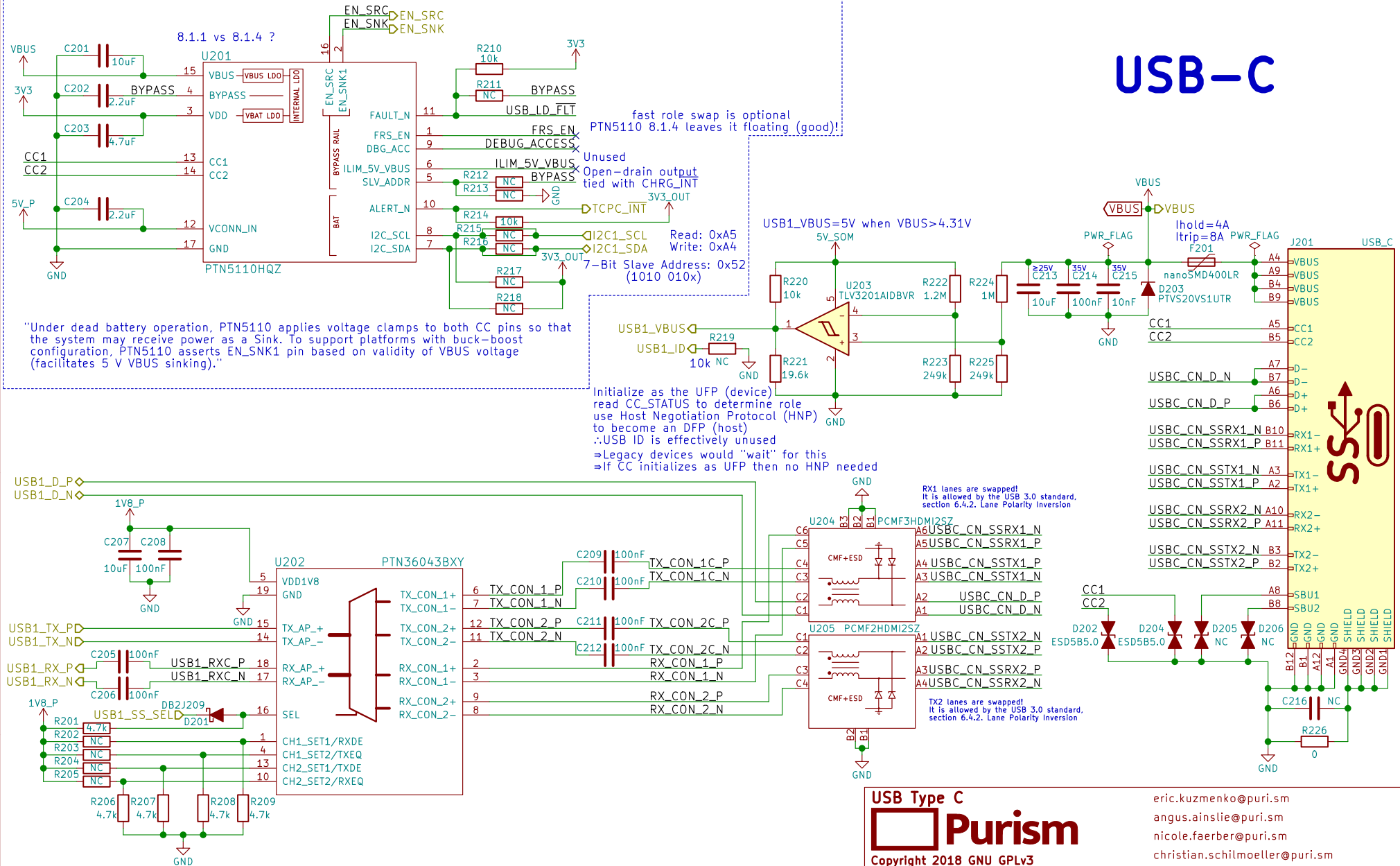


USB-C TCPC - Config Channel (CC) and PD Role Controller

USB-C



USB Type C

Purism

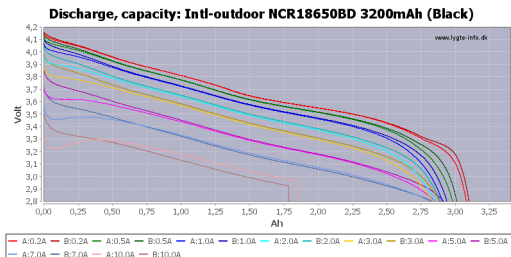
Copyright 2018 GNU GPLv3

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

Size: A4 Date: 2018-08-14
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nicole.faeber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 2/24

