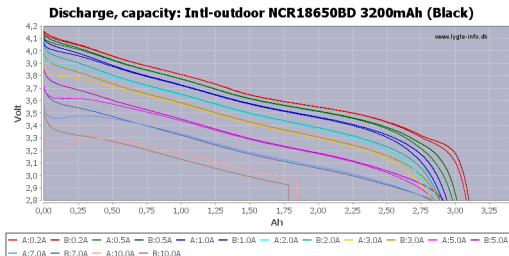
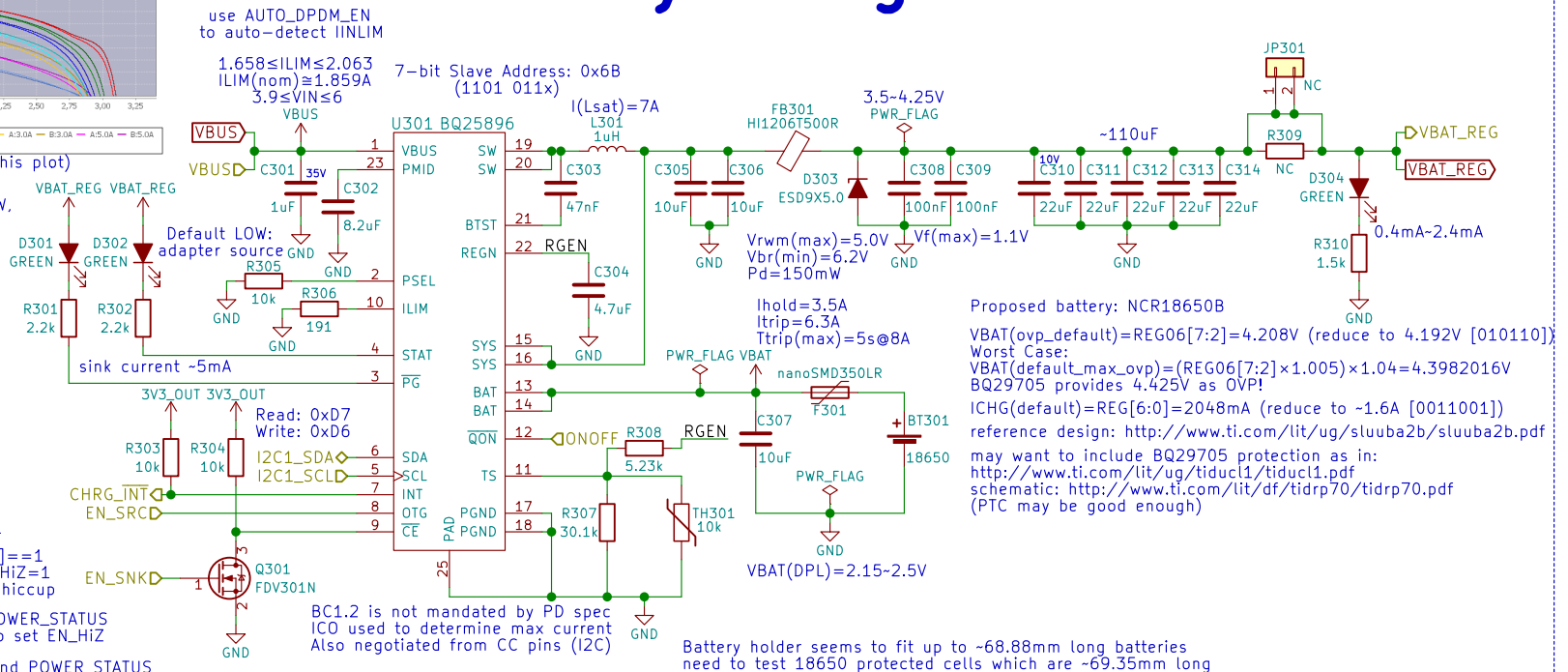


Battery Charge Controller



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



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

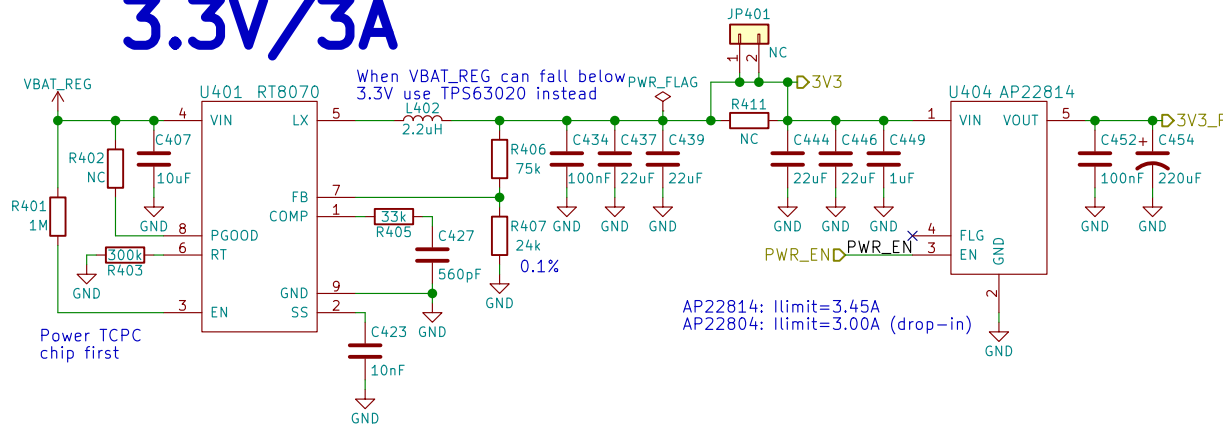
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

