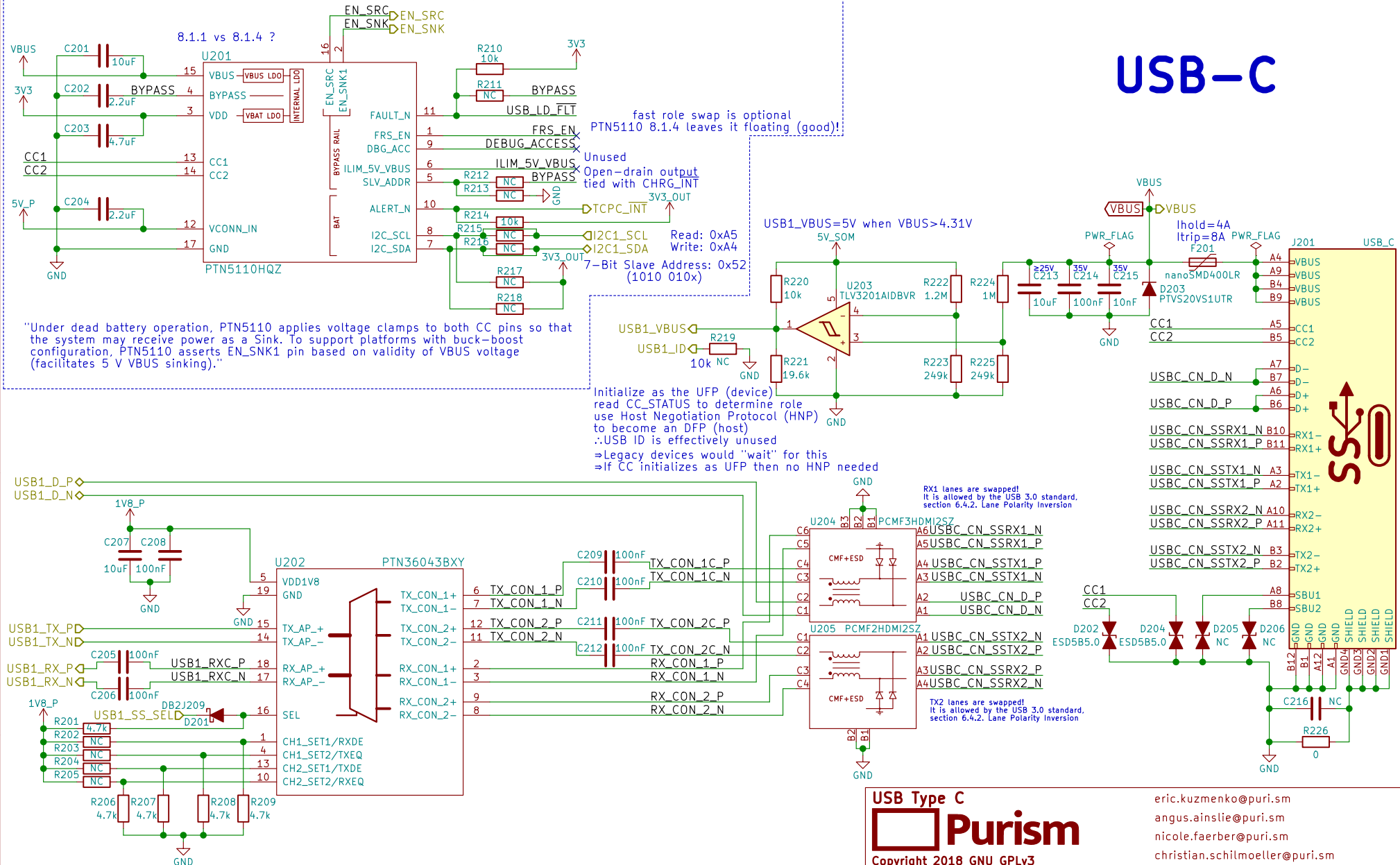


USB-C TCPC - Config Channel (CC) and PD Role Controller

USB-C



USB Type C

Purism

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

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

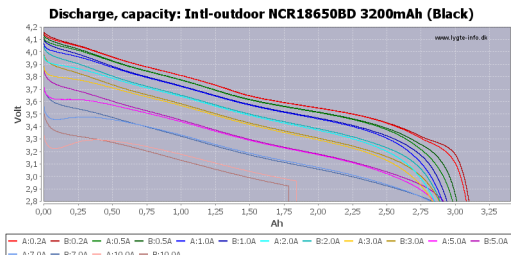
eric.kuzmenko@puri.sm

angus.ainstie@puri.sm

nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 2/24



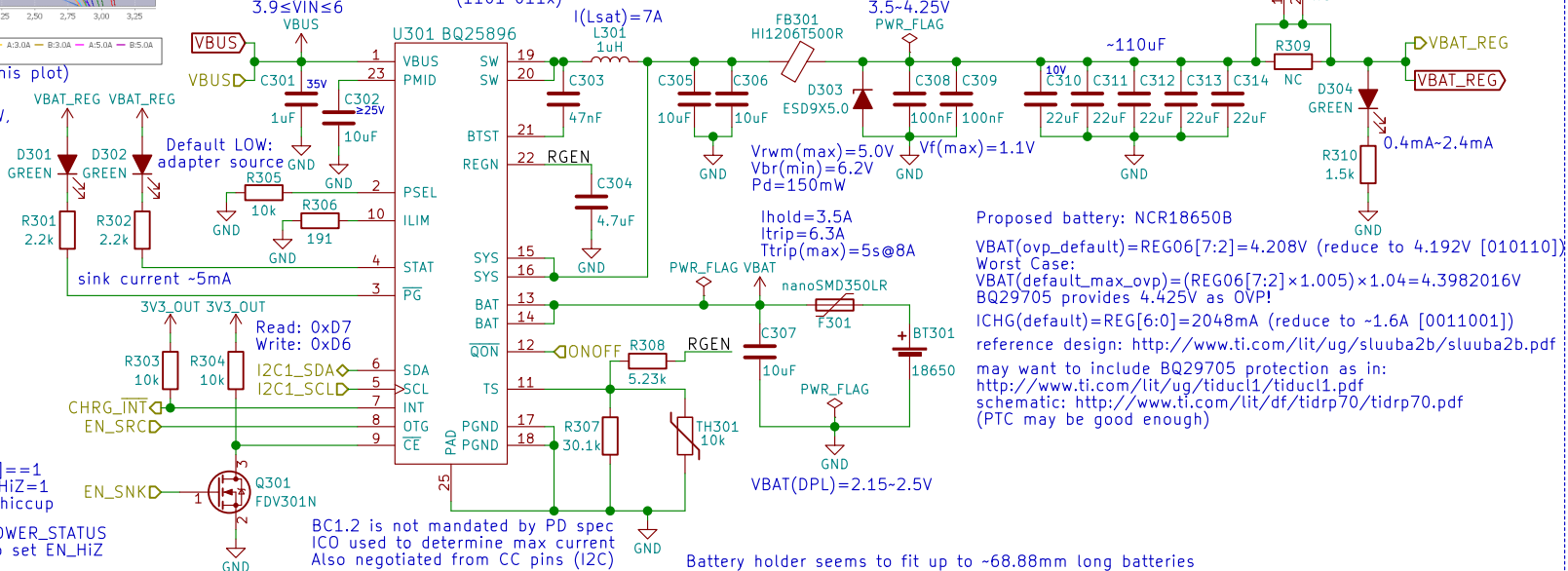
(interpret RSOC% based on this plot)

