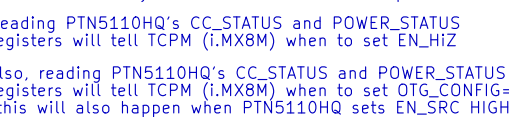
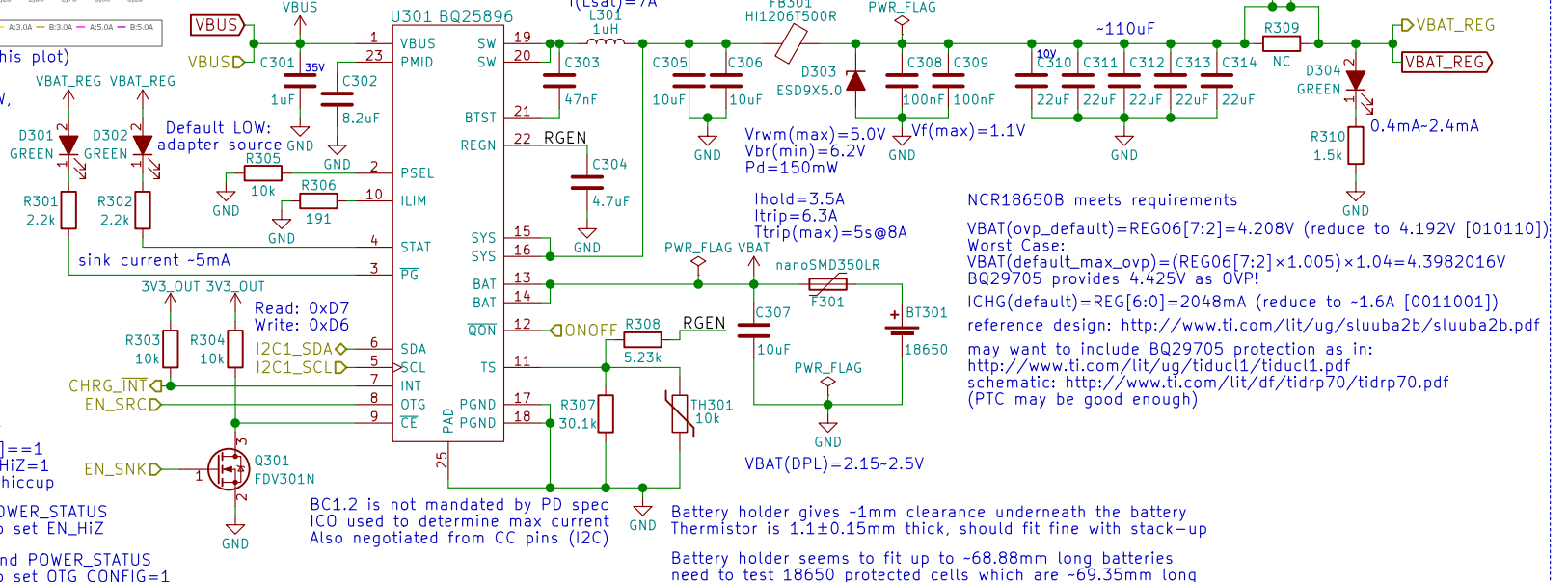


