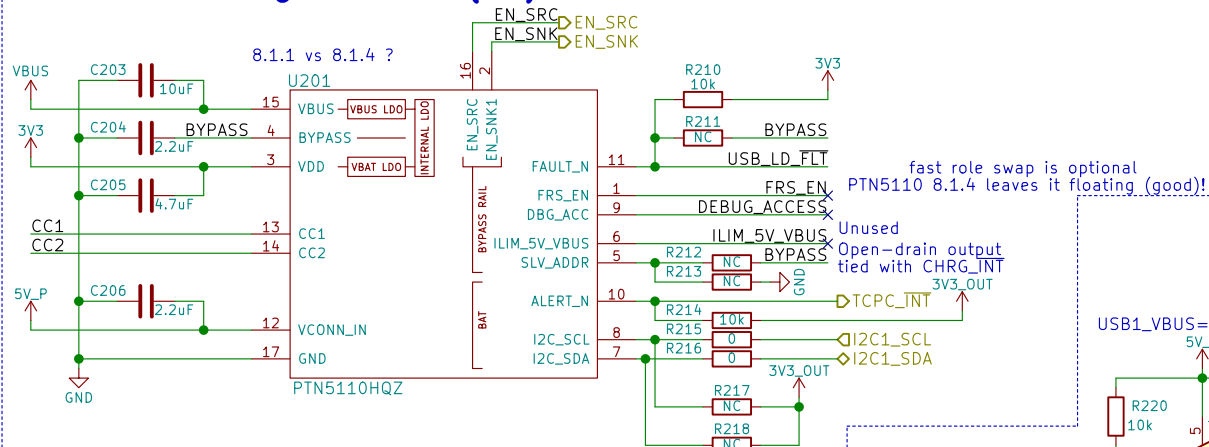
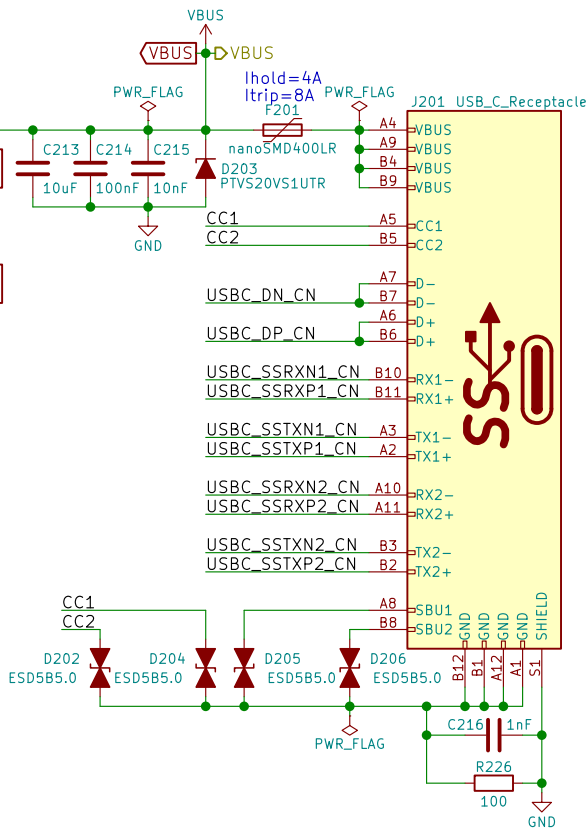
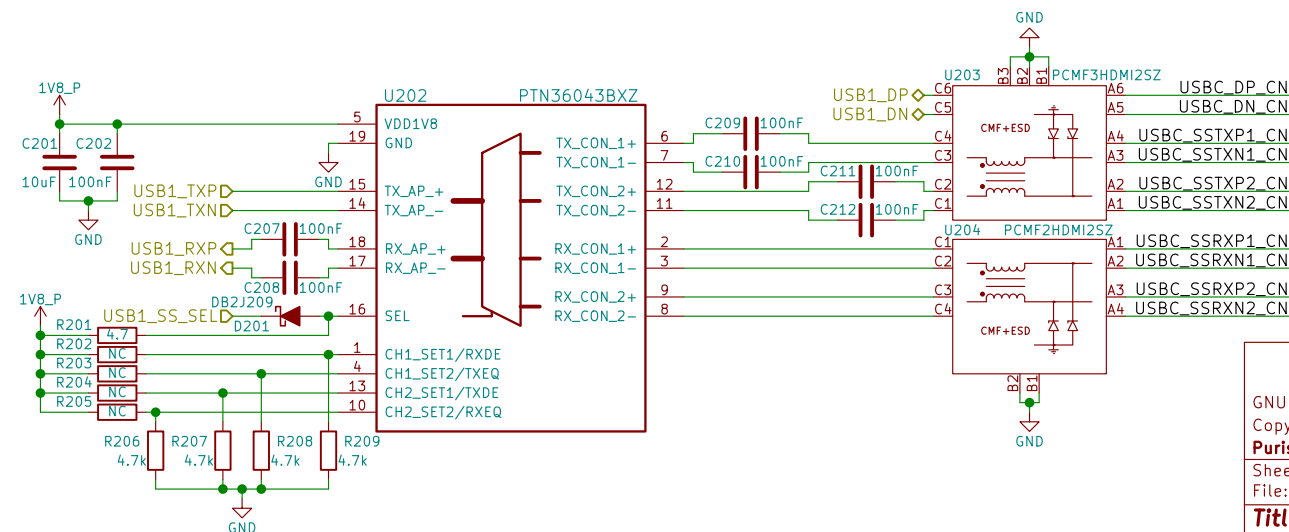


USB-C Config Channel (CC) and PD Role Controller



"Under dead battery operation, PTN5110 applies voltage clamps to both CC pins so that the system may receive power as a Sink. To support platforms with buck-boost configuration, PTN5110 asserts EN_SNK1 pin based on validity of VBUS voltage (facilitates 5 V VBUS sinking)."

Initialize as the UFP (device)
read CC_STATUS to determine role
use Host Negotiation Protocol (HNP)
to become an DFP (host)
∴ USB ID is effectively unused
⇒ Legacy devices would "wait" for this
⇒ If CC initializes as UFP then no HNP needed