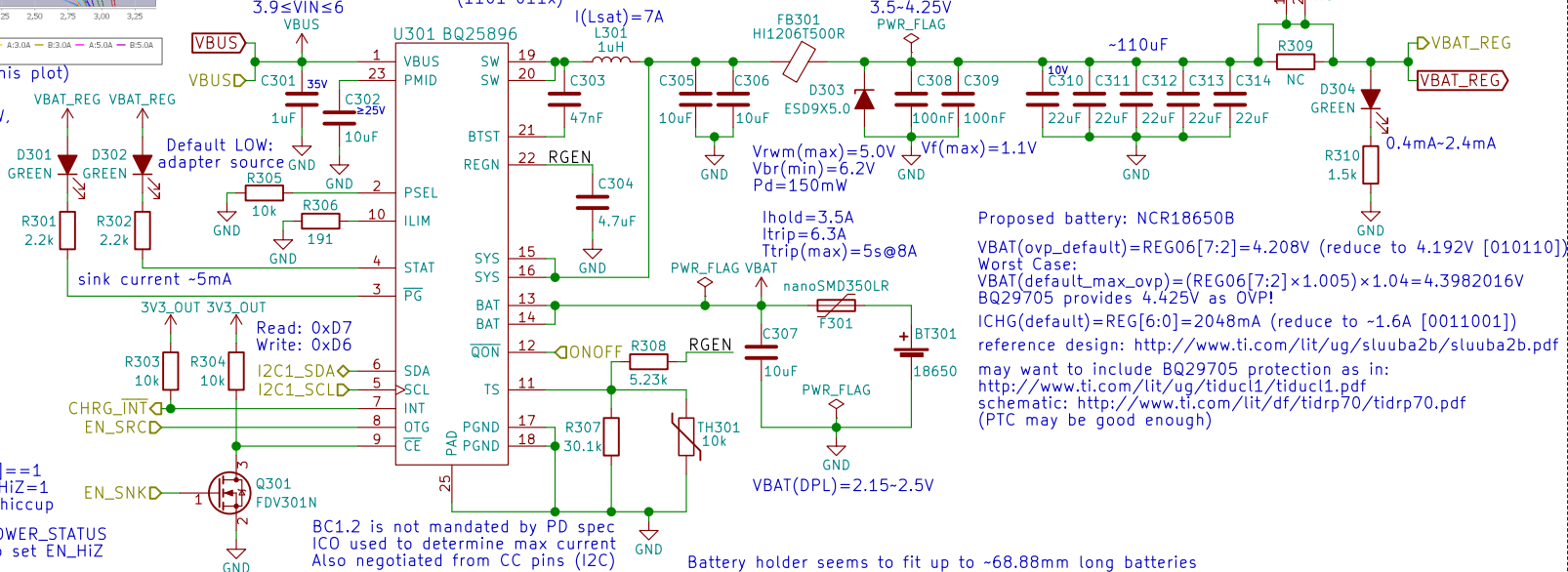


(interpret RSOC% based on this plot)

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)



Read: 0xD7
 Write: 0xD6
 CHRG_INT
 EN_SRC
 EN_SNK
 Q301 FDS301N

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)

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

Battery holder seems to fit up to ~68.88mm long batteries
 need to test 18650 protected cells which are ~69.35mm long

Proposed battery: NCR18650B

$VBAT(ovp_default) = REG06[7:2] = 4.208V$ (reduce to 4.192V [010110])
 Worst Case:
 $VBAT(default_max_ovp) = (REG06[7:2] \times 1.005) \times 1.04 = 4.3982016V$
 BQ29705 provides 4.425V as OVP!
 $ICHG(default) = REG[6:0] = 2048mA$ (reduce to ~1.6A [0011001])
 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)

Battery

Purism

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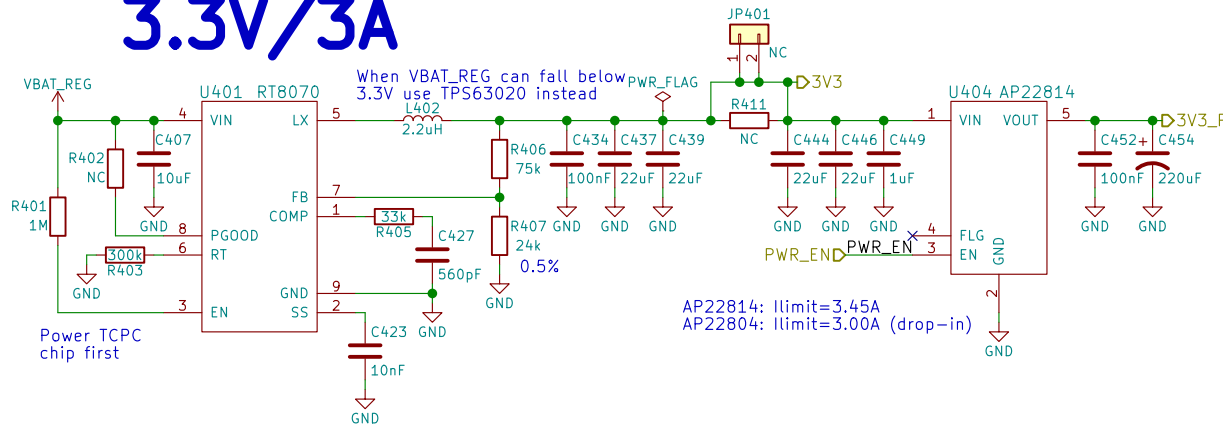
Sheet: /Battery/
 File: battery.sch

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

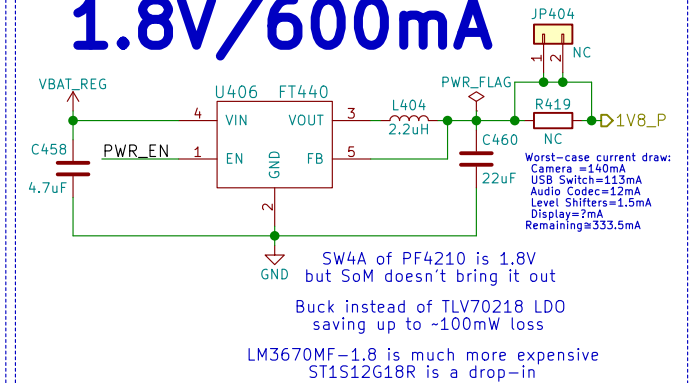
eric.kuzmenko@puri.sm
 angus.ainslie@puri.sm
 nicole.farber@puri.sm
 christian.schilmoeller@puri.sm

