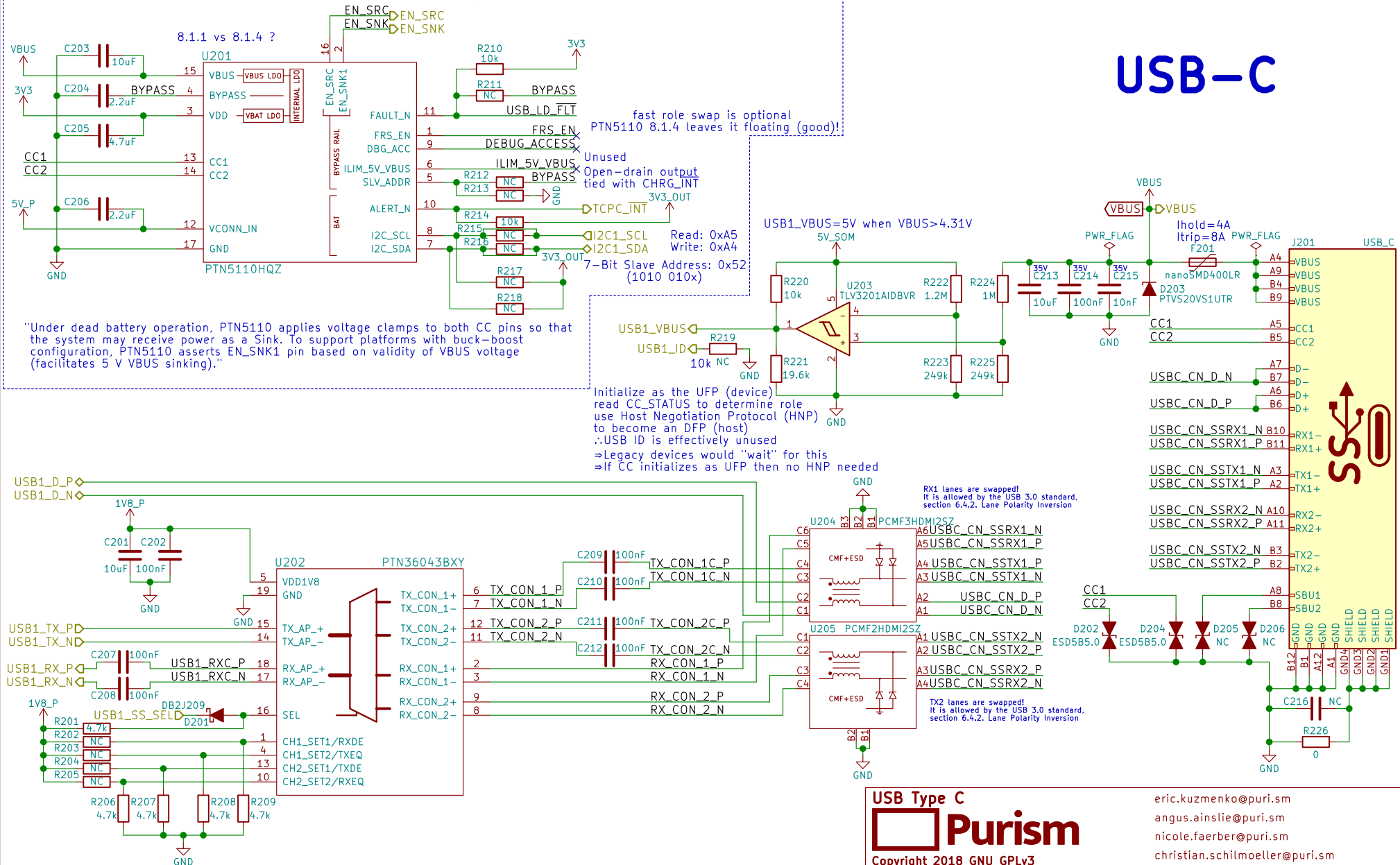




# USB-C TCPC - Config Channel (CC) and PD Role Controller

## USB-C



USB Type C

**Purism**

Copyright 2018 GNU GPLv3

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

Size: A4 Date: 2018-07-17  
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

