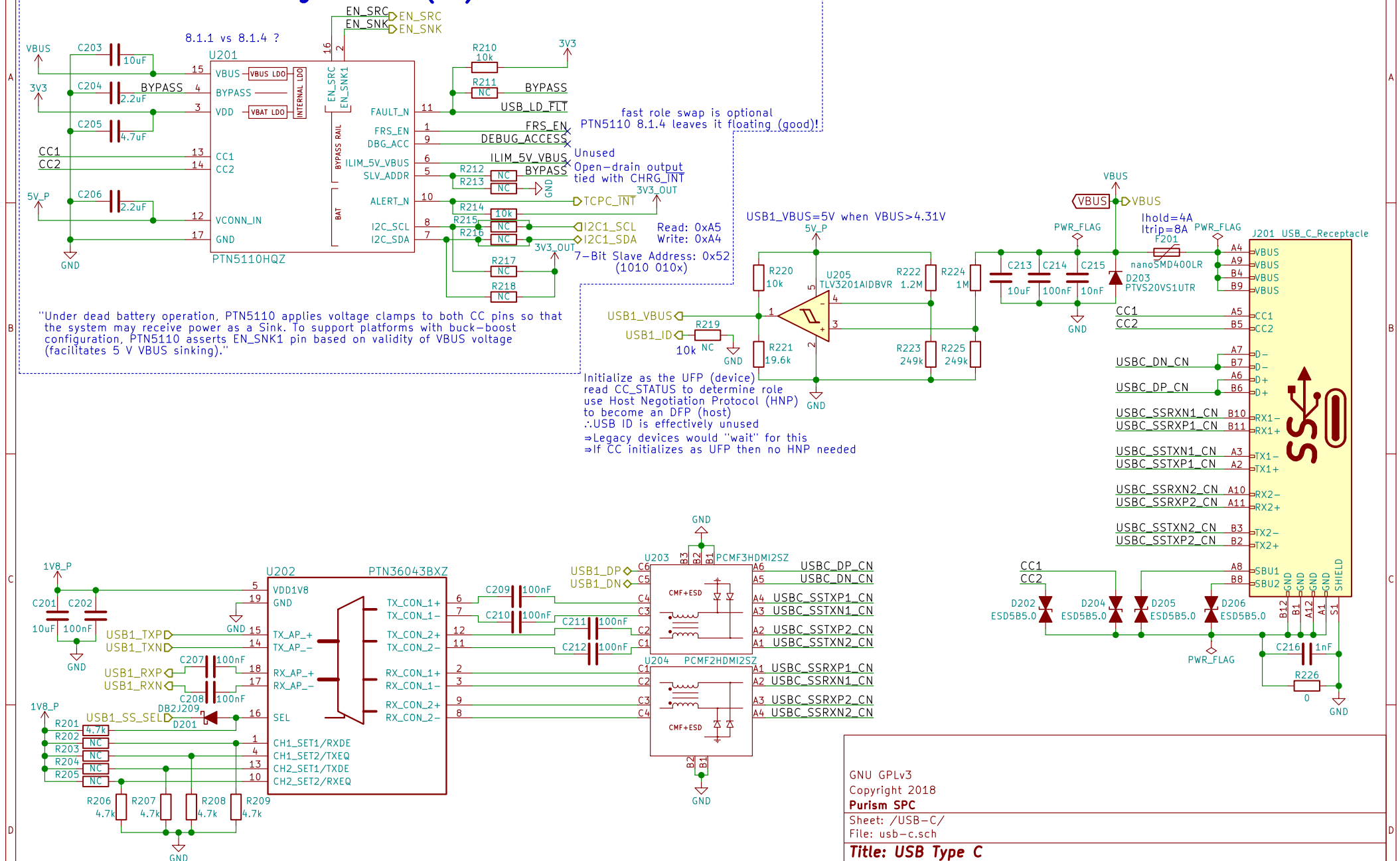


USB-C TCPC – Config Channel (CC) and PD Role Controller



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Purism SPC
Sheet: /USB-C
File: usb-c.sch

Title: USB Type C

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

Rev: v0.1.0
Id: 2/24



Drawing ~333.33mA, VBAT

or consuming $<1.2W$,
should give close to
10 hours going from
100% to 0% charge

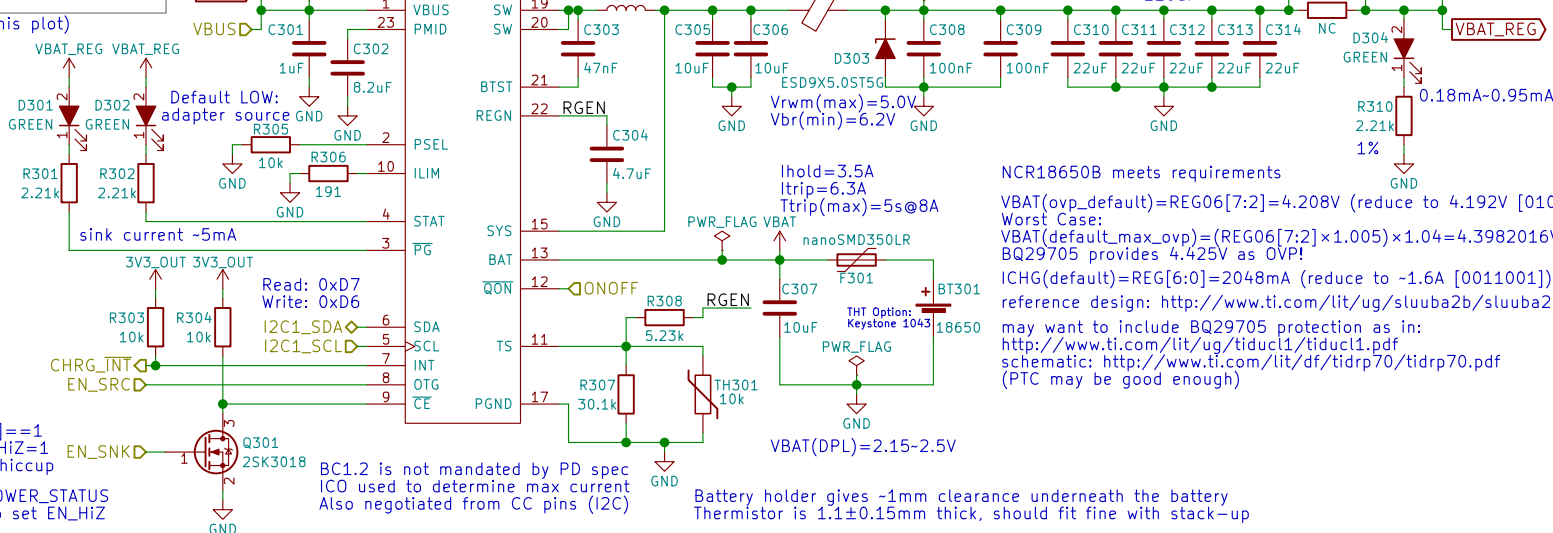
 $1.658 < \text{ILIM} < 2.063$
$$1.658 \leq I_{LIM} \leq 2.065$$

