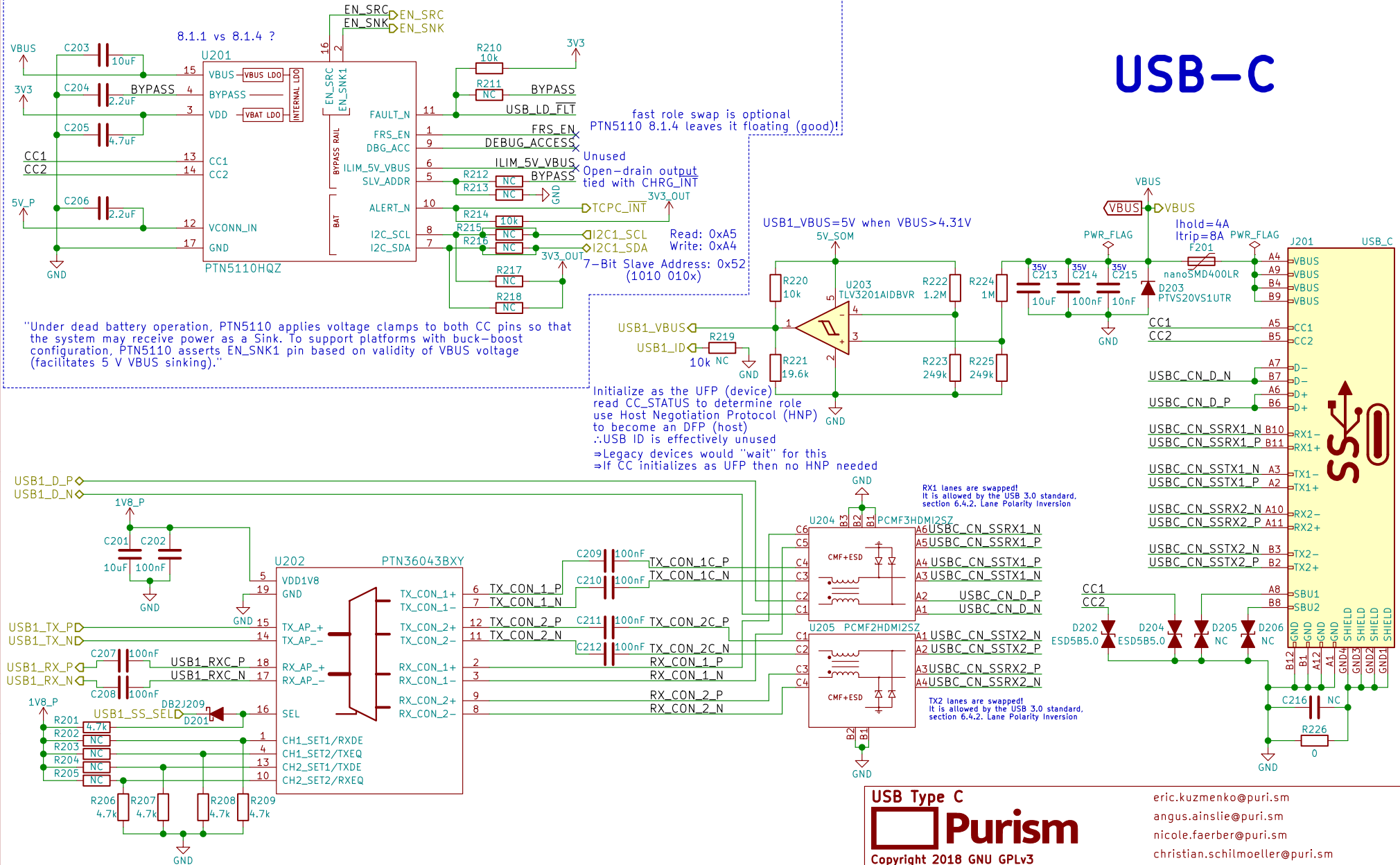


USB-C TCPC - Config Channel (CC) and PD Role Controller

USB-C



USB Type C

Purism

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Sheet: /USB-C/

File: usb-c.sch

Size: A4

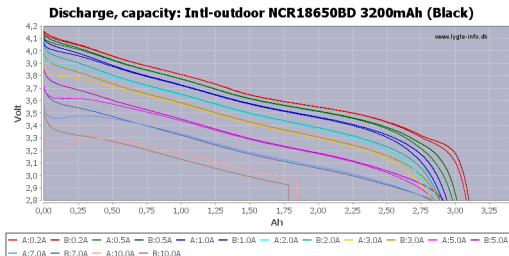
Date: 2018-07-17

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

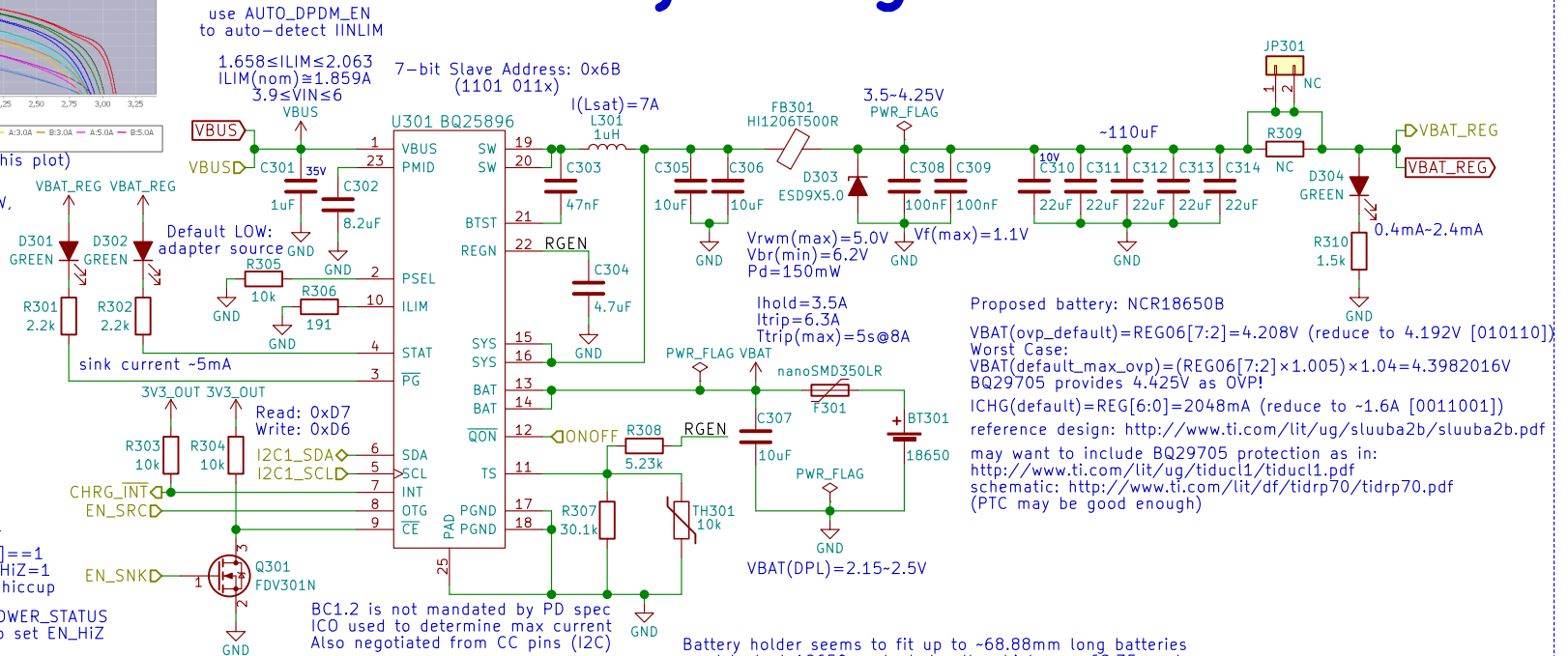
Id: 2/24

Battery Charge Controller



(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



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: 2018-07-17

KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

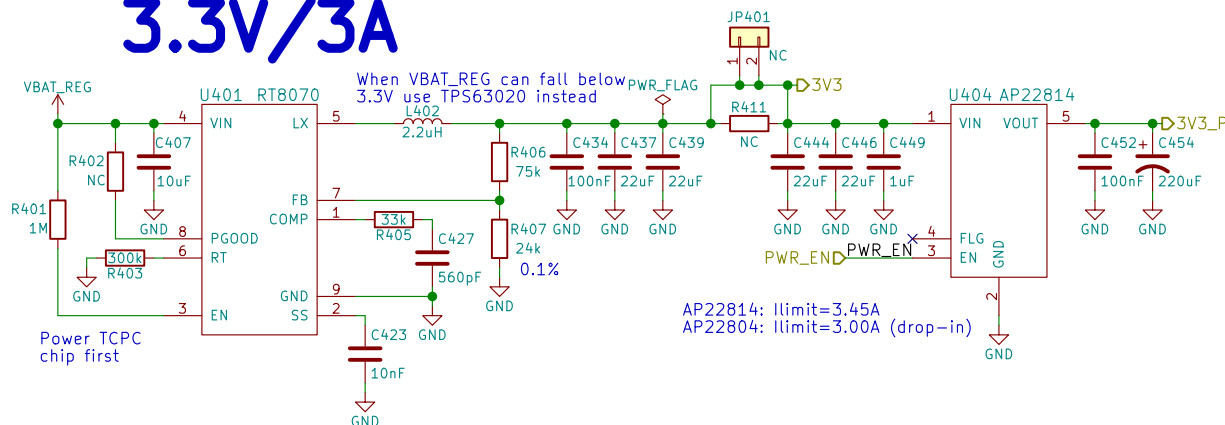
nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

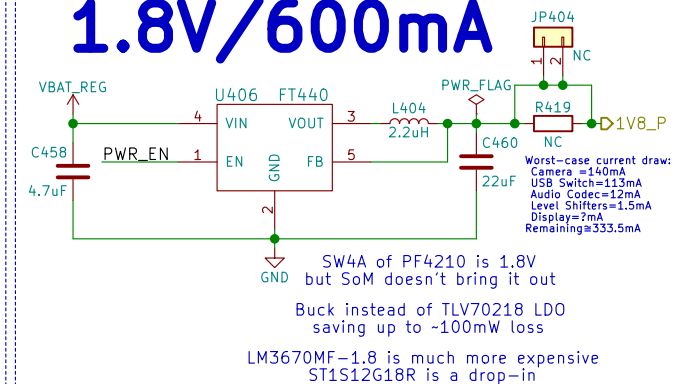
Rev: v0.1.0

Id: 3/24

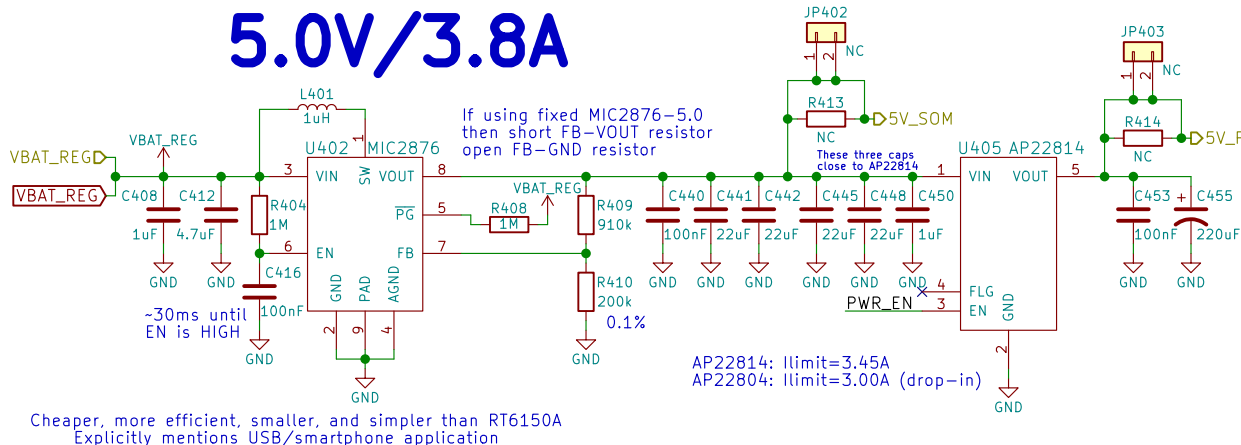
3.3V/3A



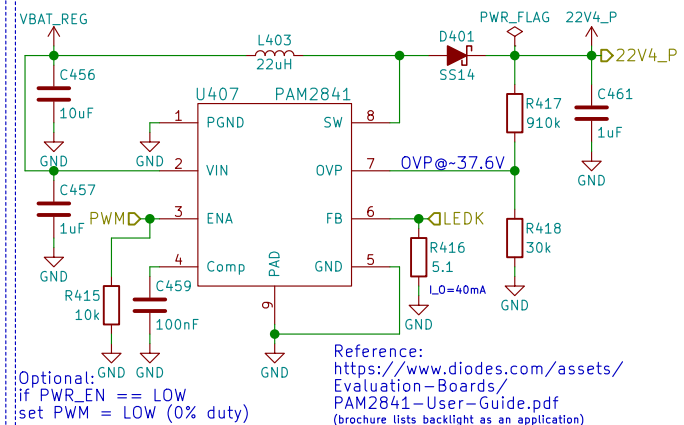
1.8V/600mA



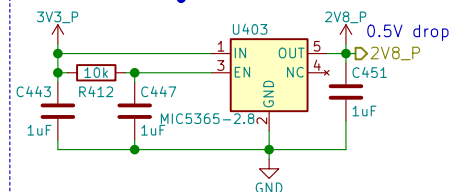
5.0V/3.8A



22.4V/40mA



2.8V/150mA



Power

Power

Purism

Copyright 2018 GNU GPLv3

Sheet: /Power/
File: power.sch

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

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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 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