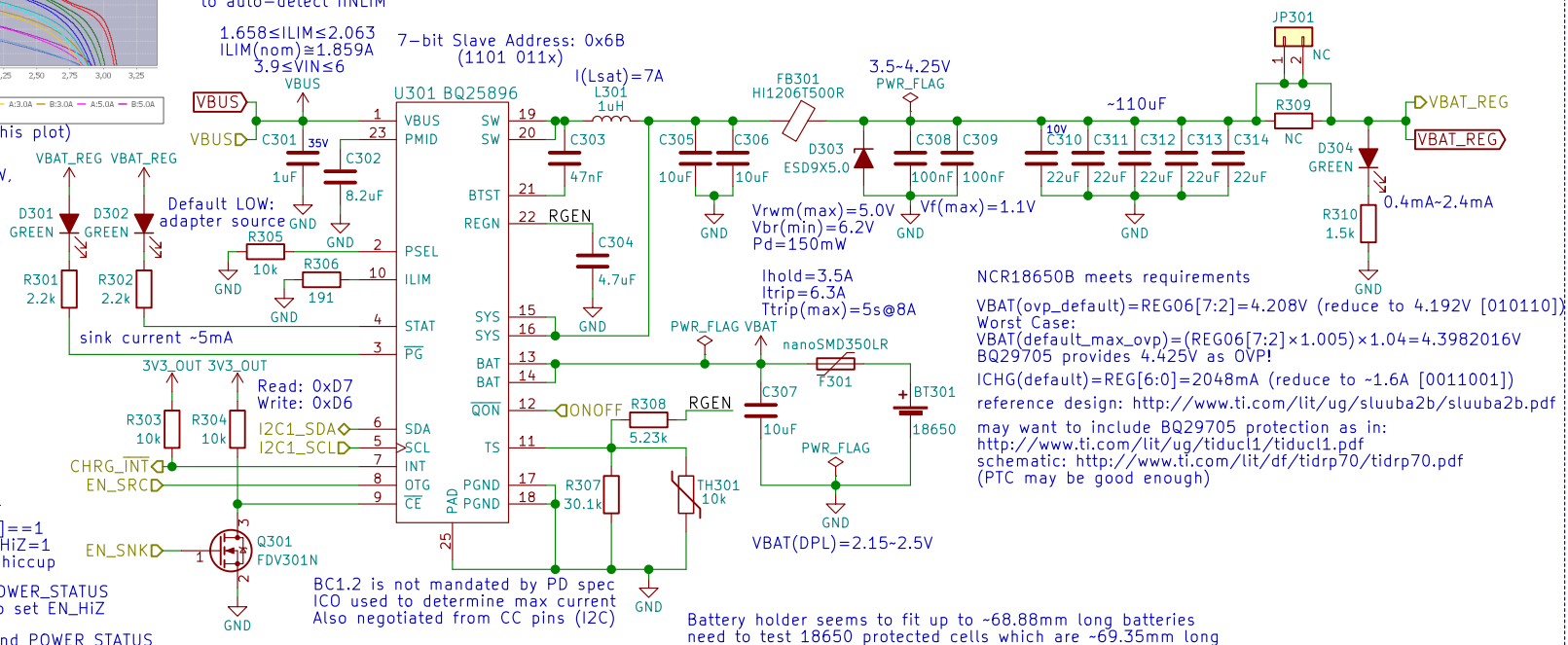
Id: 2/24



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



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**

Copyright 2018 GNU GPLv3

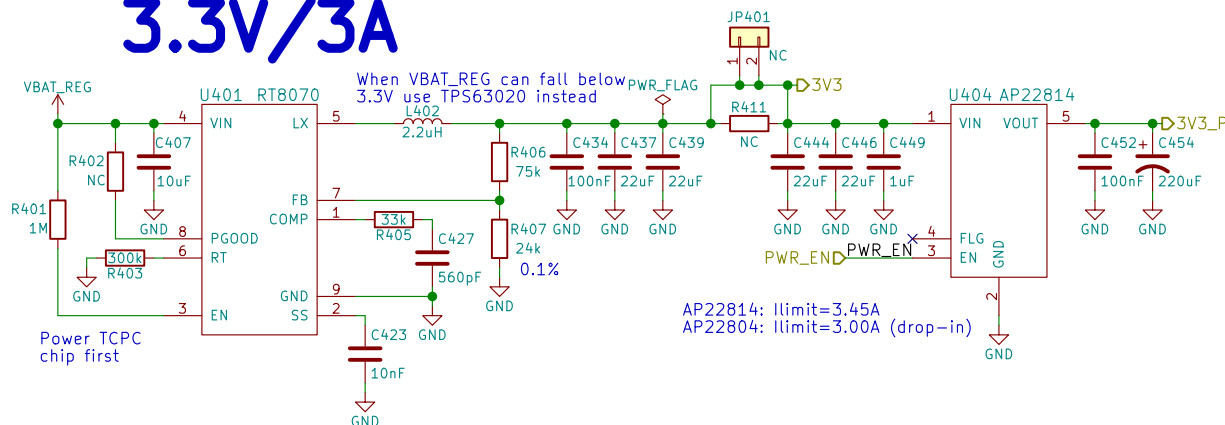
Sheet: /Battery/  
File: battery.sch

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

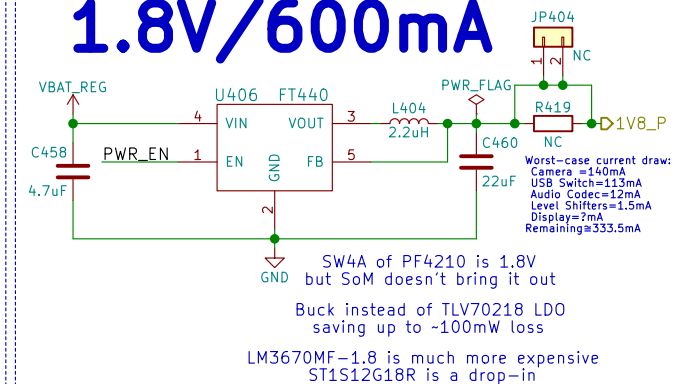
eric.kuzmenko@puri.sm  
 angus.ainslie@puri.sm  
 nicole.farber@puri.sm  
 christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 3/24

