

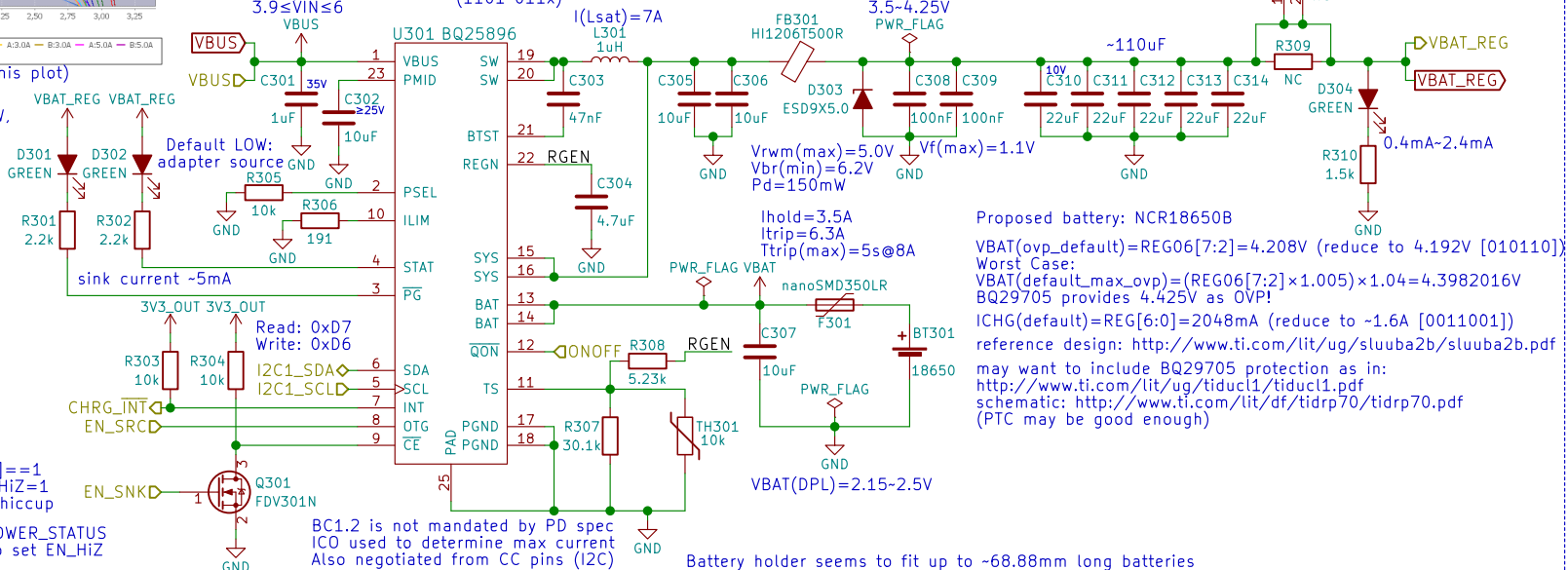
(interpret RSOC% based on this plot)

Drawing ~320mA, or consuming $\leq 1.152W$, should give close to 10 hours going from 100% to 0% charge

use AUTO_DPDM_EN to auto-detect IINLIM

$1.658 \leq ILIM \leq 2.063$
 $ILIM(nom) \approx 1.859A$
 $3.9 \leq VIN \leq 6$
 7-bit Slave Address: 0x6B (1101 011x)

Battery Charge Controller



This disables charging but maybe not $VBUS \rightarrow VOUT$ if PTN5110HQ's $FAULT_STATUS[6] = 1$ (Force Off VBUS bit) then set $EN_HiZ = 1$ EN_HiZ may be auto-set when in hiccup

Reading PTN5110HQ's CC_STATUS and $POWER_STATUS$ registers will tell TCPM (i.MX8M) when to set EN_HiZ

Also, reading PTN5110HQ's CC_STATUS and $POWER_STATUS$ registers will tell TCPM (i.MX8M) when to set $OTG_CONFIG = 1$ (this will also happen when PTN5110HQ sets EN_SRC HIGH)

Battery

Purism

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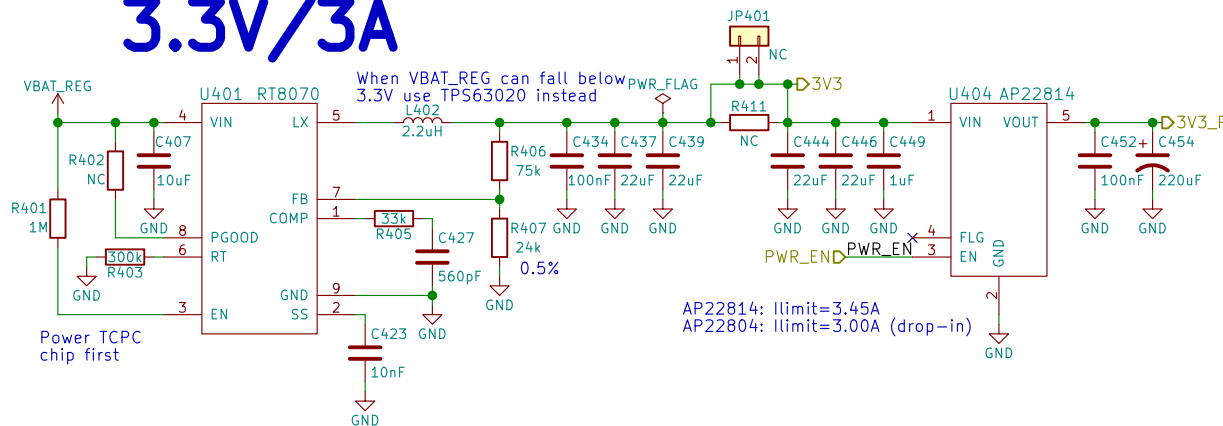
Sheet: /Battery/
 File: battery.sch