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Purism SPC

Sheet: /USB-C/

File: usb-c.sch

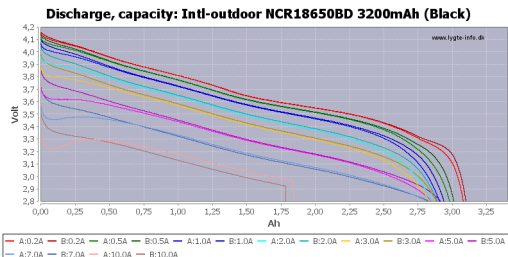
Title: USB Type C

Size: A4 Date: 2018-05-23

KiCad E.D.A. kicad 4.0.7

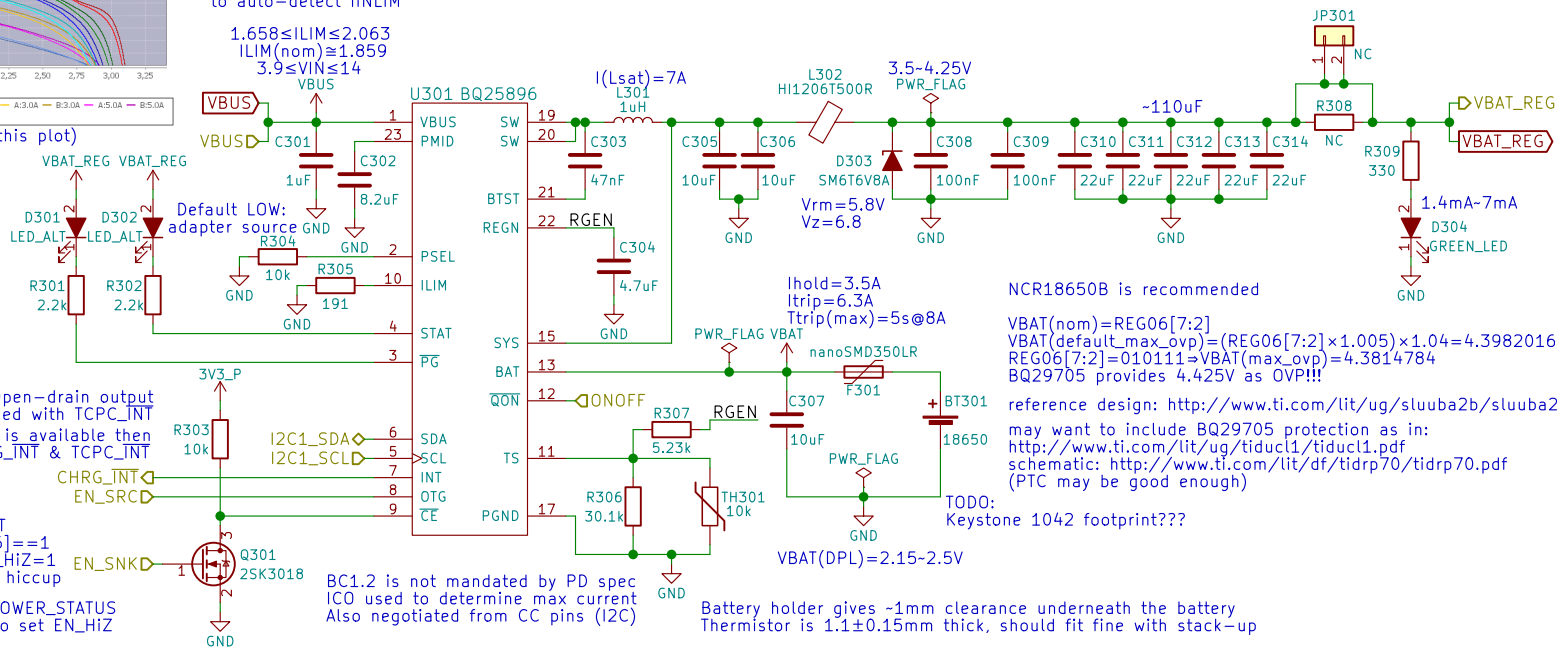
Rev: v0.1.0

Id: 2/23



(interpret RSOC% based on this plot)

use AUTO_DPDM_EN
to auto-detect IINLIM

$$\begin{aligned} 1.658 \leq I_{LIM} \leq 2.063 \\ I_{LIM}(\text{nom}) \cong 1.859 \\ 3.9 \leq V_{IN} \leq 14 \end{aligned}$$


NCR18650B is recommended

VBAT(nom)=REG06[7:2]
 VBAT(default_max_ovp)=(REG06[7:2]×1.005)×1.04=4.3982016V
 REG06[7:2]=010111→VBAT(max_ovp)=4.3814784
 BQ29705 provides 4.425V as OVP!!!

reference design: <http://www.ti.com/lit/ug/sluuaba2b/sluuaba2b.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)

TODO:
Keystone 1042 footprint???

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

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Purism SPC

Sheet: /Battery/
File: battery.sch

Title: Battery

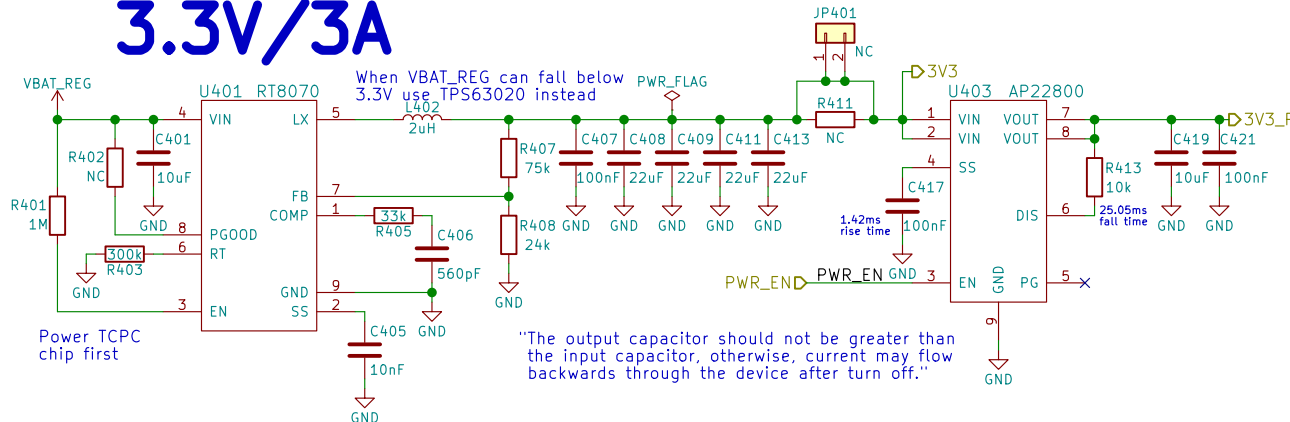
Size: A4	Date: 2018-05-23
----------	------------------

