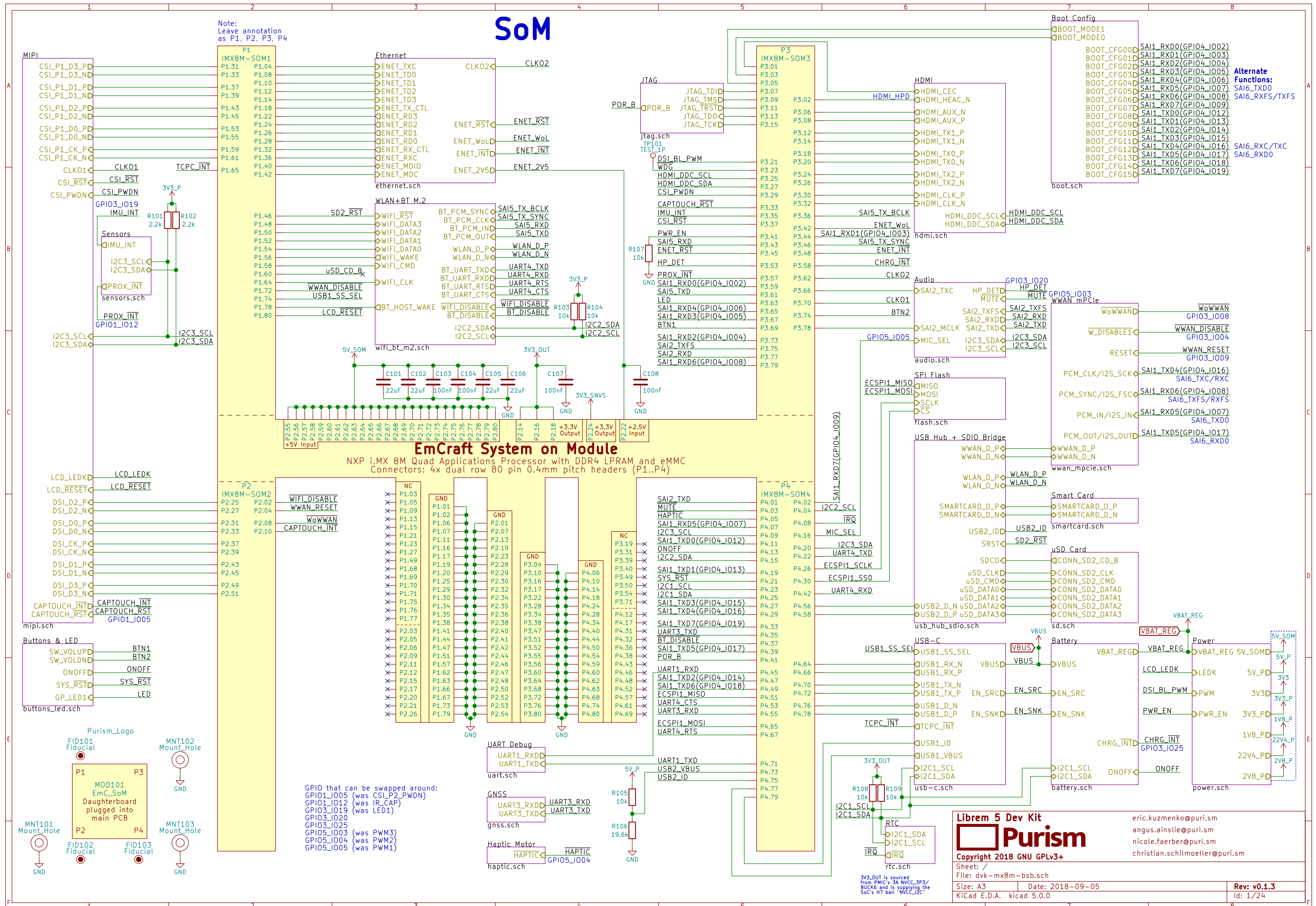


SoM

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



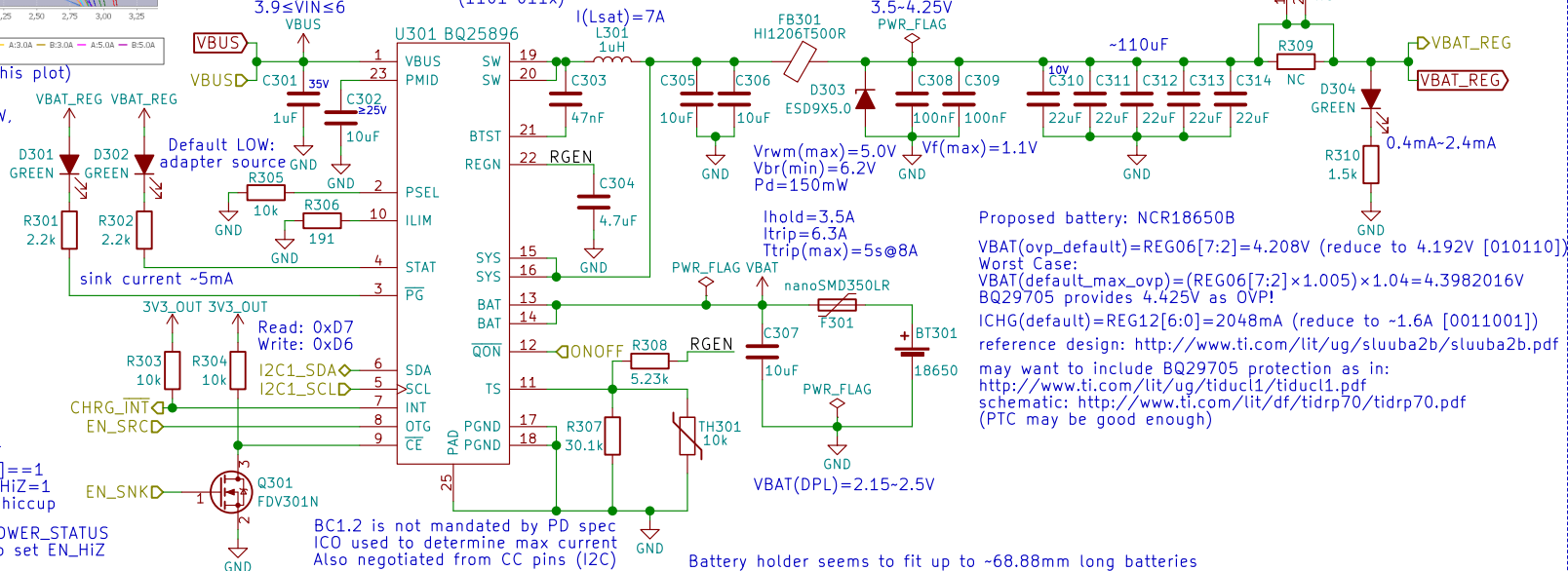


(interpret RSOC% based on this plot)

