







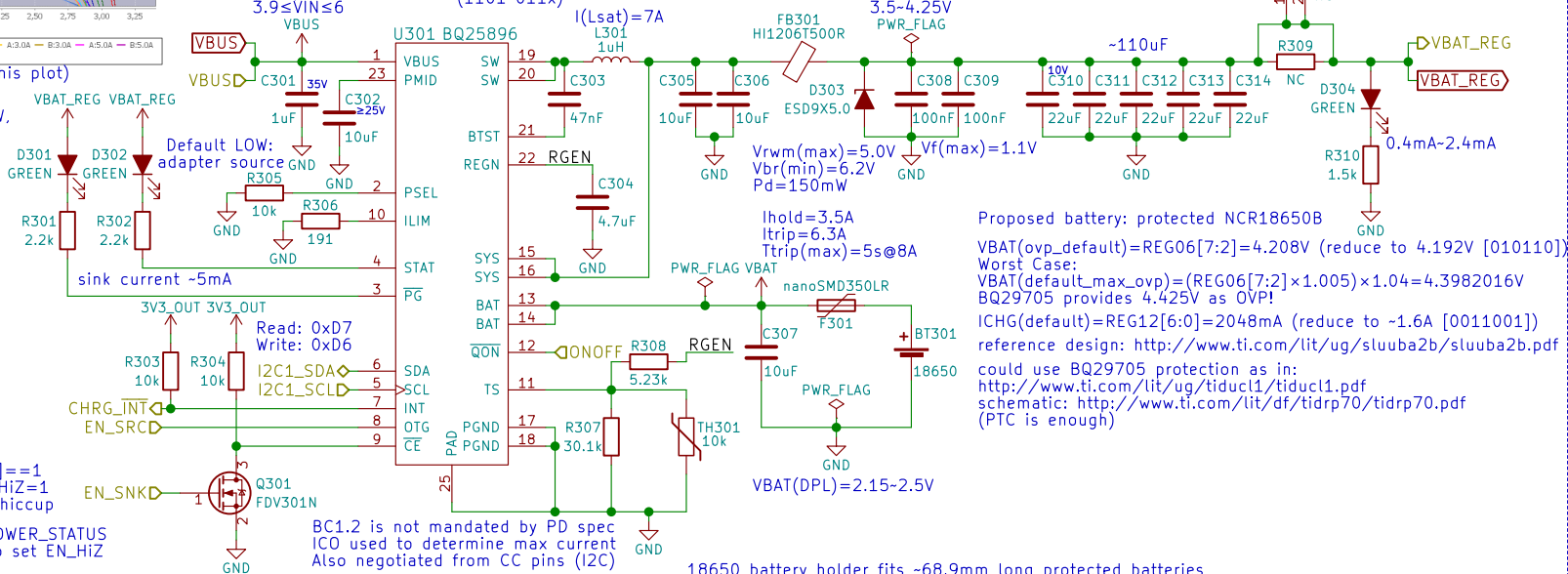
(interpret RSOC% based on this plot)

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  
 $3.9 \leq V_{IN} \leq 6$   
 7-bit Slave Address: 0x6B (1101 011x)

# Battery Charge Controller



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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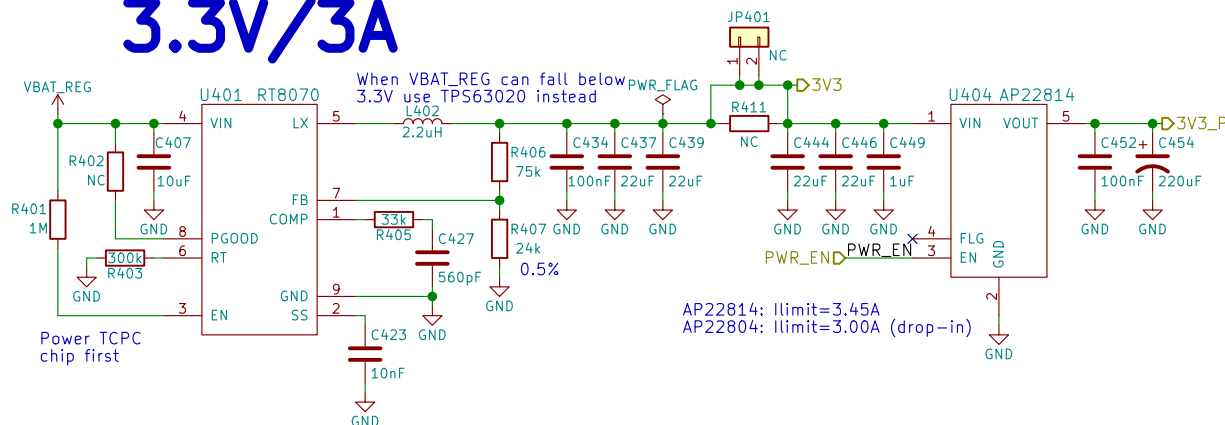
Sheet: /Battery/  
 File: battery.sch

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

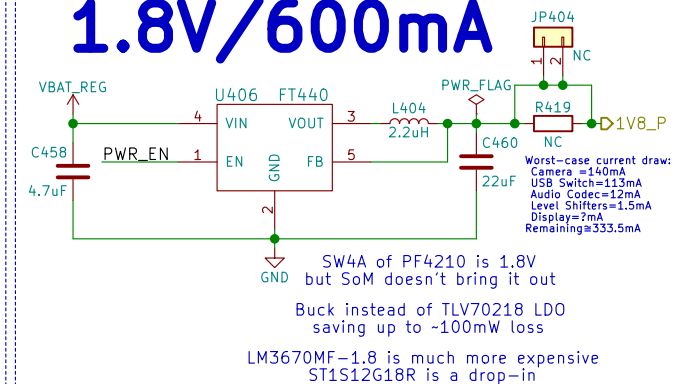
eric.kuzmenko@puri.sm  
 angus.ainslie@puri.sm  
 nicole.ferber@puri.sm  
 christian.schilmoeller@puri.sm