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

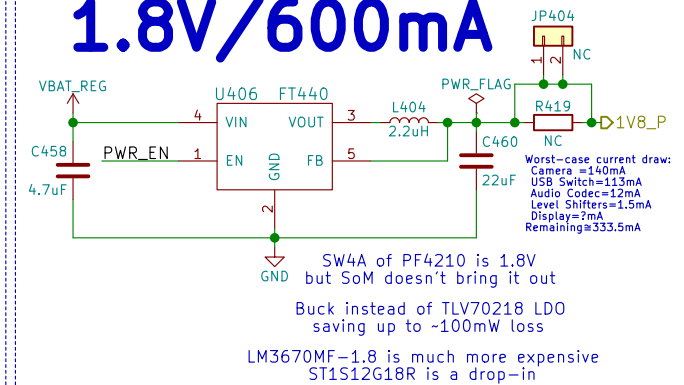
eric.kuzmenko@puri.sm
 angus.ainslie@puri.sm
 nicole.ferber@puri.sm
 christian.schilmoeller@puri.sm

Rev: v0.1.0
 Id: 3/24

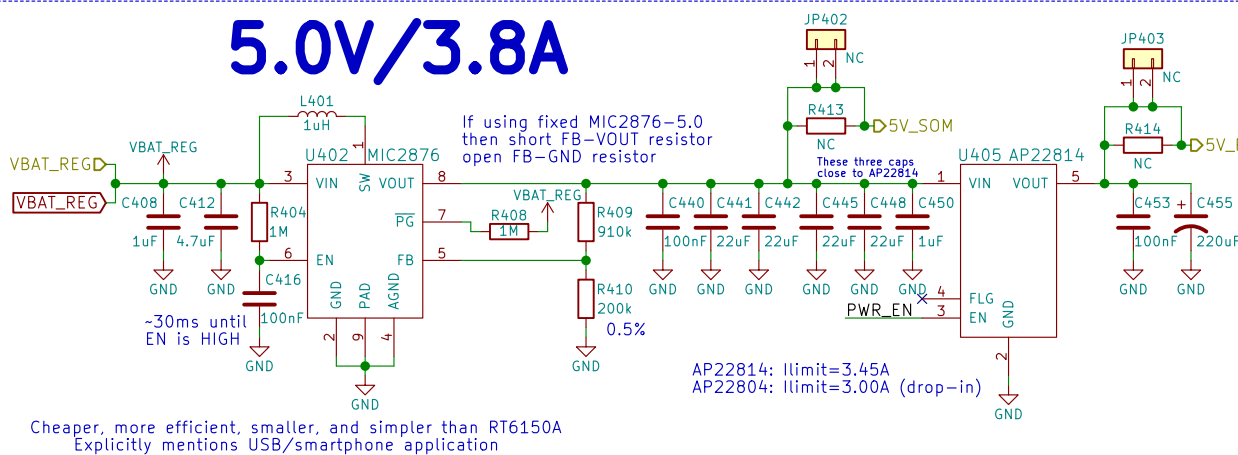
3.3V/3A



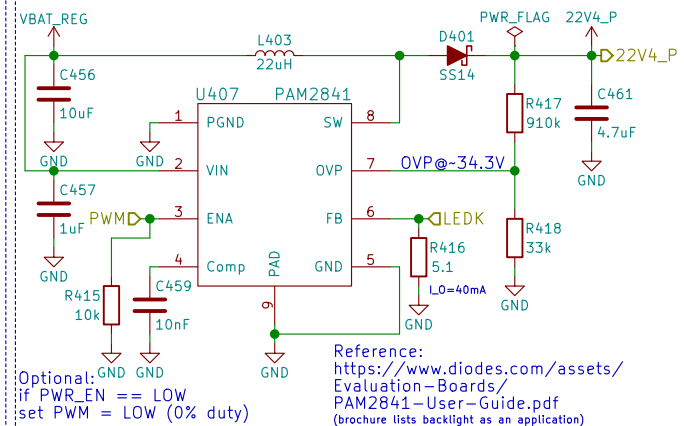
1.8V/600mA



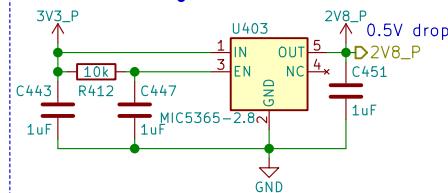
5.0V/3.8A



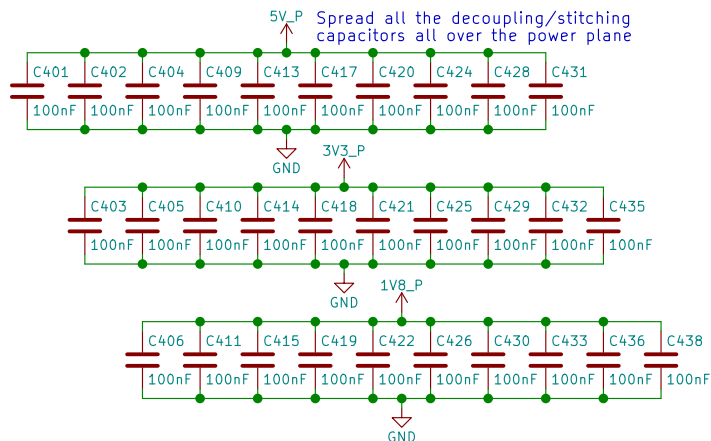
22.4V/40mA



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

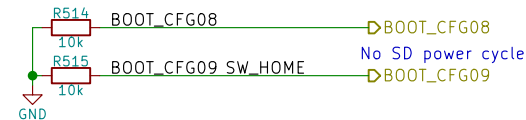
Boot Config



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 ¹	Shipped value	Settings