KiCad E.D.A. kicad 4.0.7

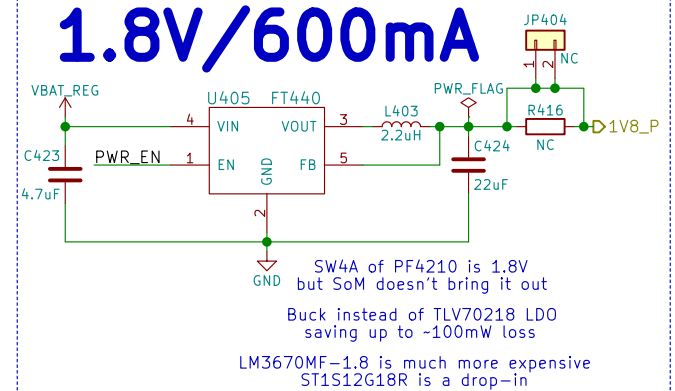
Rev: v0.1.0

Id: 3/23

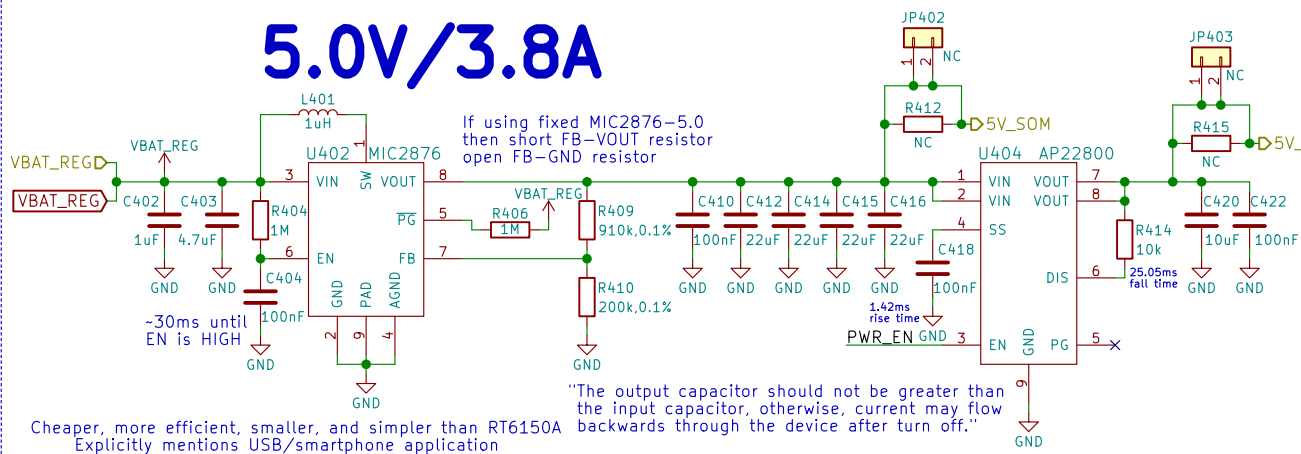
3.3V/3A



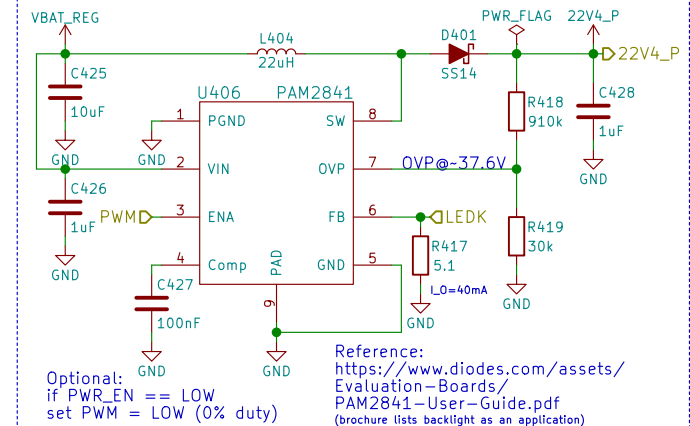
1.8V/600mA



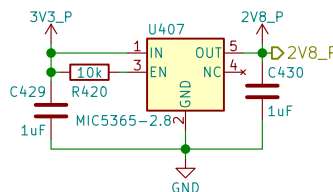
5.0V/3.8A



22.4V/40mA



TODO:
add parallel 100nF bulk caps!
& spread all over the power plane



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Purism SPC

Sheet: /Power/
File: power.sch

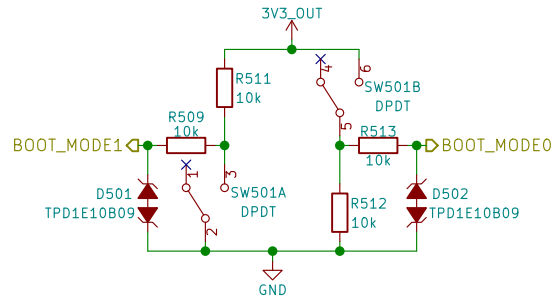
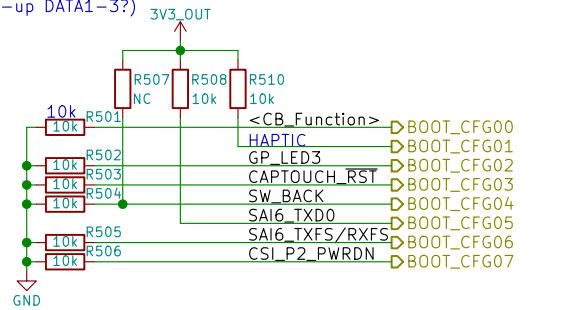
Title: Power

Size: A4 Date: 2018-05-23
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 4/23

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

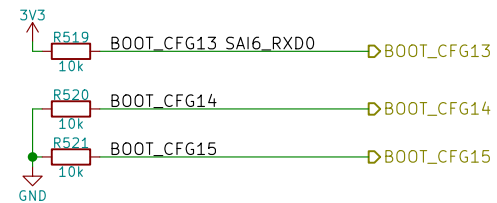
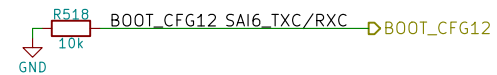
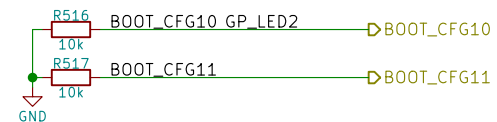
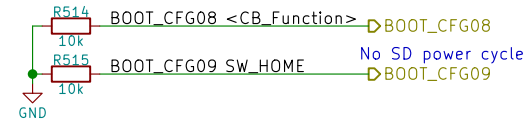


2->1: eMMC
2->3: USB (Serial Downloader)

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



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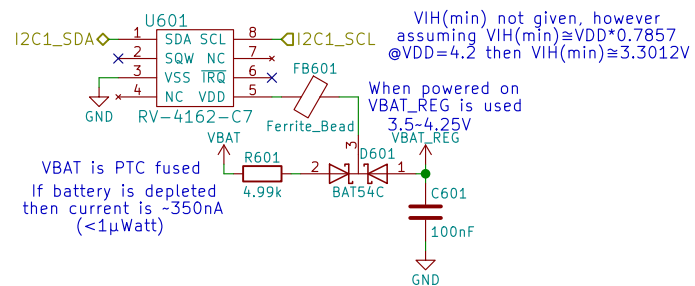
Purism SPC

Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

Size: A4 Date: 2018-05-23
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 5/23



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Purism SPC

Sheet: /RTC/
File: rtc.sch

Title: RTC

Size: A4 Date: 2018-05-23

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 6/23

Id: 7/23



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Purism SPC

Sheet: /JTAG/

File: jtag.sch

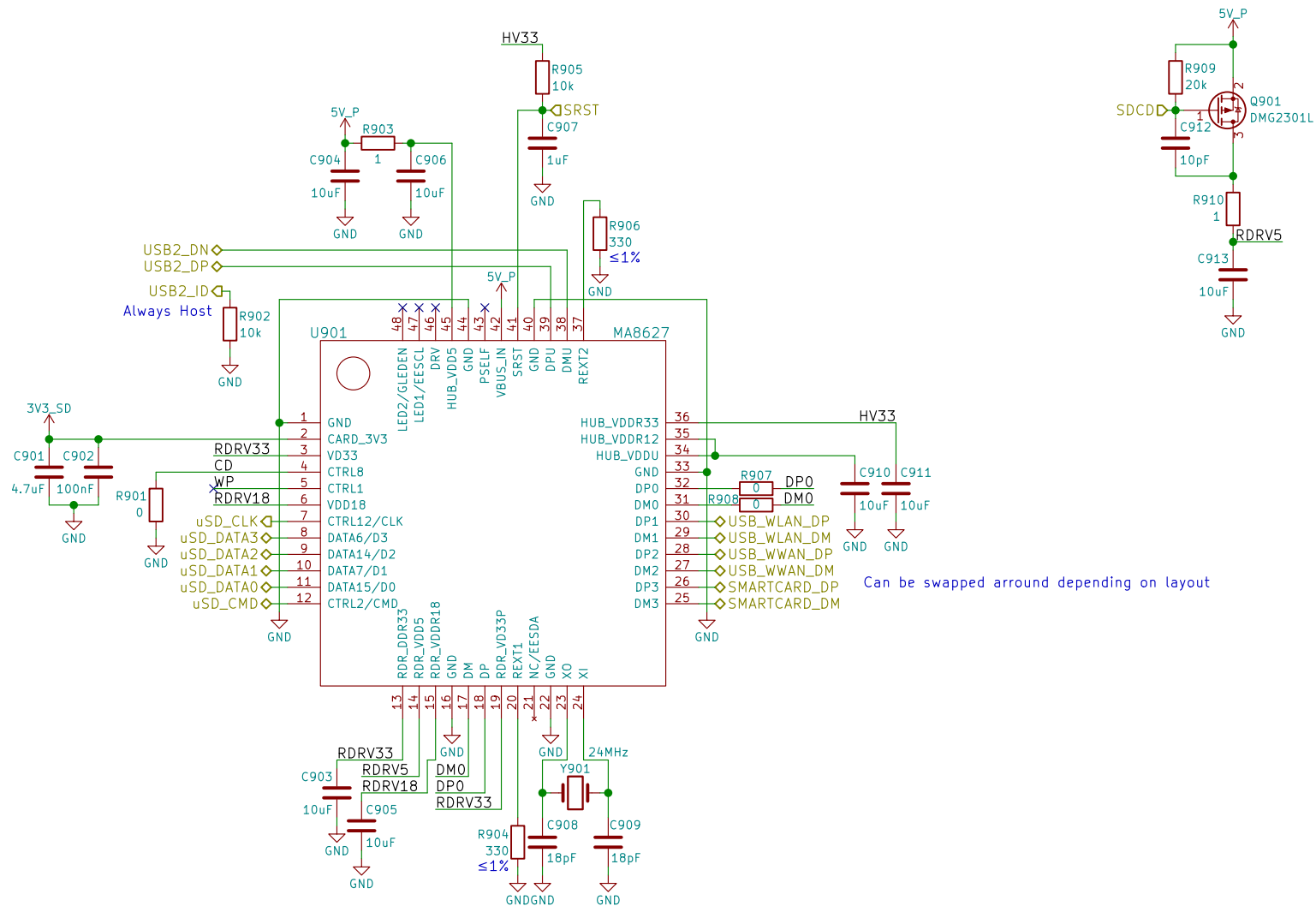
Title: JTAG

Size: A4 Date: 2018-05-23

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 8/23



GNU GPLv3
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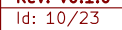
Purism SPC

