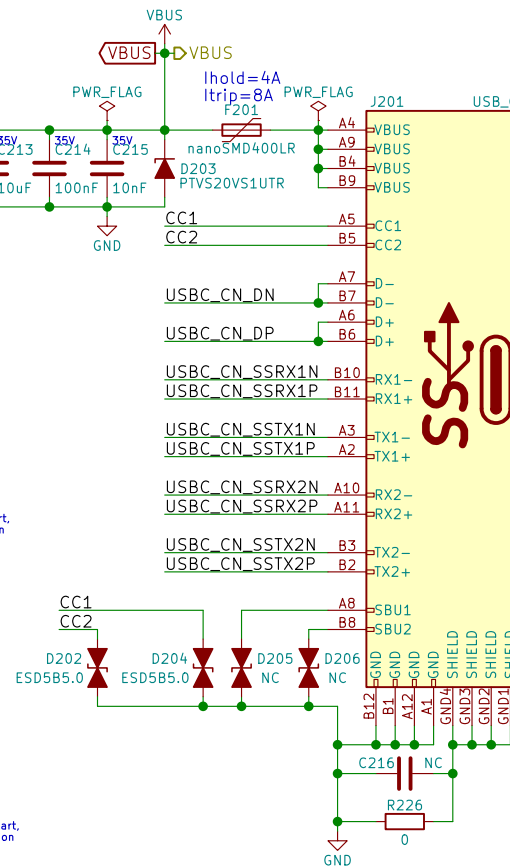
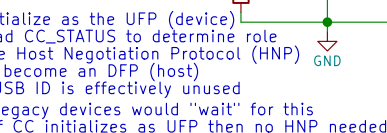


# USB-C



Size: A4	Date: 2018-06-18	Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7		Id: 2/24



(interpret RSOC% based on this plot)

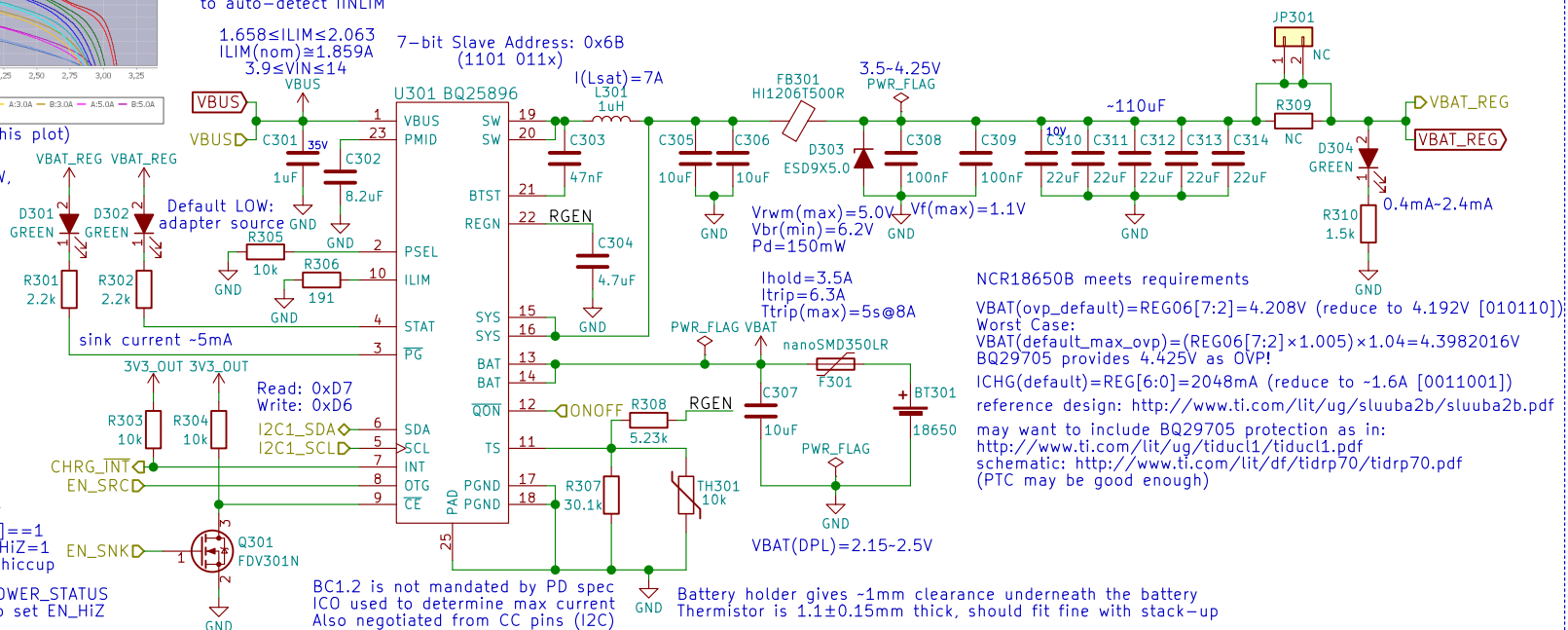
Drawing ~320mA, or consuming  $\leq 1.152W$ , should give close to 10 hours going from 100% to 0% charge

use AUTO\_DPDM\_EN to auto-detect IINLIM

$1.658 \leq I_{LIM} \leq 2.063$   
 $I_{LIM}(nom) \approx 1.859A$   
 $3.9 \leq V_{IN} \leq 14$

7-bit Slave Address: 0x6B (1101 011x)