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 $V_{BUS} \rightarrow V_{OUT}$ 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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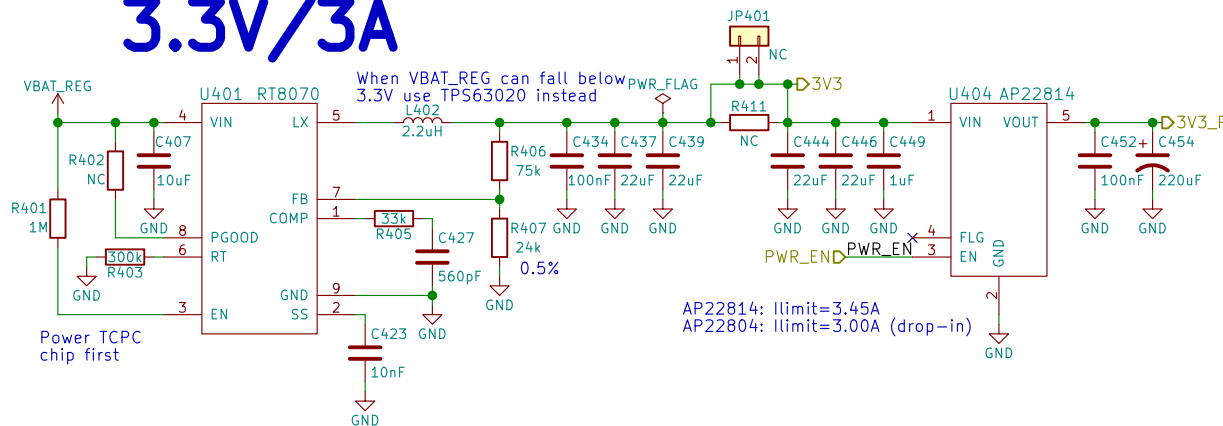
Sheet: /Battery/
 File: battery.sch

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

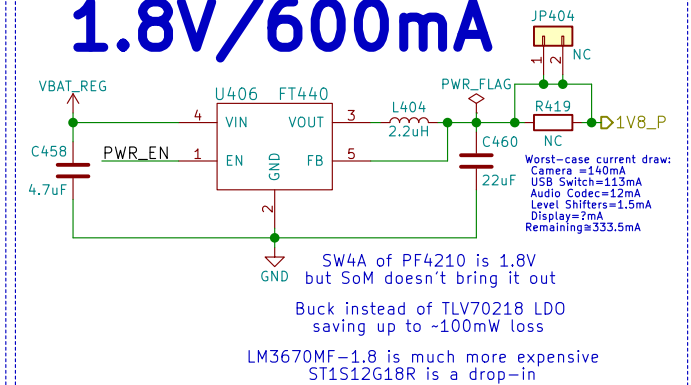
eric.kuzmenko@puri.sm
 angus.ainslie@puri.sm
 nicole.farber@puri.sm
 christian.schilmoeller@puri.sm