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

use AUTO_DPDM_EN to auto-detect IINLIM

$1.658 \leq ILIM \leq 2.063$
 $ILIM(nom) \approx 1.859A$
 $3.9 \leq VIN \leq 6$
 7-bit Slave Address: 0x6B (1101 011x)



sink current ~5mA

3V3_OUT 3V3_OUT

Read: 0xD7 Write: 0xD6

I2C1_SDA I2C1_SCL

CHRG_INT EN_SRC

EN_SNKD

Q301 FDS301N

BC1.2 is not mandated by PD spec

ICO used to determine max current

Also negotiated from CC pins (I2C)

Battery holder seems to fit up to ~68.88mm long batteries
 need to test 18650 protected cells which are ~69.35mm long

Proposed battery: NCR18650B

$V_{BAT}(ovp_default) = REG06[7:2] = 4.208V$ (reduce to 4.192V [010110])

Worst Case:
 $V_{BAT}(default_max_ovp) = (REG06[7:2] \times 1.005) \times 1.04 = 4.3982016V$

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>

may want to include BQ29705 protection as in:

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

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

(PTC may be good enough)

Battery

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Sheet: /Battery/

File: battery.sch

Size: A4 Date: 2018-08-14

KiCad E.D.A. kicad 5.0.0

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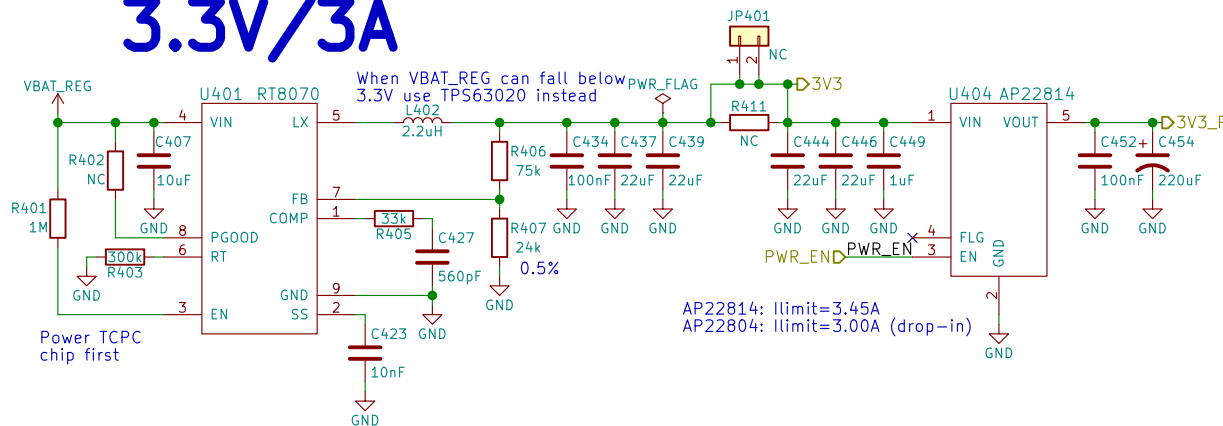
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

