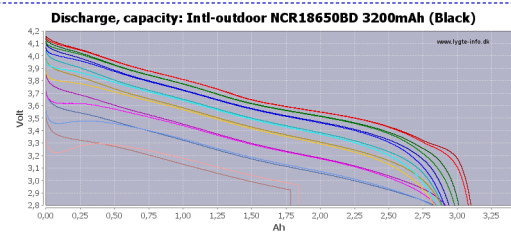


USB-C





```
use AUTO_DPDM_EN
to auto-detect IINLIM
```

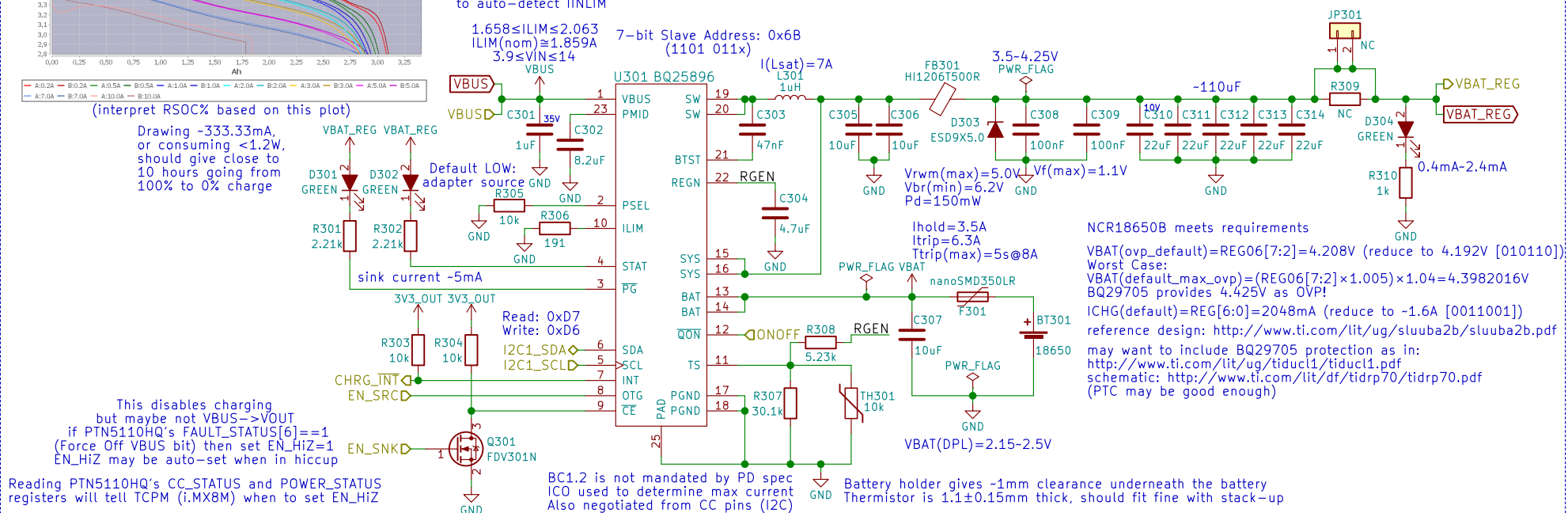
$$1.658 \leq ILIM \leq 2.063$$

$$ILIM(nom) \cong 1.859A$$

$$3.9 < V_{IN} \leq 14$$

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)

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

Battery holder gives ~1mm clearance underneath the battery
Thermistor is 1.1 ± 0.15 mm thick, should fit fine with stack-up

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

NCR18650B meets requirements

VBAT(ovp_default)=REG06[7:2]=4.208V (reduce to 4.192V [010110]);
 Worst Case:
 VBAT(default_max_ovp)=(REG06[7:2]×1.005)×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



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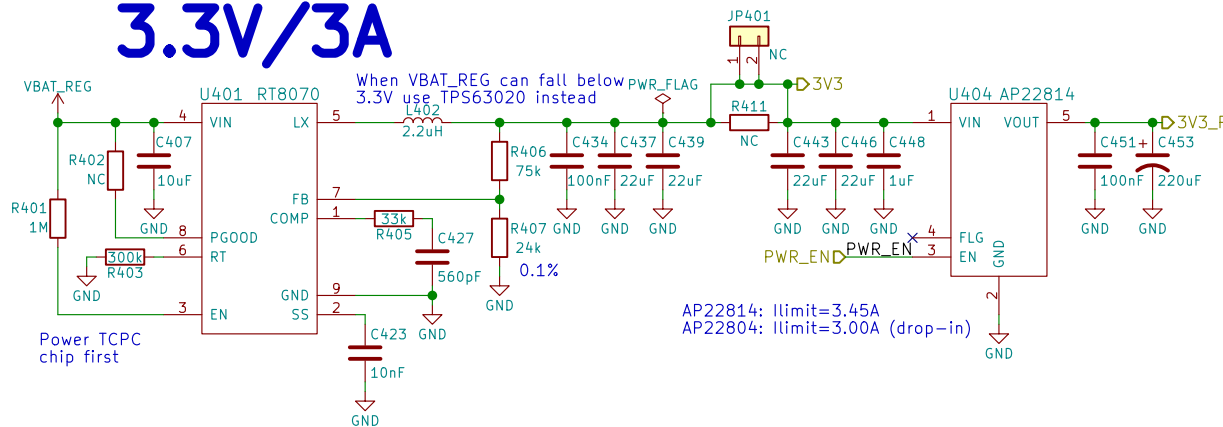
Sheet: /Battery/
File: battery.sch