$$I_{LIM}(\text{nom}) \cong 1.859A$$

$$3.9 \leq V_{IN} \leq 14$$

11301 BQ25806 1(Lsat) 1301

L301
1uH



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 RTN5110HQ's CC STATUS and POWER STATUS

Also, reading PTN5110HQ's CC_STAT03 and POWER_STAT03 registers will tell TCPM (i.MX8M) when to set OTG_CONFIG=1 (this will also happen when PTN5110HQ sets EN_SRC HIGH)

Battery holder seems to fit up to ~68.88mm long batteries

need to test 18650 protected cells which are ~69.35mm long

Sheet: /Battery/
File: battery.sch

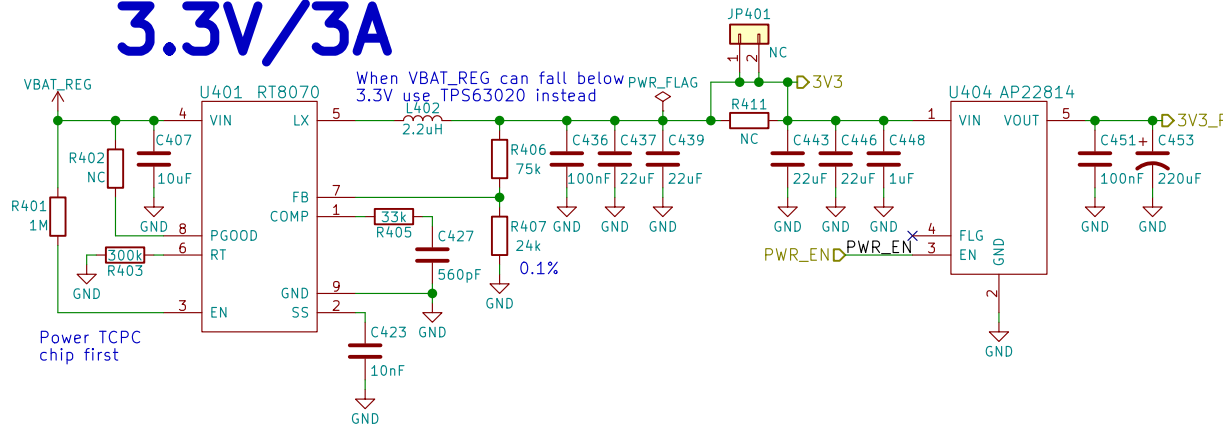
Size: A4

KiCad E.D.A. kicad 4.0.7

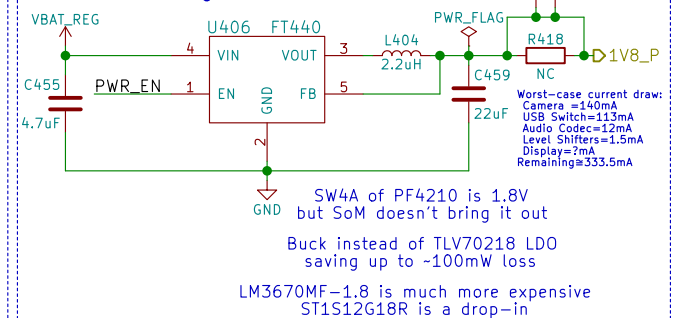
4

Id: 3/24

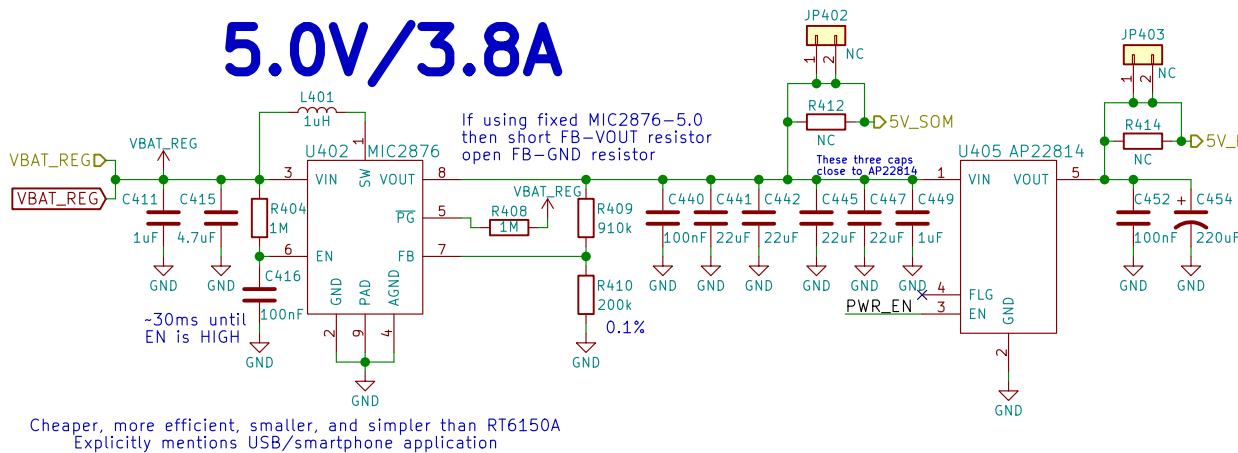
3.3V/3A



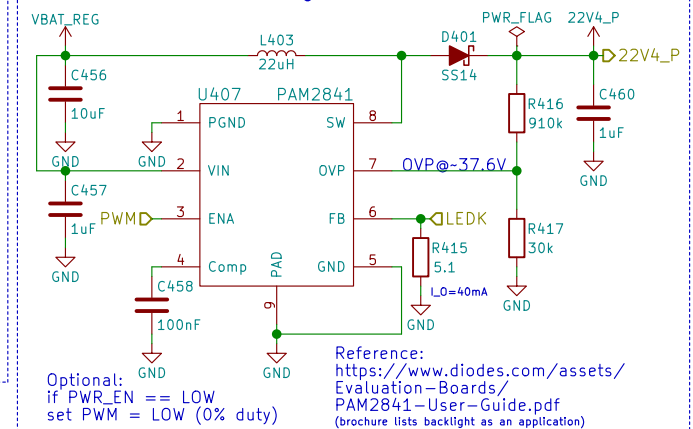
1.8V/600mA