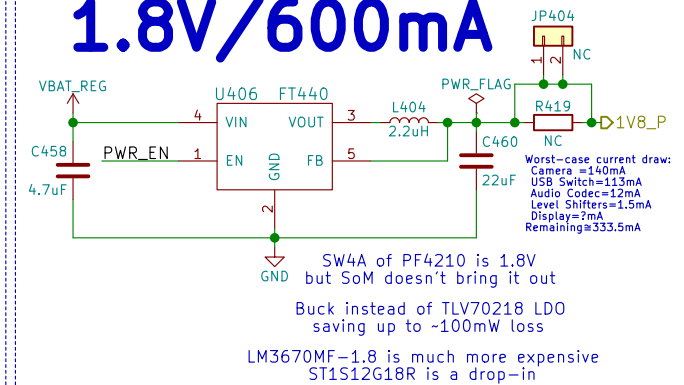
Rev: v0.1.0

Id: 3/24

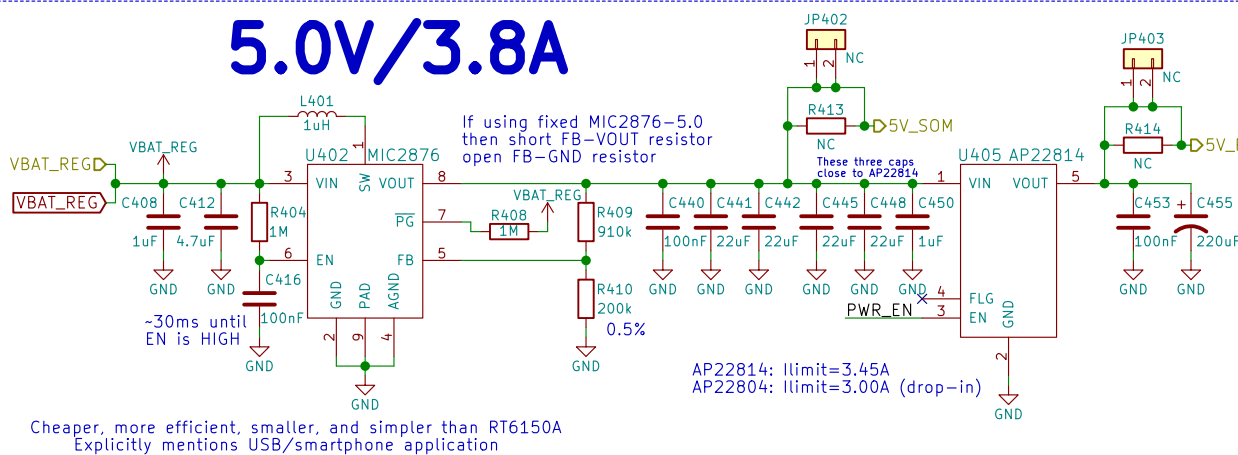
3.3V/3A



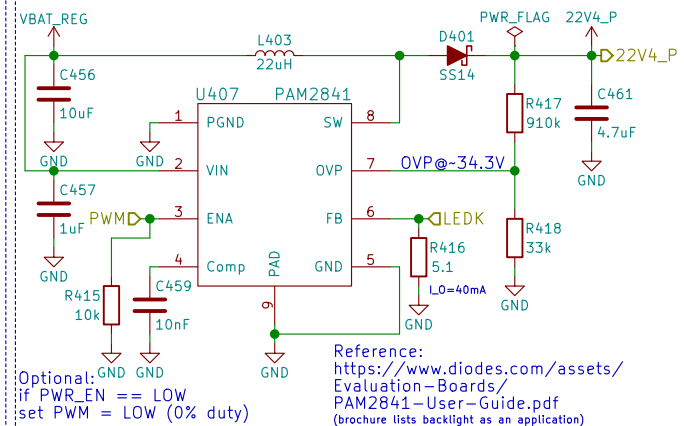
1.8V/600mA



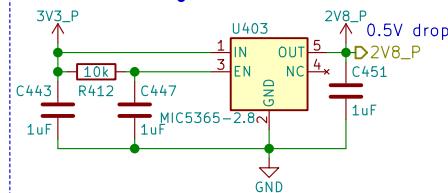
5.0V/3.8A



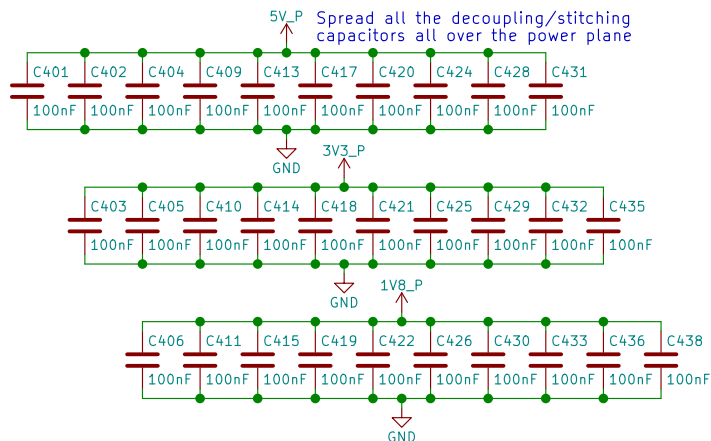
22.4V/40mA



2.8V/150mA



Power



Power

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Sheet: /Power/
File: power.sch

Size: A4
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Date: 2018-08-14

Rev: v0.1.0
Id: 4/24

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christian.schilmoeller@puri.sm

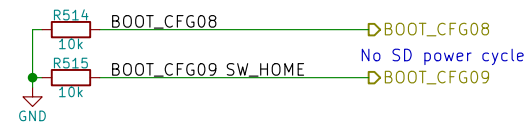
Boot Config



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
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Date: 2018-08-14

Rev: v0.1.0

Id: 5/24

eric.kuzmenko@puri.sm

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christian.schilmoeller@puri.sm

7-bit Slave Address: 0x68
(1101 000x)

Read: 0xD1
Write: 0xD0

U601

I2C1_SDA 1 SDA SCL 8 I2C1_SCL 7 D601 DB2J209 3V3_OUT R601 10k FB601

2 SQA NC 6 VSS IRQ 5 NC VDD

RV-4162-C7

GND

When powered on VBAT_REG is used 3.5-4.25V

VIH(min) not given, however assuming $V_{IH(min)} \approx 0.77647 \cdot V_{DD}$
@ $V_{DD} = 4.25V$ then $V_{IH(min)} \approx 3.2999975V$

VBAT is PTC fused
If battery is depleted then current is $\sim 350nA$ ($< 1\mu W$)

BLM18PG1215N1D

VBAT

R602 4.99k

BAT54C

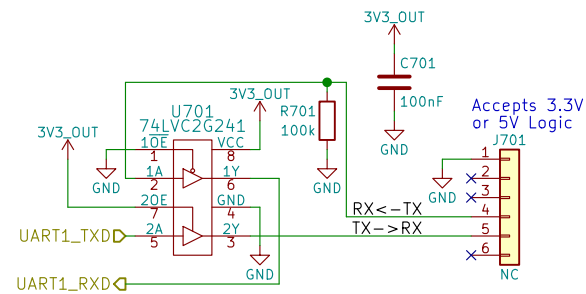
VBAT_REG

C601 100nF

GND

<div> <div> <div>RTC</div> <div>  <div>Purism</div> </div> </div> <div> <div>eric.kuzmenko@puri.sm</div> <div>angus.ainslie@puri.sm</div> <div>nicole.ferber@puri.sm</div> <div>christian.schilmoeller@puri.sm</div> </div> </div>	
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Sheet: /RTC/	
File: rtc.sch	
Size: A4	Date: 2018-08-14
KiCad E.D.A. kicad 5.0.0	Rev: 6

