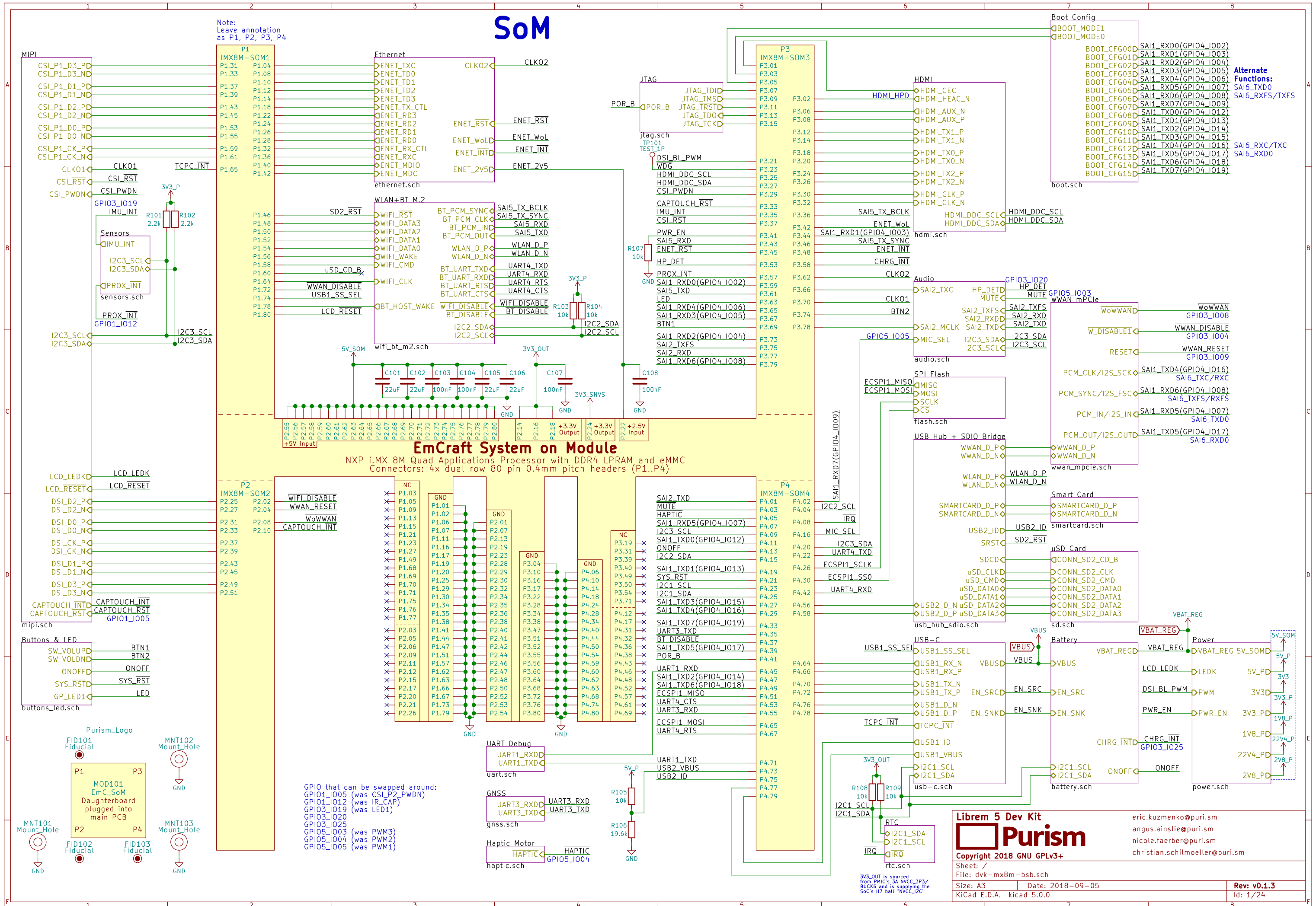


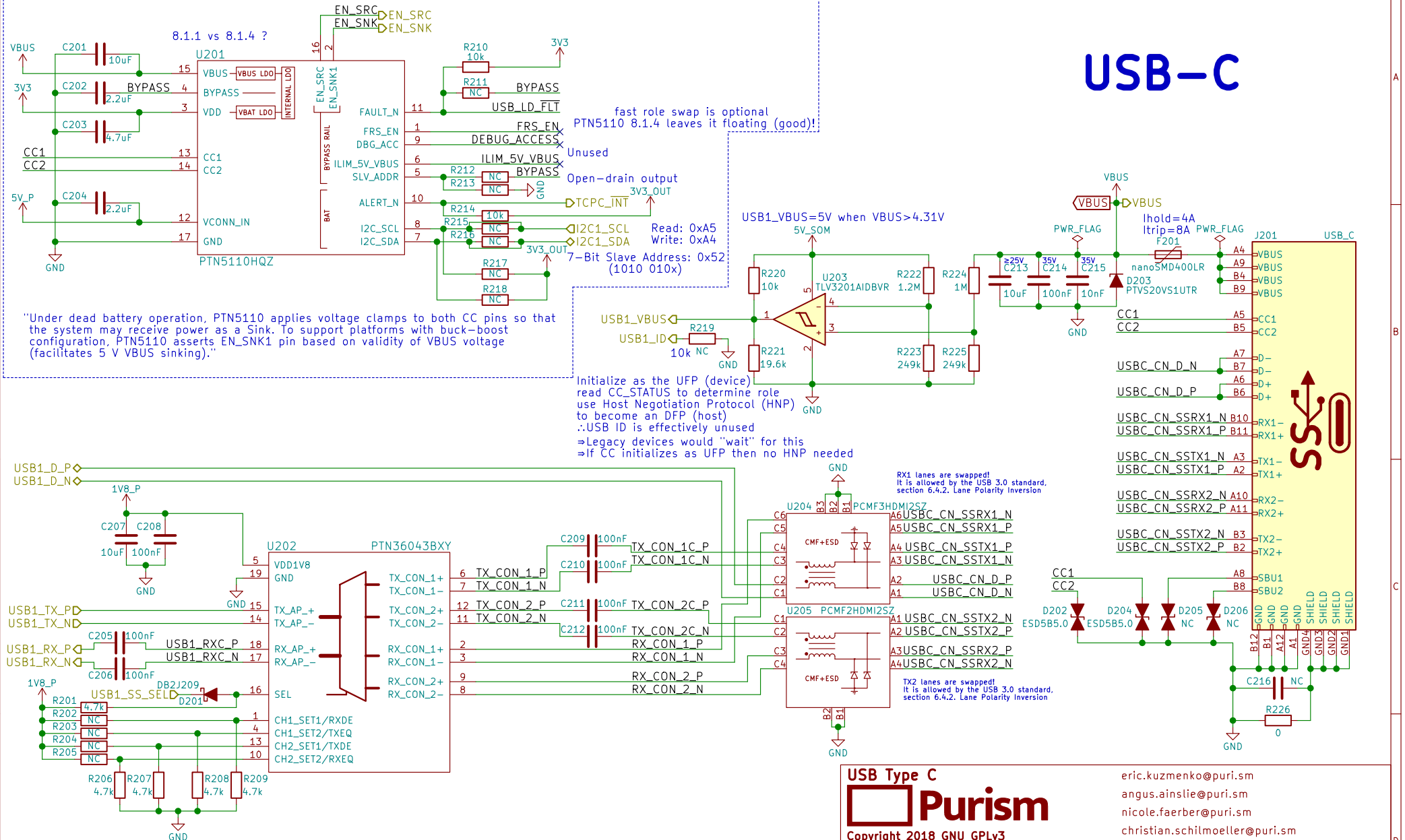
SoM

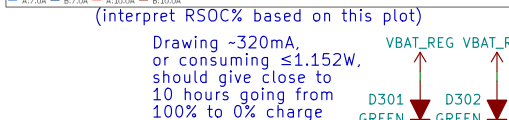
Note:
Leave annotation
as P1, P2, P3, P4



