

USB-C



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Rev: v0.1.0
Id: 2/24



Drawing ~333.33mA,
or consuming <1.2W,
should give close to
10 hours going from
100% to 0% charge

$$1.658 \leq ILIM \leq 2.063$$

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

$$3.9 < V_{IN} \leq 14$$
$$I(\text{sat}) = 7\text{A}$$


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/tiduc11/tiduc11.pdf>
schematic: <http://www.ti.com/lit/df/tidrp70/tidrp70.pdf>
(PTC may be good enough)

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

Purism

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Id: 3/24

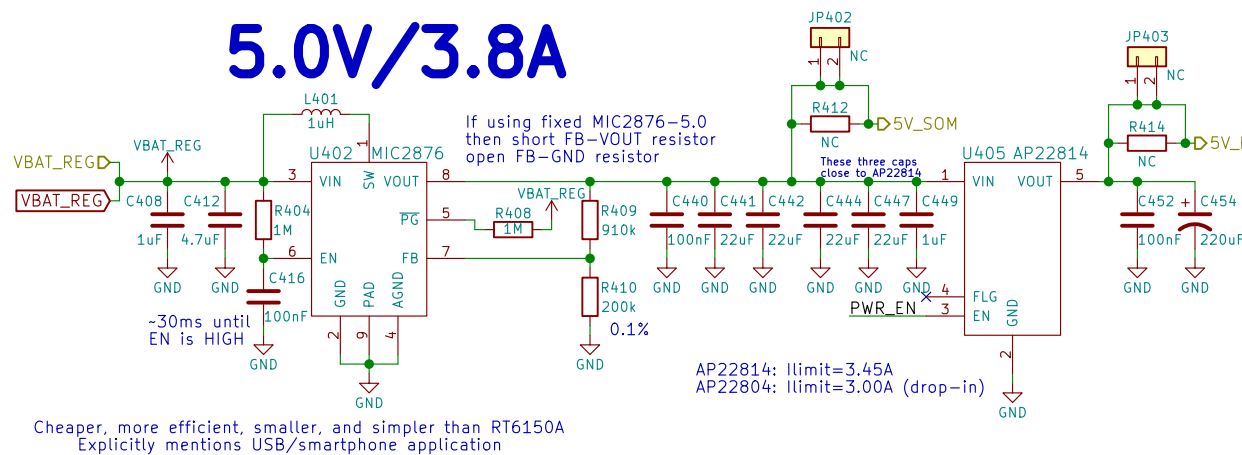
3.3V/3A



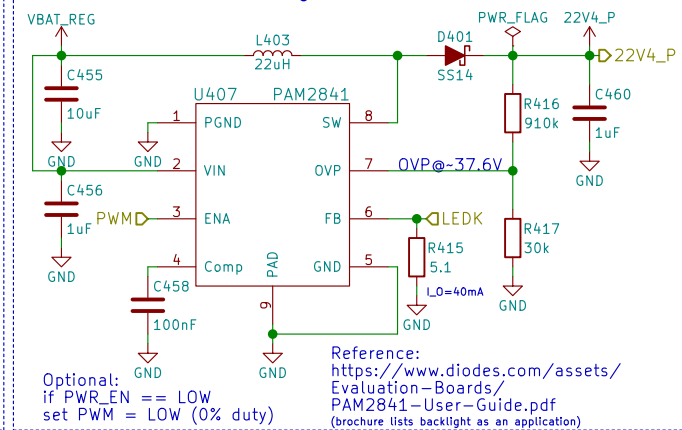
1.8V/600mA



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 4.0.7

Date: 2018-06-18

Rev: v0.1.0

Id: 4/24

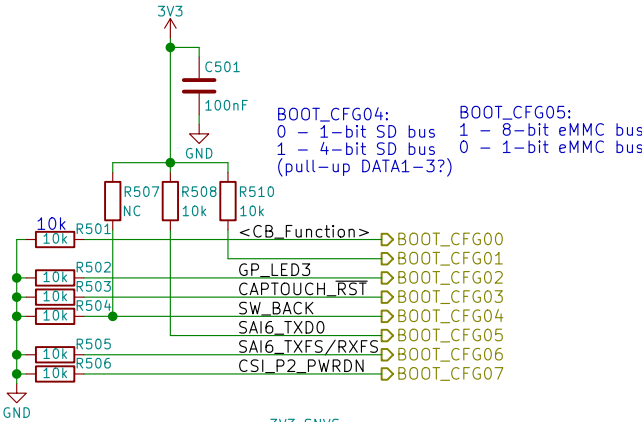
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

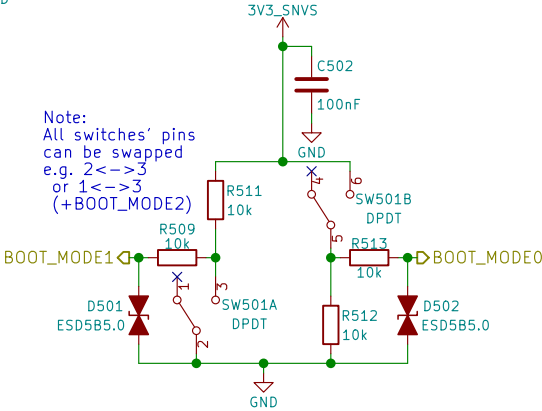
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Boot Config