BOOT_CFG[11:10]	OEM	USDHC port selection	Yes	00	00 - USDHC-1 01 - USDHC-2 10 - USDHC-3 else - reserved



Boot Configuration



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Sheet: /Boot Config/
File: boot.sch

Size: A4
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Date: 2018-08-14

Rev: v0.1.0

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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 $\sim 350nA$ ($< 1\mu W$)

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

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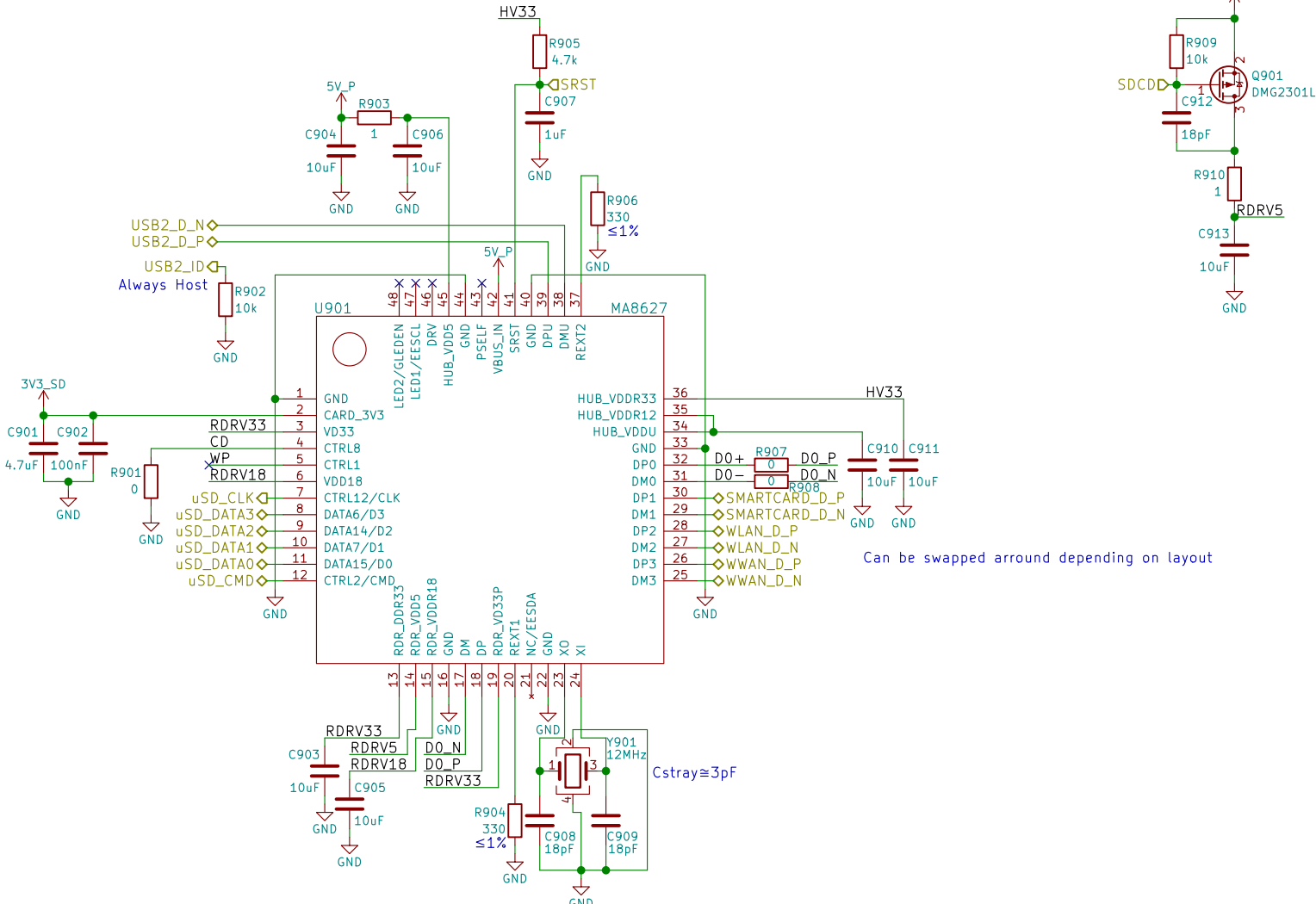
eric.kuzmenko@puri.sm
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File: jtag.sch

