

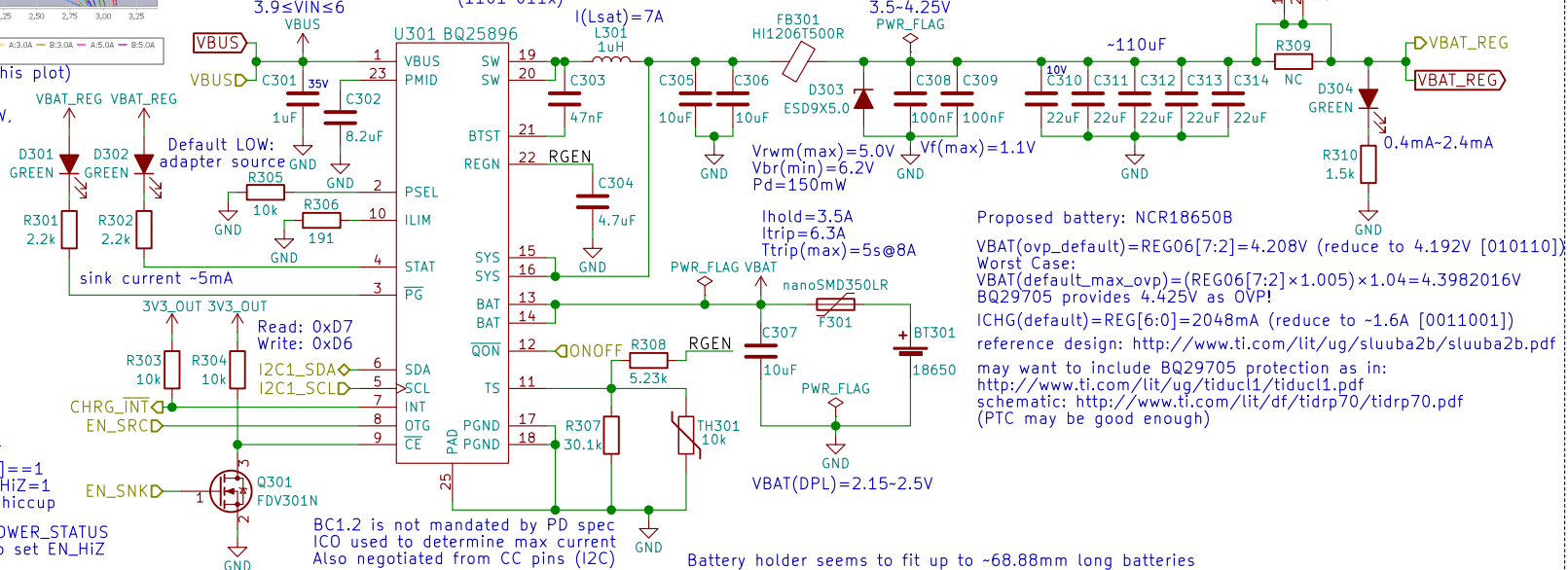


(interpret RSOC% based on this plot)

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)



sink current ~5mA

3V3_OUT 3V3_OUT

Read: 0xD7 Write: 0xD6

I2C1_SDA I2C1_SCL

CHRG_INT EN_SRC

EN_SNK

Q301 FDS301N

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

$V_{BAT}(ovp_default) = REG06[7:2] = 4.208V$ (reduce to 4.192V [010110])
 Worst Case:
 $V_{BAT}(default_max_ovp) = (REG06[7:2] \times 1.005) \times 1.04 = 4.3982016V$
 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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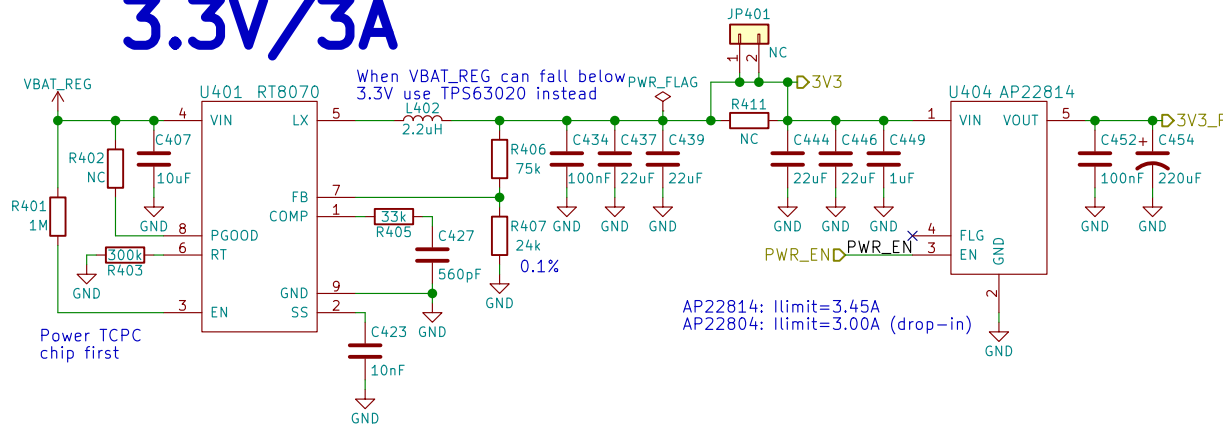
Sheet: /Battery/
 File: battery.sch

Size: A4 Date: 2018-07-17
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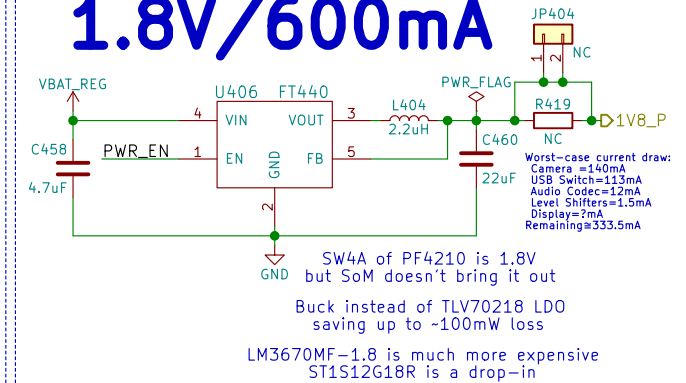
eric.kuzmenko@puri.sm
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 nicole.farber@puri.sm
 christian.schilmoeller@puri.sm