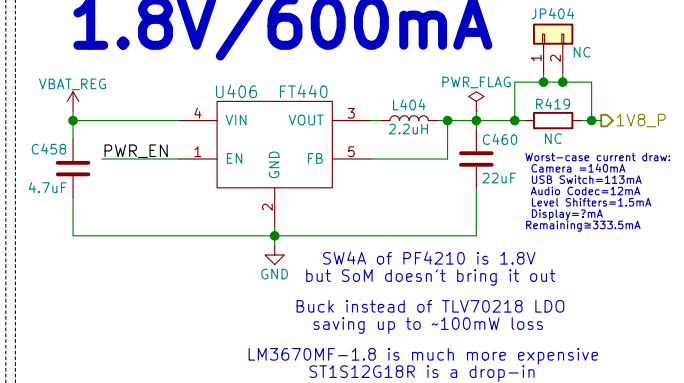
Rev: v0.1.0

Id: 3/24

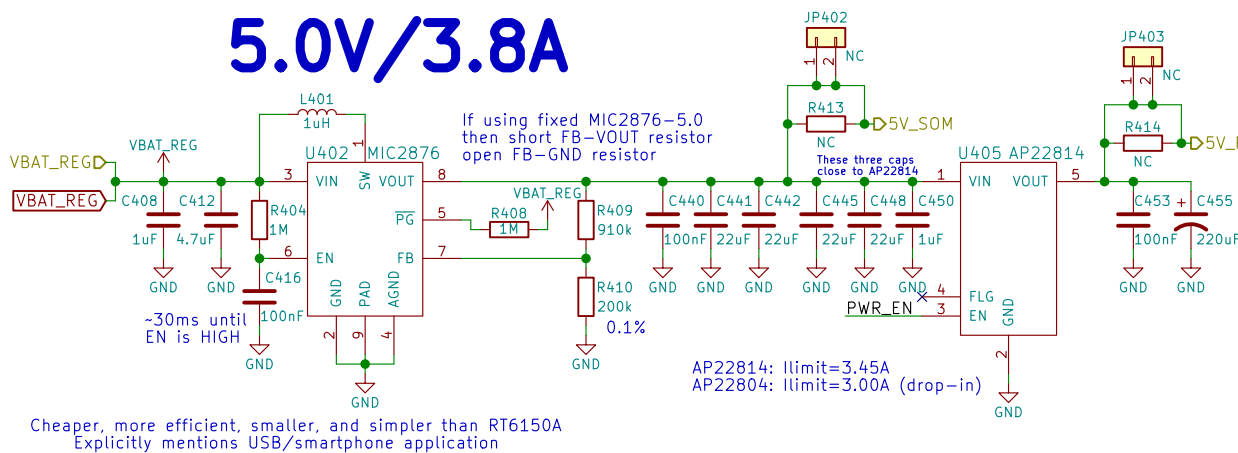
3.3V/3A



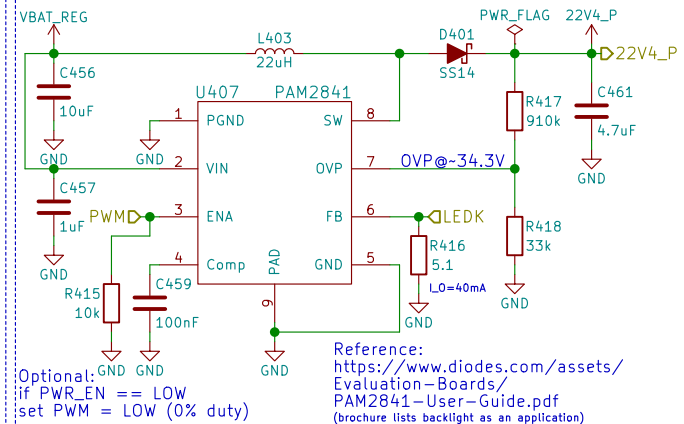
1.8V/600mA



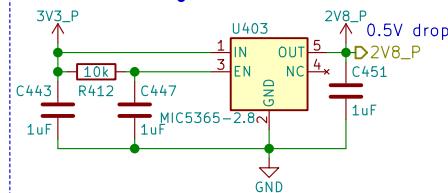
5.0V/3.8A



22.4V/40mA



2.8V/150mA



Power

Power

Purism

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Sheet: /Power/
File: power.sch

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

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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

BOOT_CFG[14:12]		Only eMMC			
		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
KiCad E.D.A. kicad 5.0.0

Date: 2018-08-14

Rev: v0.1.0

Id: 5/24

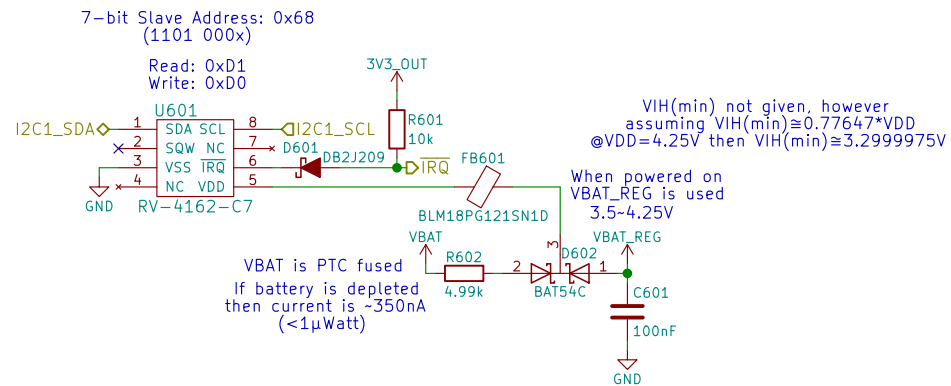
eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