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

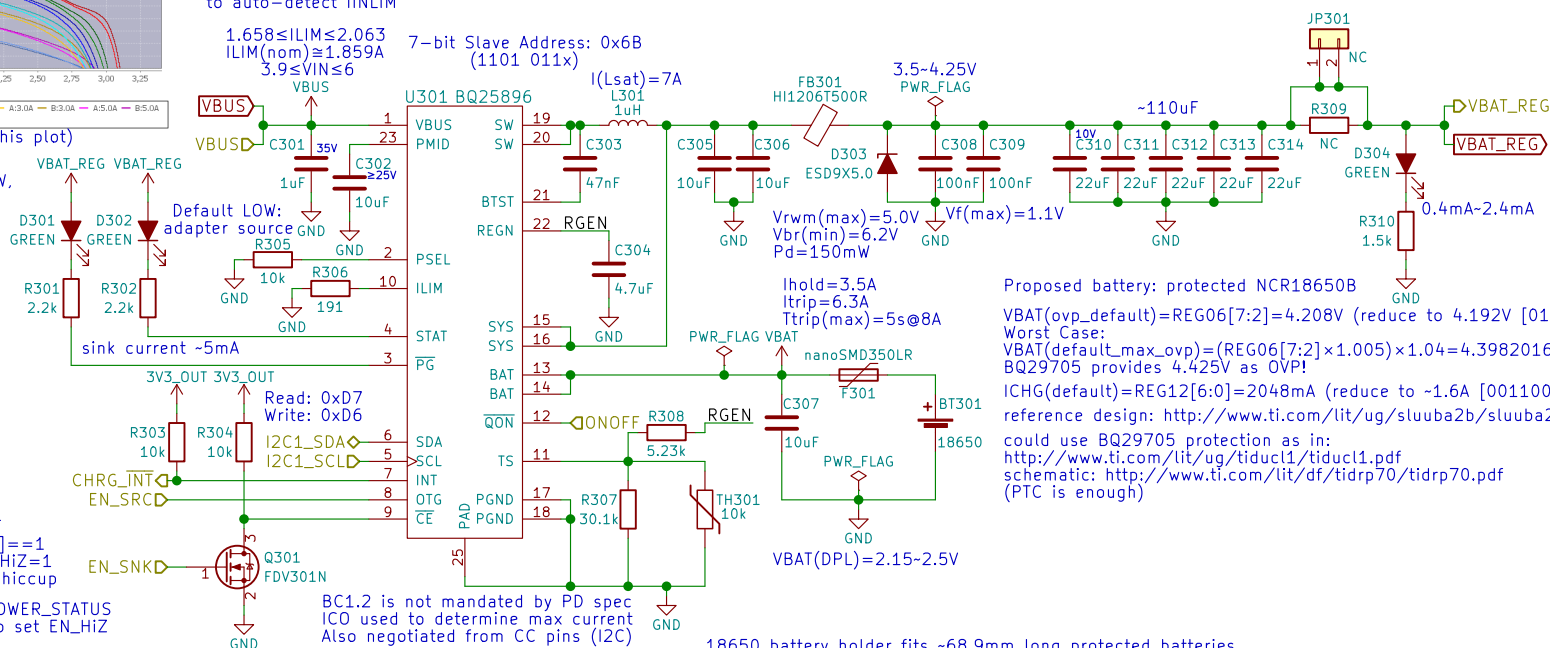
USB-C






1.658 ≤ ILIM ≤ 2.063 7-bit Slave Address: 0x6B
ILIM(nom) ≈ 1.859A (1101 011x)
3 9 ≤ VIN ≤ 6

Battery Charge Controller



Proposed battery: protected NCR18650B  GND

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)=REG12[6:0]=2048mA (reduce to -1.6A [0011001])

reference design: <http://www.ti.com/lit/ug/sluuba2b/sluuba2b.pdf>

could use BQ29705 protection as in:

<http://www.ti.com/lit/ug/tiduc1/tiduc1.pdf>

schematic: <http://www.ti.com/lit/df/tidrp70/tidrp70.pdf>

(PTC is enough)

18650 battery holder fits ~68.9mm long protected batteries

Battery



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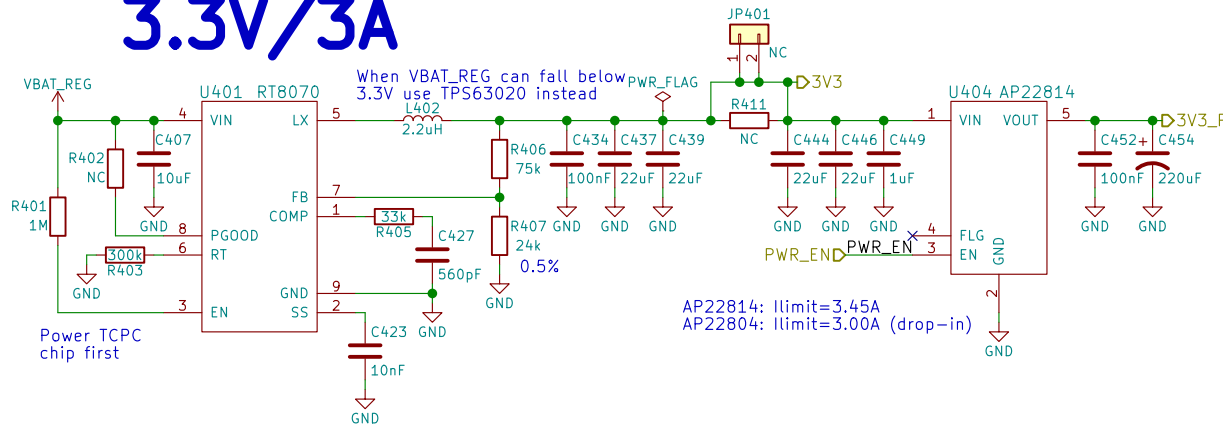
Sheet: /Battery/
File: battery.sch

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

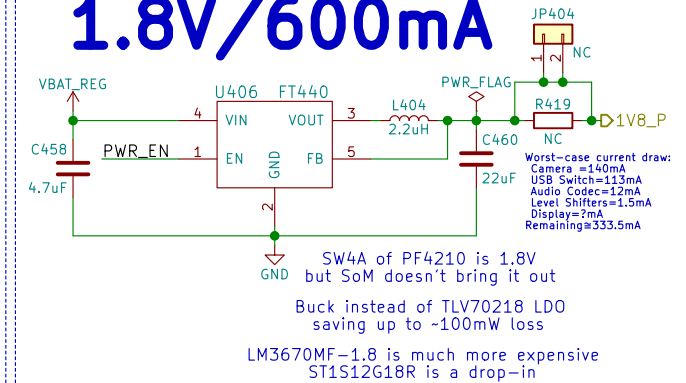
eric.kuzmenko@puri.sm
angus.ainslie@puri.sm
nicole.ferber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 3/24

