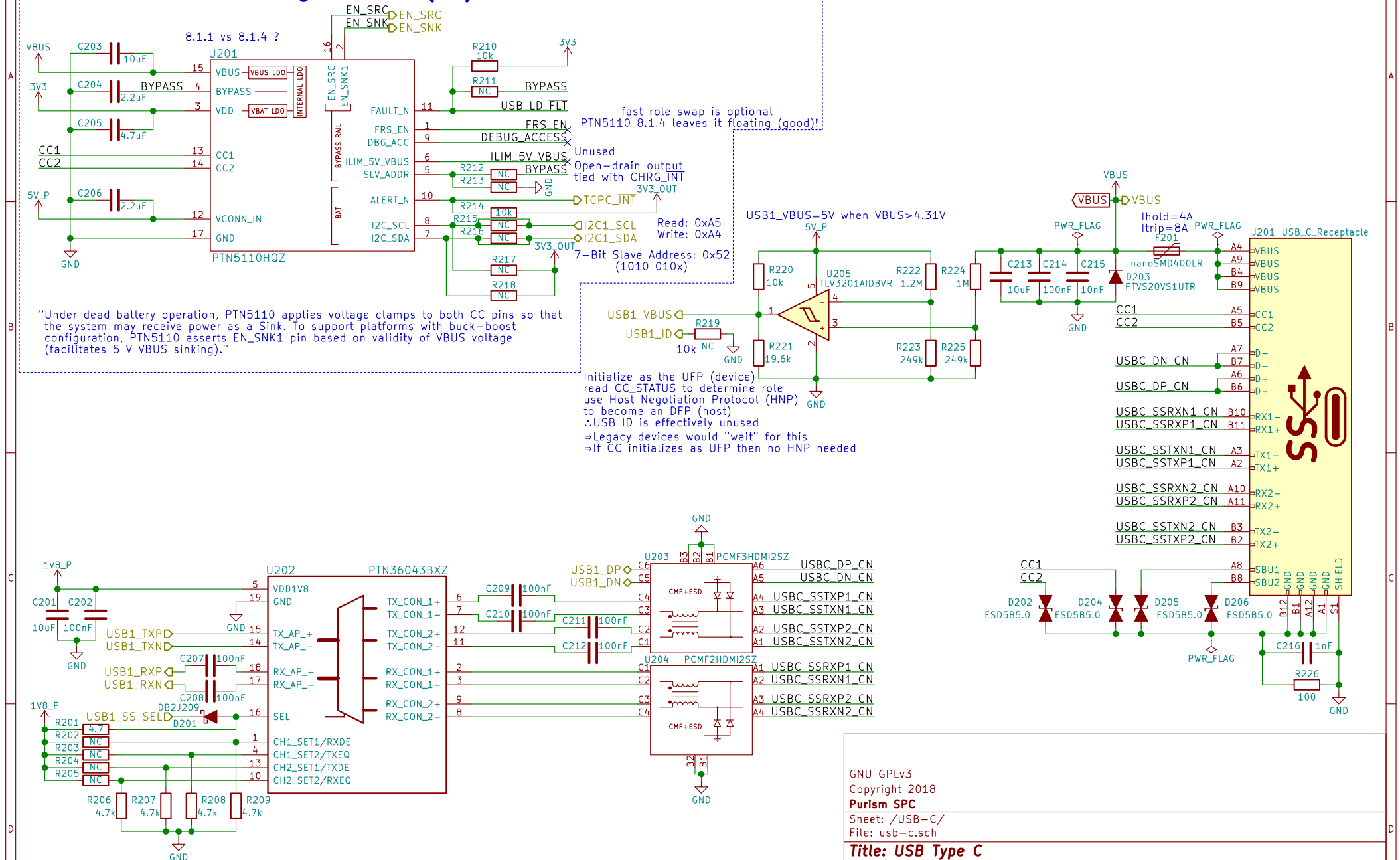


USB-C TCPC – Config Channel (CC) and PD Role Controller

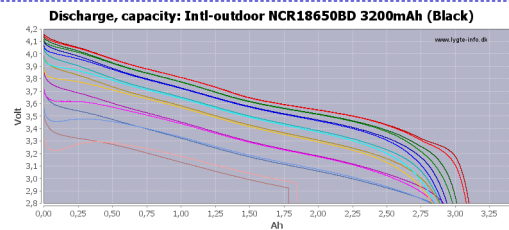


Purism SPC

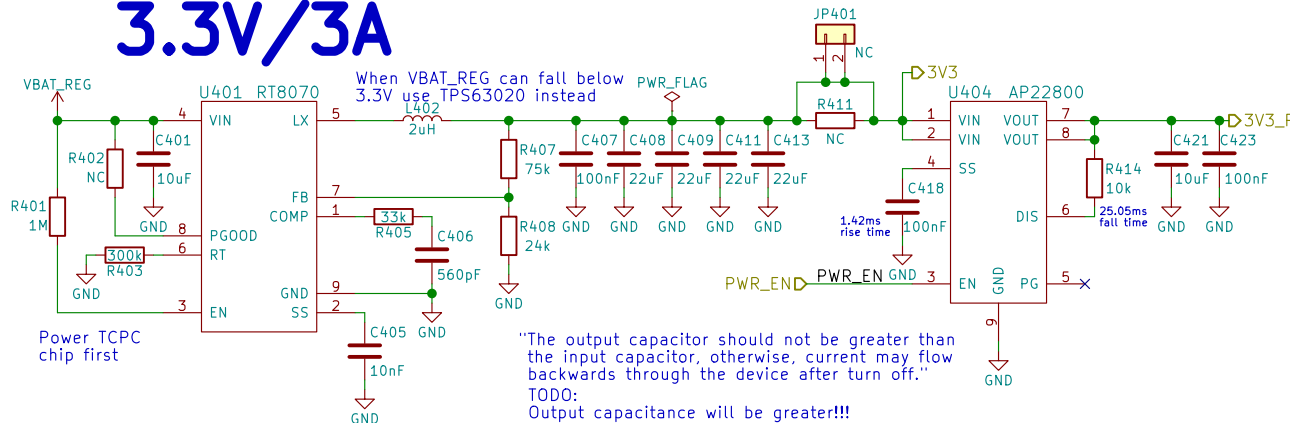
Title: USB Type C

Size: A4	Date: 2018-06-01
KiCad E.D.A. kicad 4.0.7	