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: 2018-08-14

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 6/24

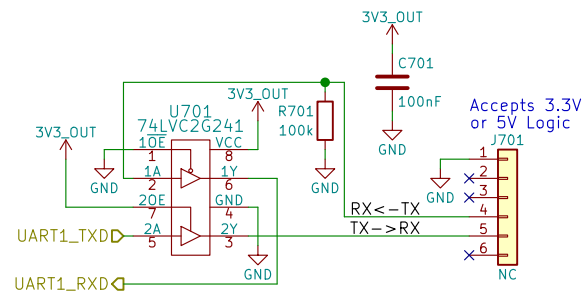
eric.kuzmenko@puri.sm

angus.ainstlie@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: 2018-08-14

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 7/24

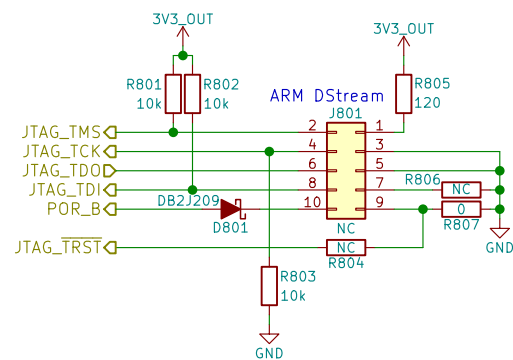
eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

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JTAG



JTAG



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christian.schilmoeller@puri.sm

Sheet: /JTAG/

File: jtag.sch

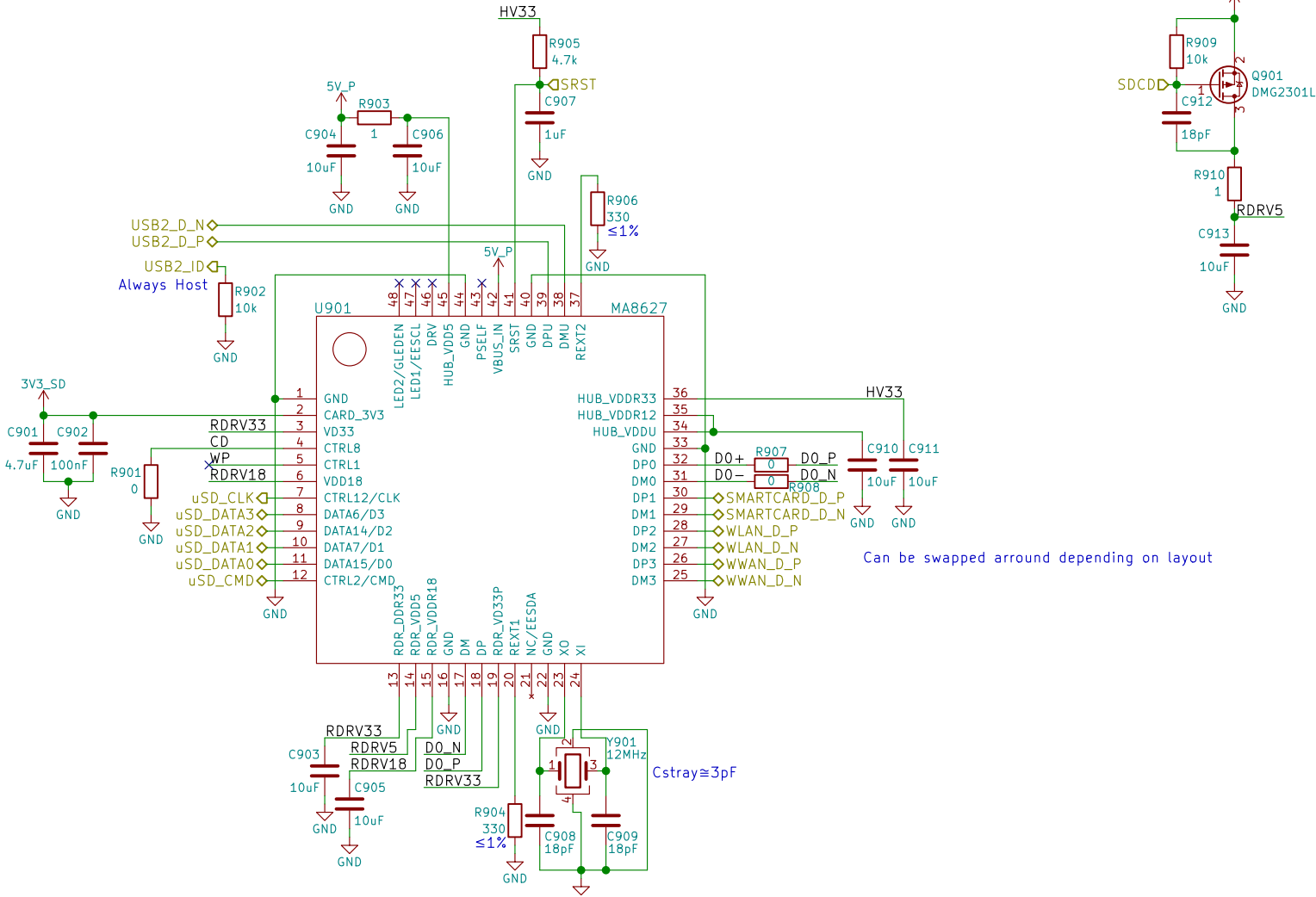
Size: A4	Date: 2018-08-14
----------	------------------

Size: A1	Date: 2
KiCad E.D.A.	kiCad 5.0.0

Rev: v0.1.0

Id: 8/24

USB Hub + SDIO Bridge



Can be swapped around depending on layout



Purism

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Sheet: /USB Hub + SDIO Bridge/

