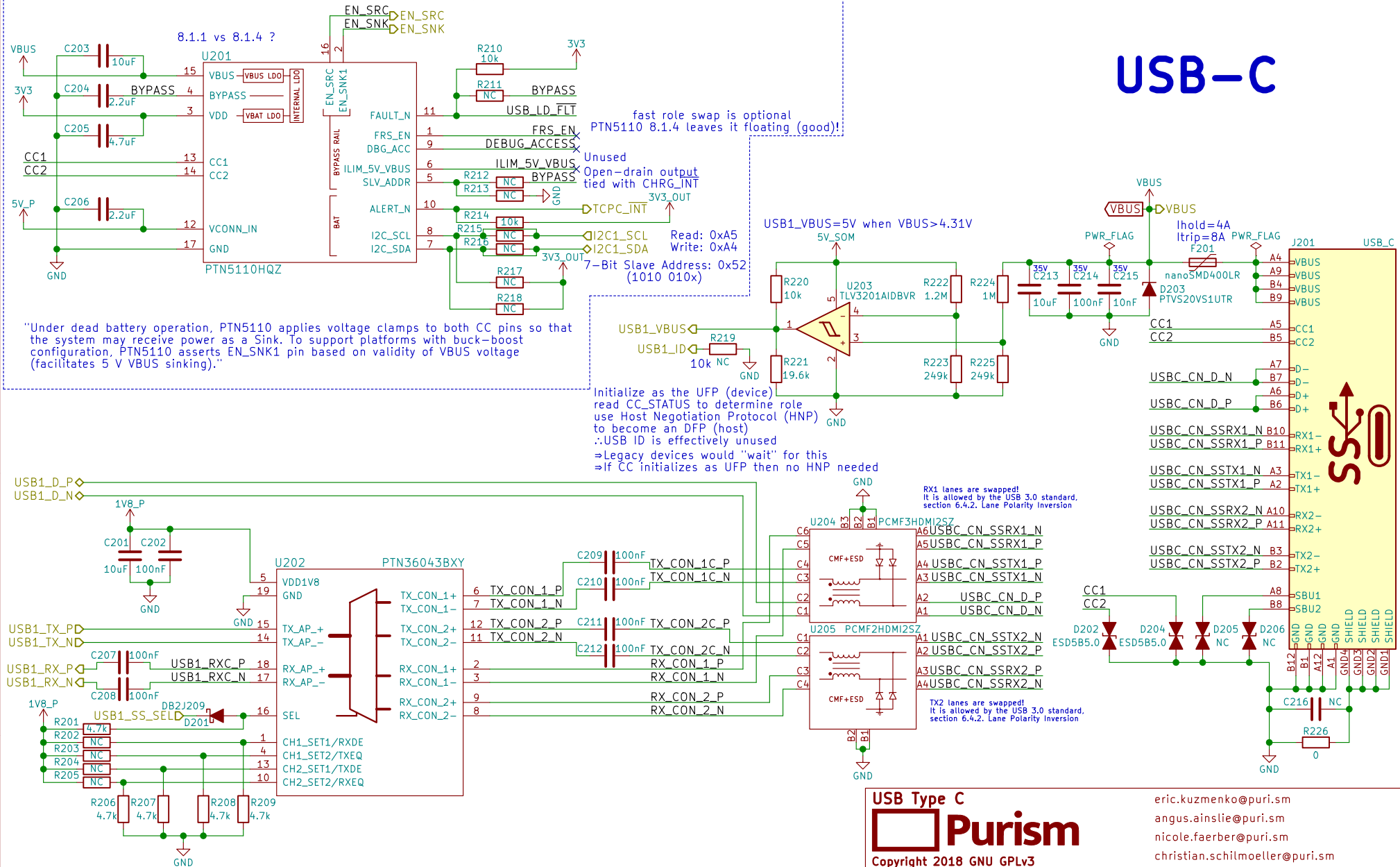


USB-C TCPC - Config Channel (CC) and PD Role Controller

USB-C



USB Type C

Purism

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

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

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nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 2/24



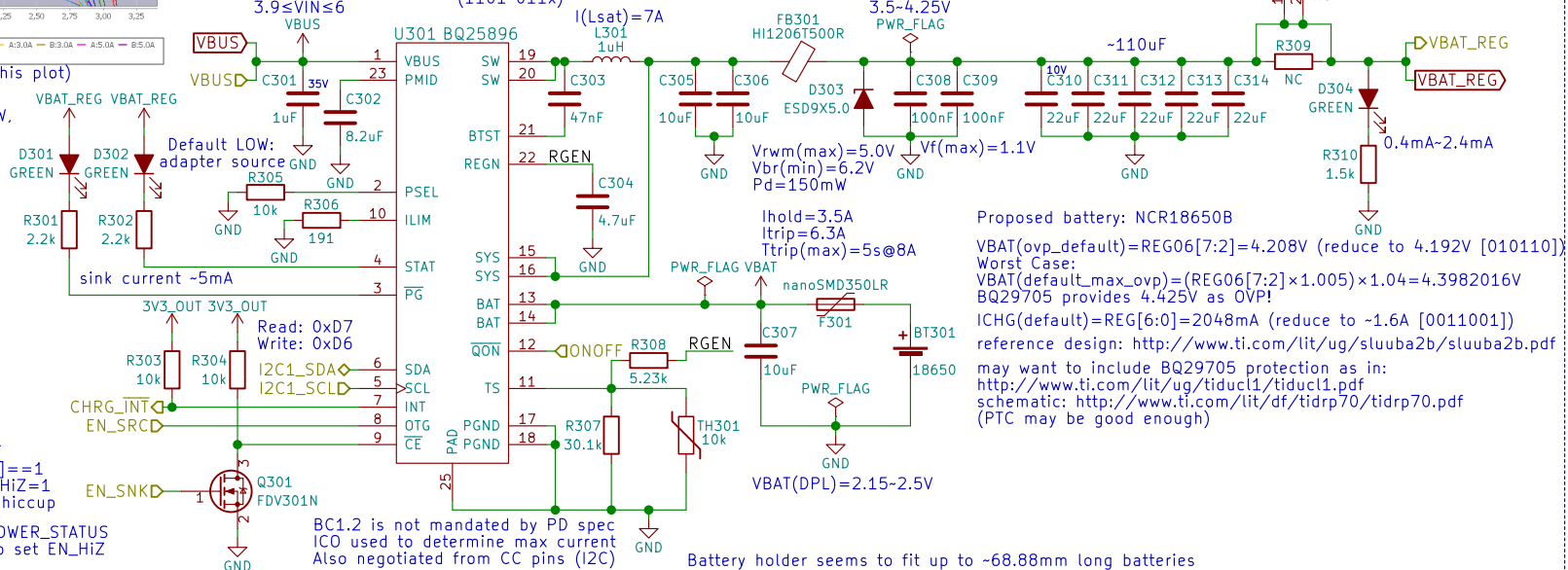
(interpret RSOC% based on this plot)