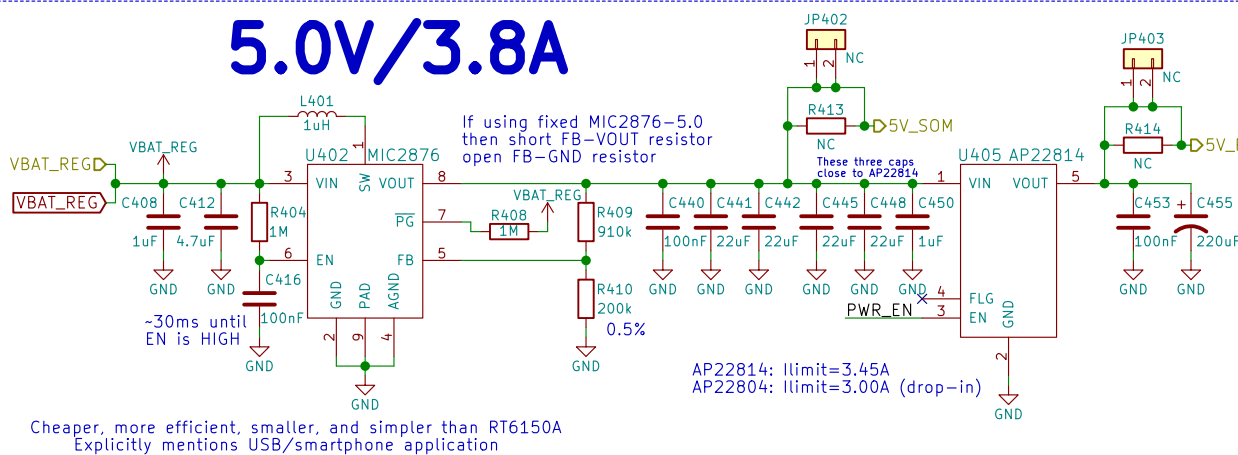
3.3V/3A



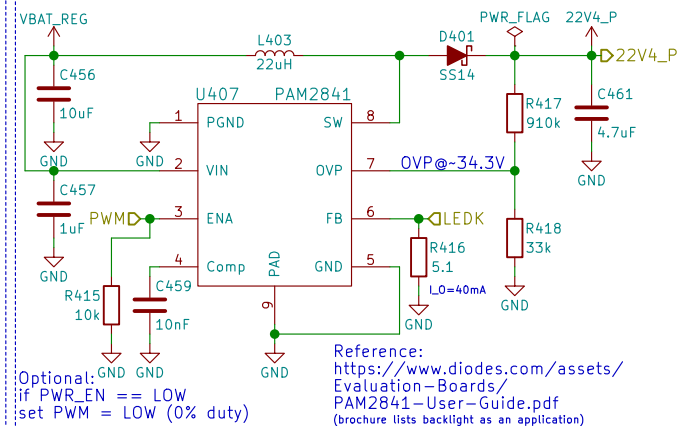
1.8V/600mA



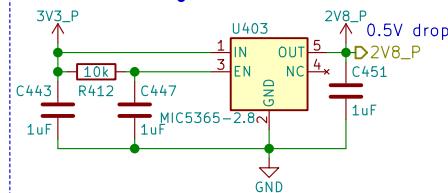
5.0V/3.8A



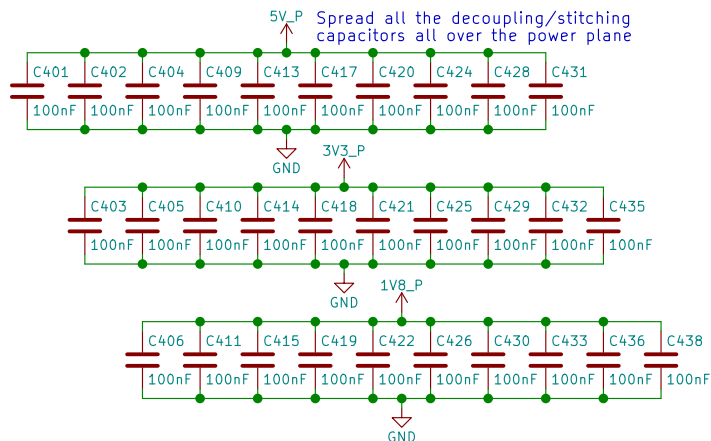
22.4V/40mA



2.8V/150mA



Power



Power

Purism

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Sheet: /Power/
File: power.sch

Size: A4 Date: 2018-08-14
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eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

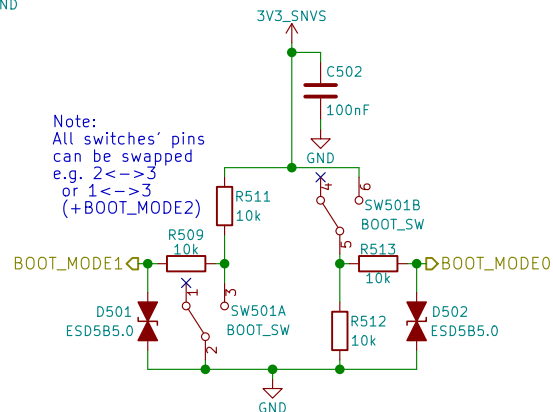
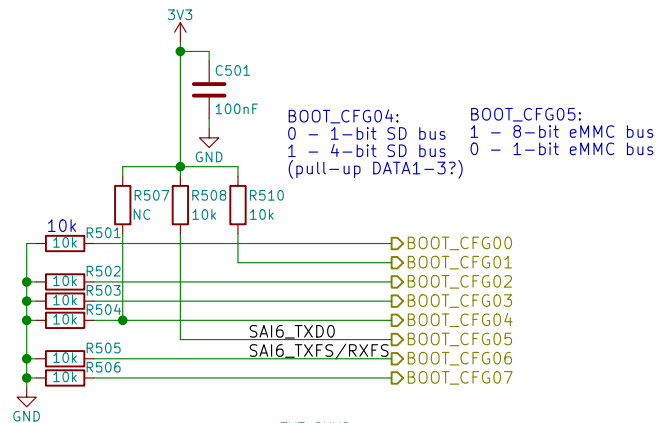
nicole.faeber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

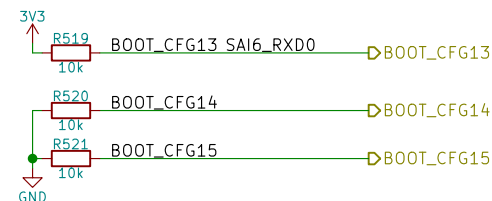
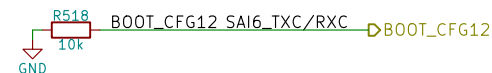
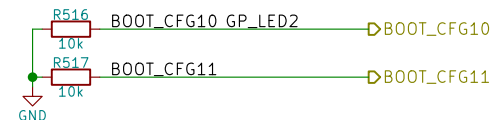
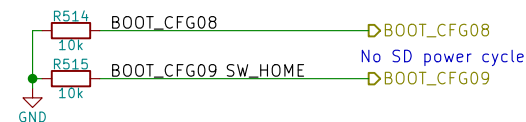
Id: 4/24

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
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eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

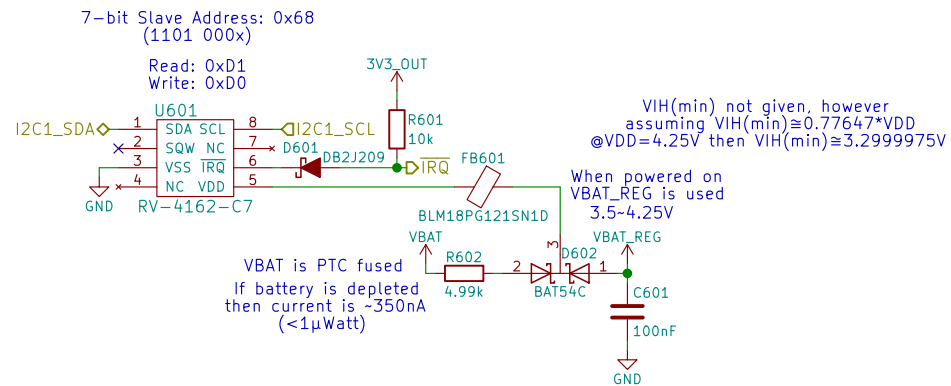
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 5/24