Rev: v0.1.0
 Id: 3/24

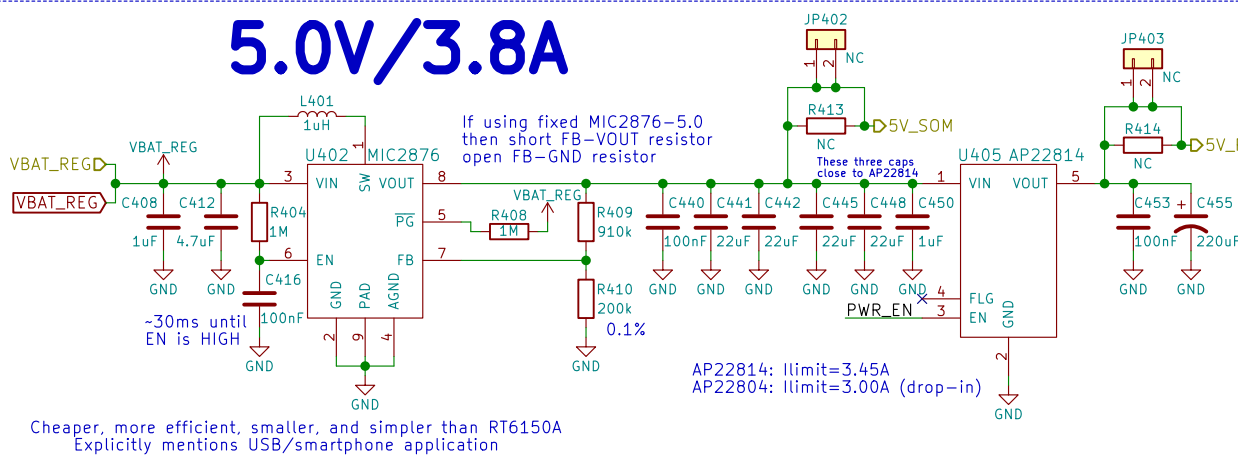
3.3V/3A



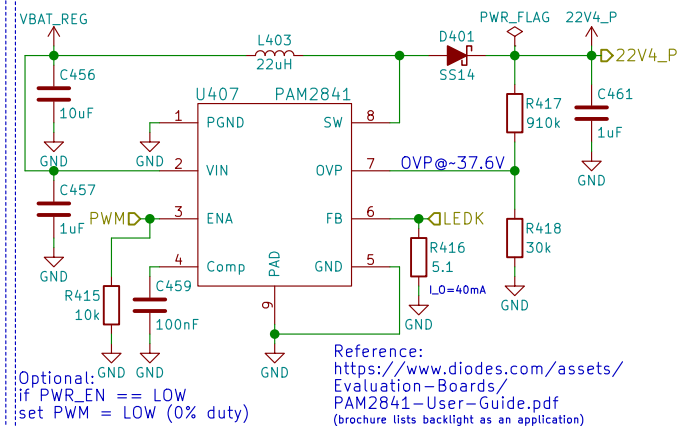
1.8V/600mA



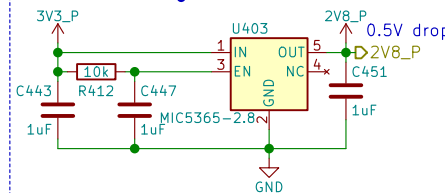
5.0V/3.8A



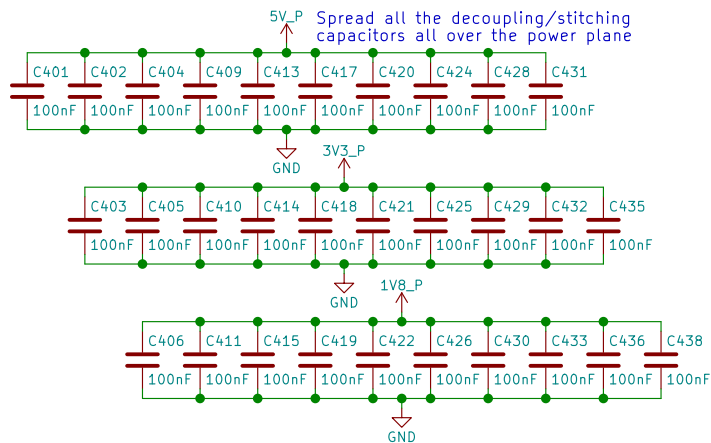
22.4V/40mA



2.8V/150mA



Power



Power

Purism

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File: power.sch

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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

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

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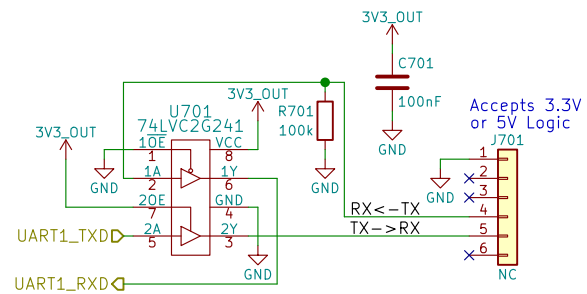
Rev: v0.1.0

Id: 5/24

[illegible]

<div> <div>RTC</div> <div>  <div>Purism</div> </div> </div> <div> <p>Copyright 2018 GNU GPLv3</p> <p>Sheet: /RTC/ File: rtc.sch</p> </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>Size: A4</div> <div>Date: 2018-07-17</div> </div>	<div> <div>Rev: v0.1.0</div> <div>KiCad E.D.A. kicad 5.0.0</div> <div>Id: 6/24</div> </div>