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

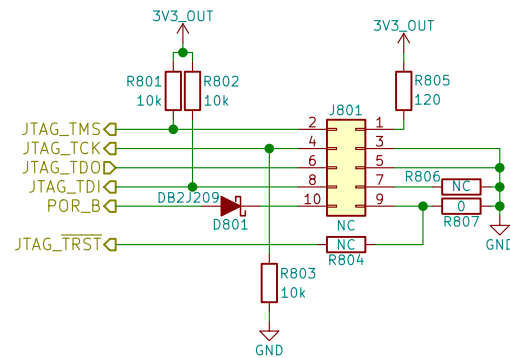
eric.kuzmenko@puri.sm

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JTAG



JTAG



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Sheet: /JTAG/

File: jtag.sch

Size: A4 Date: 2018-08-14

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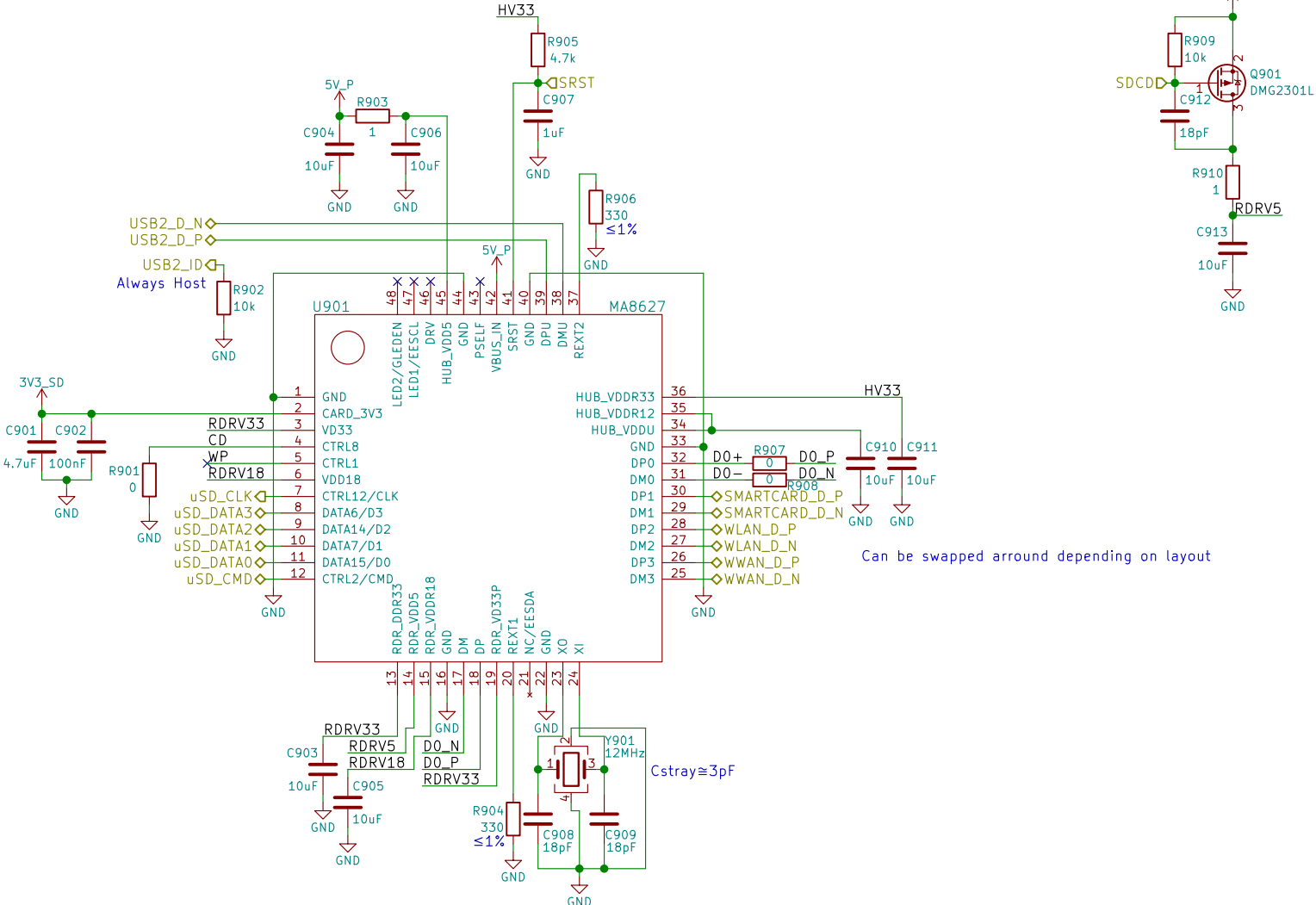
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christian.schilmoeller@puri.sm

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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angus.ainslie@puri.sm

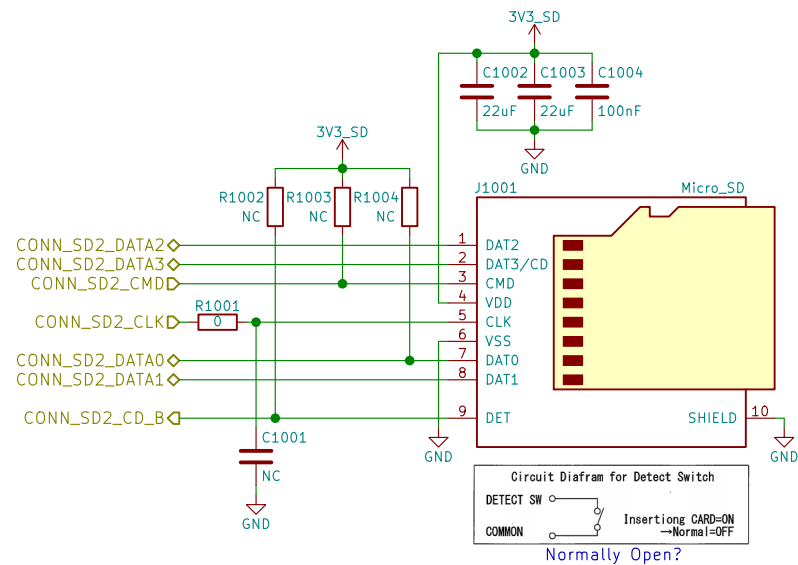
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christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 9/24

μSD



uSD Card



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Sheet: /uSD Card/

File: sd.sch

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nicole.ferber@puri.sm

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Size: A4	Date: 2018-08-14
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Size: A1	Date: 2
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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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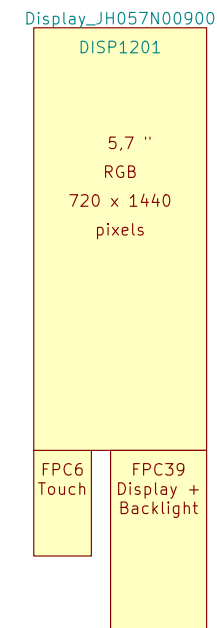
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

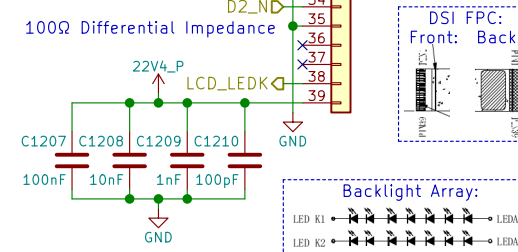
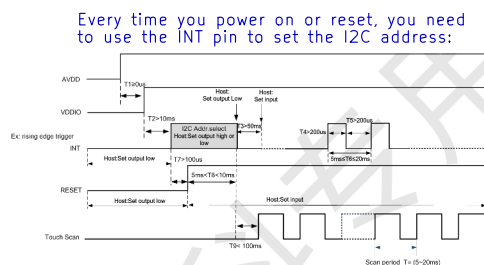
Rev: v0.1.0

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



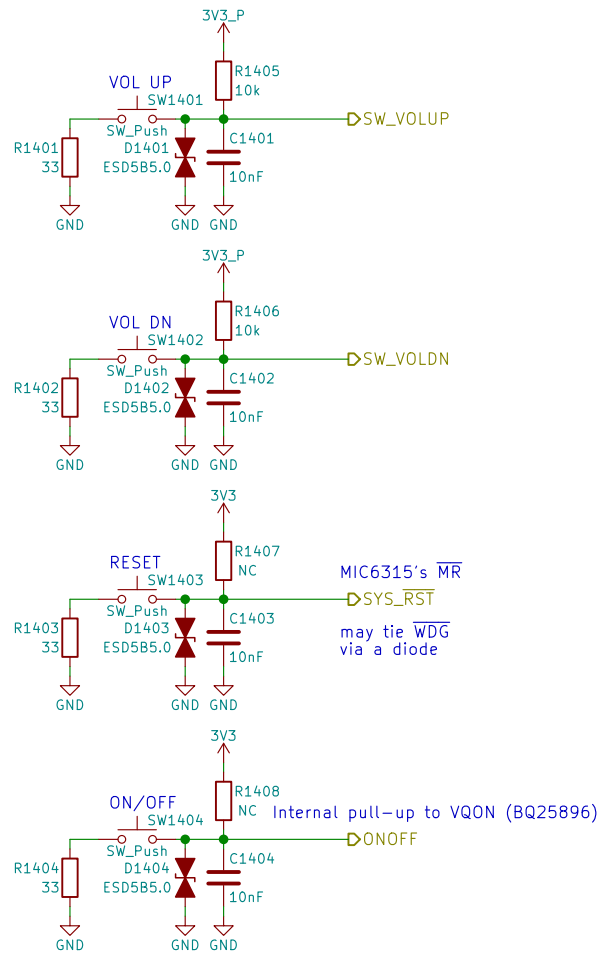
 Purism

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christian.schilmoeller@puri.sm