Rev: v0.1.0

Id: 8/24

USB Hub + SDIO Bridge



Can be swapped around depending on layout

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Sheet: /USB Hub + SDIO Bridge/

File: usb_hub_sdio.sch

Size: A4	Date:
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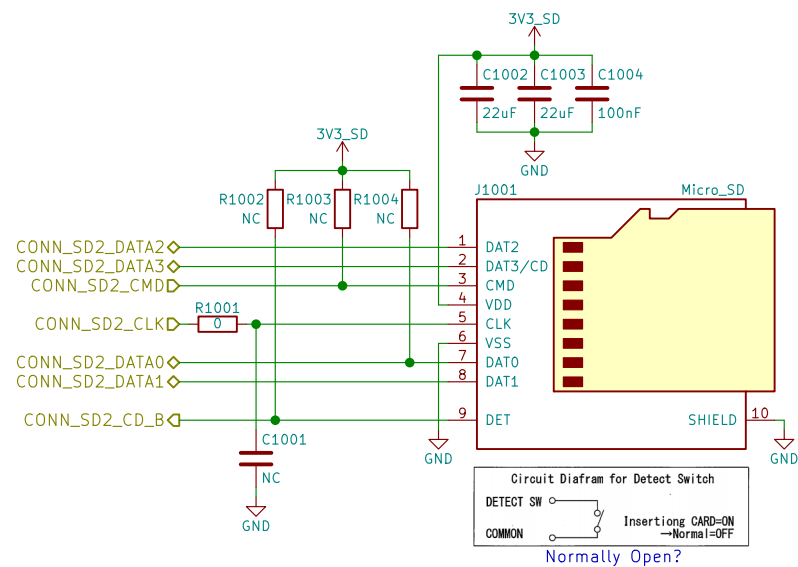
christian.schilmoeller@

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 9/24

μ SD



uSD Card



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Sheet: /uSD Card/

File: sd.sch

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

Rev: v0.1.0

Id: 10/24

MIPI



MIPI



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Sheet: /MIPI/
File: mipi.sch

Size: A4 Date: 2018-08-14

KiCad E.D.A. kicad 5.0.0

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christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 11/24

A

B

C

D

1

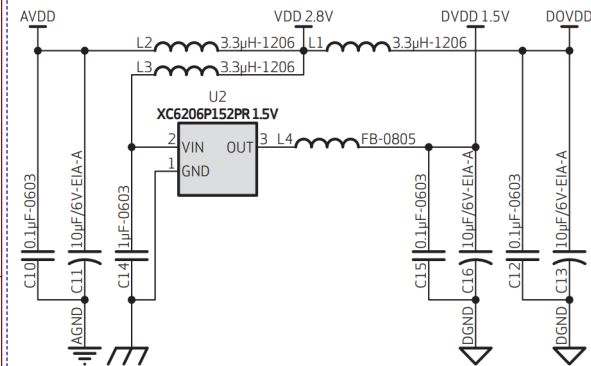
1

2

7

Camera

Using Internal DVDD 1.5V Regulator:



2.7 POWER UP SEQUENCE

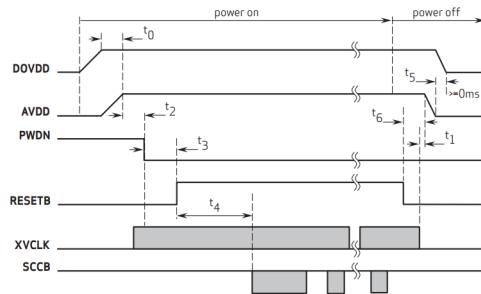
Based on the system power configuration (1.8V or 2.8V for I/O power, using external DVDD or internal DVDD, requiring access to the I2C during power up period or not), the power up sequence will differ. If 1.8V is used for I/O power, using the internal DVDD is preferred. If 2.8V is used for I/O power,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

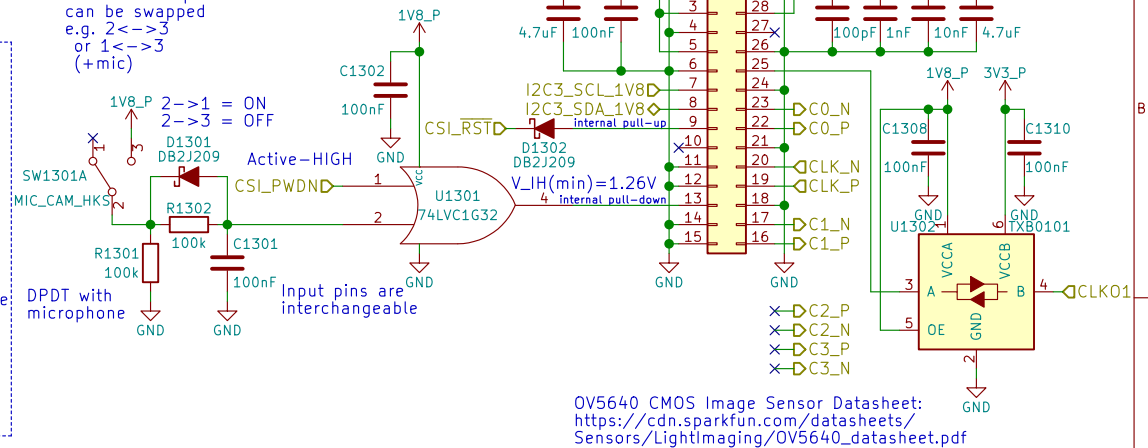
figure 2-3 power up timing with internal DVDD