Rev: v0.1.0
 Id: 3/24

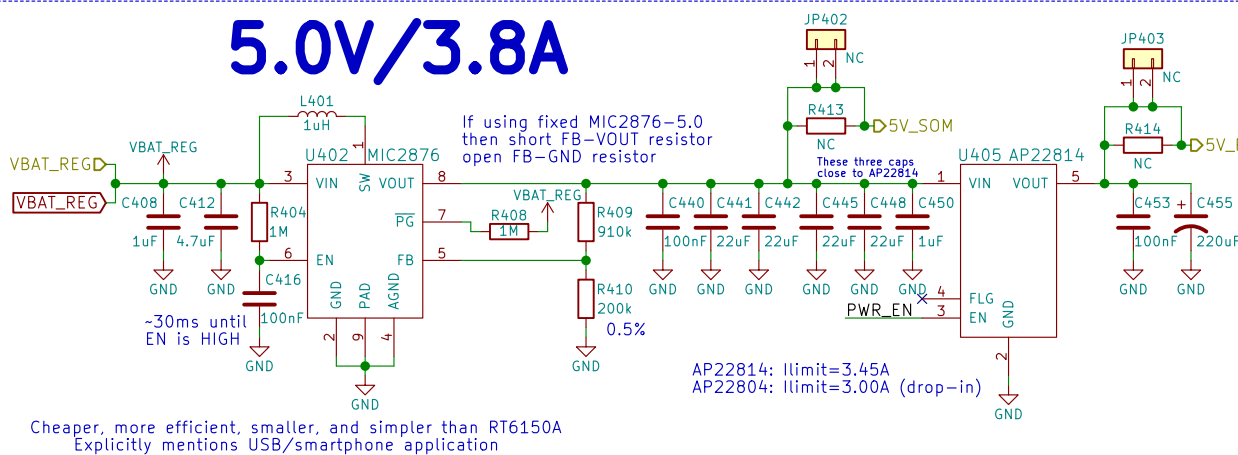
3.3V/3A



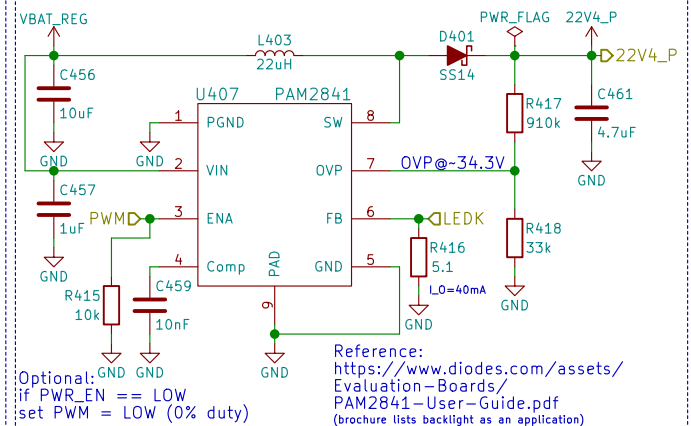
1.8V/600mA



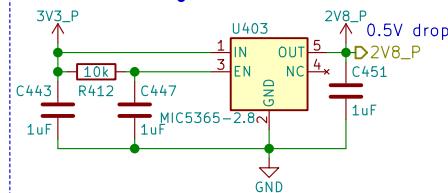
5.0V/3.8A



22.4V/40mA



2.8V/150mA



Power

Power

Purism

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Sheet: /Power/
File: power.sch

Size: A4
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Date: 2018-08-14

Rev: v0.1.0
Id: 4/24

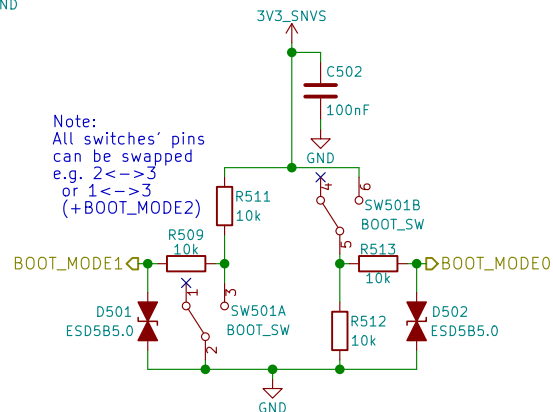
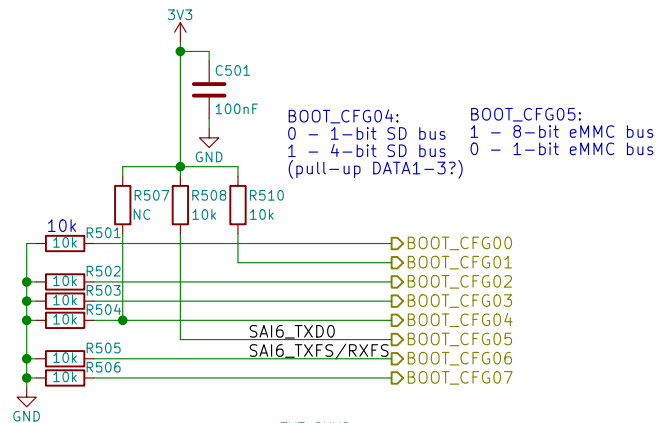
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

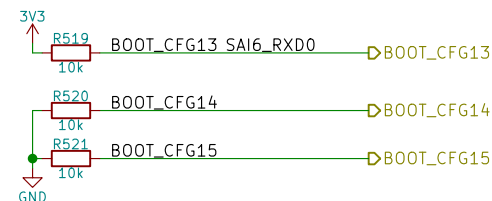
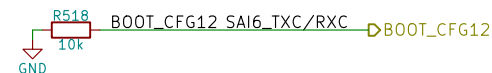
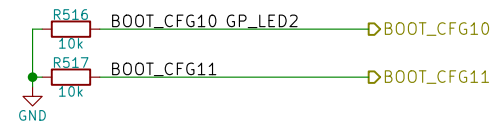
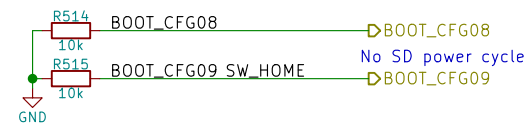
Boot Config



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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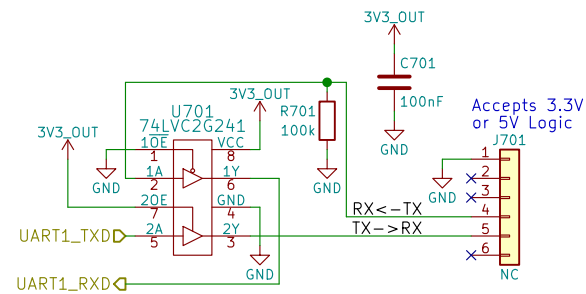
nicole.ferber@puri.sm

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Rev: v0.1.0

Id: 5/24

UART Debug



UART Debug



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Sheet: /UART Debug/

File: uart.sch

Size: A4

Date: 2018-08-14

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 7/24

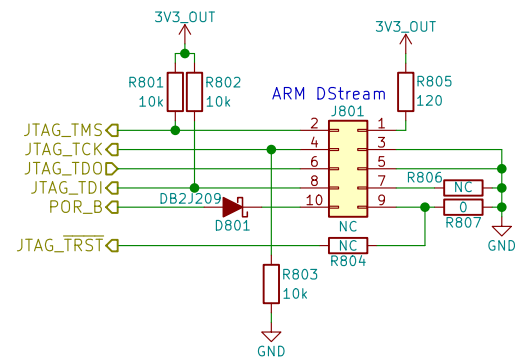
eric.kuzmenko@puri.sm

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JTAG



JTAG



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Sheet: /JTAG/

File: jtag.sch

Size: A4	Date: 2018-08-14
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Size: A4	Date: 11/01/2025
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eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