Rev: v0.1.0  
 Id: 3/24

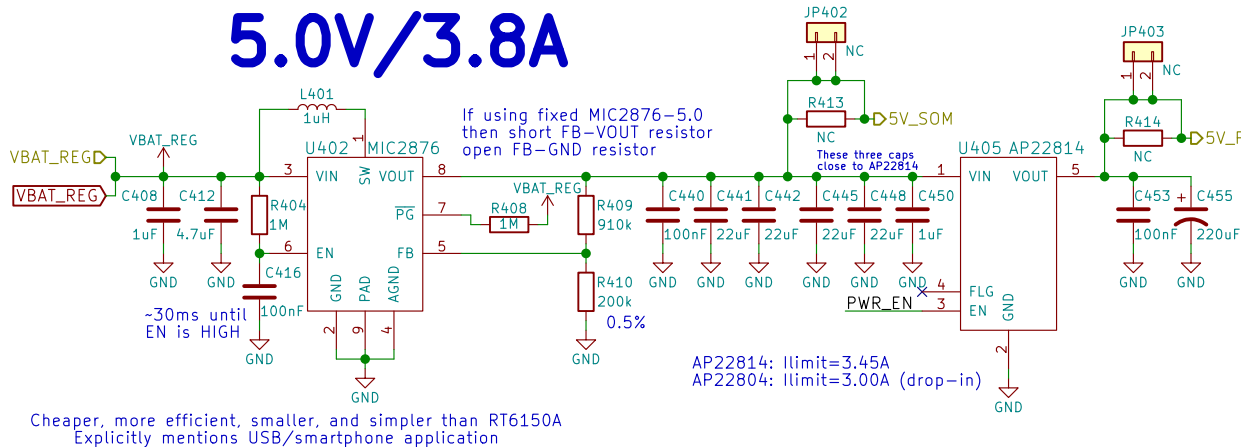
## 3.3V/3A



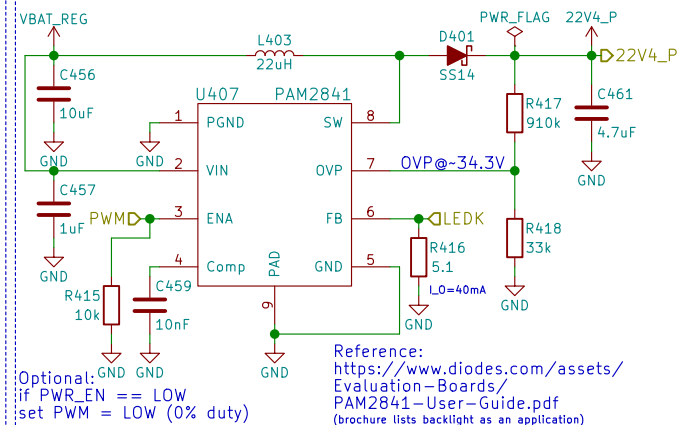
## 1.8V/600mA



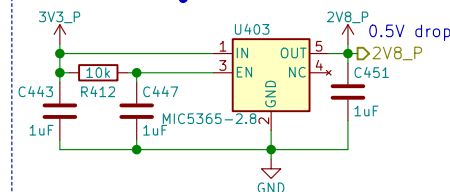
## 5.0V/3.8A



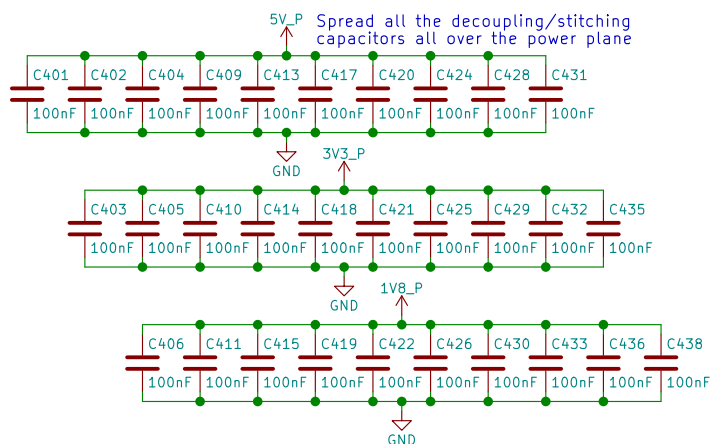
## 22.4V/40mA



## 2.8V/150mA



## Power



Power

**Purism**

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Sheet: /Power/  
File: power.sch

Size: A4  
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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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Date: 2018-08-14

Rev: v0.1.0

Id: 5/24

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7-bit Slave Address: 0x68  
(1101 000x)

Read: 0xD1  
Write: 0xD0

U601

I2C1\_SDA 1 SDA SCL 8 I2C1\_SCL 7 D601 DB2J209 3V3\_OUT R601 10k FB601

2 SQA NC 6 VSS IRQ 5 NC VDD

RV-4162-C7

GND

When powered on VBAT\_REG is used 3.5-4.25V

VIH(min) not given, however assuming  $V_{IH(min)} \approx 0.77647 \cdot V_{DD}$   
@  $V_{DD} = 4.25V$  then  $V_{IH(min)} \approx 3.2999975V$

VBAT is PTC fused  
If battery is depleted then current is  $\sim 350nA$  ( $< 1\mu Watt$ )

BLM18PG1215N1D

VBAT

R602 4.99k

BAT54C

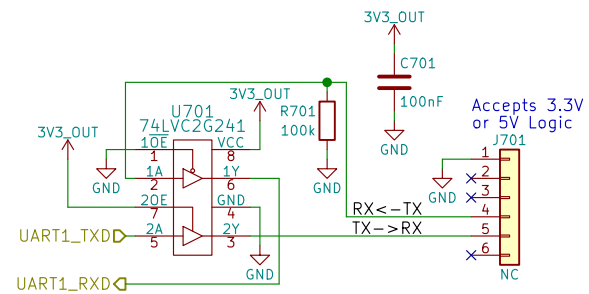
VBAT\_REG

C601 100nF

GND

<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>	
Copyright 2018 GNU GPLv3	
Sheet: /RTC/	
File: rtc.sch	
Size: A4	Date: 2018-08-14
KiCad E.D.A.    kicad 5.0.0	Rev: 6

# UART Debug



## UART Debug



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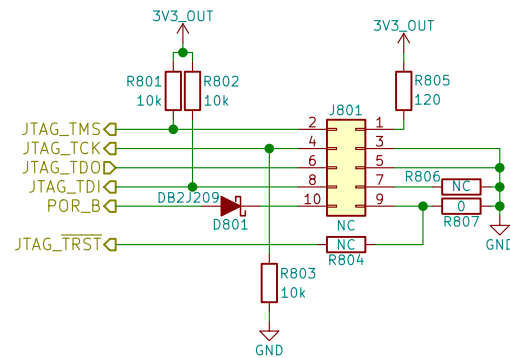
Sheet: /UART Debug/  
File: uart.sch