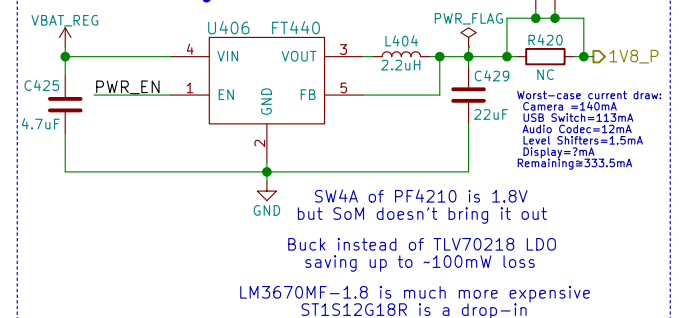
Rev: v0.1.0
Id: 2/24



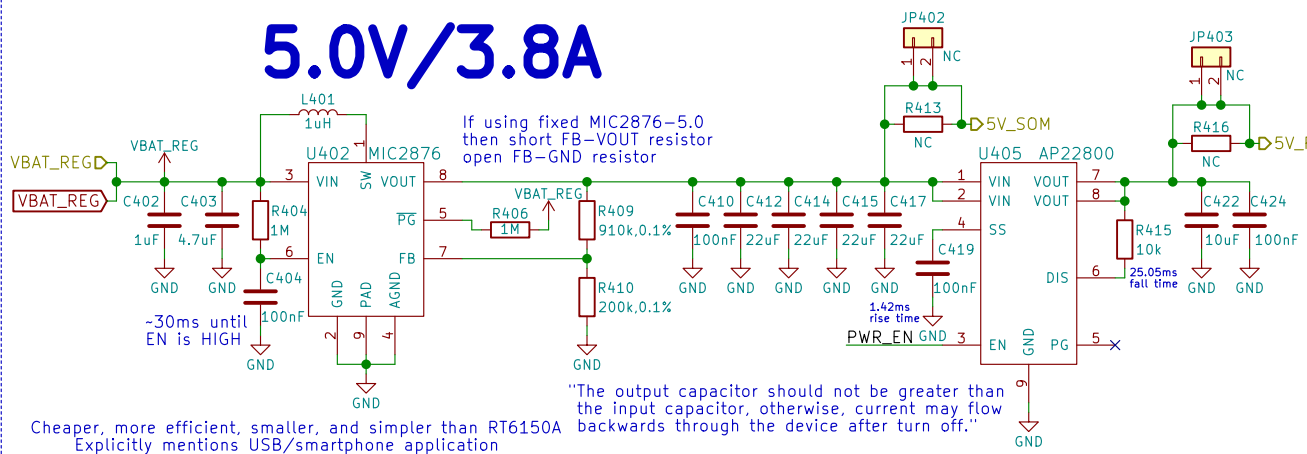
3.3V/3A



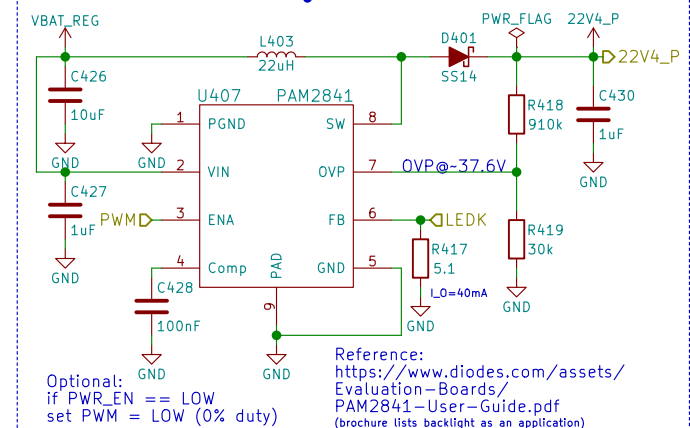
1.8V/600mA



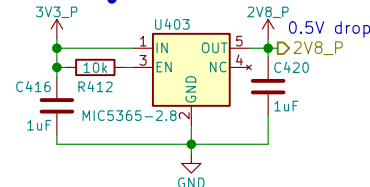
5.0V/3.8A



22.4V/40mA



2.8V/150mA



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