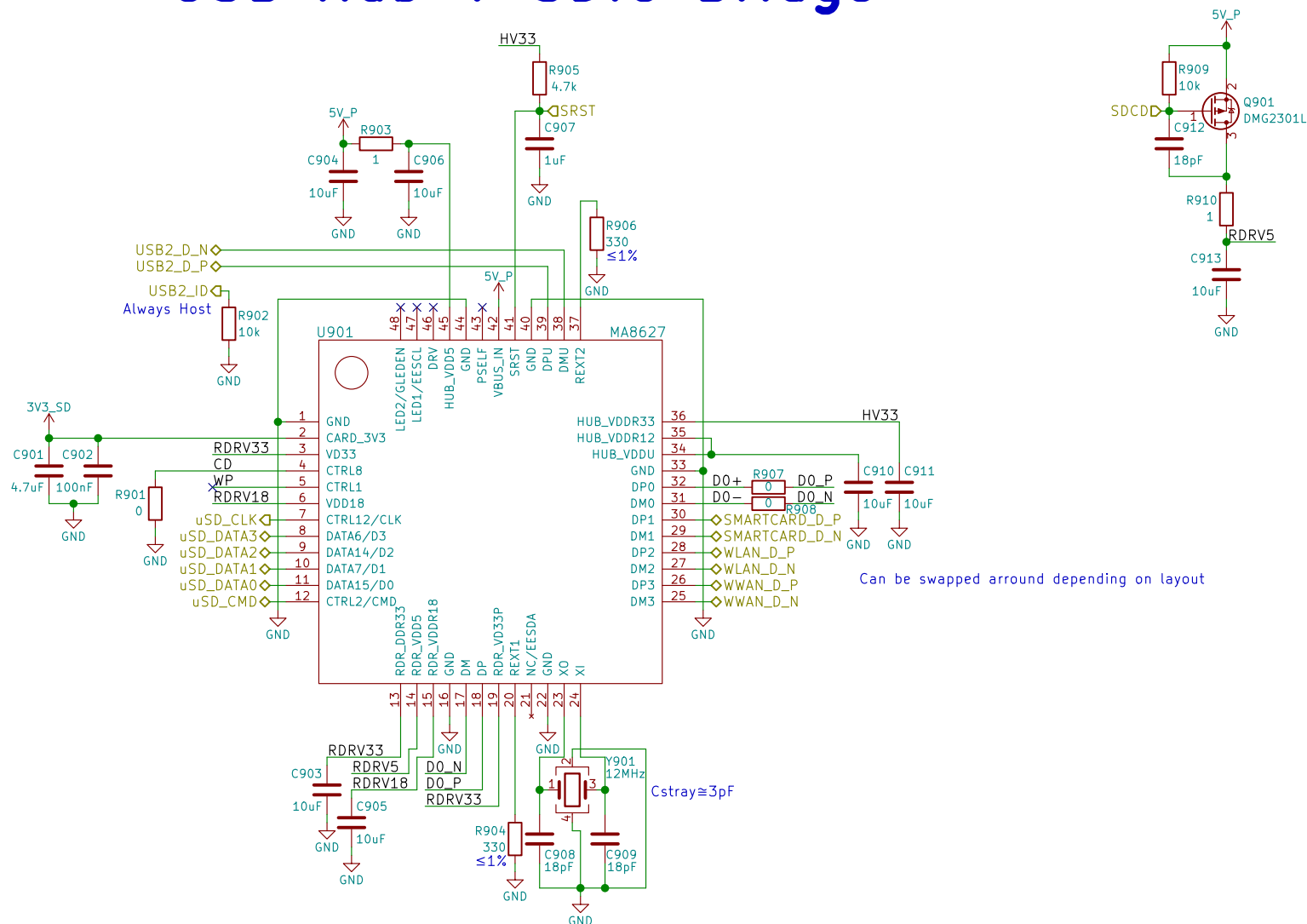
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Rev: v0.1.0

Id: 8/24

USB Hub + SDIO Bridge



USB Hub + SDIO Bridge



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

Size: A4 Date: 2018-08-14
KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm

angus.ainstie@puri.sm

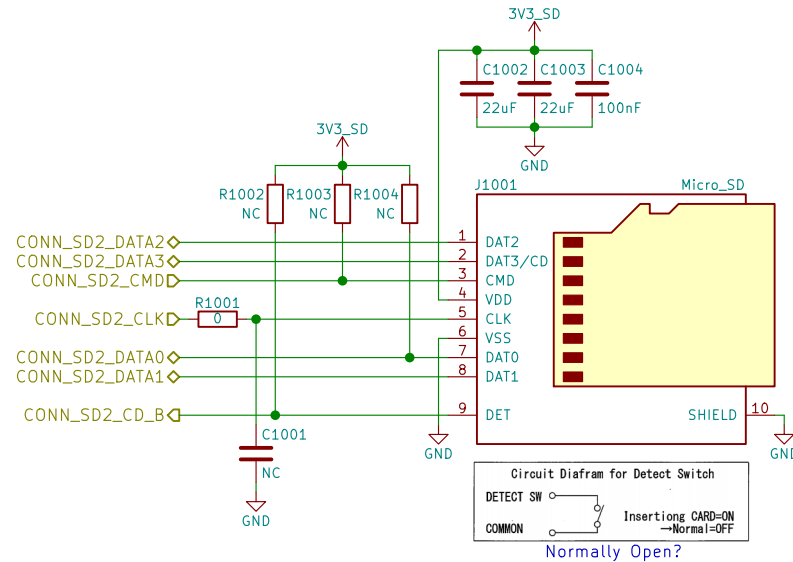
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 9/24

μSD



uSD Card



Purism

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Sheet: /uSD Card/

File: sd.sch

Size: A4 Date: 2018-08-14

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Rev: v0.1.0

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MIPI



MIPI



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Sheet: /MIPI/
File: mipi.sch

Size: A4 Date: 2018-08-14

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eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