File: usb_hub_sdio.sch

Size: A4	Date:
----------	-------

eric.kuzmenko@puri.sm

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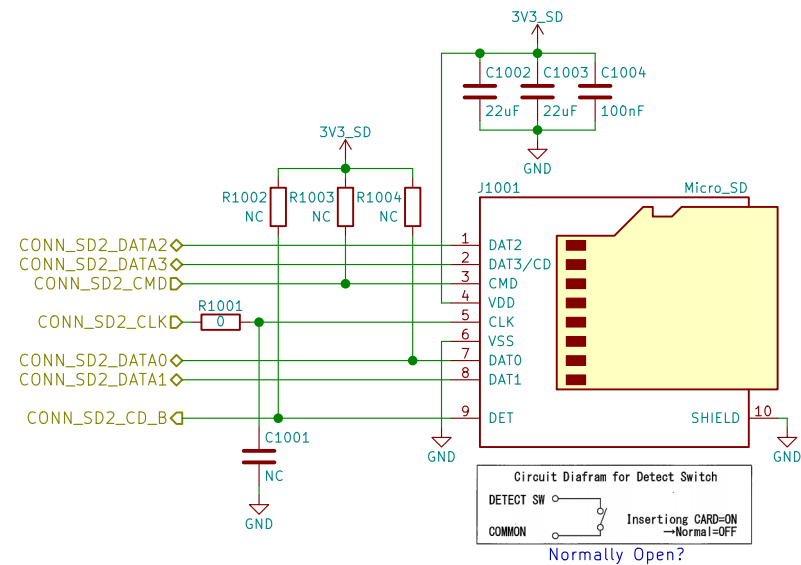
nicole.faerber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 9/24

μSD



uSD Card



Purism

Copyright 2018 GNU GPLv3

Sheet: /uSD Card/

File: sd.sch

eric.kuzmenko@puri.sm

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nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

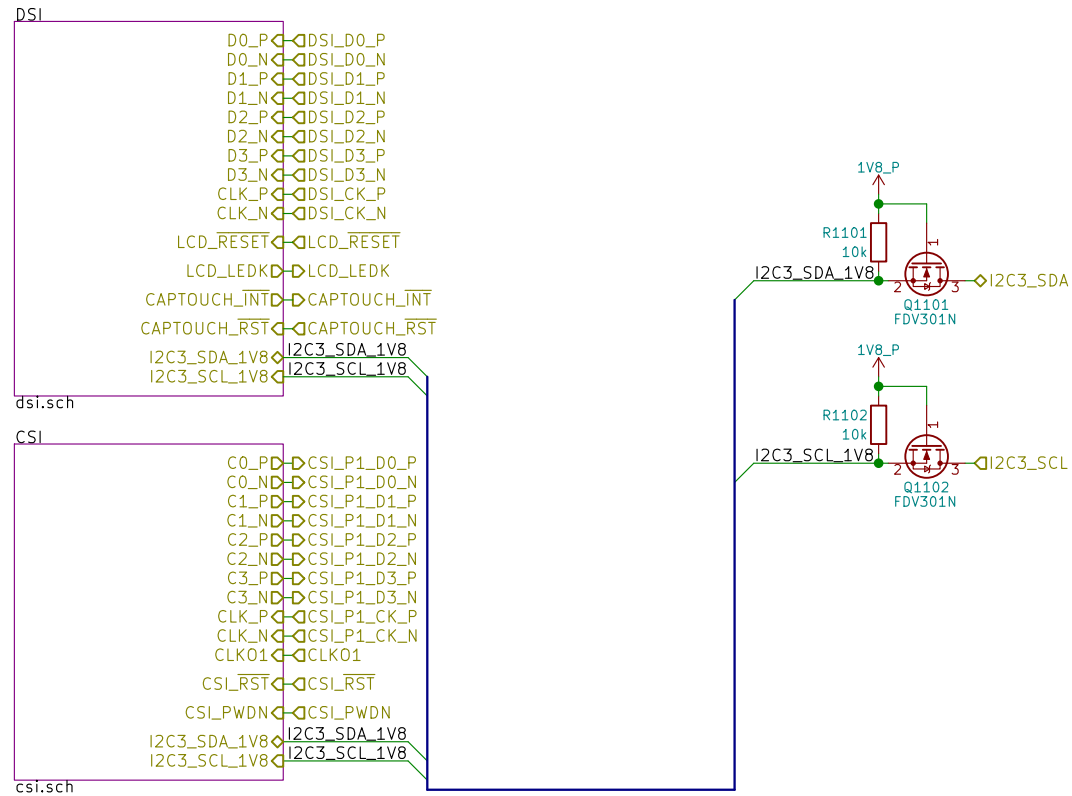
Size: A4	Date: 2018-08-14
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KiCad E.D.A.	kicad 5.0.0
--------------	-------------

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

eric.kuzmenko@puri.sm

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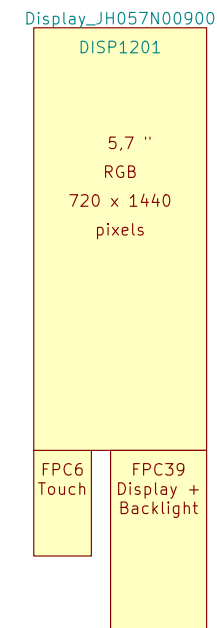
nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