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

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Rev: v0.1.0  
Id: 7/24

# JTAG



JTAG



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Sheet: /JTAG/

File: jtag.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

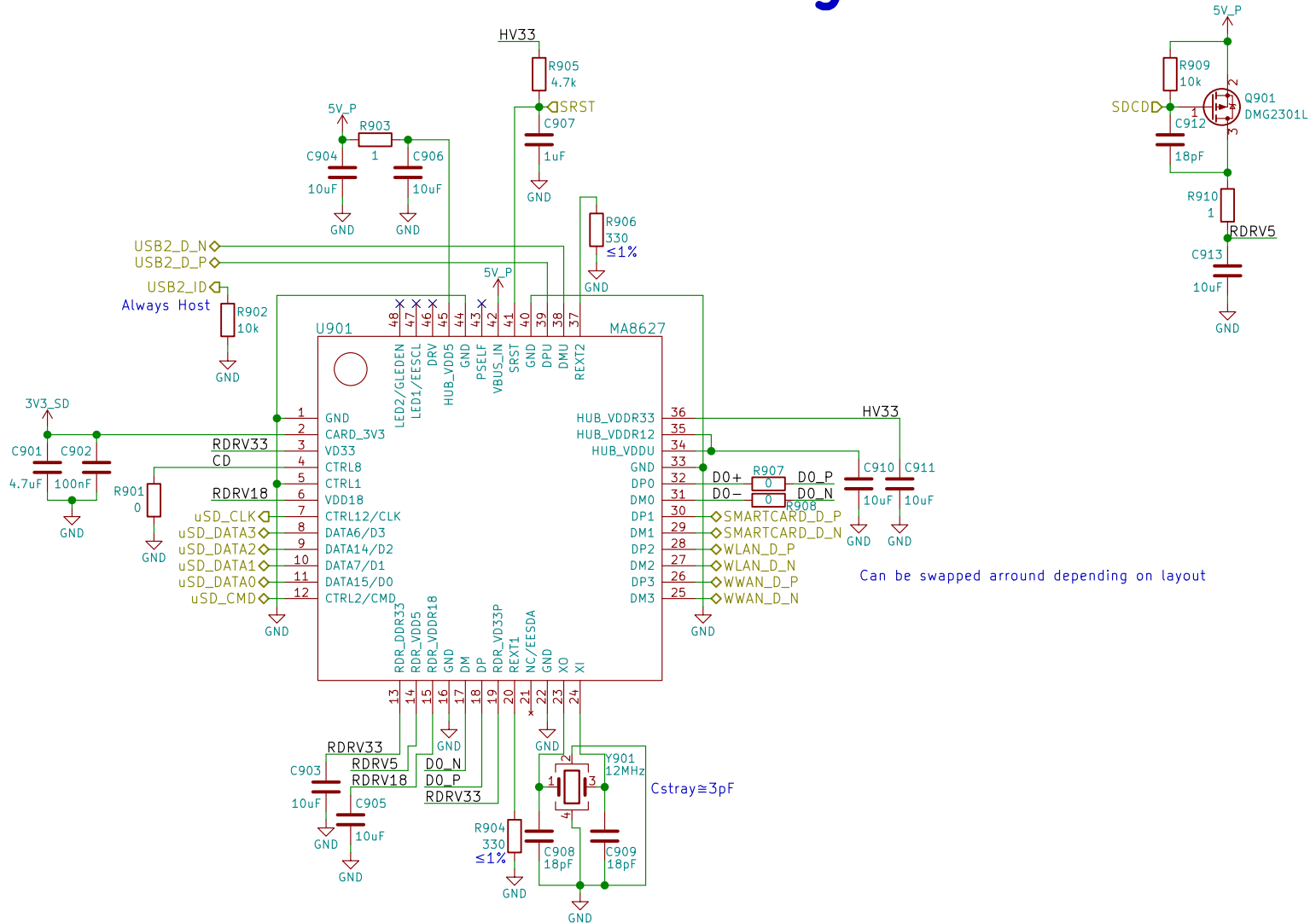
christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 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

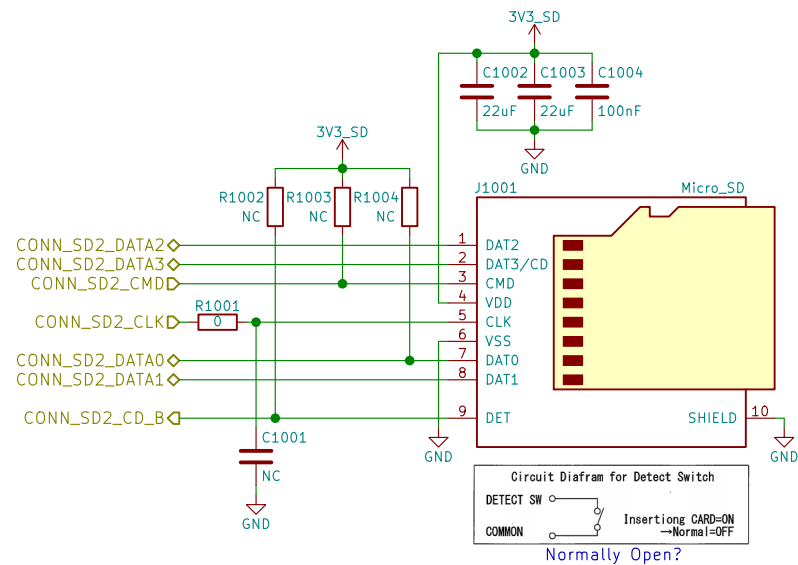
nicole.faerber@puri.sm

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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

---

eric.kuzmenko@puri.sm

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christian.schilmoeller@puri.sm

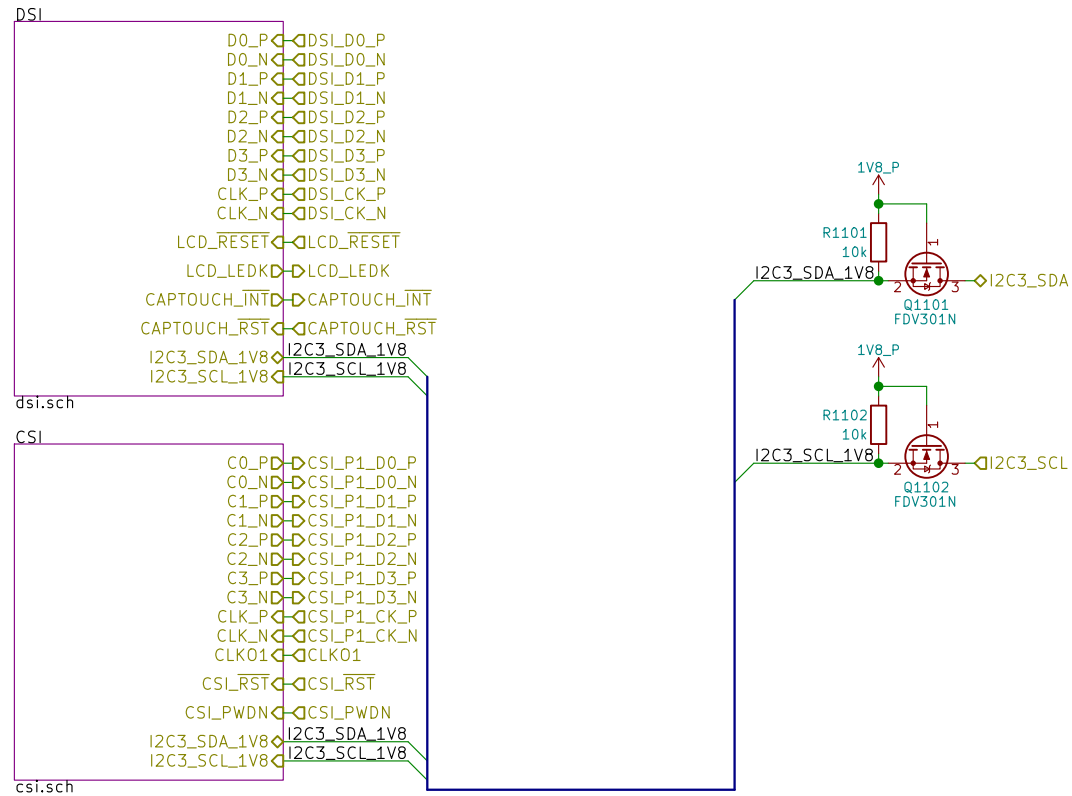
Size: A4	Date: 2018-08-14
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Size: A4	Date:
KiCad E.D.A.	kicad 5.0.0

Rev: v0.1.0

Id: 10/24

# MIPI



MIPI



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Sheet: /MIPI/  
File: mipi.sch

Size: A4 Date: 2018-08-14

KiCad E.D.A. kicad 5.0.0

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christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 11/24