# Battery Charge Controller



NCR18650B meets requirements

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/tiduc1/tiduc1.pdf>  
 schematic: <http://www.ti.com/lit/df/tidrp70/tidrp70.pdf>  
 (PTC may be good enough)

Reading PTN5110HQ's CC\_STATUS and POWER\_STATUS registers will tell TCPM (i.MX8M) when to set EN\_HI\_Z

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±0.15mm 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

Battery

**Purism**

Copyright 2018 GNU GPLv3

Sheet: /Battery/  
 File: battery.sch

Size: A4 Date: 2018-06-18

KiCad E.D.A. kicad 4.0.7

eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

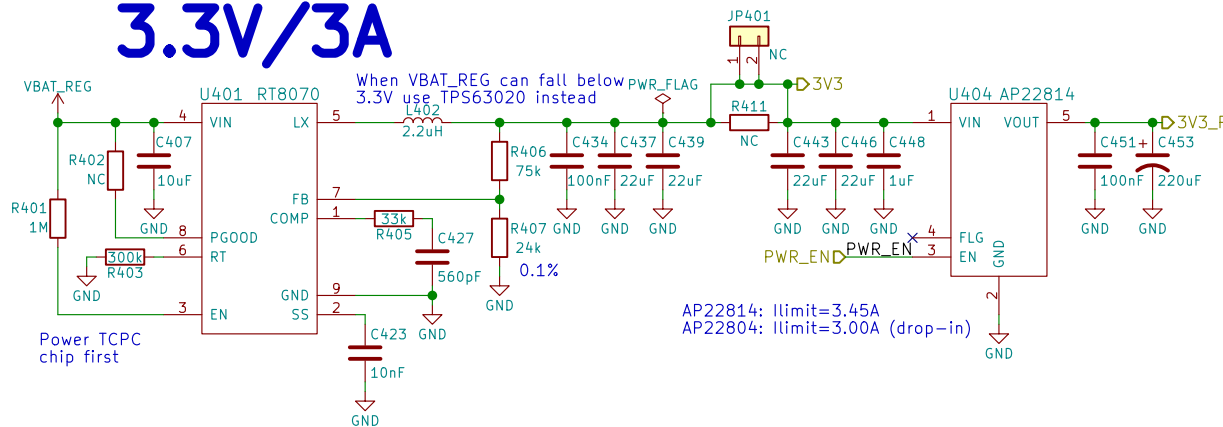
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 3/24