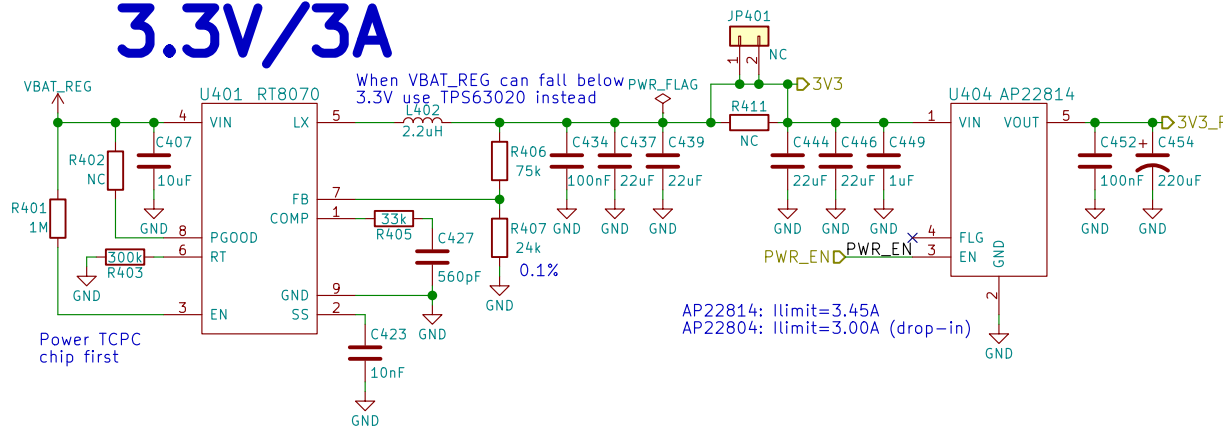
USB-C



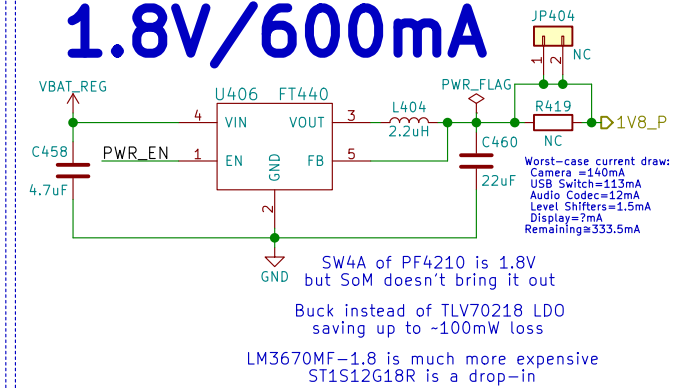

$$I(L_{sat}) = 7A$$


Id: 3/24

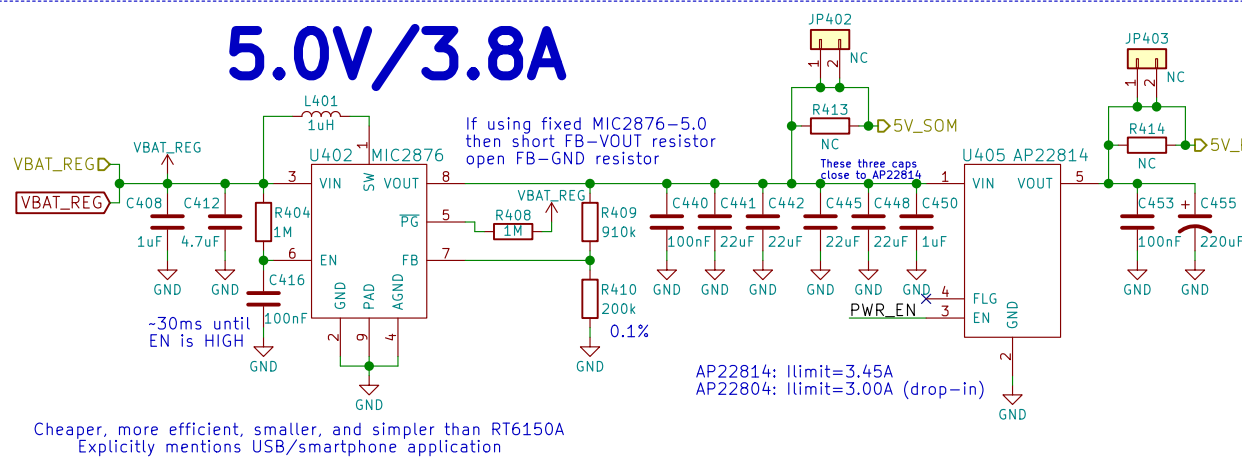
3.3V/3A



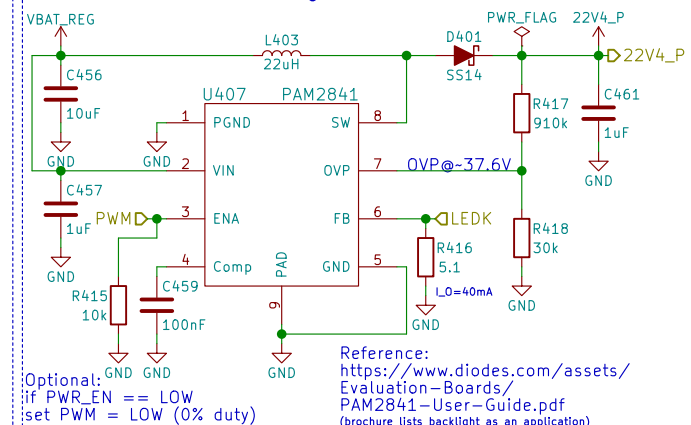
1.8V/600mA



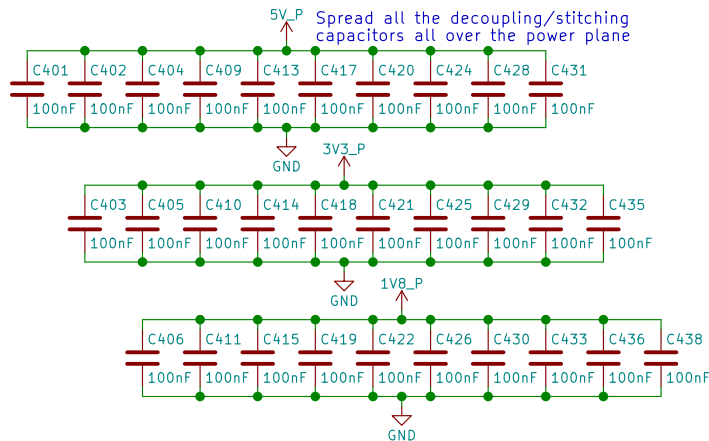
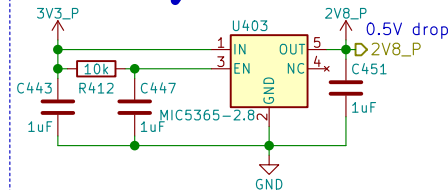
5.0V/3.8A



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 4.0.6

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

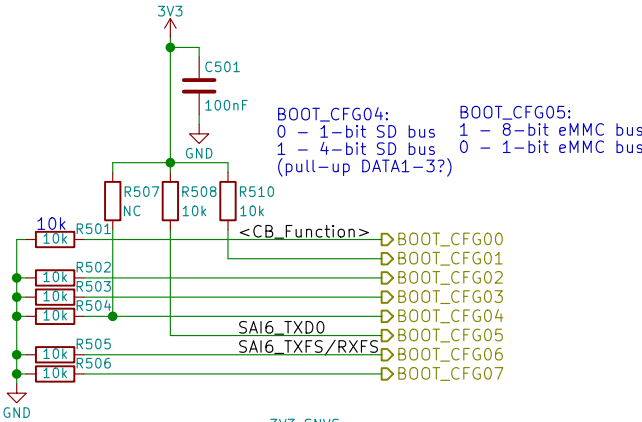
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

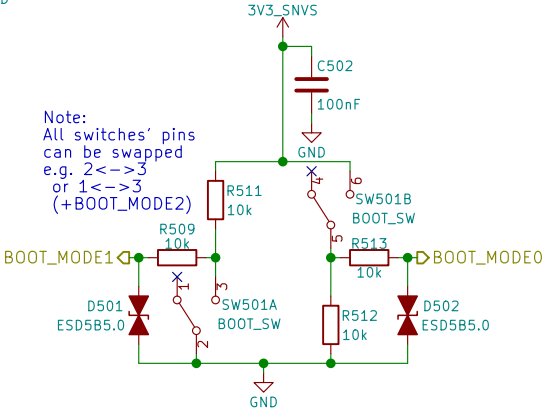
Rev: v0.1.0

Id: 4/24

Boot Config

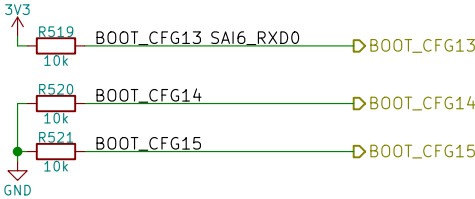
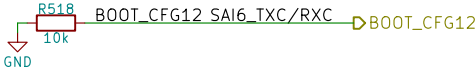
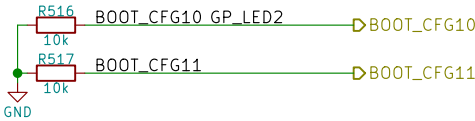
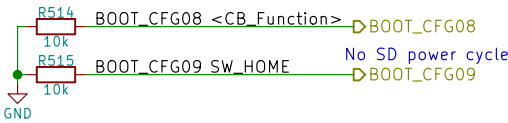