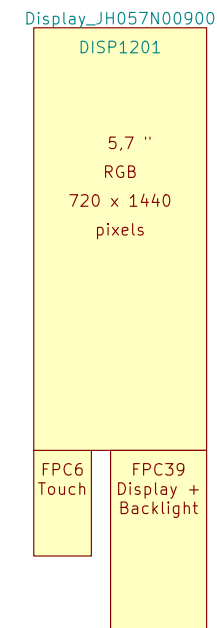
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

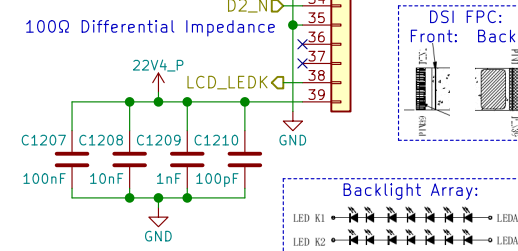
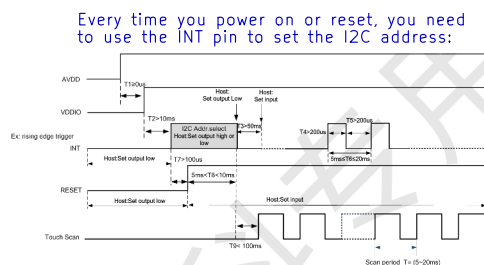
Rev: v0.1.0

Id: 11/24

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



	7-Bit Address	8-Bit Write Address	8-Bit Read Address
LOW	0x5D	0xBA	0xBB
HIGH	0x14	0x28	0x29



 **Purism**

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Size: A4	Date: 2018-08-14
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Rev: v0.1.0
Id: 12/24