Rev: v0.1.0
 Id: 3/24

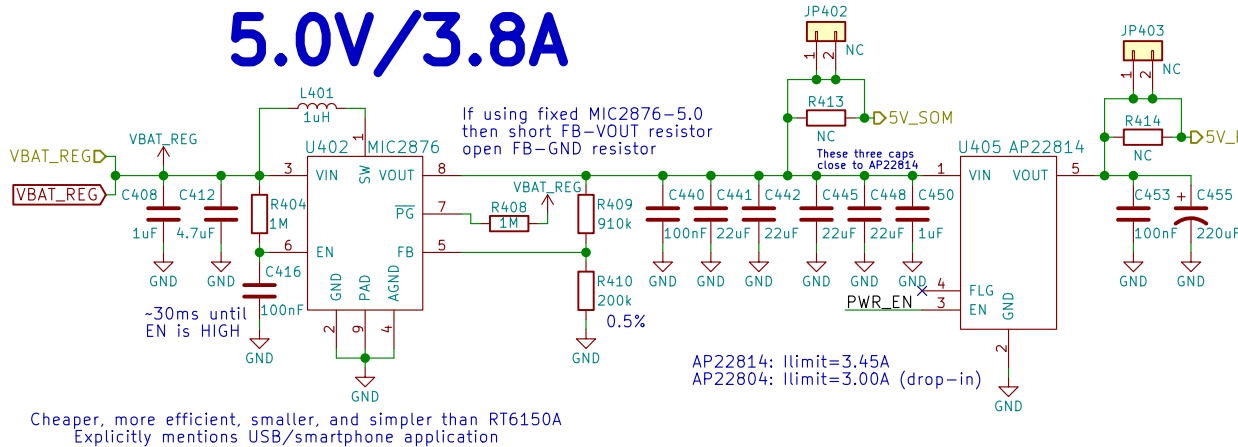
3.3V/3A



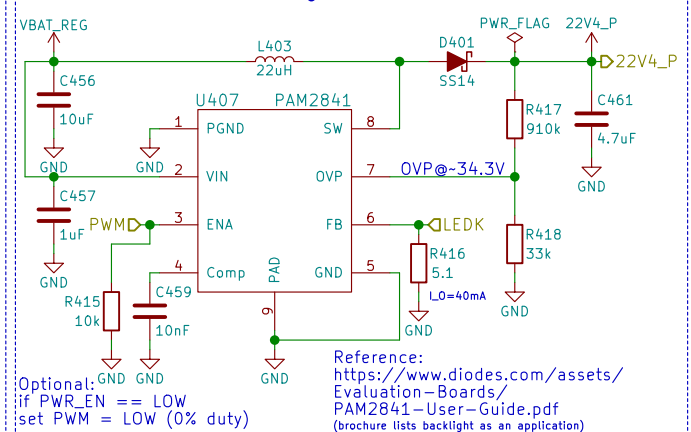
1.8V/600mA



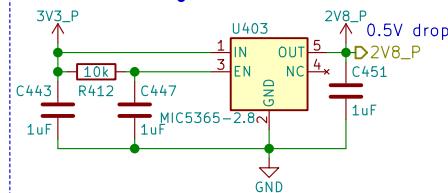
5.0V/3.8A



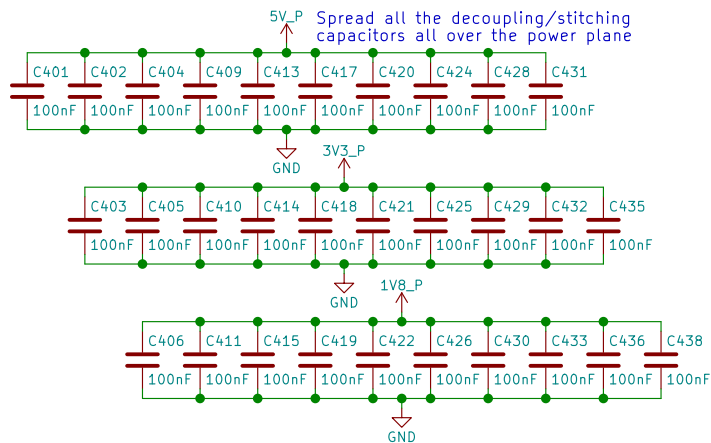
22.4V/40mA



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

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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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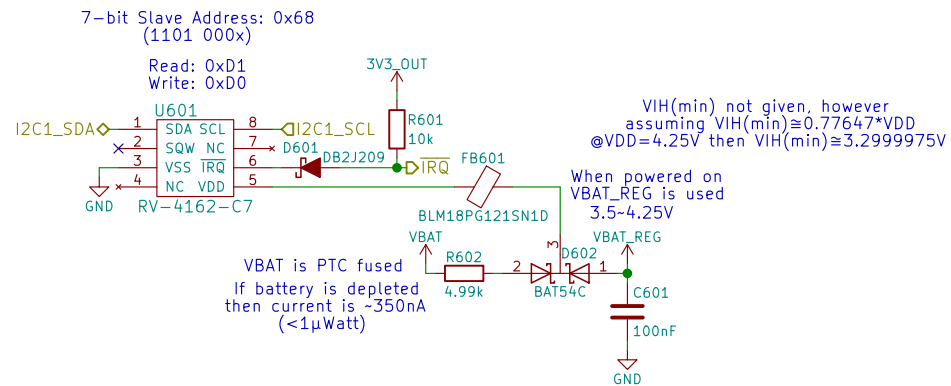
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 5/24

Real-Time Clock



Note:
Datasheet says slave address is 0xD0
with a R/W bit appended, since 0xD must
be 4-bits wide the actual 7-bit address is
0x68 (110 1000), and becomes 0xD0 during a
write operation (1101 0000)

Reference:
https://github.com/HIO-Project/linux-imx6-nano-imx_3.10.17_1.0.1_ga/blob/8848e94b2f889fe44f6736e2d4c98851a2282275/arch/arm/boot/dts/imx6qdl-mtp.dtsi#L351

RTC



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Sheet: /RTC/

File: rtc.sch

Size: A4 Date: 2018-08-14

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angus.ainstlie@puri.sm

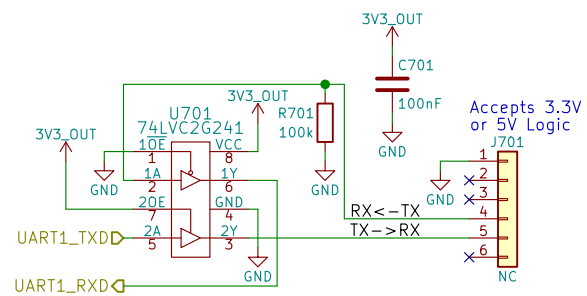
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christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 6/24

Accepts 3.3V or 5V Logic



 Purism

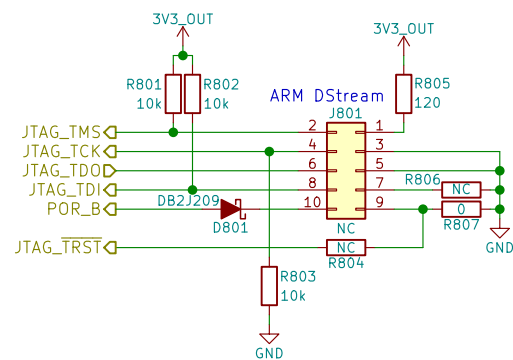
eric.kuzmenko@puri.sm
angus.ainslie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