Note:
All switches' pins
can be swapped
e.g. 2<->3
or 1<->3
(+BOOT_MODE2)



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



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Sheet: /Boot Config/
File: boot.sch

Size: A4
KiCad E.D.A. kicad 4.0.6

Date: 2018-06-18

Rev: v0.1.0

Id: 5/24

eric.kuzmenko@puri.sm
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nicole.farber@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: 2018-06-18

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

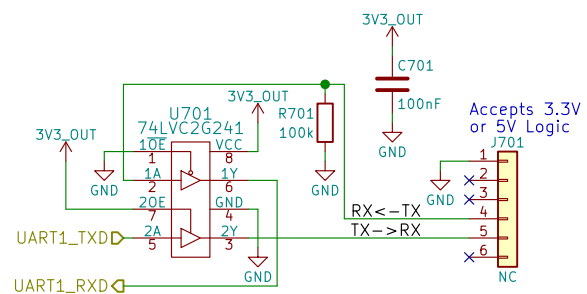
Id: 6/24

eric.kuzmenko@puri.sm

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nicole.farber@puri.sm

christian.schilmoeller@puri.sm

[illegible]

Purism

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christian.schilmoeller@puri.sm

Id: 7/24

JTAG



JTAG



Copyright 2018 GNU GPLv3

Sheet: /JTAG/

File: jtag.sch

Size: A4 Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

eric.kuzmenko@puri.sm

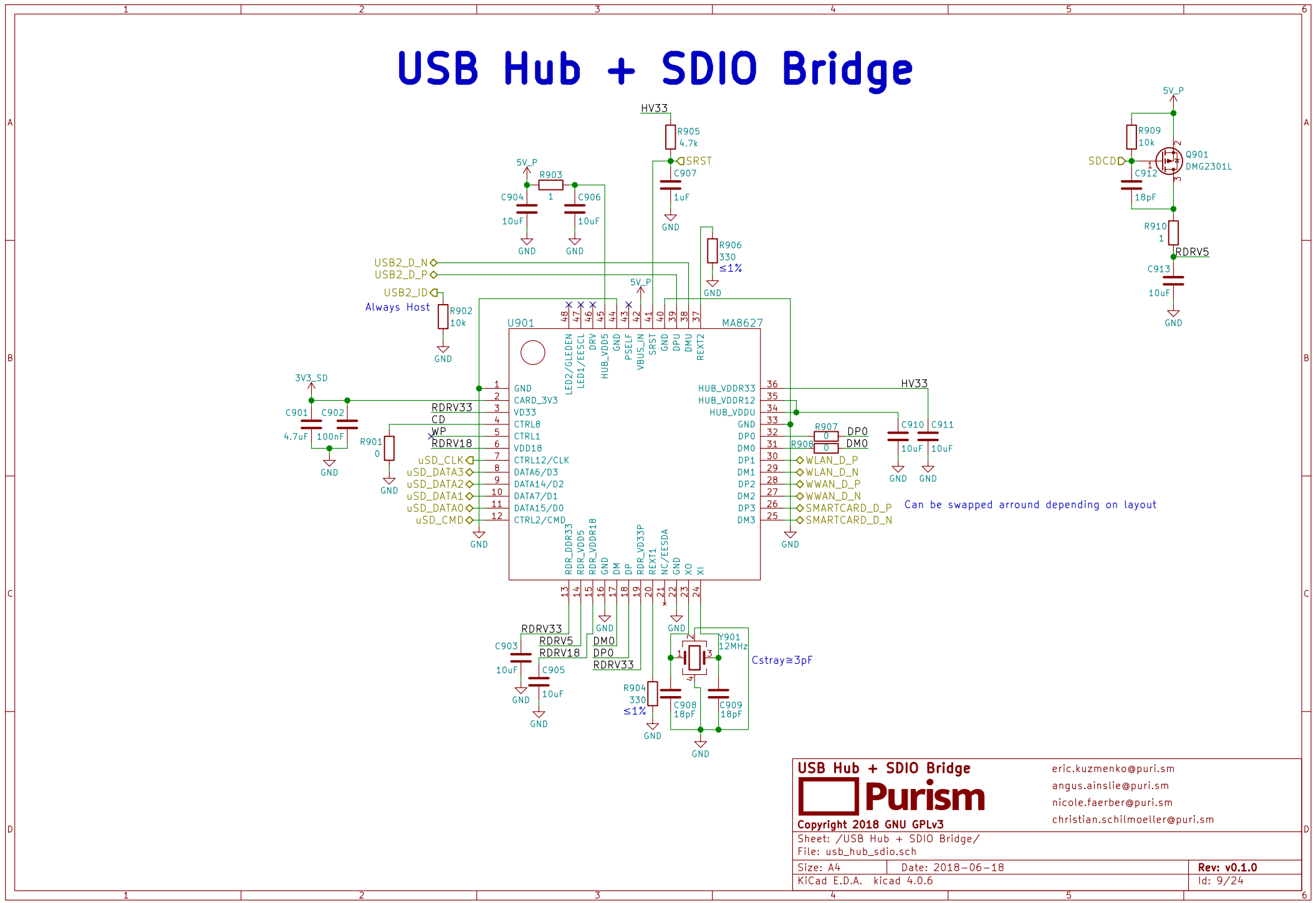
angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

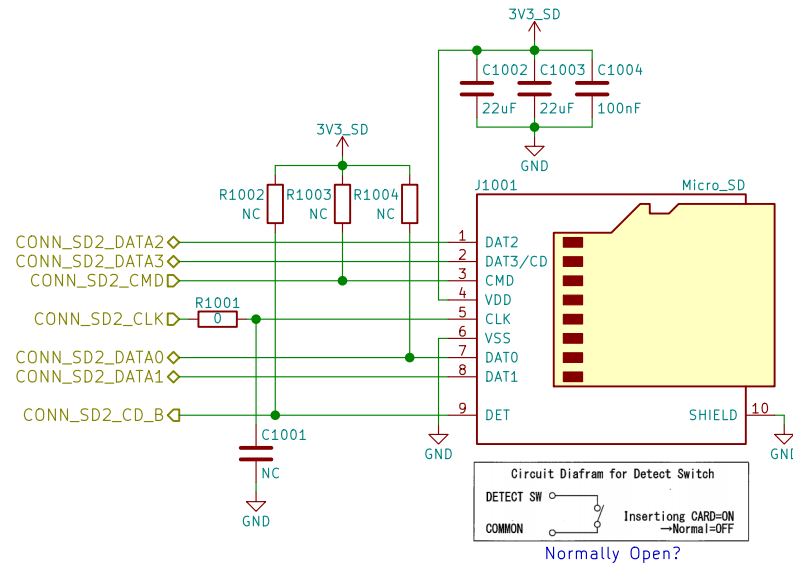
Rev: v0.1.0

Id: 8/24

[illegible][illegible]