Size: A4	Date: 2018-06-18
KiCad E.D.A. kicad 4.0.7	

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

Rev: v0.1.0
Id: 3/24

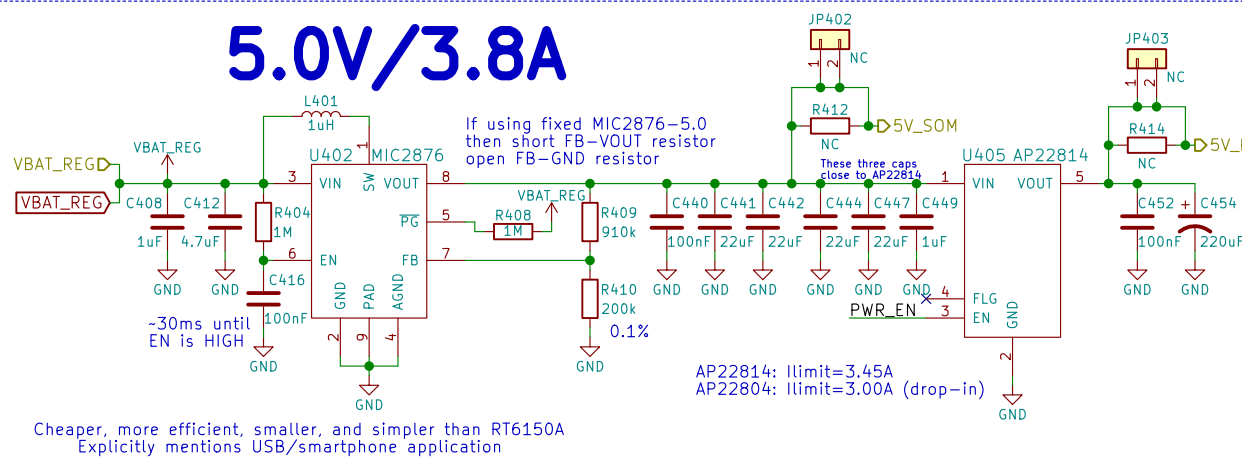
3.3V/3A



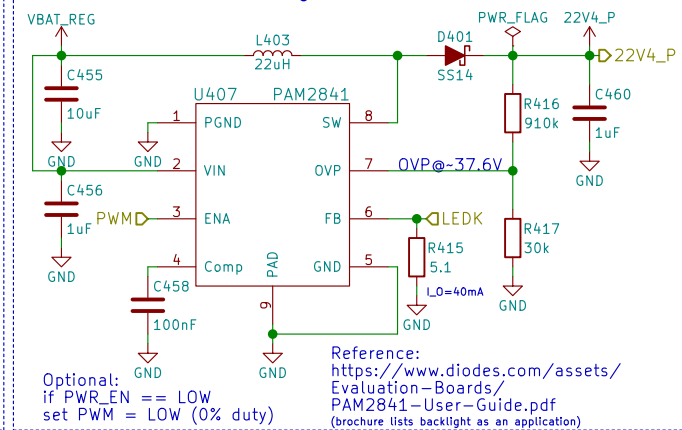
1.8V/600mA



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: 2018-06-18

Rev: v0.1.0

Id: 4/24

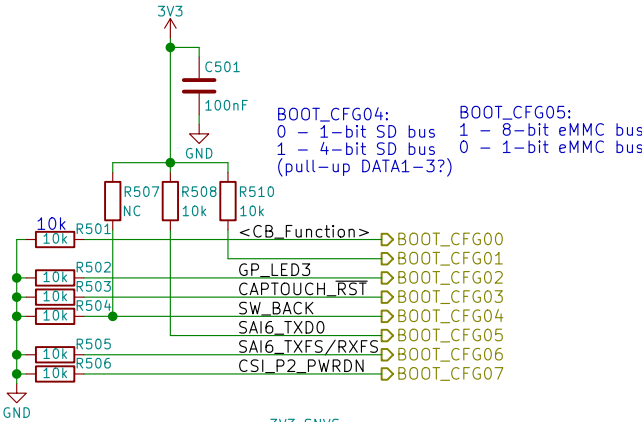
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

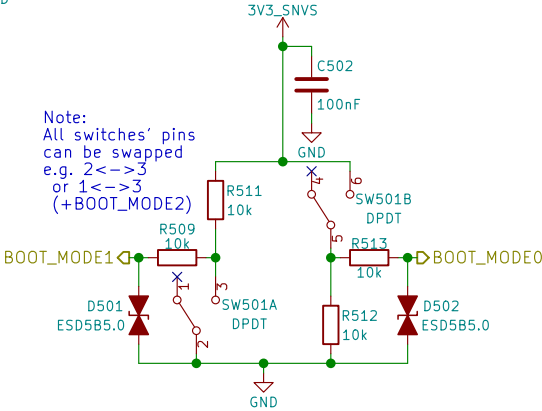
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Boot Config



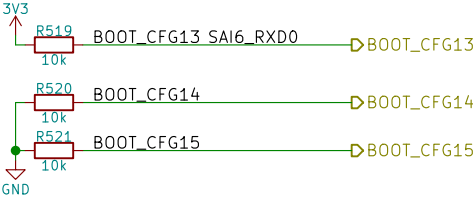
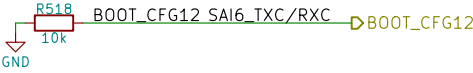
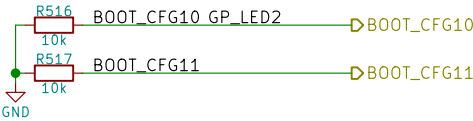
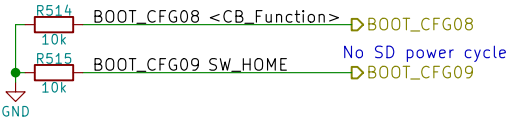
BOOT_CFG04: 0 - 1-bit SD bus
1 - 4-bit SD bus (pull-up DATA1-3?)
BOOT_CFG05: 1 - 8-bit eMMC bus
0 - 1-bit eMMC bus




Note:
All switches' pins
can be swapped
e.g. 2<->3
or 1<->3
(+BOOT_MODE2)

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

Purism

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Sheet: /Boot Config/
File: boot.sch

Size: A4
KiCad E.D.A. kicad 4.0.7

eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
nicole.ferber@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: 2018-06-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 6/24