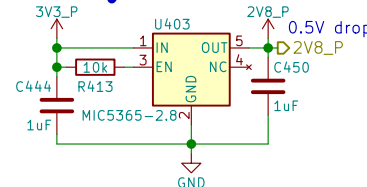
5.0V/3.8A



22.4V/40mA



2.8V/150mA



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Sheet: /Power/
File: power.sch

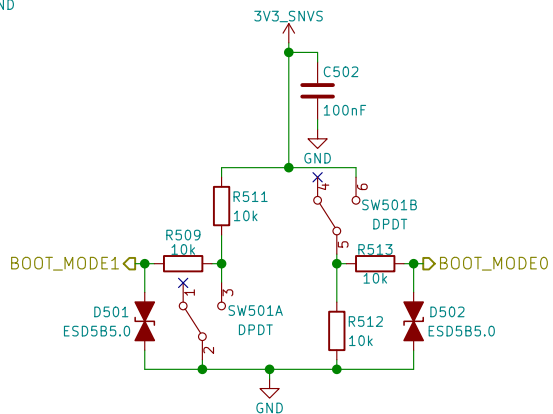
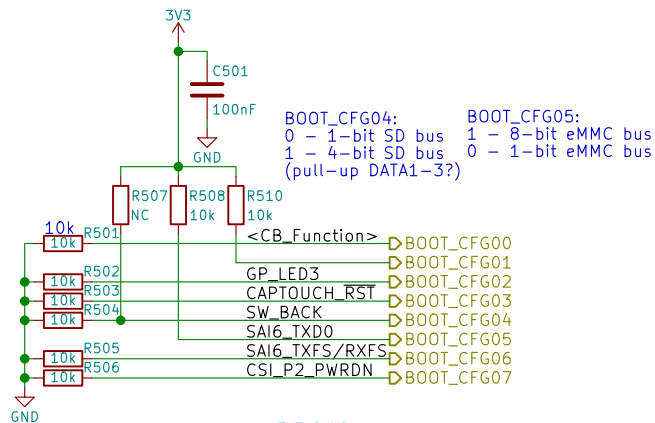
Title: Power

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

Date: 2018-06-06

Rev: v0.1.0

Id: 4/24

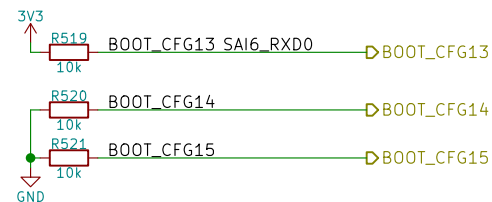
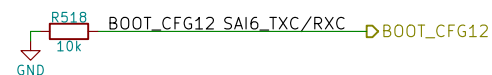
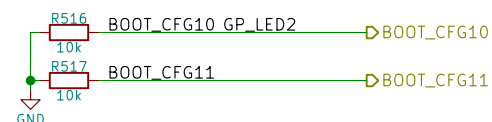
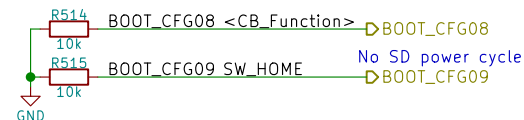


2->1: eMMC 2->3: USB (Serial Downloader)	
BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

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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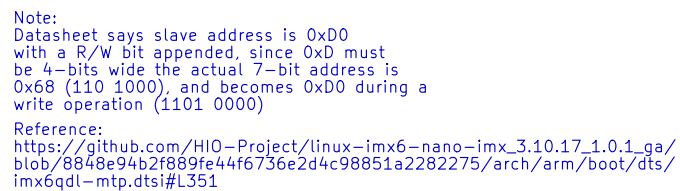
Purism SPC