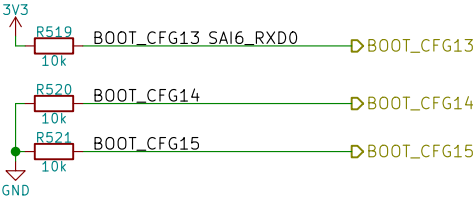
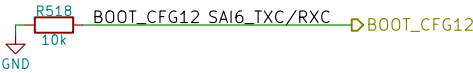
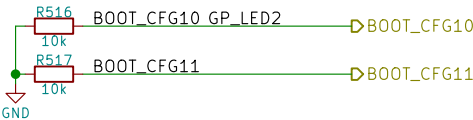
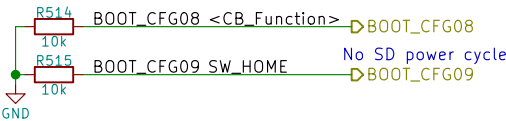
BOOT_CFG04: 0 - 1-bit SD bus
1 - 4-bit SD bus (pull-up DATA1-3?)
BOOT_CFG05: 1 - 8-bit eMMC bus
0 - 1-bit eMMC bus



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
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Date: 2018-06-18

Rev: v0.1.0
Id: 5/24

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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

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Rev: v0.1.0

Id: 6/24

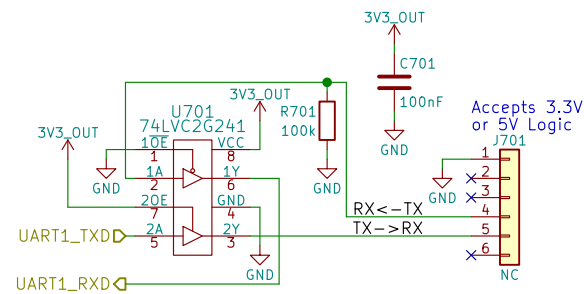
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christian.schilmoeller@puri.sm