# Display & Touch Controller

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

Display Driver IC PN:  
Sitrionix ST7703

Display\_JH057N00900

DISP1201

5.7 "  
RGB  
720 x 1440  
pixels

FPC6  
Touch

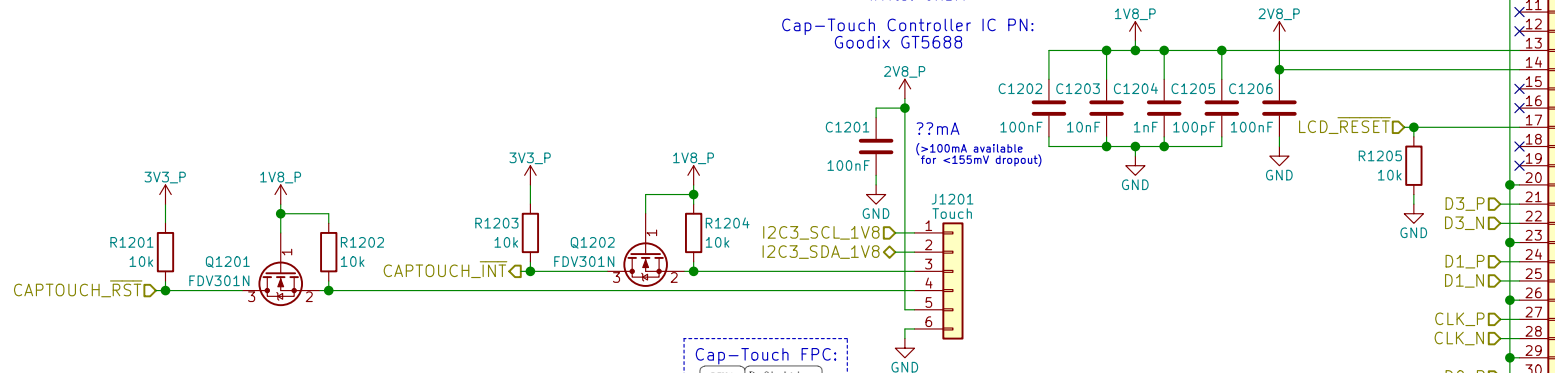
FPC39  
Display +  
Backlight

Note:  
No power-up sequence is  
given in the spec sheet

7-bit Slave Address: 0x5D  
(1011 101x)

Read: 0xBB  
Write: 0xBA

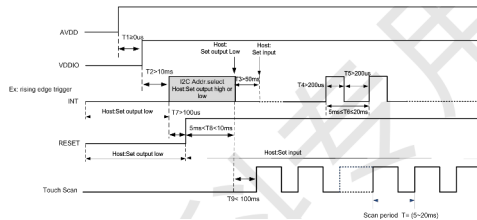
Cap-Touch Controller IC PN:  
Goodix GT5688



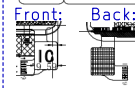
The upper 7 bits are the address,  
and bit 0 is used to select read or write.  
GT5688 has two slave device addresses to choose from:

INT	7-bit Address	8-bit Write Address	8-bit Read Address
LOW	0x5D	0xBA	0xBB
HIGH	0x14	0x2B	0x29

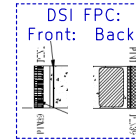
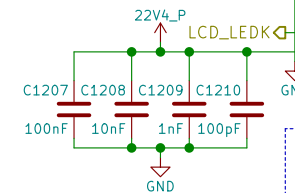
Every time you power on or reset, you need  
to use the INT pin to set the I2C address:



Pin#	Definition
1	SCL
2	SDA
3	INT
4	RESET
5	VDD2_85
6	GND



100Ω Differential Impedance



Backlight Array:



MIPI DSI



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Sheet: /MIPI/DSI/  
File: dsi.sch

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

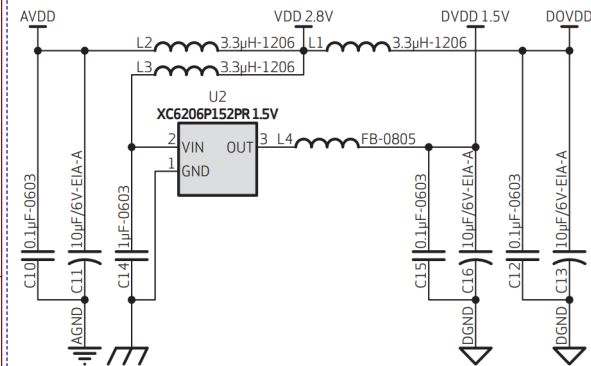
Size: A4  
KiCad E.D.A. kicad 5.0.0

Date: 2018-08-14

Rev: v0.1.0  
Id: 12/24

# Camera

## Using Internal DVDD 1.5V Regulator:



## 2.7 POWER UP SEQUENCE

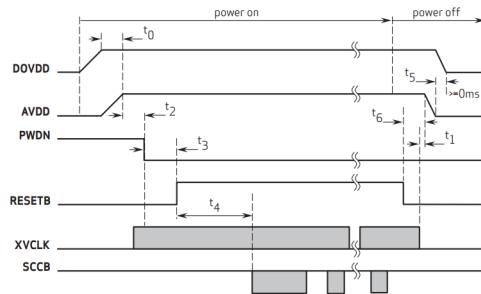
Based on the system power configuration (1.8V or 2.8V for I/O power, using external DVDD or internal DVDD, requiring access to the I2C during power up period or not), the power up sequence will differ. If 1.8V is used for I/O power, using the internal DVDD is preferred. If 2.8V is used for I/O power, due to a high voltage drop at the internal DVDD regulator, there is a potential heat issue. Hence, for a 2.8V power system, OmniVision recommends using an external DVDD source. Due to the higher power down current when using an external DVDD source, OmniVision strongly recommends cutting off all powers, including the external DVDD, when the sensor is not in use in the case of 2.8V I/O and external DVDD.

### 2.7.1 POWER UP WITH INTERNAL DVDD

For powering up with the internal DVDD and I2C access during the power ON period, the following conditions must occur:

1. when DOVDD and AVDD are turned ON, make sure DOVDD becomes stable before AVDD becomes stable
2. PWDN is active high with an asynchronized design (does not need clock)
3. PWDN pin tied to digital ground if it is not controlled.
4. if PWDN pin is controlled as below, for PWDN to go low, power must first become stable (AVDD to PWDN  $\geq 5$  ms)
5. RESETB is active low with an asynchronized design
6. master clock XVCLK should provide at least 1 ms before host accesses the sensor's registers
7. host can access I2C bus (if shared) during entire period. 20ms after RESETB goes high, host can access the sensor's registers to initialize sensor