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

use AUTO_DPDM_EN to auto-detect IINLIM

$1.658 \leq ILIM \leq 2.063$
 $ILIM(nom) \approx 1.859A$
 $3.9 \leq VIN \leq 6$
 7-bit Slave Address: 0x6B (1101 011x)

Battery Charge Controller



This disables charging but maybe not $VBUS \rightarrow VOUT$ if PTN5110HQ's $FAULT_STATUS[6] = 1$ (Force Off VBUS bit) then set $EN_HiZ = 1$ EN_HiZ may be auto-set when in hiccup

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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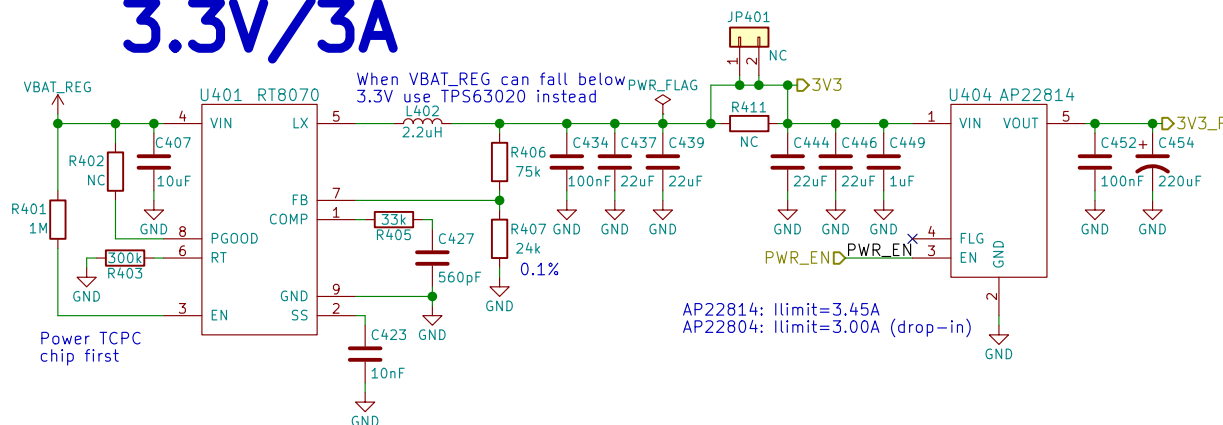
Sheet: /Battery/
 File: battery.sch

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

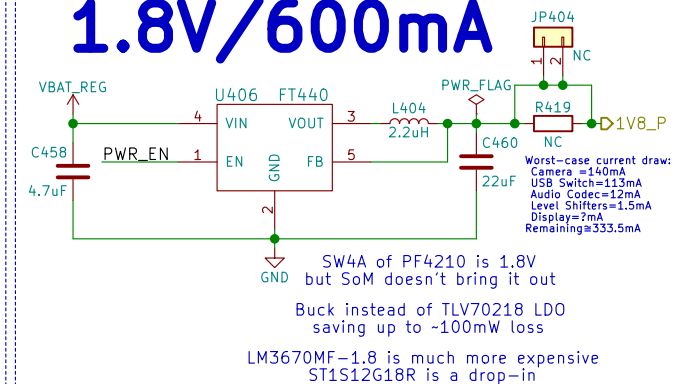
eric.kuzmenko@puri.sm
 angus.ainslie@puri.sm
 nicole.farber@puri.sm
 christian.schilmoeller@puri.sm

