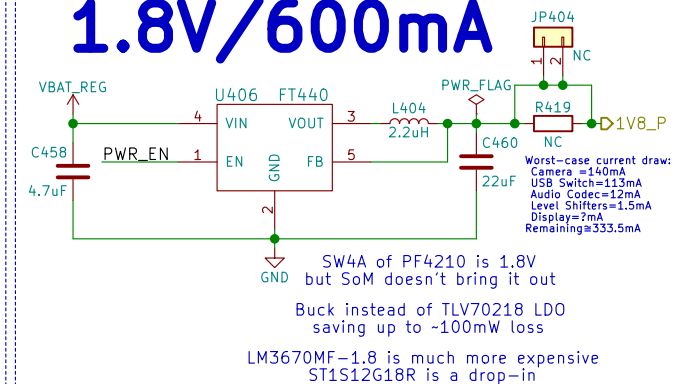
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

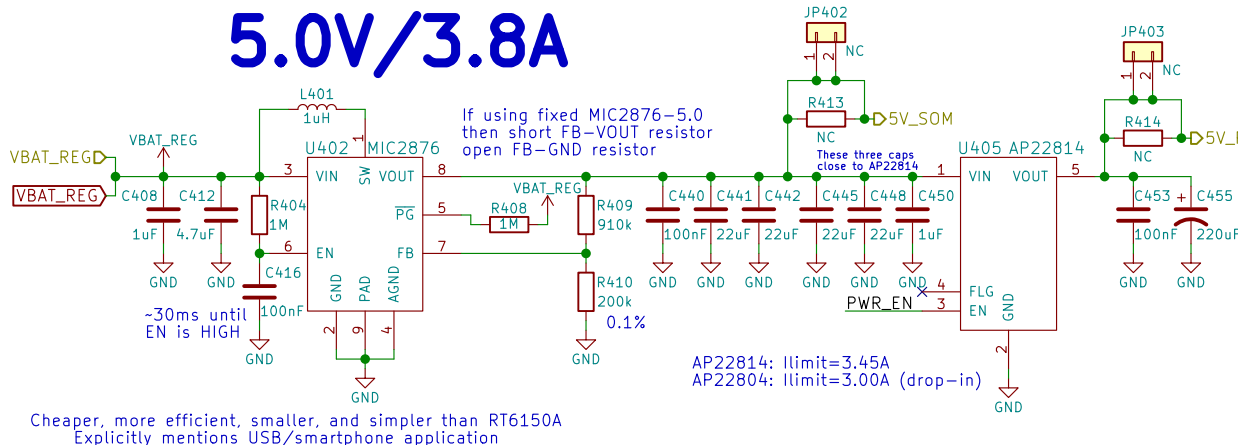
## 3.3V/3A



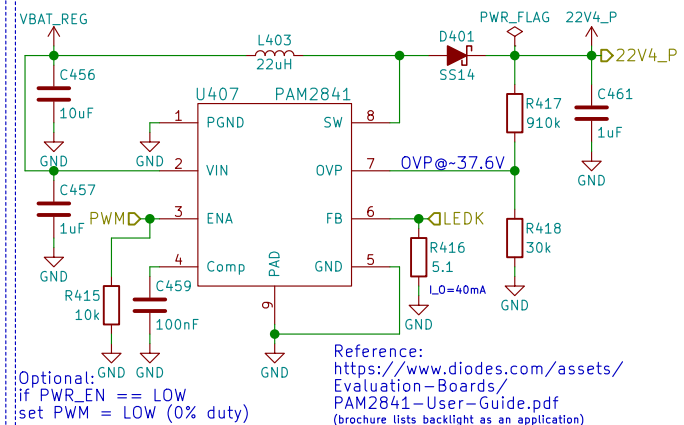
## 1.8V/600mA



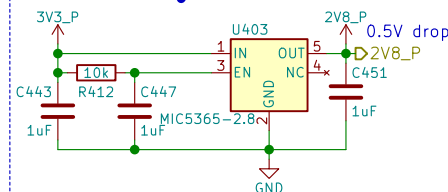
## 5.0V/3.8A



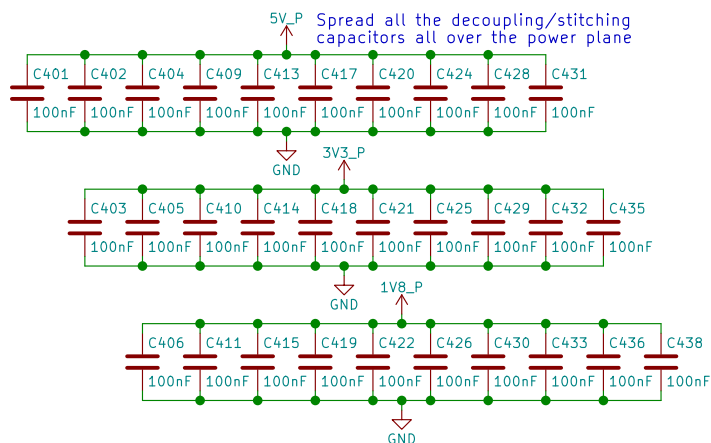
## 22.4V/40mA



## 2.8V/150mA



## Power



Power

**Purism**

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Sheet: /Power/  
File: power.sch