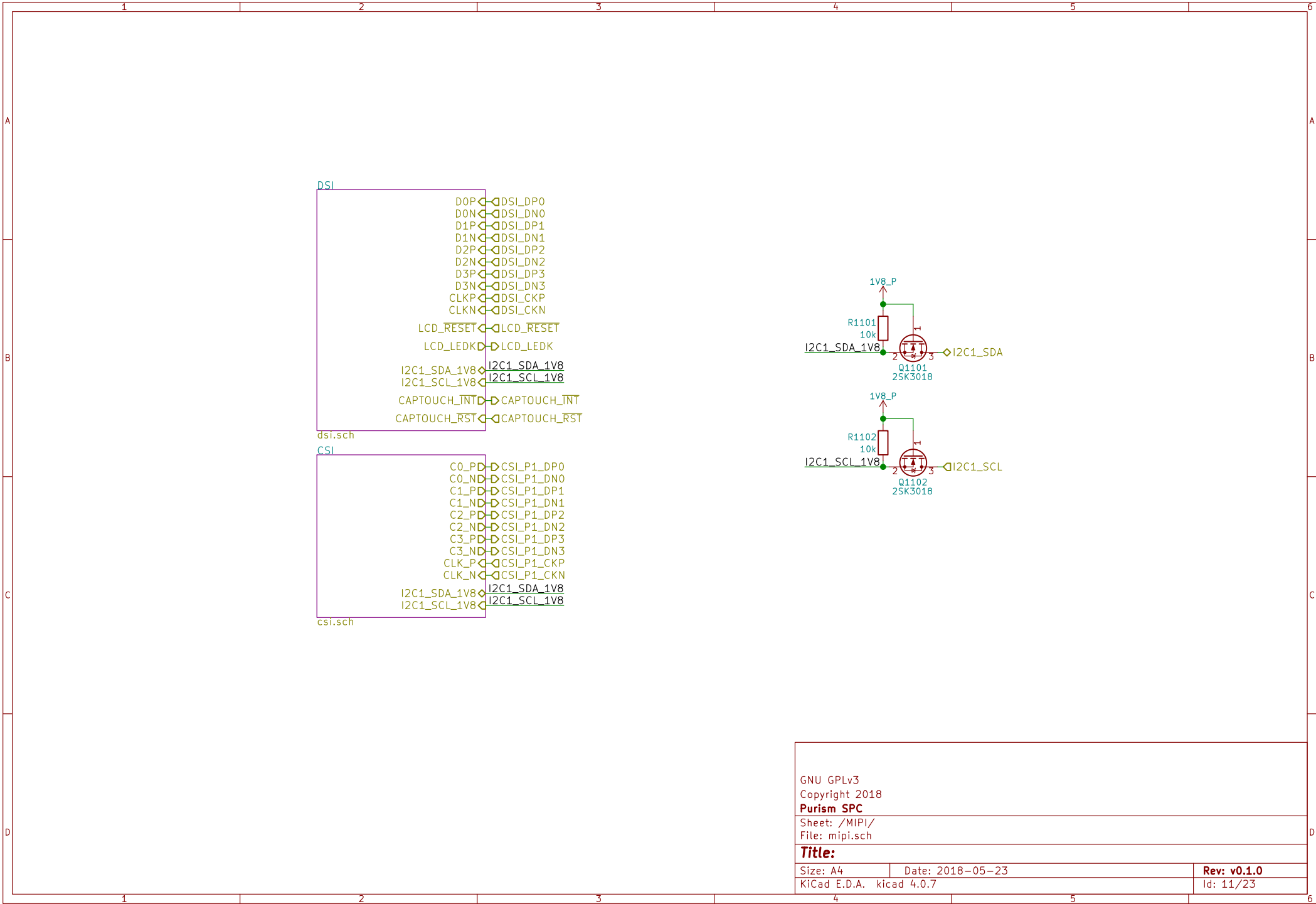
Sheet: /USB Hub + SDIO Bridge/
File: usb_hub_sdio.sch

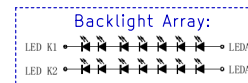
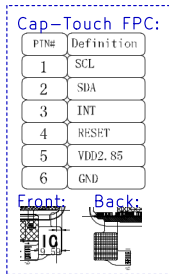
Title:

Size: A4 Date: 2018-05-23
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 9/23

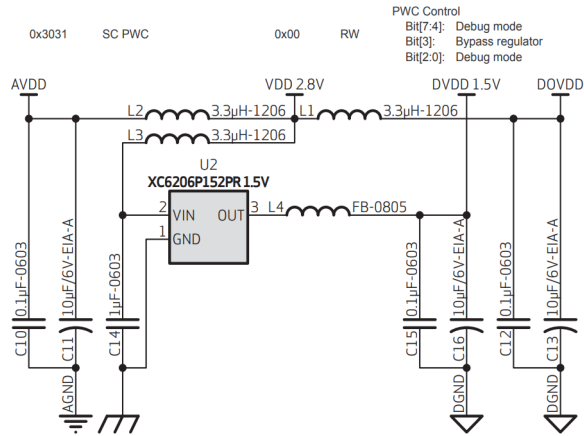






Id: 12/23

Using Internal DVDD 1.5V Regulator:



2.7 POWER UP SEQUENCE

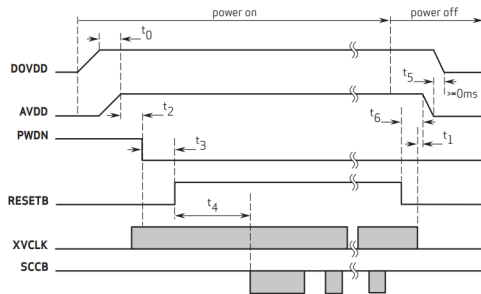
Based on the system power configuration (1.8V or 2.8V for I/O power, using external DVDD or internal DVDD, requiring access to the I2C during power up period or not), the power up sequence will differ. If 1.8V is used for I/O power, using the internal DVDD is preferred. If 2.8V is used for I/O power, due to a high voltage drop at the internal DVDD regulator, there is a potential heat issue. Hence, for a 2.8V power system, OmniVision recommends using an external DVDD source. Due to the higher power down current when using an external DVDD source, OmniVision strongly recommends cutting off all powers, including the external DVDD, when the sensor is not in use in the case of 2.8V I/O and external DVDD.

2.7.1 POWER UP WITH INTERNAL DVDD

For powering up with the internal DVDD and I2C access during the power ON period, the following conditions must occur:

1. when DOVDD and AVDD are turned ON, make sure DOVDD becomes stable before AVDD becomes stable
2. PWDN is active high with an asynchronized design (does not need clock)
3. PWDN pin tied to digital ground if it is not controlled.
4. if PWDN pin is controlled as below, for PWDN to go low, power must first become stable (AVDD to PWDN ≥ 5 ms)
5. RESETB is active low with an asynchronized design
6. master clock XVCLK should provide at least 1 ms before host accesses the sensor's registers
7. host can access I2C bus (if shared) during entire period. 20ms after RESETB goes high, host can access the sensor's registers to initialize sensor

figure 2-3 power up timing with internal DVDD



- note $t_0 \geq 0$ ms, delay from DOVDD stable to AVDD stable, it is recommended to power up AVDD shortly after DOVDD has been powered up
- $t_1 \geq 0$ ms, delay from XVCLK off to AVDD off
- $t_2 \geq 5$ ms, delay from AVDD stable to sensor power up stable, PWDN can be pulled low after this point. XVCLK can be turned on after power on
- $t_3 \geq 1$ ms, delay from sensor power up stable to RESETB pull up
- $t_4 \geq 20$ ms, delay from RESETB pull high to SCCB initialization
- $t_5 \geq 0$ ms, delay from AVDD off to DOVDD off
- $t_6 \geq 0$ ms, delay from RESETB pull low to AVDD off