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

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Rev: v0.1.0
Id: 7/24

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

eric.kuzmenko@puri.sm

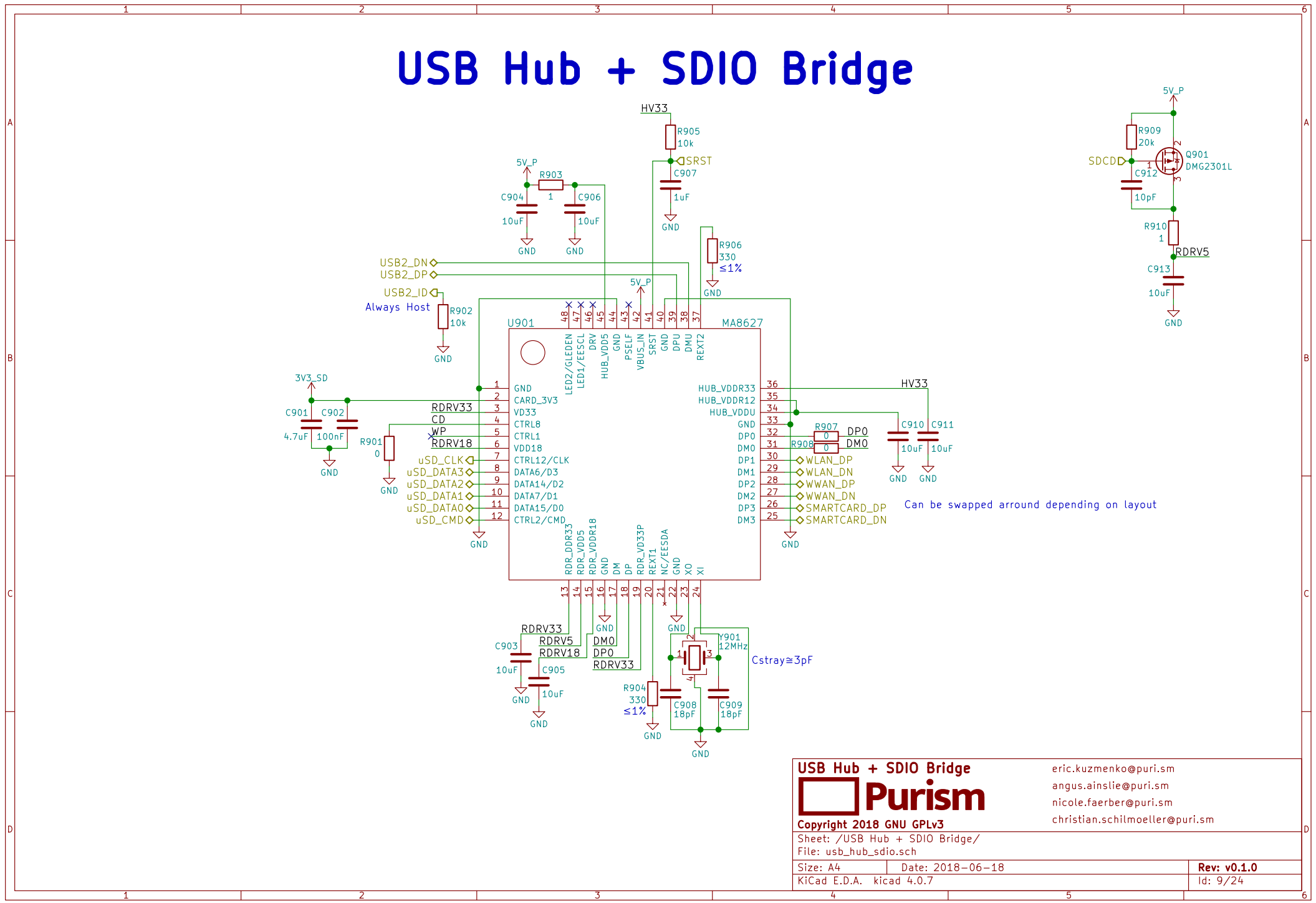
angus.ainstlie@puri.sm

nicole.farber@puri.sm

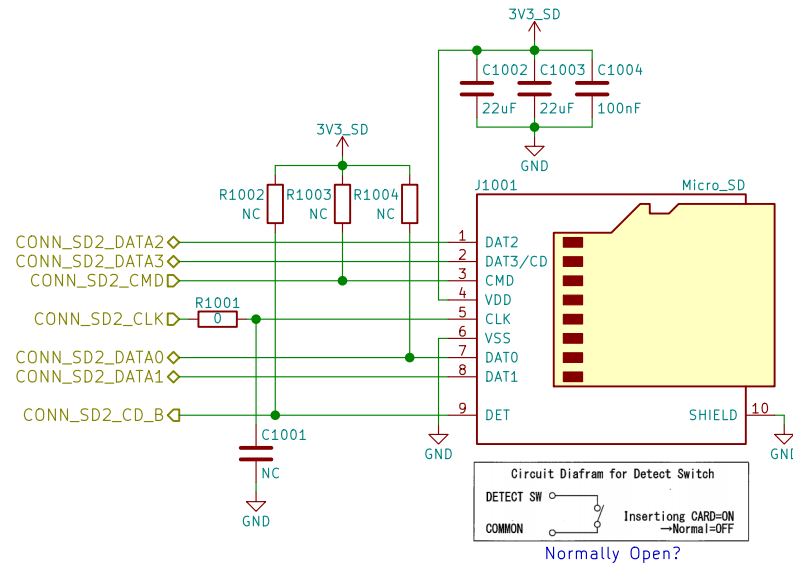
christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 8/24

[illegible][illegible]

μSD



uSD Card



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Sheet: /uSD Card/

File: sd.sch

Size: A4

Date: 2018-06-18

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Rev: v0.1.0

Id: 10/24

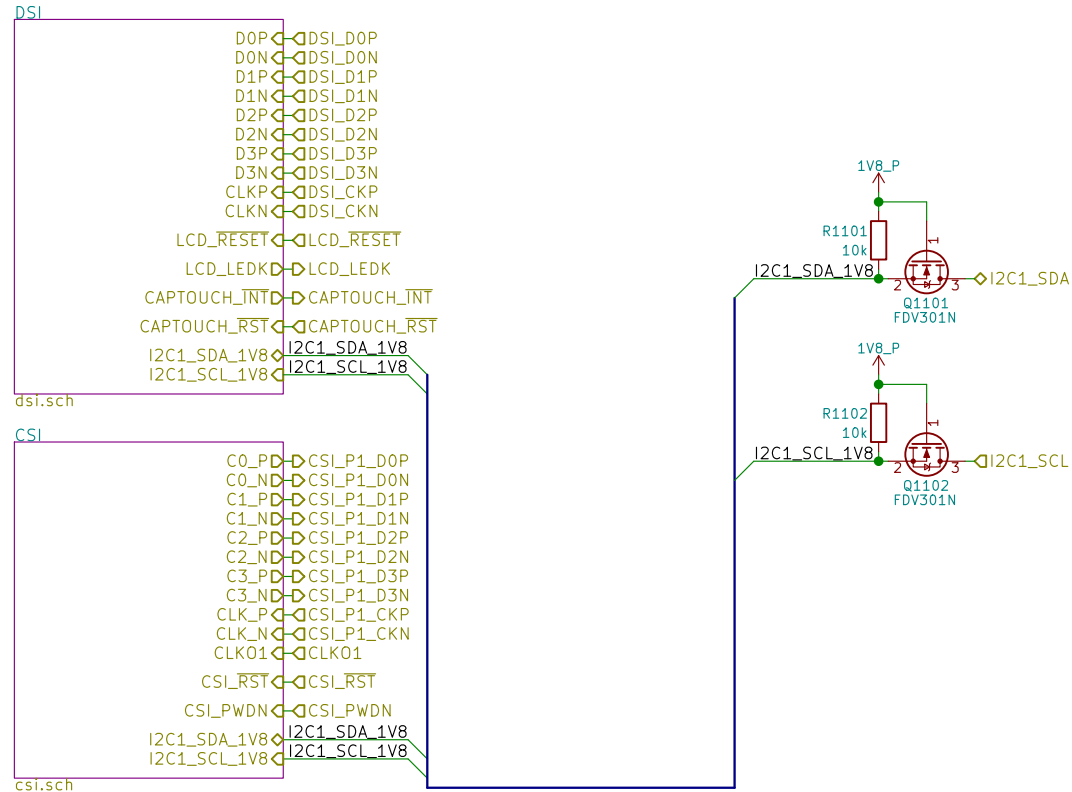
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

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

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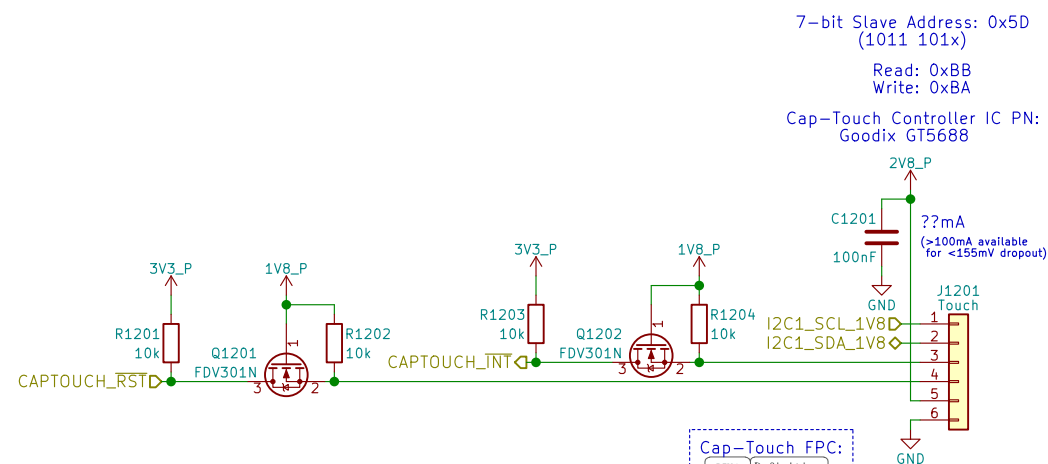
christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 11/24