Size: A4 Date: 2018-07-17  
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christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 4/24

# Boot Config



2->1: eMMC 2->3: USB (Serial Downloader)	
BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

Only eMMC	
BOOT_CFG[14:12]	Boot device
001	SD/eSD
010	MMC/eMMC
011	NAND

Fuse	Config	Definition	GPIO <sup>1</sup>	Shipped value	Settings
BOOT_CFG[11:10]	OEM	USDHC port selection	Yes	00	00 - USDHC-1 01 - USDHC-2 10 - USDHC-3 else - reserved



## Boot Configuration



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Sheet: /Boot Config/  
File: boot.sch

Size: A4  
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Rev: v0.1.0

Id: 5/24



The diagram shows a 74LVC2G24 inverter (U701) used as a logic level converter. The inverter has two input/output pairs: 1A/1Y and 2A/2Y. The 1A input is connected to UART1\_TXDD (3.3V logic). The 1Y output is connected to 3V3\_OUT (5V logic). The 2A input is connected to UART1\_RXDD (5V logic). The 2Y output is connected to 3V3\_OUT (3.3V logic). A 100k resistor (R701) is connected between 3V3\_OUT and GND. A 100nF capacitor (C701) is connected between 3V3\_OUT and GND. A 20E capacitor is connected between 1A and GND. The inverter is powered by 3V3\_OUT. A note indicates that the circuit 'Accepts 3.3V or 5V Logic'.

<b>UART Debug</b>  <b>Purism</b> <b>Copyright 2018 GNU GPLv3</b>	eric.kuzmenko@puri.sm angus.ainslie@puri.sm nicole.ferber@puri.sm christian.schilmoeller@puri.sm
---	---



**Purism**

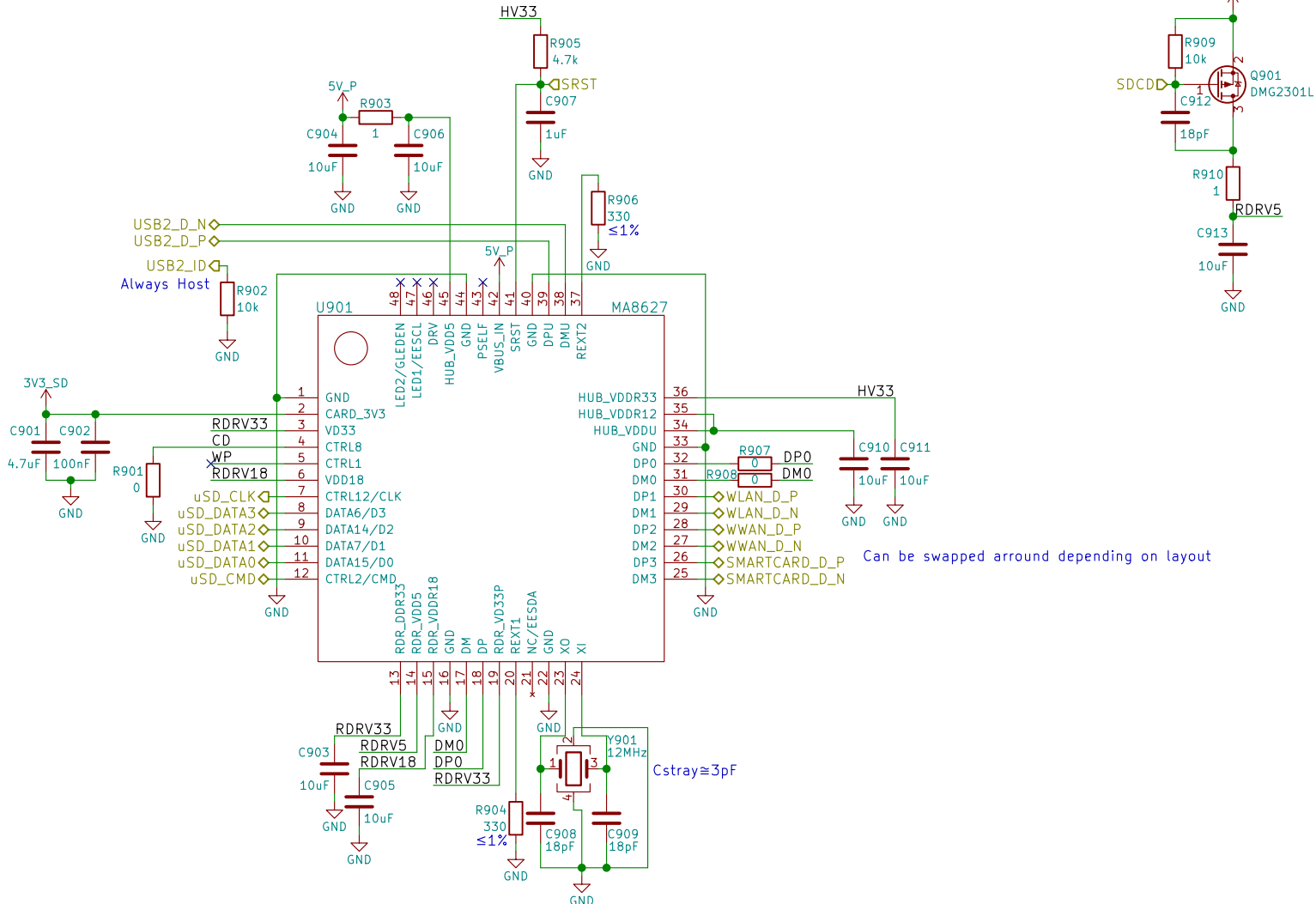
eric.kuzmenko@puri.sm  
angus.ainslie@puri.sm  
nicole.faeber@puri.sm  
christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 8/24