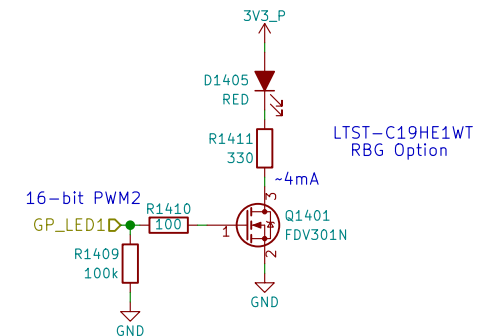
Size: A4	Date: 2018-08-14
KiCad E.D.A. kicad 5.0.0	

Rev: v0.1.0
Id: 12/24

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

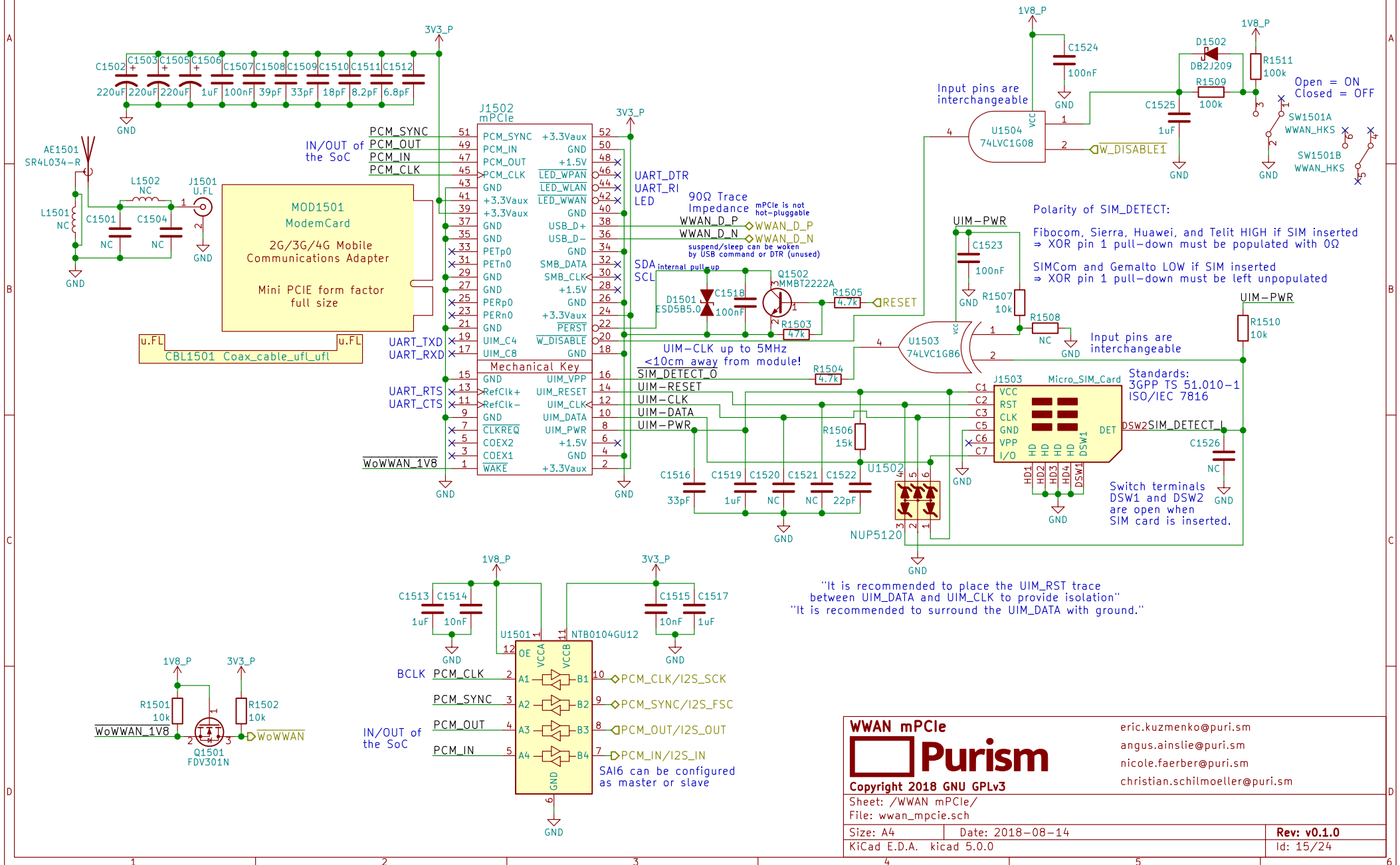
Size: A4
KiCad E.D.A. kicad 5.0.0

Date: 2018-08-14

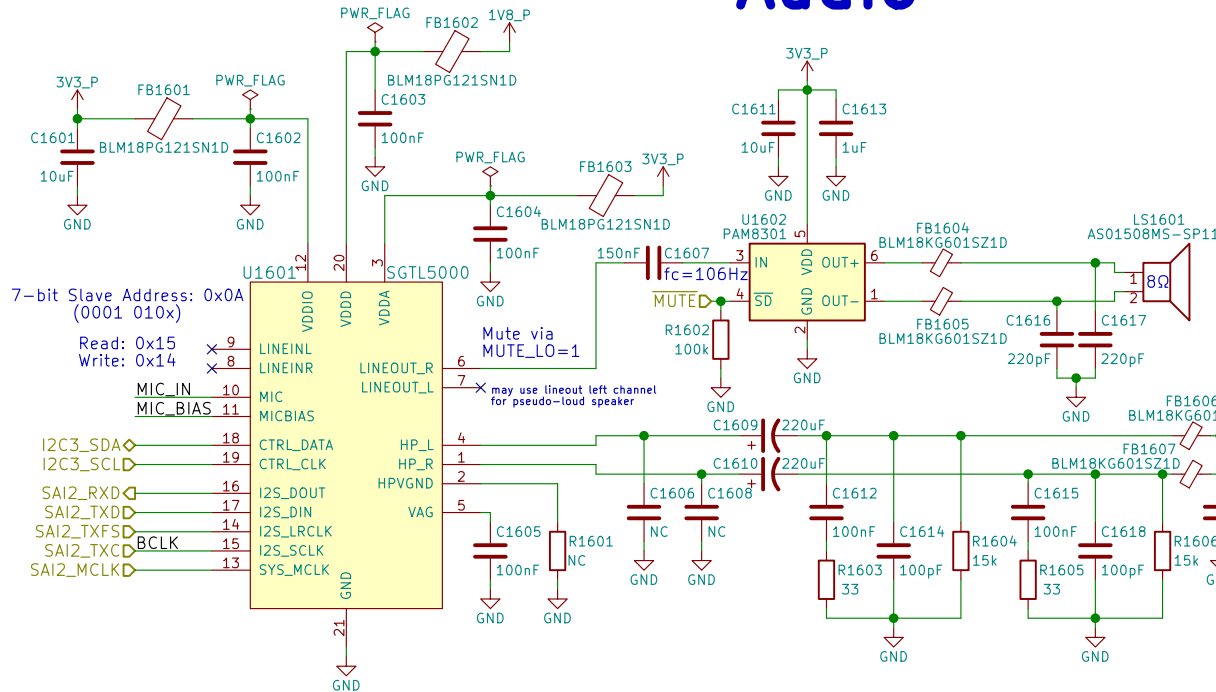
Rev: v0.1.0
Id: 14/24

eric.kuzmenko@puri.sm
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christian.schilmoeller@puri.sm

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

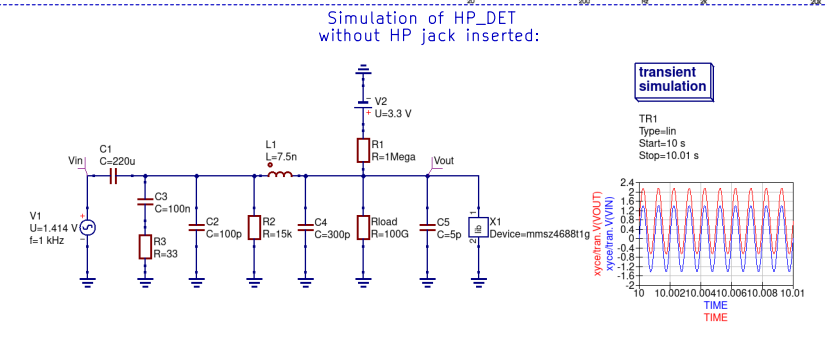
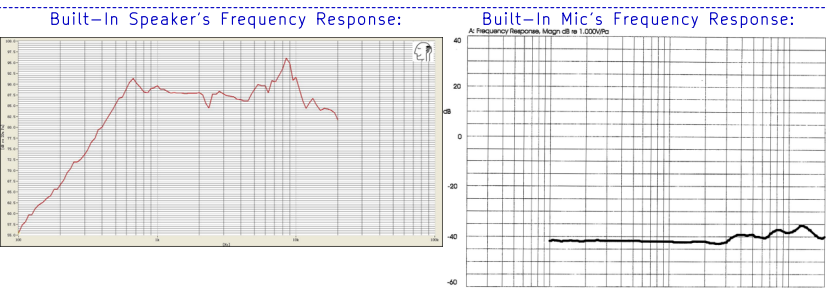
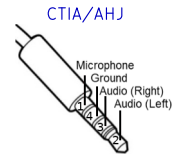