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

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Rev: v0.1.0

Id: 6/24

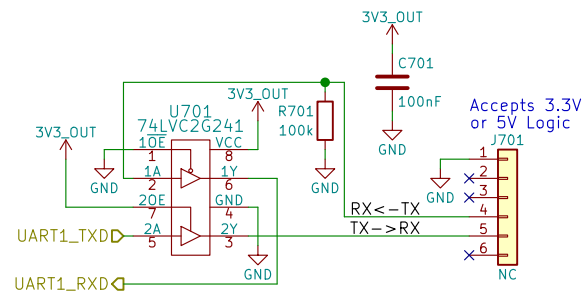
eric.kuzmenko@puri.sm

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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

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

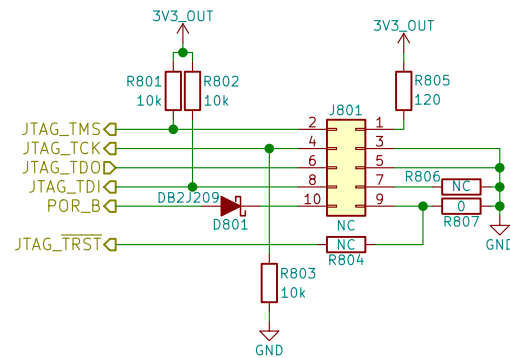
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 7/24

JTAG



JTAG



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Sheet: /JTAG/

File: jtag.sch

Size: A4 Date: 2018-08-14

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eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

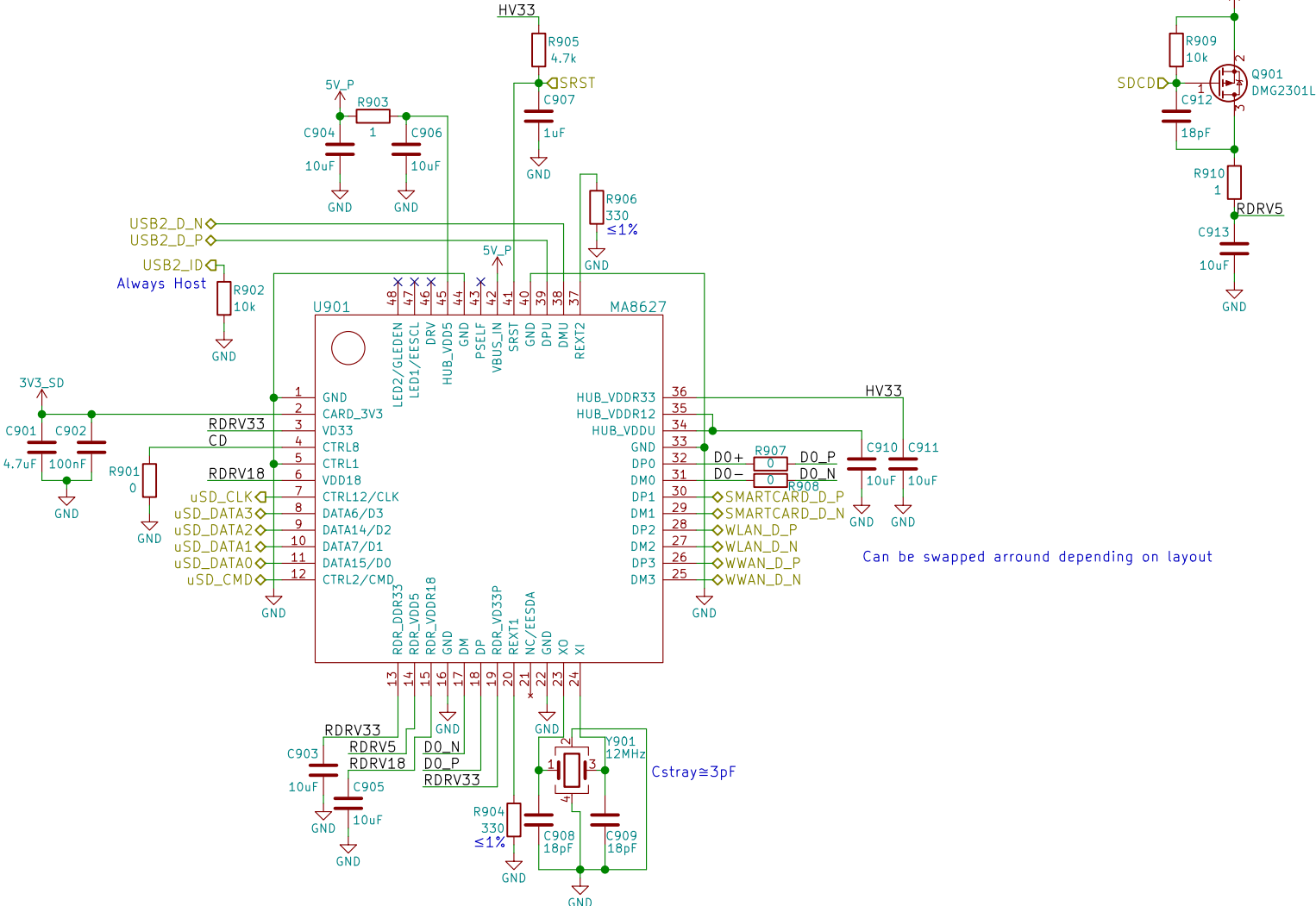
nicole.farber@puri.sm

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: 2018-08-14

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eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

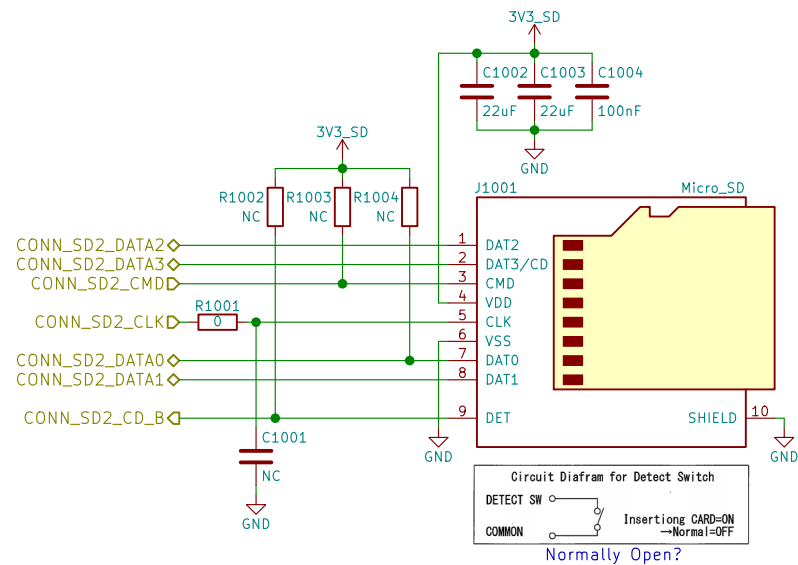
nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 9/24