Display & Touch Controller

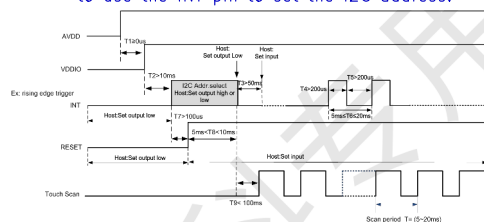
LCD PN:
Shenzhen Jinghong Electronics Co., Ltd.
JH057N00900



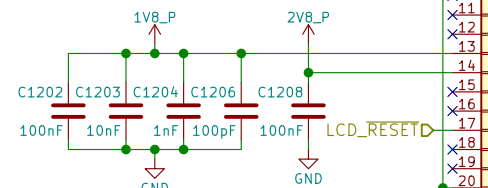
The upper 7 bits are the address,
and bit 0 is used to select read or write.
GT5688 has two slave device addresses to choose from:

INT	7-bit Address	8-bit Write Address	8-bit Read Address
LOW	0x5D	0xBA	0xBB
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



Display_JH057N00900

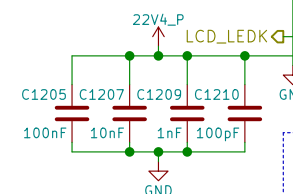
DISP1201

5.7 "
RGB
720 x 1440
pixels

FPC6
Touch

FPC39
Display +
Backlight

100Ω Differential Impedance



DSI FPC:
Front: Back:

Backlight Array:



MIPI DSI

Purism

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Sheet: /MIPI/DSI/

File: dsi.sch

Size: A4 Date: 2018-06-18

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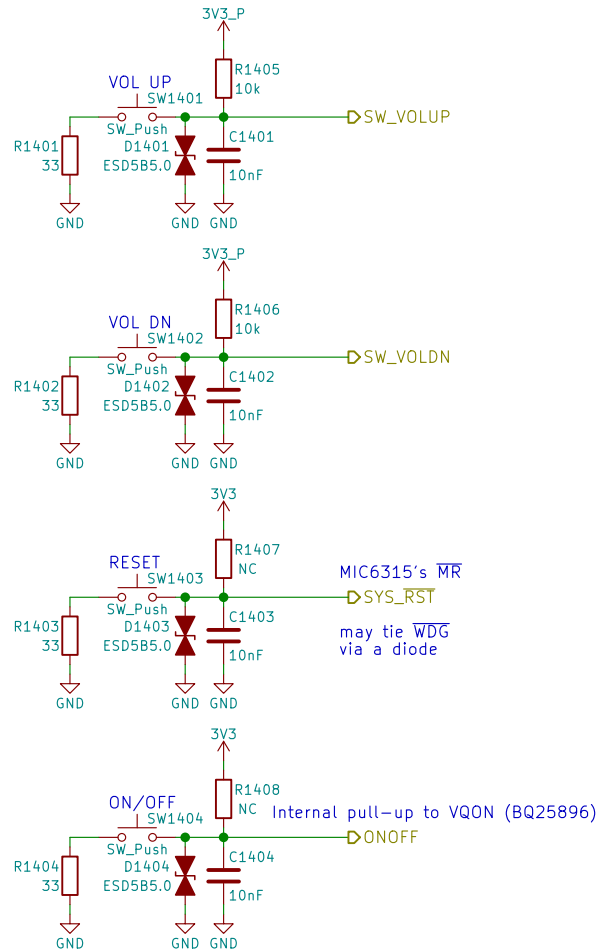
nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 12/24