File: uart.sch

Rev: v0.1.0

Id: 7/24

JTAG



JTAG



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Sheet: /JTAG/

File: jtag.sch

Size: A4	Date: 2018-08-14
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Size: A4	Date: 2
KiCad E.D.A.	kicad 5.0.0

eric.kuzmenko@puri.sm

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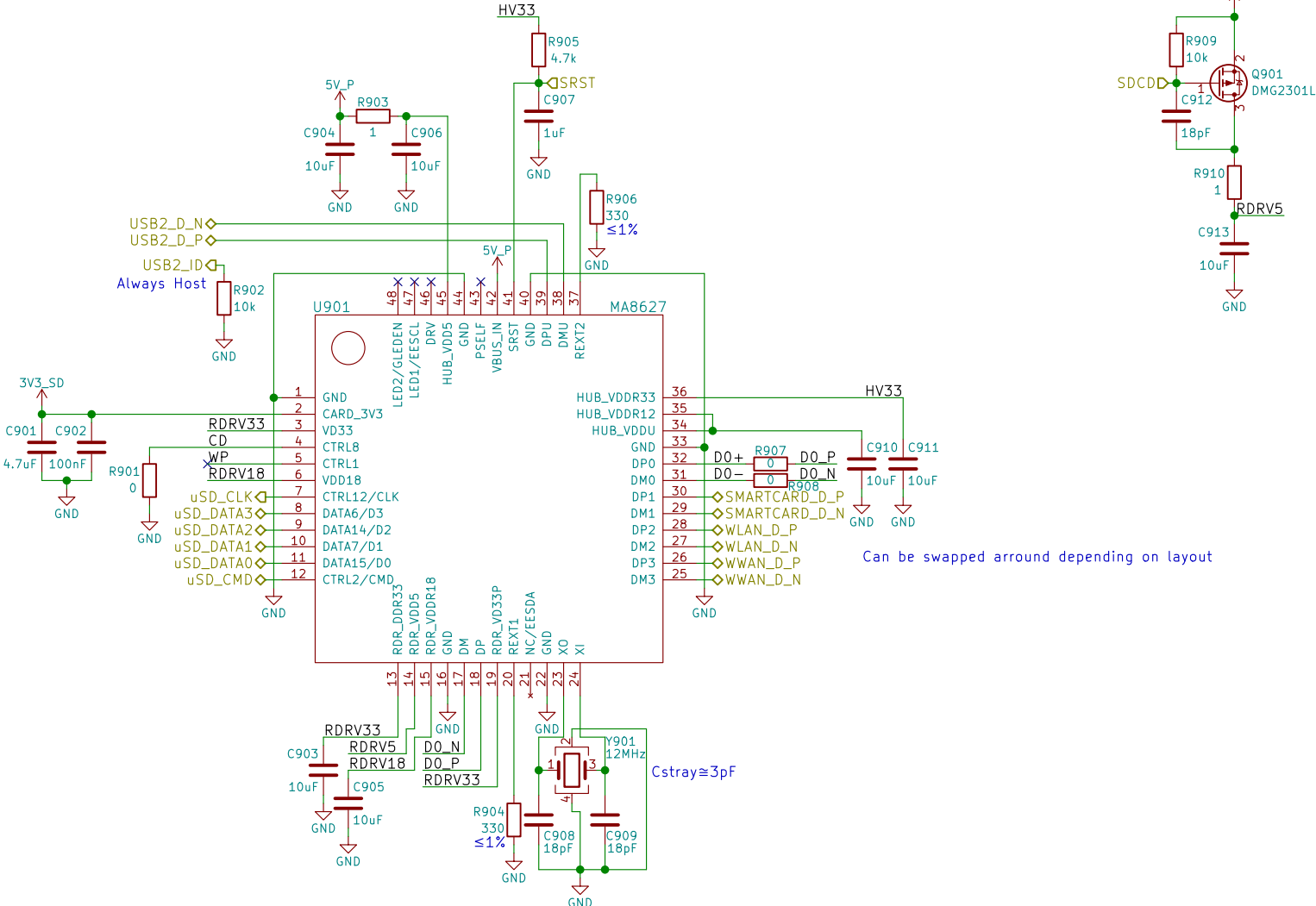
nicole.faerber@puri.sm

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: 2018-08-14

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eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

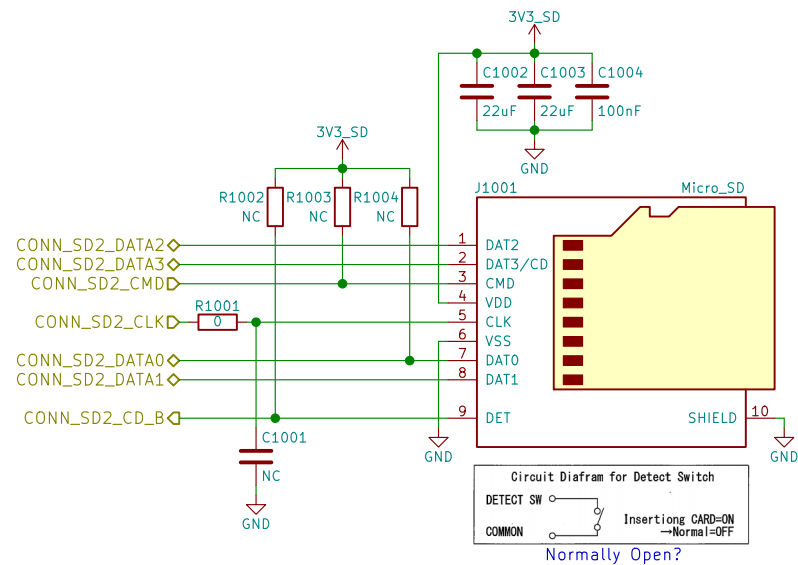
nicole.farber@puri.sm

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

eric.kuzmenko@puri.sm

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christian.schilmoeller@puri.sm

Size: A4	Date: 2018-08-14
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Size: A4	Date: 11/01/2025
KiCad E.D.A.	kicad 5.0.0

Rev: v0.1.0

Id: 10/24

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

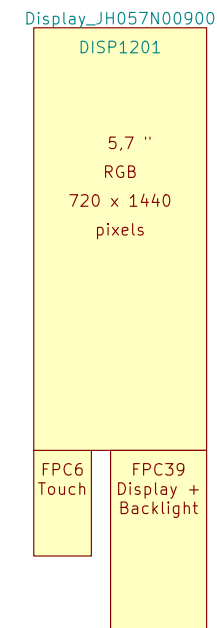
nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