Id: 9/24

μSD



uSD Card



Purism

Copyright 2018 GNU GPLv3

Sheet: /uSD Card/

File: sd.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

Id: 10/24

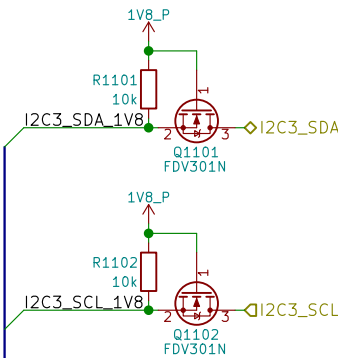
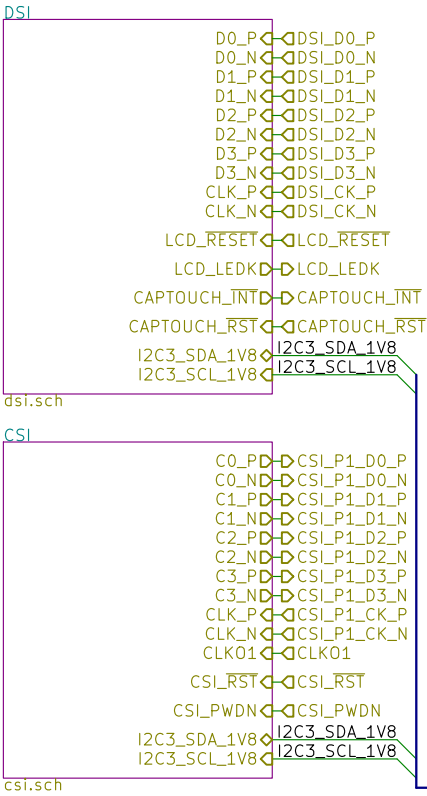
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

MIPI



MIPI



Copyright 2018 GNU GPLv3

Sheet: /MIPI/

File: mipi.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

Rev: v0.1.0

Id: 11/24

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm


A


B

C

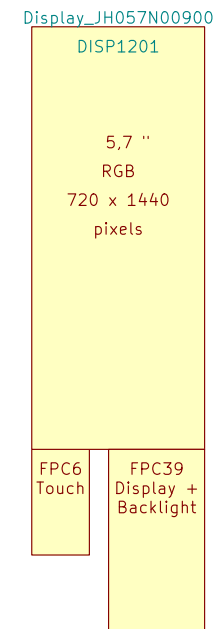
D

Pin#	Definition
1	SCL
2	SDA
3	INT
4	RESET
5	VDD2.85
6	GND

Front: 

Back: 

Timing diagram for the EX-10000 showing signals AVID, VDDIO, Ex rising edge trigger, INT, RESET, and Touch Scan. The diagram illustrates the sequence of events during a scan cycle, including host set output low, host set output high, and host set input. Key timing parameters are labeled: T1=100µs, T2=10ms, T3=20ms, T4=200µs, T5=200µs, T6=200µs, T7=100µs, T8=5ms, T9=10ms, T10=10ms, T11=10ms, T12=10ms, T13=10ms, T14=10ms, T15=10ms, T16=10ms, T17=10ms, T18=10ms, T19=10ms, T20=10ms, T21=10ms, T22=10ms, T23=10ms, T24=10ms, T25=10ms, T26=10ms, T27=10ms, T28=10ms, T29=10ms, T30=10ms, T31=10ms, T32=10ms, T33=10ms, T34=10ms, T35=10ms, T36=10ms, T37=10ms, T38=10ms, T39=10ms, T40=10ms, T41=10ms, T42=10ms, T43=10ms, T44=10ms, T45=10ms, T46=10ms, T47=10ms, T48=10ms, T49=10ms, T50=10ms, T51=10ms, T52=10ms, T53=10ms, T54=10ms, T55=10ms, T56=10ms, T57=10ms, T58=10ms, T59=10ms, T60=10ms, T61=10ms, T62=10ms, T63=10ms, T64=10ms, T65=10ms, T66=10ms, T67=10ms, T68=10ms, T69=10ms, T70=10ms, T71=10ms, T72=10ms, T73=10ms, T74=10ms, T75=10ms, T76=10ms, T77=10ms, T78=10ms, T79=10ms, T80=10ms, T81=10ms, T82=10ms, T83=10ms, T84=10ms, T85=10ms, T86=10ms, T87=10ms, T88=10ms, T89=10ms, T90=10ms, T91=10ms, T92=10ms, T93=10ms, T94=10ms, T95=10ms, T96=10ms, T97=10ms, T98=10ms, T99=10ms, T100=10ms.

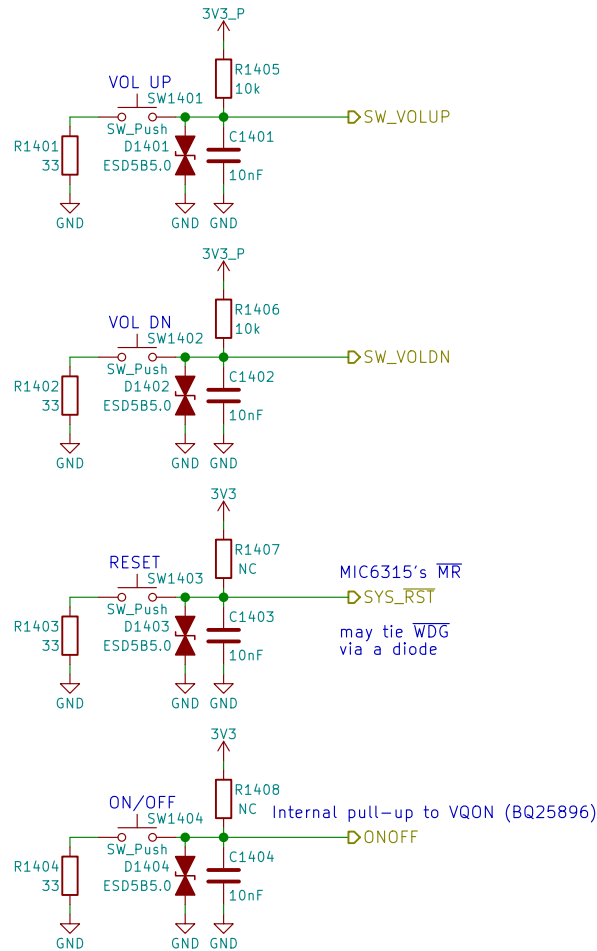


DSI FPC:
Front: Back:

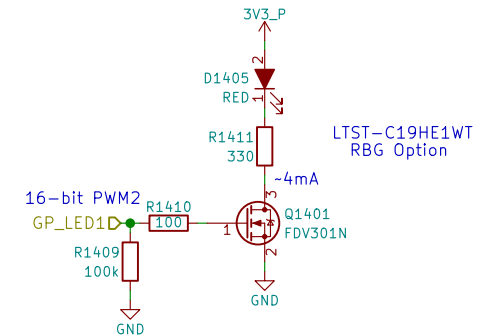
Rev: v0.1.0
Id: 12/24

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 4.0.6

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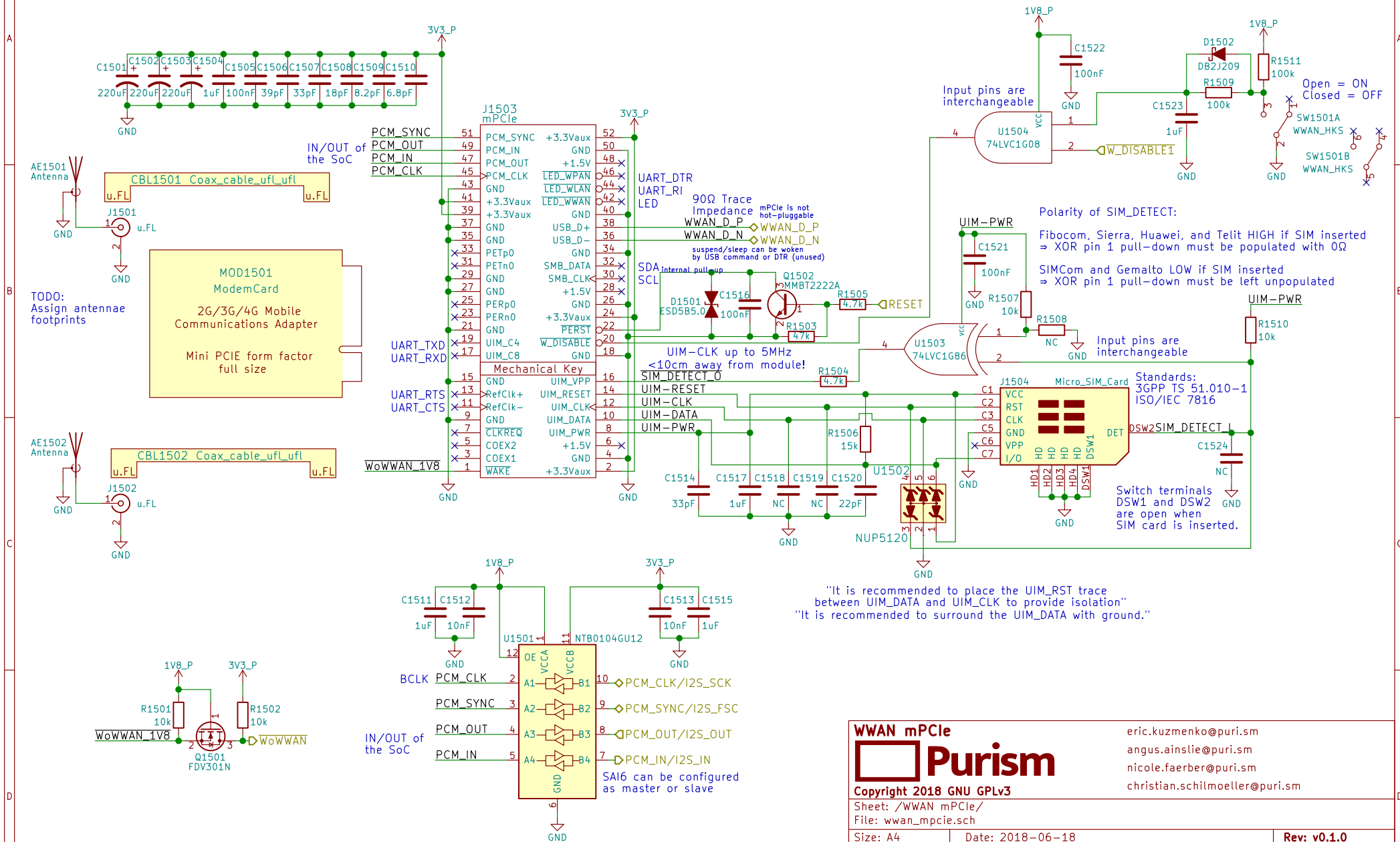
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 14/24

WWAN mPCle



WWAN mPCIe



Copyright 2018 GNU GPLv3

Sheet: /WWAN mPCIe/
File: wwan_mpcie.sch

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Size: A4	Date: 2018-06-18
----------	------------------