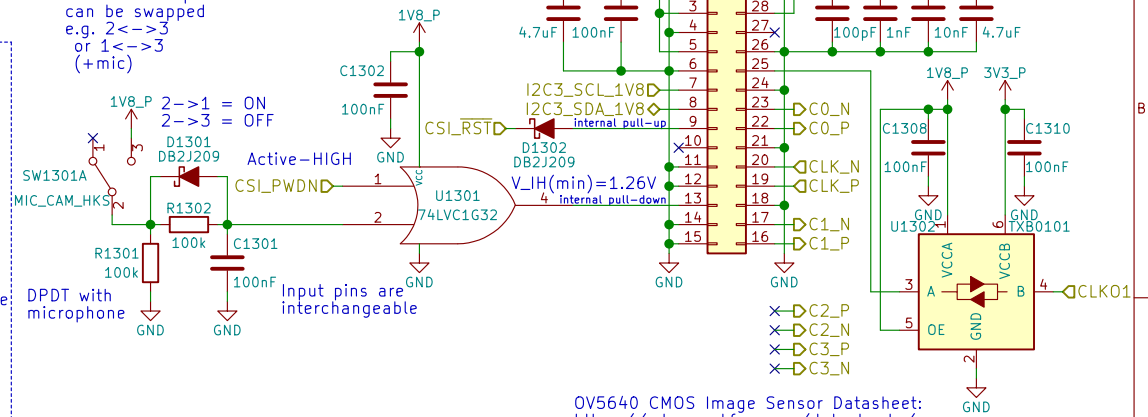
figure 2-3 power up timing with internal DVDD



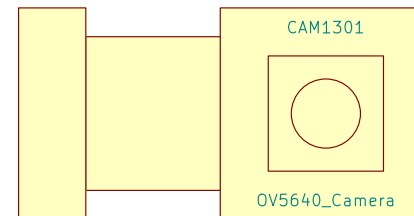
**note**  $t_0 \geq 0$ ms, delay from DOVDD stable to AVDD stable, it is recommended to power up AVDD shortly after DOVDD has been powered up  
 $t_1 \geq 0$ ms, delay from XVCLK off to AVDD off  
 $t_2 \geq 5$ ms, delay from AVDD stable to sensor power up stable, PWDN can be pulled low after this point, XVCLK can be turned on after power on  
 $t_3 \geq 1$ ms, delay from sensor power up stable to RESETB pull up  
 $t_4 \geq 20$ ms, delay from RESETB pull high to SCCB initialization  
 $t_5 \geq 0$ ms, delay from AVDD off to DOVDD off  
 $t_6 \geq 0$ ms, delay from RESETB pull low to AVDD off

5640\_05\_2.2

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



OV5640 CMOS Image Sensor Datasheet:  
[https://cdn.sparkfun.com/datasheets/Sensors/LightImaging/OV5640\\_datasheet.pdf](https://cdn.sparkfun.com/datasheets/Sensors/LightImaging/OV5640_datasheet.pdf)



MIPI CSI

**Purism**

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Sheet: /MIPI/CSI/  
File: csi.sch

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

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

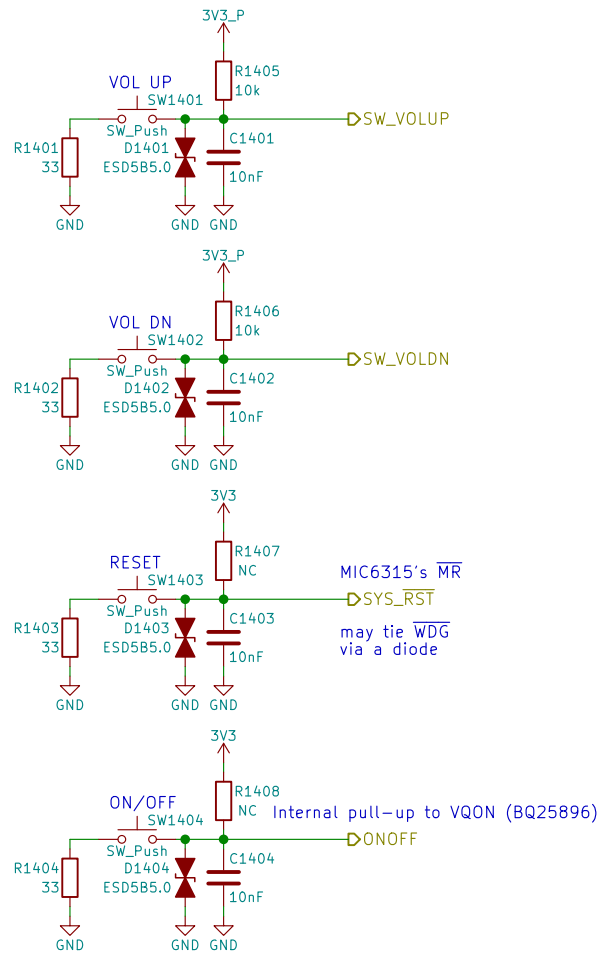
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

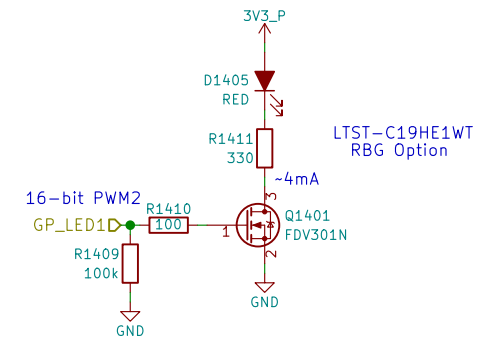
Rev: v0.1.0

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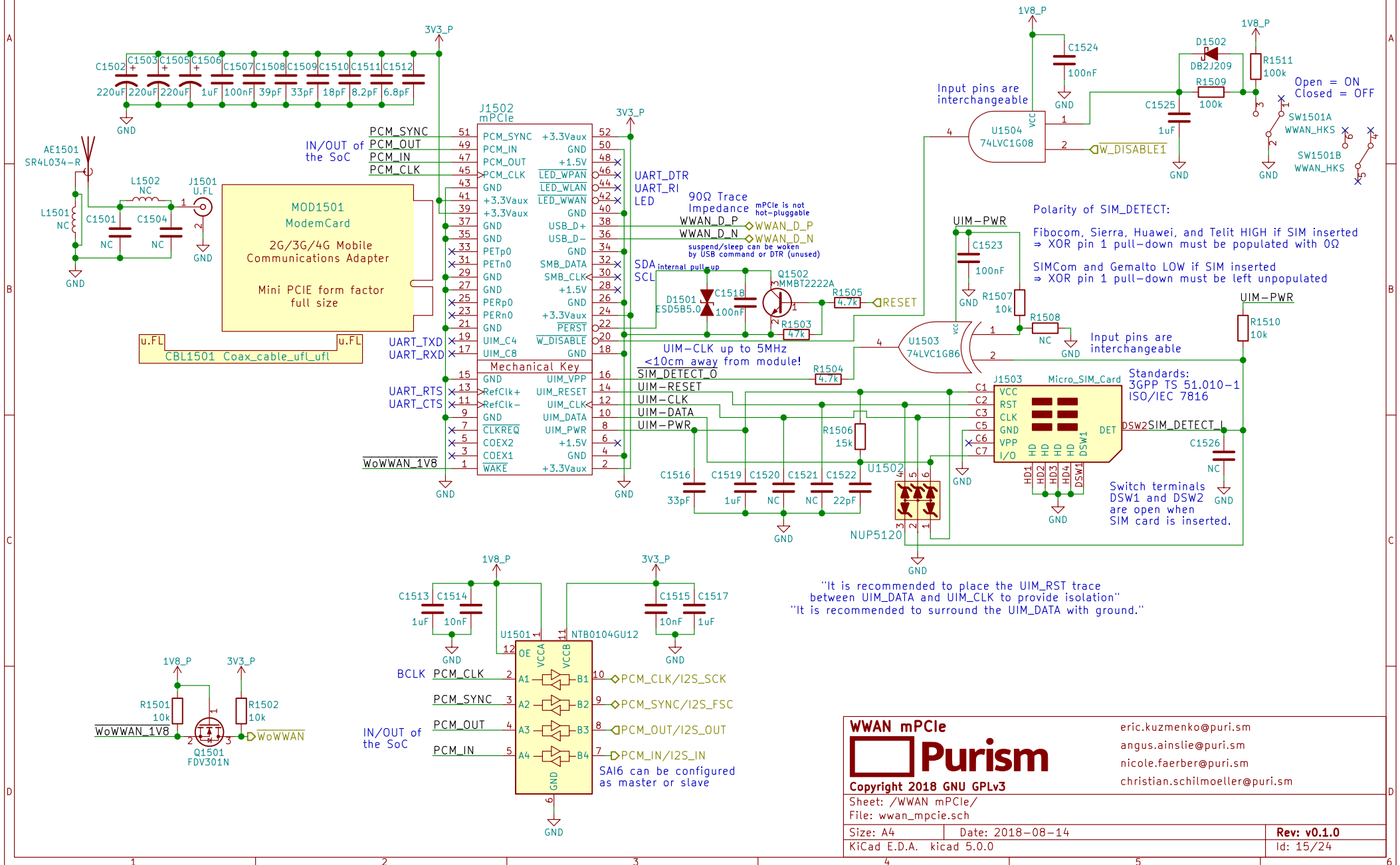
Sheet: /Buttons & LED/  
File: buttons\_led.sch