# USB Hub + SDIO Bridge



## USB Hub + SDIO Bridge



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Sheet: /USB Hub + SDIO Bridge/

Size: A4

Date: 2018-07-17

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eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

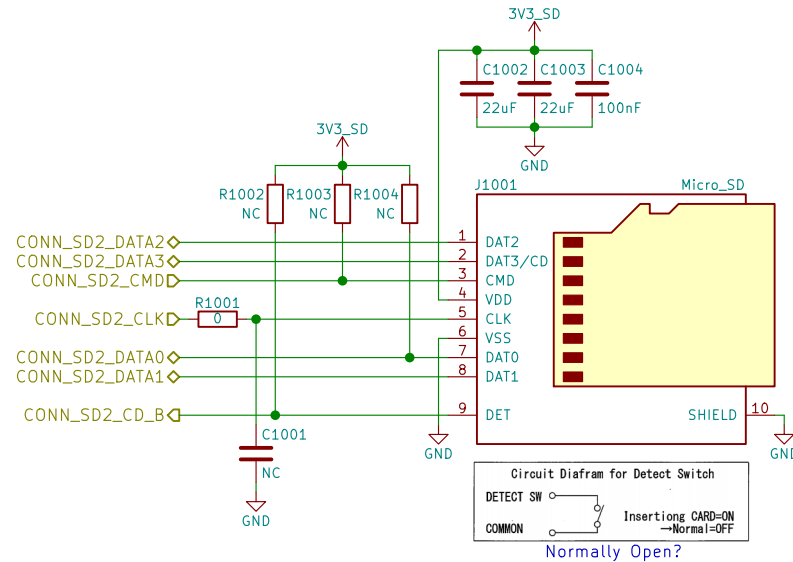
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Rev: v0.1.0

Id: 9/24

# μSD



uSD Card



**Purism**

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Sheet: /uSD Card/

File: sd.sch

Size: A4 Date: 2018-07-17

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Rev: v0.1.0

Id: 10/24

# MIPI



MIPI



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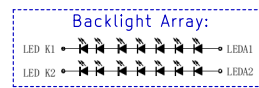
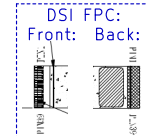
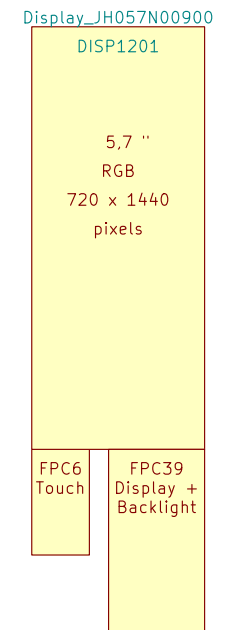
Sheet: /MIPI/  
File: mipi.sch

Size: A4 Date: 2018-07-17  
KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm  
angus.ainstlie@puri.sm  
nicole.ferber@puri.sm  
christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 11/24

LCD PN:  
Shenzhen Jinghong Electronics Co., Ltd.  
JH057N00900



MIPI DSI  
Purism  
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angus.ainslie@puri.sm  
nicole.faerber@puri.sm  
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Sheet: /MIPI/DSI/	
File: dsi.sch	
Size: A4	Date: 2018-07-17
KiCad E.D.A.    kicad 5.0.0	

Rev: v0.1.0  
Id: 12/24

Id: 13/24

# Buttons & LED



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)