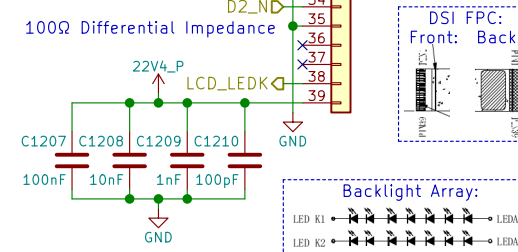
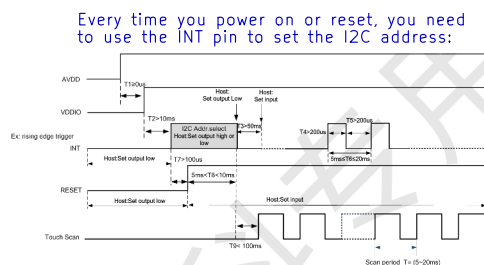
Rev: v0.1.0

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**

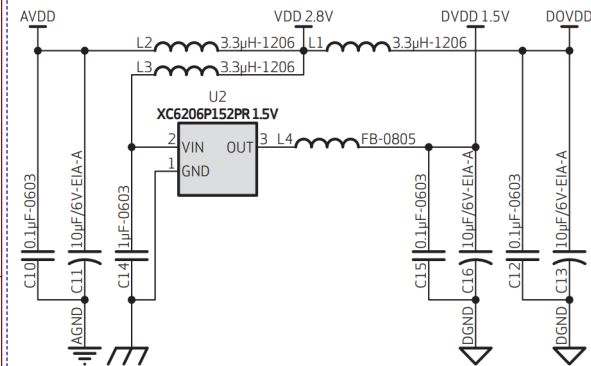
eric.kuzmenko@puri.sm
angus.ainslie@puri.sm
nicole.ferber@puri.sm
christian.schilmoeller@puri.sm

Size: A4	Date: 2018-08-14
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

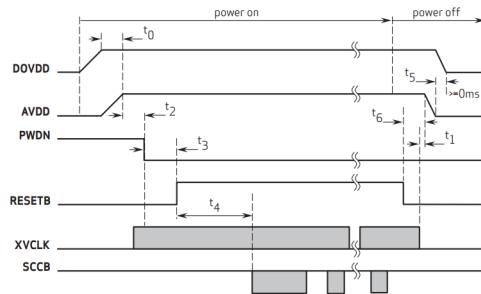
Based on the system power configuration (1.8V or 2.8V for I/O power, using external DVDD or internal DVDD, requiring access to the I2C during power up period or not), the power up sequence will differ. If 1.8V is used for I/O power, using the internal DVDD is preferred. If 2.8V is used for I/O power,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

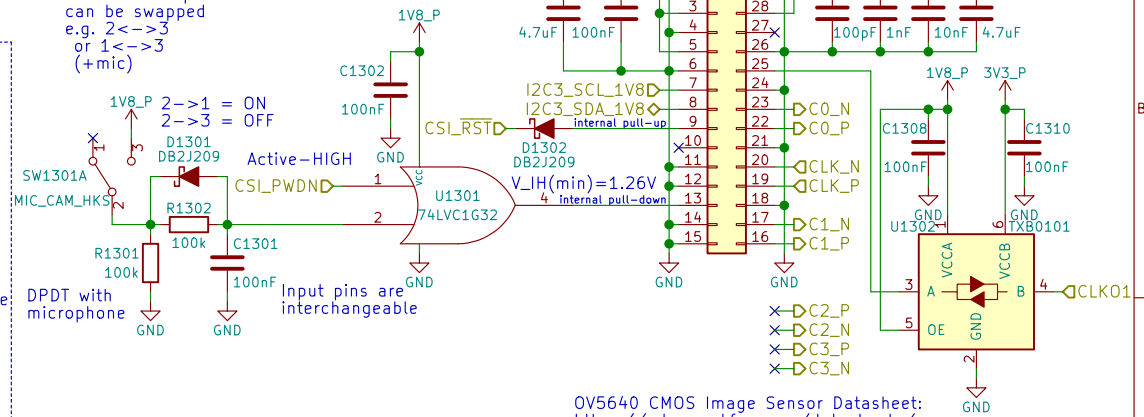
figure 2-3 power up timing with internal DVDD