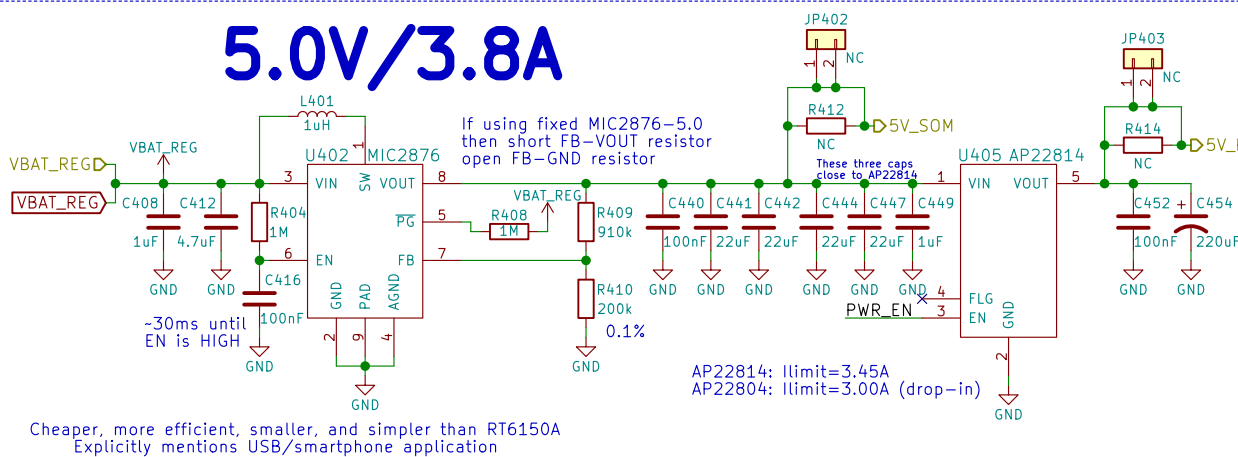
## 3.3V/3A



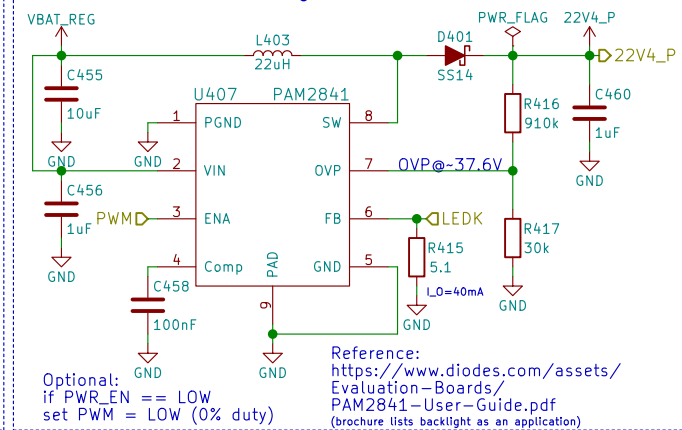
## 1.8V/600mA



## 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 4.0.7

Date: 2018-06-18

Rev: v0.1.0

Id: 4/24

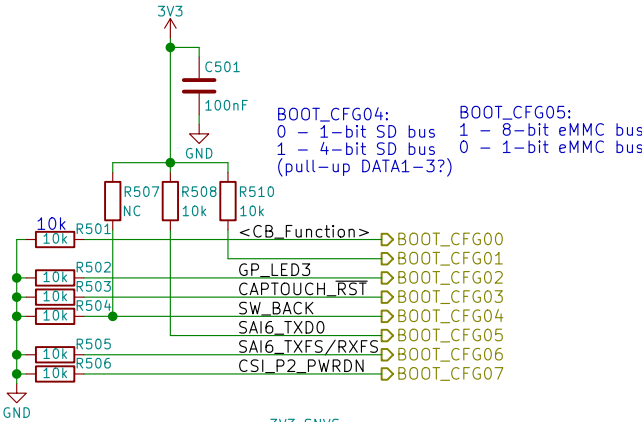
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

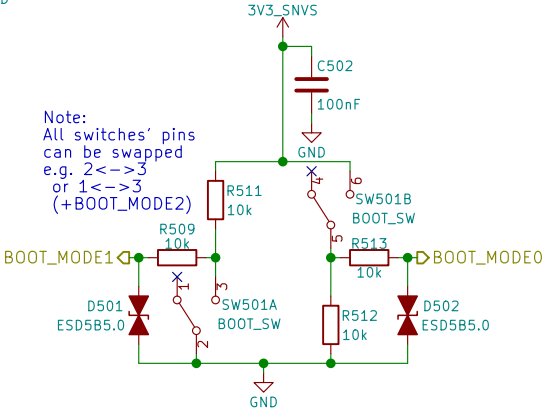
nicole.farber@puri.sm

christian.schilmoeller@puri.sm

# Boot Config



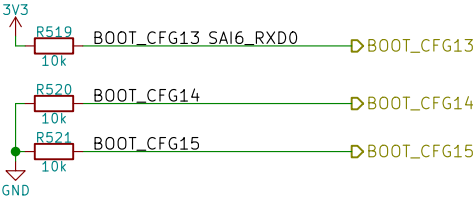
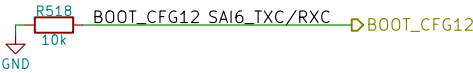
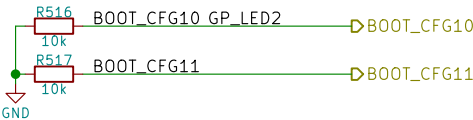
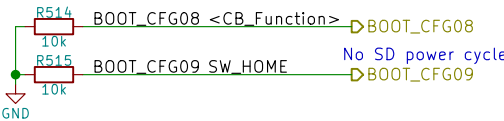
BOOT\_CFG04: 0 - 1-bit SD bus  
1 - 4-bit SD bus (pull-up DATA1-3?)  
BOOT\_CFG05: 1 - 8-bit eMMC bus  
0 - 1-bit eMMC bus




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 <sup>1</sup>	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



Copyright 2018 GNU GPLv3

Sheet: /Boot Config/  
File: boot.sch

Size: A4  
KiCad E.D.A. kicad 4.0.7

Date: 2018-06-18

Rev: v0.1.0  
Id: 5/24

eric.kuzmenko@puri.sm  
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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](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 4.0.7

Rev: v0.1.0

Id: 6/24

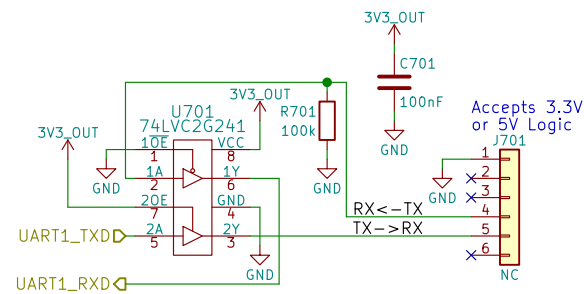
eric.kuzmenko@puri.sm

angus.ainslie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm

# UART Debug



## UART Debug



Copyright 2018 GNU GPLv3

Sheet: /UART Debug/  
File: uart.sch

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

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

Rev: v0.1.0  
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 4.0.7

Rev: v0.1.0

Id: 8/24

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.farber@puri.sm

christian.schilmoeller@puri.sm



[illegible]