eric.kuzmenko@puri.sm

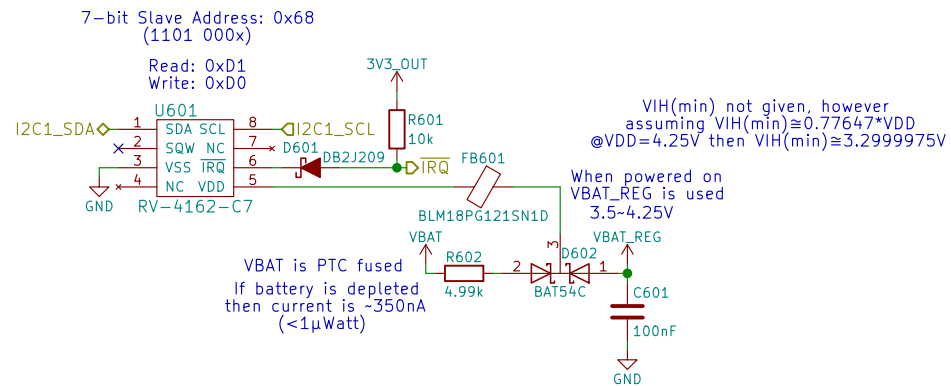
angus.ainstlie@puri.sm

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christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 5/24



Note:
Datasheet says slave address is 0xD0 with a R/W bit appended, since 0xD0 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-n/blob/8848e94b2f889fe44f6736e2d4c98851a22f10mx6qdl-mtp.dts#L351>

RTC



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Sheet: /RTC/

File: rtc.sch

Size: A4	Date: 2018-07-17
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Size: A4	Date: 11/01/2025
KiCad E.D.A.	kicad 5.0.0

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Rev: v0.1.0

Id: 6/24

The diagram shows a 74LVC2G24 inverter (U701) used as a logic level converter. The inverter has two input/output pairs: 1A/1Y and 2A/2Y. The 1A input is connected to UART1_TXDD (3.3V logic). The 1Y output is connected to 3V3_OUT (5V logic). The 2A input is connected to UART1_RXDD (5V logic). The 2Y output is connected to 3V3_OUT (3.3V logic). A 100k resistor (R701) is connected between 3V3_OUT and GND. A 100nF capacitor (C701) is connected between 3V3_OUT and GND. A 20E capacitor is connected between 1A and GND. The inverter is powered by 3V3_OUT. A note indicates that the circuit 'Accepts 3.3V or 5V Logic'.

UART Debug  Purism Copyright 2018 GNU GPLv3	eric.kuzmenko@puri.sm angus.ainslie@puri.sm nicole.ferber@puri.sm christian.schilmoeller@puri.sm
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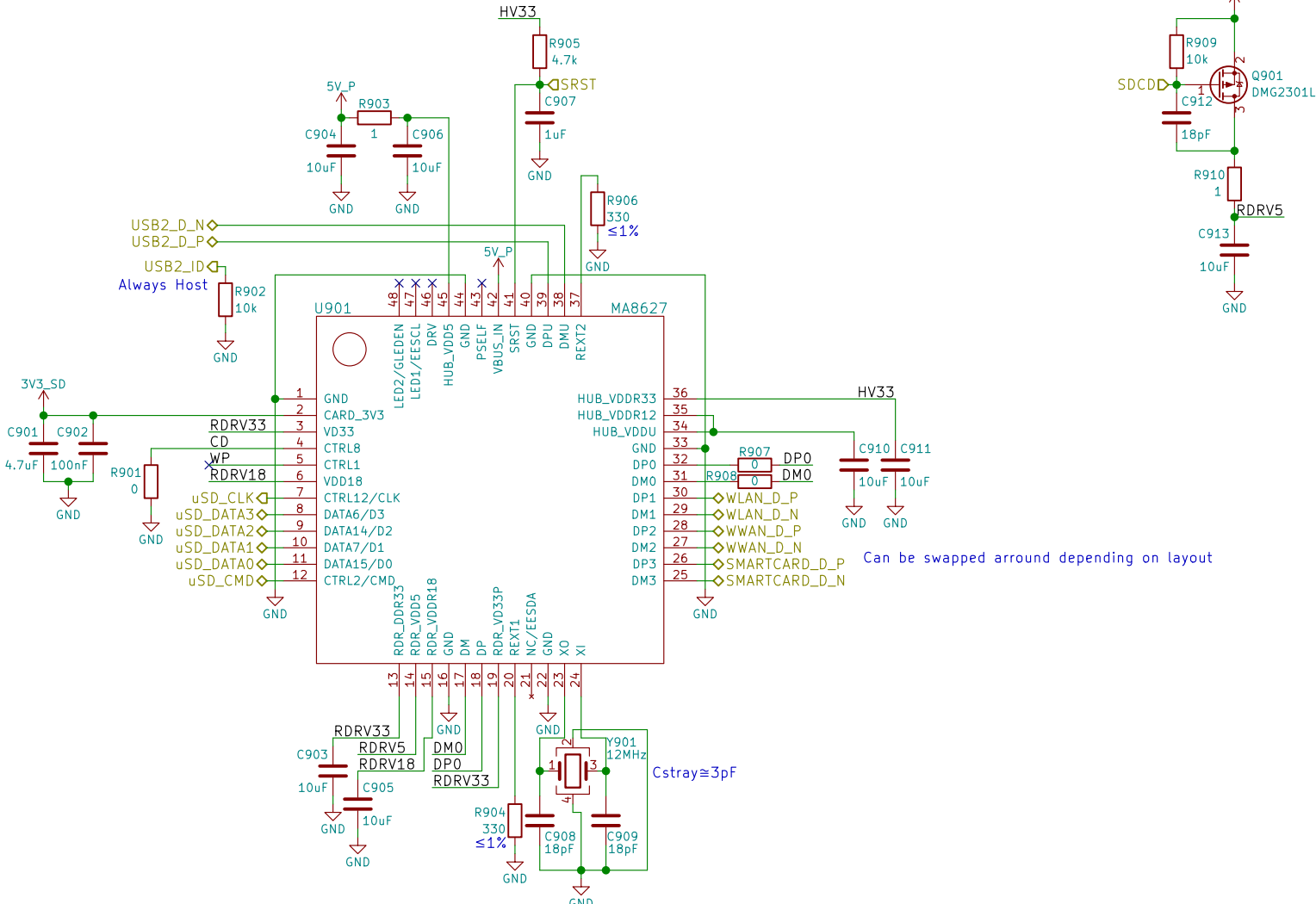
Purism