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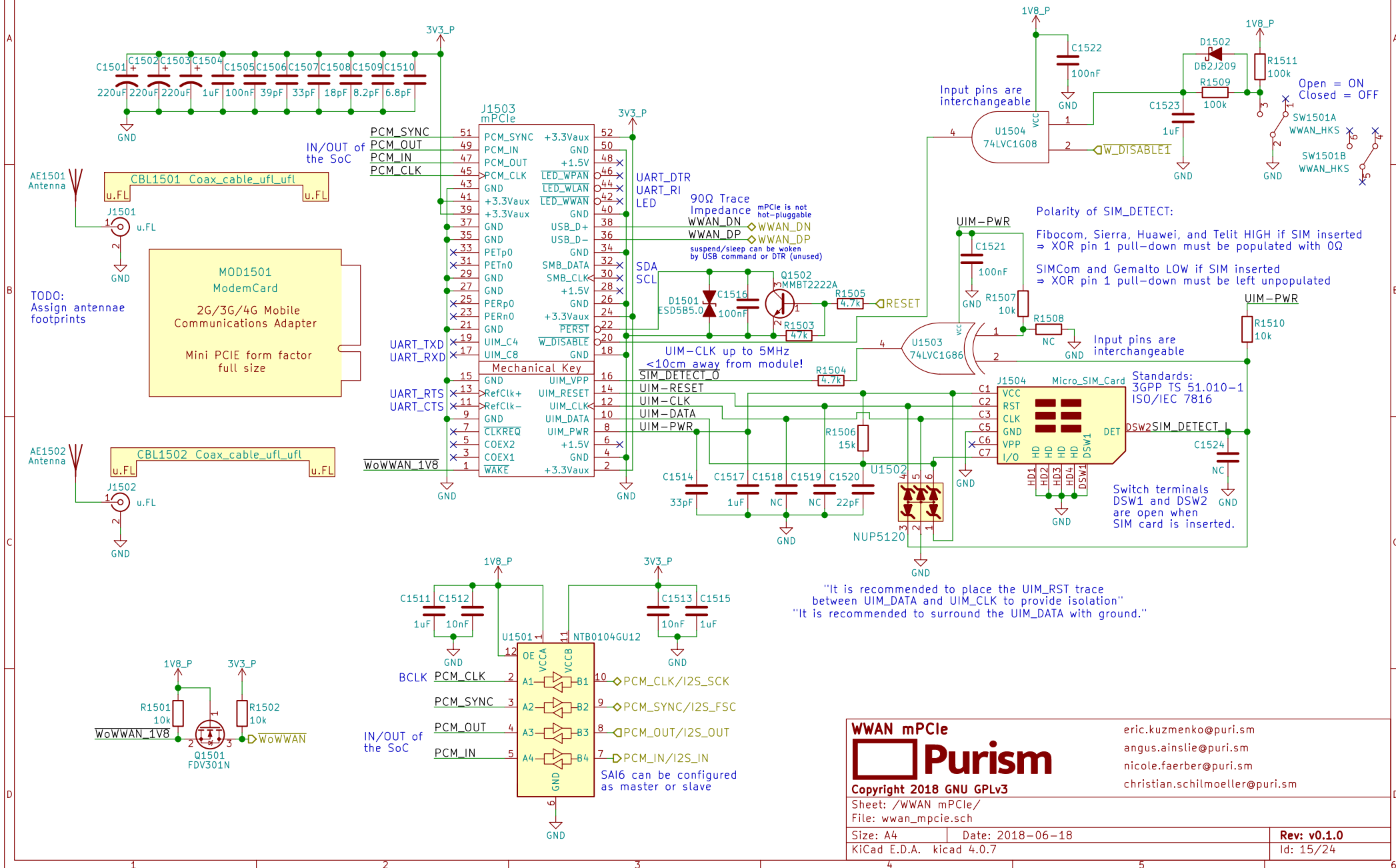
Sheet: /Buttons & LED/
 File: buttons_led.sch

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

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 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

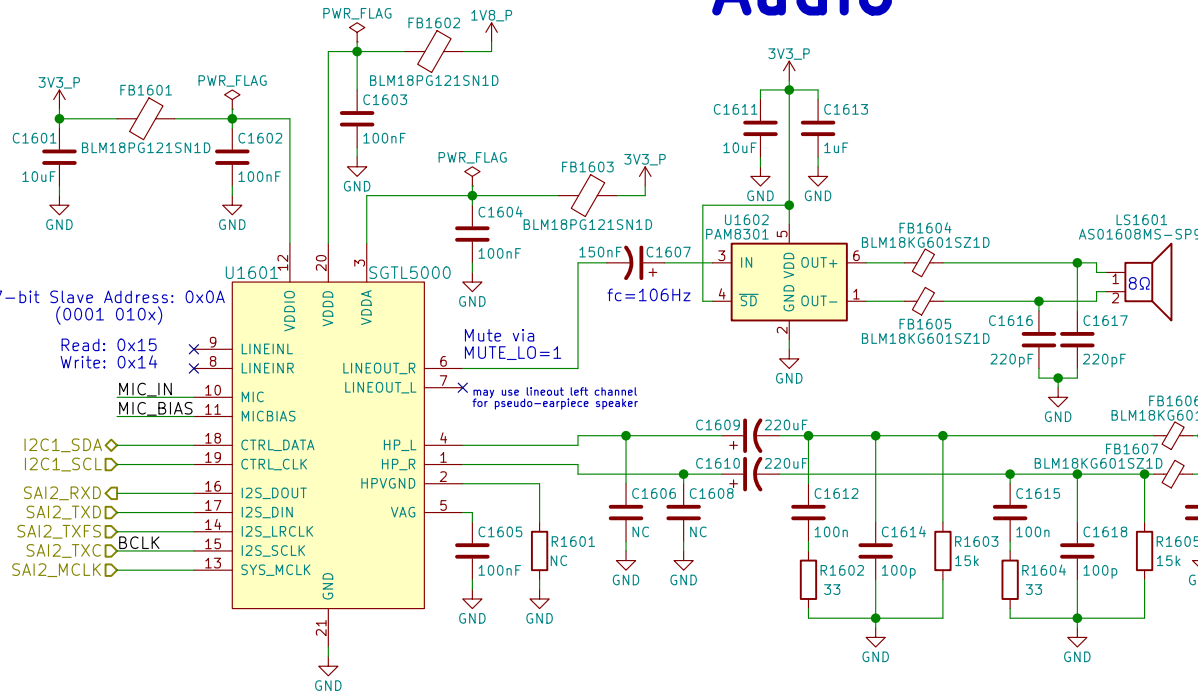
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

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

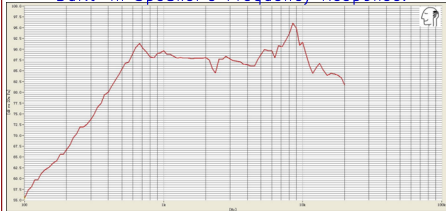
If HP_DET is HIGH for >100ms then HPs are present