Rev: v0.1.0
 Id: 3/24

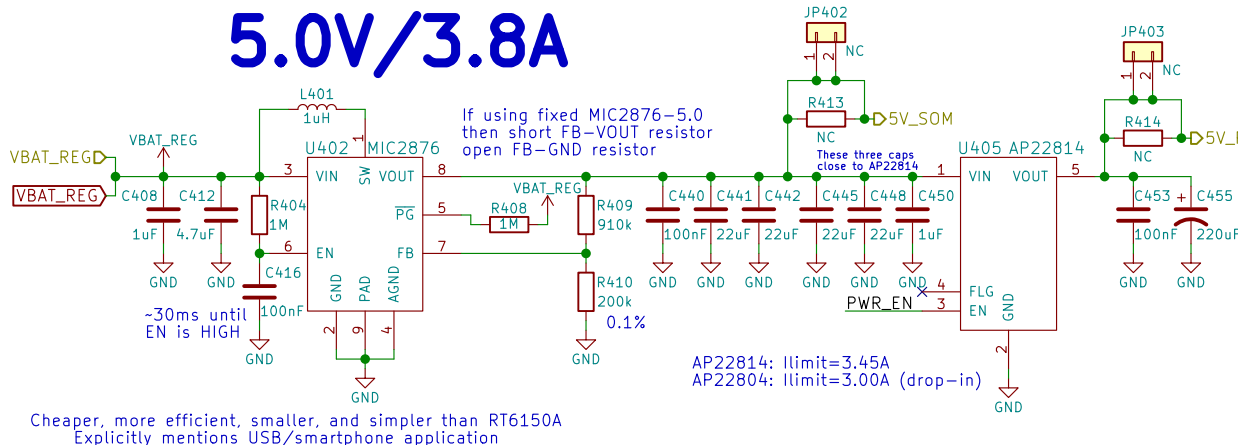
3.3V/3A



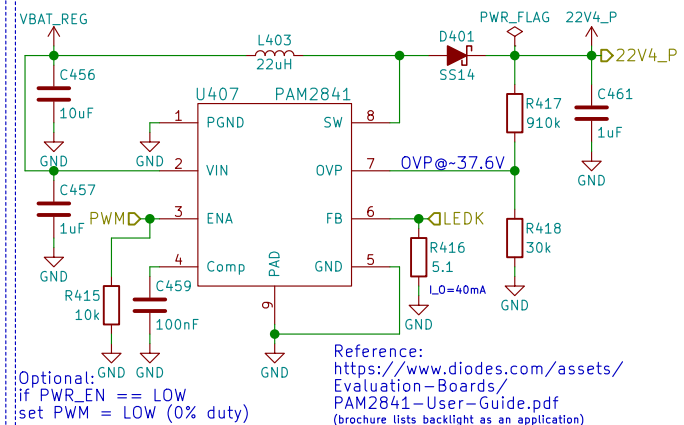
1.8V/600mA



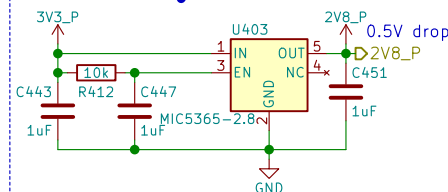
5.0V/3.8A



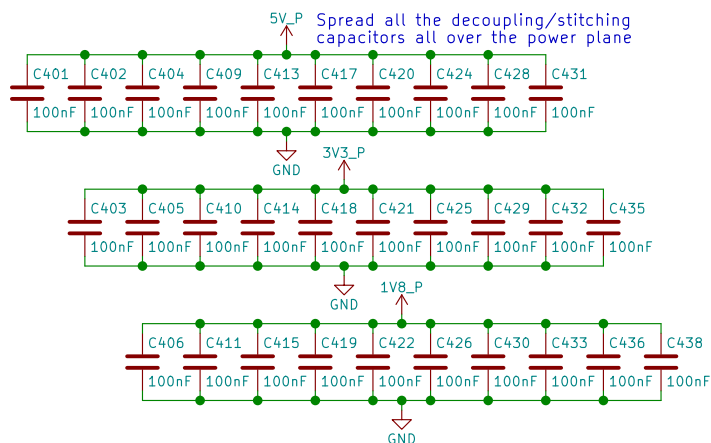
22.4V/40mA



2.8V/150mA



Power



Power

Purism

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Sheet: /Power/
File: power.sch

Size: A4
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eric.kuzmenko@puri.sm

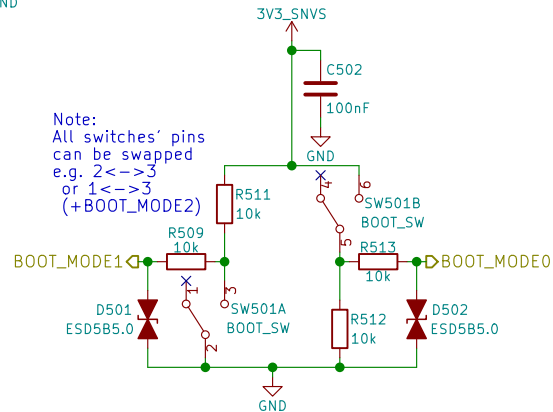
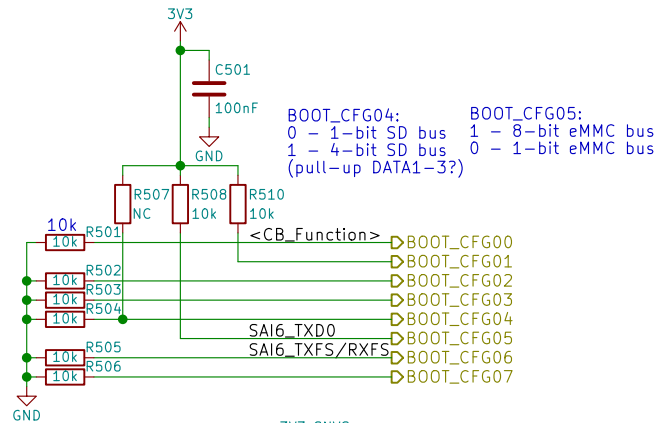
angus.ainslie@puri.sm

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Rev: v0.1.0
Id: 4/24

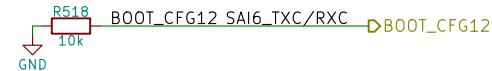
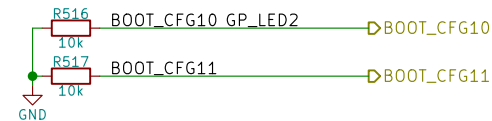
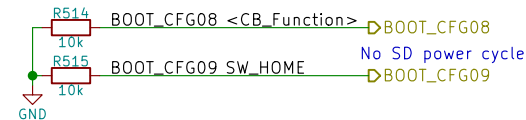
Boot Config



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 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



Boot Configuration



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Sheet: /Boot Config/
File: boot.sch

Size: A4
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Date: 2018-07-17

Rev: v0.1.0

Id: 5/24

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm


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christian.schilmoeller@puri.sm

[illegible]

<div> <div> <div>RTC</div> <div>  <div>Purism</div> </div> </div> <div> <div>eric.kuzmenko@puri.sm</div> <div>angus.ainslie@puri.sm</div> <div>nicole.ferber@puri.sm</div> <div>christian.schilmoeller@puri.sm</div> </div> </div>	
<div> <div>Copyright 2018 GNU GPLv3</div> <div> <div>Sheet: /RTC/</div> <div>File: rtc.sch</div> </div> </div>	
<div> <div>Size: A4</div> <div>Date: 2018-07-17</div> </div>	<div> <div>Rev:</div> <div>Id: 6</div> </div>
<div> <div>KiCad E.D.A. kicad 5.0.0</div> </div>	

The diagram shows a 74LVC2G24 inverter used as a level shifter. The input side (left) has two pins: UART1_TXDD (pin 2) and UART1_RXDD (pin 5). The output side (right) has two pins: 3V3_OUT (pin 8) and 3V3_OUT (pin 3). A 10F capacitor is connected between pins 1 and 2. A 100k resistor (R701) is connected between pin 8 and GND. A 100nF capacitor (C701) is connected between the 3V3_OUT output and GND. A note indicates that the circuit 'Accepts 3.3V or 5V Logic'.