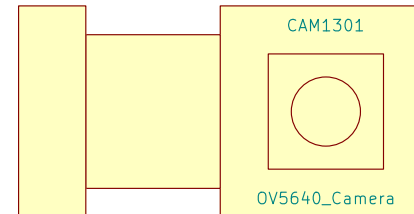
note $t_0 \geq 0$ ms, delay from DOVDD stable to AVDD stable, it is recommended to power up AVDD shortly after DOVDD has been powered up
 $t_1 \geq 0$ ms, delay from XVCLK off to AVDD off
 $t_2 \geq 5$ ms, delay from AVDD stable to sensor power up stable, PWDN can be pulled low after this point, XVCLK 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: 2018-08-14
KiCad E.D.A. kicad 5.0.0

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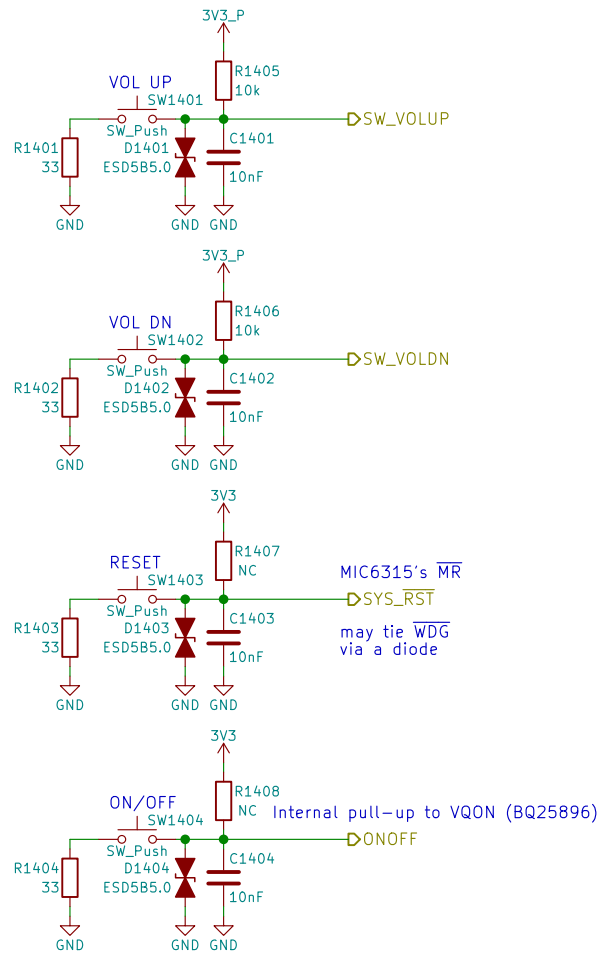
nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