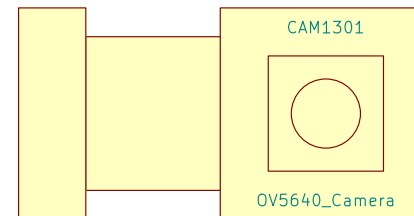
note $t_0 \geq 0$ ms, delay from DOVDD stable to AVDD stable, it is recommended to power up AVDD shortly after DOVDD has been powered up
 $t_1 \geq 0$ ms, delay from XVCLK off to AVDD off
 $t_2 \geq 5$ ms, delay from AVDD stable to sensor power up stable, PWDN can be pulled low after this point, XVCLK 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 DS_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.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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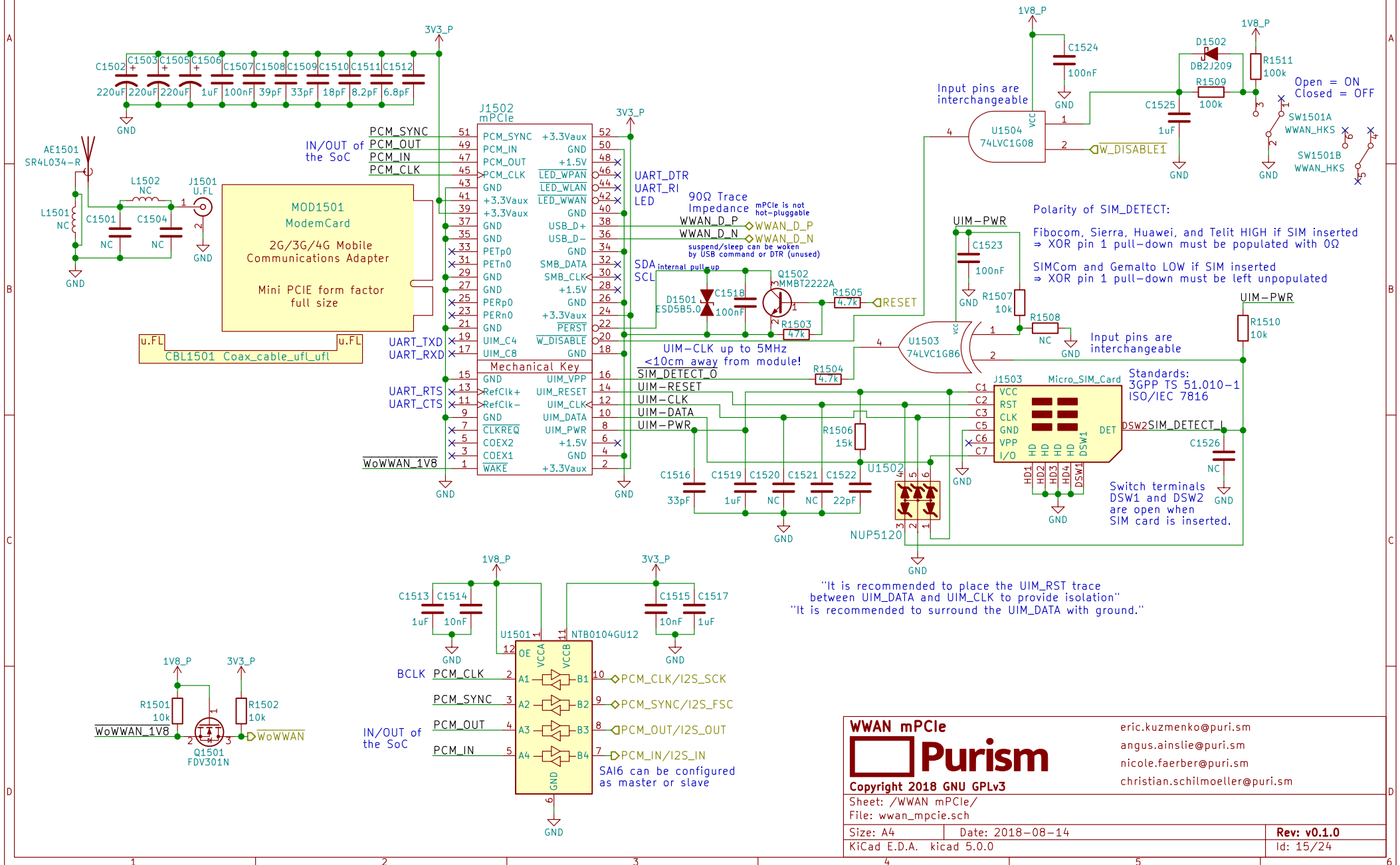
Sheet: /Buttons & LED/
File: buttons_led.sch

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

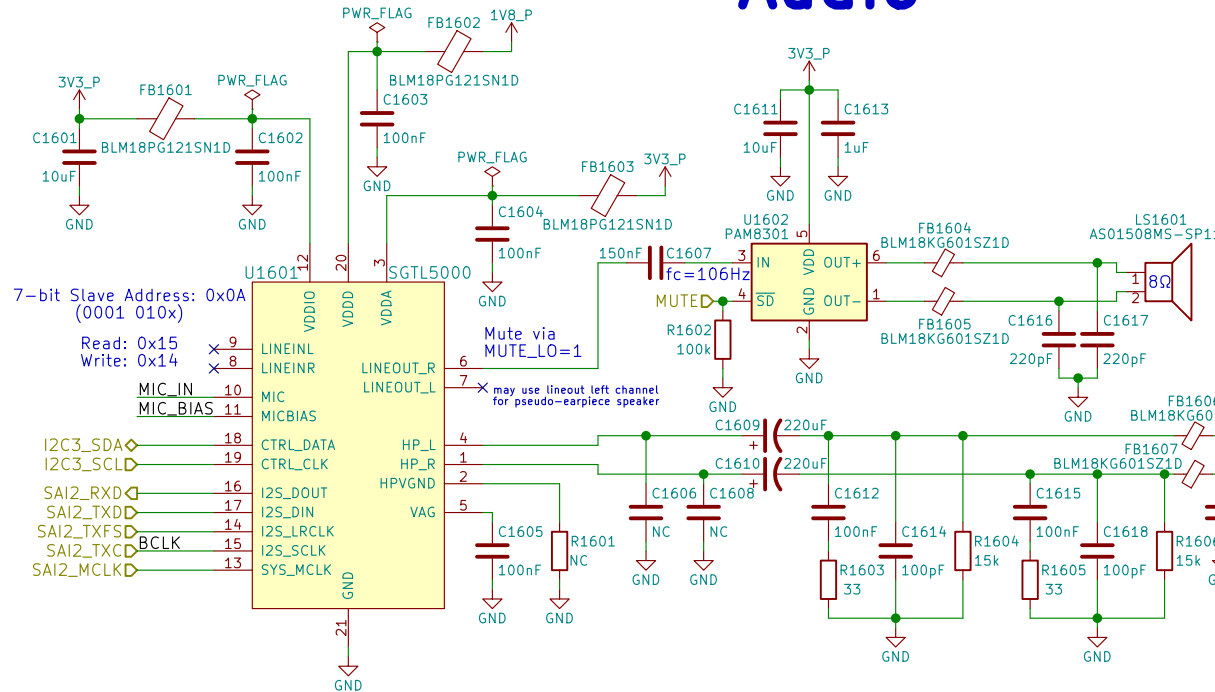
eric.kuzmenko@puri.sm
angus.ainstie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 14/24

WWAN mPCIe



Audio



Reference:
http://www.52rd.com/S_txt/2011_3/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>
 -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