UART Debug  Purism		eric.kuzmenko@puri.sm angus.ainslie@puri.sm nicole.fauberber@puri.sm christian.schilmoeller@puri.sm
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Sheet: /UART Debug/ File: uart.sch		
Size: A4	Date: 2018-07-17	Rev: v0.1.0
KiCad E.D.A. kicad 5.0.0		Id: 7/24

[illegible]

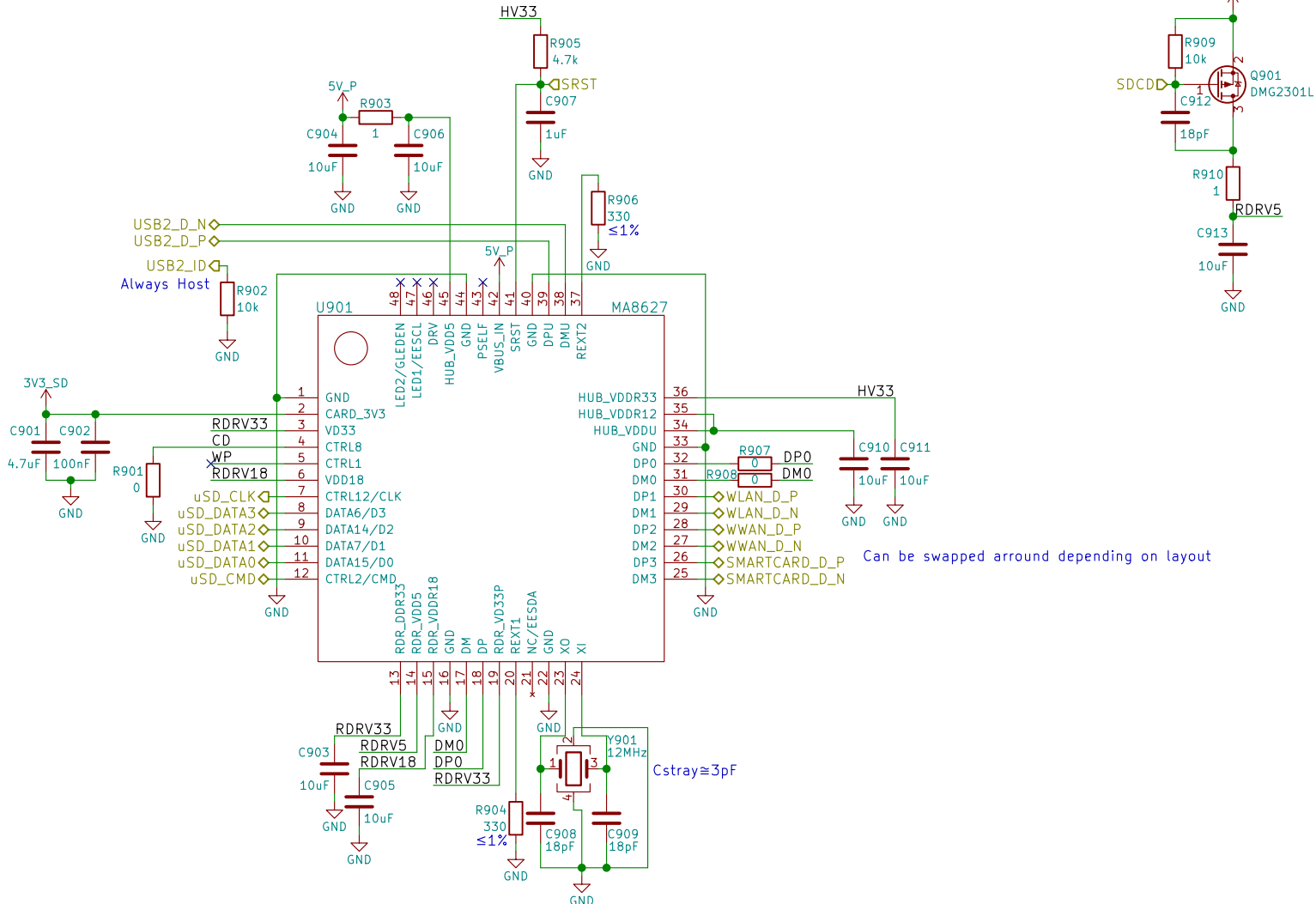
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Rev: v0.1.0

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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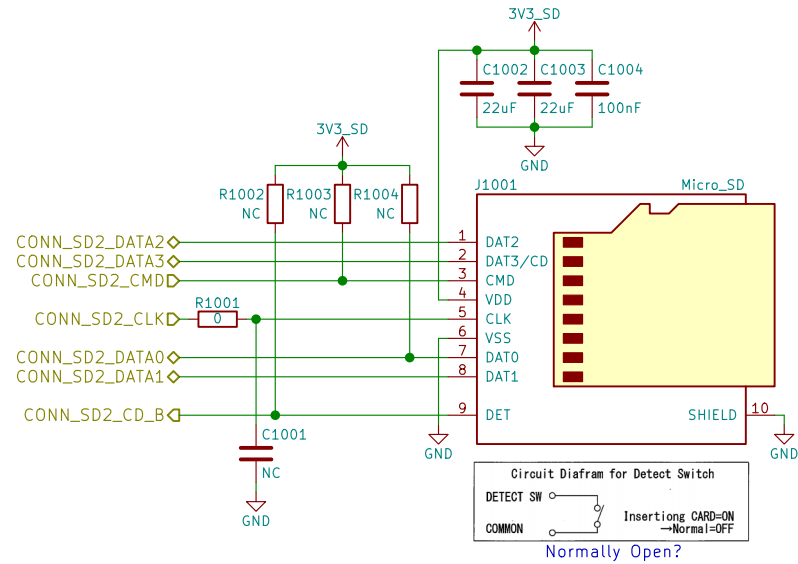
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Rev: v0.1.0

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
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nicole.ferber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 11/24