## Buttons & LED



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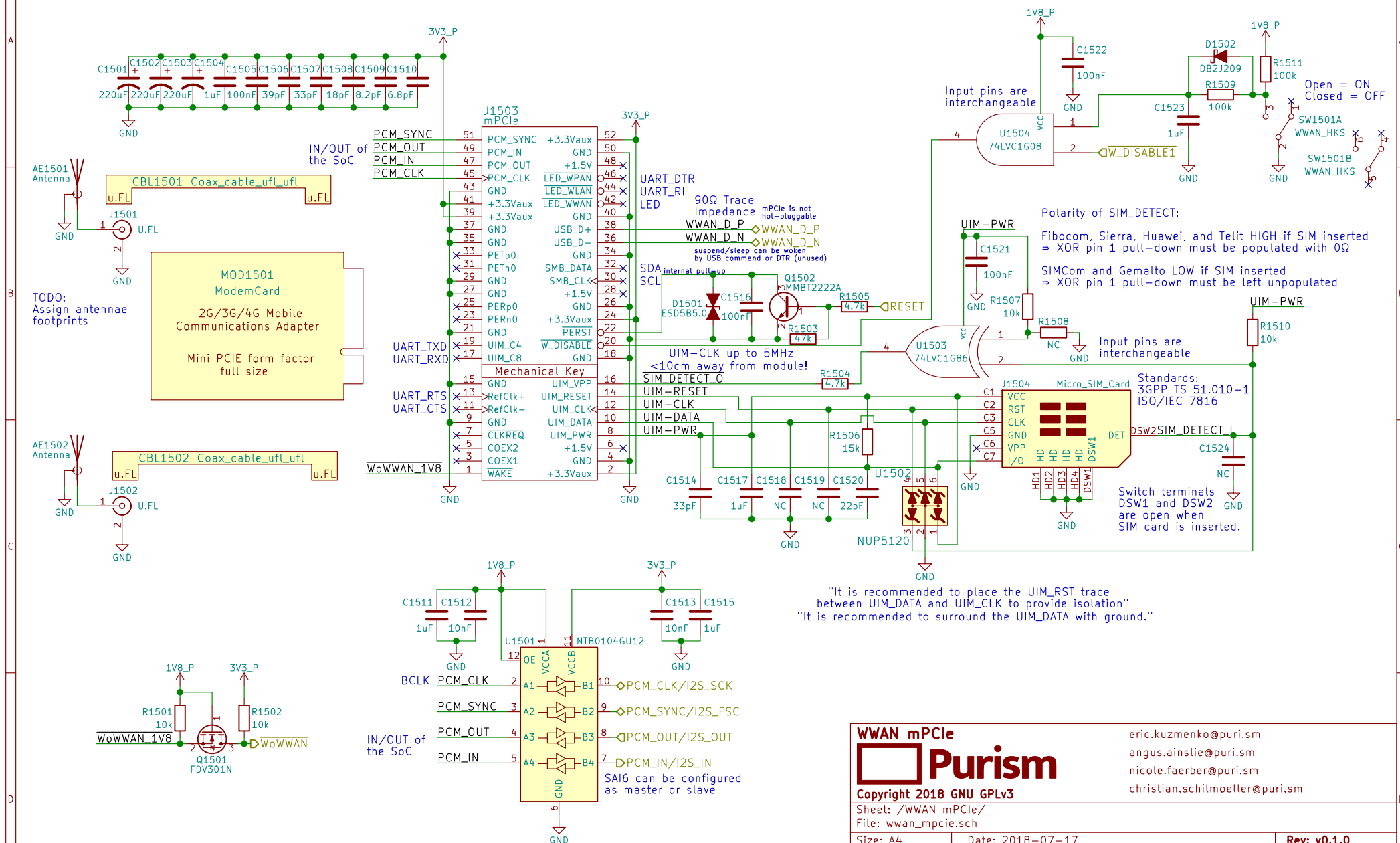
Sheet: /Buttons & LED/  
 File: buttons\_led.sch

Size: A4 Date: 2018-07-17  
 KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm  
 angus.ainstie@puri.sm  
 nicole.farber@puri.sm  
 christian.schilmoeller@puri.sm

Rev: v0.1.0  
 Id: 14/24

# WWAN mPCIe



WWAN mPCIe



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Sheet: /WWAN mPCIe/

File: wwan\_mpcie.sch

Size: A4

Date: 2018-07-17

Size: A4	Date:
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eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

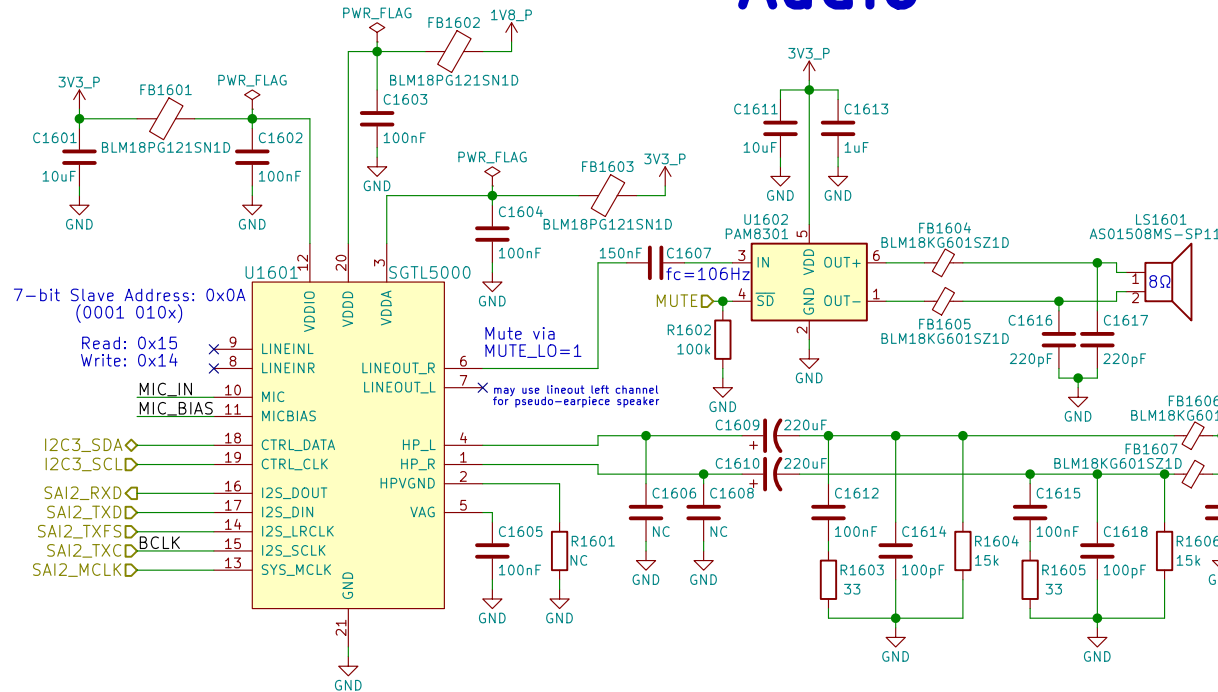
nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 15/24