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

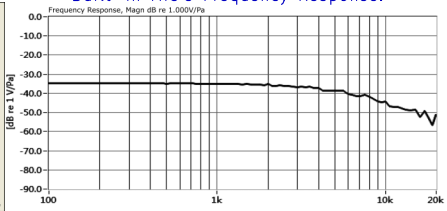
Could use FSA8008 to detect mic



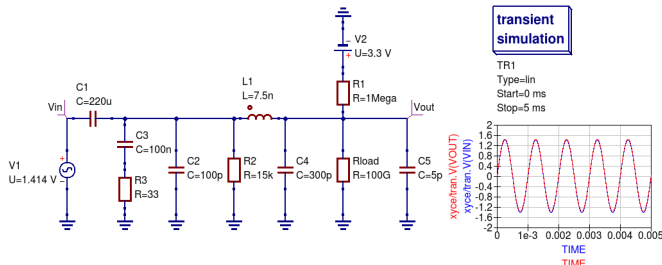
Built-In Speaker's Frequency Response:



Built-In Mic's Frequency Response:



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



LCR Measurements:

Earbud Microphone:
 @1kHz
 $L_s = 3.844mH$
 $L_p = 15.757H$
 $C_s = 6.583uF$
 $C_p = 1612.8pF$
 $R_s = 1.5465k\Omega$
 $R_p = 1.5478k\Omega$
 $\theta = -0.8deg$

Headset Speaker:
 @1kHz
 $L_s = 244.4uH$
 $L_p = 141.99mH$
 $C_s = 103.6uF$
 $C_p = 178.77nF$
 $R_s = 36.860\Omega$
 $R_p = 36.860\Omega$
 $\theta = -2.3deg$

Earbud Speaker:
 @1kHz
 $L_s = 25.2uH$
 $L_p = 311.0mH$
 $C_s = 1.0mF$
 $C_p = 81.95nF$
 $R_s = 17.0300\Omega$
 $R_p = 17.0340\Omega$
 $\theta = 0.5deg$

Audio

Purism

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Sheet: /Audio/
 File: audio.sch

Size: A4 Date: 2018-06-18

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angus.ainslie@puri.sm

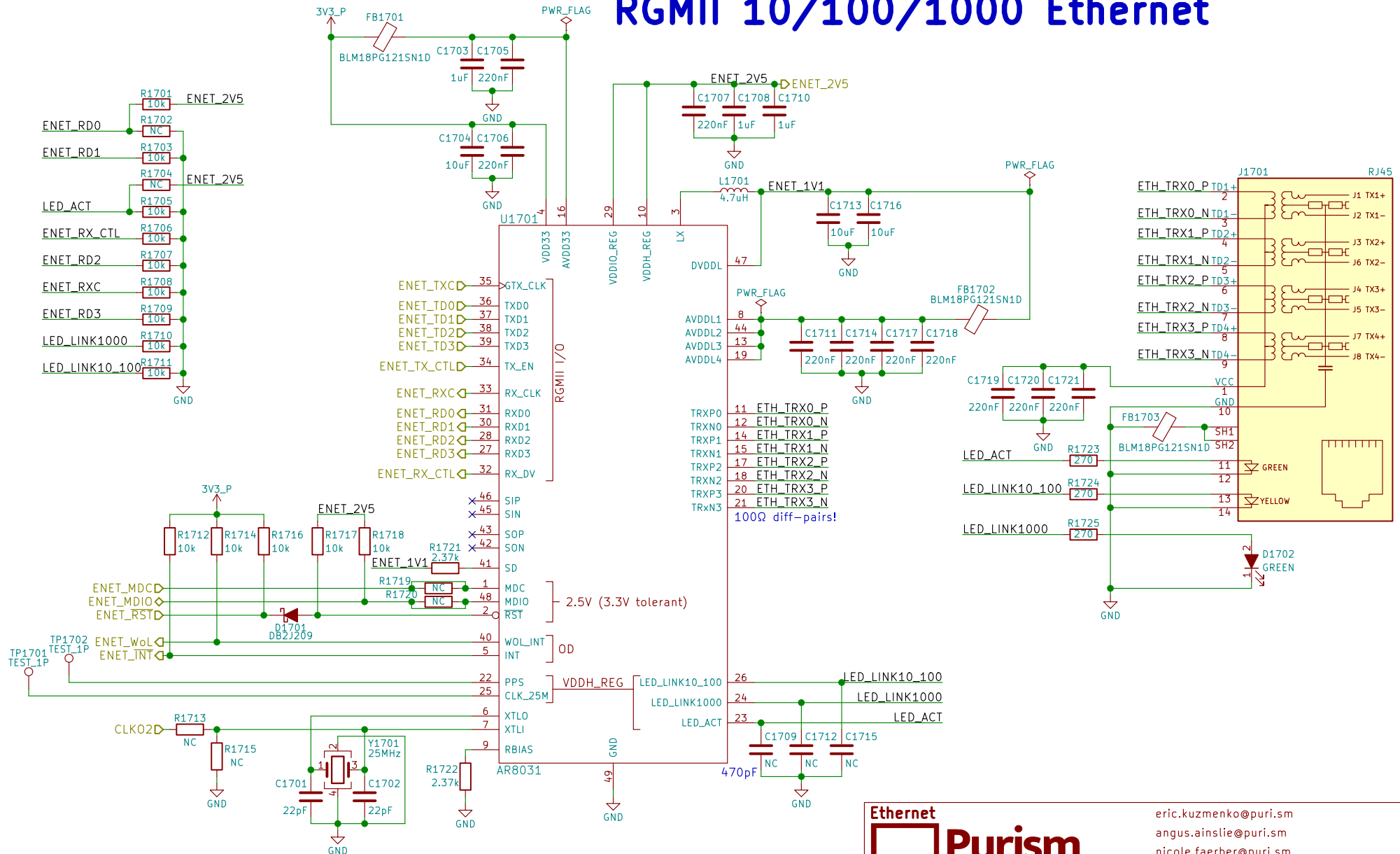
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