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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: 2018-07-17

KiCad E.D.A.	kicad 5.0.0
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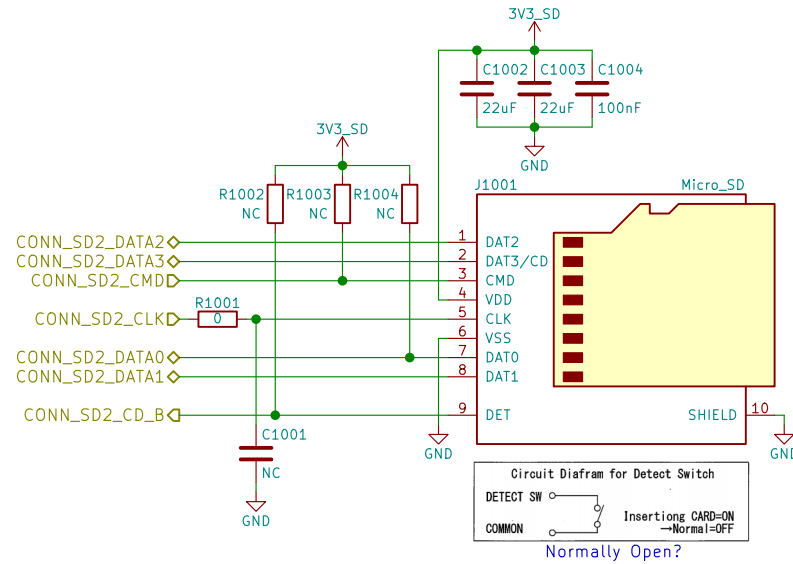
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 9/24

μSD



uSD Card



Purism

Copyright 2018 GNU GPLv3

Sheet: /uSD Card/

File: sd.sch

Size: A4 Date: 2018-07-17

KiCad E.D.A. kicad 5.0.0

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

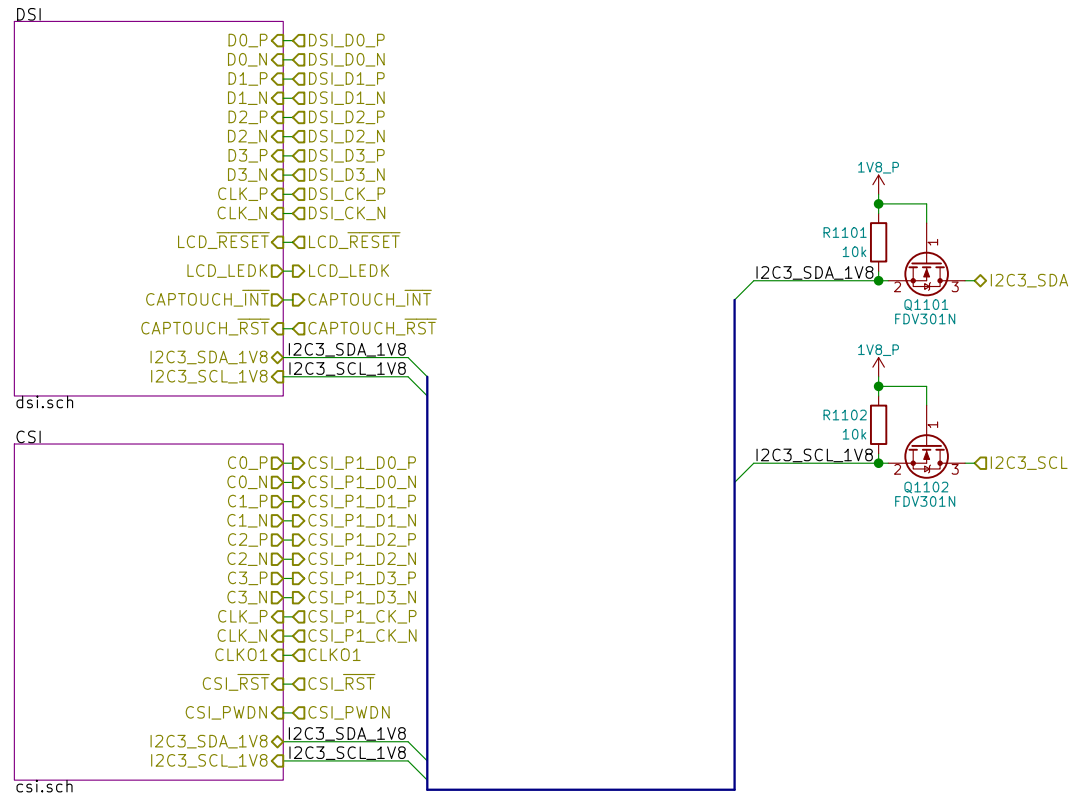
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 10/24

MIPI



MIPI



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Sheet: /MIPI/
File: mipi.sch

Size: A4 Date: 2018-07-17
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nicole.ferber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 11/24