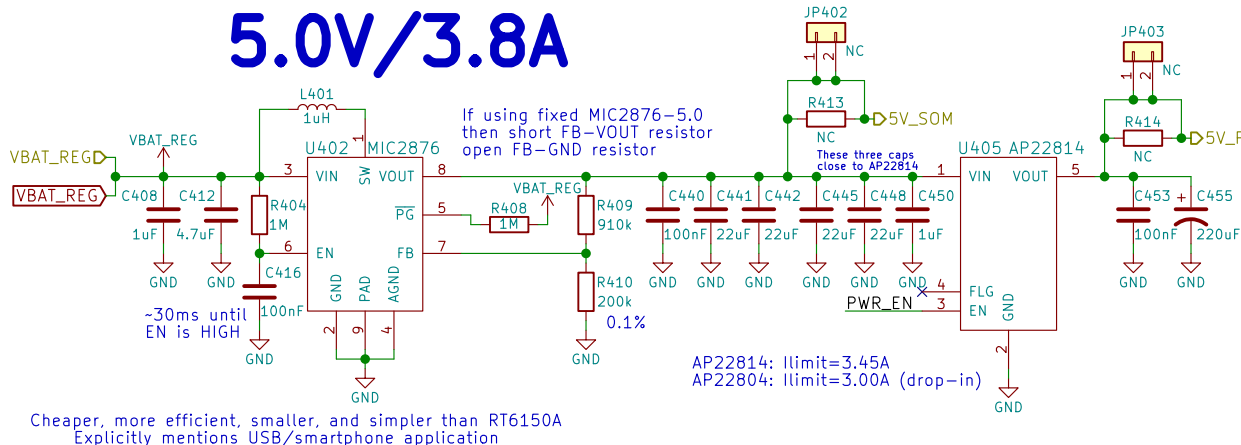
## 3.3V/3A



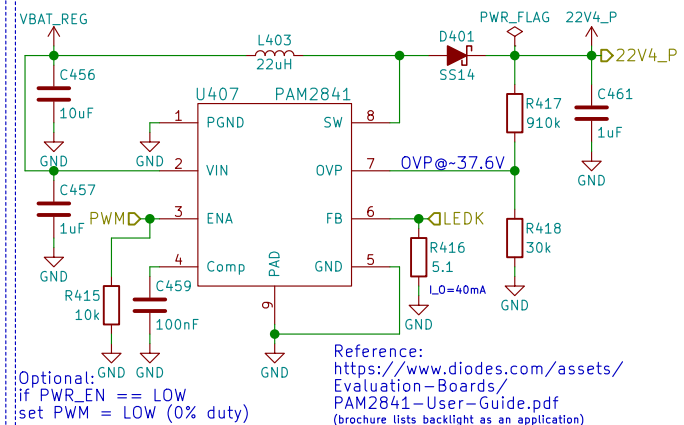
## 1.8V/600mA



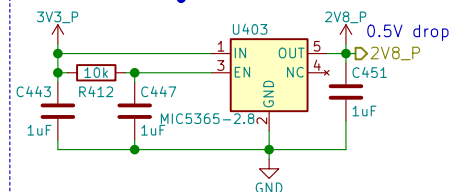
## 5.0V/3.8A



## 22.4V/40mA



## 2.8V/150mA



## Power

Power

**Purism**

Copyright 2018 GNU GPLv3

Sheet: /Power/  
File: power.sch

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

eric.kuzmenko@puri.sm

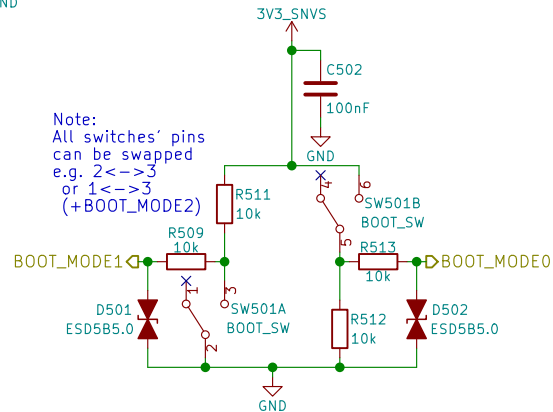
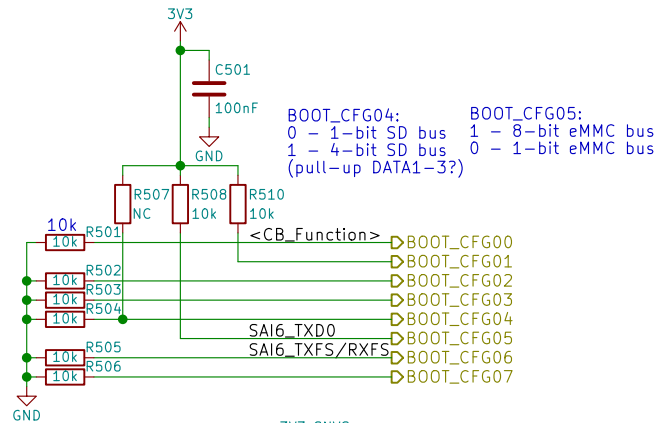
angus.ainslie@puri.sm

nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 4/24

# Boot Config

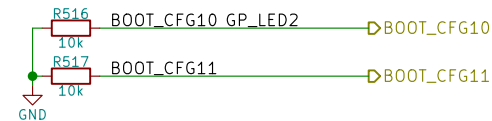
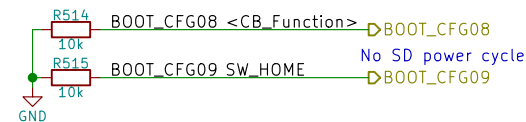


2->1: eMMC 2->3: USB (Serial Downloader)	
BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

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



Copyright 2018 GNU GPLv3

Sheet: /Boot Config/  
File: boot.sch

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

eric.kuzmenko@puri.sm

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christian.schilmoeller@puri.sm

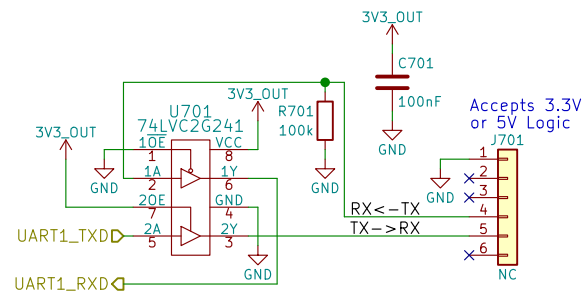
Rev: v0.1.0

Id: 5/24

[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>	

# UART Debug



## UART Debug



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Sheet: /UART Debug/

File: uart.sch

Size: A4

Date: 2018-07-17

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 7/24

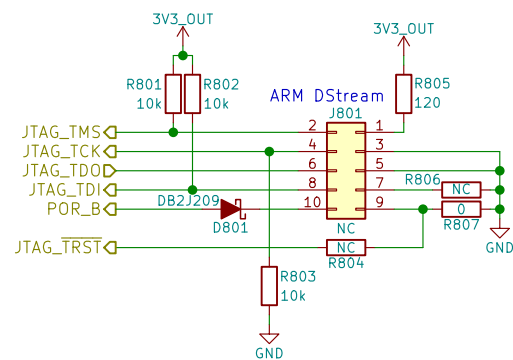
eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