μSD



uSD Card



Purism

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Sheet: /uSD Card/

File: sd.sch

eric.kuzmenko@puri.sm

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nicole.faerber@puri.sm

christian.schilmoeller@puri.sm

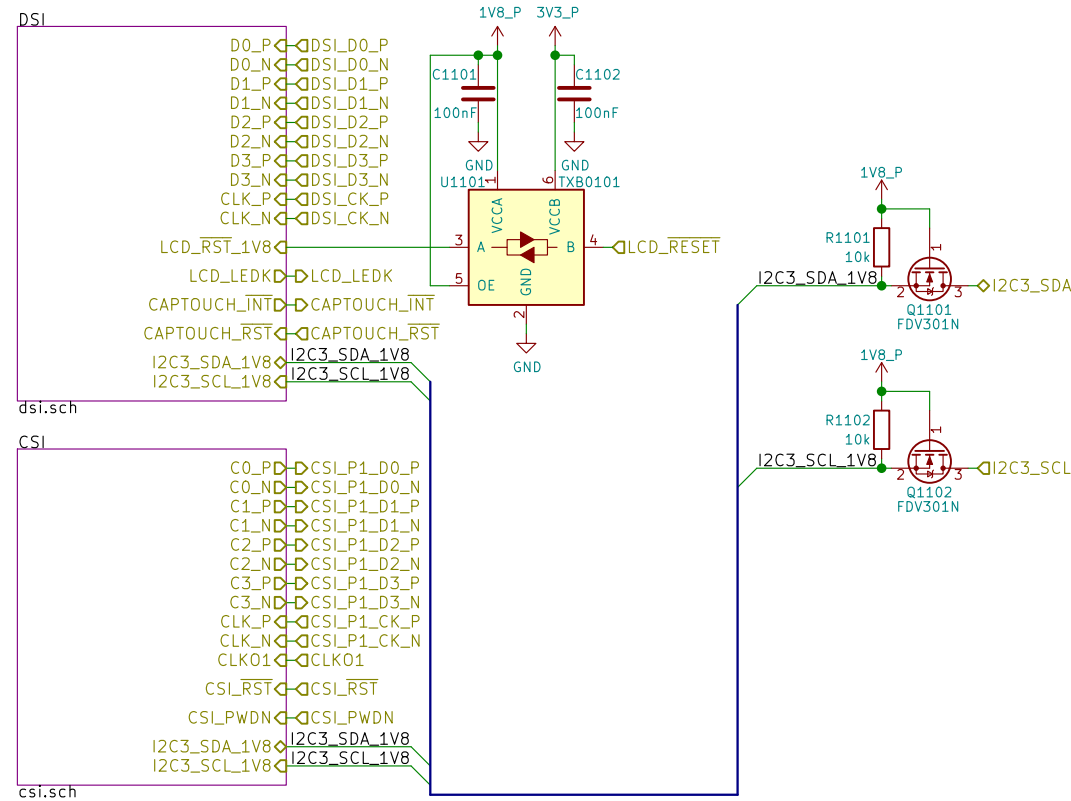
Size: A4	Date: 2018-08-14
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Size: A1	Date: 2
KiCad E.D.A.	kicad 5.0.0

Rev: v0.1.0

Id: 10/24

MIPI



MIPI



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Sheet: /MIPI/
File: mipi.sch

Size: A4 Date: 2018-08-14

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angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 11/24

Display & Touch Controller

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

Display Driver IC PN:
Sitronix ST7703

Display_JH057N00900

DISP1201

5.7 "
RGB
720 x 1440
pixels

FPC6
Touch

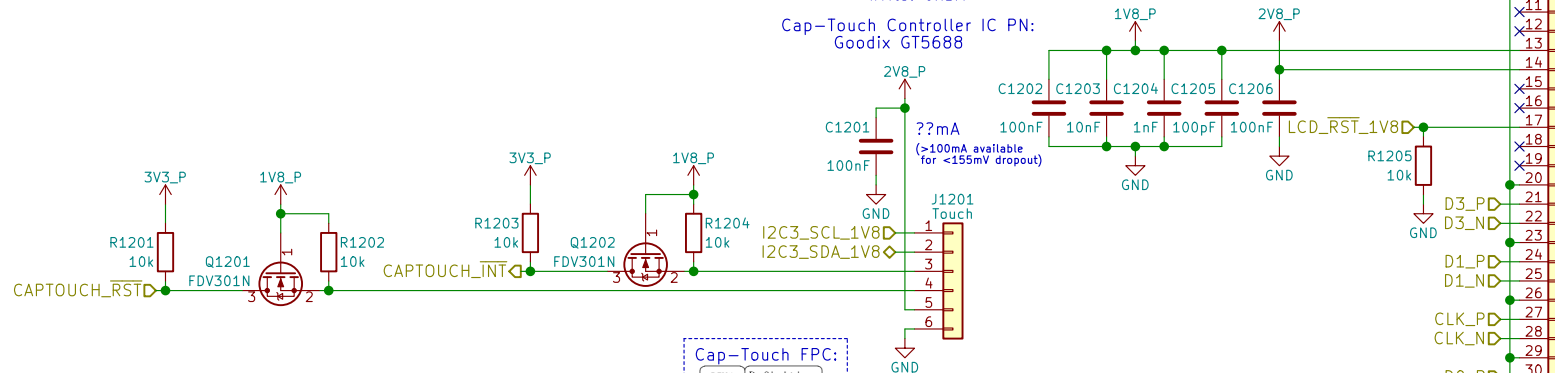
FPC39
Display +
Backlight

Note:
No power-up sequence is
given in the spec sheet

7-bit Slave Address: 0x5D
(1011 101x)

Read: 0xBB
Write: 0xBA

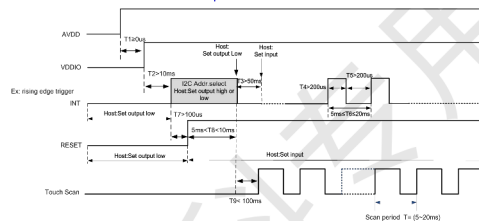
Cap-Touch Controller IC PN:
Goodix GT5688



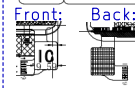
The upper 7 bits are the address,
and bit 0 is used to select read or write.
GT5688 has two slave device addresses to choose from:

INT	7-bit Address	8-bit Write Address	8-bit Read Address
LOW	0x5D	0xBA	0xBB
HIGH	0x14	0x28	0x29

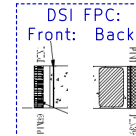
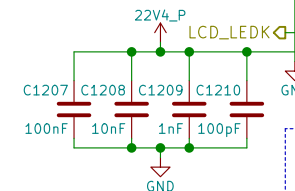
Every time you power on or reset, you need
to use the INT pin to set the I2C address:



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



100Ω Differential Impedance



Backlight Array:



MIPI DSI

Purism

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Sheet: /MIPI/DSI/

File: dsi.sch

Size: A4 Date: 2018-08-14

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eric.kuzmenko@puri.sm

angus.ainstie@puri.sm

nicole.farber@puri.sm

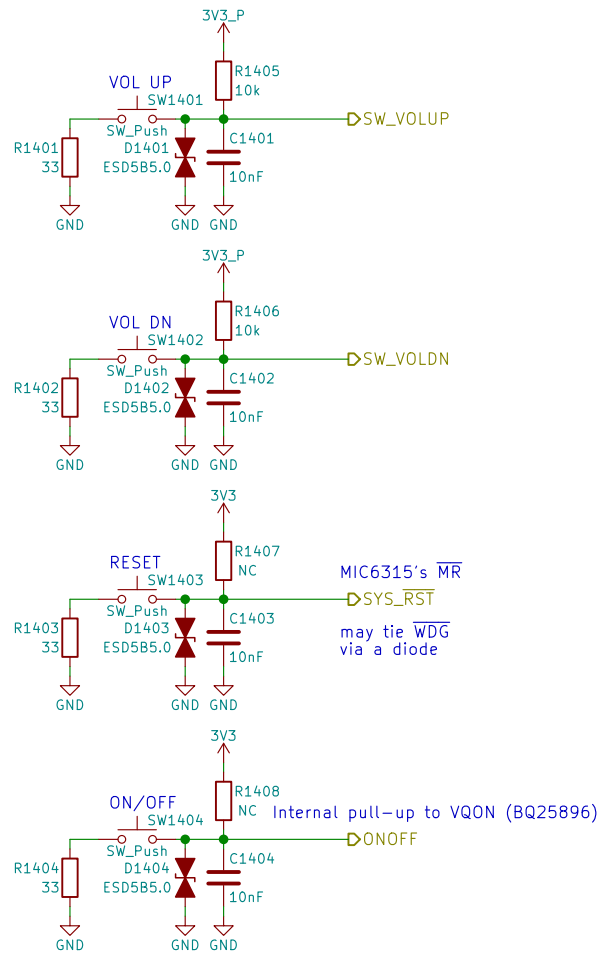
christian.schilmoeller@puri.sm

Rev: v0.1.0

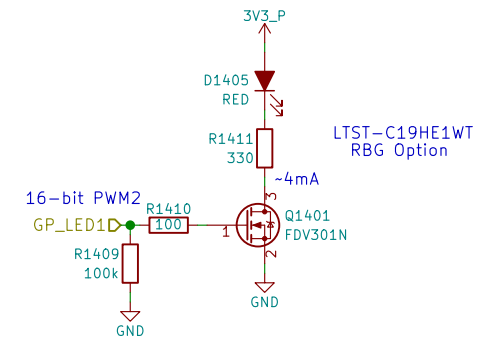
Id: 12/24

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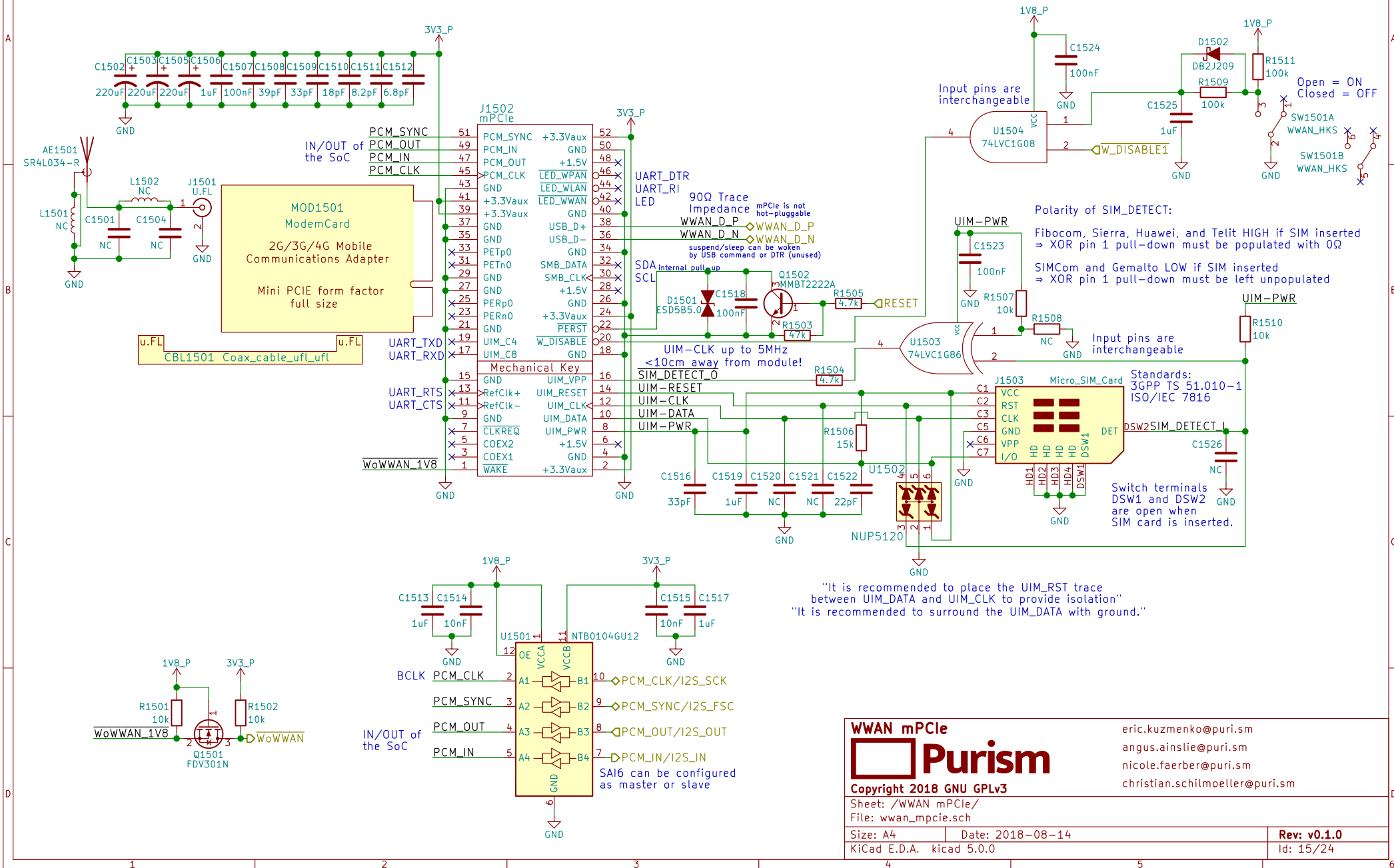
Sheet: /Buttons & LED/
 File: buttons_led.sch

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

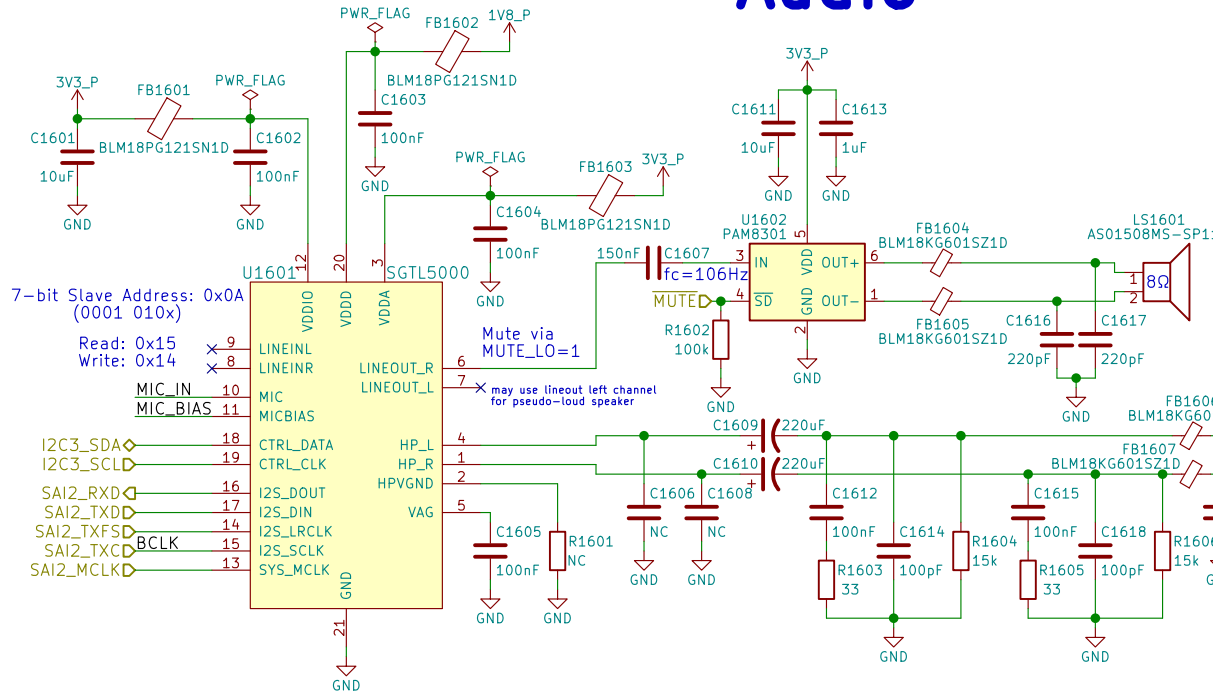
eric.kuzmenko@puri.sm
 angus.ainstie@puri.sm
 nicole.farber@puri.sm
 christian.schilmoeller@puri.sm