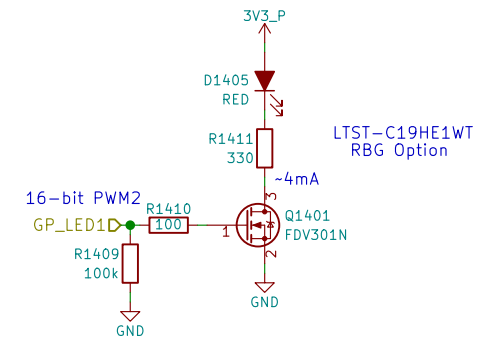
Rev: v0.1.0

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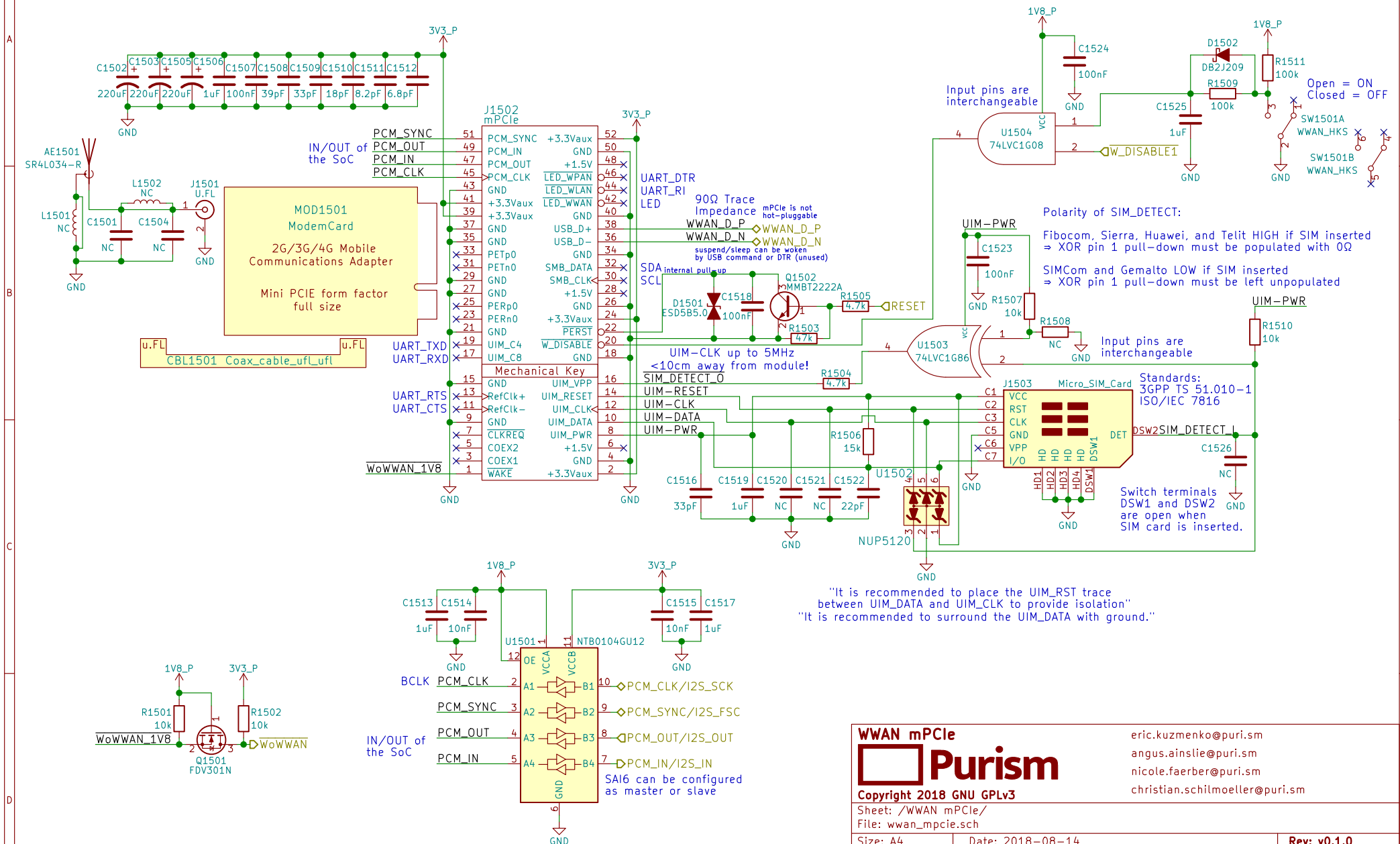
Sheet: /Buttons & LED/
 File: buttons_led.sch

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

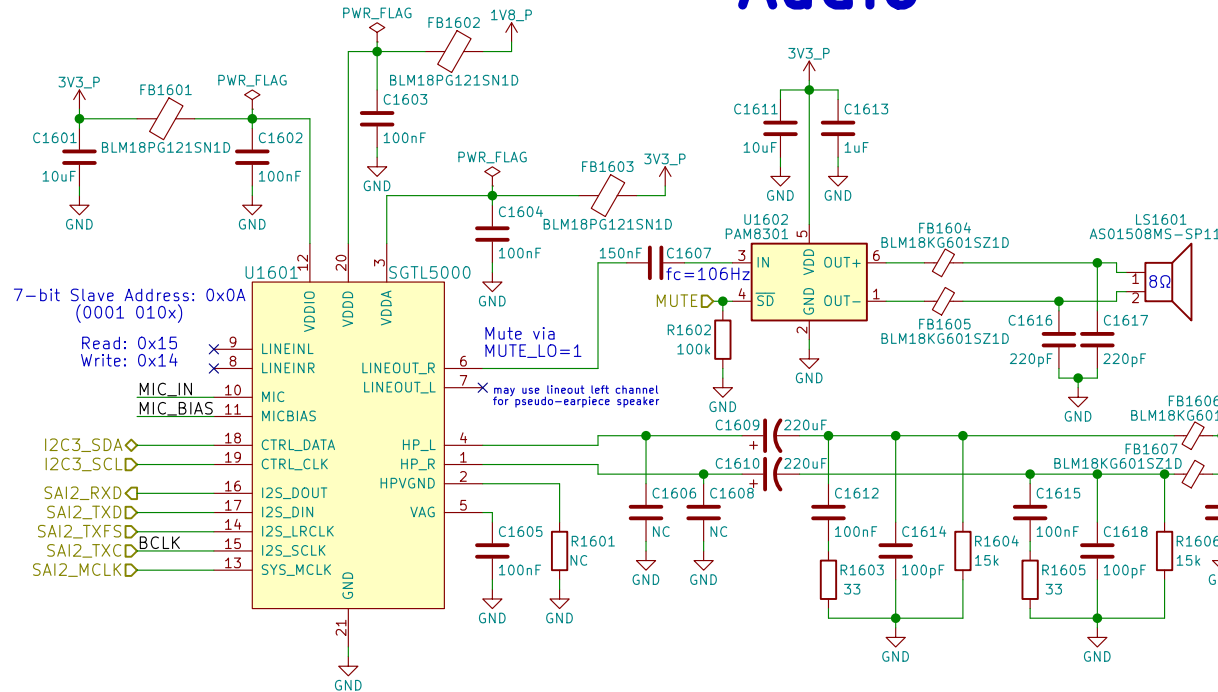
eric.kuzmenko@puri.sm
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 christian.schilmoeller@puri.sm

Rev: v0.1.0
 Id: 14/24

WWAN mPCIe



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-circuitry>
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