# JTAG



JTAG



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Sheet: /JTAG/

File: jtag.sch

Size: A4	Date: 2018-07-17
----------	------------------

Size: A4	Date: 11/01/2025
KiCad E.D.A.	kicad 5.0.0

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.faerber@puri.sm

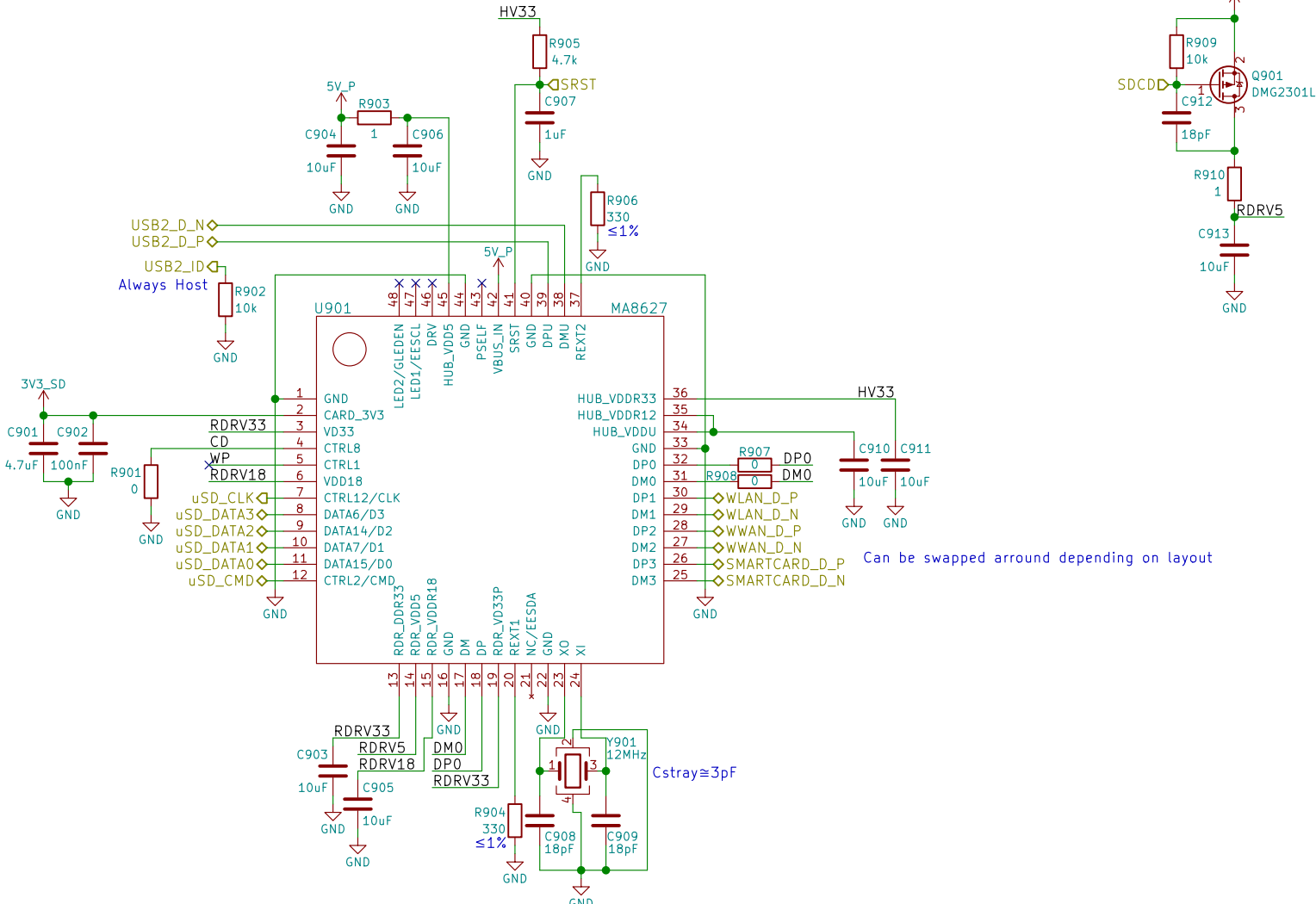
christian.schilmoeller@puri.sm

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: 2018-07-17

KiCad E.D.A.	kicad 5.0.0
--------------	-------------

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

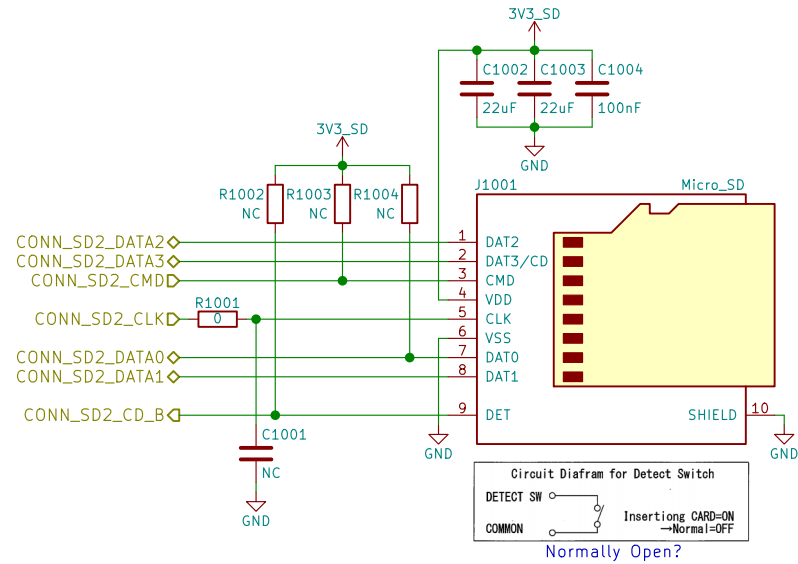
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 9/24

# μSD



uSD Card



**Purism**

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Sheet: /uSD Card/

File: sd.sch

Size: A4 Date: 2018-07-17

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 10/24

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

# MIPI



MIPI



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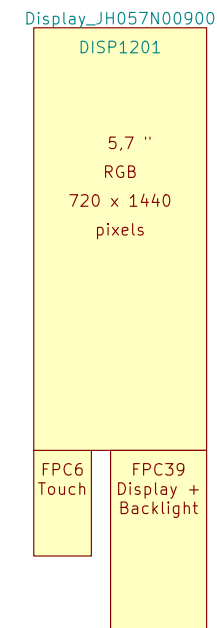
Sheet: /MIPI/  
File: mipi.sch

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

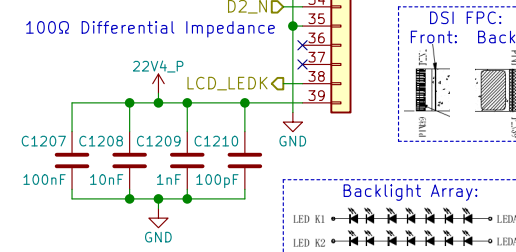
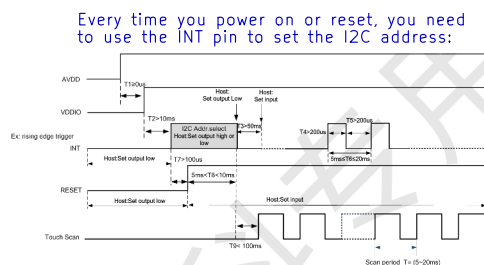
eric.kuzmenko@puri.sm  
angus.ainstlie@puri.sm  
nicole.ferber@puri.sm  
christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 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**

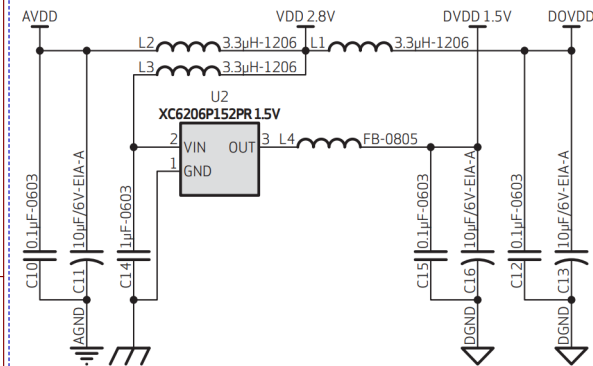
eric.kuzmenko@puri.sm  
angus.ainslie@puri.sm  
nicole.ferber@puri.sm  
christian.schilmoeller@puri.sm

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

Rev: v0.1.0  
Id: 12/24

# Camera

## Using Internal DVDD 1.5V Regulator:



## 2.7 POWER UP SEQUENCE

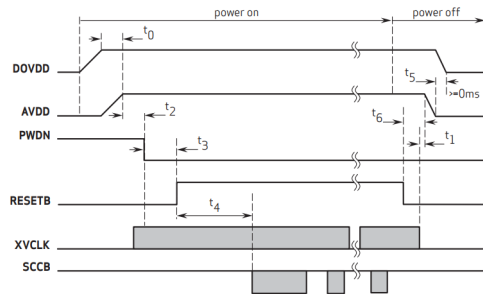
Based on the system power configuration (1.8V or 2.8V for I/O power, using external DVDD or internal DVDD, requiring access to the I2C during power up period or not), the power up sequence will differ. If 1.8V is used for I/O power, using the internal DVDD is preferred. If 2.8V is used for I/O power, 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 asynchronous 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 asynchronous 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