Sheet: /Boot Config/
 File: boot.sch

Title: Boot Configuration

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

Rev: v0.1.0
 Id: 5/24



Id: 6/24

Id: 7/24



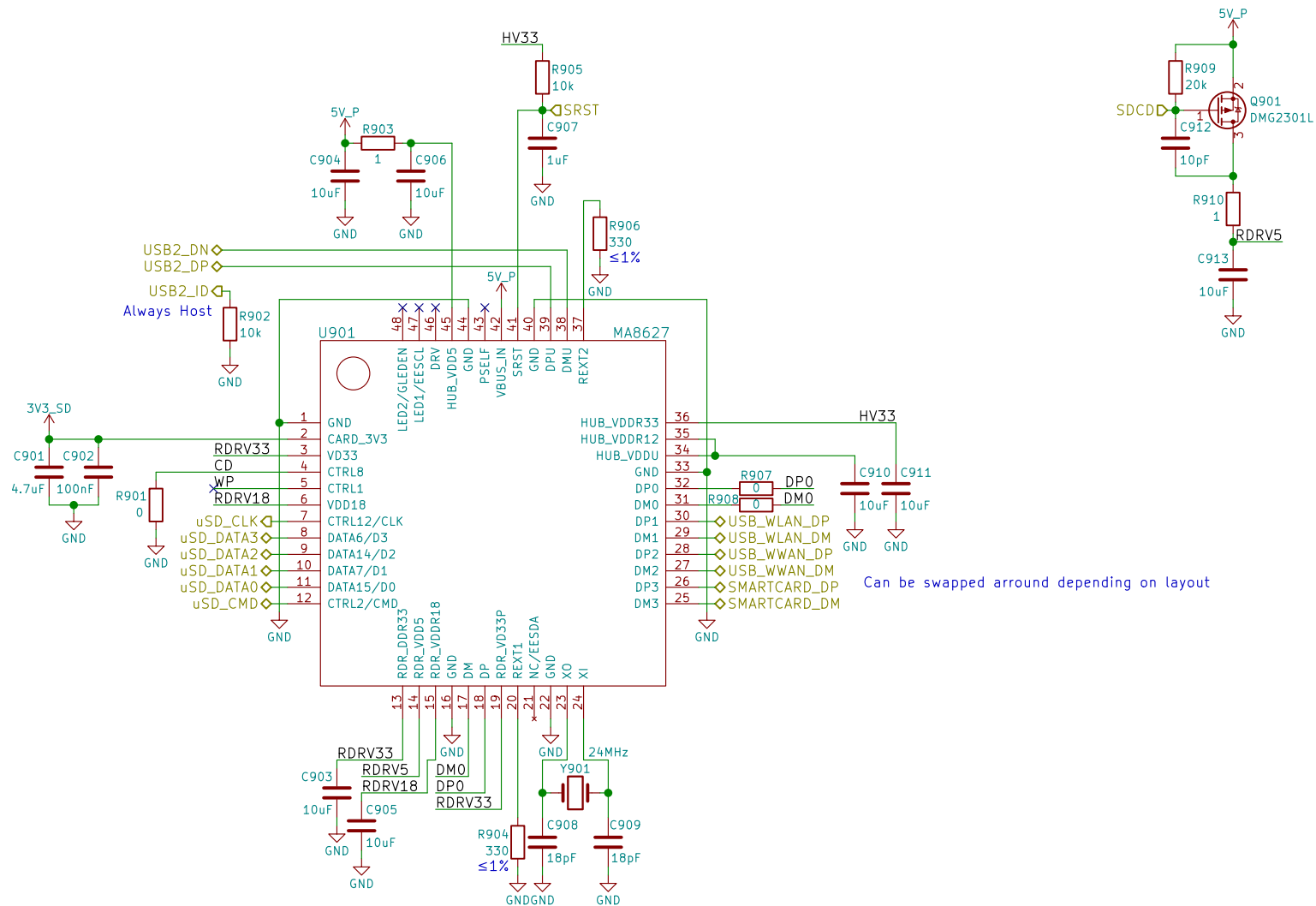
GNU GPLv3
Copyright 2018
Purism SPC
Sheet: /JTAG/
File: jtag.sch

Title: JTAG

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

Date: 2018-06-06

Rev: v0.1.0
Id: 8/24



GNU GPLv3
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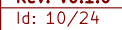
Purism SPC

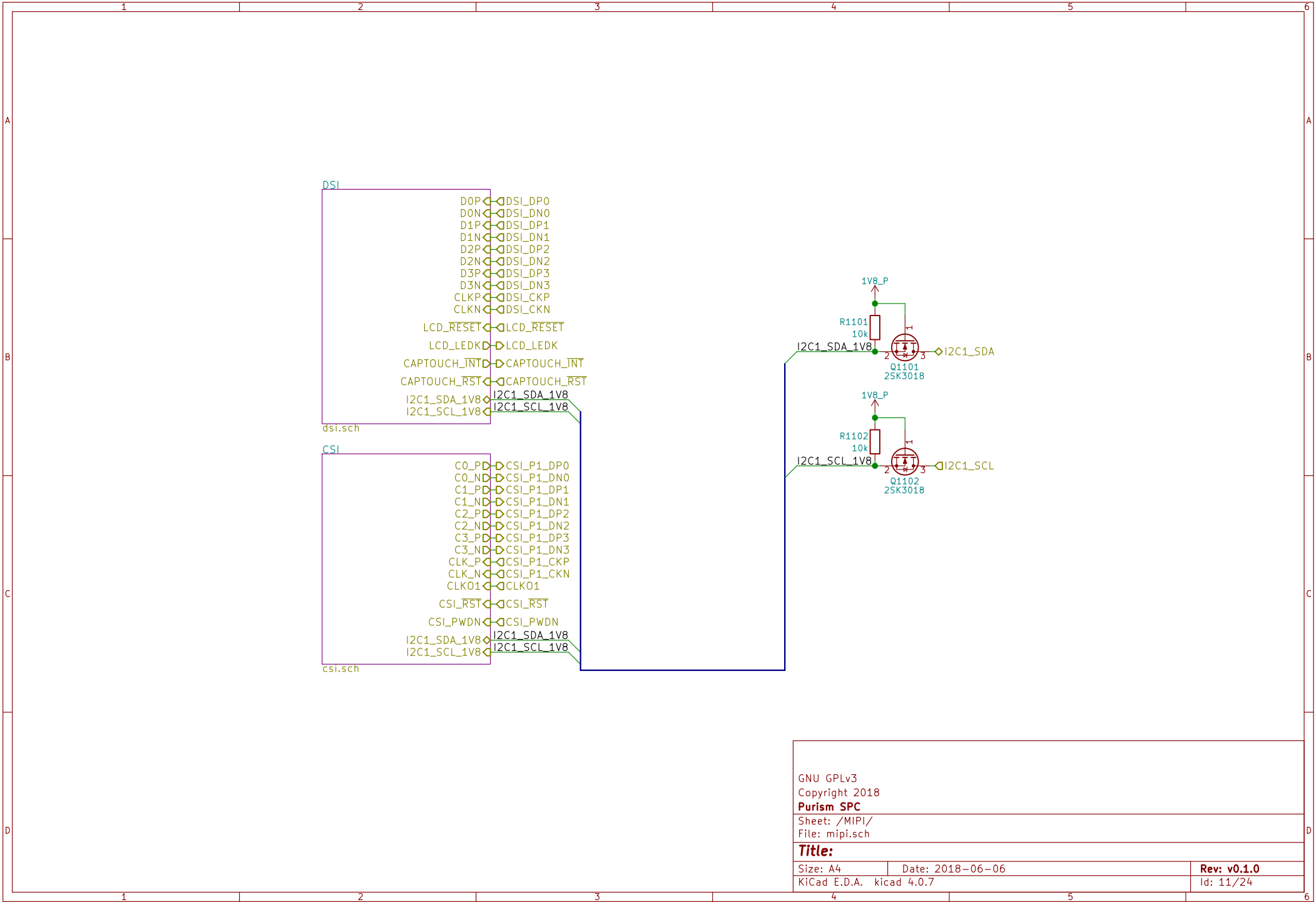
Sheet: /USB Hub + SDIO Bridge/
File: usb_hub_sdio.sch