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: 2018-06-18
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

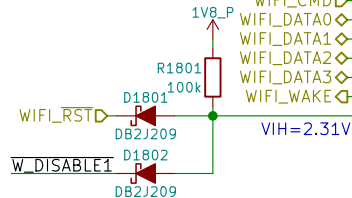
Id: 17/24

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



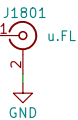
RedPine RS9116
has 100k pull-up to
3.3V making SDIO_RST
~2.55V when HIGH

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

TODO:
Assign antennae
footprints

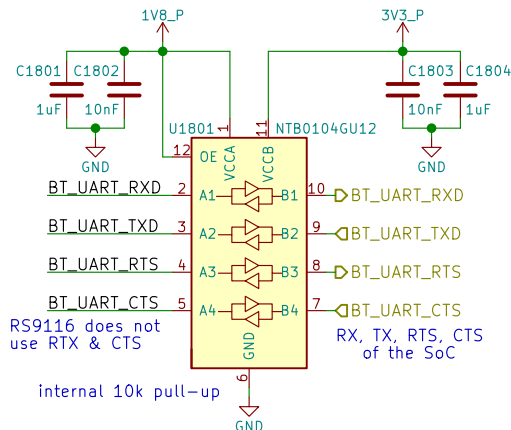
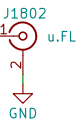
AE1801
FR05-S1-NO-1-004