UART Debug



UART Debug



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Sheet: /UART Debug/

File: uart.sch

Size: A4

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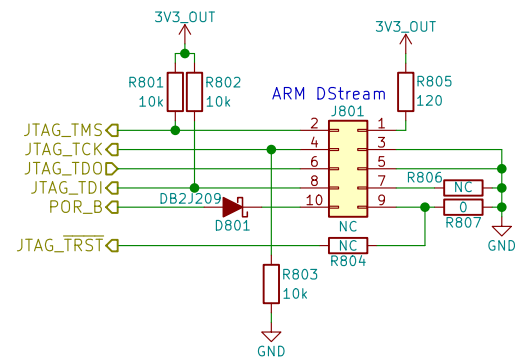
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JTAG



JTAG



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Sheet: /JTAG/

File: jtag.sch

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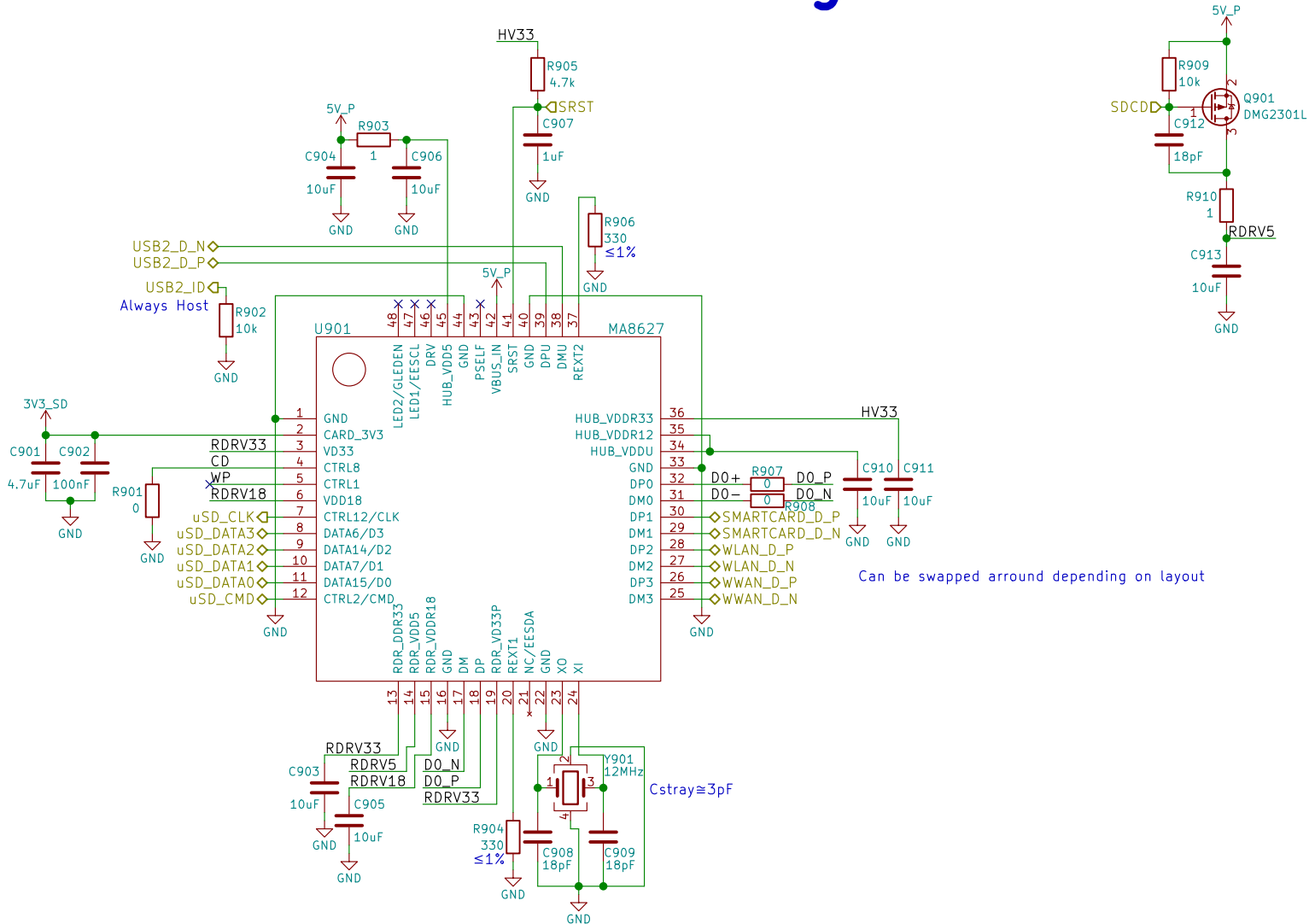
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USB Hub + SDIO Bridge



USB Hub + SDIO Bridge



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Sheet: /USB Hub + SDIO Bridge/

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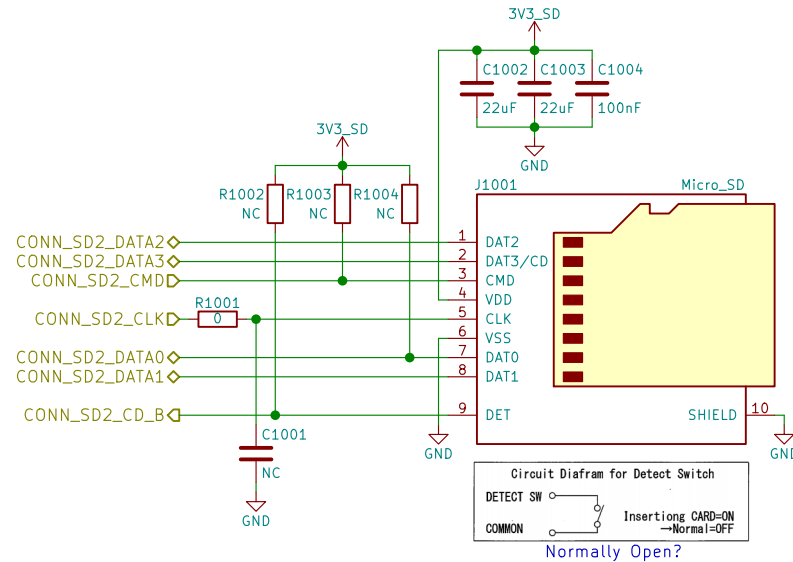
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μSD