5640_05_2-2

×D C0_P
×D C0_N
×D C1_P
×D C1_N
×D C2_P
×D C2_N
×D C3_P
×D C3_N
×D CLK_P
×D CLK_N

◇ I2C1_SDA_1V8
◇ I2C1_SCL_1V8

GNU GPLv3
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Purism SPC

Sheet: /MIPI/CSI/
File: csi.sch

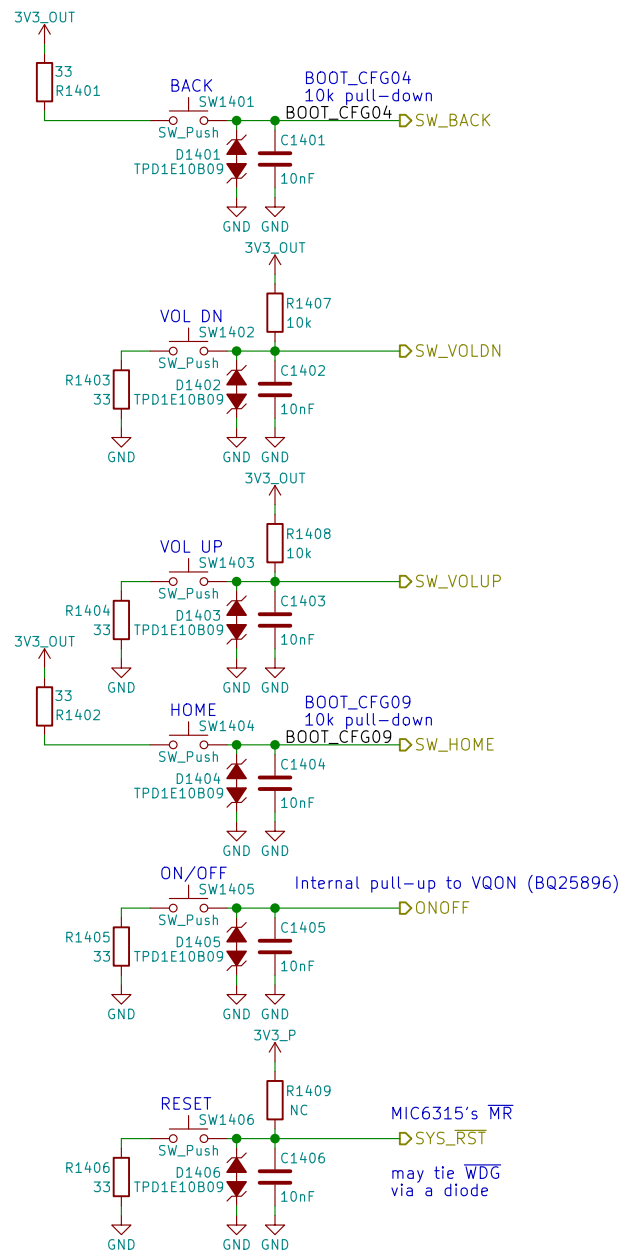
Title:

Size: A4 Date: 2018-05-23

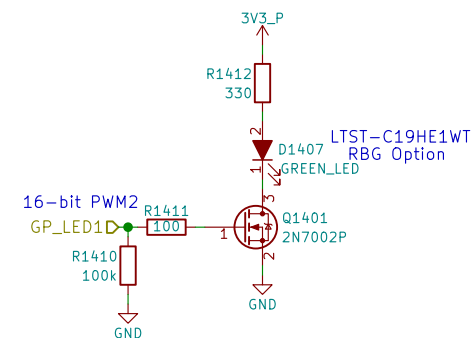
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 13/23



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)



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 Copyright 2018

Purism SPC

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

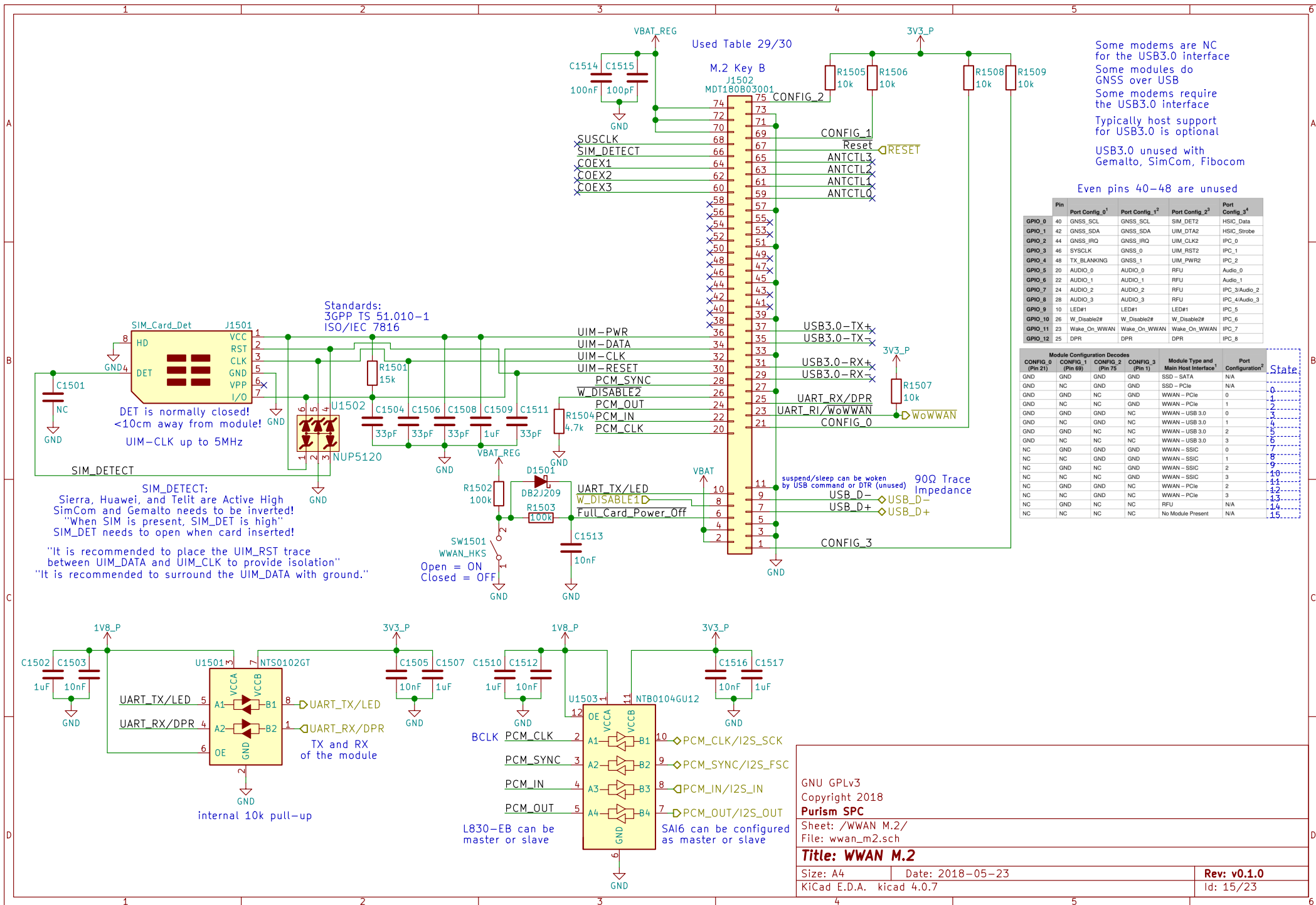
Title: Buttons & LED

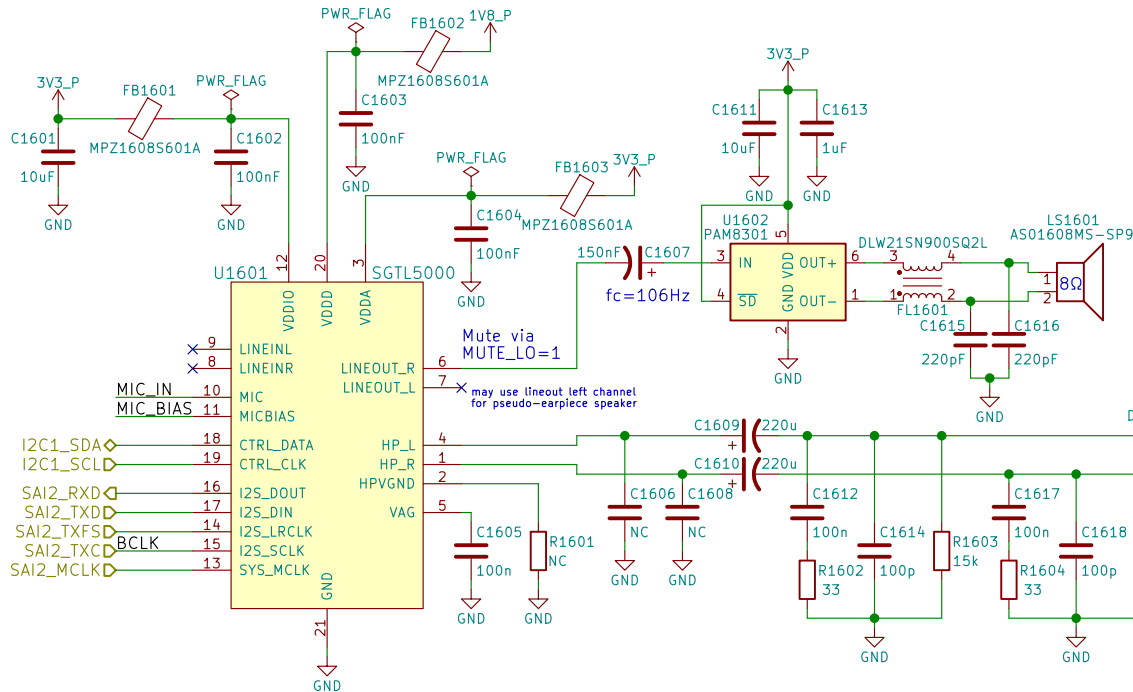
Size: A4 Date: 2018-05-23

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 14/23





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-\(Ntt6-does-the-same\)](https://electronics.stackexchange.com/questions/31442/how-can-i-switch-this-audio-jack-using-its-own-mechanical-switches-without-crc-(Ntt6-does-the-same))
 +Zener diode to protect against ranges outside of -0.9V to 3.3V