CBL1801 Coax_cable_ufl_ufl
u.FL

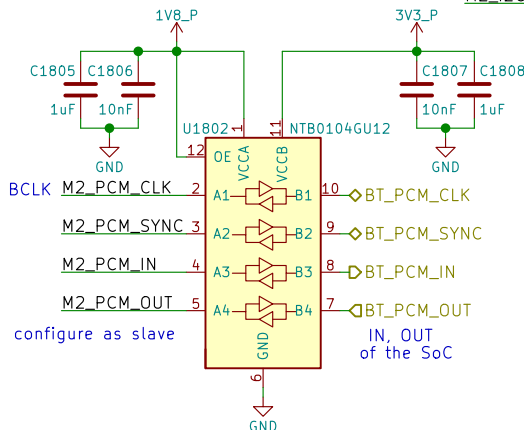


AE1802
FR05-S1-NO-1-004

CBL1802 Coax_cable_ufl_ufl
u.FL

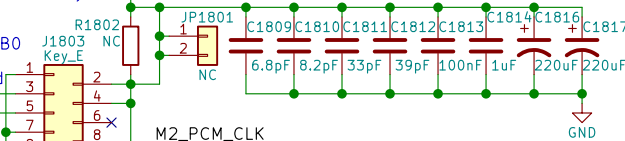


internal 10k pull-up



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

BT_DISABLE
WIFI_DISABLE

Input pins are
interchangeable

1V8_P
3V3_P

R1804 10k
Q1801 FDV301N

M2_I2C_SDA
Q1801 FDV301N

M2_I2C_SCL
Q1802 FDV301N

1V8_P
3V3_P

R1806 10k
Q1802 FDV301N

M2_I2C_SDA
Q1801 FDV301N

M2_I2C_SCL
Q1802 FDV301N

1V8_P
3V3_P

R1806 10k
Q1802 FDV301N

M2_I2C_SDA
Q1801 FDV301N

M2_I2C_SCL
Q1802 FDV301N

1V8_P
3V3_P

R1806 10k
Q1802 FDV301N

M2_I2C_SDA
Q1801 FDV301N

M2_I2C_SCL
Q1802 FDV301N

1V8_P
3V3_P

R1806 10k
Q1802 FDV301N

M2_I2C_SDA
Q1801 FDV301N

M2_I2C_SCL
Q1802 FDV301N

1V8_P
3V3_P

R1806 10k
Q1802 FDV301N

M2_I2C_SDA
Q1801 FDV301N

M2_I2C_SCL
Q1802 FDV301N

1V8_P
3V3_P

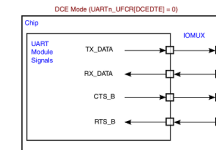
R1806 10k
Q1802 FDV301N

M2_I2C_SDA
Q1801 FDV301N

M2_I2C_SCL
Q1802 FDV301N

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

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

3V3_P

D1803 DB2J209

R1807 100k

SW1801A

WLAN_HKS

Open = ON

Closed = OFF

SW1801B

WLAN_HKS

3V3_P

D1803 DB2J209

R1807 100k

SW1801A

WLAN_HKS

Open = ON

Closed = OFF

SW1801B

WLAN_HKS

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

Rev: v0.1.0

Id: 18/24

eric.kuzmenko@puri.sm

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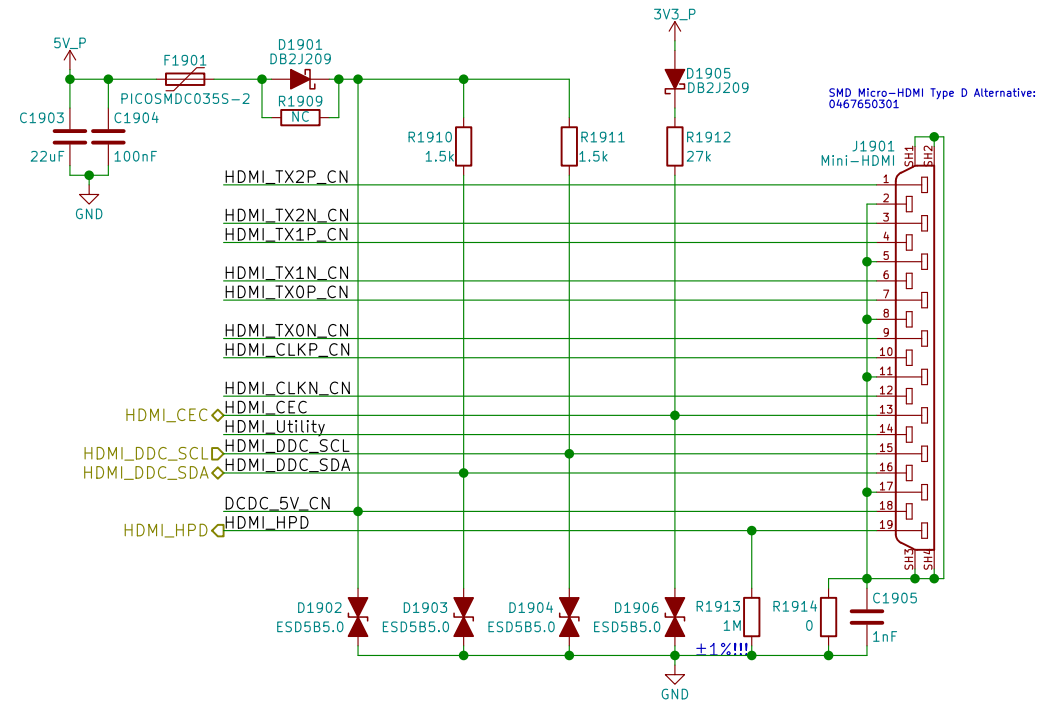
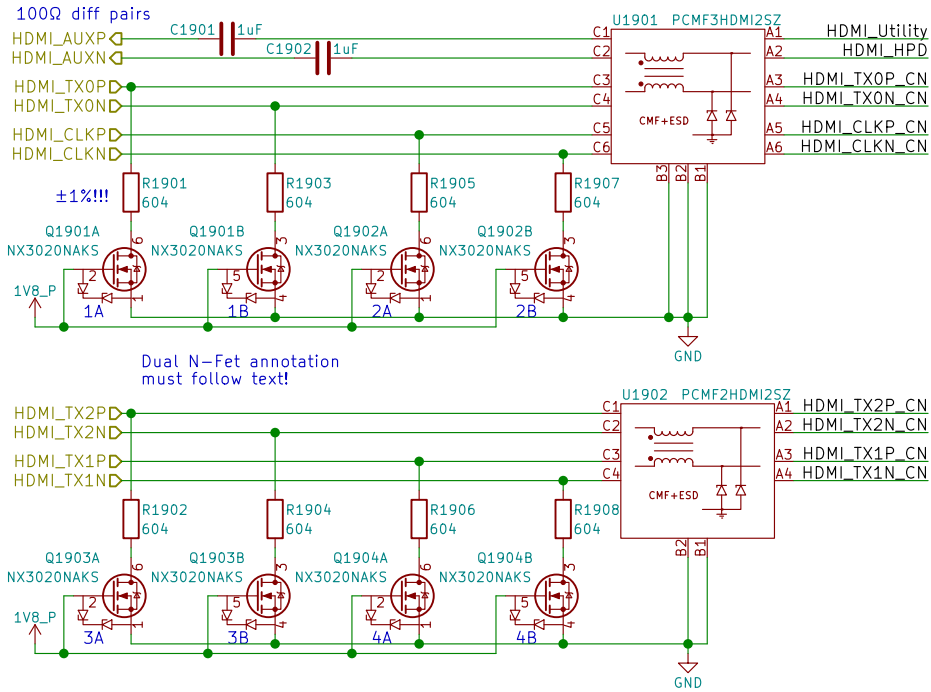
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

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
KiCad E.D.A. kicad 4.0.7

Date: 2018-06-18

Rev: v0.1.0
Id: 19/24

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

1

B



C

D

1



1



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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Rev: v0.1.0

Id: 21/24

[illegible]

Smart Card



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

Id: 22/24

GNSS



GNSS



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Sheet: /GNSS/
File: gnss.sch

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

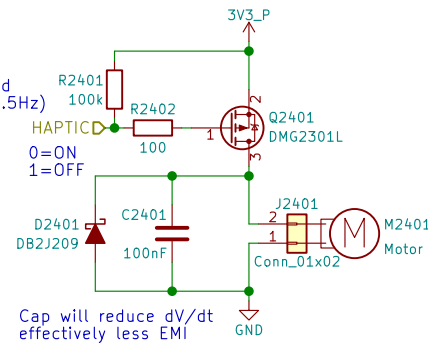
eric.kuzmenko@puri.sm
angus.ainstlie@puri.sm
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Haptic Motor

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
 (not connected to either pin)
 ⇒ could connect housing to GND

Cap will reduce dV/dt
 effectively less EMI

Cheaper Motor Connector:
https://lcsc.com/product-detail/1-25T-Connectors_1-25T-1-2AW_C10832.html

Haptic/Vibration Motor



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