 Purism

Sheet: /USB Hub + SDIO Bridge/  
File: usb\_hub\_sdio.sch

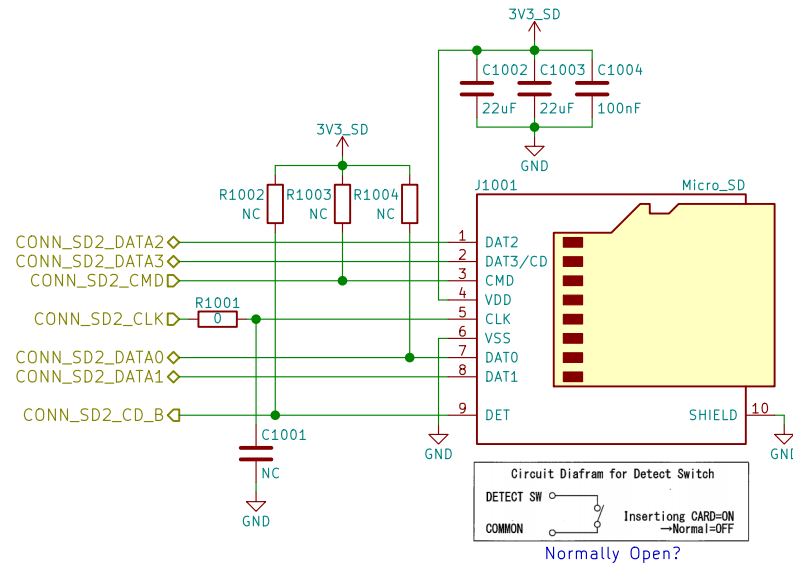
SIZE: A1	DATE:
KiCad E.D.A.	kicad 4.0.7

christian.schille@univie.ac.at

---

Id: 9/24

# μSD



uSD Card



**Purism**

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Sheet: /uSD Card/

File: sd.sch

Size: A4

Date: 2018-06-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 10/24

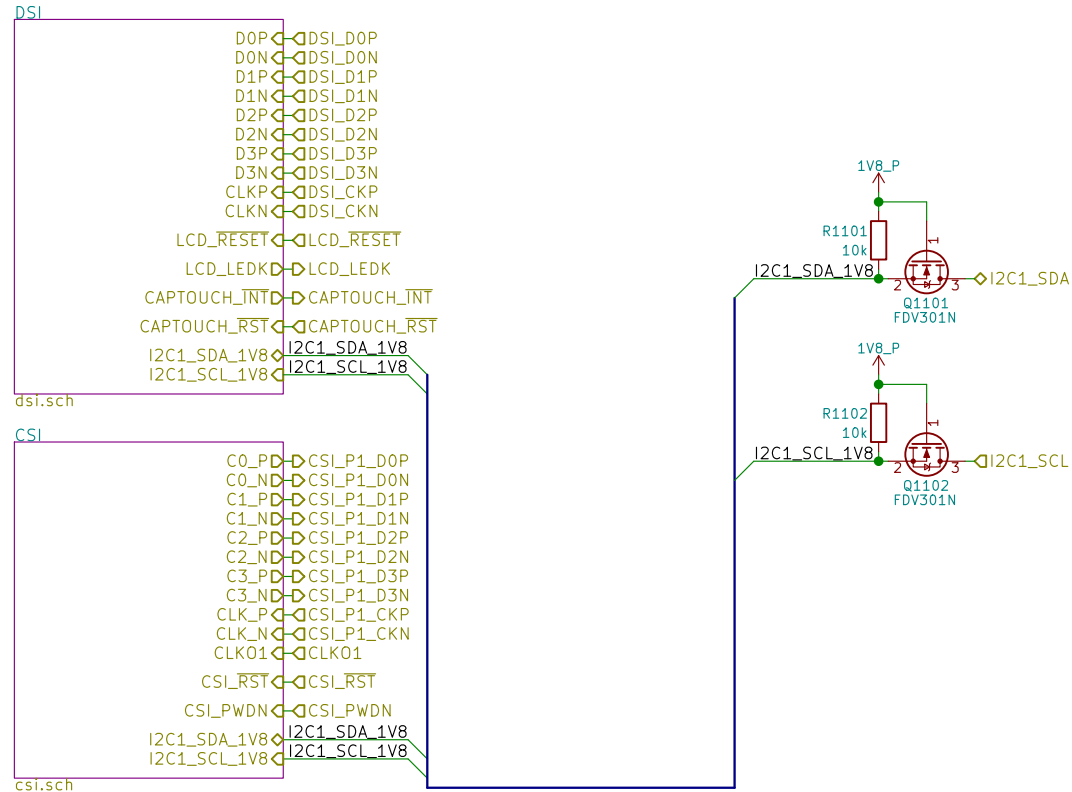
eric.kuzmenko@puri.sm

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 4.0.7

eric.kuzmenko@puri.sm

angus.ainstlie@puri.sm

nicole.farber@puri.sm

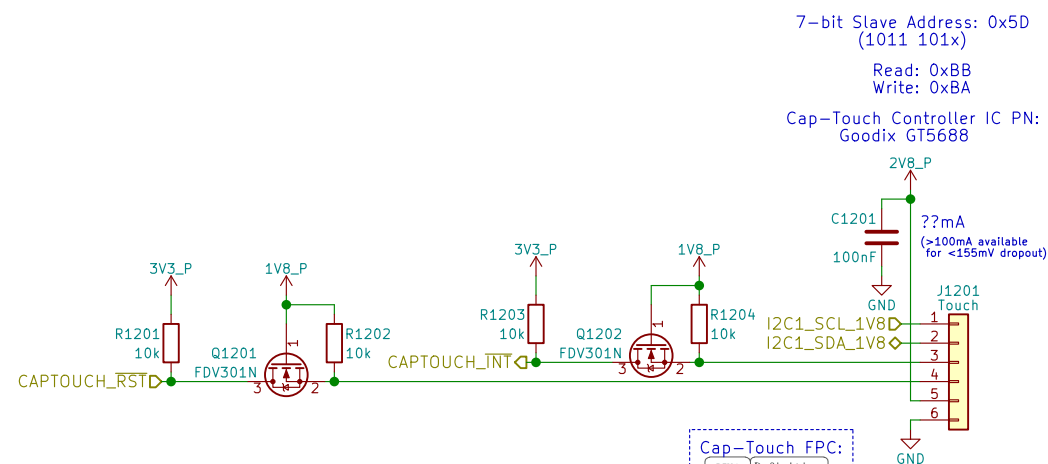
christian.schilmoeller@puri.sm

Rev: v0.1.0

Id: 11/24

# Display & Touch Controller

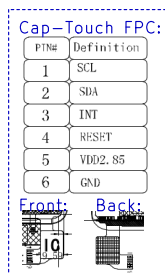
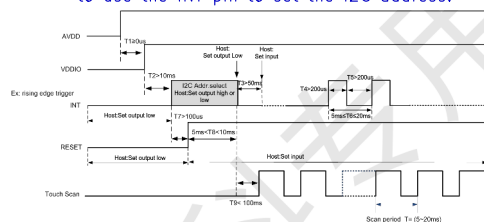
LCD PN:  
Shenzhen Jinghong Electronics Co., Ltd.  
JH057N00900