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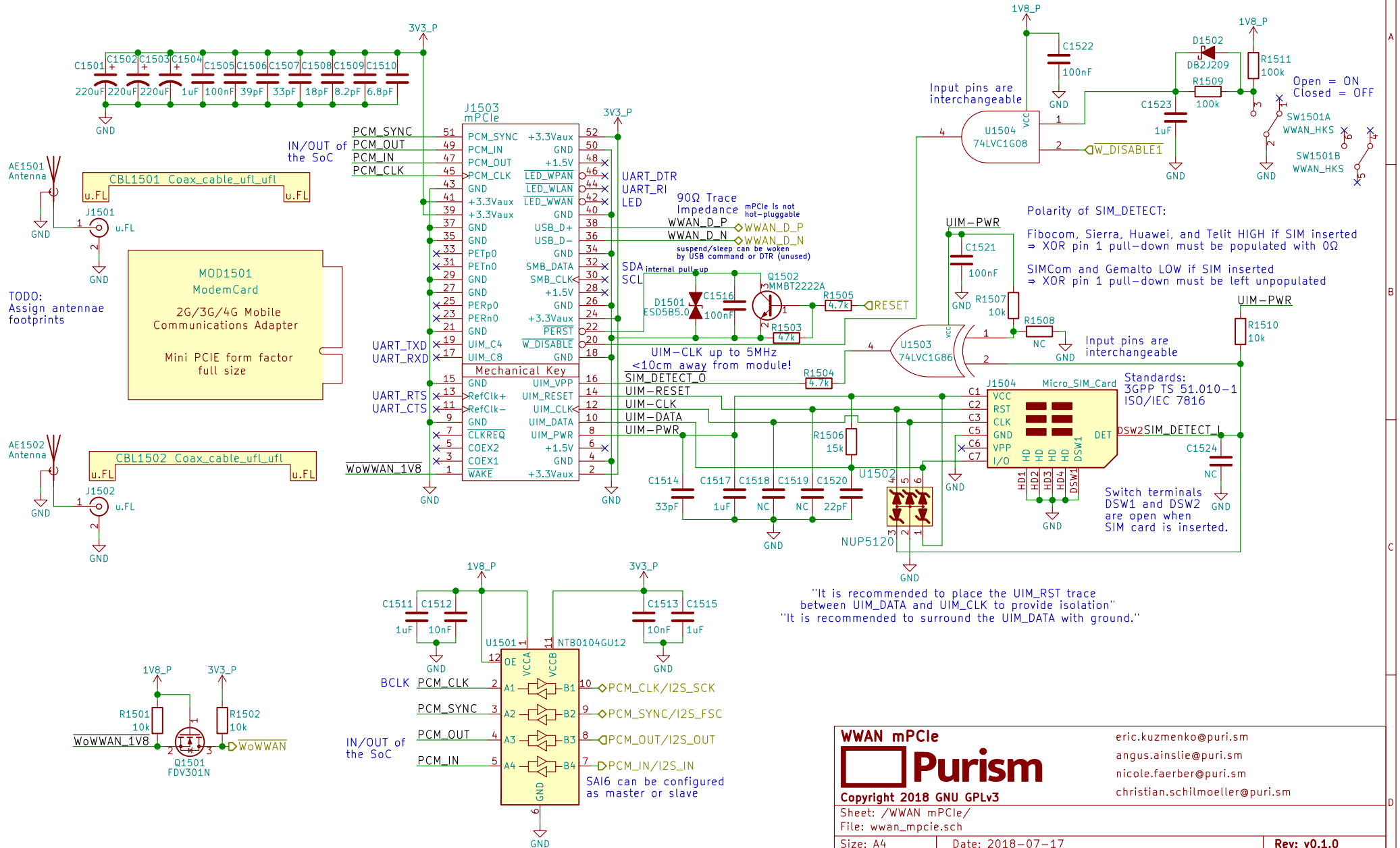
Sheet: /Buttons & LED/
 File: buttons_led.sch

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

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Rev: v0.1.0
 Id: 14/24

WWAN mPCIe



WWAN mPCIe

Purism

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Sheet: /WWAN mPCIe/
File: wwan_mpcie.sch

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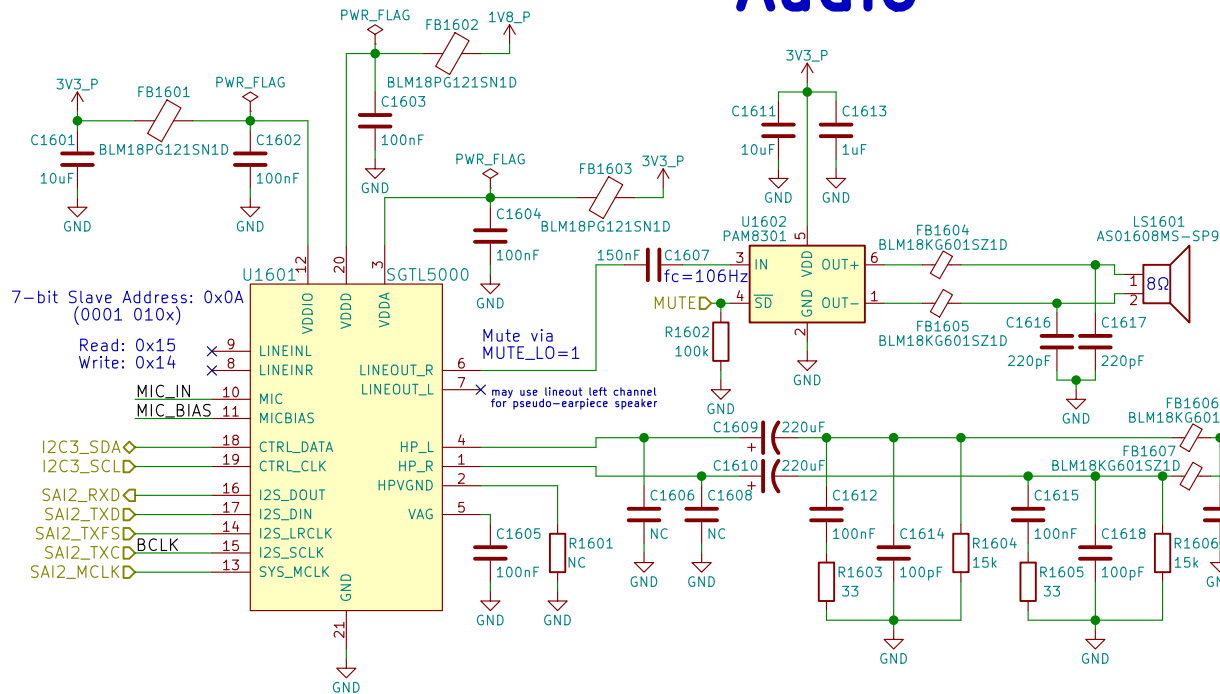
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christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 15/24

Audio



Reference:
http://www.52rd.com/S_txt/2011_3/TXT26685.htm
<http://www.sengpielaudio.com/calculator-transferfactor.htm>
<https://electronics.stackexchange.com/questions/31442/how-can-i-switch-this-audio-jack-using-its-own-mechanical-switches-without-circuit6>
 (Nit6 does the same)
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