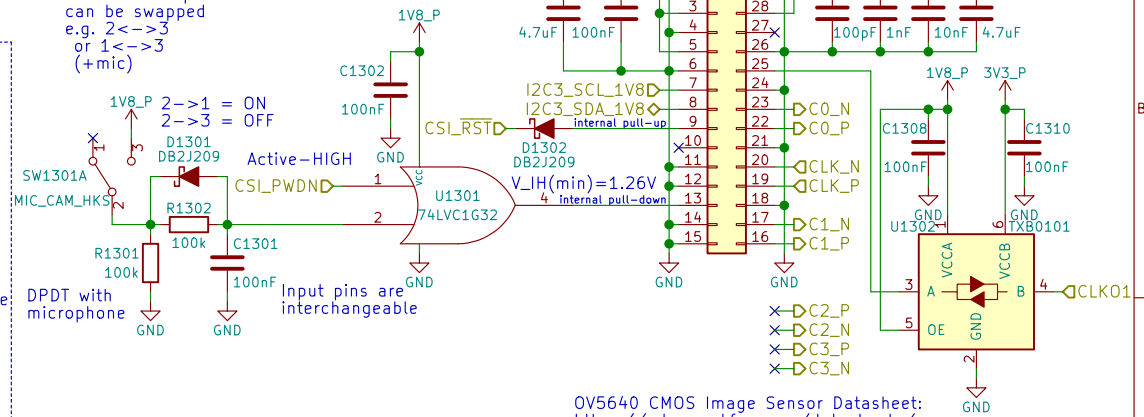
figure 2-3 power up timing with internal DVDD



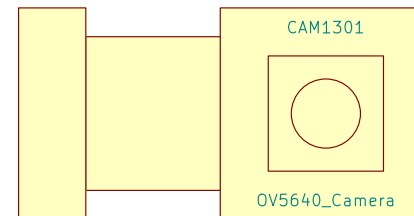
**note**  $t_0 \geq 0$ ms, delay from DOVDD stable to AVDD stable, it is recommended to power up AVDD shortly after DOVDD has been powered up  
 $t_1 \geq 0$ ms, delay from XVCLK off to AVDD off  
 $t_2 \geq 5$ ms, delay from AVDD stable to sensor power up stable, PWDN can be pulled low after this point, 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: 2018-07-17  
 KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