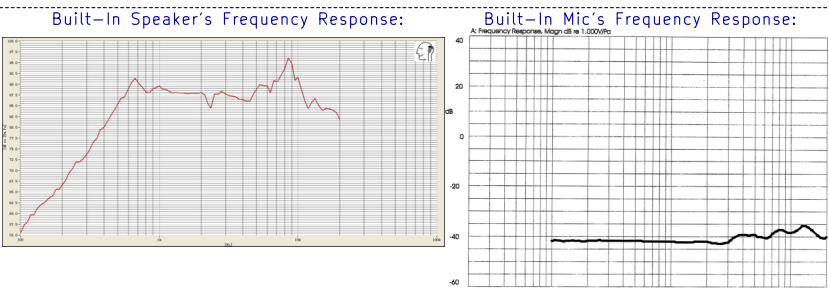
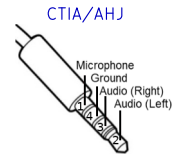
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

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

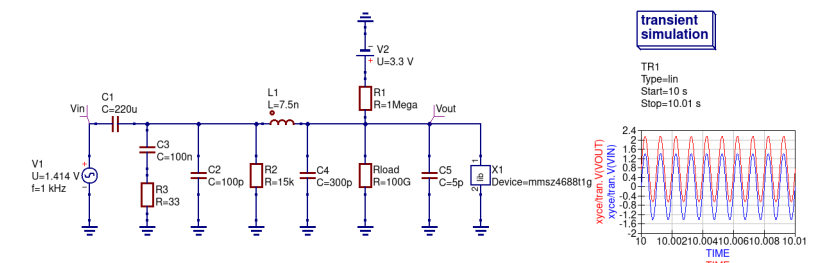
If HP_DET is HIGH for >100ms then HPs are present

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: @1kHz Ls = 3.844mH Lp = 15.757H Cs = 6.583uF Cp = 1612.8pF Rs = 1.5465kOhms Rp = 1.5478kOhms θ = -0.8deg	Headset Speaker: @1kHz Ls = 244.4uH Lp = 141.99mH Cs = 103.6uF Cp = 178.77nF Rs = 36.86Ohms Rp = 36.86Ohms θ = -2.3deg	Earbud Speaker: @1kHz Ls = 25.2uH Lp = 311.0mH Cs = 1.0mF Cp = 81.95nF Rs = 17.030Ohms Rp = 17.034Ohms θ = 0.5deg
---	--	---

Audio

Purism

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Sheet: /Audio/
File: audio.sch

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

Date: 2018-08-14
 Rev: v0.1.0
 Id: 16/24

RGMII 10/100/1000 Ethernet

The schematic diagram illustrates the RGMII 10/100/1000 Ethernet interface. It features an Ethernet controller (U1701) connected to an RJ45 connector (J1701). The controller's pins are connected to the RJ45 pins as follows:

- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N

The controller is powered by 3V3_P and ENET_2V5. The ENET_2V5 is connected to the controller's VDD33 and AVDD33 pins. The 3V3_P is connected to the controller's VDDIO and VDDH pins. The controller's signals are connected to the RJ45 pins as follows:

- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N

The controller is also connected to the LED_LINK1000 and LED_ACT signals. The LED_LINK1000 is connected to the controller's LED_LINK1000 pin, and the LED_ACT is connected to the controller's LED_ACT pin. The controller's signals are connected to the RJ45 pins as follows:

- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N

The controller is also connected to the LED_LINK1000 and LED_ACT signals. The LED_LINK1000 is connected to the controller's LED_LINK1000 pin, and the LED_ACT is connected to the controller's LED_ACT pin. The controller's signals are connected to the RJ45 pins as follows:

- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N
- ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, ETH_TRX3_N



Purism

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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