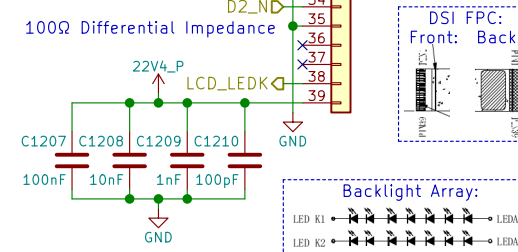
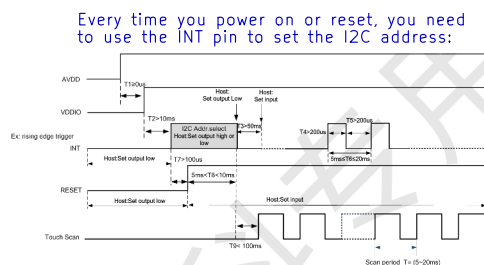
Rev: v0.1.0

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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christian.schilmoeller@puri.sm

Size: A4	Date: 2018-08-14
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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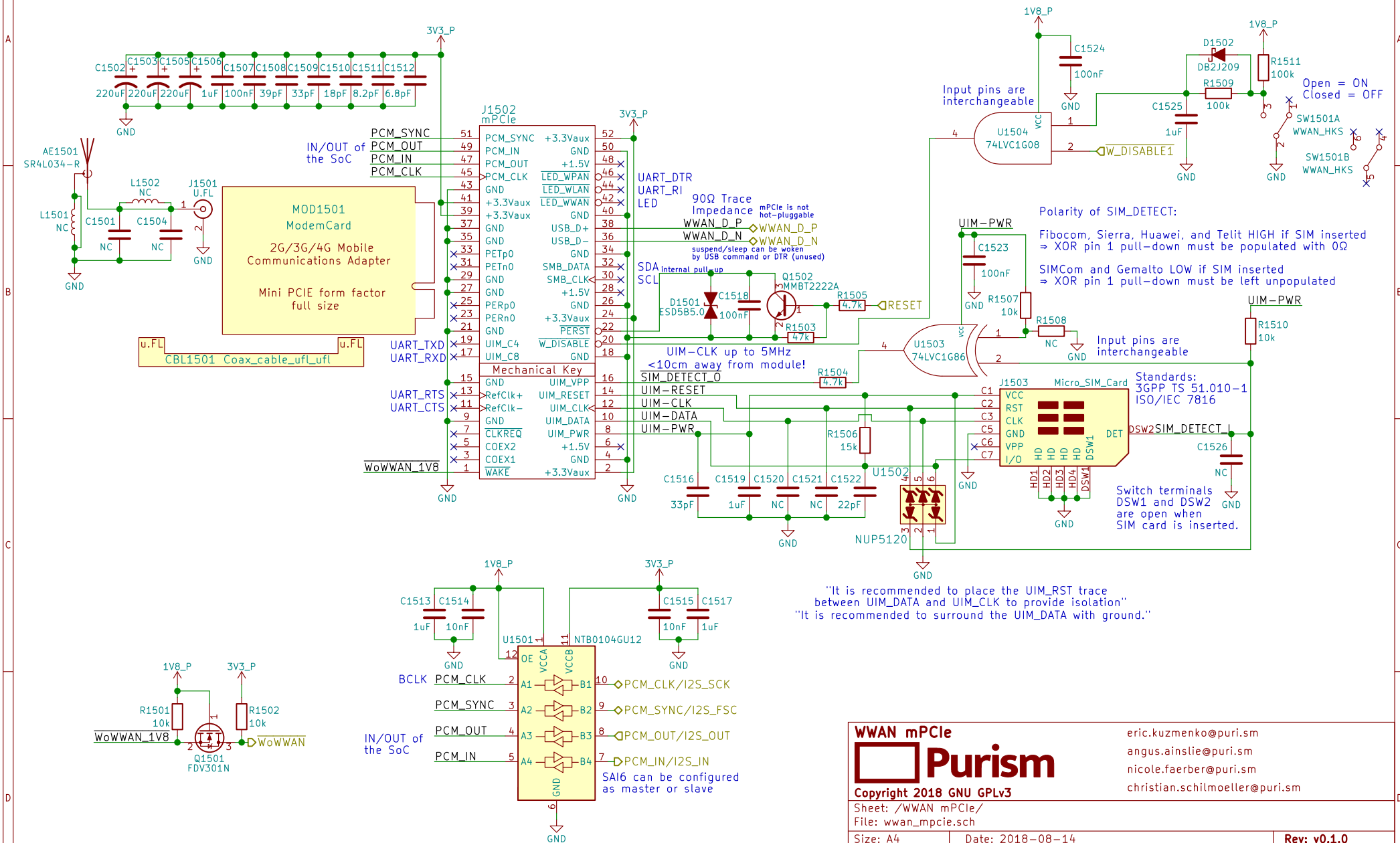
Sheet: /Buttons & LED/
 File: buttons_led.sch