Rev: v0.1.0

KiCad E.D.A. kicad 4.0.6

Id: 15/24

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

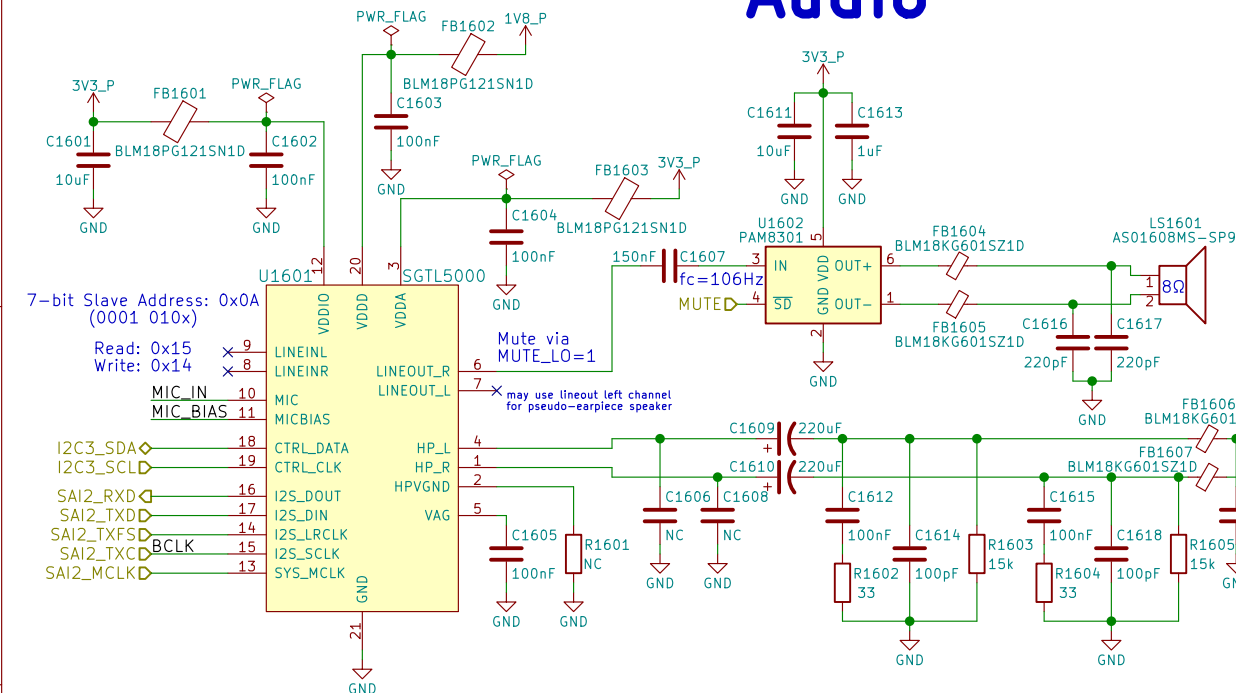
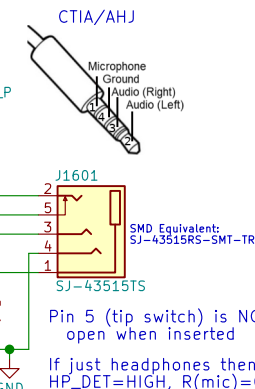
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

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

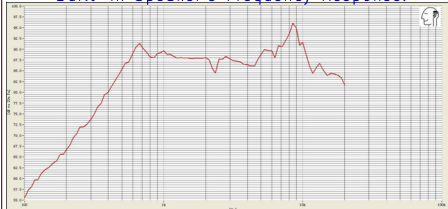
If HP_DET is HIGH for >100ms then HPs are present

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

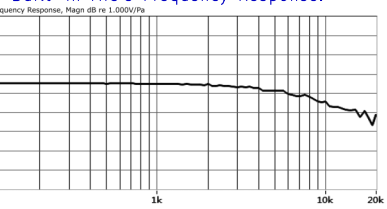
Could use FSA8008 to detect mic



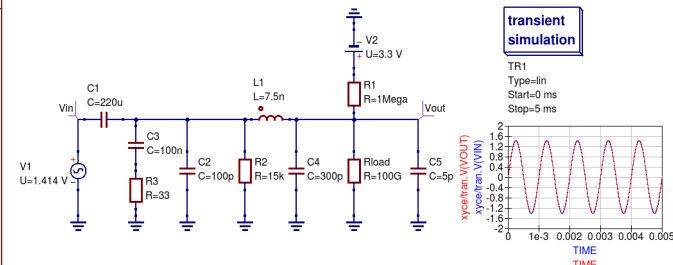
Built-In Speaker's Frequency Response:



Built-In Mic's Frequency Response:

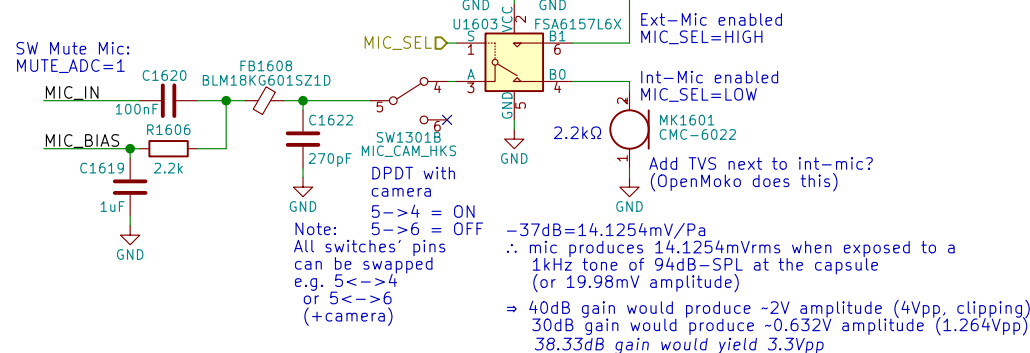


Simulation of HP_DET @ 1kHz output without HP jack inserted:



LCR Measurements:

Earbud Microphone: @1kHz	Headset Speaker: @1kHz	Earbud Speaker: @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 = 17.0300hms
RP = 1.5478kOhms	RP = 36.86Ohms	RP = 17.0340hms
θ = -0.8deg	θ = -2.3deg	θ = 0.5deg



Audio

Purism

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Sheet: /Audio/
 File: audio.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

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Rev: v0.1.0

Id: 16/24

RGMII 10/100/1000 Ethernet

Ethernet

Purism

Copyright 2018 GNU GPLv3

Sheet: /Ethernet/
File: ethernet.sch

Size: A4 Date: 2018-06-18 Rev: v0.1.0
KiCad E.D.A. kicad 4.0.6 Id: 17/24

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nicole.fauber@puri.sm
christian.schilmoeller@puri.sm



Purism

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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 MBO
Requires 5V on
Pin 54 if USB used

WLAN_D_P used
WLAN_D_N used

WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE

1V8_P
100k
D1801
D1802
DB2J209
W_DISABLE1
VIH=2.31V

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
J1801
u.FL
GND

AE1802
FR05-S1-NO-1-004
CBL1802
Coax_cable_ufl_ufl
u.FL
J1802
u.FL
GND

1V8_P
3V3_P
C1801
C1802
1uF
10nF
GND
U1801
NTB0104GU12
VCCA
VCCB
BT_UART_RXD
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS
RX, TX, RTS, CTS
of the SoC
internal 10k pull-up
GND

1V8_P
3V3_P
C1805
C1806
1uF
10nF
GND
U1802
NTB0104GU12
VCCA
VCCB
BCLK M2_PCM_CLK
M2_PCM_SYNC
M2_PCM_IN
M2_PCM_OUT
configure as slave
GND

3V3_P
C1807
C1808
10nF
1uF
GND
U1802
NTB0104GU12
VCCA
VCCB
BT_PCM_CLK
BT_PCM_SYNC
BT_PCM_IN
BT_PCM_OUT
IN, OUT
of the SoC
GND