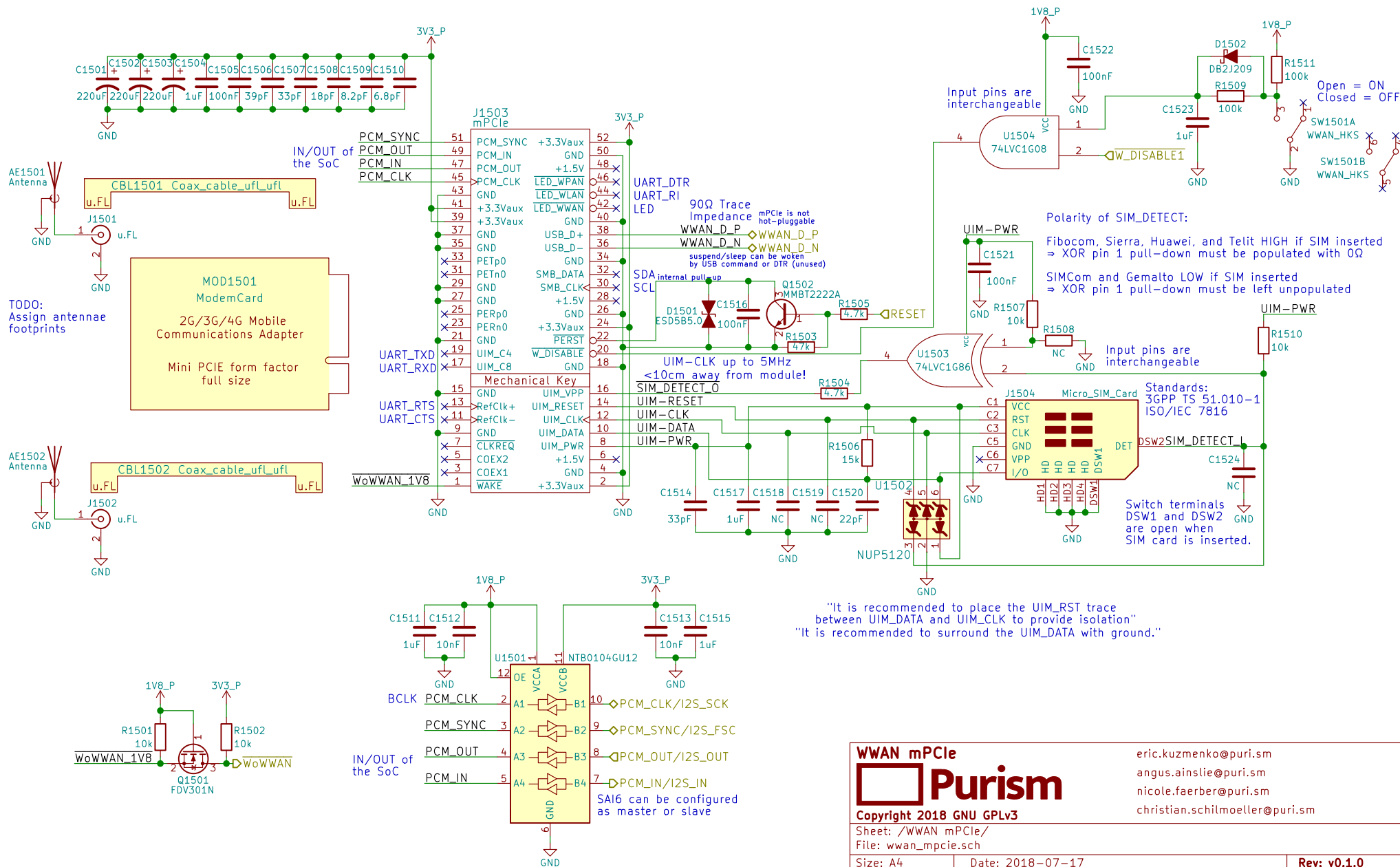
Rev: v0.1.0

Id: 13/24

C

D

# WWAN mPCIe



WWAN mPCIe

**Purism**

Copyright 2018 GNU GPLv3

Sheet: /WWAN mPCIe/

File: wwan\_mpcie.sch

Size: A4

Date: 2018-07-17

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 15/24

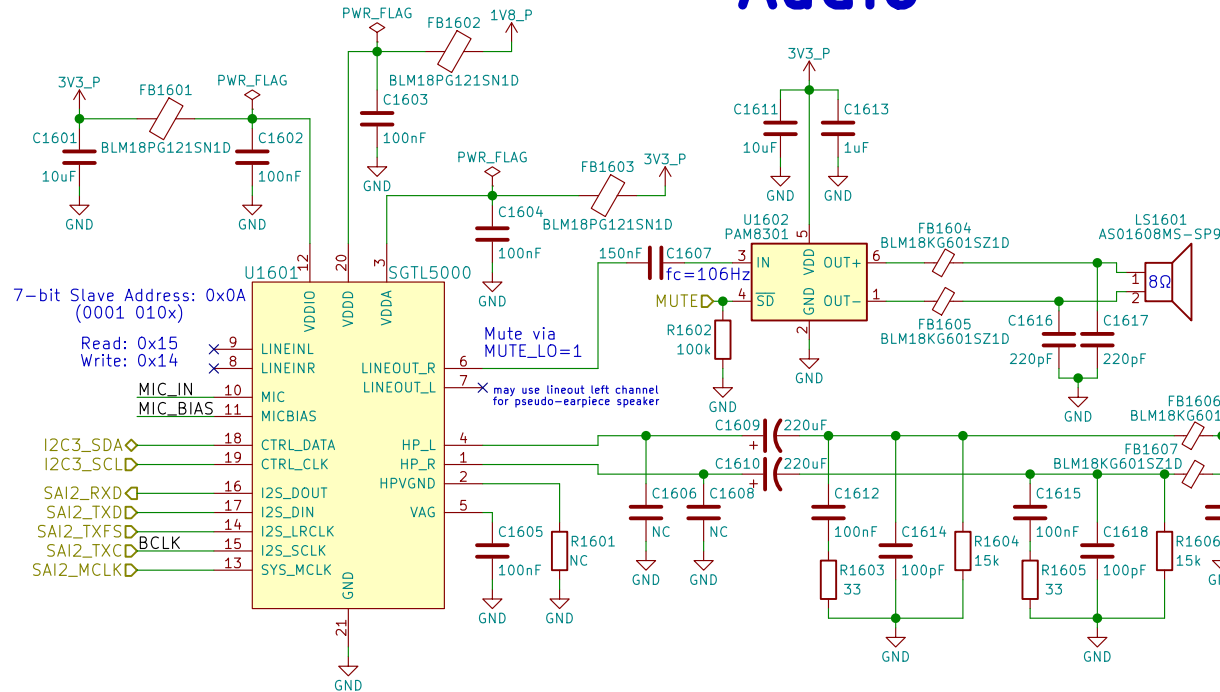
eric.kuzmenko@puri.sm

angus.ainstie@puri.sm

nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

# 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 (Nit6 does the same)  
+Zener diode to protect against ranges outside of -0.9V to 3.3V

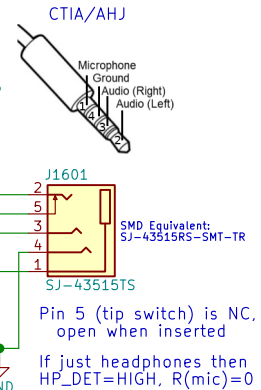
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

"HP Output - 62.5mW max, 1.02kHz sine into 16Ω load at 3.3 V"  
⇒ (1V)<sup>2</sup>/(16Ω)=62.5mW  
∴ Vrms=1V ⇒ Vp(amplitude)=1.414V  
∴ Irms(max)=62.5mA

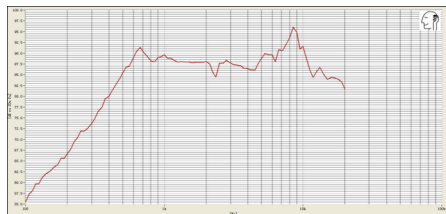
If HP\_DET is HIGH for >100ms then HPs are present

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

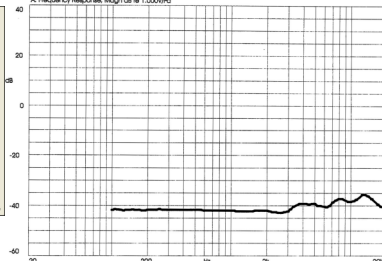
Could use FSA8008 to detect mic



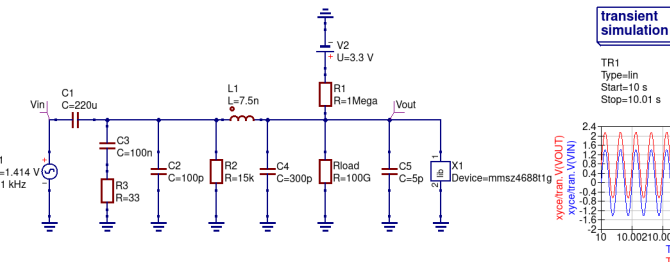
Built-In Speaker's Frequency Response:



Built-In Mic's Frequency Response:



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 = 36.86Ohms	RS = 17.030Ohms
RP = 1.5478kOhms	RP = 36.86Ohms	RP = 17.034Ohms
θ = -0.8deg	θ = -2.3deg	θ = 0.5deg

## Audio

**Purism**

Copyright 2018 GNU GPLv3

Sheet: /Audio/  
File: audio.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: 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 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 FB1703 BLM18PG121SN1D SH1 SH2 GREEN D1702 GREEN LED\_LINK10\_100 R1723 270 R1724 270 LED\_LINK1000 R1725 270 GND

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 XTLI 9 RBIAS AR8031 49 GND

ENET\_2V5 R1712 10k R1714 10k R1716 10k R1717 10k R1718 1.62k 1x R1721 2.37k ENET\_1V1 R1719 NC R1720 NC D1701 DB2J209 TP1701 TEST\_1P TP1702 TEST\_1P ENET\_WoL ENET\_INT CLK02 R1713 NC R1715 NC GND C1701 27pF C1702 27pF R1722 2.37k GND

ETH\_TRX0\_P TD1+ J1701 RJ45 J1 TX1+ J2 TX1- J3 TX2+ J6 TX2- J4 TX3+ J5 TX3- J7 TX4+ J8 TX4- ETH\_TRX0\_N TD1- ETH\_TRX1\_P TD2+ ETH\_TRX1\_N TD2- ETH\_TRX2\_P TD3+ ETH\_TRX2\_N TD3- ETH\_TRX3\_P TD4+ ETH\_TRX3\_N TD4-

100Ω diff-pairs!