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

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

Rev: v0.1.0
 Id: 14/24

WWAN mPCIe



Purism

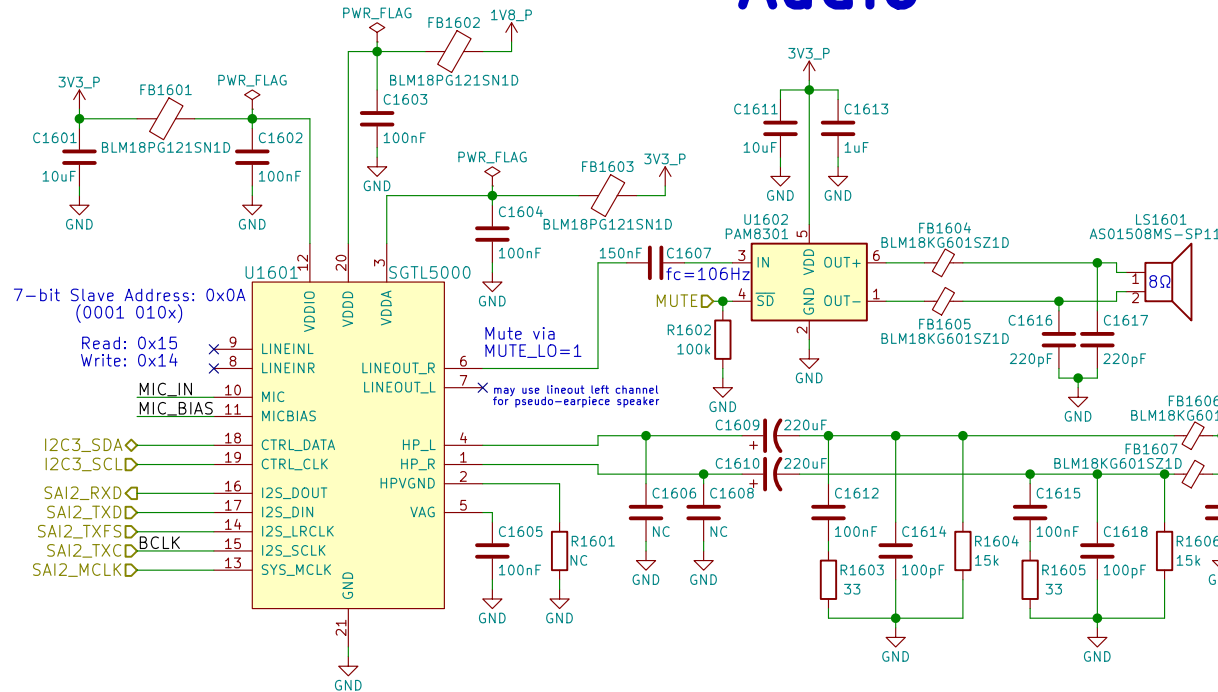
Sheet: /WWAN mPCIe/
File: wwan_mpcie.sch

Size: A4	Date: 2018-08-14
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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-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

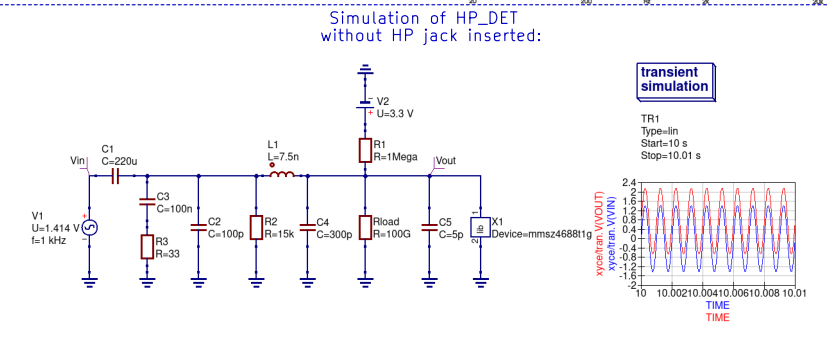
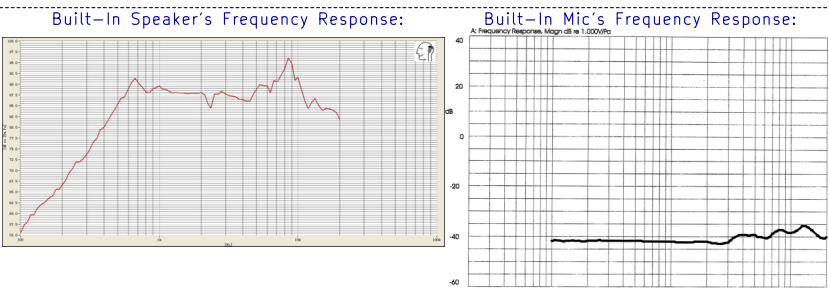
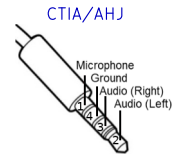
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

"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



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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-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

Power Supply:

- 3V3_P:** BLM18PG121SN1D, C1703 (1uF), C1705 (220nF), C1704 (10uF), C1706 (220nF).
- ENET_2V5:** C1707 (220nF), C1708 (1uF), C1710 (1uF).
- ENET_1V1:** L1701 (4.7uH), C1713 (10uF), C1716 (220nF).

Signal Connections:

- TX:** ENET_TXC, ENET_TD0, ENET_TD1, ENET_TD2, ENET_TD3, ENET_TX_CTL, ENET_TX_CLK, ENET_TX_CTL.
- RX:** ENET_RXC, ENET_RD0, ENET_RD1, ENET_RD2, ENET_RD3, ENET_RX_CTL, ENET_RX_CLK, ENET_RX_CTL.
- Control:** LED_ACT, LED_LINK1000, LED_LINK10_100, LED_LINK1000, LED_ACT.

Components:

- Resistors:** R1701, R1702, R1703, R1704, R1705, R1706, R1707, R1708, R1709, R1710, R1711, R1712, R1713, R1714, R1715, R1716, R1717, R1718, R1719, R1720, R1721, R1722, R1723, R1724, R1725.
- Capacitors:** C1701, C1702, C1703, C1704, C1705, C1706, C1707, C1708, C1710, C1713, C1716, C1717, C1718, C1719, C1720, C1721, C1722, C1723, C1724, C1725.
- Fuses:** FB1701, FB1702, FB1703.
- Crystal:** Y1701 (25MHz).
- LED:** D1702 (GREEN).