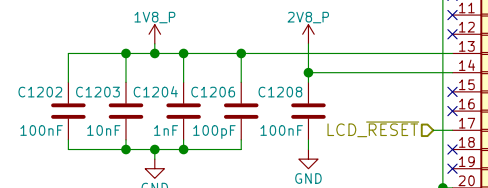
The upper 7 bits are the address, and bit 0 is used to select read or write. GT5688 has two slave device addresses to choose from:

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

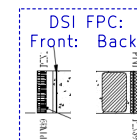
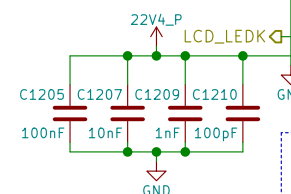
Every time you power on or reset, you need to use the INT pin to set the I2C address:



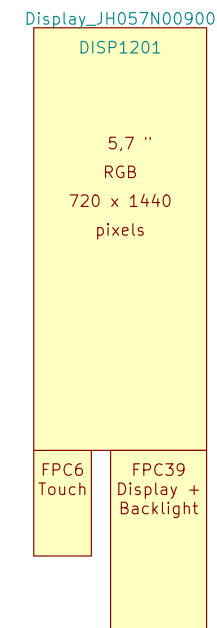
Note:  
No power-up sequence is given in the spec sheet



100Ω Differential Impedance



Backlight Array:



MIPI DSI



Copyright 2018 GNU GPLv3

Sheet: /MIPI/DSI/  
File: dsi.sch

Size: A4  
KiCad E.D.A. kicad 4.0.7

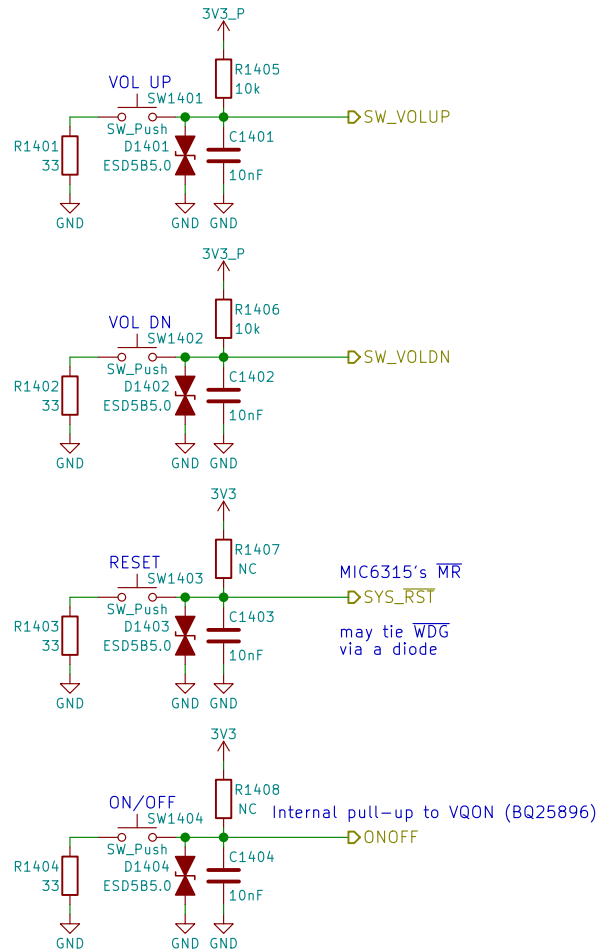
Date: 2018-06-18

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



Copyright 2018 GNU GPLv3

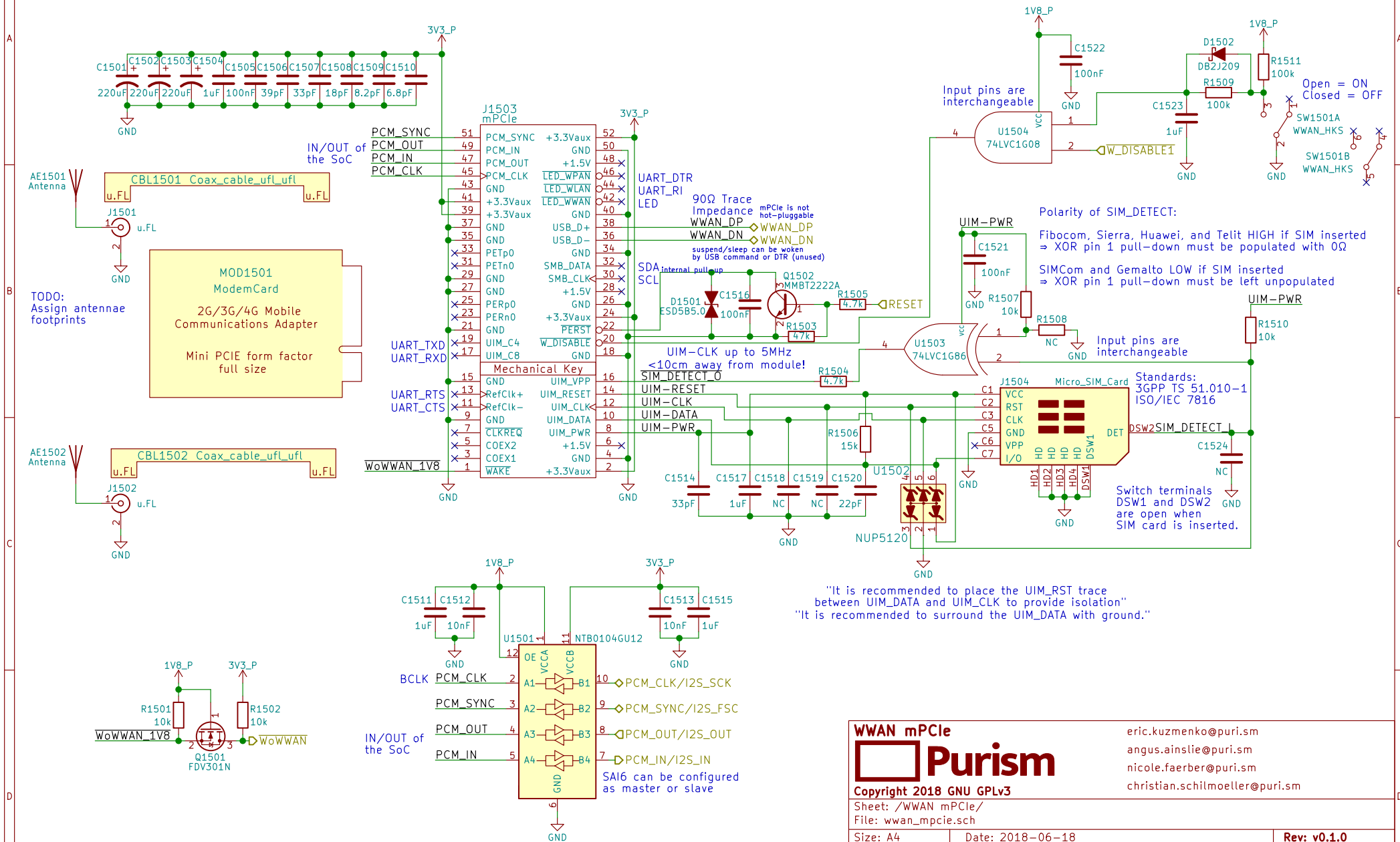
Sheet: /Buttons & LED/  
 File: buttons\_led.sch

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: 14/24

# WWAN mPCle



WWAN mPCIe



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Sheet: /WWAN mPCIe/  
File: wwan\_mpcie.sch

eric.kuzmenko@puri.sm

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nicole.ferber@puri.sm

christian.schilmoeller@puri.sm

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

Rev: v0.1.0

KiCad E.D.A. kicad 4.0.7

Id: 15/24

# Audio

Reference:  
[http://www.52rd.com/S\\_txt/2011\\_3/TXT26685.htm](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



Pin 5 (tip switch) is NC, open when inserted  
 If just headphones then HP\_DET=HIGH, R(mic)=0  
 may add ~220uF cap parallel to Zener

Ext-Mic enabled MIC\_SEL=HIGH  
 Int-Mic enabled MIC\_SEL=LOW  
 Add TVS next to int-mic? (OpenMoko does this)  
 Note: 5->4 = ON  
 5->6 = OFF  
 All switches' pins can be swapped e.g. 5<->4 or 5<->6 (+camera)  
 $-37dB=14.1254mV/Pa$   
 $\therefore \text{mic produces } 14.1254mV_{rms} \text{ when exposed to a } 1kHz \text{ tone of } 94dB-SPL \text{ at the capsule (or } 19.98mV \text{ amplitude)}$   
 $\Rightarrow 40dB \text{ gain would produce } -2V \text{ amplitude (4Vpp, clipping)}$   
 $30dB \text{ gain would produce } -0.632V \text{ amplitude (1.264Vpp)}$   
 $38.33dB \text{ gain would yield } 3.3V_{pp}$

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON

5->6 = OFF

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

GND

GND

GND

GND

SW Mute Mic: MUTE\_ADC=1

MIC\_IN

MIC\_BIAS

C1619

1uF

GND

C1620

100nF

GND

FB1608

BLM18KG601SZ1D

GND

C1622

270pF

GND

SW1301B

MIC\_CAM\_HKS

DPDT with camera

5->4 = ON



# RGMII 10/100/1000 Ethernet

The schematic diagram illustrates the RGMII 10/100/1000 Ethernet interface. It features an Ethernet controller (U1701) connected to an RJ45 connector (J1701). The controller's pins are organized into several groups: TX (TXD0-TXD3, TXEN, TX\_CTL), RX (RXD0-RXD3, RX\_CTL, RX\_DV), and control (MDC, MDIO, RST, WOL\_INT, INT, PPS, CLK, XTLO, XTLI, RBIAS). The RJ45 connector pins are labeled ETH\_TRX0\_P, ETH\_TRX0\_N, ETH\_TRX1\_P, ETH\_TRX1\_N, ETH\_TRX2\_P, ETH\_TRX2\_N, ETH\_TRX3\_P, ETH\_TRX3\_N, VCC, GND, GREEN, and YELLOW. The diagram includes power and ground connections, such as 3V3\_P, ENET\_2V5, and ENET\_1V1, along with various capacitors (C1701-C1715) and resistors (R1701-R1725) for decoupling and signal conditioning. A transformer (J1701) is used to interface the RJ45 connector with the controller's TX and RX pins. The diagram also shows a 2.5V (3.3V tolerant) signal path and a 100Ω differential pair for the TX and RX signals.