A

B

C

D

1

1

2

7

F

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



Copyright 2018 GNU GPLv3

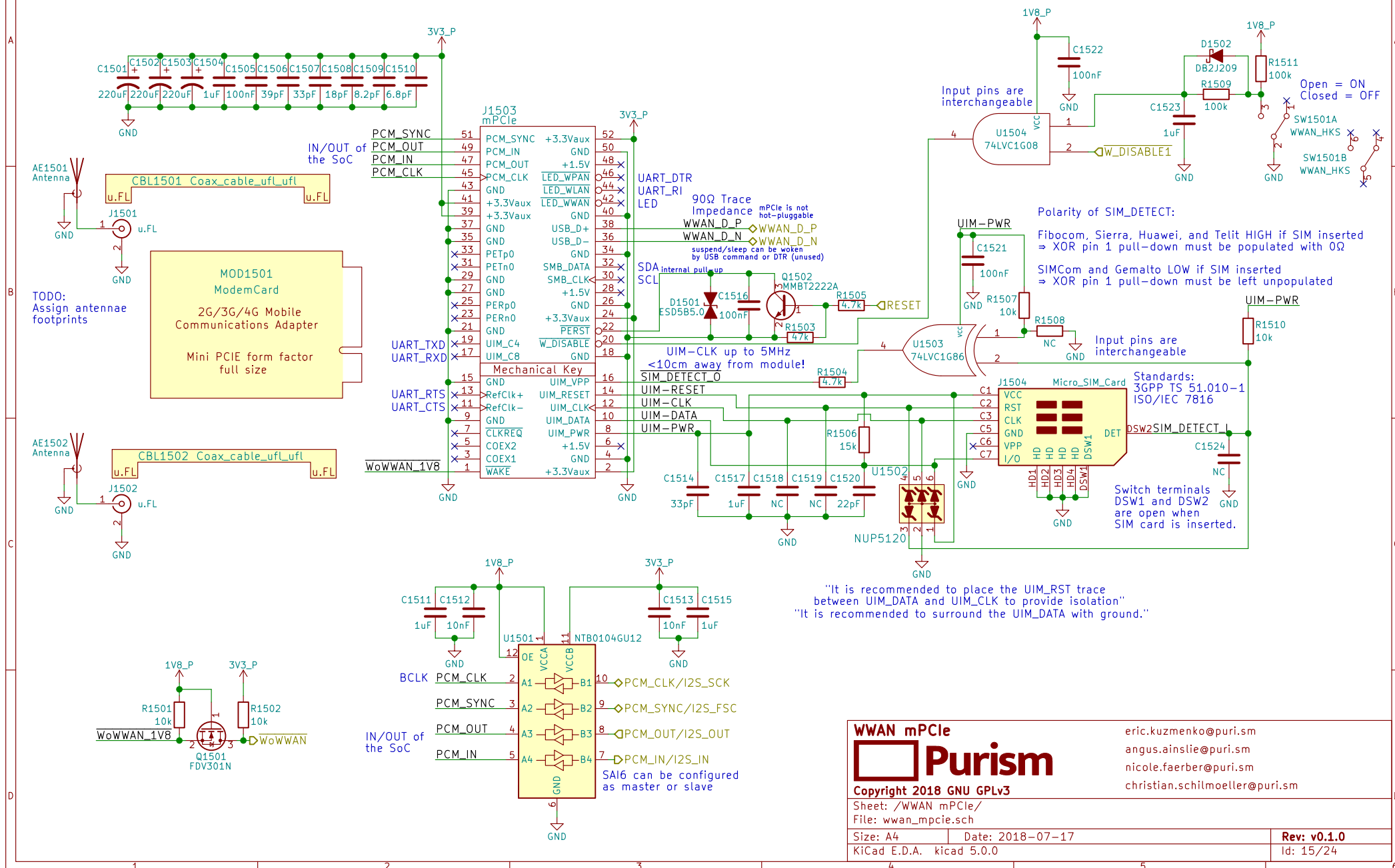
Sheet: /Buttons & LED/
File: buttons_led.sch

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

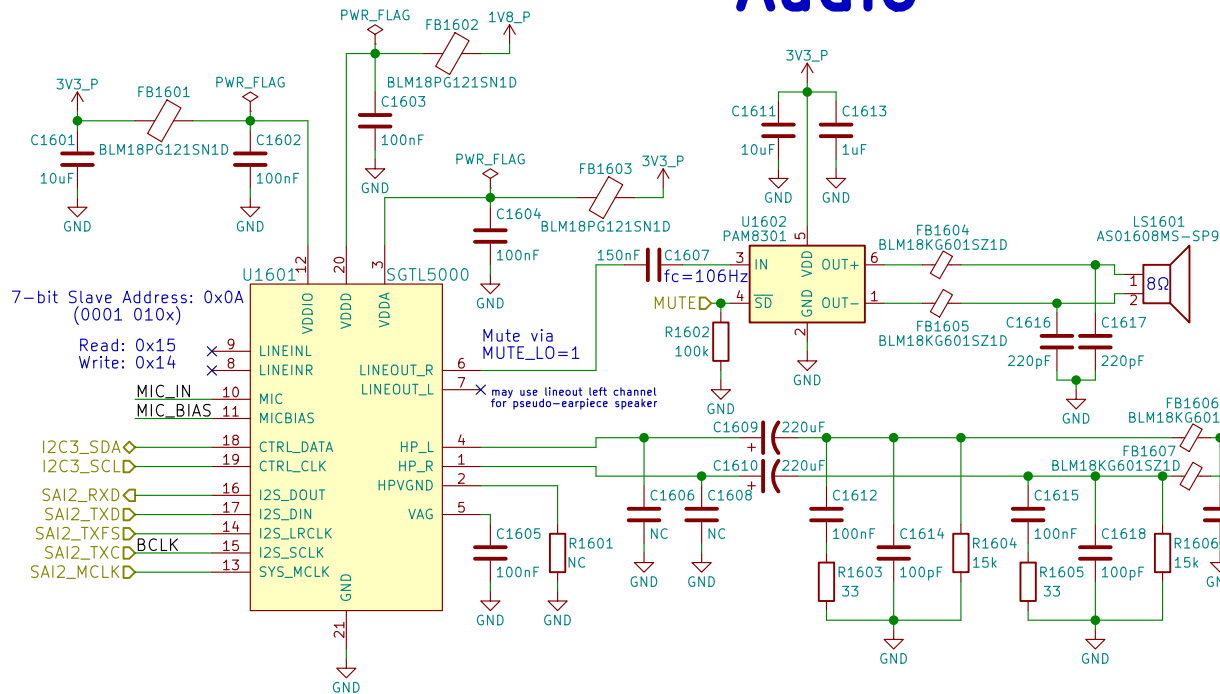
eric.kuzmenko@puri.sm
angus.ainstie@puri.sm
nicole.farber@puri.sm
christian.schilmoeller@puri.sm

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-circuit6>
 (Nit6 does the same)
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