uSD Card



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Sheet: /uSD Card/

File: sd.sch

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MIPI



MIPI



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Sheet: /MIPI/
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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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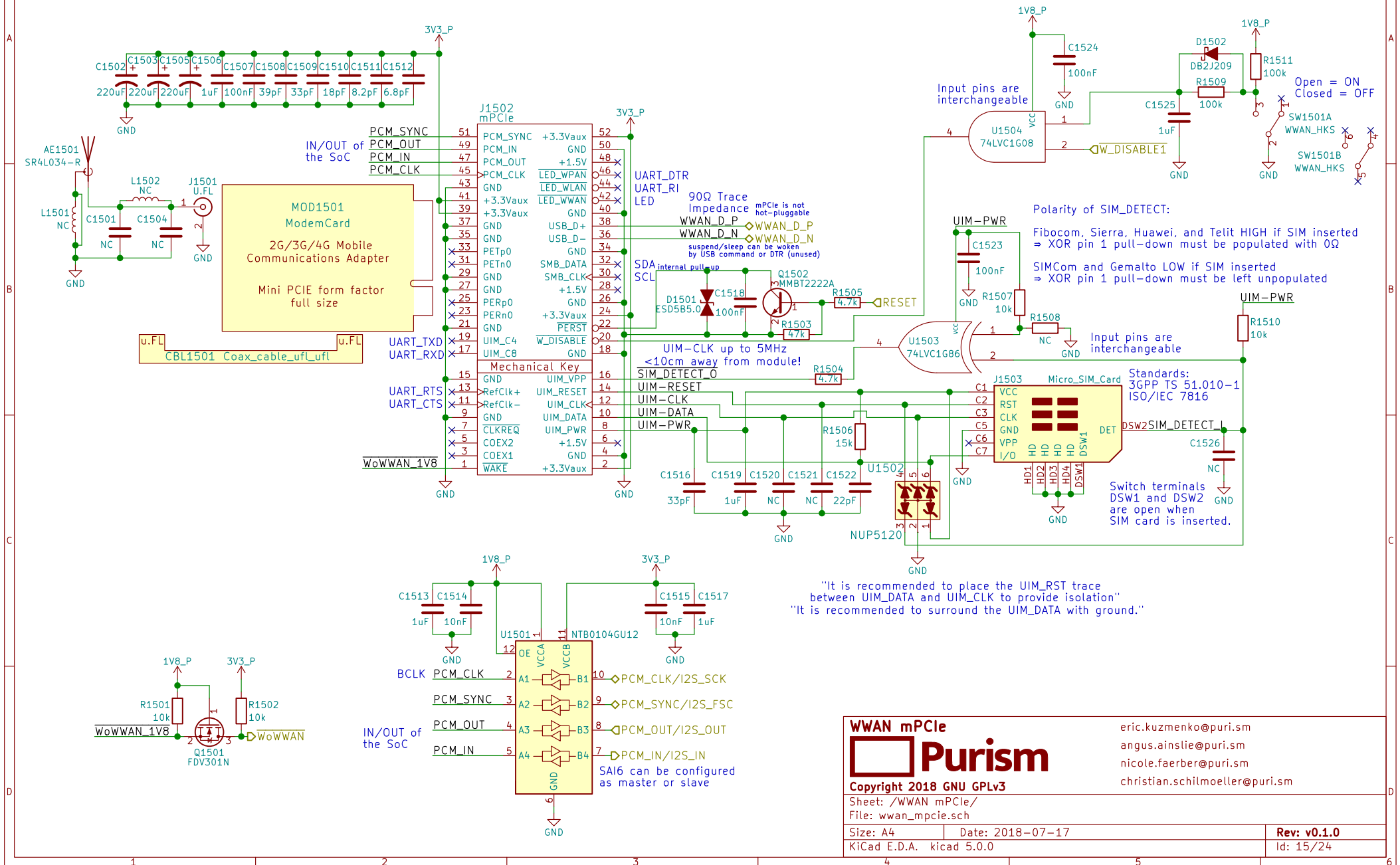
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 File: buttons_led.sch

Size: A4 Date: 2018-07-17
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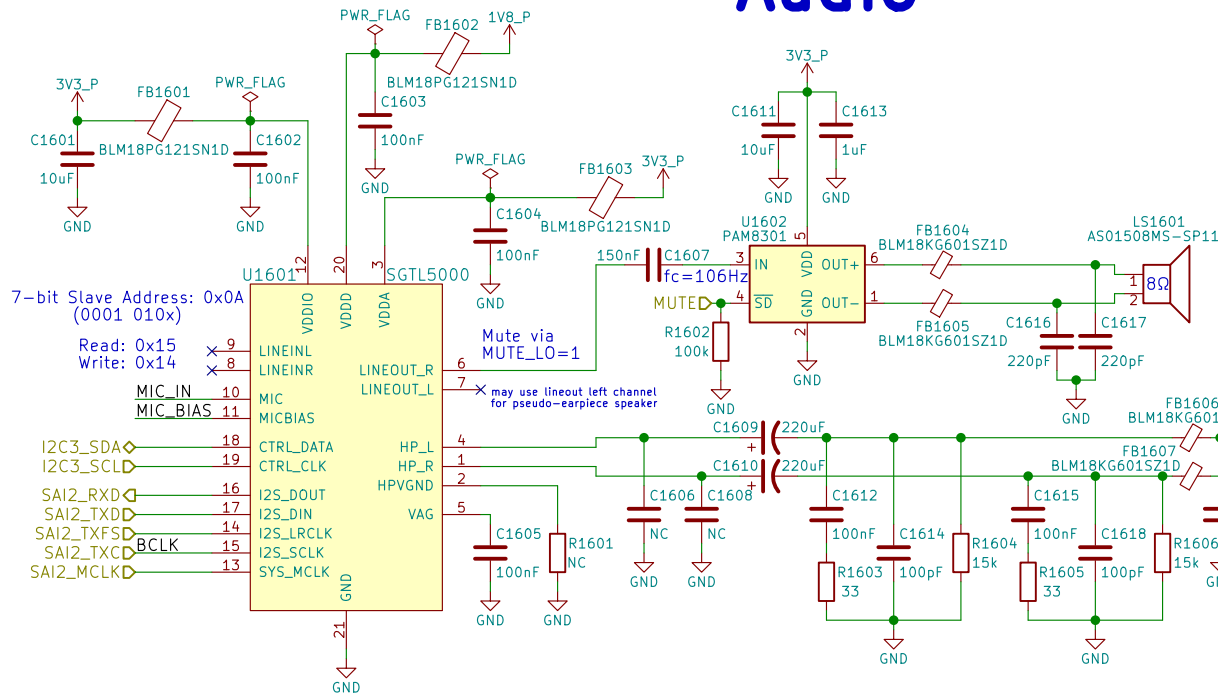
eric.kuzmenko@puri.sm
 angus.ainstie@puri.sm
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Rev: v0.1.0
 Id: 14/24