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

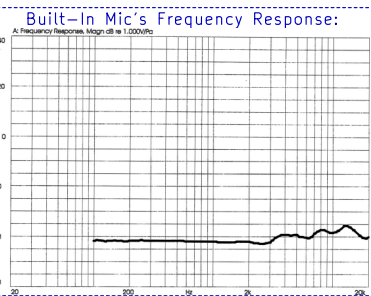
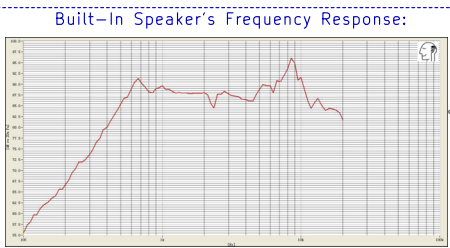
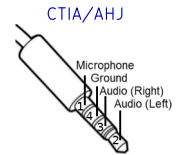
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

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

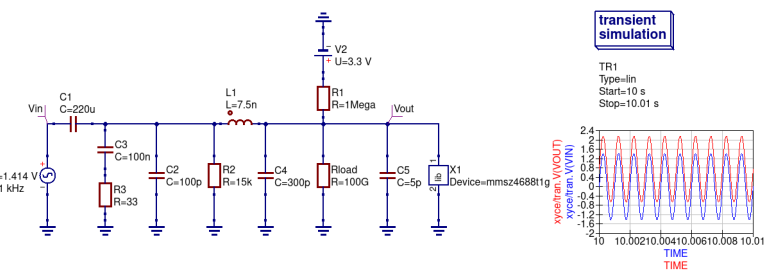
If HP_DET is HIGH for >100ms then HPs are present

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
---	--	---

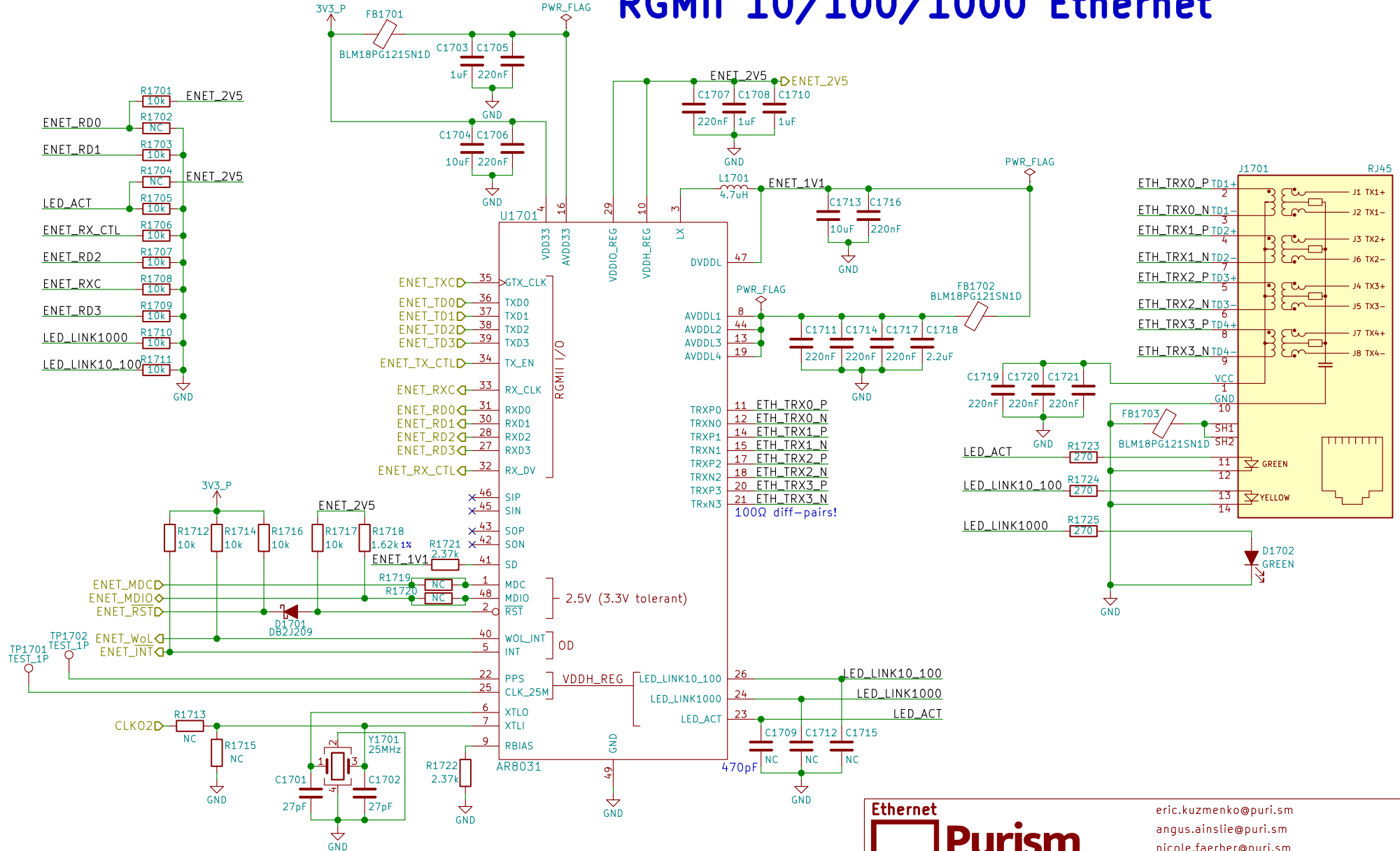
Audio

eric.kuzmenko@puri.sm
 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
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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: 2018-08-14
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

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

1V8_P

VIH=2.31V

WIFI_RST

W_DISABLE1

BT_HOST_WAKE

M2_UART_RXD

SoC's RX
Module's TX

SoC's TX
Module's RX

M2_UART_TXD

M2_UART_RTS

M2_UART_CTS

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

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

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

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

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

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

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

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

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

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

1V8_P

3V3_P

1V8_P

3V3_P

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3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