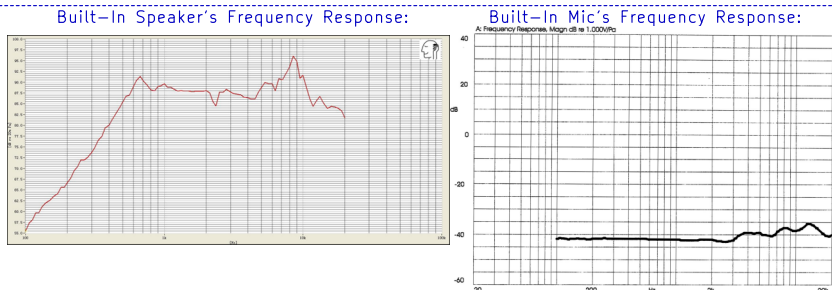
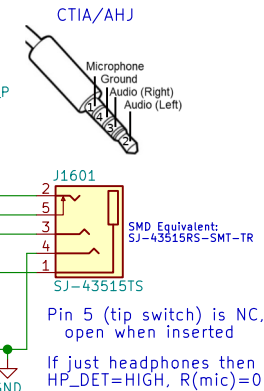
dB specs in datasheet is a unit of power gain (not dBu or VU)
with respect to the DAC's unattenuated output

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

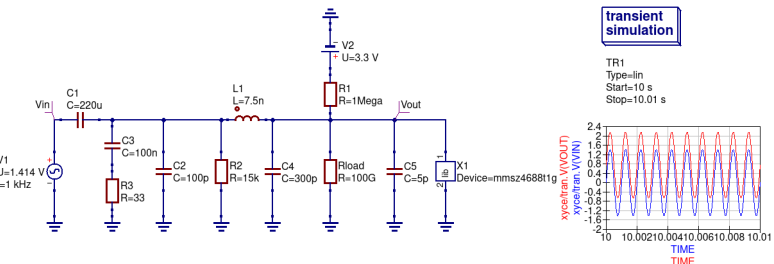
If HP_DET is HIGH for >100ms then HPs are present

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

Could use FSA8008 to detect mic



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 = 36.86kOhms	Rs = 17.03kOhms
Rp = 1.5478kOhms	Rp = 36.86kOhms	Rp = 17.03kOhms
θ = -0.8deg	θ = -2.3deg	θ = 0.5deg

Audio



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Sheet: /Audio/
File: audio.sch

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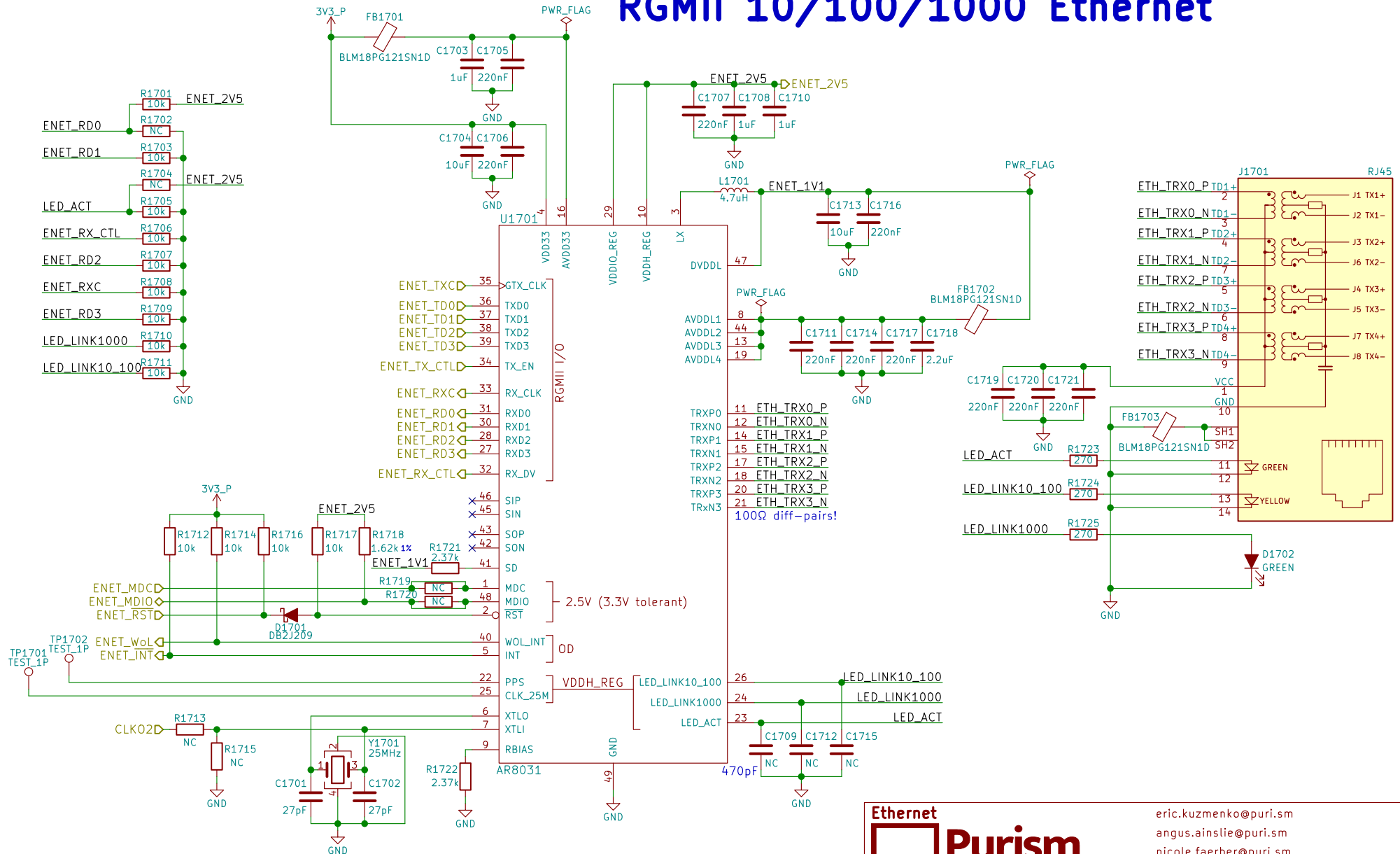
Size: A4	Date: 2018-07-17
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KiCad E.D.A.	kicad 5.0.0
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Rev: v0.1.0

Id: 16/24

RGMII 10/100/1000 Ethernet



Ethernet

Purism

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Sheet: /Ethernet/
File: ethernet.sch

Size: A4 Date: 2018-07-17
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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

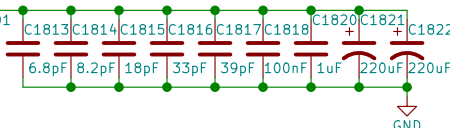
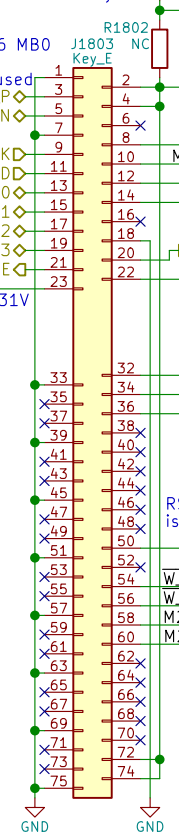
RedPine RS9116 MB0
Requires 5V on
Pin 54 if USB used