A	
B	
C	
D	

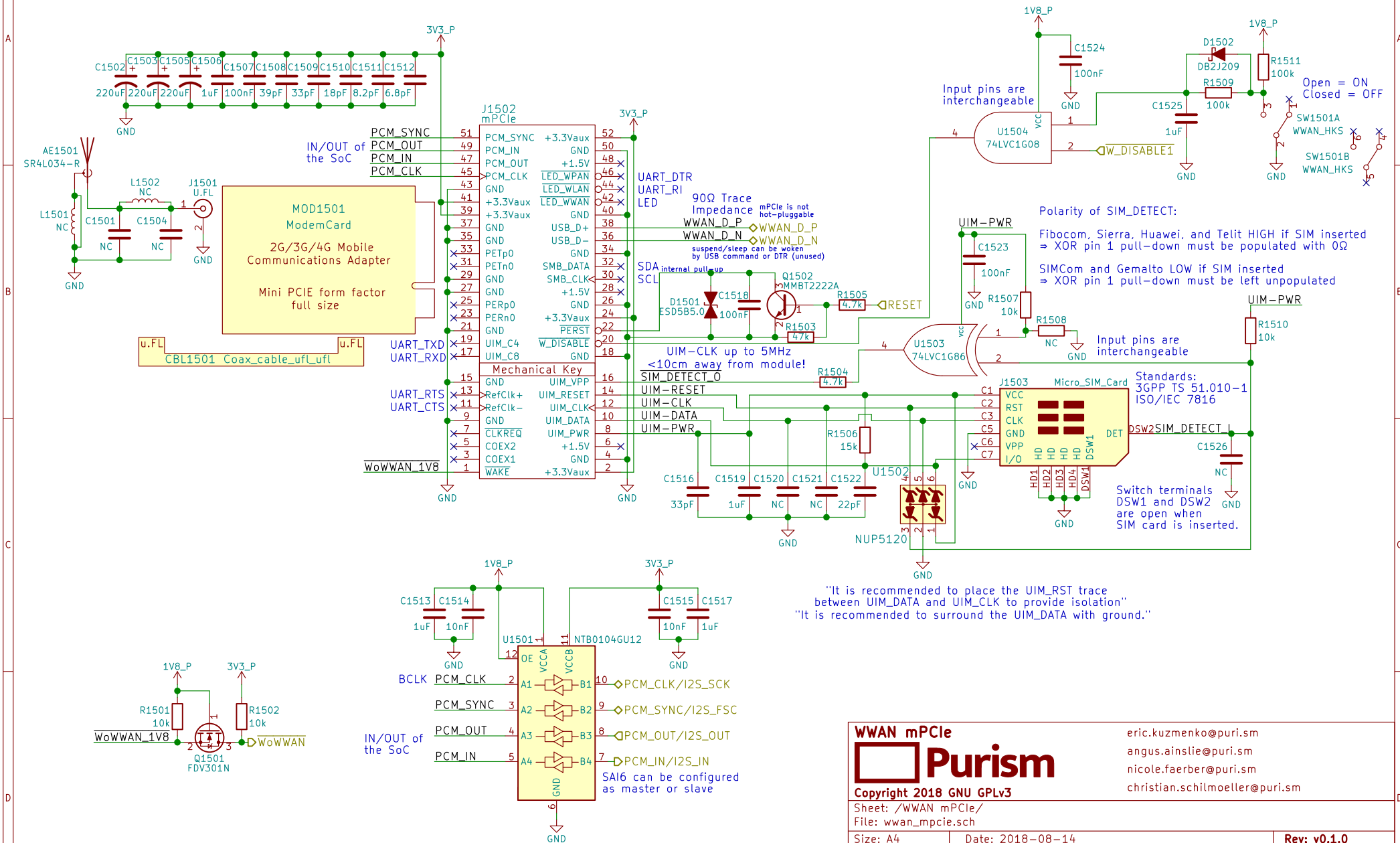


D



D

WWAN mPCIe



Purism

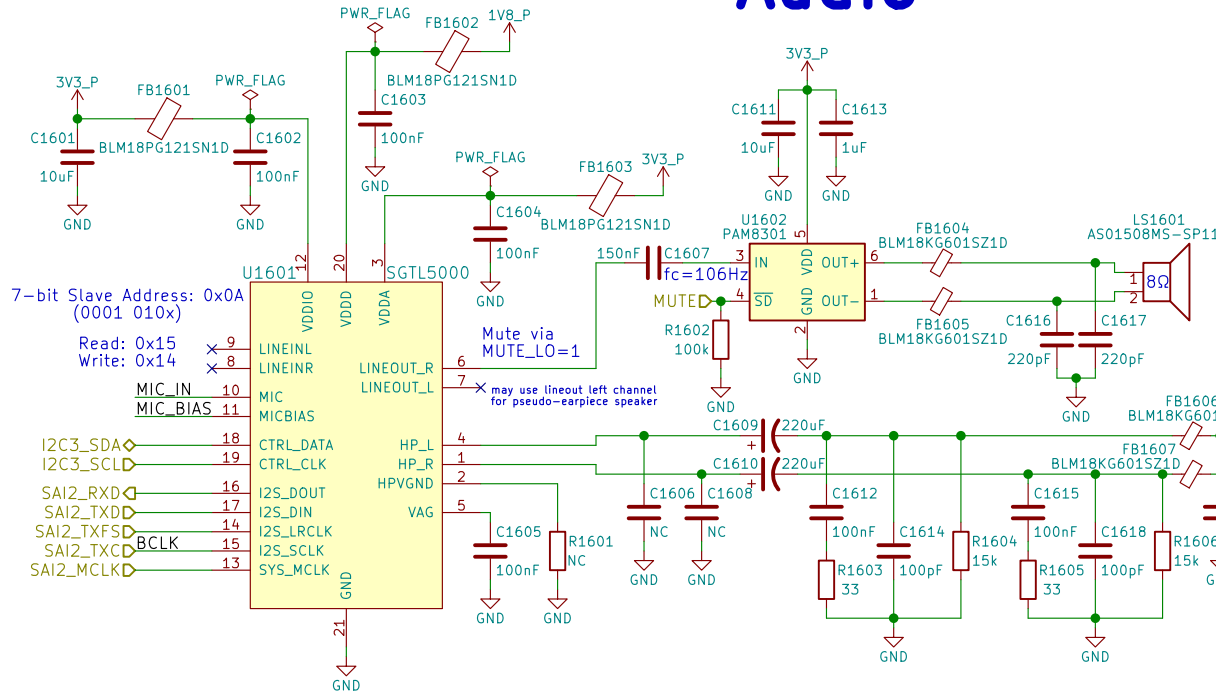
Sheet: /WWAN mPCIe/
File: wwan_mpcie.sch

Size: A4	Date: 2018-08-14
KiCad E.D.A. kicad 5.0.0	

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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.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>
 -switch-this-audio-jack-using-its-own-mechanical-switches-without-crc (Nit6 does the same)
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

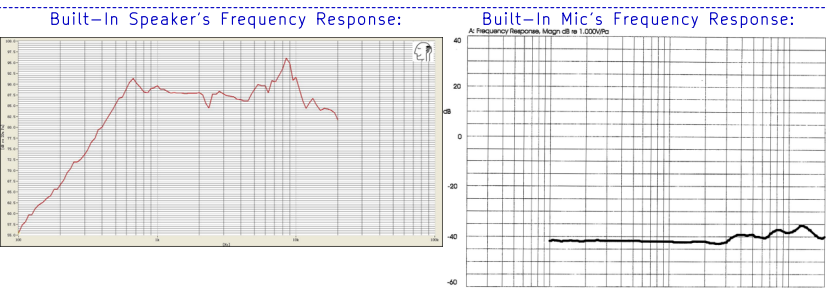
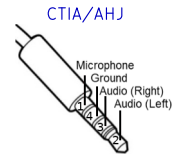
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

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

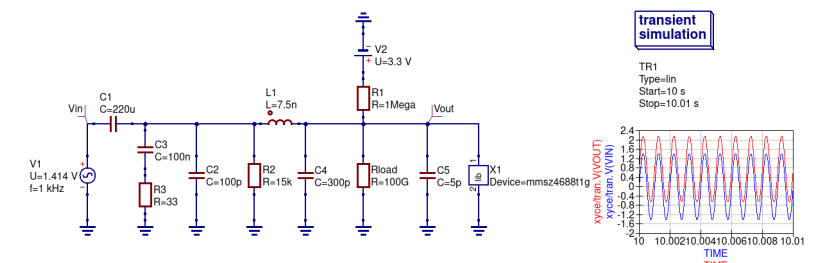
If HP_DET is HIGH for >100ms then HPs are present

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: @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 = 36.86Ohms Rp = 36.86Ohms 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
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 nicole.farber@puri.sm
 christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 16/24

-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

Note:
 All switches' pins can be swapped
 e.g. 5<->4 or 5<->6 (+camera)

[illegible]

Purism

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WLAN+BT M.2

RS9116 NC:
RTS, CTS, BT_HOST_WAKE

RS9116 datasheet says
no WIFI_WAKE
but the schematic has it

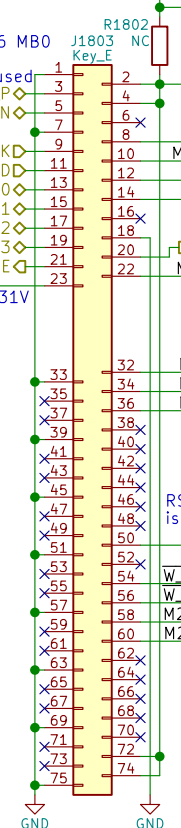
RedPine RS9116 MB0
Requires 5V on
Pin 54 if USB used

WLAN_D_P
WLAN_D_N
WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE

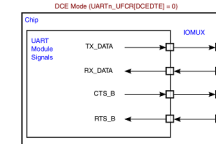
RedPine RS9116
has 100k pull-up to
3.3V making SDIO_RST
~2.55V when HIGH