1802 NC

JP1801

1801 100k

DB2J209

1802

DB2J209

1V8_P

VIH=2.31V

WIFI_RST

W_DISABLE1

33

35

37

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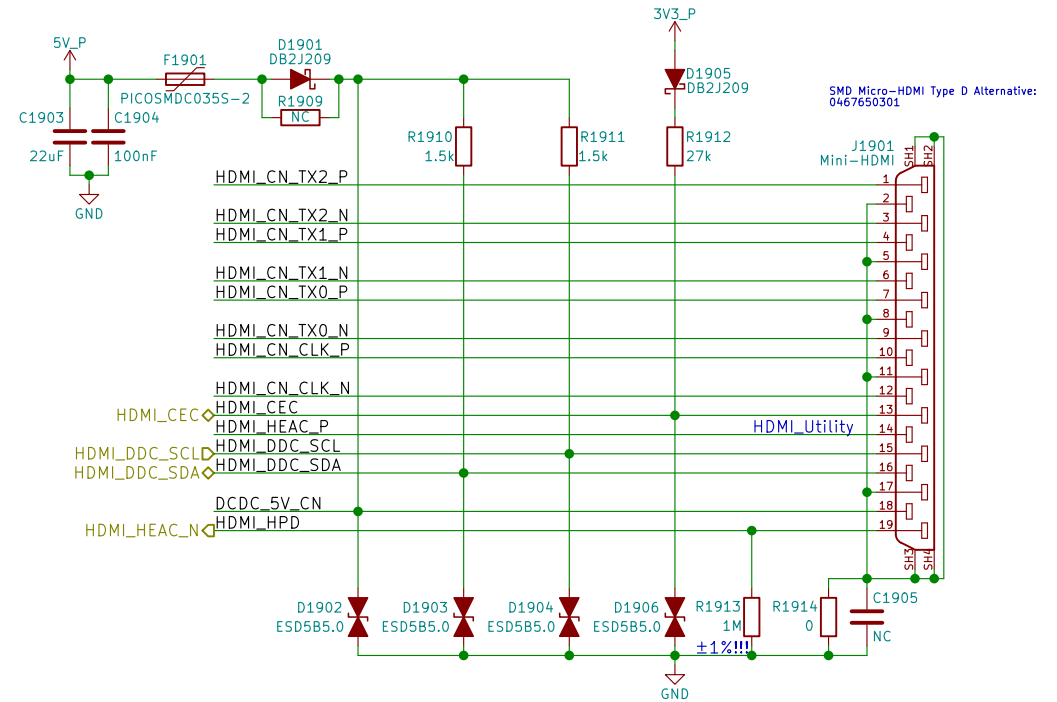
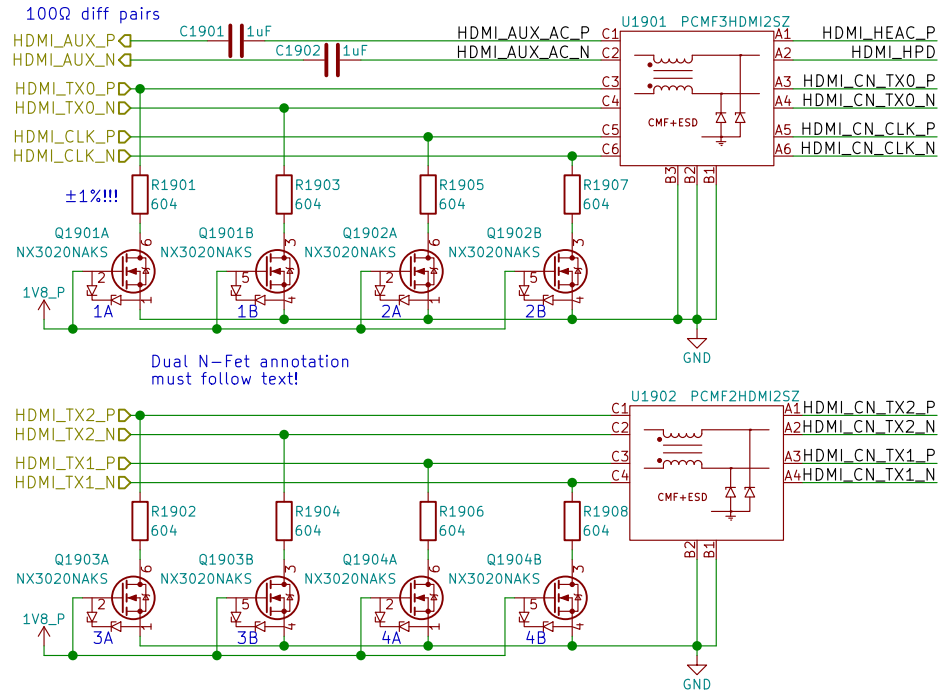
GND

GND

GND

TUSB1046 can be used for DP over USB-C

HDMI



HDMI



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Sheet: /HDMI/
File: hdmi.sch

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

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Rev: v0.1.0
Id: 19/24

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Id: 20/24

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Sheet: /SPI Flash/ File: flash.sch		
Size: A4	Date: 2018-08-14	Rev: v0.1.0
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The schematic shows the connection between a microcontroller (U2201) and a Smart Card (J2201). The microcontroller has pins for SMARTCARD_D_P, SMARTCARD_D_N, USB_DP, USB_DM, VDD5, VDD33, SC1_VCC, SC1_RST, SC1_CLK, SC1_I/O, SC1_C4, SC1_C8, SC1_PRSENT_N/JTAG_TMS, RESET Misc./JTAG, JTAG_TDI, TEST SC_LED_ACT/JTAG_TDO, JTAG_CLK, and VSS(flag). The Smart Card has pins for VCC, RST, CLK, GND, VPP, I/O, CASE, DET, C8, C4, SCH, SW2, C8, C4, SW1, and GND. Power supply connections include 5V_P, 100nF capacitors (C2201, C2202), and 1uF capacitors (C2203, C2204). A 100k resistor (R2201) is connected to the RESET pin. The Smart Card is labeled "Normally Open".

Smart Card



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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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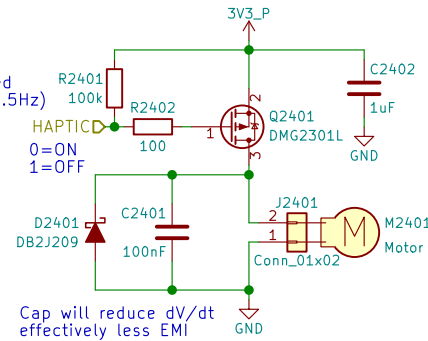
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Haptic Motor

PWM pins occupied:
 GPIO1_I001 - LCD Backlight
 GPIO1_I013 - LED
 GPIO1_I014 - Ethernet (CLKO_25MHz)
 GPIO1_I015 - CSI (CLKO2)

PWM needed?
 Only needs to be toggled
 ON 1 sec, OFF 1 sec (0.5Hz)
 Can MUX as either
 GPIO or PWM2
 swapping with LED



When the motor is off
 both terminals are at GND
 Motor will have wire leads
 with a 2-pin Molex or Boom Precision
 connector installed (by request)
 Metal housing is floating
 thick adhesive layer underneath
 (not connected to either pin)

Haptic/Vibration Motor



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 File: haptic.sch

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