# Audio



Reference:  
[http://www.52rd.com/S\\_txt/2011\\_3/TXT26685.htm](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-circuitry>  
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

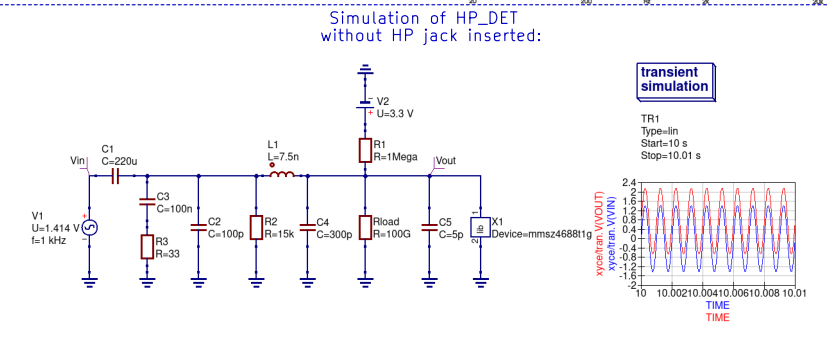
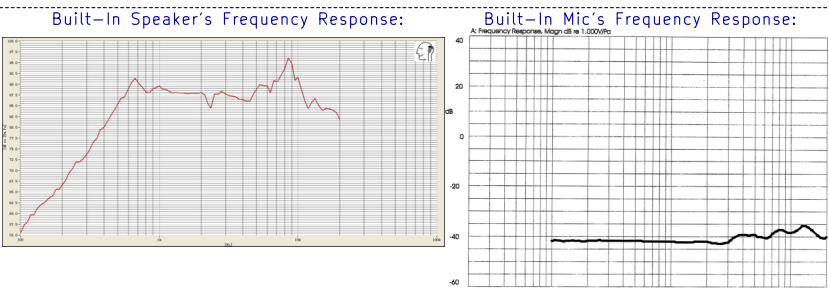
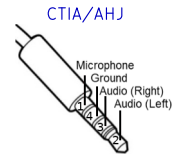
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

"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



## LCR Measurements:

Earbud Microphone: @1kHz Ls = 3.844mH Lp = 15.757H Cs = 6.583uF Cp = 1612.8pF Rs = 1.5465kOhms Rp = 1.5478kOhms θ = -0.8deg	Headset Speaker: @1kHz Ls = 244.4uH Lp = 141.99mH Cs = 103.6uF Cp = 178.77nF Rs = 36.860hms Rp = 36.860hms θ = -2.3deg	Earbud Speaker: @1kHz Ls = 25.2uH Lp = 311.0mH Cs = 1.0mF Cp = 81.95nF Rs = 17.030Ohms Rp = 17.034Ohms θ = 0.5deg
---	--	---

## Audio

**Purism**

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Sheet: /Audio/  
File: audio.sch