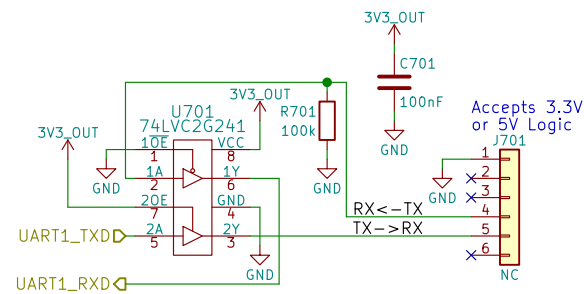
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

UART Debug



UART Debug



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Sheet: /UART Debug/

File: uart.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.7

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: 2018-06-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 8/24

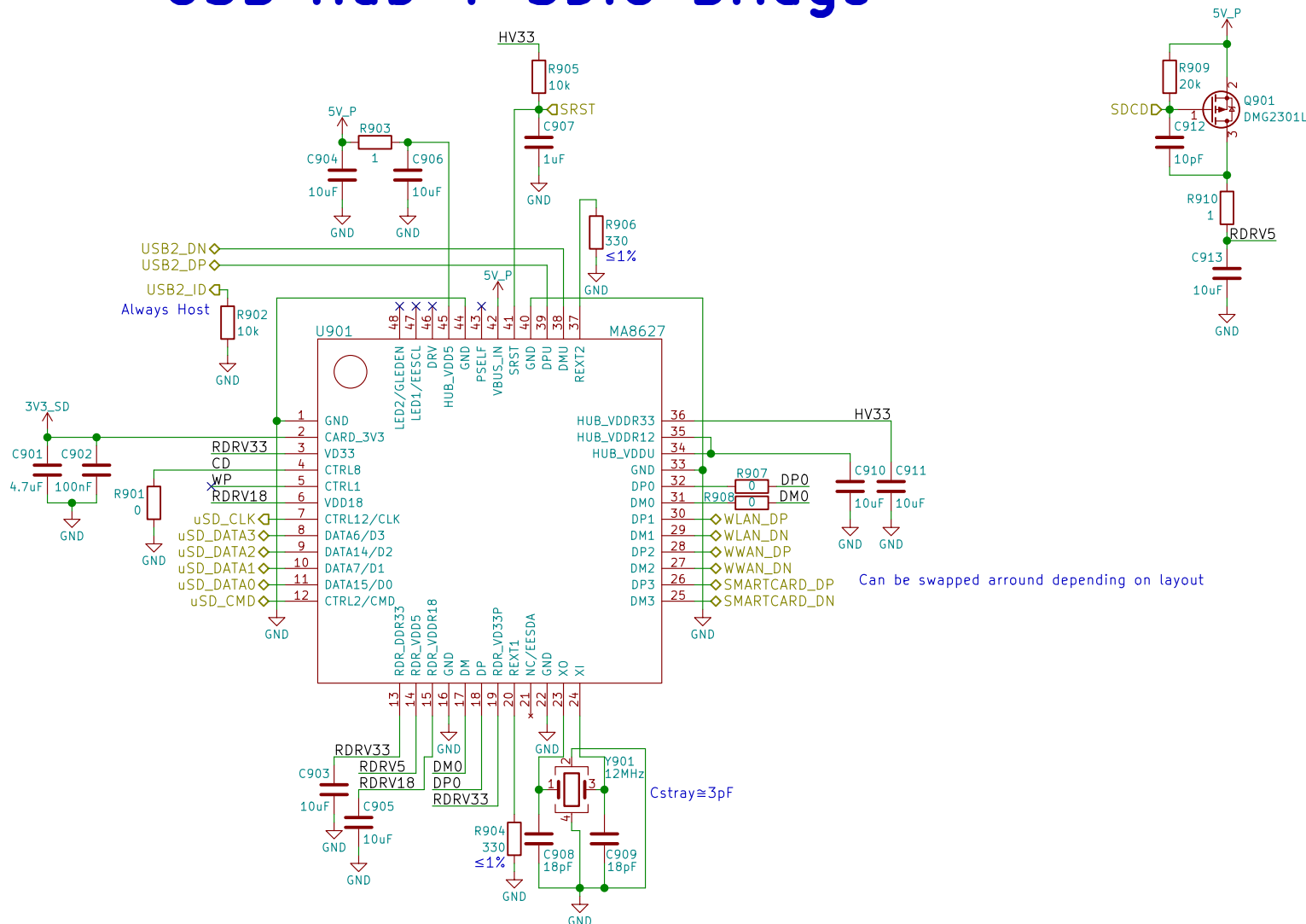
eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

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: 2018-06-18
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Size: A1	Date:
KiCad E.D.A.	kicad 4.0.7

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

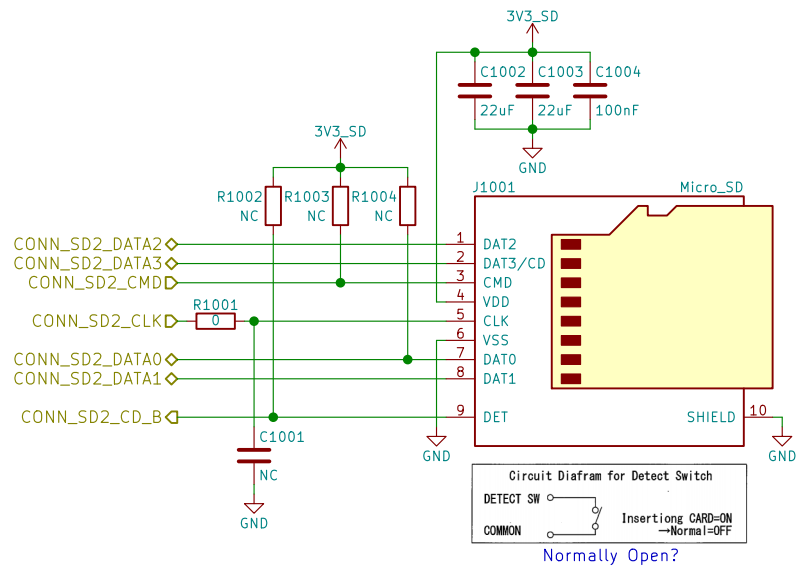
nicole.ferber@puri.sm

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: 2018-06-18
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KiCad E.D.A.	kicad 4.0.7
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eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