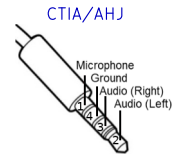
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

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

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

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

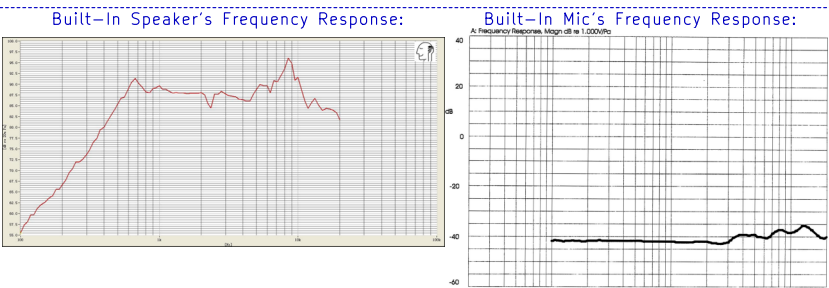
Could use FSA8008 to detect mic



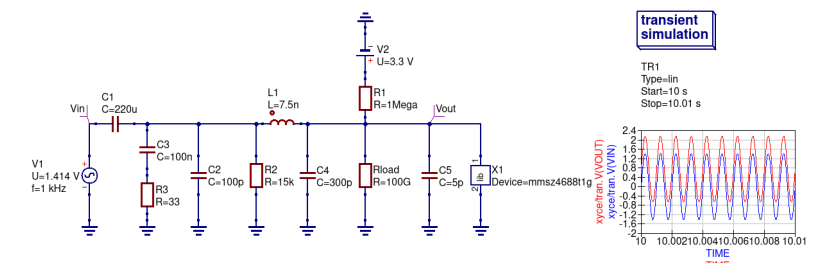
SMD Equivalent: SJ-43515TS

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



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

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

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 Sheet: /Audio/
 File: audio.sch
 Size: A4
 Date: 2018-08-14
 KiCad E.D.A. kicad 5.0.0

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 29 10 3 DVDDL 47 8 44 13 19 AVDDL1 AVDDL2 AVDDL3 AVDDL4 11 ETH_TRX0_P 12 ETH_TRX0_N 14 ETH_TRX1_P 15 ETH_TRX1_N 17 ETH_TRX2_P 18 ETH_TRX2_N 20 ETH_TRX3_P 21 ETH_TRX3_N 100Ω diff-pairs! TRXP0 TRXN0 TRXP1 TRXN1 TRXP2 TRXN2 TRXP3 TRXN3 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 VDDH_REG LED_LINK10_100 LED_LINK1000 LED_ACT 6 XTLO 7 XTLO 9 RBIAS AR8031 49 GND 26 LED_LINK10_100 24 LED_LINK1000 23 LED_ACT C1709 C1712 C1715 470pF GND C1719 C1720 C1721 220nF 220nF 220nF GND LED_ACT LED_LINK10_100 LED_LINK1000 LED_ACT R1723 R1724 R1725 270 270 270 GND FB1703 BLM18PG121SN1D SH1 SH2 GREEN YELLOW D1702 GREEN J1701 RJ45 ETH_TRX0_P_TD1+ 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- J1 TX1+ J2 TX1- J3 TX2+ J4 TX2- J5 TX3+ J6 TX3- J7 TX4+ J8 TX4-

Ethernet
Purism
Copyright 2018 GNU GPLv3
Sheet: /Ethernet/
File: ethernet.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: 17/24



Purism

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

WLAN+BT M.2

RS9116 NC:
RTS, CTS, BT_HOST_WAKE

RS9116 datasheet says
no WIFI_WAKE
but the schematic has it

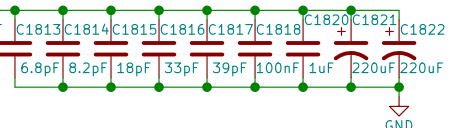
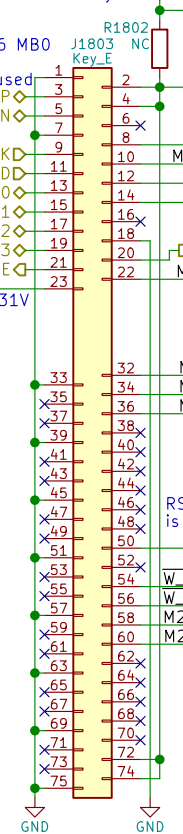
RedPine RS9116 MB0
Requires 5V on
Pin 54 if USB used

WLAN_D_P
WLAN_D_N
WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE

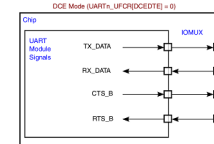
RedPine RS9116
has 100k pull-up to
3.3V making SDIO_RST
~2.55V when HIGH

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



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

SoC's IN/OUT
SoC's RX
Module's TX
SoC's TX
Module's RX
M2_UART_TXD
M2_UART_RTS
M2_UART_CTS