Socket: Table 46
Module: Table 23

M.2 Key E

3V3_P
R1802
NC
JP1801
2
NC
C1809
C1810
C1811
C1812
C1813
C1814
C1816
C1817
C1818
6.8pF
8.2pF
18pF
33pF
39pF
100nF
1uF
220uF
GND

M2_PCM_CLK
M2_PCM_SYNC
M2_PCM_IN
M2_PCM_OUT

SoC's IN/OUT

BT_HOST_WAKE
BT_UART_RXD
SoC's RX
Module's TX
SoC's TX
Module's RX
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

I.MX8M in DCE mode (POR state)
has CTS output, RTS input

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

3V3_P
C1815
100nF
GND

Leave BT_DISABLE
LOW for RS9116

BT_DISABLE

Input pins are
interchangeable

D1803
DB2J209
R1807
100k
3V3_P
C1819
100nF
GND

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

SW1801A
WLAN_HKS
Open = ON
Closed = OFF

SW1801B
WLAN_HKS

1V8_P
3V3_P
R1804
10k
Q1801
FDV301N
M2_I2C_SDA
I2C2_SDA
R1806
10k
Q1802
FDV301N
M2_I2C_SCL
I2C2_SCL

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

6.2 M.2 Signal Directions
UARTn_UFCR[DCEDTE]=0 on POR

Chip
UART Module Signals
TX_DATA
RX_DATA
CTS_B
RTS_B
External Signals
UARTn_TX_DATA
UARTn_RX_DATA
UARTn_CTS_B
UARTn_RTS_B
TX output
RX input
CTS output
RTS input
=> TX->RX
RX->TX
CTS->CTS
RTS->RTS

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

WLAN+BT M.2

Purism

Copyright 2018 GNU GPLv3

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

Size: A4
Date: 2018-06-18
KiCad E.D.A. kicad 4.0.6

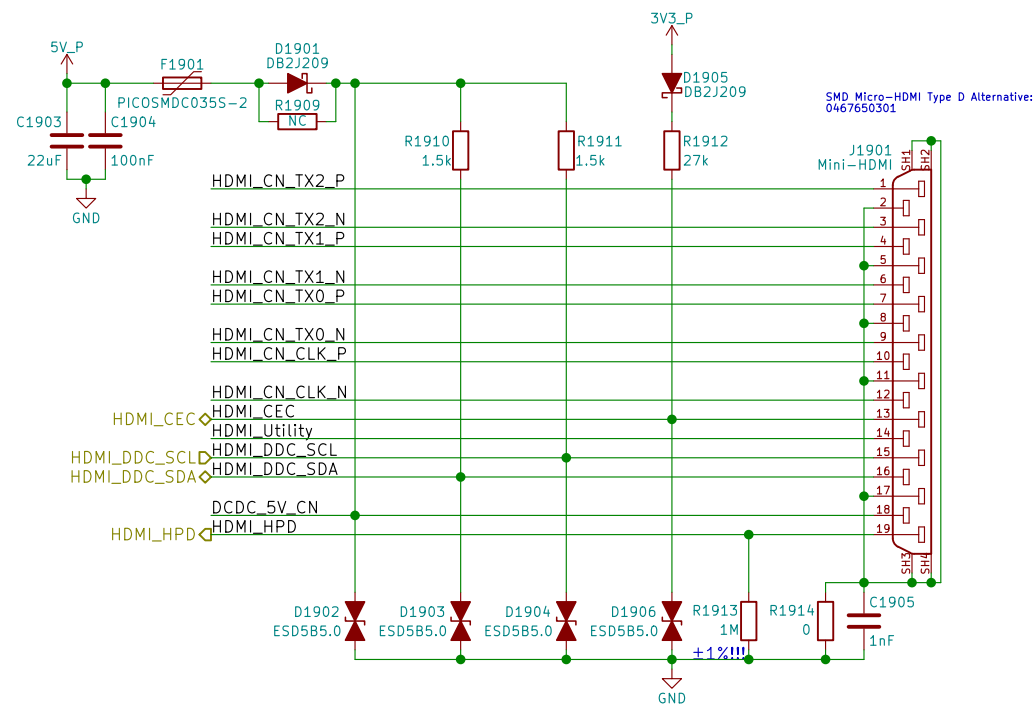
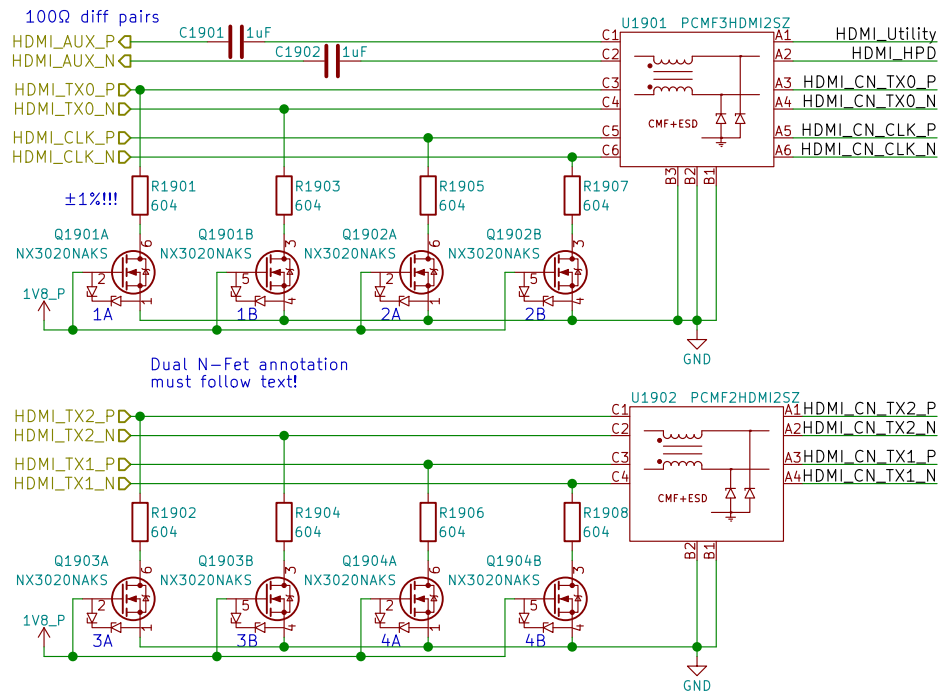
Rev: v0.1.0
Id: 18/24