**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 4.0.7 Id: 17/24

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

 **Purism**

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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 R  
Requires  
Pin 54 if

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

AE1802  
FR05-S1-NO-1-004

RS9116 does not  
use RTX & CTS

internal 10k pull-up

- BT\_UART\_RXD
- BT\_UART\_TXD
- BT\_UART\_RTS
- BT\_UART\_CTS

RX, TX, RTS, CTS  
of the SoC

configure as slave

## IN, OUT of the SoC

## WLAN+BT M.2



**Purism**

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Sheet: /WLAN+BT M.2/

Size: A4

Date: 2018-06-18

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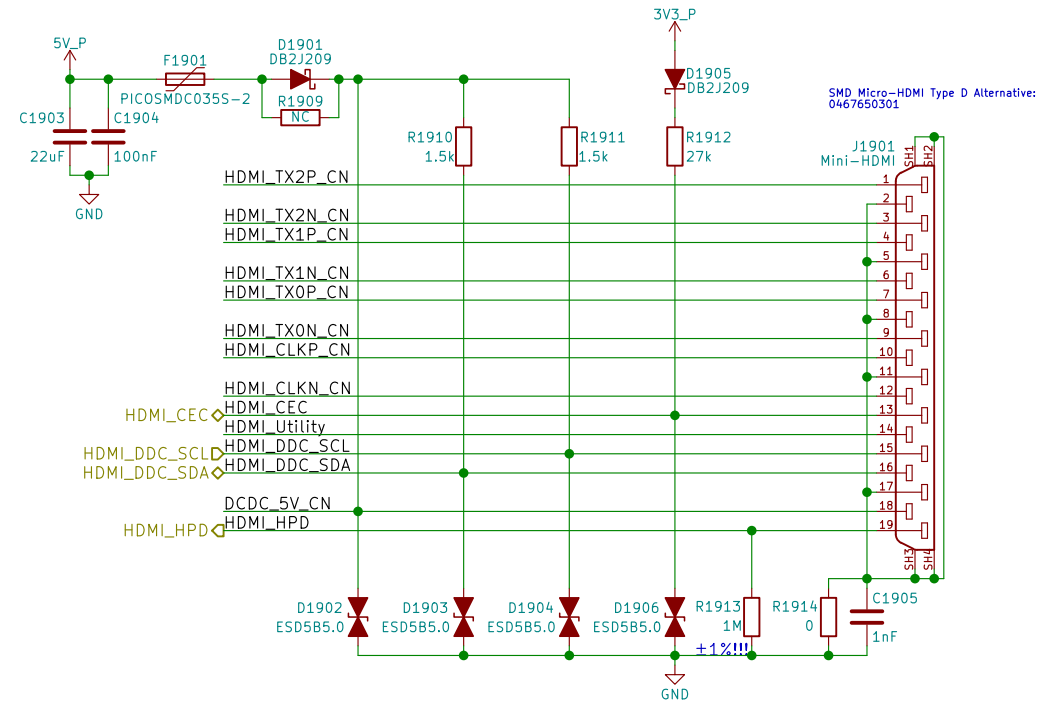
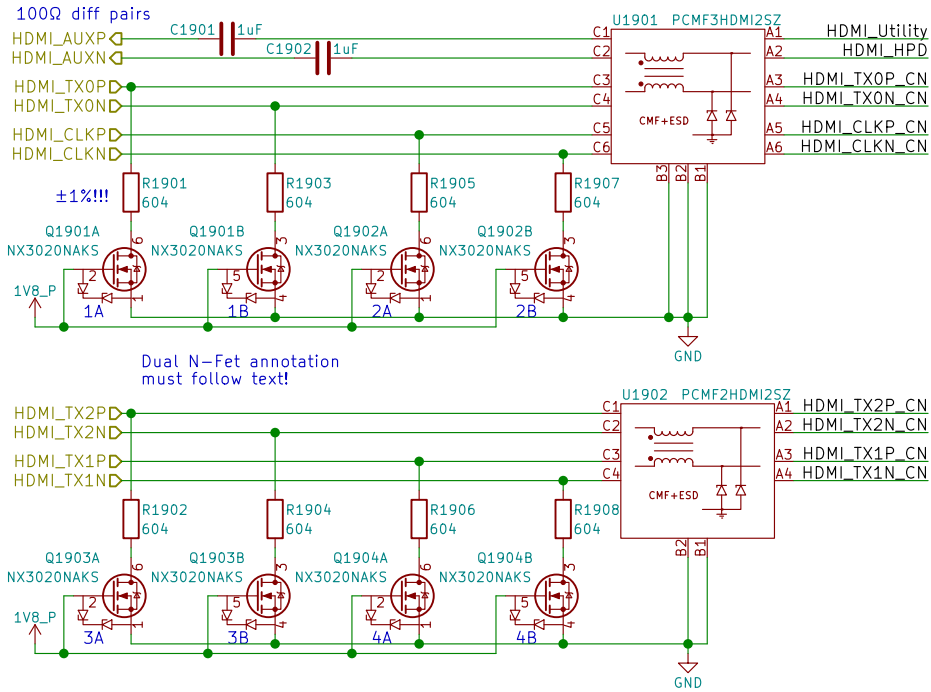
Rev: v0.1.0