WWAN mPCIe



Audio



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-creating-a-switching-point>
 (N16 does the same)
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

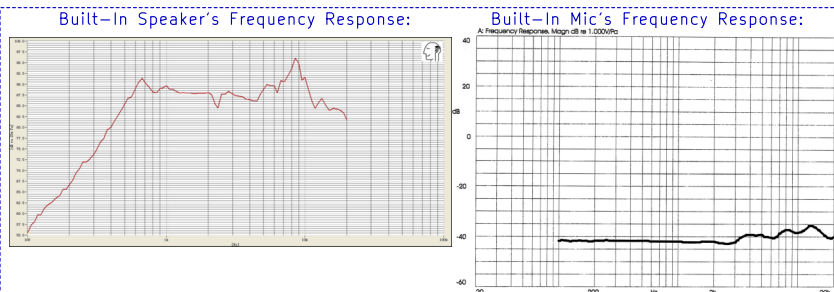
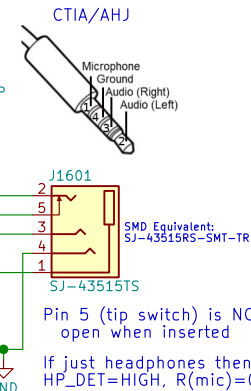
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

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

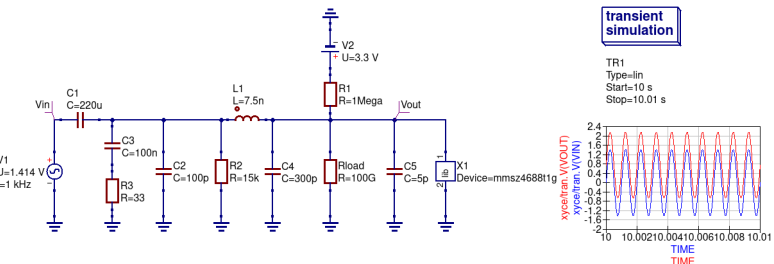
If HP_DET is HIGH for >100ms then HPs are present

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:
$\leq 1\text{kHz}$ $L_s = 3.844\text{mH}$ $L_p = 15.757\text{H}$ $C_s = 6.583\text{uF}$ $C_p = 1612.8\text{pF}$ $R_s = 1.5465\text{6kOhms}$ $R_p = 1.5478\text{4kOhms}$ $\theta = -0.8\text{deg}$	$\leq 1\text{kHz}$ $L_s = 244.4\text{uH}$ $L_p = 141.99\text{mH}$ $C_s = 103.6\text{uF}$ $C_p = 178.77\text{nF}$ $R_s = 36.86\text{0Ohms}$ $R_p = 36.86\text{0Ohms}$ $\theta = -2.3\text{deg}$	$\leq 1\text{kHz}$ $L_s = 25.2\text{uH}$ $L_p = 311.0\text{mH}$ $C_s = 1.0\text{mF}$ $C_p = 81.95\text{nF}$ $R_s = 17.030\text{0Ohms}$ $R_p = 17.034\text{0Ohms}$ $\theta = 0.5\text{deg}$

Audio



Purism

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Sheet: /Audio/
File: audio.sch