dB specs in datasheet is a unit of power gain (not dBu or VU) with respect to the DAC's unattenuated output

"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



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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Sheet: /Audio/
File: audio.sch

Size: A4
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Rev: v0.1.0
Id: 16/24

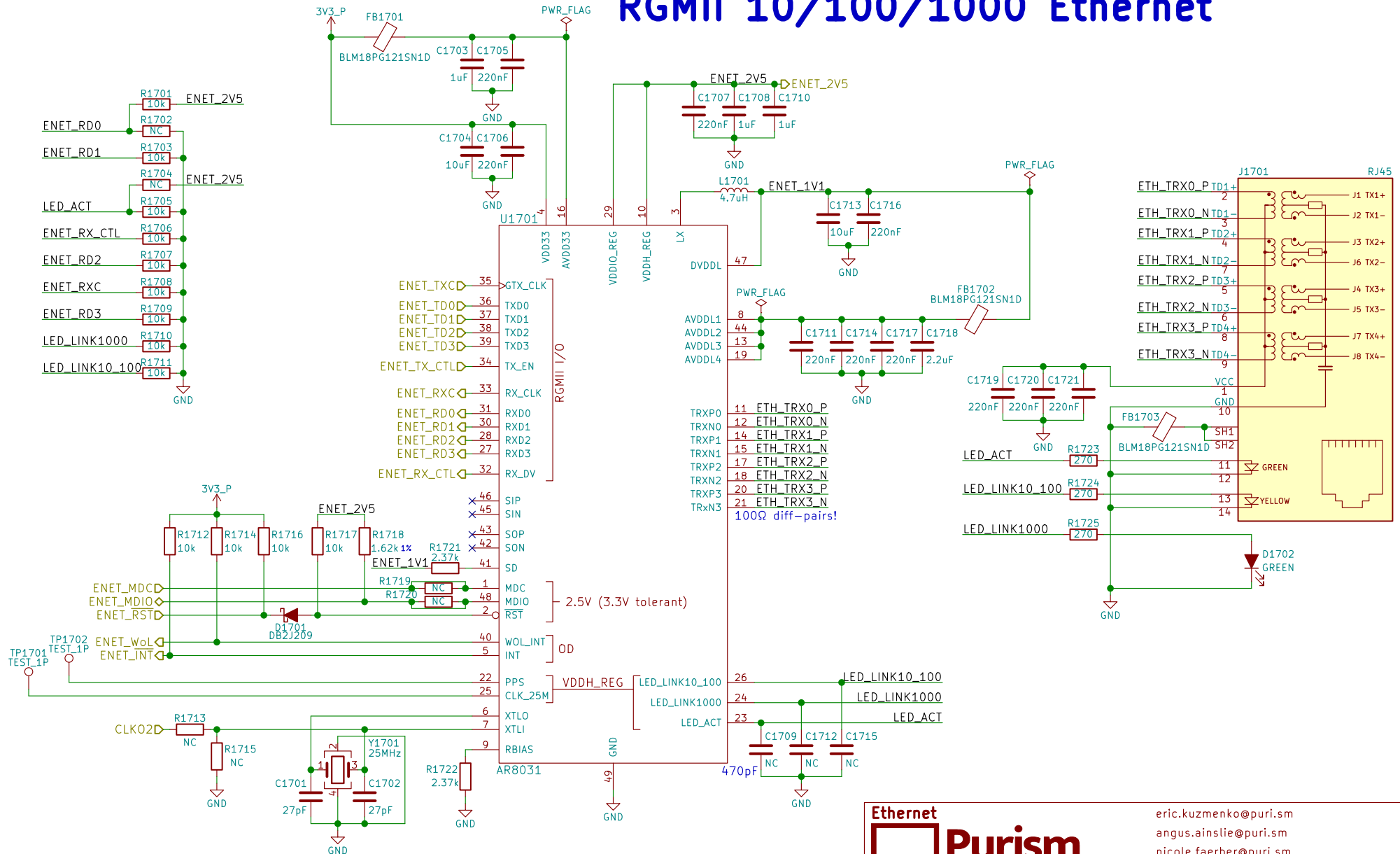
-37dB=14.1254mV/Pa
 \therefore mic produces 14.1254mVrms when exposed to a 1kHz tone of 94dB-SPL at the capsule (or 19.98mV amplitude)
 \Rightarrow 40dB gain would produce ~2V amplitude (4Vpp, clipping)
 30dB gain would produce ~0.632V amplitude (1.264Vpp)
 38.33dB gain would yield 3.3Vpp