Legend:

- GREEN: LED_LINK1000
- YELLOW: LED_LINK10_100

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Ethernet

Purism

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nicole.faeber@puri.sm
christian.schilmoeller@puri.sm

Sheet: /Ethernet/
File: ethernet.sch

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

Rev: v0.1.0
Id: 17/24



Purism

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

WLAN+BT M.2

RS9116 NC:
RTS, CTS, BT_HOST_WAKE

RS9116 datasheet says
no WIFI_WAKE
but the schematic has it

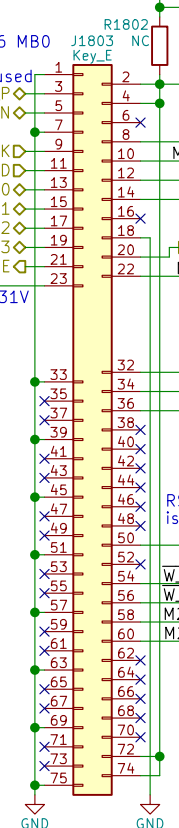
RedPine RS9116 MB0
Requires 5V on
Pin 54 if USB used

WLAN_D_P
WLAN_D_N
WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE

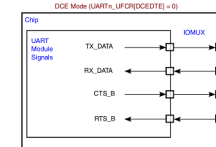
RedPine RS9116
has 100k pull-up to
3.3V making SDIO_RST
~2.55V when HIGH

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 output
RX input
CTS output
RTS input
⇒ 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

Input pins are
interchangeable

BT_DISABLE

WIFI_DISABLE

SW1801A
WLAN_HKS

SW1801B
WLAN_HKS

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

Open = ON
Closed = OFF

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

Q1803
FDV301N

Q1804
FDV301N

Q1805
FDV301N

Q1806
FDV301N

Q1807
FDV301N

Q1808
FDV301N

Q1809
FDV301N

Q1810
FDV301N

Q1811
FDV301N

Q1812
FDV301N

Q1813
FDV301N

Q1814
FDV301N

Q1815
FDV301N

Q1816
FDV301N

Q1817
FDV301N

Q1818
FDV301N

WLAN+BT M.2

Purism

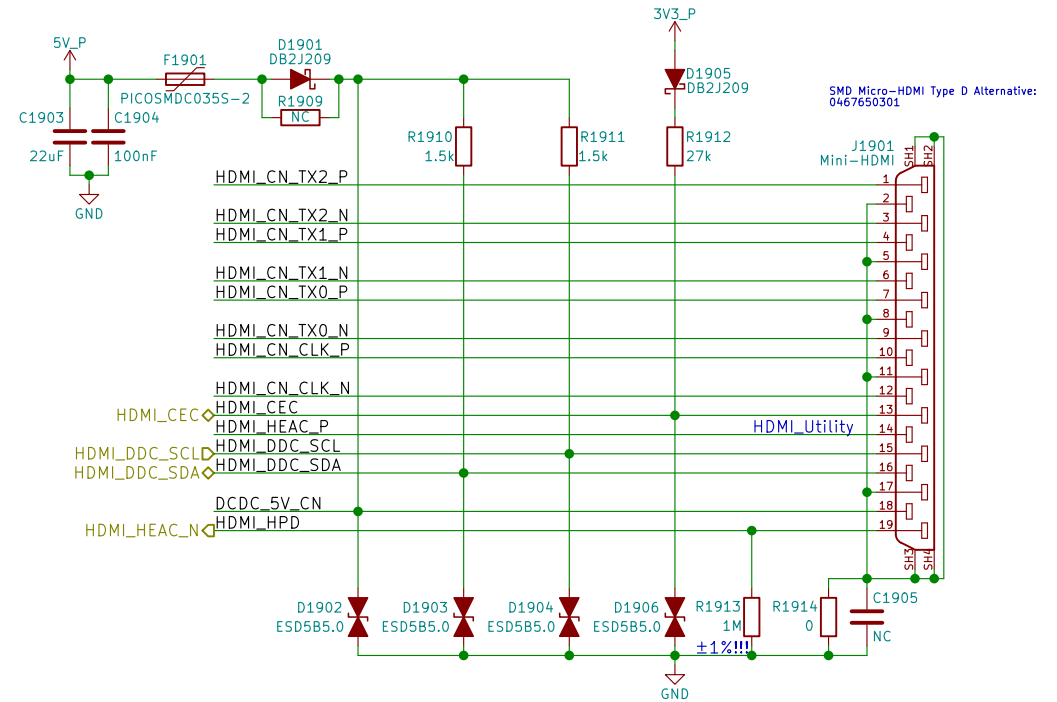
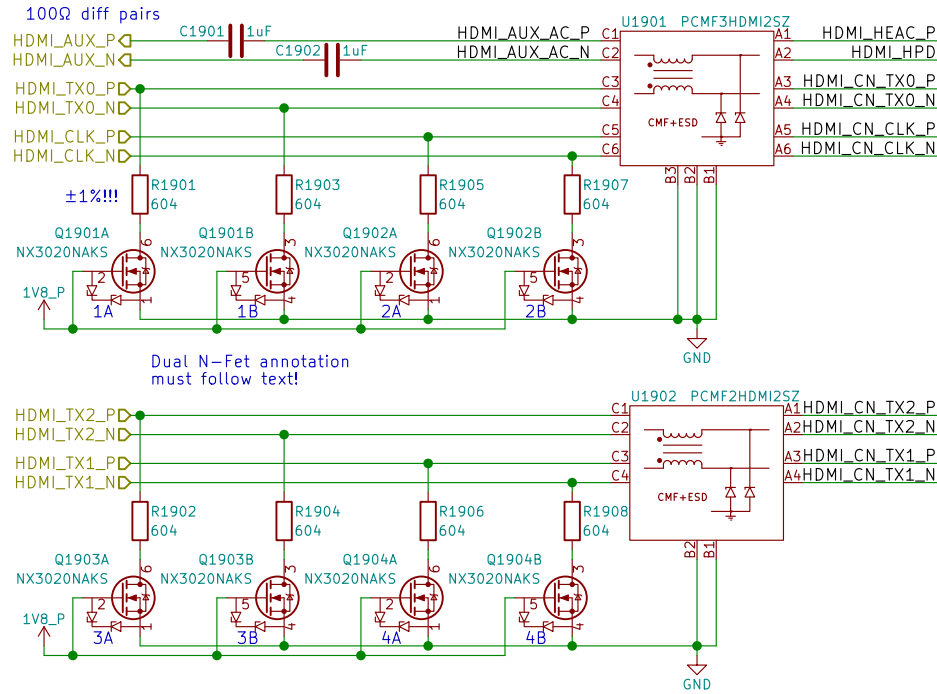
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christian.schilmoeller@puri.sm

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Sheet: /WLAN+BT M.2/
File: wifi_bt_m2.sch
Size: A4
KiCad E.D.A. kicad 5.0.0