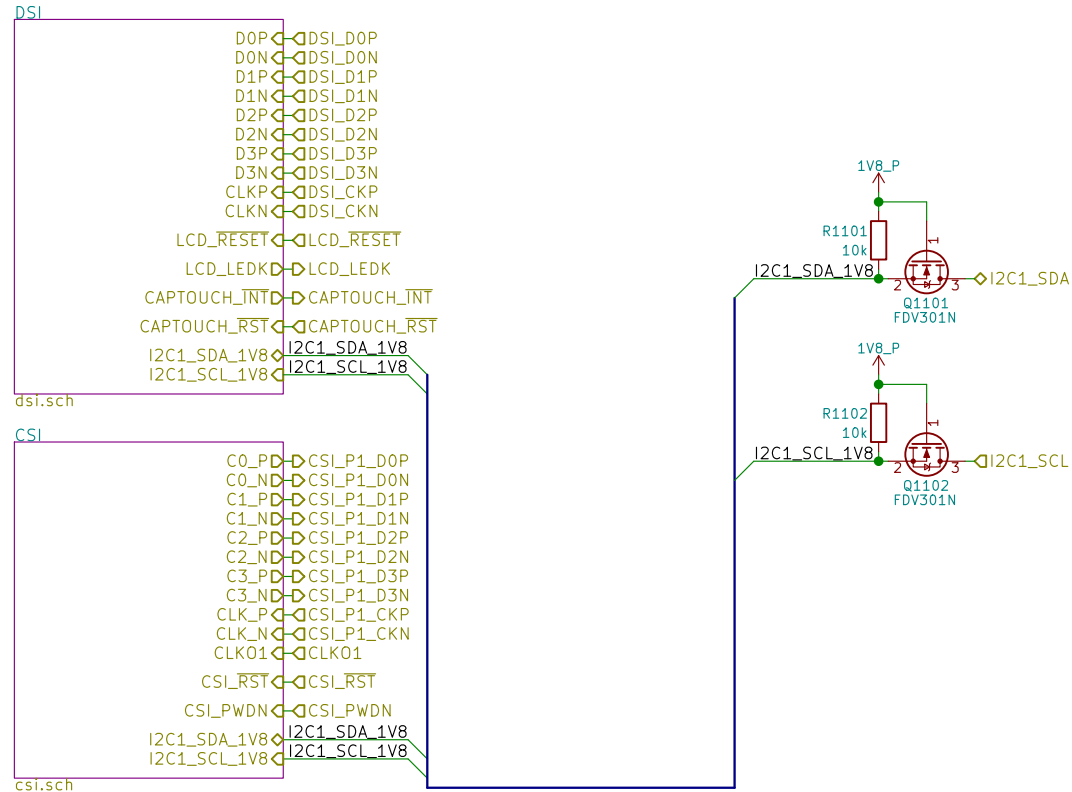
nicole.faerber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 10/24

MIPI



MIPI



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Sheet: /MIPI/

File: mipi.sch

Size: A4 Date: 2018-06-18

KiCad E.D.A. kicad 4.0.7

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.ferber@puri.sm

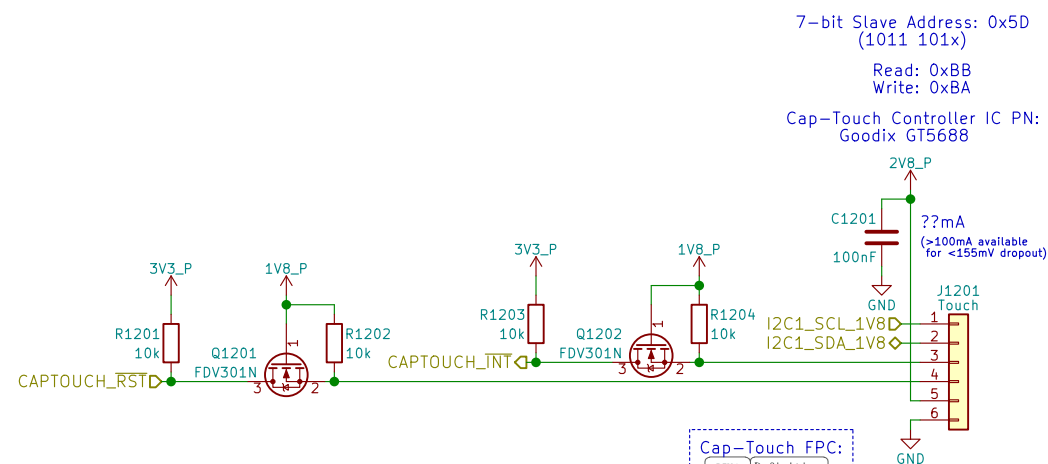
christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 11/24

Display & Touch Controller

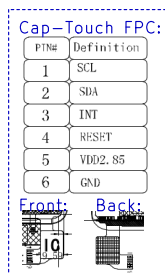
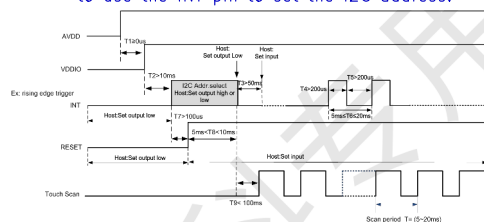
LCD PN:
Shenzhen Jinghong Electronics Co., Ltd.
JH057N00900



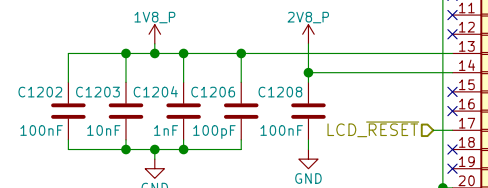
The upper 7 bits are the address, and bit 0 is used to select read or write. GT5688 has two slave device addresses to choose from:

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

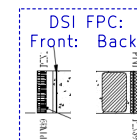
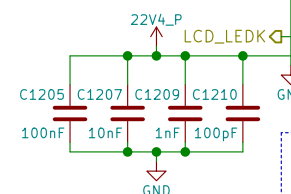
Every time you power on or reset, you need to use the INT pin to set the I2C address:



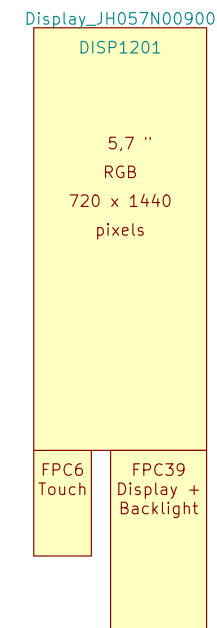
Note:
No power-up sequence is given in the spec sheet



100Ω Differential Impedance



Backlight Array:



MIPI DSI



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

Size: A4
KiCad E.D.A. kicad 4.0.7

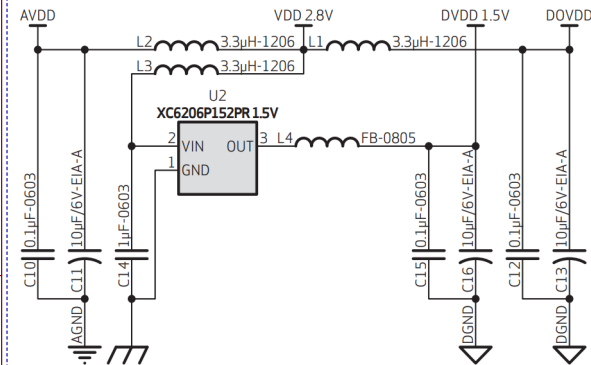
Date: 2018-06-18

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

Rev: v0.1.0
Id: 12/24

Camera

Using Internal DVDD 1.5V Regulator:



2.7 POWER UP SEQUENCE

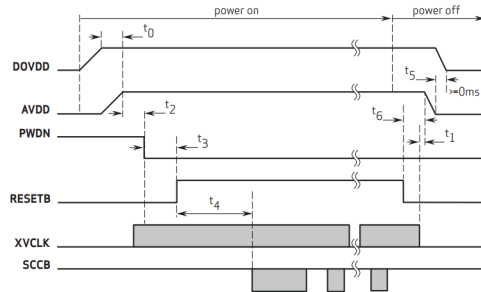
Based on the system power configuration (1.8V or 2.8V for I/O power, using external DVDD or internal DVDD, requiring access to the I2C during power up period or not), the power up sequence will differ. If 1.8V is used for I/O power, using the internal DVDD is preferred. If 2.8V is used for I/O power,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

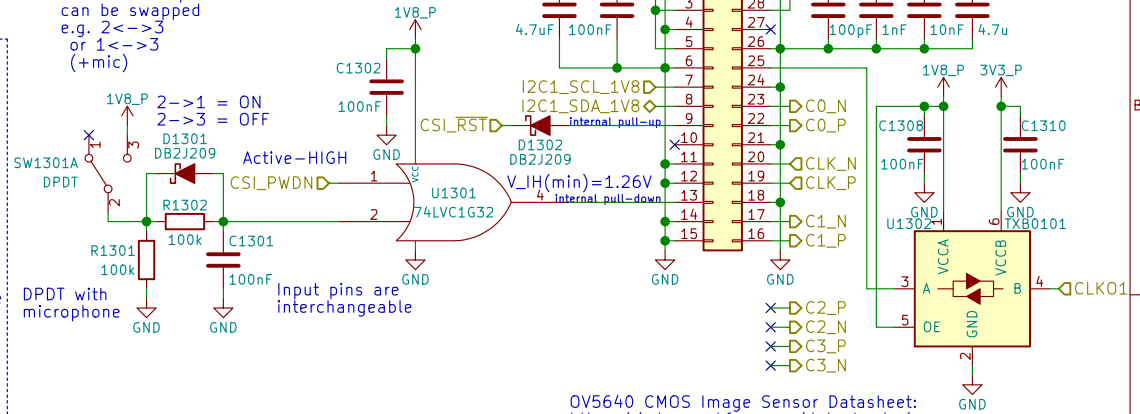
figure 2-3 power up timing with internal DVDD



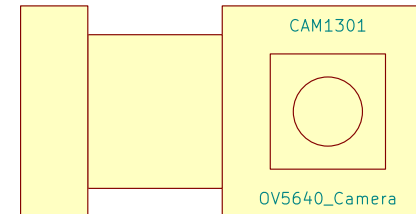
note $t_0 \geq 0$ ms, delay from DOVDD stable to AVDD stable, it is recommended to power up AVDD shortly after DOVDD has been powered up
 $t_1 \geq 0$ ms, delay from XVCLK off to AVDD off
 $t_2 \geq 5$ ms, delay from AVDD stable to sensor power up stable, PWDN can be pulled low after this point, XVCLK 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