Ethernet  
Copyright 2018 GNU GPLv3  
Sheet: /Ethernet/  
File: ethernet.sch  
Size: A4 Date: 2018-07-17  
KiCad E.D.A. kicad 5.0.0  
Rev: v0.1.0  
Id: 17/24

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



**Purism**

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

Rev: v0.1.0  
Id: 17/24

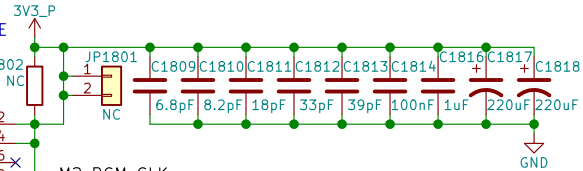
# WLAN+BT M.2

RS9116 NC:  
RTS, CTS, BT\_HOST\_WAKE

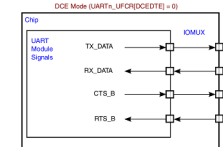
RS9116 datasheet says  
no WIFI\_WAKE  
but the schematic has it

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

Socket: Table 46  
Module: Table 23  
M.2 Key E



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

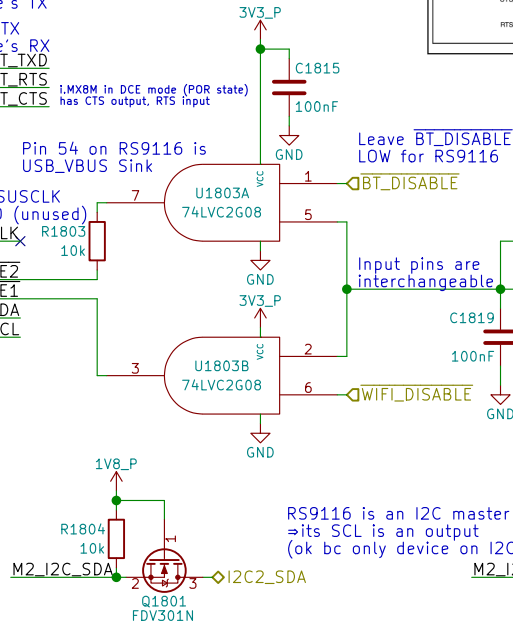
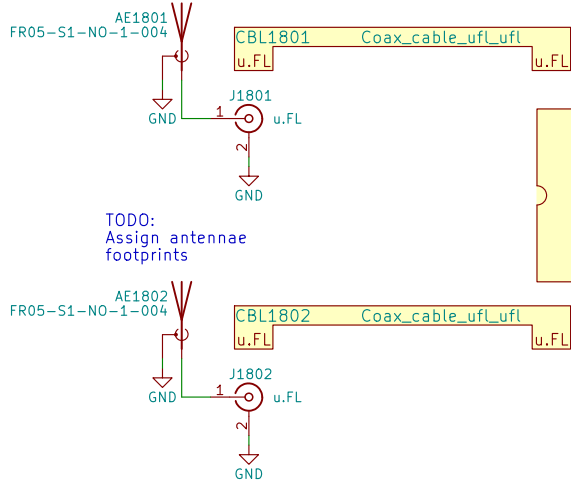


TX output  
RX input  
CTS output  
RTS input  
TX<->RX  
RX<->CTS  
RTS<->RTS

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

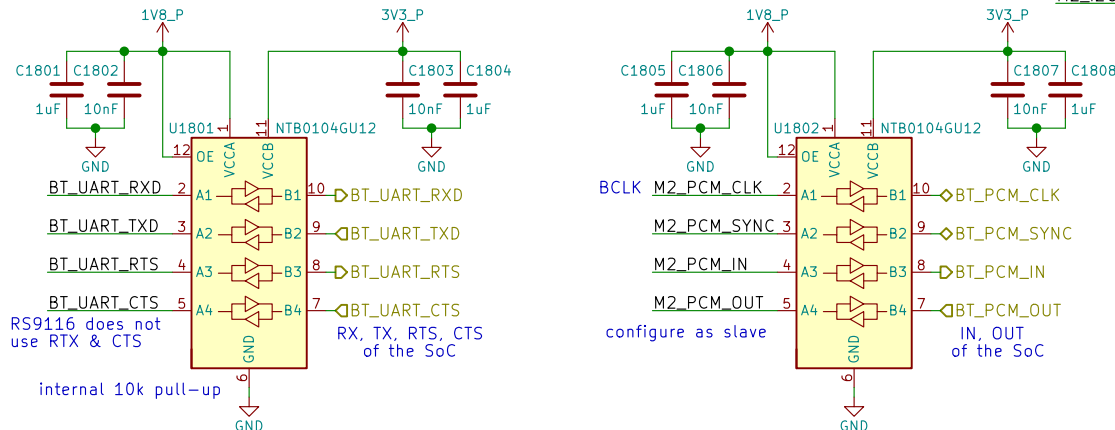
MOD1801  
WifiBTCard  
WiFi + Bluetooth  
M.2 Form Factor  
Key ID "E"  
width: 22 mm  
length: 30 mm