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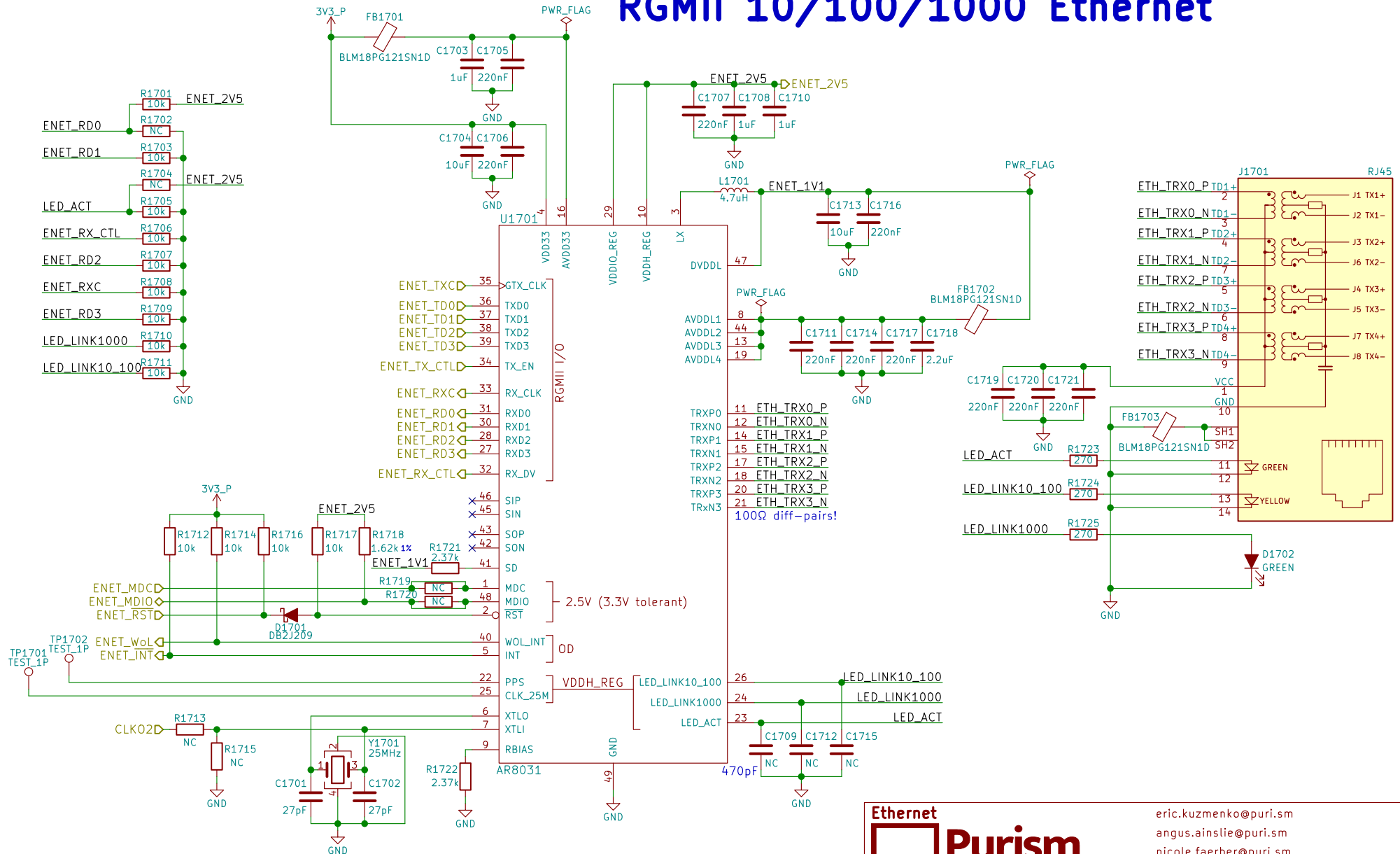
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Rev: v0.1.0

Id: 16/24

RGMII 10/100/1000 Ethernet



Ethernet

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Sheet: /Ethernet/
File: ethernet.sch

Size: A4 Date: 2018-07-17
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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

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

3V3_P

1V8_P

VIH=2.31V

WIFI_RST

W_DISABLE1

BT_HOST_WAKE

M2_UART_RXD

SoC's RX
Module's TX

SoC's TX
Module's RX

M2_UART_TXD

M2_UART_RTS

M2_UART_CTS

RS9116 SUSCLK
is a GPIO (unused)

SUSCLK

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

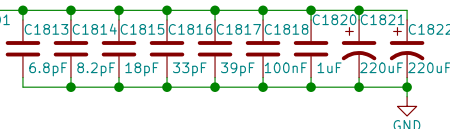
3V3_P

1V8_P

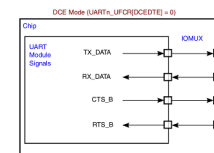
3V3_P

1V8_P

3V3_P



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

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

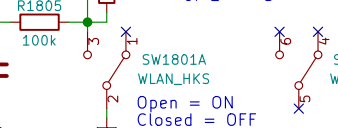
3V3_P

1V8_P

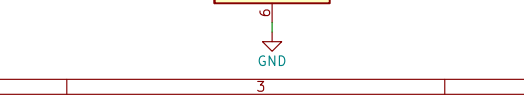
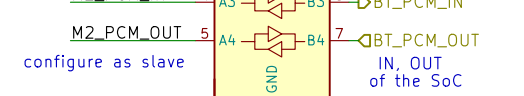
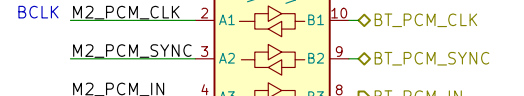
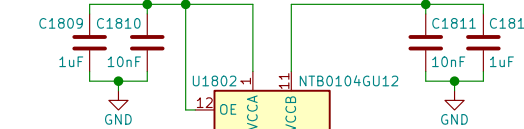
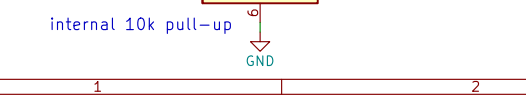
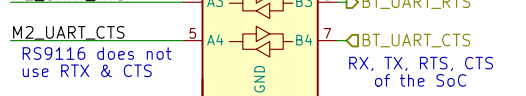
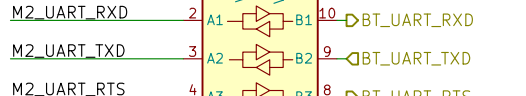
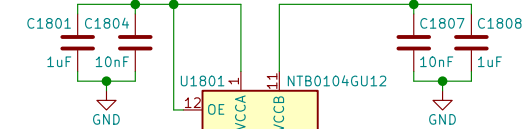
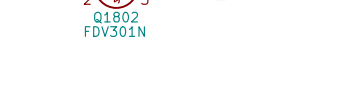
3V3_P