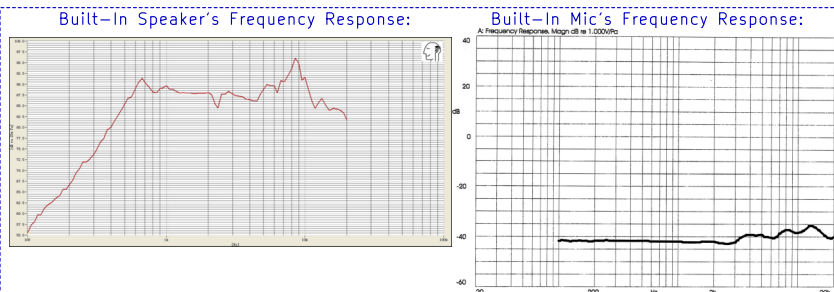
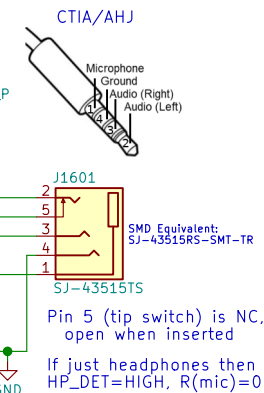
dB specs in datasheet is a unit of power gain (not dBu or VU)
with respect to the DAC's unattenuated output

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

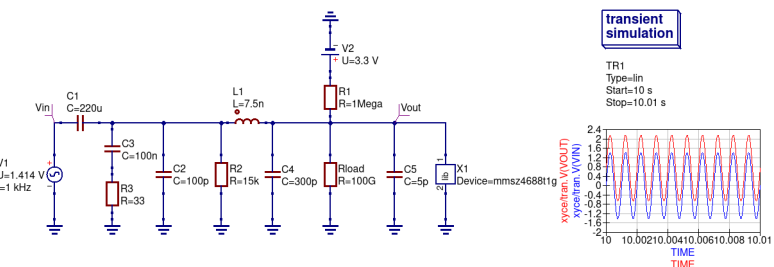
If HP_DET is HIGH for >100ms then HPs are present

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

Could use FSA8008 to detect mic



Simulation of HP_DET
without HP jack inserted:



LCR Measurements:

Earbud Microphone:	Headset Speaker:	Earbud Speaker:
@1kHz	@1kHz	@1kHz
Ls = 3.844mH	Ls = 244.4uH	Ls = 25.2uH
Lp = 15.757H	Lp = 141.99mH	Lp = 311.0mH
Cs = 6.583uF	Cs = 103.6uF	Cs = 1.0mF
Cp = 1612.8pF	Cp = 178.77nF	Cp = 81.95nF
Rs = 1.5465kOhms	Rs = 36.86kOhms	Rs = 17.03kOhms
Rp = 1.5478kOhms	Rp = 36.86kOhms	Rp = 17.03kOhms
θ = -0.8deg	θ = -2.3deg	θ = 0.5deg

Audio



Purism

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Sheet: /Audio/
File: audio.sch

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christian.schilmoeller@puri.sm

Size: A4	Date: 2018-07-17
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Rev: v0.1.0

Id: 16/24

RGMII 10/100/1000 Ethernet

3V3_P FB1701 BLM18PG121SN1D C1703 C1705 1uF 220nF GND C1704 C1706 10uF 220nF GND U1701 4 16 VDD33 AVDD33 VDDIO_REG VDDH_REG LX 29 10 3 DVDDL AVDDL1 AVDDL2 AVDDL3 AVDDL4 8 44 13 19 PWR_FLAG ENET_2V5 ENET_2V5 C1707 C1708 C1710 220nF 1uF 1uF GND L1701 4.7uH ENET_1V1 C1713 C1716 10uF 220nF GND PWR_FLAG FB1702 BLM18PG121SN1D C1711 C1714 C1717 C1718 220nF 220nF 220nF 2.2uF GND C1719 C1720 C1721 220nF 220nF 220nF GND LED_ACT R1723 270 FB1703 BLM18PG121SN1D SH1 SH2 GREEN LED_LINK10_100 R1724 270 YELLOW LED_LINK1000 R1725 270 GND D1702 GREEN

ENET_RD0 R1701 10k ENET_2V5 R1702 NC ENET_RD1 R1703 10k ENET_2V5 R1704 NC LED_ACT R1705 10k ENET_RX_CTL R1706 10k ENET_RD2 R1707 10k ENET_RXC R1708 10k ENET_RD3 R1709 10k LED_LINK1000 R1710 10k LED_LINK10_100 R1711 10k GND

ENET_TXC 35 GTX_CLK 36 TXD0 37 TXD1 38 TXD2 39 TXD3 34 TX_EN 33 RX_CLK 31 RXD0 30 RXD1 28 RXD2 27 RXD3 32 RX_DV 46 SIP 45 SIN 43 SOP 42 SON 41 SD 1 MDC 48 MDIO 2 RST 40 WOL_INT 5 INT 22 PPS 25 CLK_25M LED_LINK10_100 26 LED_LINK1000 24 LED_ACT 23 XTLO 7 XTLO 9 RBIAS AR8031 49 GND

ENET_MDC ENET_MDIO ENET_RST ENET_WoL ENET_INT TP1701 TEST_1P TP1702 TEST_1P CLK02 R1713 NC R1715 NC GND C1701 27pF C1702 27pF Y1701 25MHz R1722 2.37k GND

ETH_TRX0_P TD1+ J1701 RJ45 ETH_TRX0_N TD1- J1 TX1+ J2 TX1- J3 TX2+ J6 TX2- ETH_TRX1_P TD2+ J4 TX3+ J5 TX3- ETH_TRX2_N TD3- J7 TX4+ J8 TX4- ETH_TRX3_P TD4+ ETH_TRX3_N TD4-

Sheet: /Ethernet/
File: ethernet.sch
Size: A4 Date: 2018-07-17
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Rev: v0.1.0
Id: 17/24



Purism

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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 MB0
Requires 5V on
Pin 54 if USB used