Note:
 All switches' pins can be swapped
 e.g. 5<->4 or 5<->6 (+camera)

may add ~220uF cap parallel to Zener

Pin 5 (tip switch) is NC, open when inserted
 If just headphones then HP_DET=HIGH, R(mic)=0

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

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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

1V8_P
VIH=2.31V

WIFI_RST

W_DISABLE1

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

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

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M2_I2C_SCL

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M2_I2C_SDA

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M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

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W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

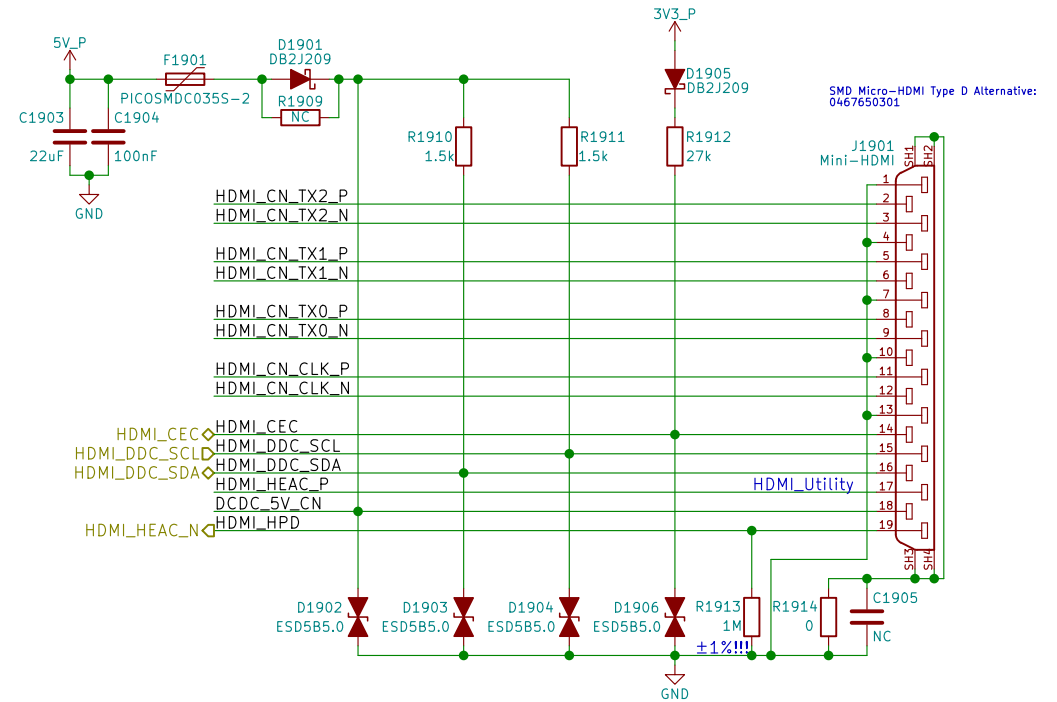
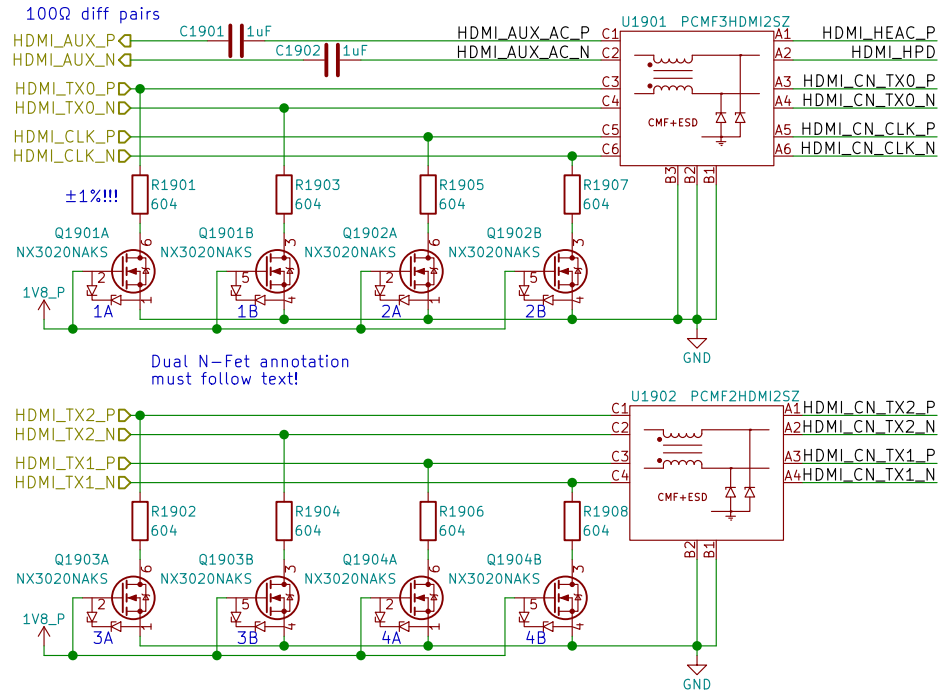
M2_I2C_SCL