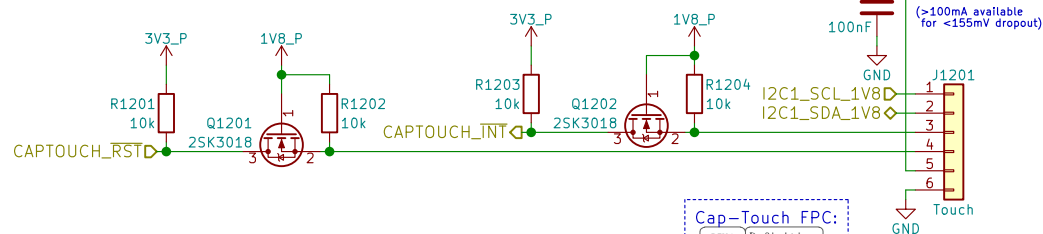
Title:

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

Rev: v0.1.0
Id: 9/24



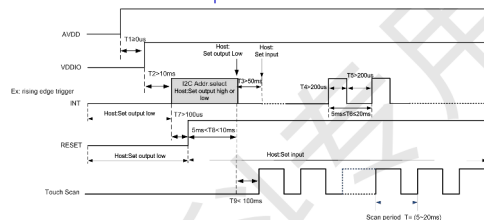




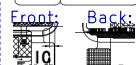
The upper 7 bits are the address, and bit 0 is used to select read or write. GT5688 has two slave device addresses to choose from:

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:

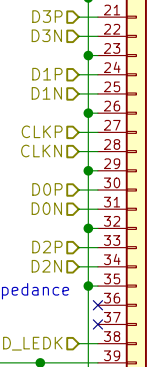
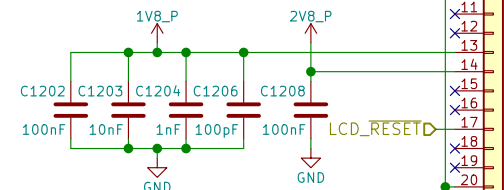


Pin#	Definition
1	SCL
2	SDA
3	INT
4	RESET
5	VDD2_R5
6	GND

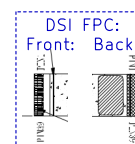
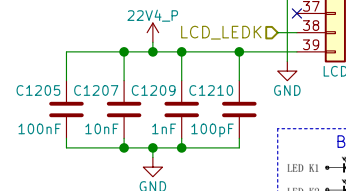


LCD PN:
Shenzhen Jinghong Electronics Co., Ltd.
JH057N00900

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



100Ω Differential Impedance



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Purism SPC

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

Title: MIPI DSI

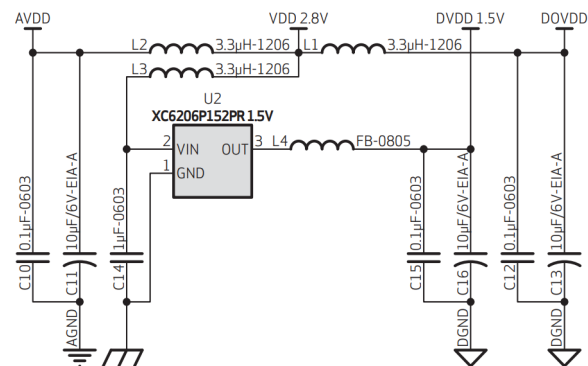
Size: A4 Date: 2018-06-06

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 12/24

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:

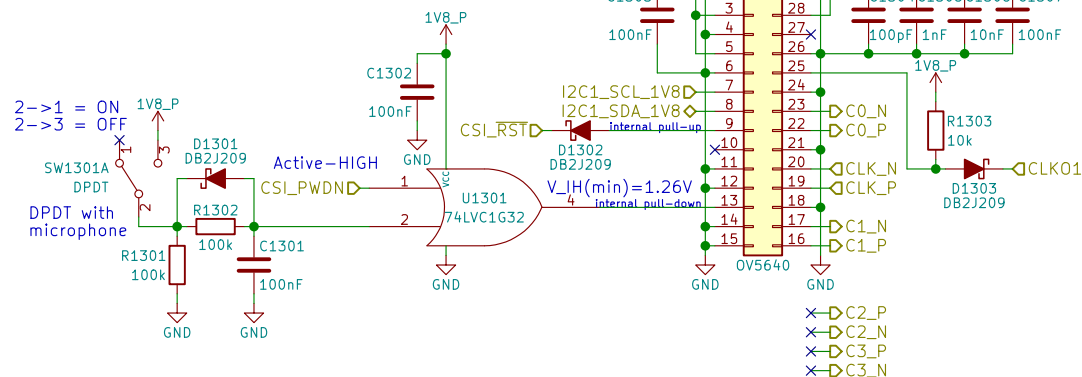
1. when DOVDD and AVDD are turned ON, make sure DOVDD becomes stable before AVDD becomes stable
2. PWDN is active high with an asynchronous design (does not need clock)
3. PWDN pin tied to digital ground if it is not controlled.
4. if PWDN pin is controlled as below, for PWDN to go low, power must first become stable (AVDD to PWDN ≥ 5 ms)
5. RESETB is active low with an asynchronous 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



Camera PN:
 Truly C08725-B5SA-E
 7-bit Slave Address: 0x78
 (1111 000x)
 Read: 0xF1
 Write 0xF0

OV5640 CMOS Image Sensor Datasheet:
https://cdn.sparkfun.com/datasheets/Sensors/LightImaging/OV5640_datasheet.pdf