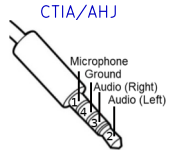
dB specs in datasheet is a unit of power gain (not dBu or VU)
 with respect to the DAC's unattenuated output

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

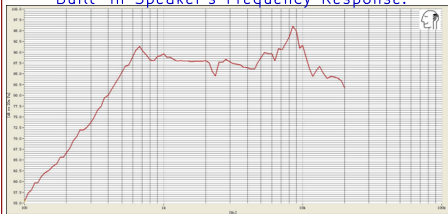
If HP_DET is HIGH for >100ms then HPs are present

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

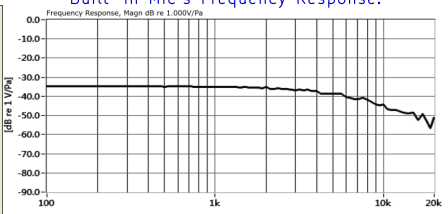
Could use FSA8008 to detect mic



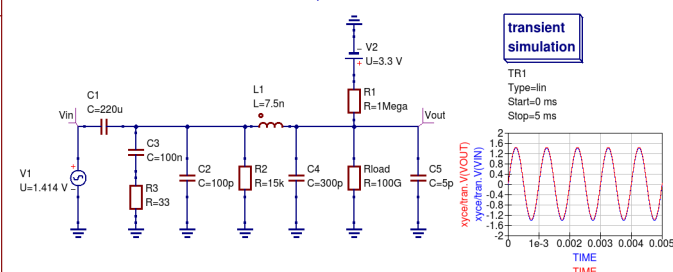
Built-In Speaker's Frequency Response:



Built-In Mic's Frequency Response:

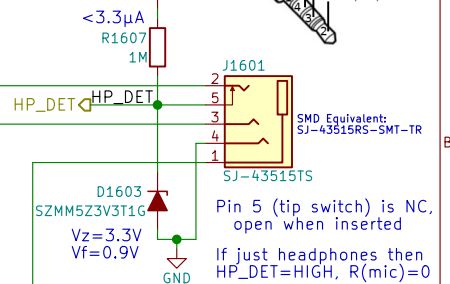


Simulation of HP_DET @ 1kHz output
 without HP jack inserted:



LCR Measurements:

Earbud Microphone: @1kHz	Headset Speaker: @1kHz	Earbud Speaker: @1kHz
$L_s = 3.844mH$ $L_p = 15.757H$ $C_s = 6.583uF$ $C_p = 1612.8pF$ $R_s = 1.5465k\Omega$ $R_p = 1.5478k\Omega$ $\theta = -0.8deg$	$L_s = 244.4uH$ $L_p = 141.99mH$ $C_s = 103.6uF$ $C_p = 178.77nF$ $R_s = 36.860\Omega$ $R_p = 36.860\Omega$ $\theta = -2.3deg$	$L_s = 25.2uH$ $L_p = 311.0mH$ $C_s = 1.0mF$ $C_p = 81.95nF$ $R_s = 17.0300\Omega$ $R_p = 17.0340\Omega$ $\theta = 0.5deg$



-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

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Purism SPC

Sheet: /Audio/
 File: audio.sch

Title: Audio

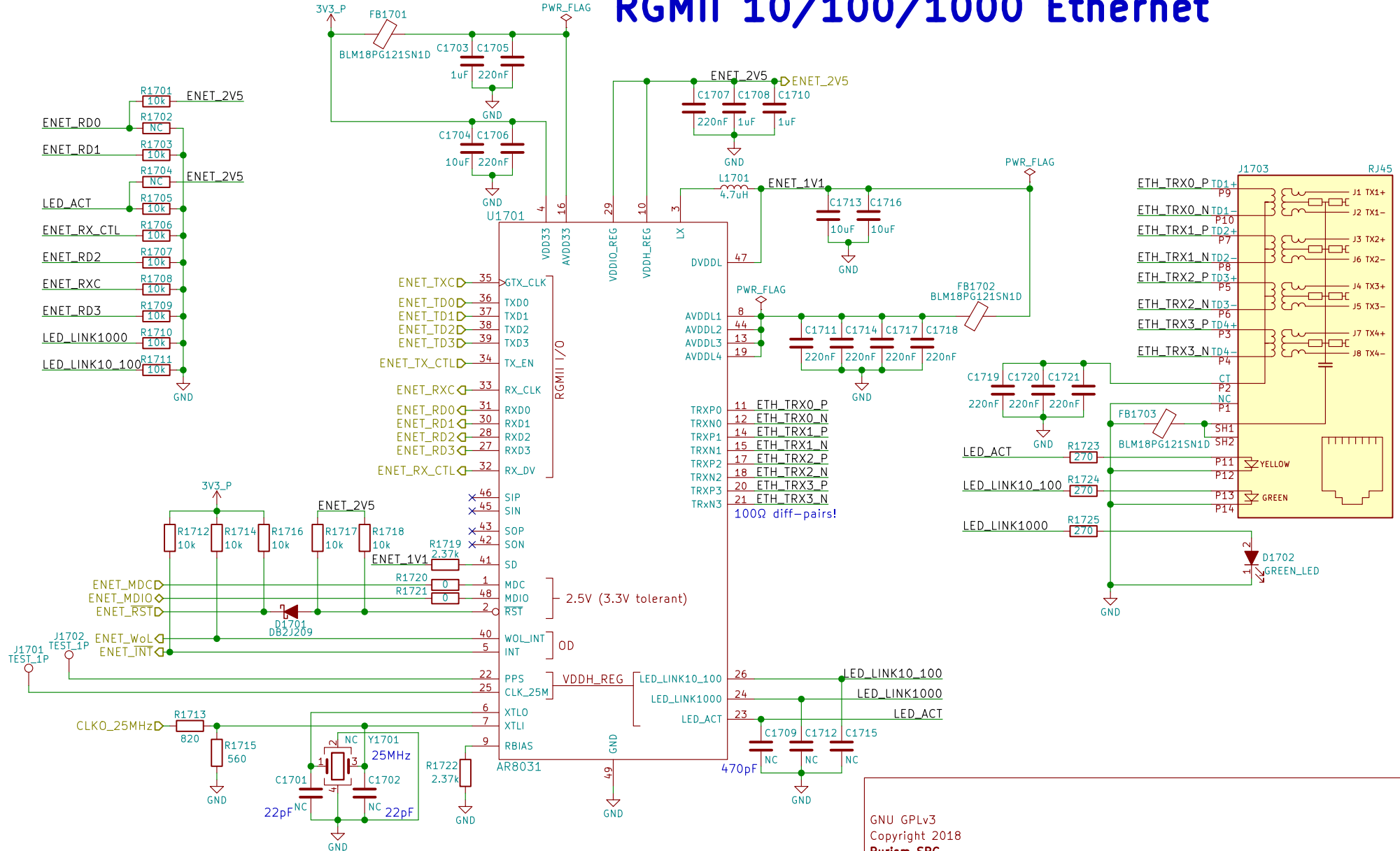
Size: A4 Date: 2018-05-23

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 16/23

RGMII 10/100/1000 Ethernet



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Purism SPC

Sheet: /Ethernet/
File: ethernet.sch

Title: Ethernet

Size: A4 Date: 2018-05-23
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 17/23



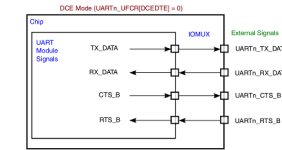
RedPine RS9116
Requires 5V on
Pin 54 for USB!