Socket: Table 46
Module: Table 23

M.2 Key E

3V3_P

NC

Key E

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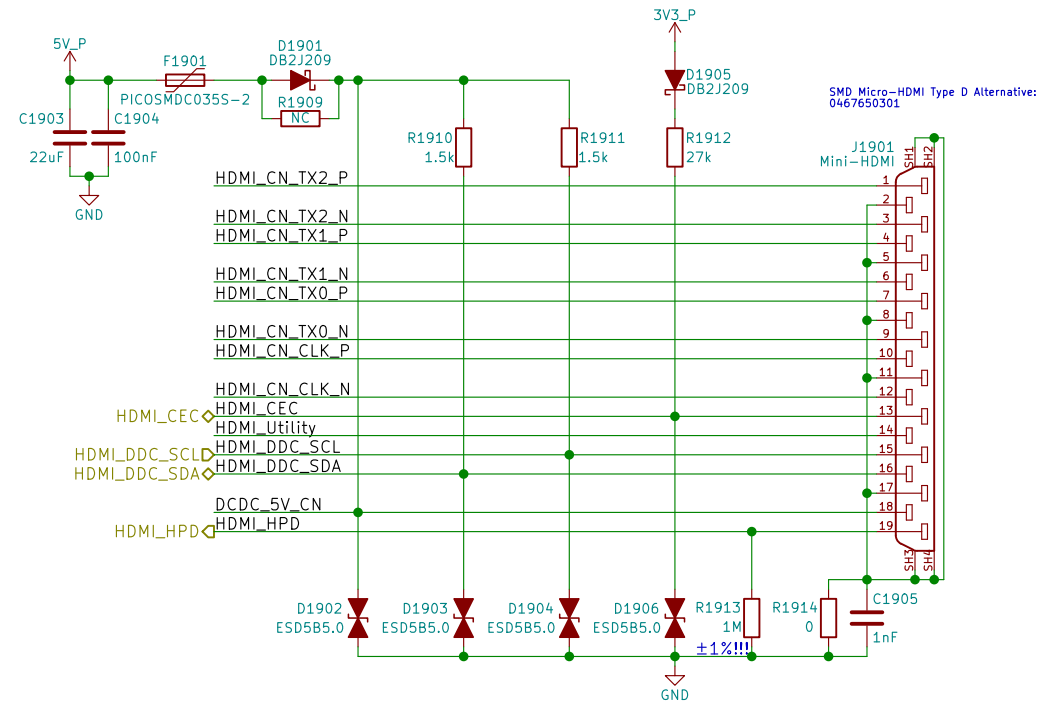
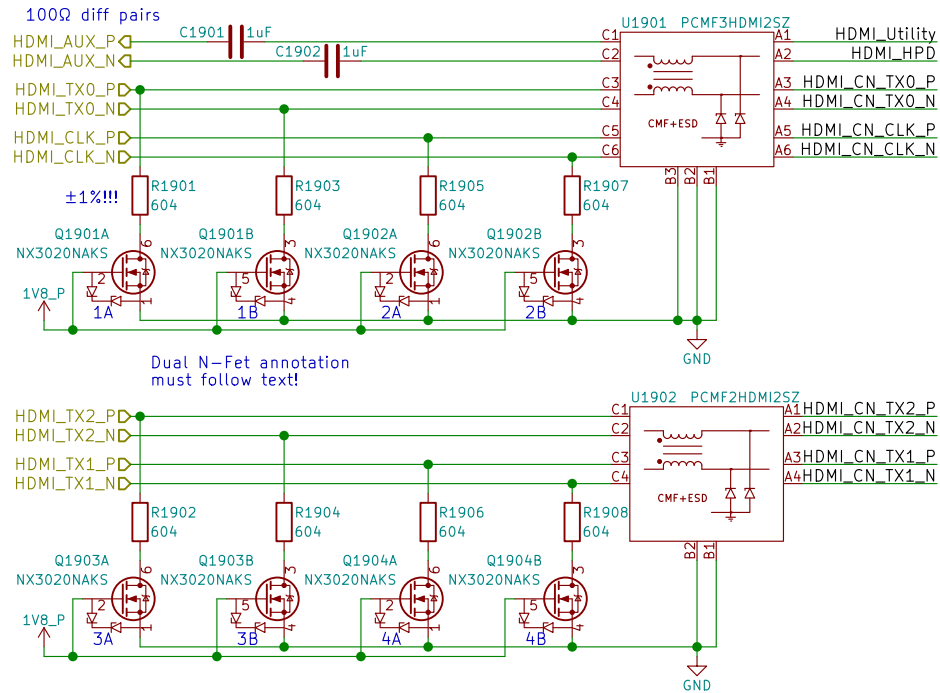
289

290

TUSB1046 can be used for DP over USB-C

HDMI

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



HDMI



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Sheet: /HDMI/
File: hdmi.sch

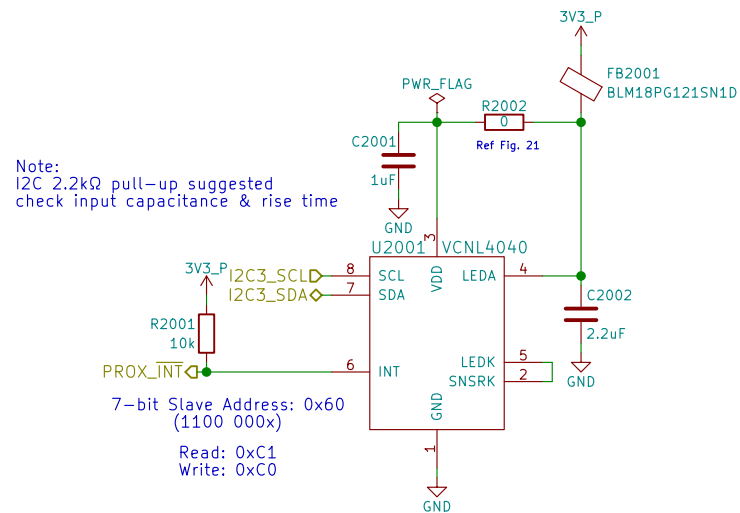
Size: A4 Date: 2018-07-17
KiCad E.D.A. kicad 5.0.0