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: 2018-06-18
KiCad E.D.A. kicad 4.0.6	

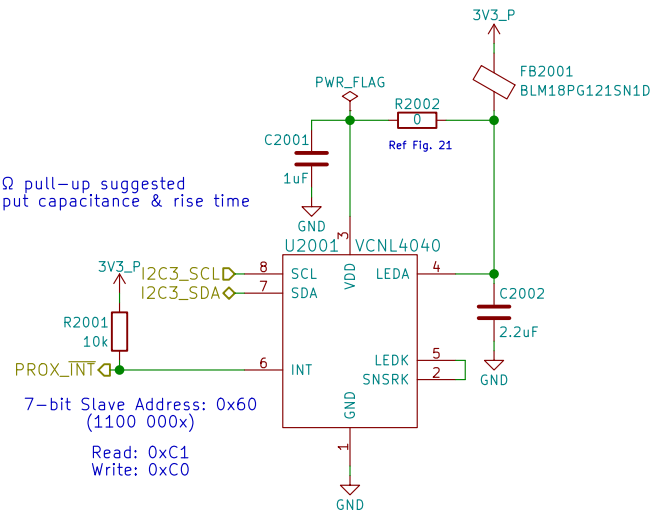
eric.kuzmenko@puri.sm
angus.ainslie@puri.sm
nicole.ferber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 19/24

Sensors

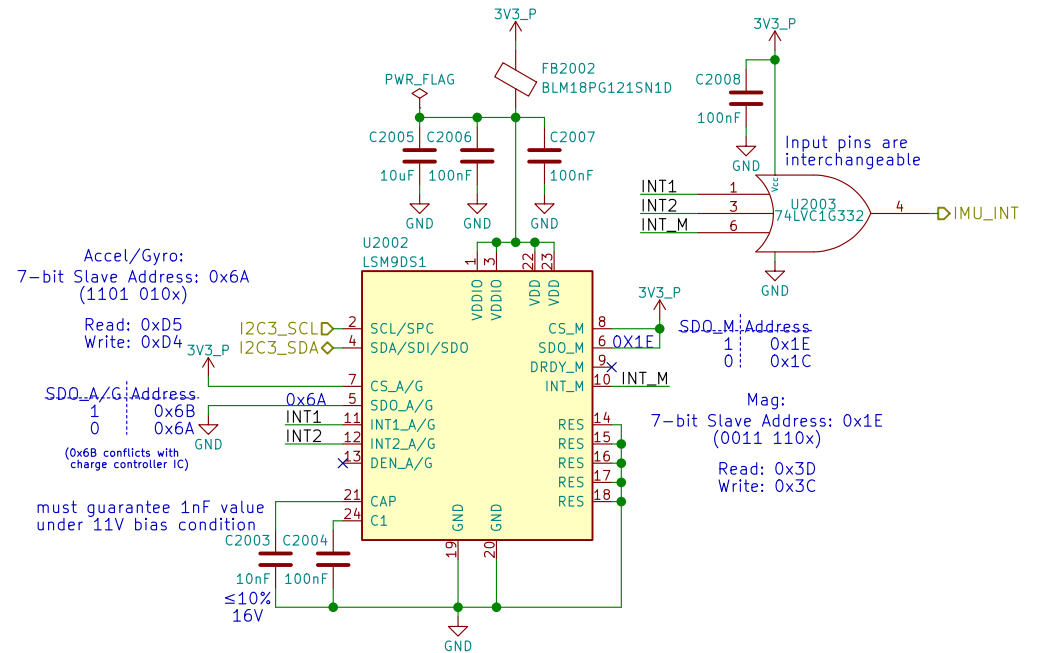
Proximity & Ambient Light

Note:
I2C 2.2kΩ pull-up suggested
check input capacitance & rise time



Reference:
<https://www.vishay.com/docs/84307/designingvcnl4040.pdf>
<http://www.vishay.com/docs/84931/vcnl4040sensorboardfiles.pdf>

9-Axis IMU



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

Command	SAD[6:1]	SAD[0] = SA0	R/W	SAD+R/W
Read	110101	0	1	11010101 (D5h)
Write	110101	0	0	11010100 (D4h)
Read	110101	1	1	11010111 (D7h)
Write	110101	1	0	11010110 (D6h)

Command	SAD[6:2]	SAD[1] = SDO/SA1	SAD[0]	R/W	SAD+R/W
Read	00111	0	0	1	00111001 (39h)
Write	00111	0	0	0	00111000 (38h)
Read	00111	1	0	1	00111101 (3Dh)
Write	00111	1	0	0	00111100 (3Ch)

Sensors



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Sheet: /Sensors/
File: sensors.sch

Size: A4 Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

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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: 2018-06-18

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[illegible]

Smart Card



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Id: 22/24

MAX-M8Q

U2301

MAX-M8Q

RF_IN 11

VCC 8

VCC_IO 7

VCC_RF 14

V_BACKUP 6

TXD 2

RXD 3

SDA 16

SCL 17

TIMEPULSE 4

EXT_INT 5

RESET_N 9

ANT_ON/RESV 13

V_ANT/RESV 15

SAFEBOOT/RESV 18

3V3_P

FB2301

BLM18PG1215N1D

PWR_FLAG

C2301 100nF

C2302 10nF

C2303 1nF

C2304 100pF

R2301

L2301

C2305 33nH

C2306 22pF

10Ω

Matching Circuit

L2302

C2307

AE2301

ACM4-5036-A1-CC-5

3.4dBic

RESET_N low activates a hardware reset system. Use this pin only to reset the module. Use RESET_N to turn the module on and off. The reset state increases power consumption.

VCC_RF used for active antenna or LNA

1PPS Output "Leave open if not used"

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



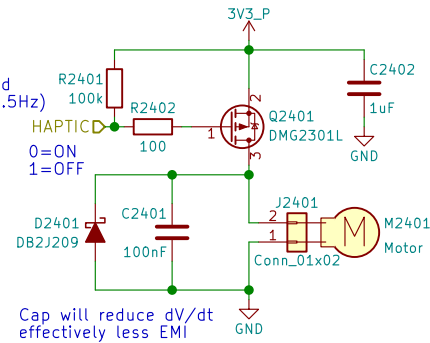
Purism

Id: 23/24

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)

Cap will reduce dV/dt
 effectively less EMI

Haptic/Vibration Motor



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Sheet: /Haptic Motor/

File: haptic.sch

Size: A4 Date: 2018-06-18

KiCad E.D.A. kicad 4.0.6

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