1V8_P

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



Open = ON
Closed = OFF



WLAN+BT M.2

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Sheet: /WLAN+BT M.2/

File: wifi_bt_m2.sch

Size: A4

Date: 2018-07-17

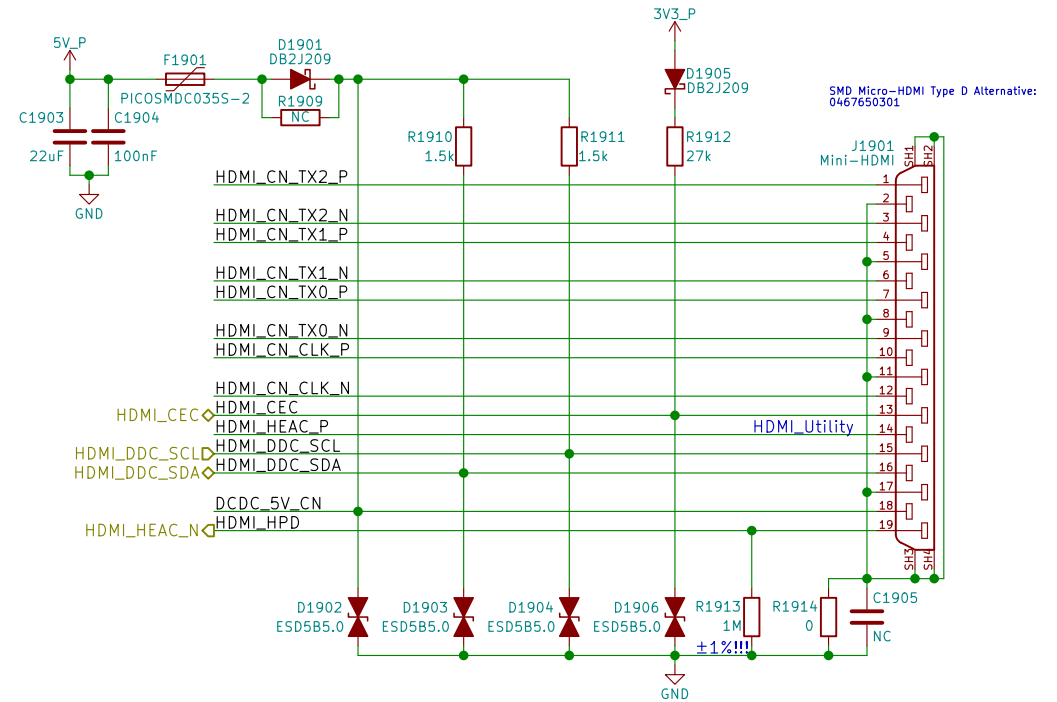
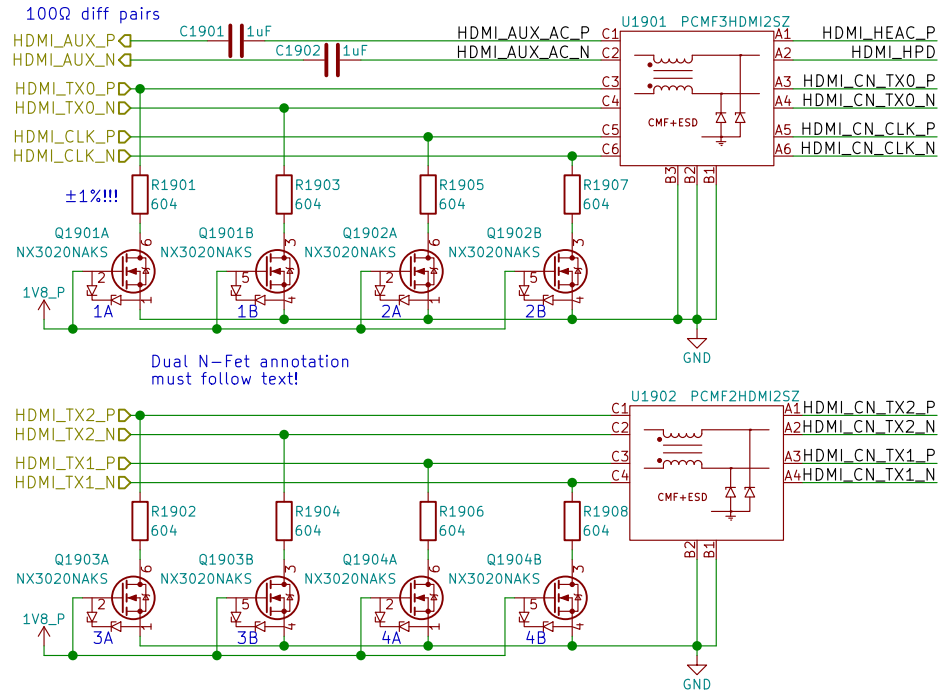
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Rev: v0.1.0

Id: 18/24

TUSB1046 can be used for DP over USB-C

HDMI



HDMI



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Sheet: /HDMI/
File: hdmi.sch

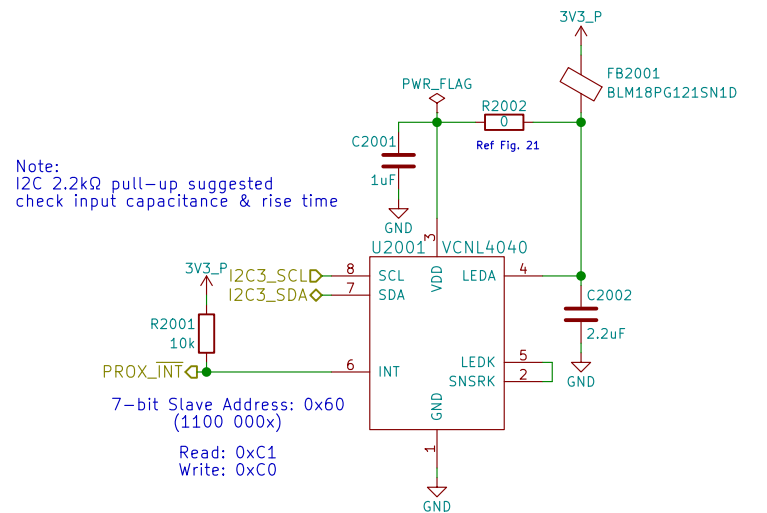
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Rev: v0.1.0
Id: 19/24