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

Module: Table 23
Socket: Table 46

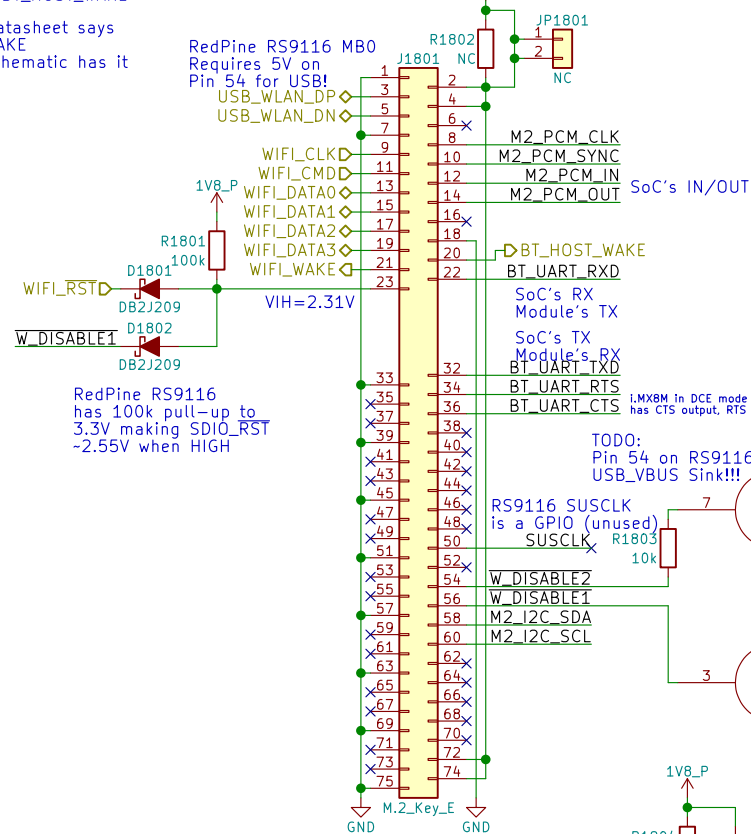
3V3_P

UARTn_UFCR[DCEDTE]=0 on POR



TX output
RX input
CTS output
RTS input

⇒ TX → RX
RX ← TX
CTS → CTS
RTS ← RTS

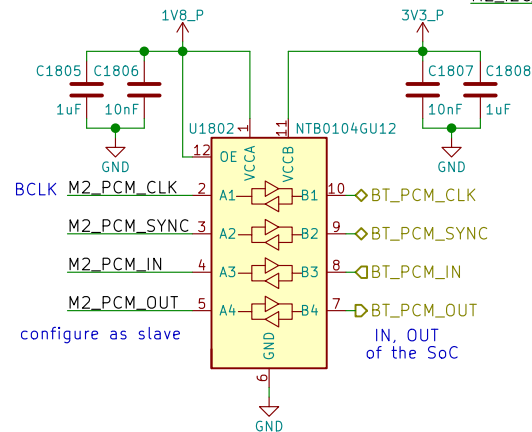
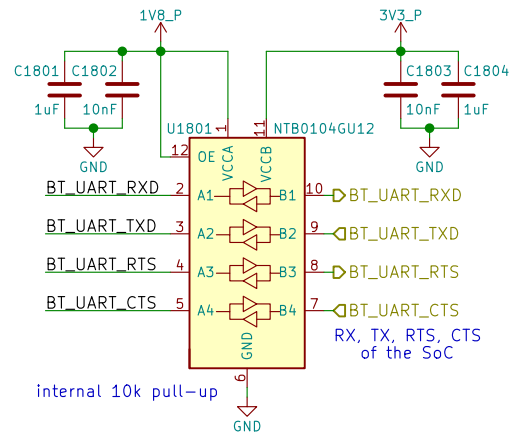


TODO:
Pin 54 on RS9116 is
USB_VBUS Sink!!!

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK R1803

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

Q1802
 25K3018



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

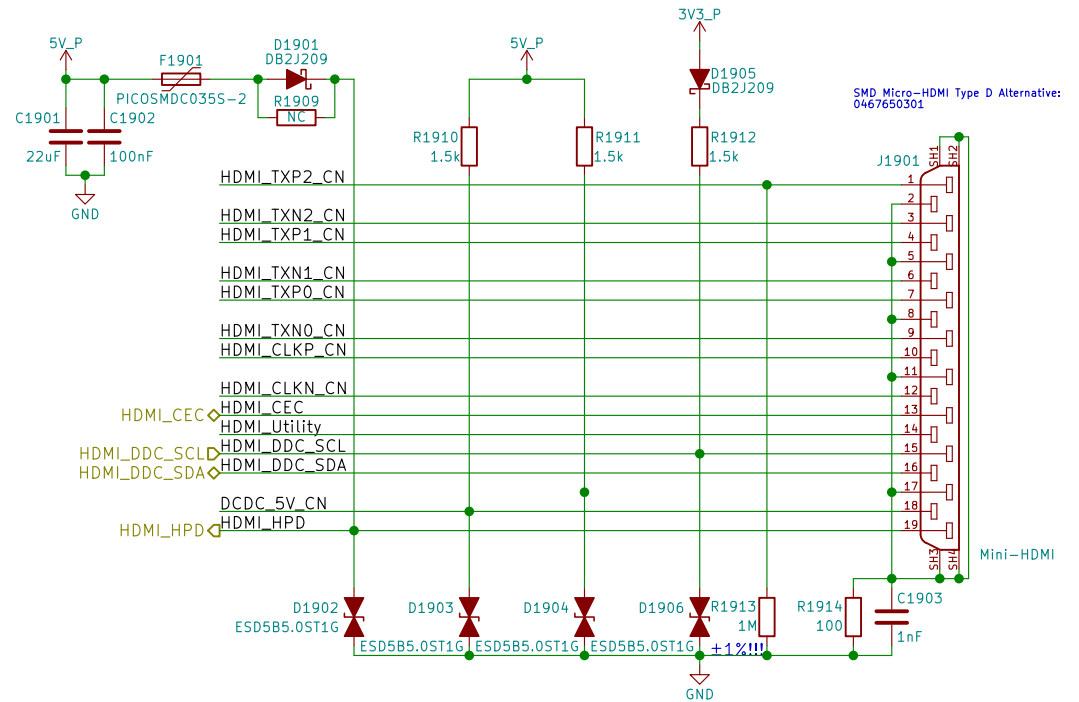
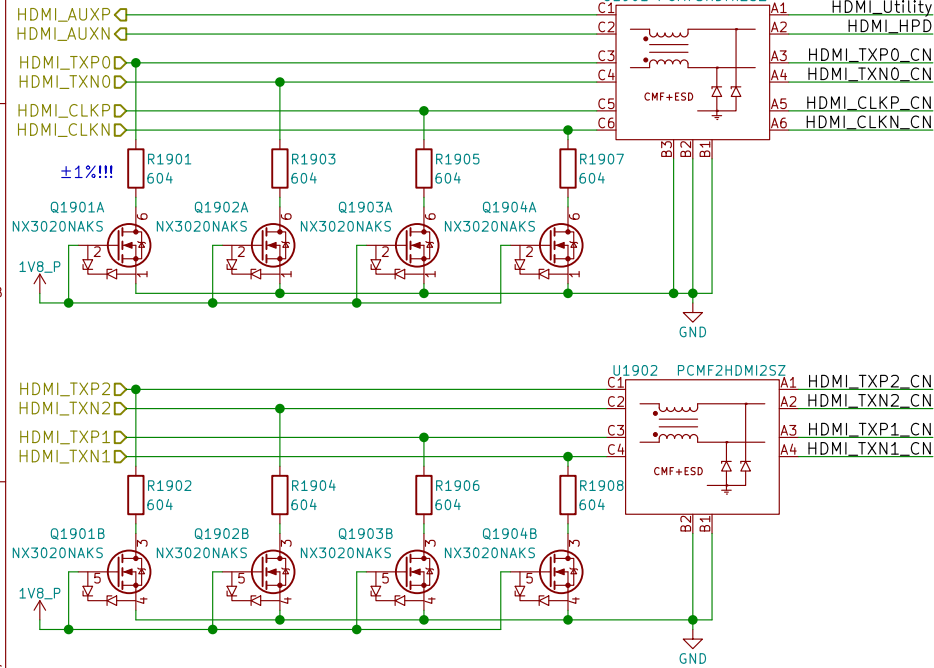
Size: A4	Date:
KiCad E.D.A.	kicad 4.0.7