TODO:  
Assign antennae  
footprints



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

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



WLAN+BT M.2

**Purism**

Copyright 2018 GNU GPLv3

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

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

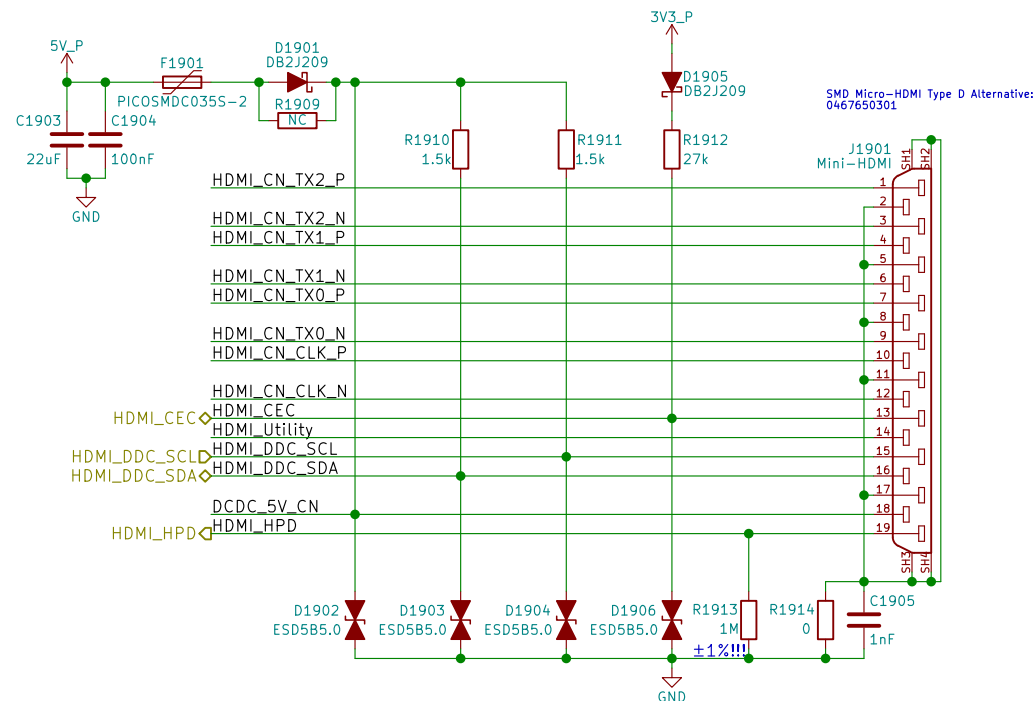
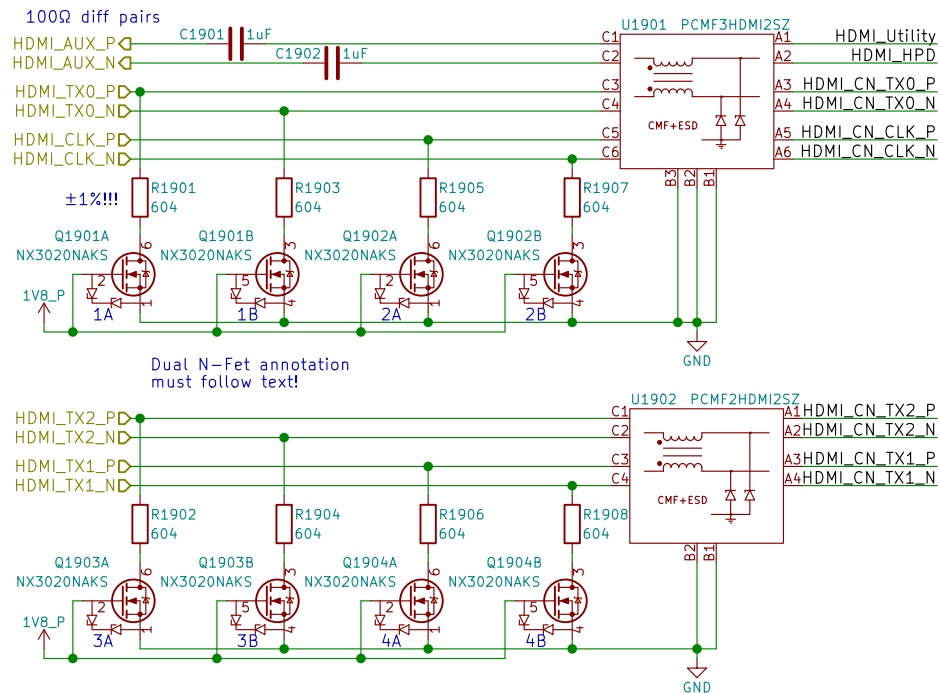
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nicole.farber@puri.sm  
christian.schilmoeller@puri.sm

Rev: v0.1.0  
Id: 18/24

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

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Rev: v0.1.0  
Id: 19/24

## 1

## B



C

D

## 1

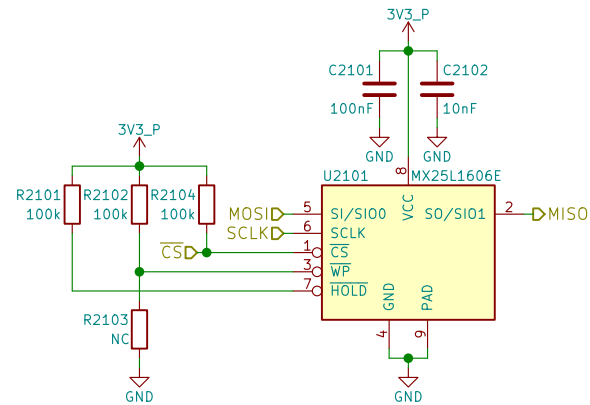


1



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

KiCad E.D.A. kicad 5.0.0

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Rev: v0.1.0

Id: 21/24

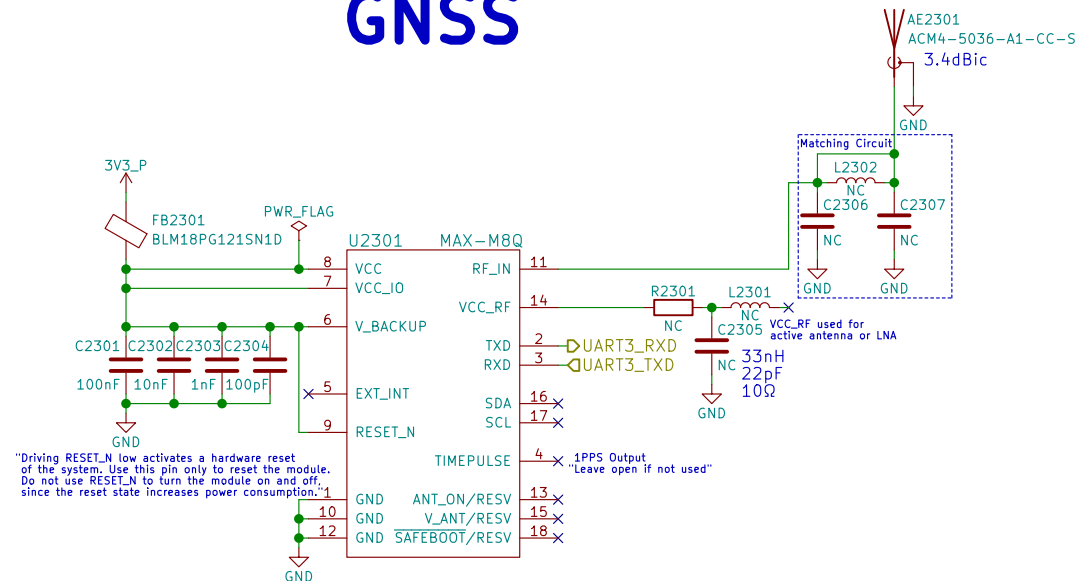
## Smart Card



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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-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](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

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

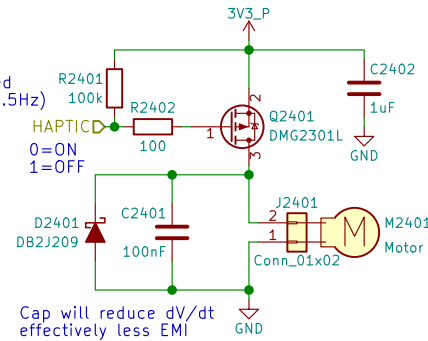
Id: 23/24

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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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Sheet: /Haptic Motor/  
 File: haptic.sch

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Size: A4 Date: 2018-07-17

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 24/24