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Purism SPC

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

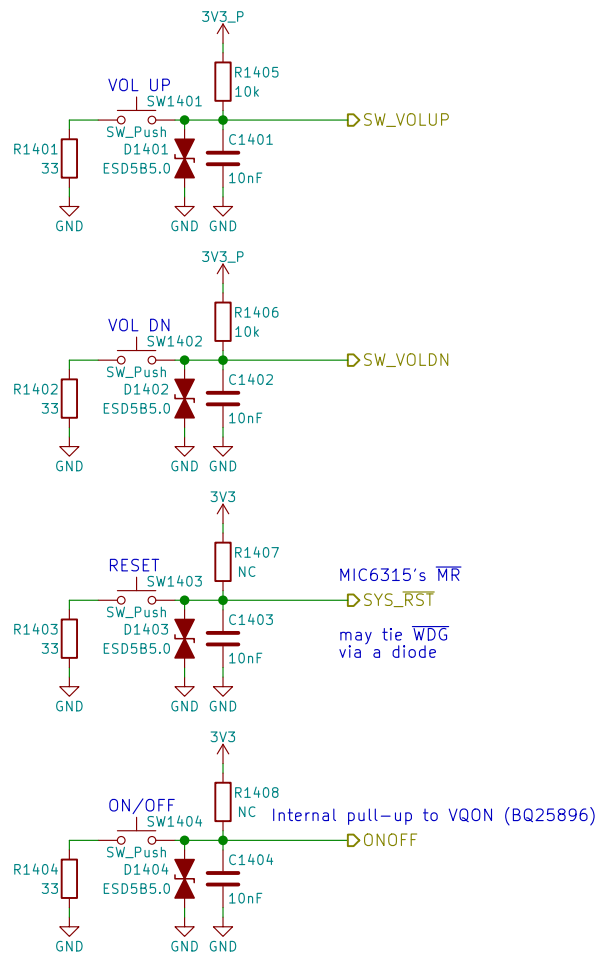
Title:

Size: A4 Date: 2018-06-06

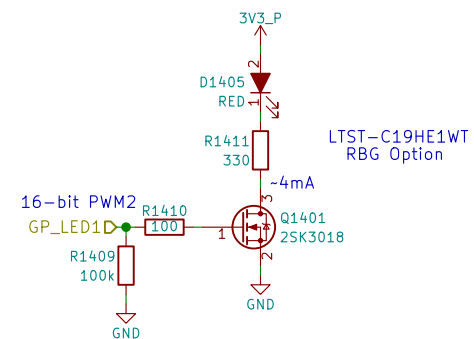
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 13/24



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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Purism SPC

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

Title: Buttons & LED

Size: A4 Date: 2018-06-06

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 14/24

RGMII 10/100/1000 Ethernet

GNU GPLv3
Copyright 2018
Purism SPC
Sheet: /Ethernet/
File: ethernet.sch

Title: Ethernet	
Size: A4	Date: 2018-06-06
KiCad E.D.A. kicad 4.0.7	Rev: v0.1.0
Id: 17/24	

Id: 17/24

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 for USB!

USB_WLAN_DP
USB_WLAN_DN

WIFI_CLK
WIFI_CMD

WIFI_DATA0
WIFI_DATA1

WIFI_DATA2
WIFI_DATA3

WIFI_WAKE

WIFI_RST

W_DISABLE1

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

1V8_P

VIH=2.31V

3V3_P

BT_HOST_WAKE

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

RS9116 SUSCLK
is a GPIO (unused)

SUSCLK

W_DISABLE2

W_DISABLE1

M2_I2C_SDA

M2_I2C_SCL

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

internal 10k pull-up

1V8_P

3V3_P

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

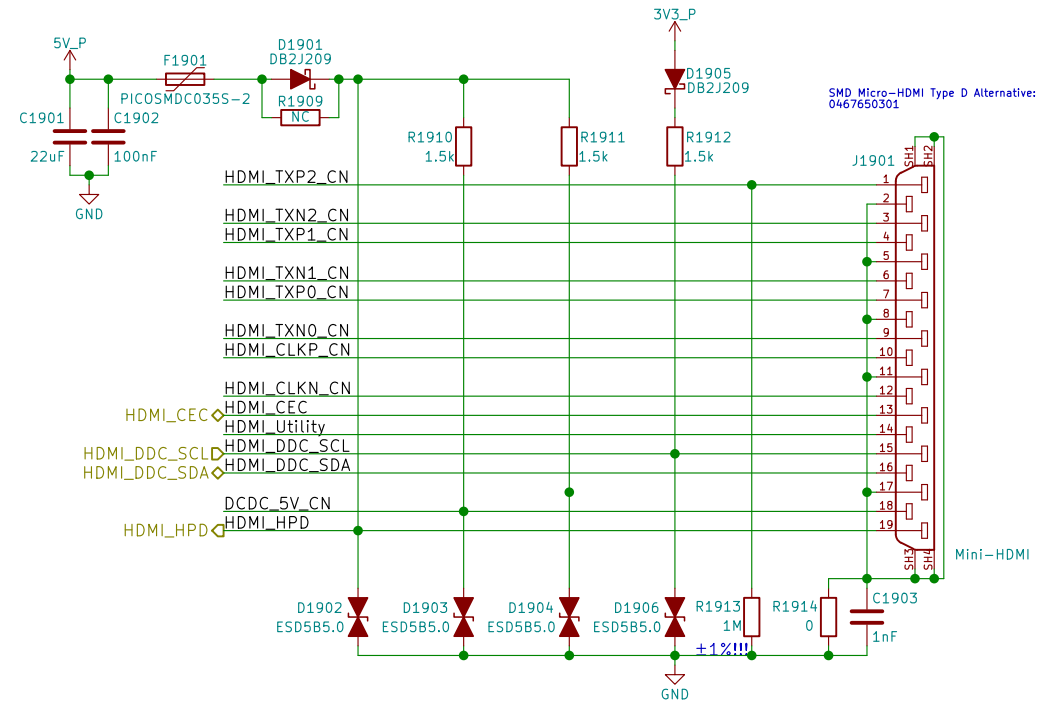
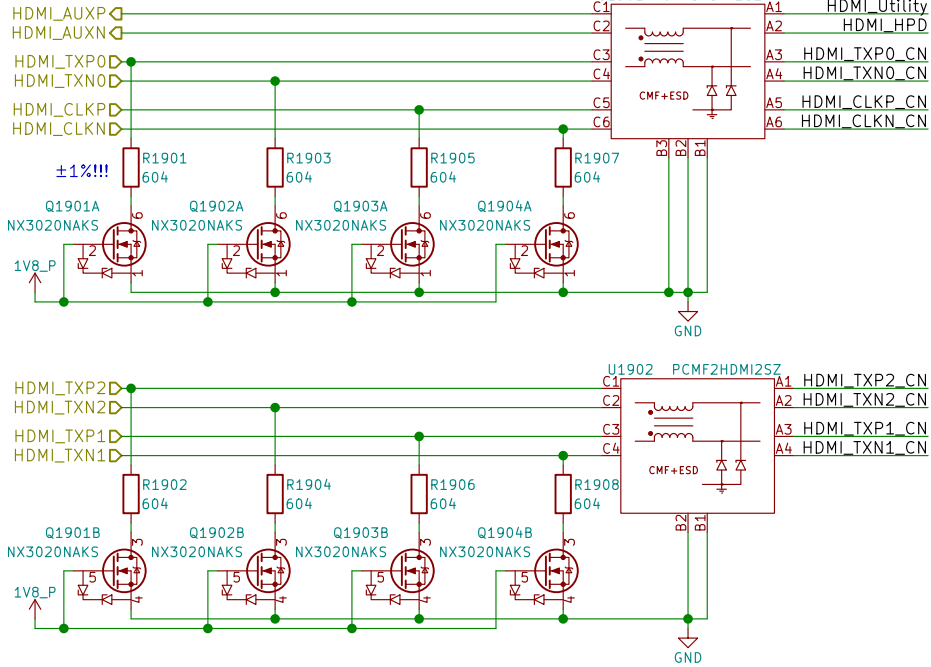
BT_UART_CTS