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

Pin 54 on RS9116 is
USB_VBUS Sink

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK

W_DISABLE2
W_DISABLE1
M2_I2C_SDA
M2_I2C_SCL

U1803A
74AUP2G08
U1803B
74AUP2G08

BT_DISABLE
WIFI_DISABLE

Input pins are
interchangeable

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

M2_I2C_SDA
M2_I2C_SCL

Q1801
FDV301N
Q1802
FDV301N

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

WLAN+BT M.2
Purism

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

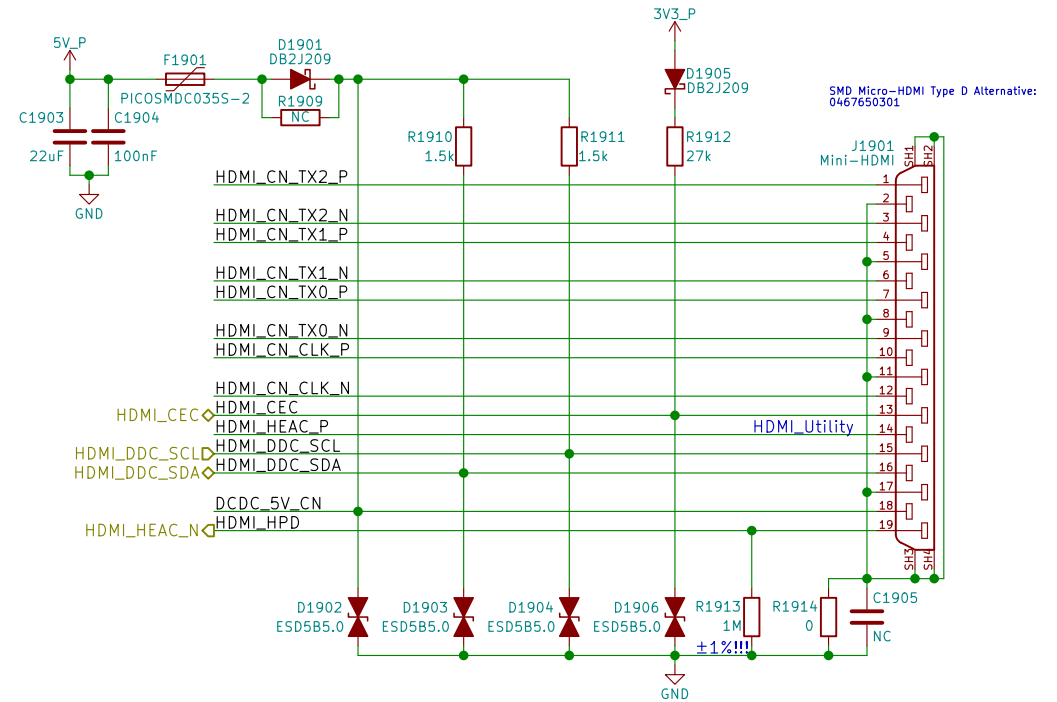
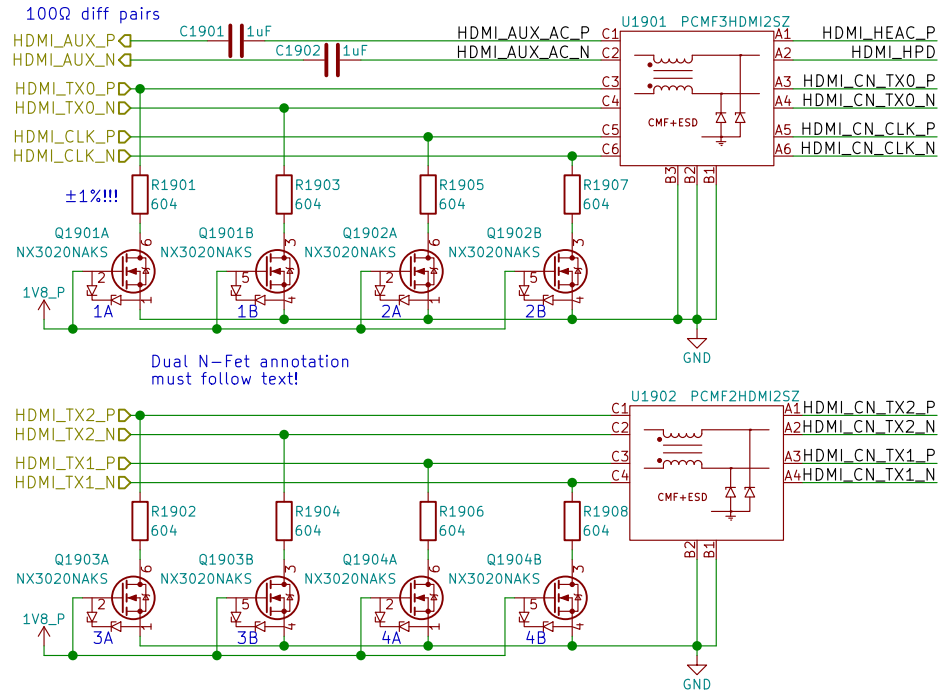
Size: A4
KiCad E.D.A. kicad 5.0.0