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

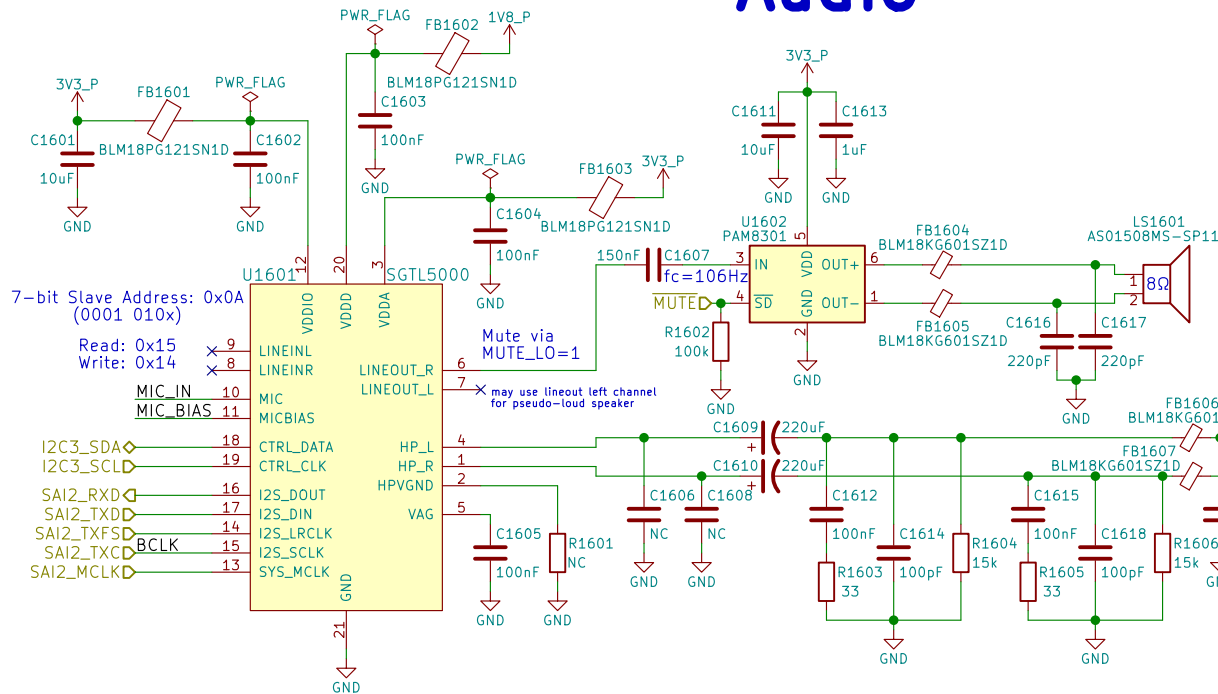
eric.kuzmenko@puri.sm  
angus.ainstie@puri.sm  
nicole.farber@puri.sm  
christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 14/24

# WWAN mPCIe



## Audio



Reference:  
[http://www.52rd.com/S\\_txt/2011\\_3/XT26685.htm](http://www.52rd.com/S_txt/2011_3/XT26685.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>  
 (Nt6 does the same)  
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

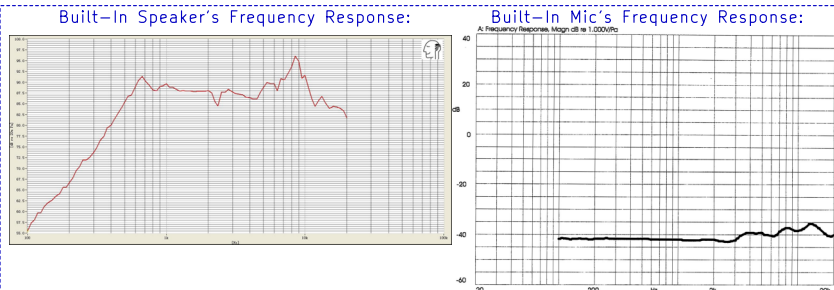
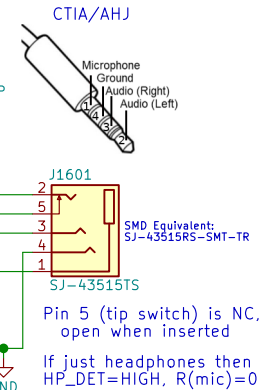
dB specs in datasheet is a unit of power gain (not dBu or VU)  
with respect to the DAC's unattenuated output

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

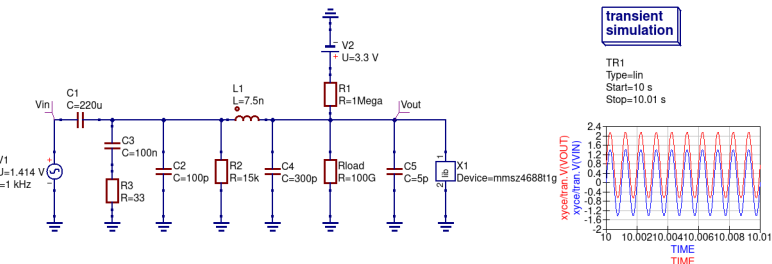
If HP\_DET is HIGH for >100ms then HPs are present

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:
①1kHz	①1kHz	①1kHz
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 = 17.030kOhms
Rp = 1.5478kOhms	Rp = 36.86kOhms	Rp = 17.034kOhms
θ = -0.8deg	θ = -2.3deg	θ = 0.5deg

**Audio**



**Purism**

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Sheet: /Audio/  
File: audio.sch