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

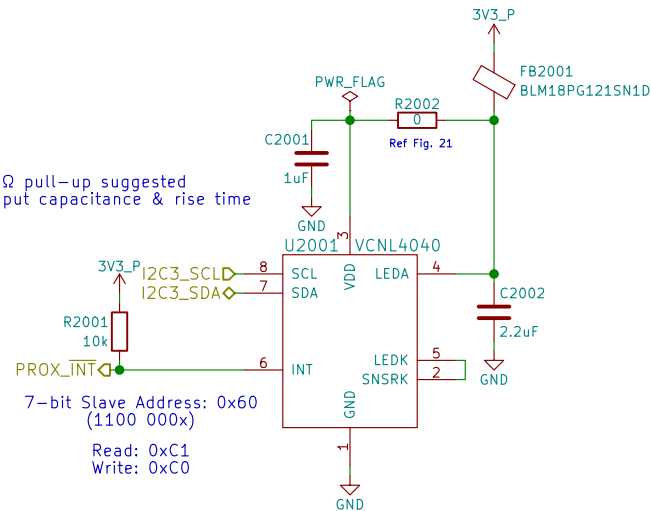
eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 19/24

Sensors

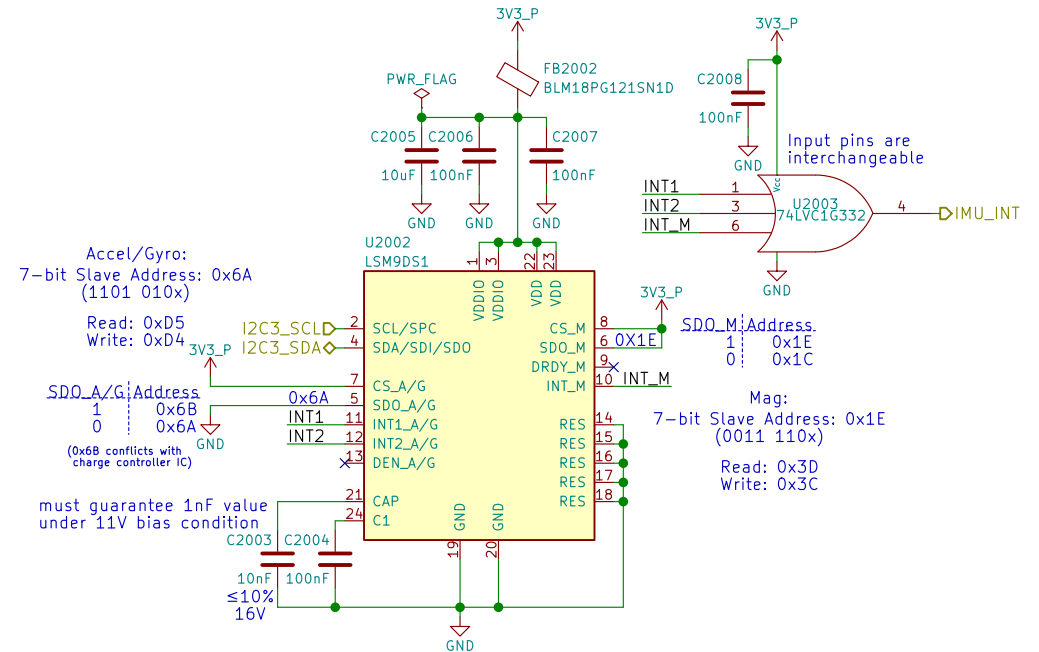
Proximity & Ambient Light

Note:
I2C 2.2k Ω pull-up suggested
check input capacitance & rise time



Reference:
<https://www.vishay.com/docs/84307/designingvcnl4040.pdf>
<http://www.vishay.com/docs/84931/vcnl4040sensorboardfiles.pdf>

9-Axis IMU



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

Table 19. Accelerometer and gyroscope SAD*Read/Write patterns

Command	SAD[6:1]	SAD[0] = SA0	R/W	SAD+R/W
Read	110101	0	1	11010101 (D5h)
Write	110101	0	0	11010100 (D4h)
Read	110101	1	1	11010111 (D7h)
Write	110101	1	0	11010110 (D6h)

Table 20. Magnetic sensor SAD*Read/Write patterns

Command	SAD[6:2]	SAD[1] = SDO/SA1	SAD[0]	R/W	SAD+R/W
Read	00111	0	0	1	00111001 (39h)
Write	00111	0	0	0	00111000 (38h)
Read	00111	1	0	1	00111101 (3Dh)
Write	00111	1	0	0	00111100 (3Ch)

Sensors



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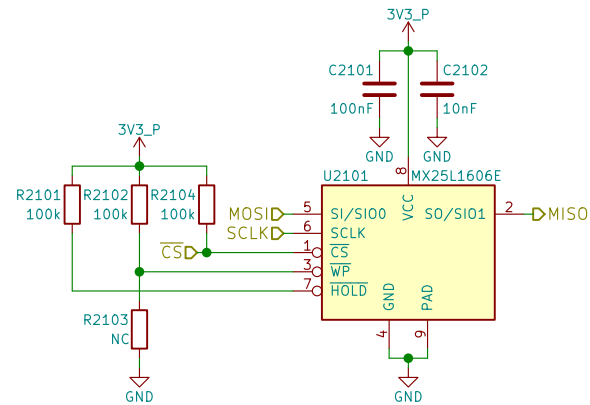
Sheet: /Sensors/
File: sensors.sch

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

eric.kuzmenko@puri.sm
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christian.schilmoeller@puri.sm

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

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Rev: v0.1.0
Id: 21/24

[illegible]

Smart Card



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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
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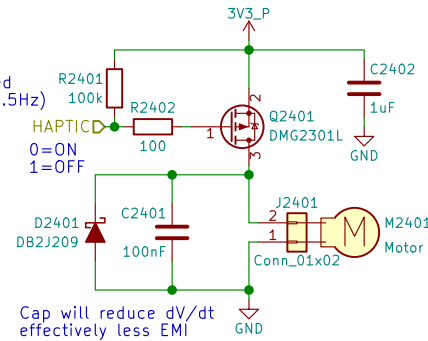
Id: 23/24

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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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 File: haptic.sch

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