MIPI CSI

Purism

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

Size: A4 Date: 2018-06-18
 KiCad E.D.A. kicad 4.0.7

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

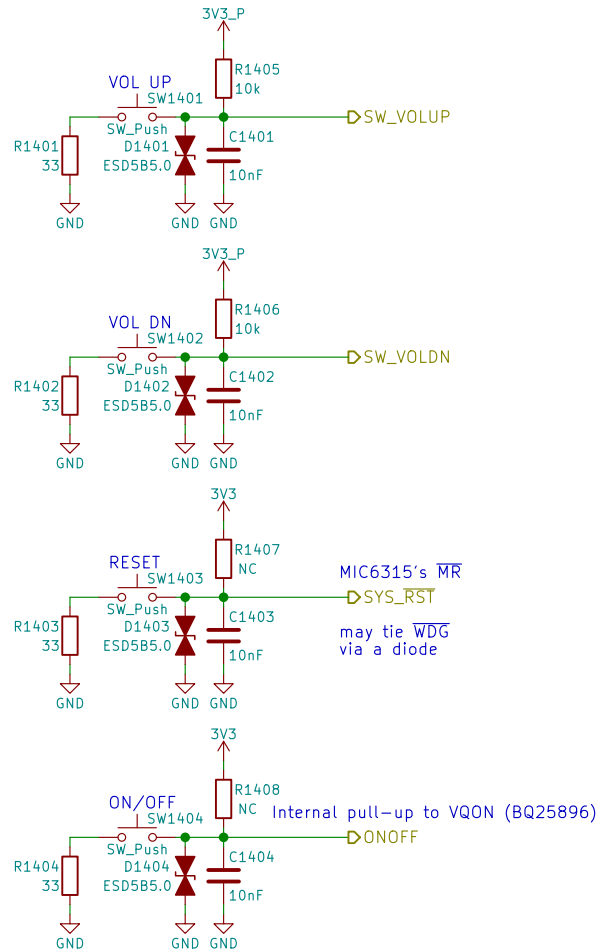
nicole.farber@puri.sm

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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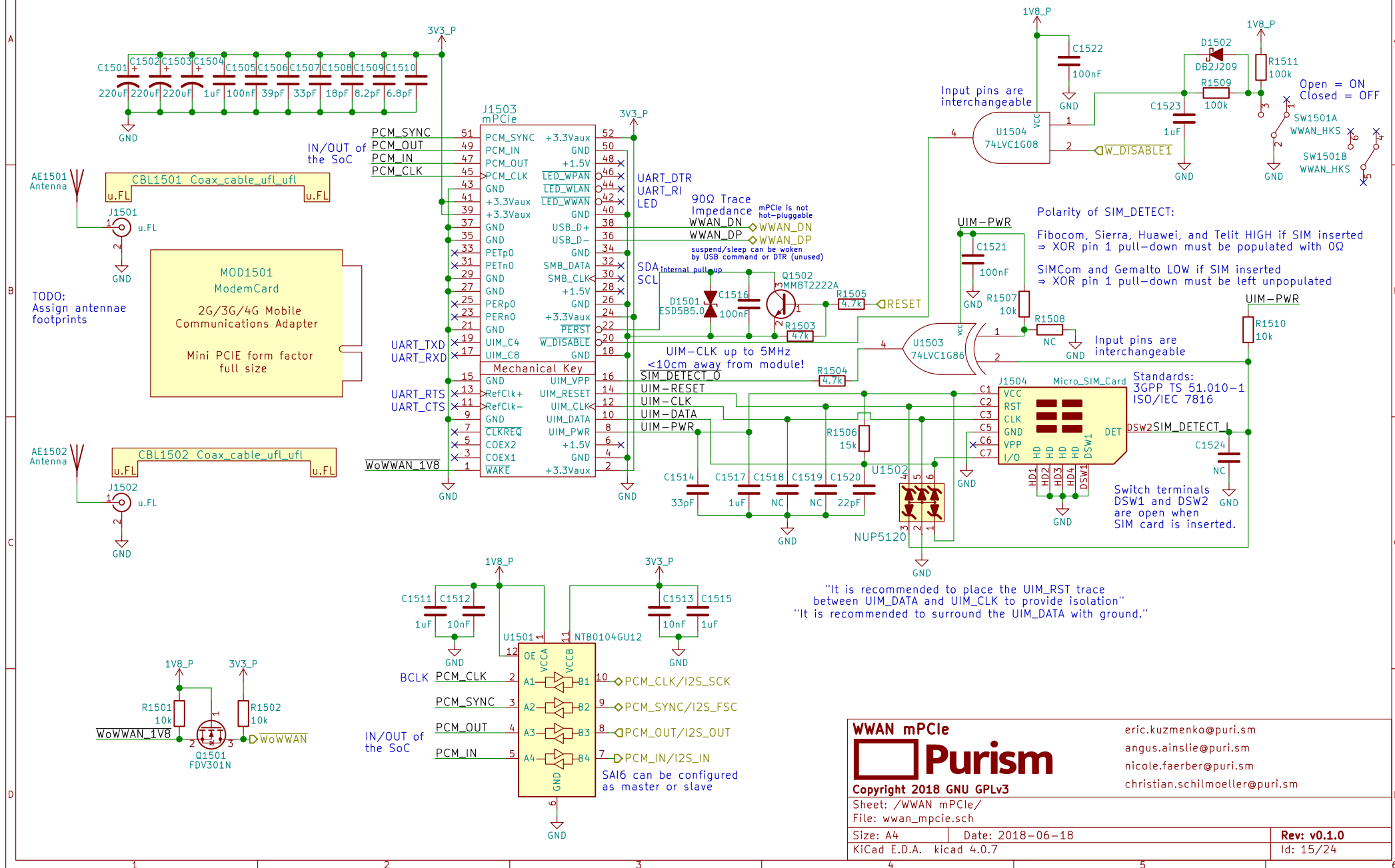
Sheet: /Buttons & LED/
File: buttons_led.sch

Size: A4 Date: 2018-06-18
KiCad E.D.A. kicad 4.0.7

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

Rev: v0.1.0
Id: 14/24

WWAN mPCle



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-cre>
 (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



Pin 5 (tip switch) is NC, open when inserted
 If just headphones then HP_DET=HIGH, R(mic)=0
 may add ~220uF cap parallel to Zener

Ext-Mic enabled MIC_SEL=HIGH
 Int-Mic enabled MIC_SEL=LOW
 Add TVS next to int-mic? (OpenMoko does this)
 $-37dB=14.1254mV/Pa$
 $\therefore \text{mic produces } 14.1254mV_{rms} \text{ when exposed to a } 1kHz \text{ tone of } 94dB-SPL \text{ at the capsule (or } 19.98mV \text{ amplitude)}$
 $\Rightarrow 40dB \text{ gain would produce } -2V \text{ amplitude (4Vpp, clipping)}$
 $30dB \text{ gain would produce } -0.632V \text{ amplitude (1.264Vpp)}$
 $38.33dB \text{ gain would yield } 3.3V_{pp}$