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angus.ainslie@puri.sm

nicole.faerber@puri.sm

christian.schilmoeller@puri.sm

Size: A4	Date: 2018-08-14
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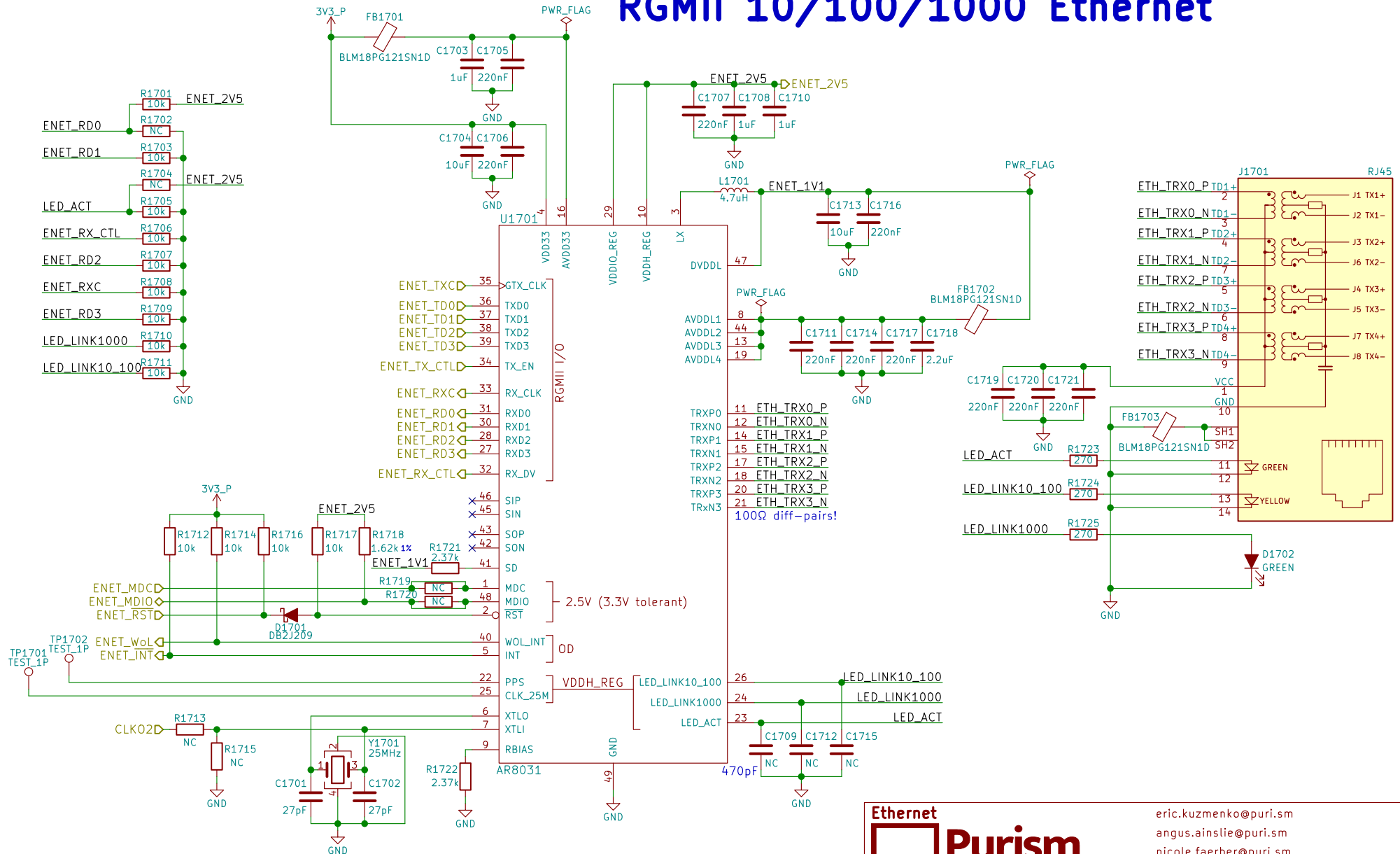
KiCad E.D.A.	kicad 5.0.0
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Rev: v0.1.0

Id: 16/24



# RGMII 10/100/1000 Ethernet



Ethernet

**Purism**

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Sheet: /Ethernet/  
File: ethernet.sch

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

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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

Socket: Table 46  
Module: Table 23

M.2 Key E

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

1V8\_P  
3V3\_P  
GND

WIFI\_RST  
W\_DISABLE1

100k  
DB2J209  
DB2J209

VIH=2.31V

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

CBL1801 Coax\_cable\_MHF4\_MHF4  
MHF4  
L1801 NC  
J1801  
C1802  
C1805  
GND

FR05-S1-NO-1-004  
AE1801

CBL1802 Coax\_cable\_MHF4\_MHF4  
MHF4  
L1802 NC  
J1802  
C1803  
C1806  
GND

FR05-S1-NO-1-004  
AE1802

1V8\_P  
3V3\_P  
GND

C1801  
C1804  
1uF  
10nF  
U1801  
NTB0104GU12  
B1  
B2  
B3  
B4  
GND

M2\_UART\_RXD  
M2\_UART\_TXD  
M2\_UART\_RTS  
M2\_UART\_CTS

RS9116 does not  
use RTX & CTS

internal 10k pull-up

1V8\_P  
3V3\_P  
GND

C1807  
C1808  
10nF  
1uF  
U1802  
NTB0104GU12  
B1  
B2  
B3  
B4  
GND

BT\_UART\_RXD  
BT\_UART\_TXD  
BT\_UART\_RTS  
BT\_UART\_CTS

RX, TX, RTS, CTS  
of the SoC

1V8\_P  
3V3\_P  
GND

C1809  
C1810  
1uF  
10nF  
U1803  
NTB0104GU12  
B1  
B2  
B3  
B4  
GND

BCLK M2\_PCM\_CLK  
M2\_PCM\_SYNC  
M2\_PCM\_IN  
M2\_PCM\_OUT

configure as slave

1V8\_P  
3V3\_P  
GND

C1811  
C1812  
10nF  
1uF  
U1804  
NTB0104GU12  
B1  
B2  
B3  
B4  
GND

BT\_PCM\_CLK  
BT\_PCM\_SYNC  
BT\_PCM\_IN  
BT\_PCM\_OUT

IN, OUT  
of the SoC

JP1801  
R1802  
J1803  
Key-E  
C1813  
C1814  
C1815  
C1816  
C1817  
C1818  
C1820  
C1821  
C1822  
6.8pF  
8.2pF  
18pF  
33pF  
39pF  
100nF  
1uF  
220uF  
220uF  
GND

M2\_PCM\_CLK  
M2\_PCM\_SYNC  
M2\_PCM\_IN  
M2\_PCM\_OUT

SoC's IN/OUT

BT\_HOST\_WAKE  
M2\_UART\_RXD  
M2\_UART\_TXD  
M2\_UART\_RTS  
M2\_UART\_CTS

SoC's RX  
Module's TX  
SoC's TX  
Module's RX  
M2\_UART\_TXD  
M2\_UART\_RTS  
M2\_UART\_CTS

i.MX8M in DCE mode  
(POR state)  
has CTS output, RTS input

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  
GND  
3V3\_P  
GND  
BT\_DISABLE  
WIFI\_DISABLE