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

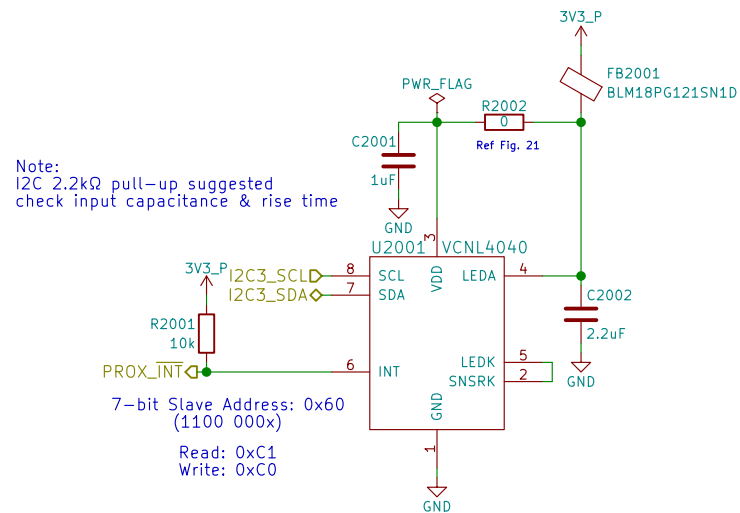
Date: 2018-08-14

Rev: v0.1.0
Id: 19/24

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

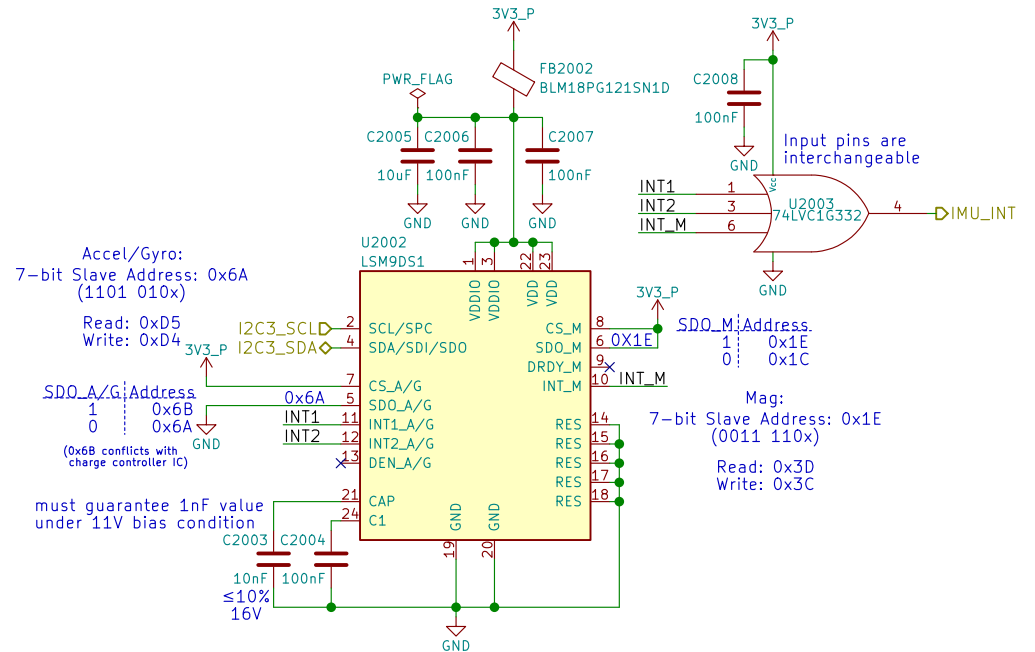
Sensors

Proximity & Ambient Light

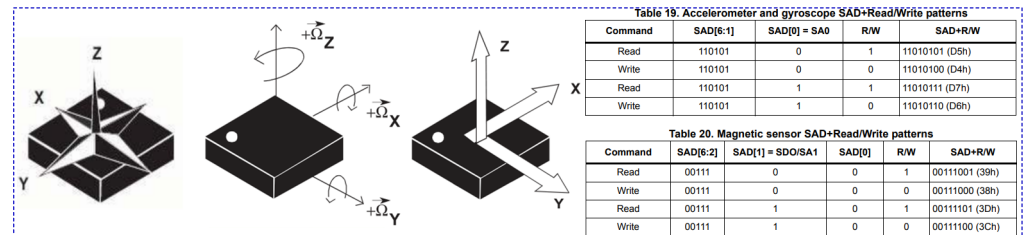


Reference:
<https://www.vishay.com/docs/84307/designingvcnl4040.pdf>
<http://www.vishay.com/docs/84931/vcni4040sensorboardfiles.pdf>

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

angus.ainslie@puri.sm

nicole.farber@puri.sm

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Size: A4	Date: 2018-08-14
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Size: A1	Date:
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Rev: v0.1.0

Id: 20/24

SPI NOR Flash  Purism		eric.kuzmenko@puri.sm angus.ainslie@puri.sm nicole.faerber@puri.sm christian.schilmoeller@puri.sm
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Sheet: /SPI Flash/ File: flash.sch		
Size: A4	Date: 2018-08-14	Rev: v0.1.0
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[illegible]

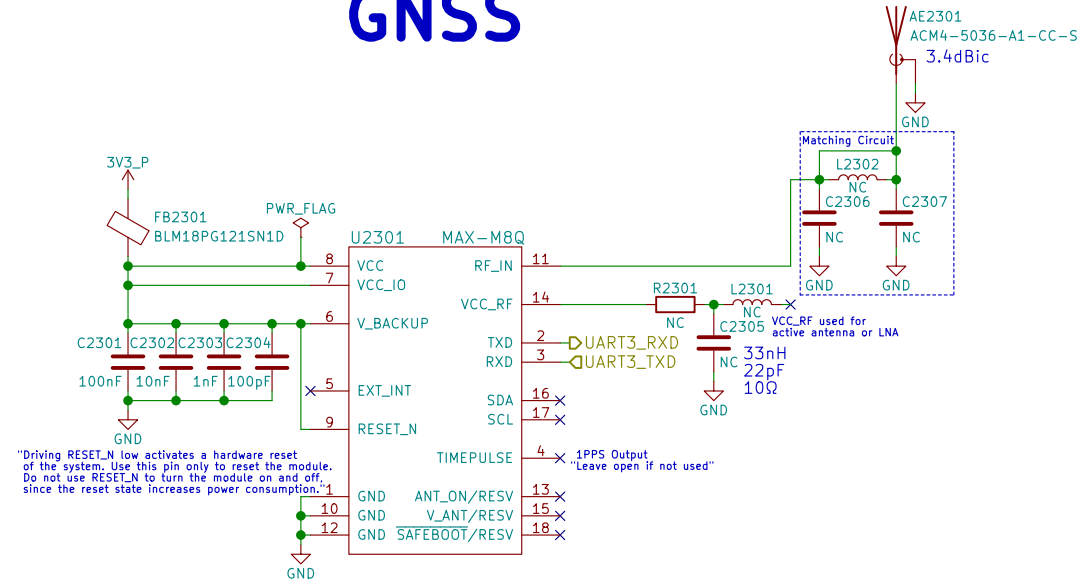
Smart Card



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-8-M8-FW3_HardwareIntegrationManual_L%28UBX-15030059%29.pdf

GNSS



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Sheet: /GNSS/
File: gnss.sch

Size: A4 Date: 2018-08-14
KiCad E.D.A. kicad 5.0.0

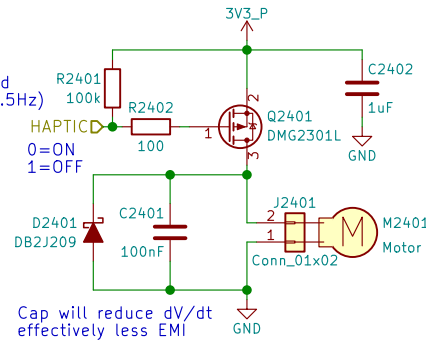
eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
nicole.ferber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 23/24

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: 2018-08-14
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 angus.ainslie@puri.sm
 nicole.farber@puri.sm
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Rev: v0.1.0
 Id: 24/24