Size: A4  
KiCad E.D.A. kicad 5.0.0

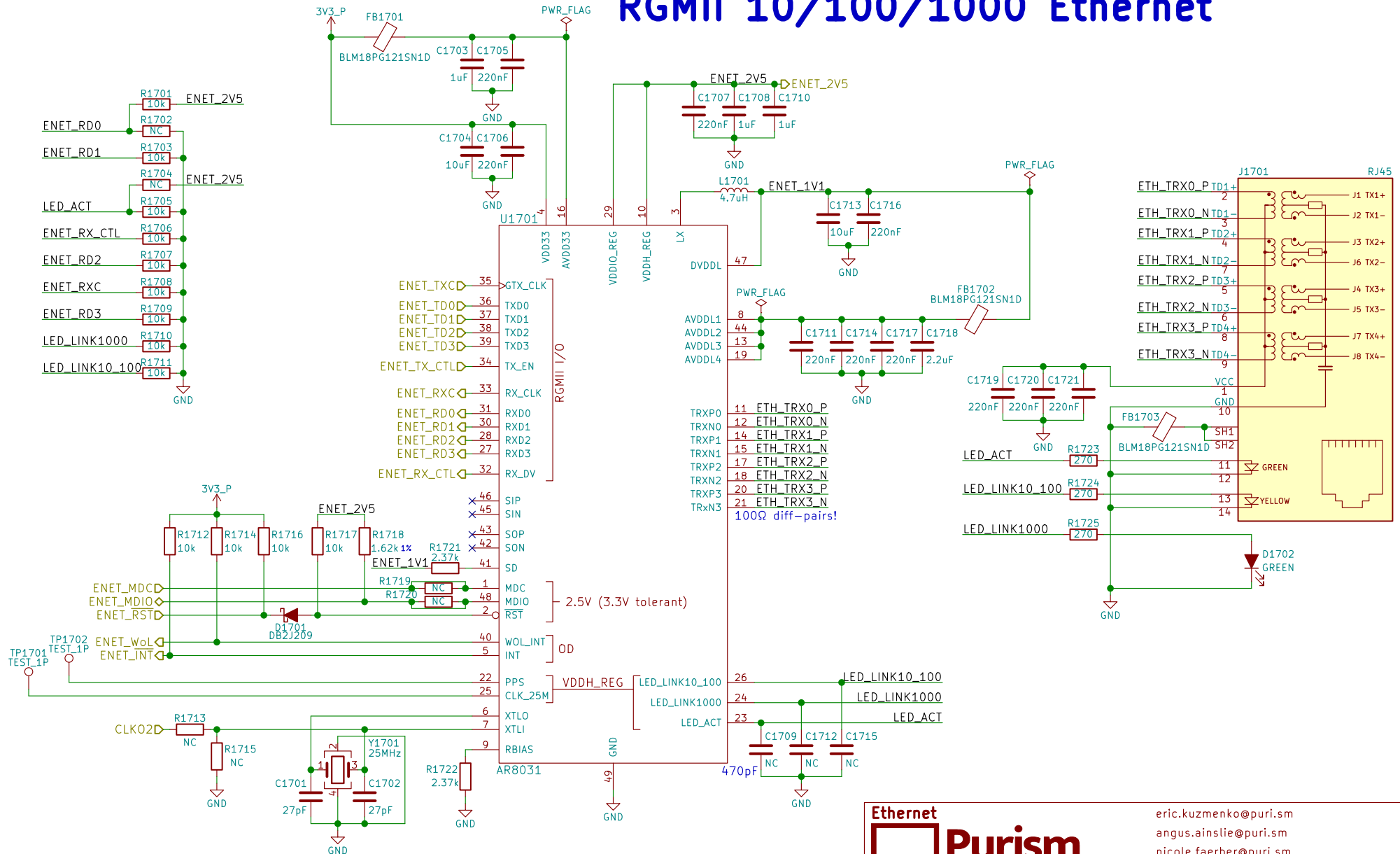
eric.kuzmenko@puri.sm  
angus.ainstlie@puri.sm  
nicole.farber@puri.sm  
christian.schilmoeller@puri.sm

-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

Rev: v0.1.0  
Id: 16/24



# RGMII 10/100/1000 Ethernet



Ethernet

**Purism**

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Sheet: /Ethernet/  
File: ethernet.sch

Size: A4 Date: 2018-07-17  
KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm  
angus.ainslie@puri.sm  
nicole.farber@puri.sm  
christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 17/24

# WLAN+BT M.2

RS9116 NC:  
RTS, CTS, BT\_HOST\_WAKE

RS9116 datasheet says  
no WIFI\_WAKE  
but the schematic has it

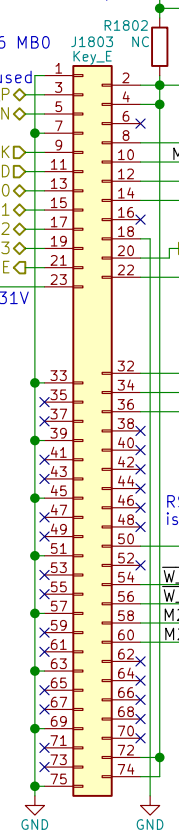
RedPine RS9116 MBO  
Requires 5V on  
Pin 54 if USB used

WLAN\_D\_P  
WLAN\_D\_N  
WIFI\_CLK  
WIFI\_CMD  
WIFI\_DATA0  
WIFI\_DATA1  
WIFI\_DATA2  
WIFI\_DATA3  
WIFI\_WAKE

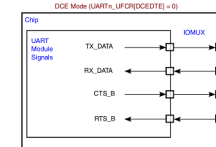
RedPine RS9116  
has 100k pull-up to  
3.3V making SDIO\_RST  
~2.55V when HIGH

MOD1801  
WifiBTCard  
WiFi + Bluetooth  
M.2 Form Factor  
Key ID "E"  
width: 22 mm  
length: 30 mm

Socket: Table 46  
Module: Table 23  
M.2 Key E



6.2 M.2 Signal Directions  
UARTn\_UFCR[DCEDTE]=0 on POR



TX→RX  
RX→TX  
CTS→CTS  
RTS→RTS

Leave BT\_DISABLE  
LOW for RS9116

Input pins are  
interchangeable

Note:  
All switches' pins  
can be swapped  
e.g. 2<->3  
or 1<->3

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

WLAN+BT M.2  
**Purism**

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Sheet: /WLAN+BT M.2/  
File: wifi\_bt\_m2.sch