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  
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Date: 2018-06-18

Rev: v0.1.0  
Id: 19/24

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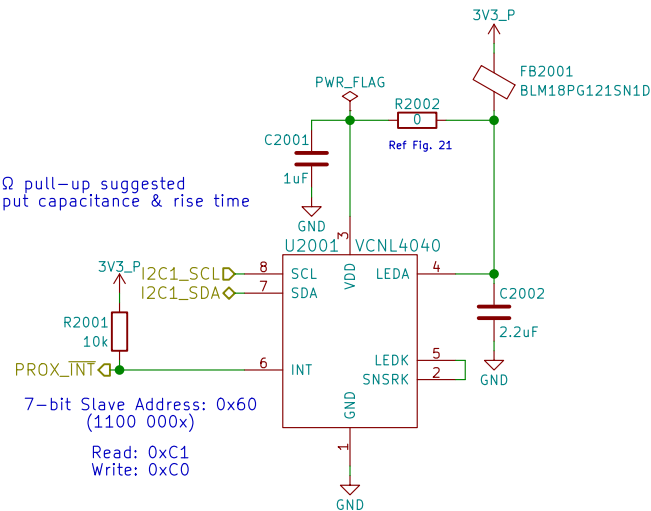
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# Sensors

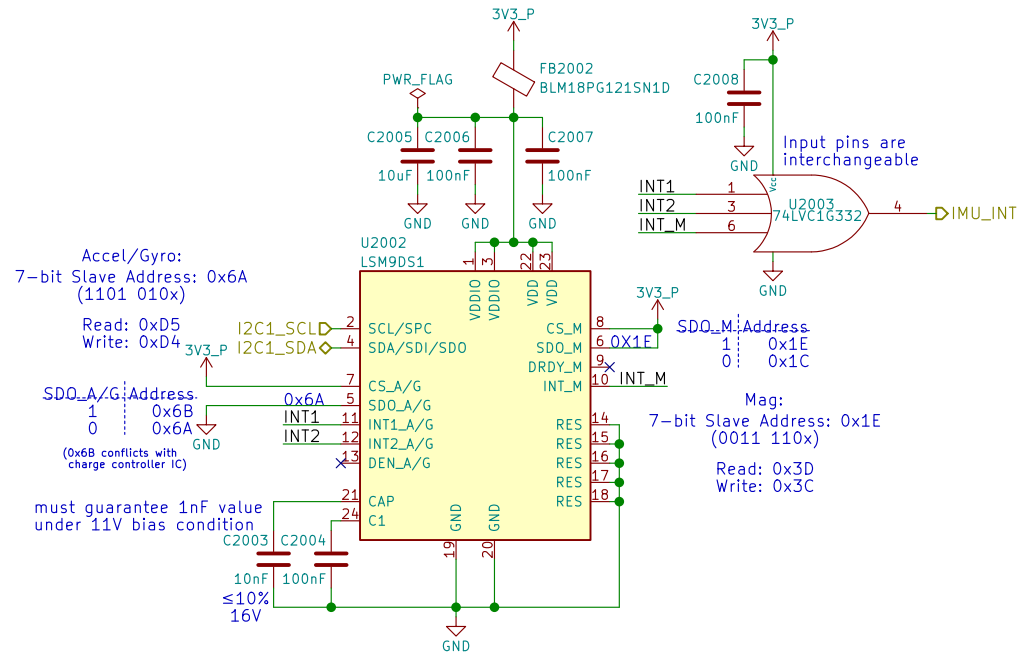
## Proximity & Ambient Light

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>

**Table 19. Accelerometer and gyroscope SAD\*Read/Write patterns**

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)

**Table 20. Magnetic sensor SAD\*Read/Write patterns**

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

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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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Rev: v0.1.0

Id: 21/24

The diagram illustrates the electrical connections for the Smart Card module (U2201) and the J2201 Smart Card connector. The USB module (U2200) provides power to the Smart Card module via VDD5 and VDD33. The Smart Card module has pins for SC1\_VCC, SC1\_RST, SC1\_CLK, SC1\_IO, SC1\_C4, SC1\_C8, and SC1\_PRSTNT\_N/JTAG\_TMS. The J2201 Smart Card connector has pins for VCC, RST, CLK, GND, VPP, I/O, CASE, and SCH. The diagram also shows the connection of the Smart Card module to the J2201 connector and the connection of the J2201 connector to the Smart Card module.

## 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-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](https://www.u-blox.com/sites/default/files/MAX-8-M8-FW3_HardwareIntegrationManual_L%28UBX-15030059%29.pdf)

GNSS



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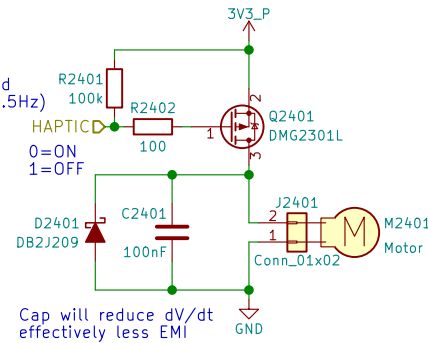
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# Haptic Motor

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)

Haptic/Vibration Motor



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Sheet: /Haptic Motor/  
 File: haptic.sch

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Size: A4 Date: 2018-06-18

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Rev: v0.1.0

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