internal 10k pull-up

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

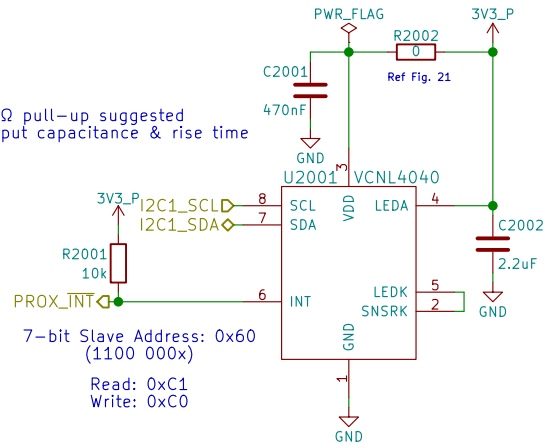
Size: A4
KiCad E.D.A. kicad 4.0.7

Date: 2018-06-06

Rev: v0.1.0
Id: 19/24

Proximity & Ambient Light

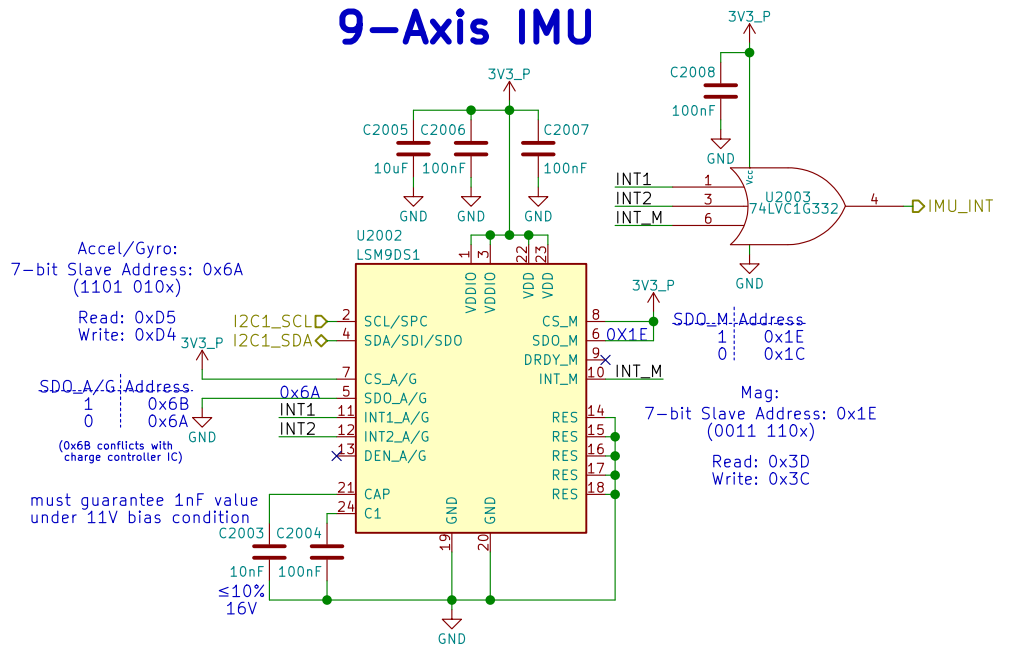
Note:
I2C 2.2kΩ pull-up suggested
check input capacitance & rise time



7-bit Slave Address: 0x60
(1100 000x)
Read: 0xC1
Write: 0xC0

Reference:
<https://www.vishay.com/docs/84307/designingvcnl4040.pdf>
<http://www.vishay.com/docs/84931/vcni4040sensorboardfiles.pdf>

9-Axis IMU



Accel/Gyro:
7-bit Slave Address: 0x6A
(1101 010x)
Read: 0xD5
Write: 0xD4

SDD_A/G: Address:
1 0x6B
0 0x6A
(0x6B conflicts with
charge controller IC)

must guarantee 1nF value
under 11V bias condition

Mag:
7-bit Slave Address: 0x1E
(0011 110x)
Read: 0x3D
Write: 0x3C

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)