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

Rev: v0.1.0
Id: 19/24

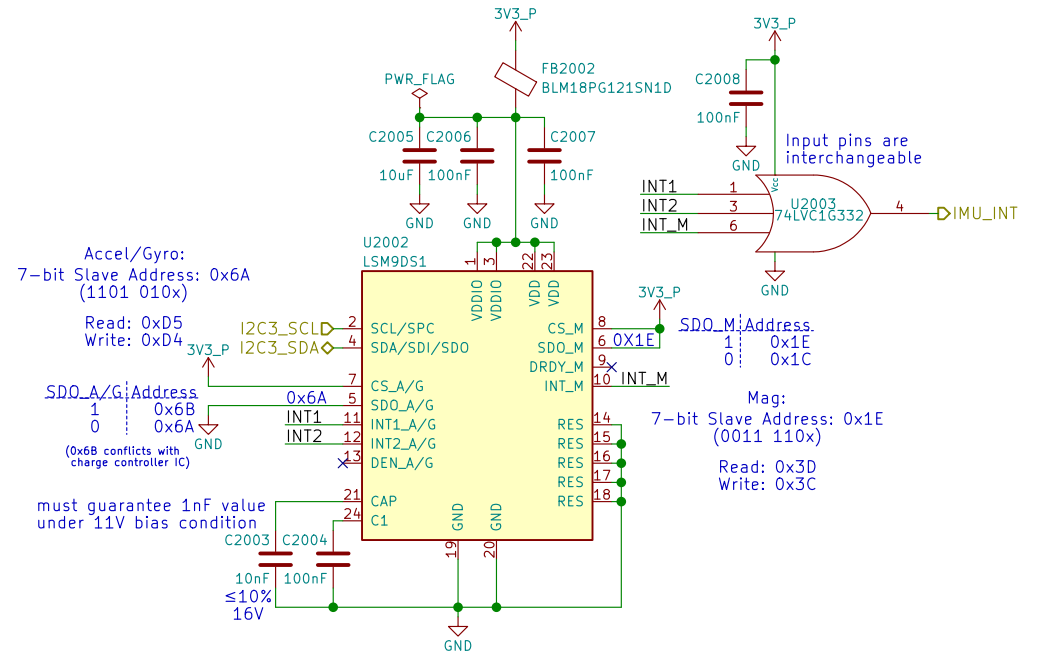
Sensors

Proximity & Ambient Light

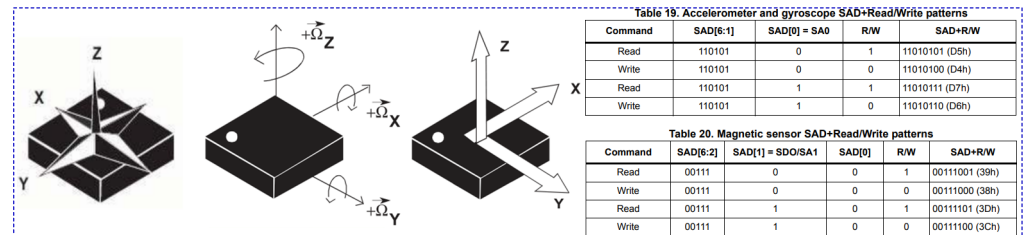


Reference:
<https://www.vishay.com/docs/84307/designingvcnl4040.pdf>
<http://www.vishay.com/docs/84931/vcni4040sensorboardfiles.pdf>

9-Axis IMU



Reference:
<http://www.st.com/en/evaluation-tools/steval-mki159v1.html>



Sensors



Purism

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Sheet: /Sensors/
File: sensors.sch

eric.kuzmenko@puri.sm

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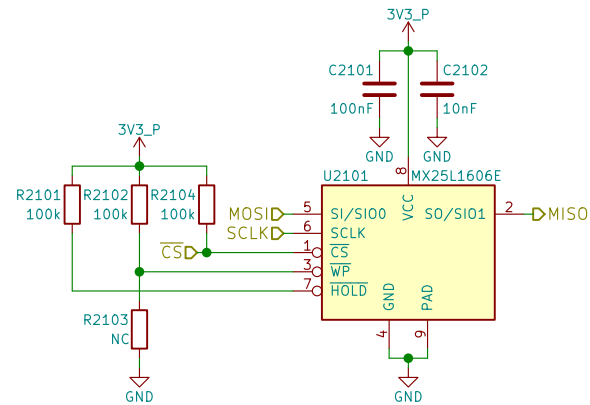
Size: A4	Date: 2018-07-17
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Size: A1	Date:
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Rev: v0.1.0

Id: 20/24

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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Rev: v0.1.0

Id: 21/24

Smart Card



christian.schilmoeller@puri.sm

Id: 22/24

MAX-M8Q Pin Connections:

- Pin 1:** GND
- Pin 2:** TXD → UART3_RXD
- Pin 3:** RXD → UART3_TXD
- Pin 4:** TIMEPULSE → .1PPS Output (Leave open if not used)
- Pin 5:** EXT_INT
- Pin 6:** V_BACKUP
- Pin 7:** VCC_I/O
- Pin 8:** VCC
- Pin 9:** RESET_N
- Pin 10:** GND
- Pin 11:** RF_IN
- Pin 12:** GND
- Pin 13:** ANT_ON/RESV
- Pin 14:** VCC_RF
- Pin 15:** GND
- Pin 16:** SDA
- Pin 17:** SCL
- Pin 18:** GND

External Components and Connections:

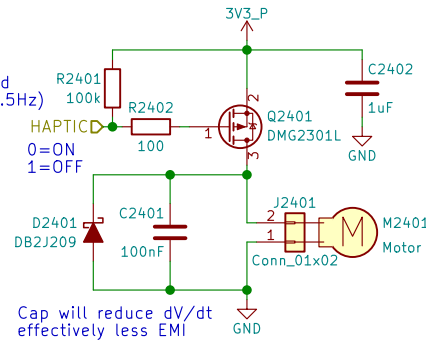
- Power:** 3V3_P supply with decoupling capacitors C2301 (100nF), C2302 (10nF), C2303 (1nF), and C2304 (100pF) to GND.
- Reset:** RESET_N pin connected to a pull-up resistor (FB2301, BLM18PG1215N1D) and a PWR_FLAG indicator.
- Antenna:** Connected via a matching circuit (L2302, C2306, C2307) and a VCC_RF input (R2301, L2301, C2305) to GND. The antenna is labeled AE2301, ACM4-5036-A1-CC-S, 3.4dBic.

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Size: A4	Date: 2018-07-17	Rev: v0.1.0
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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

Size: A4 Date: 2018-07-17
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