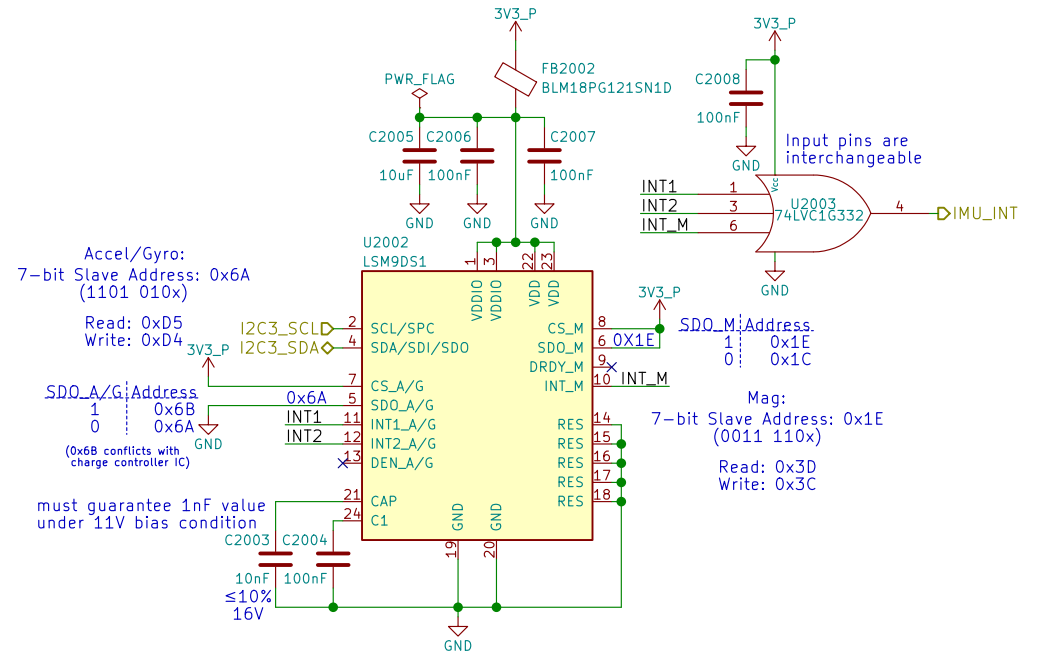
Sensors

Proximity & Ambient Light

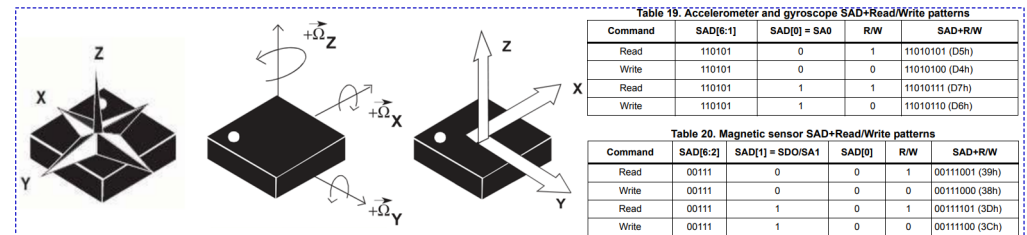


Reference:
<https://www.vishay.com/docs/84307/designingvcnl4040.pdf>
<http://www.vishay.com/docs/84931/vcni4040sensorboardfiles.pdf>

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

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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  Purism		eric.kuzmenko@puri.sm angus.ainslie@puri.sm nicole.ferber@puri.sm christian.schilmoeller@puri.sm
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Sheet: /SPI Flash/ File: flash.sch		
Size: A4	Date: 2018-07-17	Rev: v0.1.0
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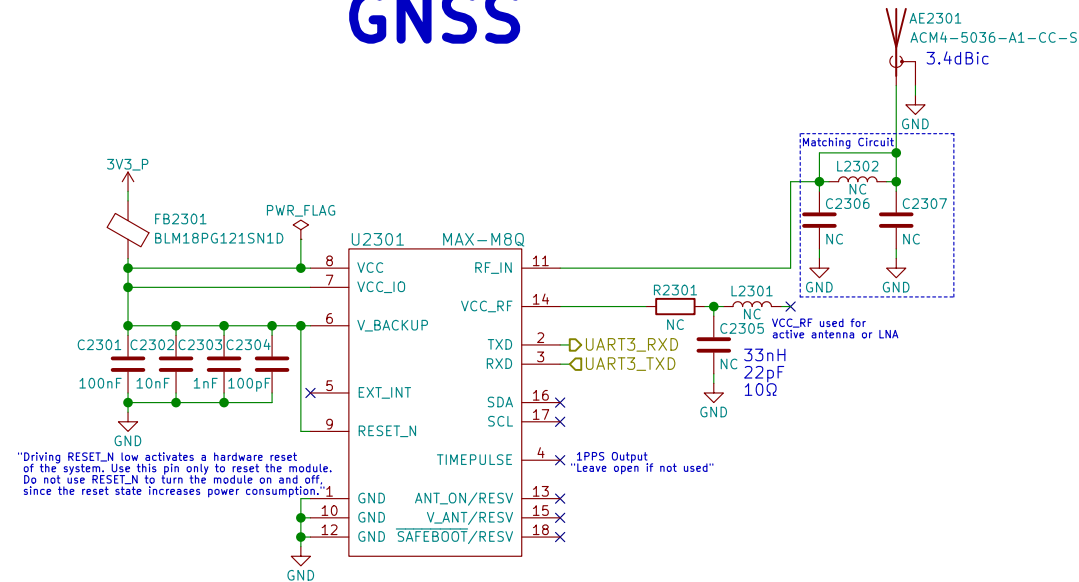
Smart Card



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: 2018-07-17
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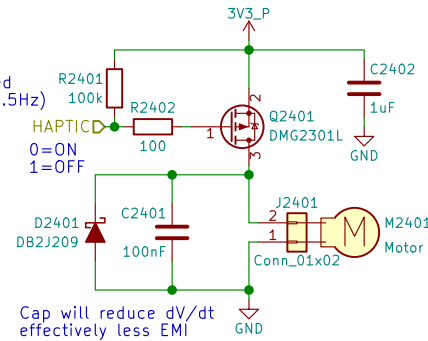
eric.kuzmenko@puri.sm
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christian.schilmoeller@puri.sm

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

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