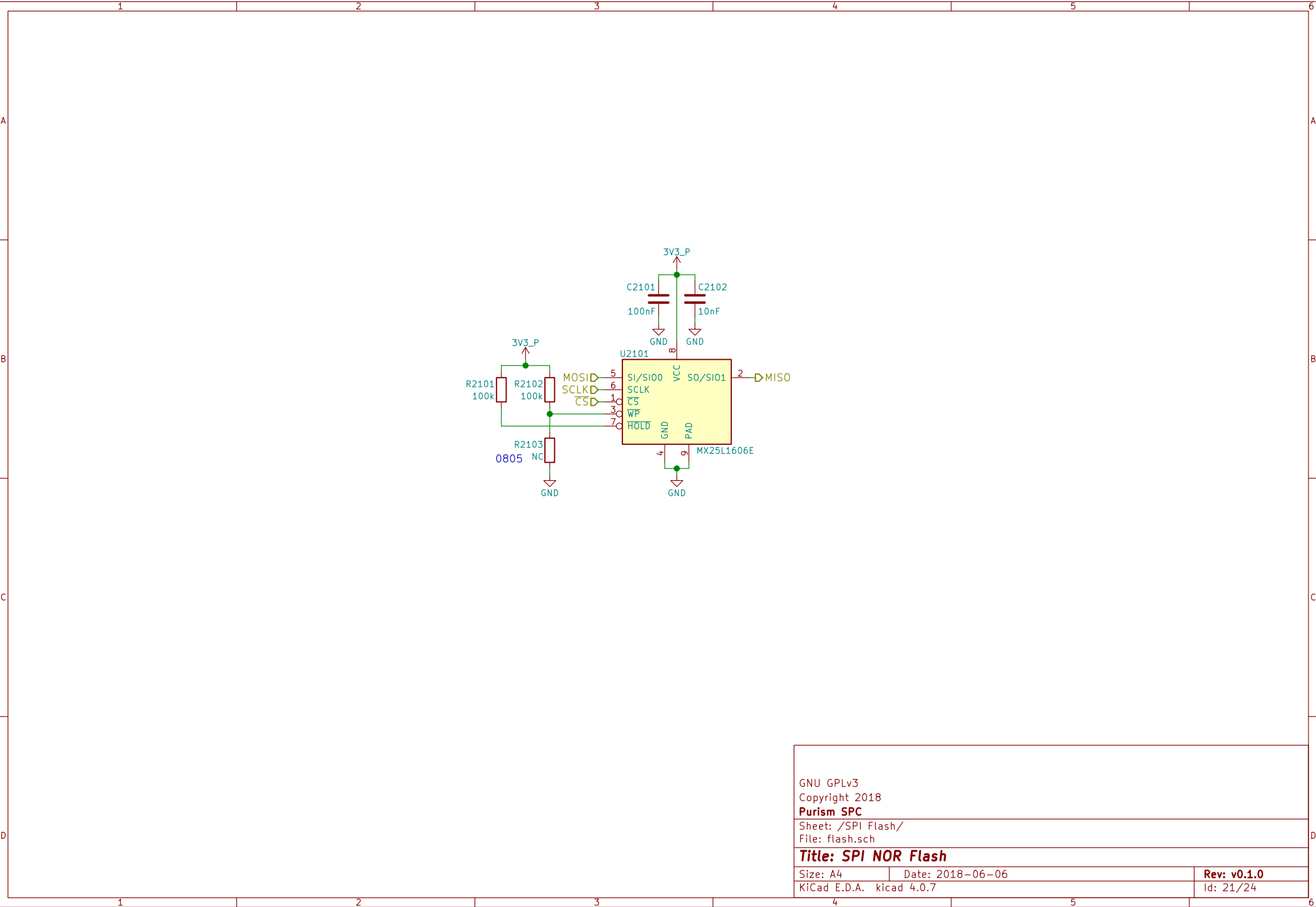
GNU GPLv3
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Purism SPC

Sheet: /Sensors/
File: sensors.sch

Title: Sensors

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

Rev: v0.1.0
Id: 20/24



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Sheet: /SPI Flash/

File: flash.sch

Title: SPI NOR Flash

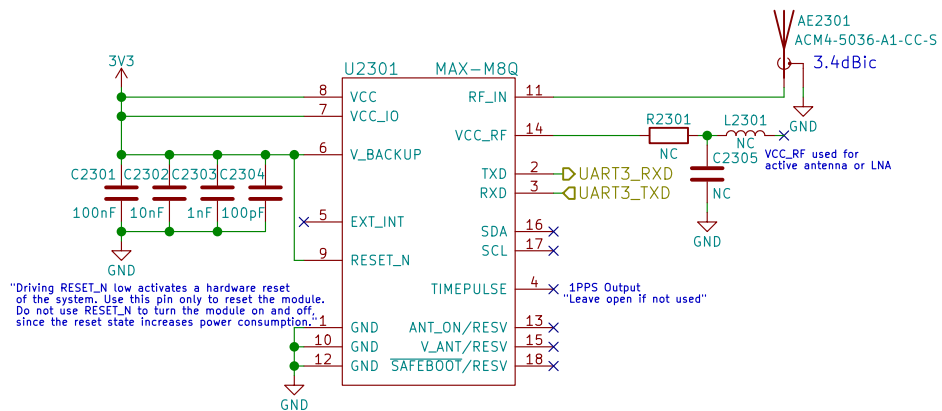
Size: A4

Date: 2018-06-06

Rev: v0.1.0

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Id: 21/24



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Sheet: /GNSS/

File: gnss.sch

Title: GNSS

Size: A4 Date: 2018-06-06

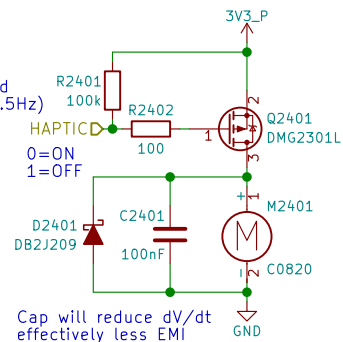
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 23/24

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)!

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

Motor Source:
https://www.alibaba.com/product-detail/Coin-motor-vibration-dc-motor-cellphone_1994583657.html?spm=a2700.8443308.0.0.5aa13e5f1wxHgs
 Motor Datasheet:
<https://cloud.puri.sm/s/z8JR6DJ4KrJYzoW>

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Sheet: /Haptic Motor/
 File: haptic.sch

Title: Haptic/Vibration Motor

Size: A4 Date: 2018-06-06

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 24/24