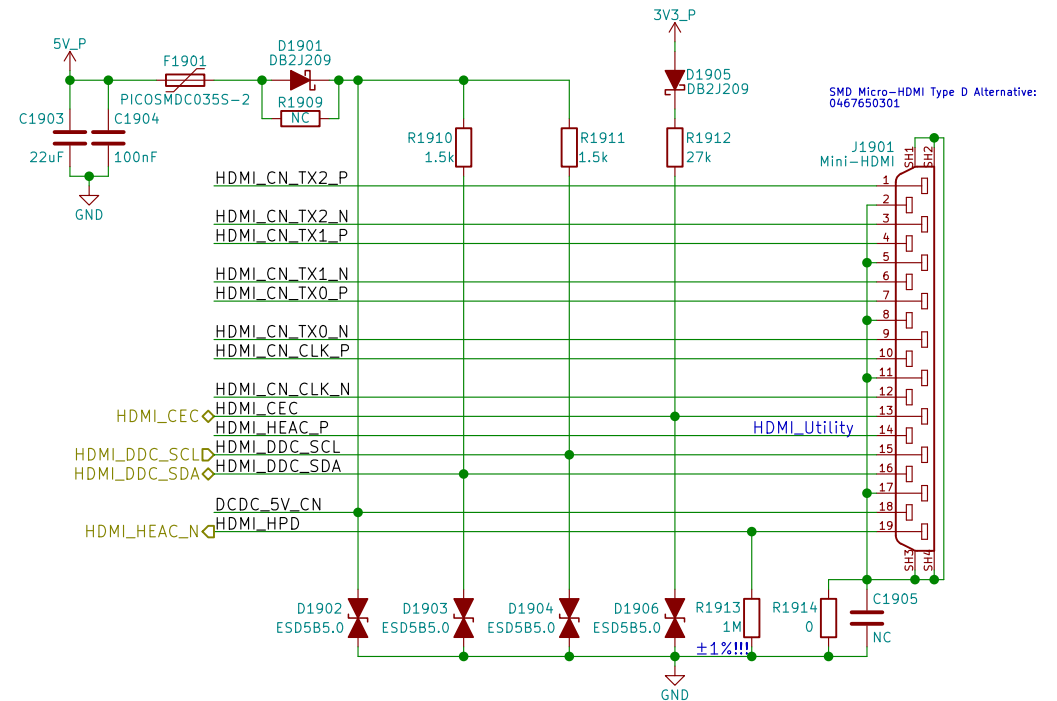
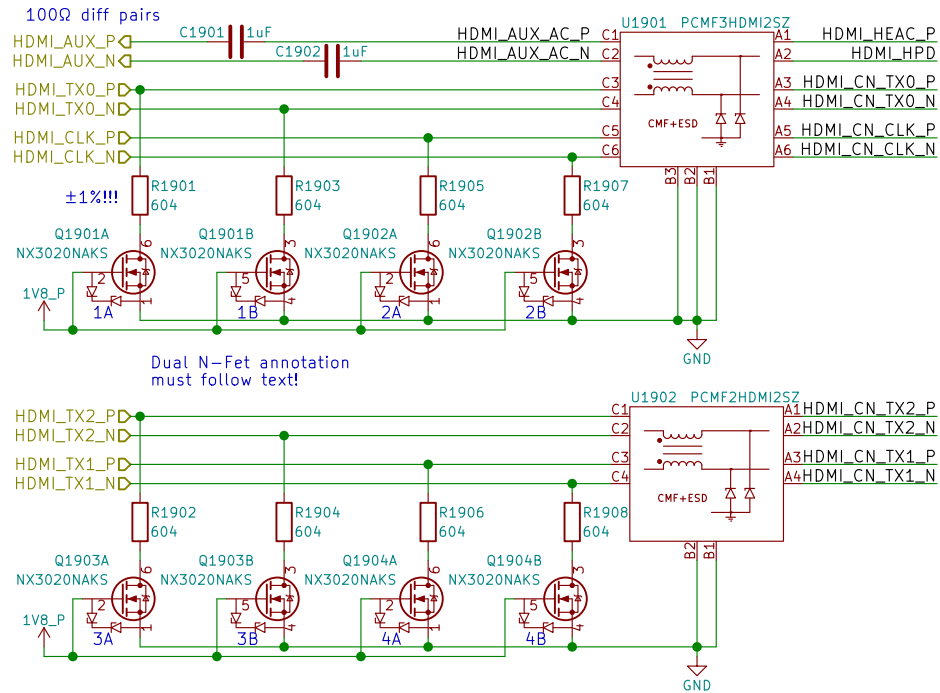
Size: A4  
KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm  
angus.ainstlie@puri.sm  
nicole.farber@puri.sm  
christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 18/24

TUSB1046 can be used for DP over USB-C

# HDMI



HDMI



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Sheet: /HDMI/  
File: hdmi.sch

Size: A4  
KiCad E.D.A. kicad 5.0.0

Date: 2018-07-17

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nicole.farber@puri.sm  
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Rev: v0.1.0  
Id: 19/24