Id: 18/23

HD3SS460 can be used for DP over USB-C

Layout Note:
May need swap some signals
due to micro-HDMI pinout diff
depending on pin location/routing

100Ω diff pairs



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Purism SPC

Sheet: /HDMI/
File: hdmi.sch

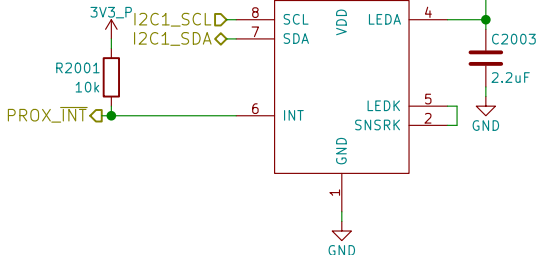
Title: HDMI

Size: A4 Date: 2018-05-23
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 19/23

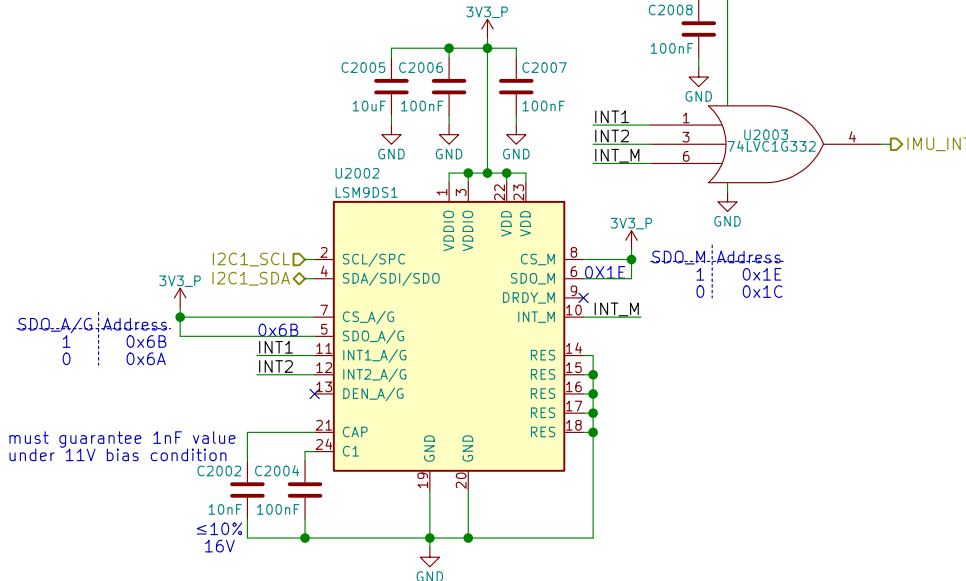
D

Note:
I2C 2.2k Ω 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>

Id



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

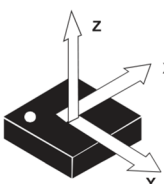
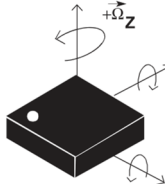
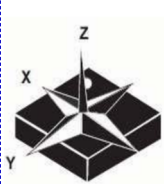


Table 19. Accelerometer and gyroscope SAD+Read/Write pattern

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 pattern

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)

GNU GPLv3
Copyright 2018
Purism SPC

Sheet: /Sensors/
File: sensors.sch

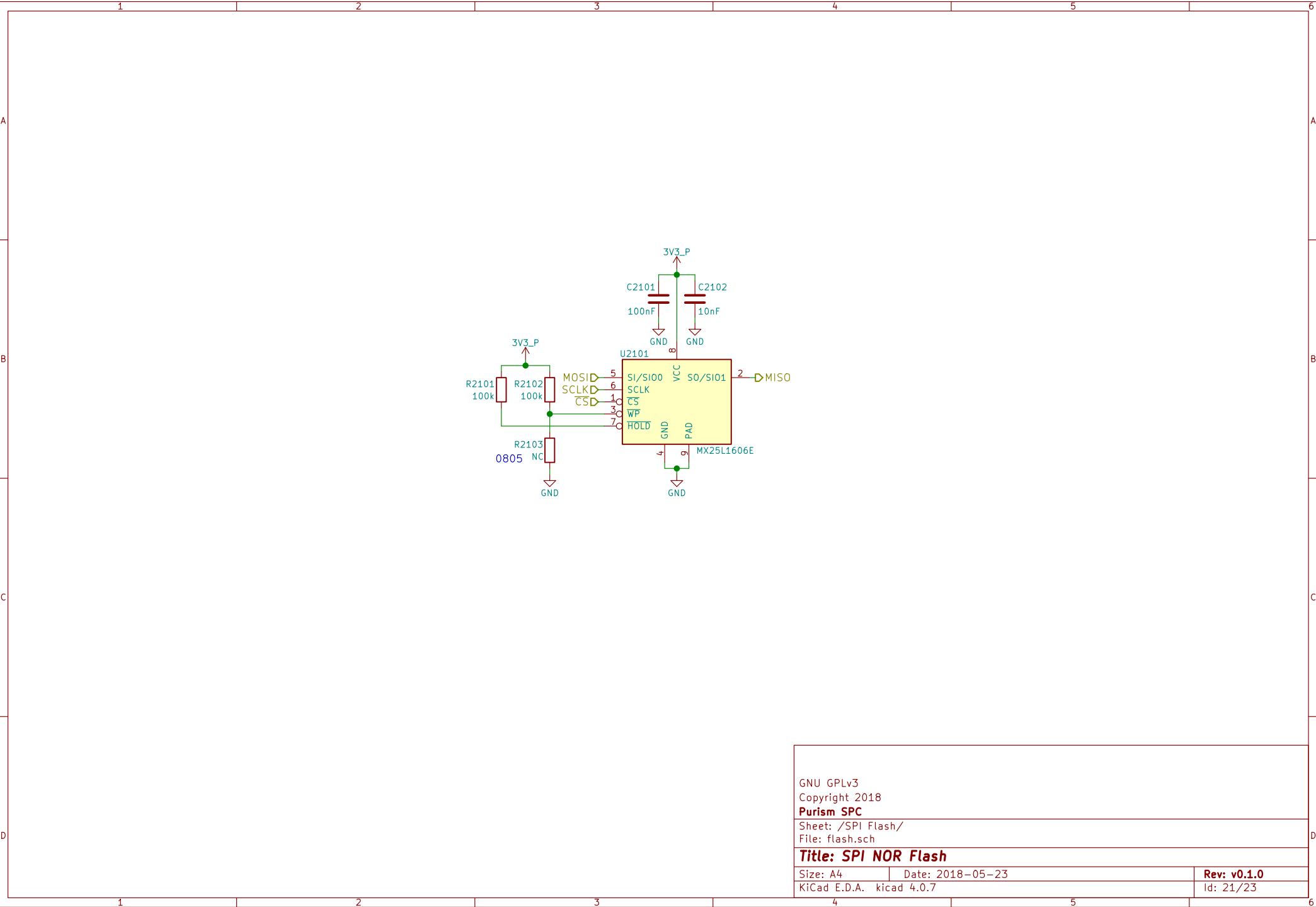
Title: Sensors

Size: A4	Date: 2018-05-23
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Rev: v0.1.0

Id: 20/23



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Purism SPC

Sheet: /SPI Flash/

File: flash.sch

Title: SPI NOR Flash

Size: A4

Date: 2018-05-23

Rev: v0.1.0

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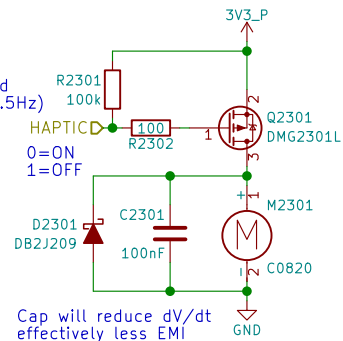
Id: 21/23



Id: 22/23

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 JST
 connector installed (by request)!

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

Alibaba Alternative Motor:
https://www.alibaba.com/product-detail/Coin-motor-vibration-dc-motor-cellphone_1994583657.html?spm=a2700.8443308.0.0.5aa13e5f1wxHgs

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Purism SPC

Sheet: /Haptic Motor/
 File: haptic.sch

Title: Haptic/Vibration Motor

Size: A4 Date: 2018-05-23

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Rev: v0.1.0

Id: 23/23