W_DISABLE2

W_DISABLE1

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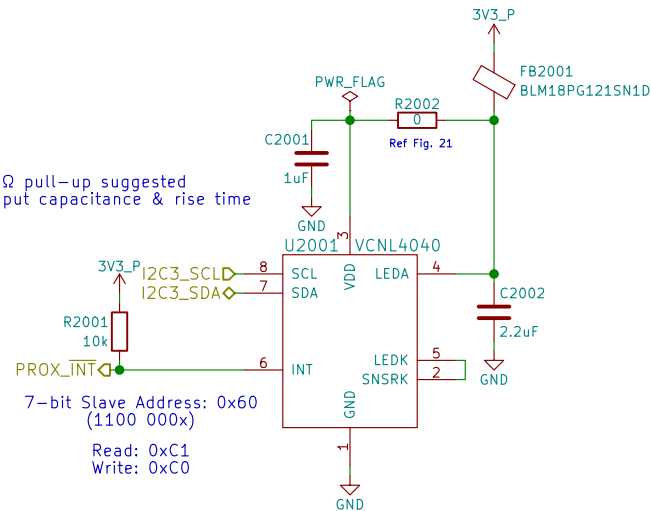
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nicole.farber@puri.sm
christian.schilmoeller@puri.sm

Rev: v0.1.0
Id: 19/24

Sensors

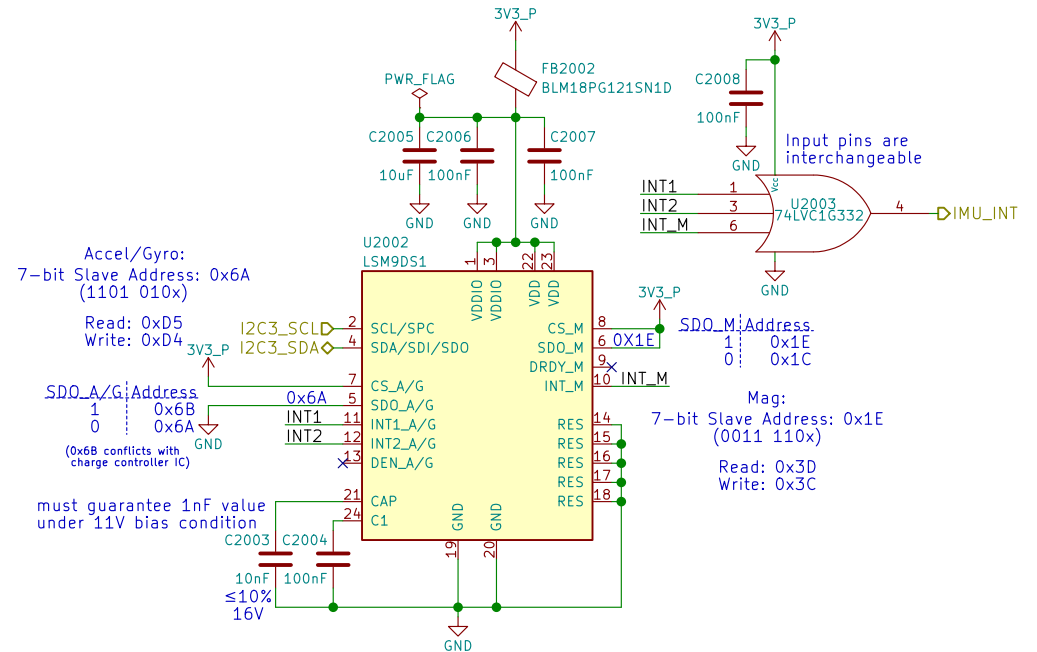
Proximity & Ambient Light

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

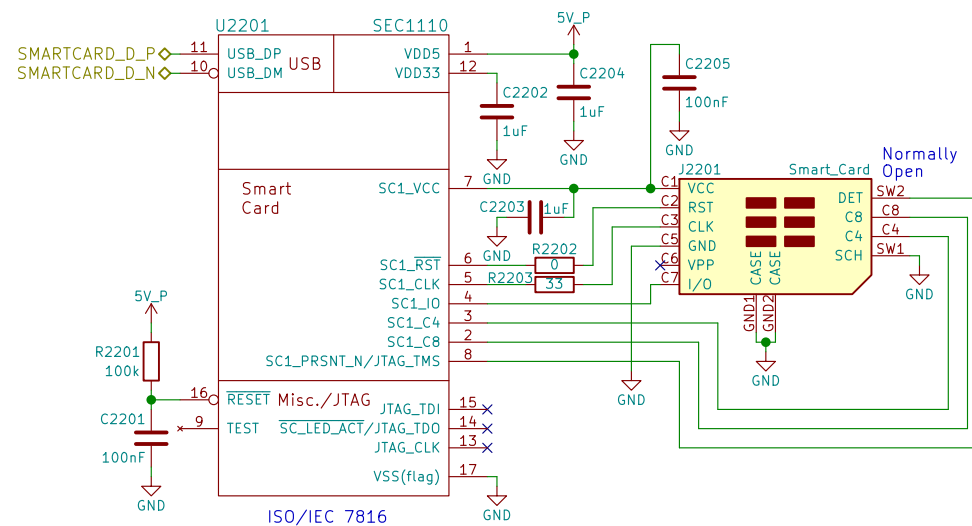
Size: A4 Date: 2018-08-14
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Rev: v0.1.0
Id: 20/24

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Sheet: /SPI Flash/ File: flash.sch		
Size: A4	Date: 2018-08-14	Rev: v0.1.0
KiCad E.D.A. kicad 5.0.0		Id: 21/24

Smart Card



Reference:
<http://www.microchip.com/DevelopmentTools/ProductDetails.aspx?PartNO=EVB-SEC1110>

Smart Card



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Sheet: /Smart Card/

File: smartcard.sch

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Rev: v0.1.0

Id: 22/24

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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
 KiCad E.D.A. kicad 5.0.0

Date: 2018-08-14

Rev: v0.1.0

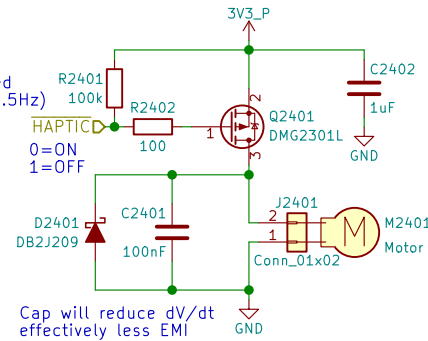
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Haptic Motor

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
 thick adhesive layer underneath
 (not connected to either pin)

Haptic/Vibration Motor



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 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