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

BT_DISABLE
WIFI_DISABLE

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

M2_I2C_SDA
M2_I2C_SCL

Q1801
FDV301N
Q1802
FDV301N

1V8_P
3V3_P

BCLK M2_PCM_CLK
M2_PCM_SYNC
M2_PCM_IN
M2_PCM_OUT

BT_PCM_CLK
BT_PCM_SYNC
BT_PCM_IN
BT_PCM_OUT

IN, OUT
of the SoC

configure as slave

internal 10k pull-up

WLAN+BT M.2

Purism

Copyright 2018 GNU GPLv3

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

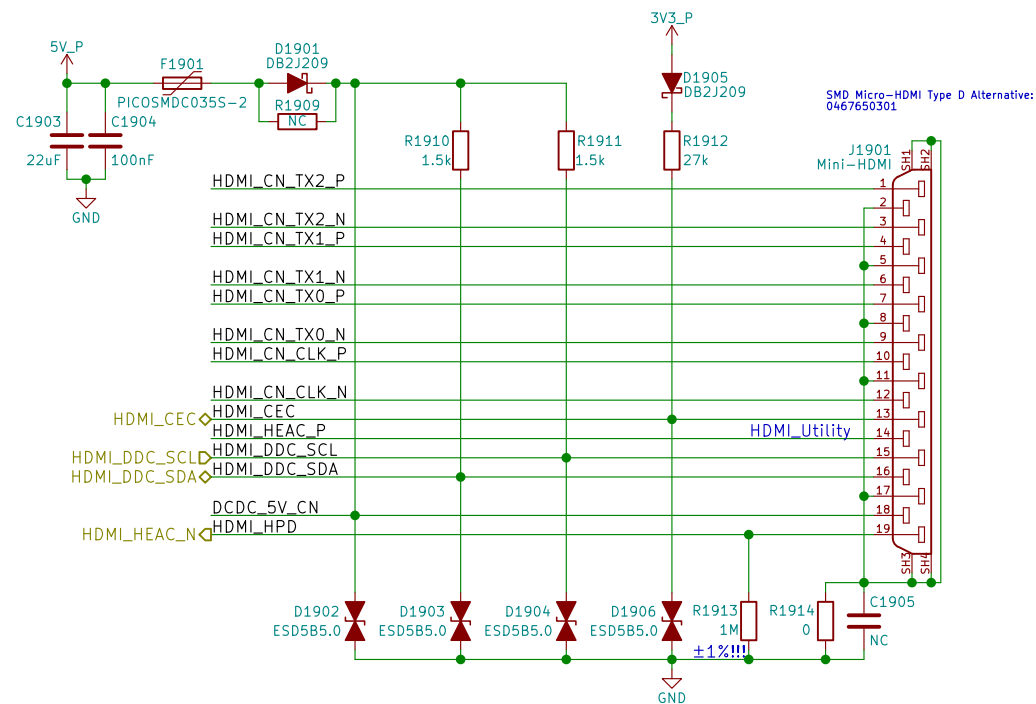
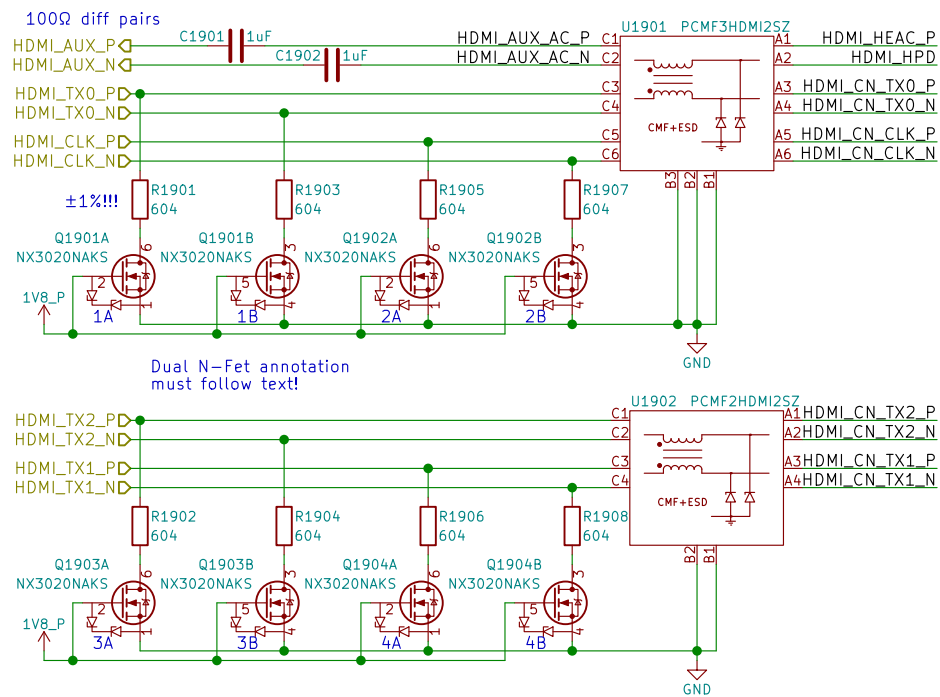
Size: A4
KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
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



HDMI



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Sheet: /HDMI/
File: hdmi.sch

Size: A4	Date: 2018-08-14
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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: 19/24

1

B



C

D


1



1



Id: 20/24

SPI NOR Flash  Purism		eric.kuzmenko@puri.sm angus.ainslie@puri.sm nicole.faeber@puri.sm christian.schilmoeller@puri.sm
Copyright 2018 GNU GPLv3		
Sheet: /SPI Flash/ File: flash.sch		
Size: A4	Date: 2018-08-14	Rev: v0.1.0
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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-8-M8-FW3_HardwareIntegrationManual_L%28UBX-15030059%29.pdf

GNSS



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Sheet: /GNSS/
 File: gnss.sch

Size: A4
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Date: 2018-08-14

Rev: v0.1.0

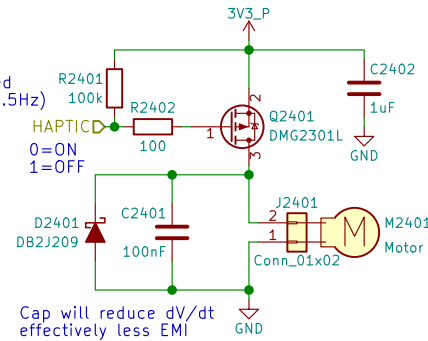
Id: 23/24

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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



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

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Rev: v0.1.0

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