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

DPDT

SW1301B

DPDT with camera

5->4 = ON

5->6 = OFF

All switches' pins can be swapped

e.g. 5<->4

or 5<->6

(+camera)

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

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GND

C1622

270pF

GND

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MIC_BIAS

C1619

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GND

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GND

C1622

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GND

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GND

C1622

270pF

GND

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MIC_BIAS

C1619

1uF

GND

C1620

100nF

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BLM18KG601SZ1D

GND

C1622

270pF

GND

DPDT

SW1301B

DPDT with camera

5->4 = ON

5->6 = OFF

All switches' pins can be swapped

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or 5<->6

(+camera)

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

DPDT

SW1301B

DPDT with camera

5->4 = ON

5->6 = OFF

All switches' pins can be swapped

e.g. 5<->4

or 5<->6

(+camera)

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

DPDT

SW1301B

DPDT with camera

5->4 = ON

5->6 = OFF

All switches' pins can be swapped

e.g. 5<->4

or 5<->6

(+camera)

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

DPDT

SW1301B

DPDT with camera

5->4 = ON

5->6 = OFF

All switches' pins can be swapped

e.g. 5<->4

or 5<->6

(+camera)

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

DPDT

SW1301B

DPDT with camera

5->4 = ON

5->6 = OFF

All switches' pins can be swapped

e.g. 5<->4

or 5<->6

(+camera)

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

DPDT

SW1301B

DPDT with camera

5->4 = ON

5->6 = OFF

All switches' pins can be swapped

e.g. 5<->4

or 5<->6

(+camera)

SW Mute Mic: MUTE_ADC=1

MIC_IN

MIC_BIAS

C1619

1uF

GND

C1620

RGMII 10/100/1000 Ethernet

Ethernet

Purism

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Sheet: /Ethernet/
File: ethernet.sch

Size: A4 Date: 2018-06-18 Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7 Id: 17/24

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 **Purism**

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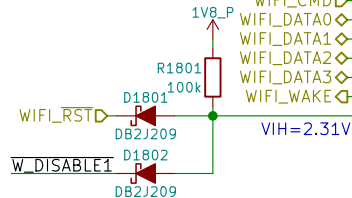
Id: 17/24

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



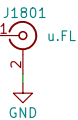
RedPine RS9116
has 100k pull-up to
3.3V making SDIO_RST
~2.55V when HIGH

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

TODO:
Assign antennae
footprints

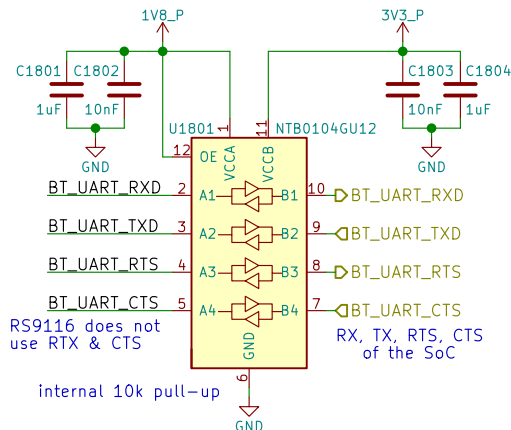
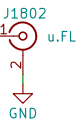
AE1801
FR05-S1-NO-1-004

CBL1801 Coax_cable_ufl_ufl
u.FL



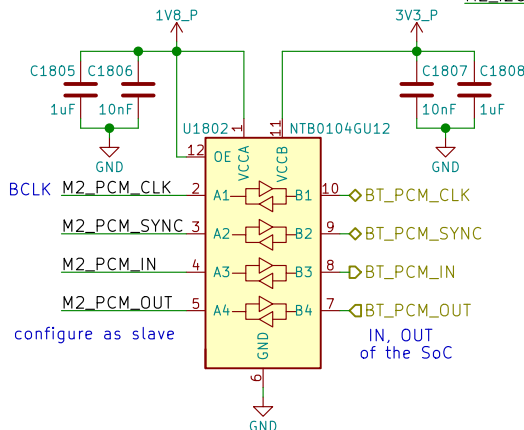
AE1802
FR05-S1-NO-1-004

CBL1802 Coax_cable_ufl_ufl
u.FL



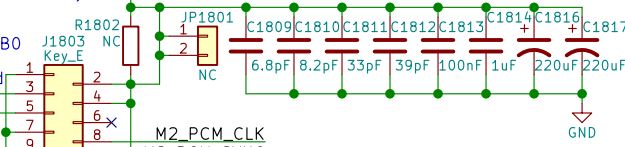
RS9116 does not
use RTX & CTS

internal 10k pull-up



configure as slave

Socket: Table 46
Module: Table 23
3V3_P
M.2 Key E



SoC's IN/OUT

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 74LVC2G08
U1803B 74LVC2G08

1V8_P
3V3_P
M2_I2C_SDA
M2_I2C_SCL

U1801 104GU12
U1802 104GU12

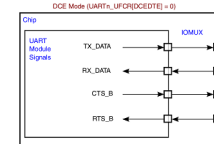
BT_UART_RXD
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