WLAN_D_P
WLAN_D_N
WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE

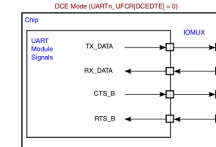
RedPine RS9116
has 100k pull-up to
3.3V making SDIO_RST
~2.55V when HIGH

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

Leave BT_DISABLE
LOW for RS9116

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

Input pins are
interchangeable

SW1801A
WLAN_HKS

SW1801B
WLAN_HKS

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)

M2_I2C_SDA
M2_I2C_SCL

Q1801
FDV301N

Q1802
FDV301N

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

1V8_P
3V3_P

WLAN+BT M.2

Purism

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

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

Date: 2018-07-17

eric.kuzmenko@puri.sm

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christian.schilmoeller@puri.sm

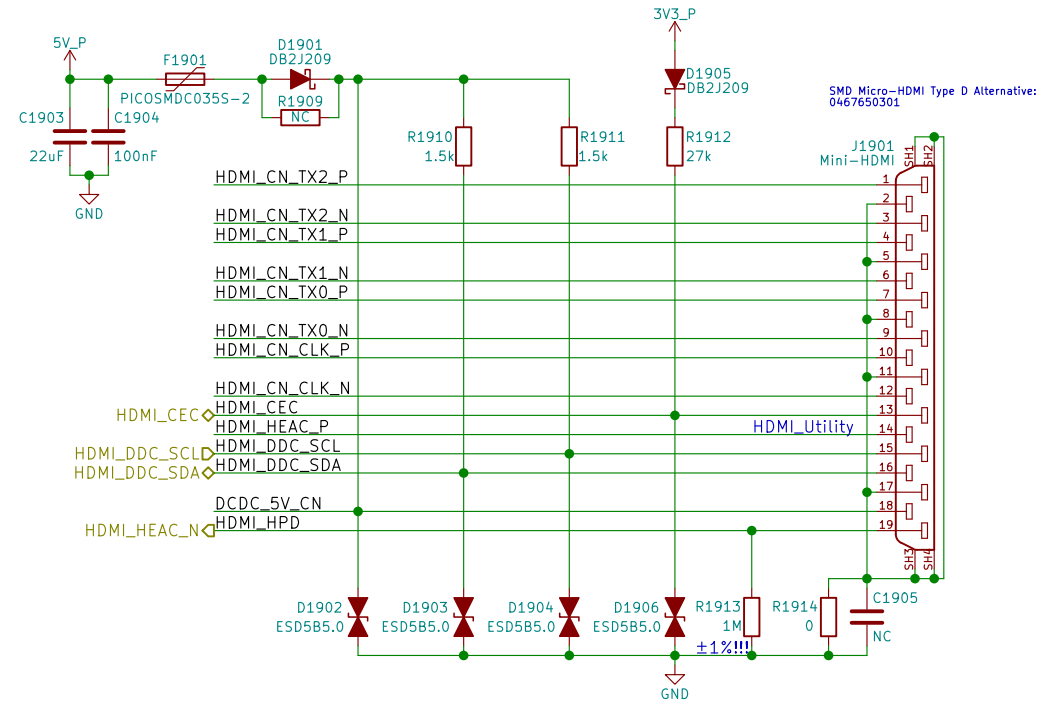
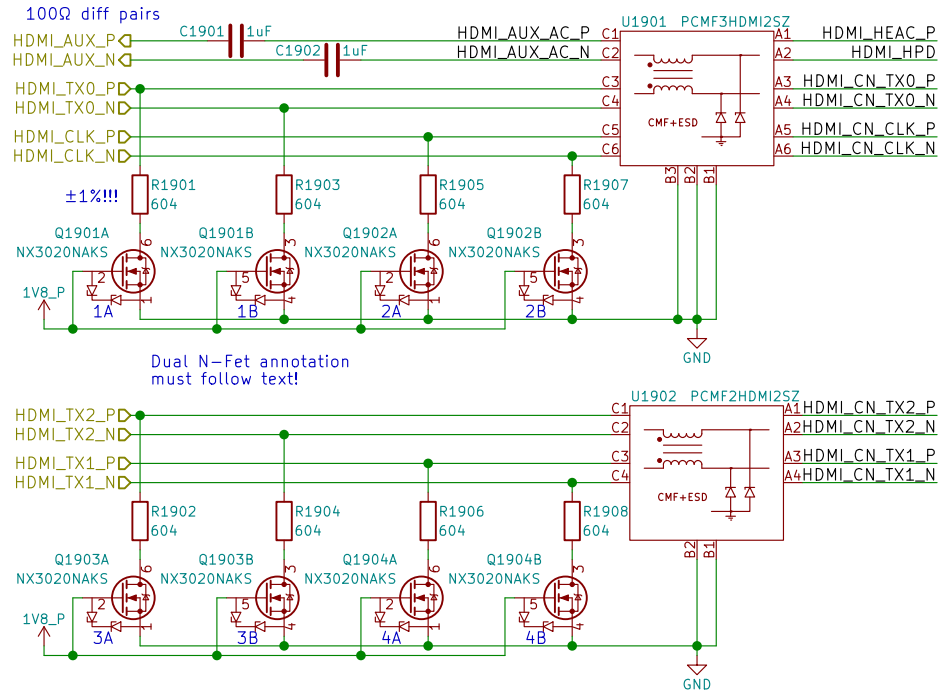
Rev: v0.1.0

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

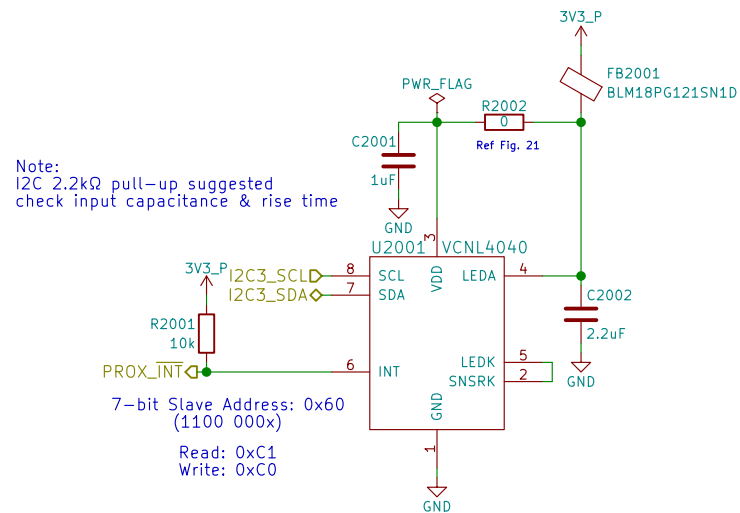
Size: A4 Date: 2018-07-17
KiCad E.D.A. kicad 5.0.0