1V8_P

3V3_P

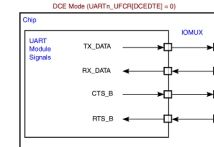
1V8_P

3V3_P

1V8_P

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

Input pins are
interchangeable

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

SW1801A
WLAN_HKS
Open = ON
Closed = OFF

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

WLAN+BT M.2

Purism

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Sheet: /WLAN+BT M.2/

File: wifi_bt_m2.sch

Size: A4

Date: 2018-08-14

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Rev: v0.1.0

Id: 18/24

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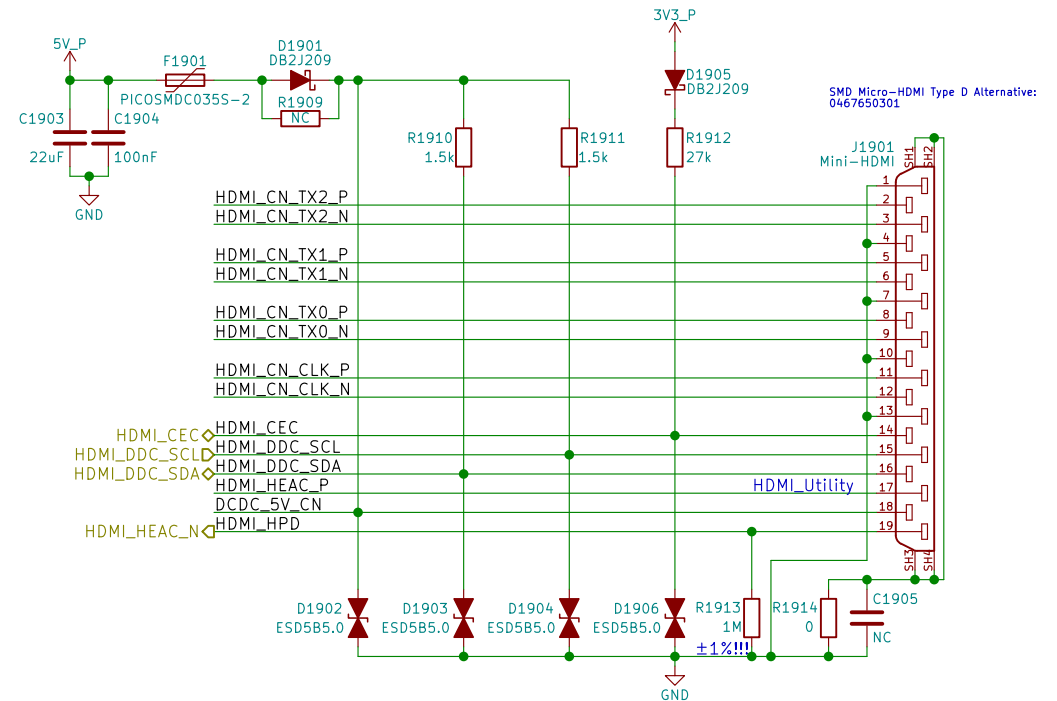
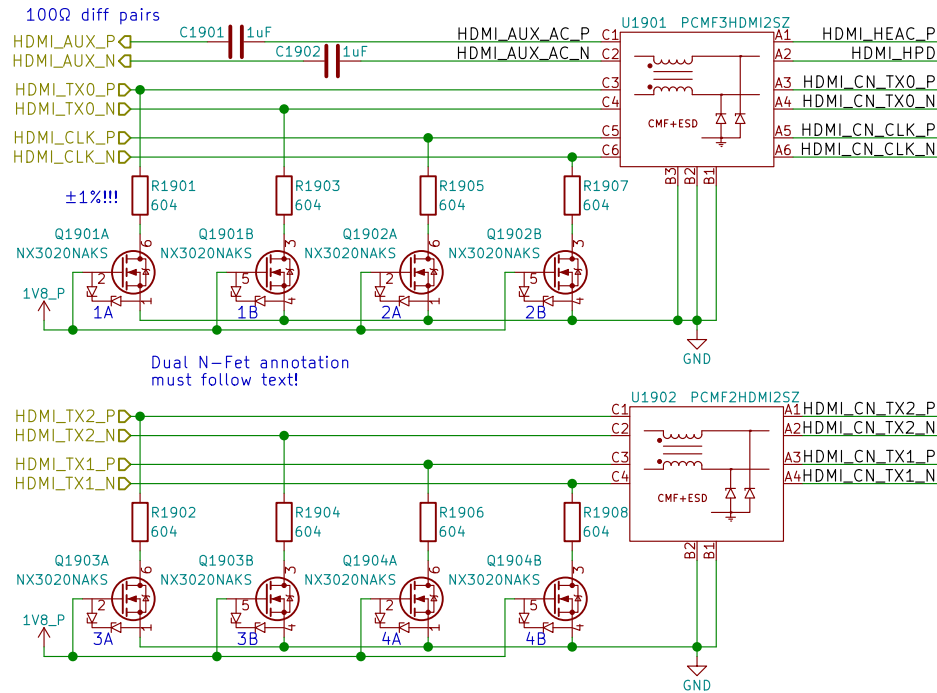
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TUSB546A-DCI can be used for HDMI over USB-C

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

1

B



C

D

Table 19: Accelerometer and gyroscope SAD+Read/Write patterns



Sensors	eric.kuzmenko@puri.cm
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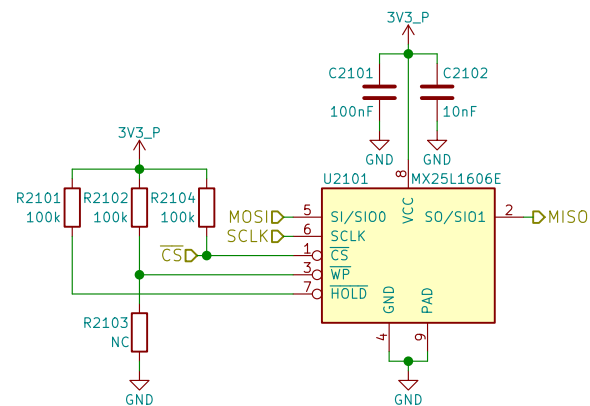
Purism

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SPI NOR Flash



SPI NOR Flash



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Sheet: /SPI Flash/

File: flash.sch

Size: A4

Date: 2018-08-14

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Rev: v0.1.0

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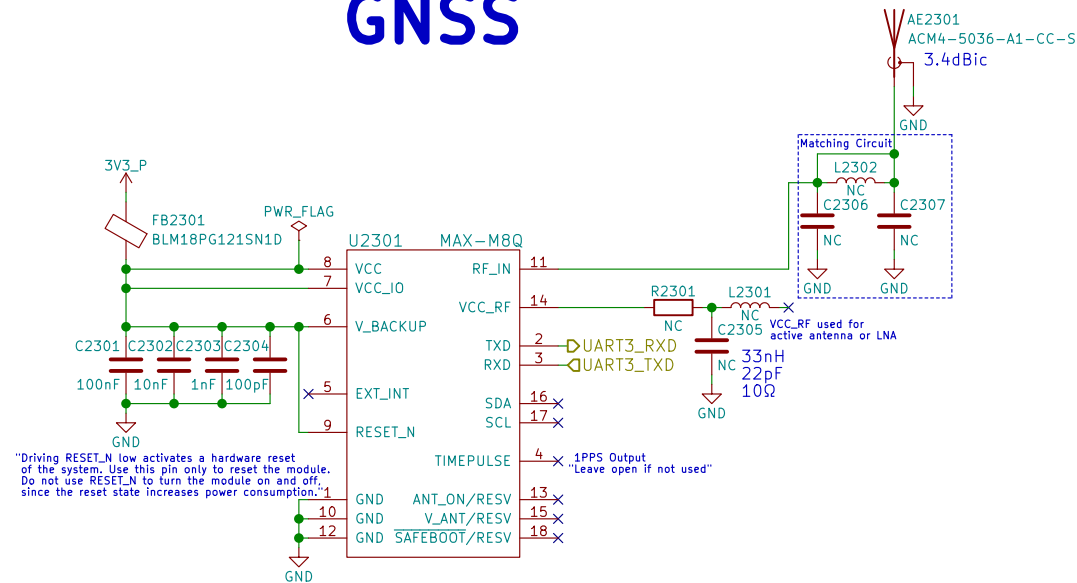
Smart Card



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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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Sheet: /GNSS/

File: gnss.sch

Size: A4 Date: 2018-08-14

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 23/24

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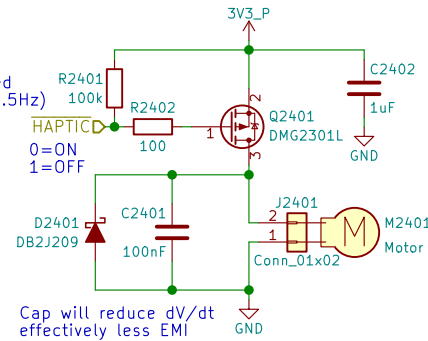
nicole.farber@puri.sm

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



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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Size: A4 Date: 2018-08-14

KiCad E.D.A. kicad 5.0.0

Rev: v0.1.0

Id: 24/24