10

## B



C

100

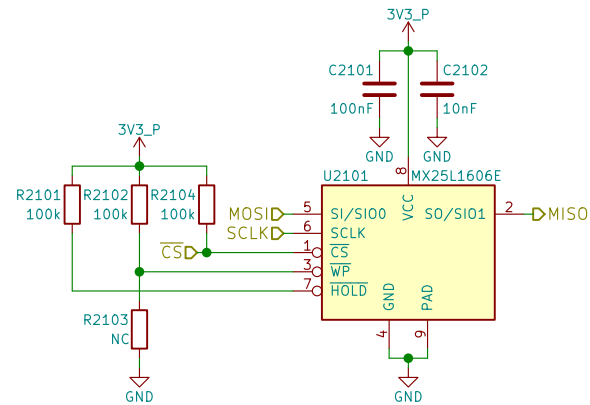


1

100

## D

# SPI NOR Flash



## SPI NOR Flash



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Sheet: /SPI Flash/

File: flash.sch

Size: A4 Date: 2018-07-17

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nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 21/24

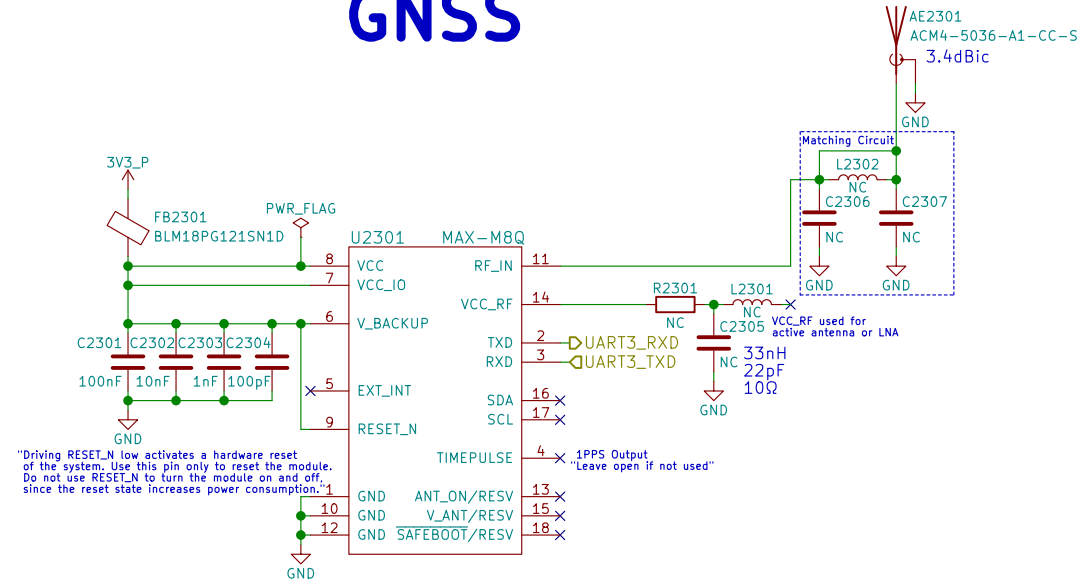
## Smart Card



christian.schilmoeller@puri.sm

Id: 22/24

# GNSS



References:  
[https://www.u-blox.com/sites/default/files/MAX-M8\\_HardwareIntegrationManual\\_L%28UBX-13004876%29.pdf](https://www.u-blox.com/sites/default/files/MAX-M8_HardwareIntegrationManual_L%28UBX-13004876%29.pdf)  
[https://www.u-blox.com/sites/default/files/MAX-8-M8-FW3\\_HardwareIntegrationManual\\_L%28UBX-15030059%29.pdf](https://www.u-blox.com/sites/default/files/MAX-8-M8-FW3_HardwareIntegrationManual_L%28UBX-15030059%29.pdf)

GNSS



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Sheet: /GNSS/  
 File: gnss.sch

Size: A4  
 KiCad E.D.A. kicad 5.0.0

Date: 2018-07-17

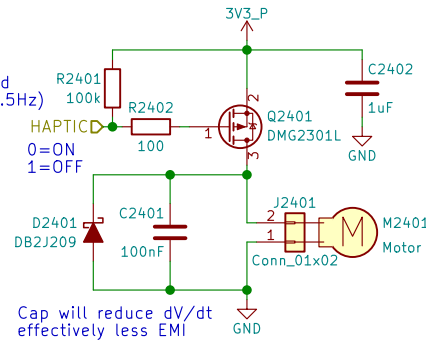
Rev: v0.1.0  
 Id: 23/24

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 angus.ainstlie@puri.sm  
 nicole.farber@puri.sm  
 christian.schilmoeller@puri.sm

# Haptic Motor

PWM pins occupied:  
 GPIO1\_I001 - LCD Backlight  
 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 Boom Precision  
 connector installed (by request)  
 Metal housing is floating  
 thick adhesive layer underneath  
 (not connected to either pin)

## Haptic/Vibration Motor



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Sheet: /Haptic Motor/  
 File: haptic.sch

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christian.schilmoeller@puri.sm

Size: A4 Date: 2018-07-17

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 24/24