Input pins are  
interchangeable

1V8\_P  
3V3\_P  
GND

R1804  
10k  
Q1801  
F0V301N  
M2\_I2C\_SDA  
I2C2\_SDA

1V8\_P  
3V3\_P  
GND

R1806  
10k  
Q1802  
F0V301N  
M2\_I2C\_SCL  
I2C2\_SCL

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

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

Chip

UARTn\_TX\_DATA  
UARTn\_RX\_DATA  
CTS\_B  
RTS\_B

TX output  
RX input  
CTS output  
RTS input

=> TX->RX  
RX->TX  
CTS->CTS  
RTS->RTS

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

SW1801A  
WLAN\_HKS  
Open = ON  
Closed = OFF

SW1801B  
WLAN\_HKS

WLAN+BT M.2

Purism

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

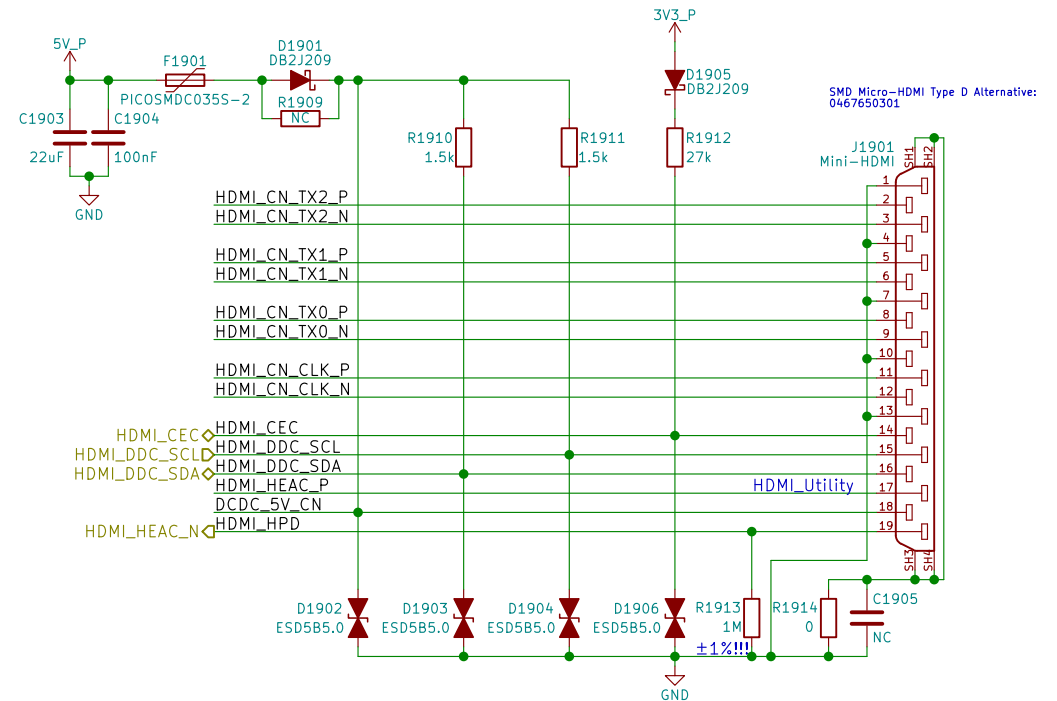
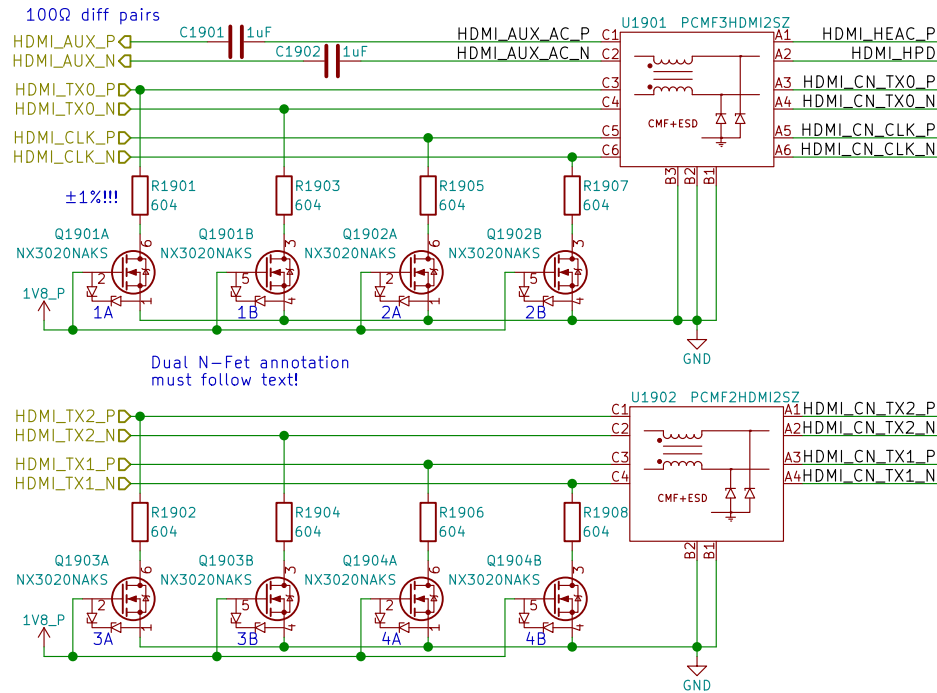
Rev: v0.1.0  
Id: 18/24

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TUSB546A-DCI can be used for HDMI 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

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Rev: v0.1.0  
Id: 19/24

1

## B



C


1



1



## D

<b>SPI NOR Flash</b>  <b>Purism</b>		eric.kuzmenko@puri.sm angus.ainslie@puri.sm nicole.faeber@puri.sm christian.schilmoeller@puri.sm
<b>Copyright 2018 GNU GPLv3</b>		
Sheet: /SPI Flash/ File: flash.sch		
Size: A4	Date: 2018-08-14	<b>Rev: v0.1.0</b>
KiCad E.D.A. kicad 5.0.0		Id: 21/24

[illegible]

## Smart Card



christian.schilmoeller@puri.sm

Id: 22/24

# GNSS



GNSS



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Sheet: /GNSS/

File: gnss.sch

Size: A4 Date: 2018-08-14

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 23/24

eric.kuzmenko@puri.sm

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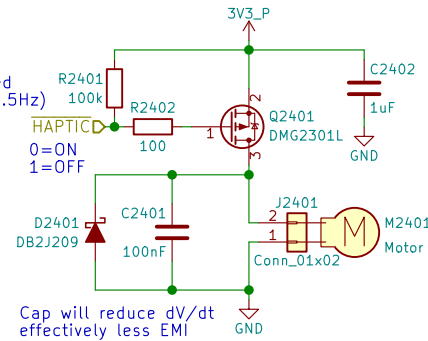
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

# Haptic Motor

PWM pins occupied:  
 GPIO1\_I001 - LCD Backlight  
 GPIO1\_I013 - LED  
 GPIO1\_I014 - Ethernet (CLK0\_25MHz)  
 GPIO1\_I015 - CSI (CLK02)

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



Cap will reduce dV/dt  
 effectively less EMI

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  
 KiCad E.D.A. kicad 5.0.0

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Rev: v0.1.0  
 Id: 24/24