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

Rev: v0.1.0
Id: 19/24

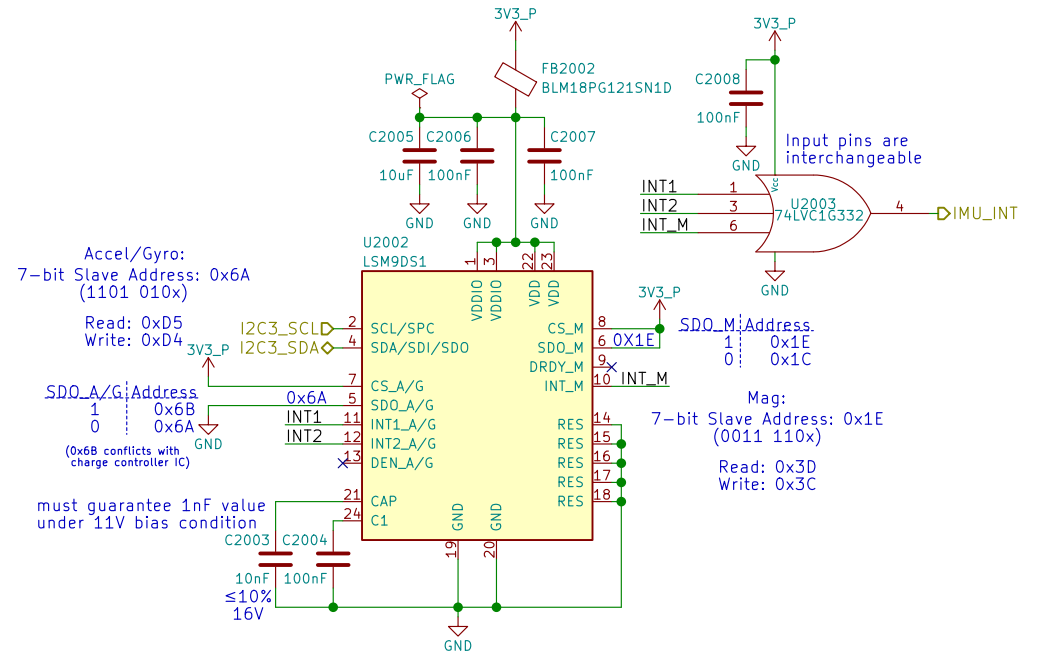
Sensors

Proximity & Ambient Light

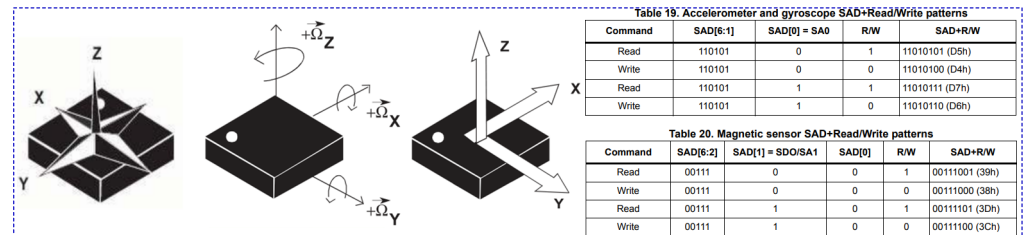


Reference:
<https://www.vishay.com/docs/84307/designingvcnl4040.pdf>
<http://www.vishay.com/docs/84931/vcni4040sensorboardfiles.pdf>

9-Axis IMU



Reference:
<http://www.st.com/en/evaluation-tools/steval-mki159v1.html>



Sensors



Purism

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Sheet: /Sensors/
File: sensors.sch

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

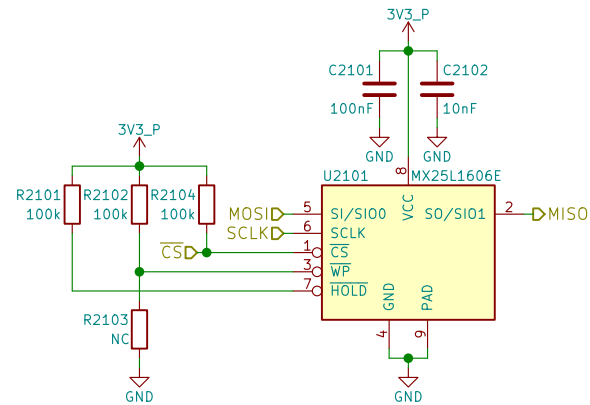
Size: A4	Date: 2018-07-17
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Size: A1	Date:
KiCad E.D.A.	kicad 5.0.0

Rev: v0.1.0

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

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christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 21/24

The schematic shows the connection between a microcontroller (U2201) and a Smart Card (J2201). The microcontroller has pins for SMARTCARD_D_P (11), SMARTCARD_D_N (10), USB_DP, USB_DM, VDD5, VDD33, SC1_VCC, SC1_RST, SC1_CLK, SC1_I/O, SC1_C4, SC1_C8, SC1_PRSTN/JTAG_TMS, RESET Misc./JTAG, JTAG_TDI, TEST SC_LED_ACT/JTAG_TDO, JTAG_CLK, JTAG_CLK, and VSS(flag). The Smart Card has pins for VCC, RST, CLK, GND, VPP, I/O, CASE, CASE, DET, C8, C4, SCH, SW2, C8, C4, SW1, and GND. The circuit includes decoupling capacitors (C2202, C2204, C2205, C2203), a pull-up resistor (R2201), and a reset network (R2202, R2203). The Smart Card is labeled as ISO/IEC 7816.

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
 KiCad E.D.A. kicad 5.0.0

Date: 2018-07-17

Rev: v0.1.0

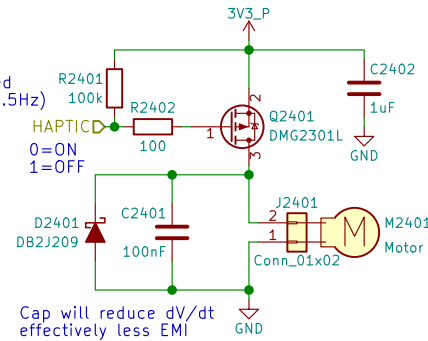
Id: 23/24

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

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

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

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

Rev: v0.1.0
 Id: 24/24