BT_PCM_CLK
BT_PCM_SYNC
BT_PCM_IN
BT_PCM_OUT

IN, OUT
of the SoC

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

Input pins are
interchangeable

U1803A 74LVC2G08
U1803B 74LVC2G08

1V8_P
3V3_P
M2_I2C_SDA
M2_I2C_SCL

U1801 104GU12
U1802 104GU12

BT_UART_RXD
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

BT_PCM_CLK
BT_PCM_SYNC
BT_PCM_IN
BT_PCM_OUT

IN, OUT
of the SoC

WIFI_DISABLE

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

SW1801A
WLAN_HKS

SW1801B
WLAN_HKS

U1803A 74LVC2G08
U1803B 74LVC2G08

1V8_P
3V3_P
M2_I2C_SDA
M2_I2C_SCL

U1801 104GU12
U1802 104GU12

BT_UART_RXD
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

WLAN+BT M.2

Purism

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

Size: A4 Date: 2018-06-18
KiCad E.D.A. kicad 4.0.7

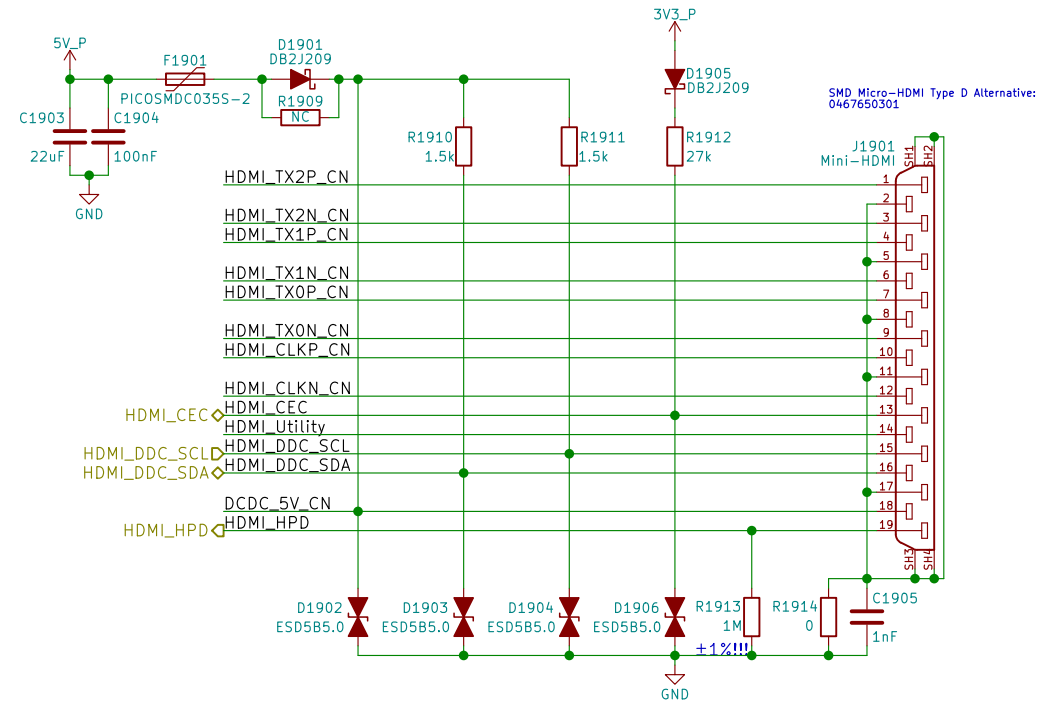
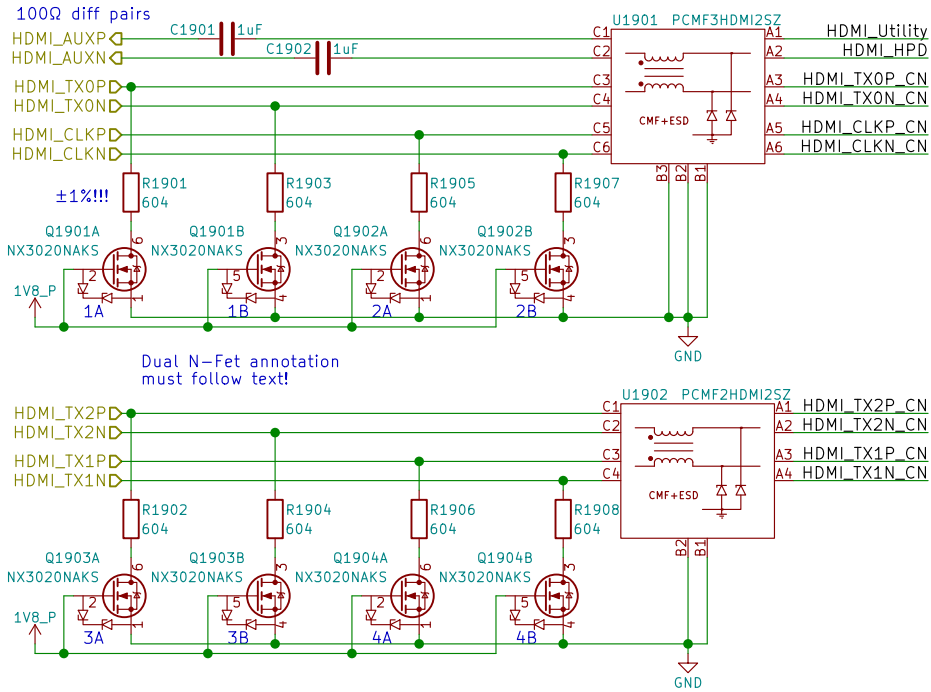
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Rev: v0.1.0
Id: 18/24

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
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Date: 2018-06-18

Rev: v0.1.0
Id: 19/24

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1

B



C

D

1



5



1

SPI NOR Flash



SPI NOR Flash



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Sheet: /SPI Flash/
File: flash.sch

Size: A4 Date: 2018-06-18
KiCad E.D.A. kicad 4.0.7

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Id: 21/24

Size: 117	Date: 2018-08-18	Rev: 10/20
KiCad E.D.A. kicad 4.0.7		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: 2018-06-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 23/24

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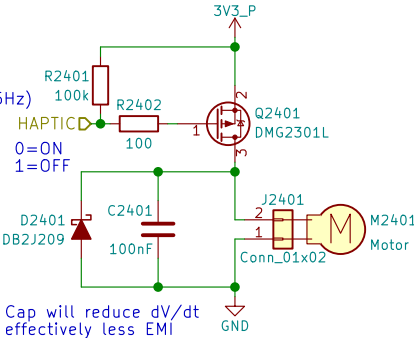
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Haptic Motor


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



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

Purism

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Sheet: /Haptic Motor/
File: haptic.sch

Size: A4

Date: 2018-06-18

Rev: v0.1.0

KiCad E.D.A. kicad 4.0.7

Id: 24/24