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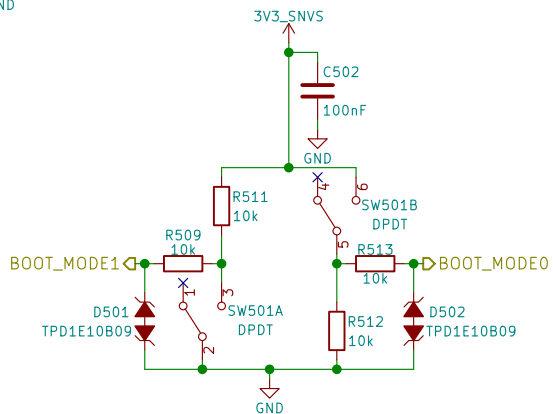
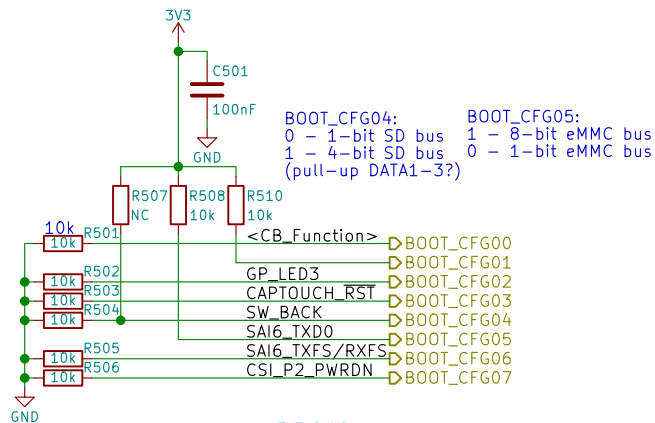
Sheet: /Power/
File: power.sch

Title: Power

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

Date: 2018-06-01

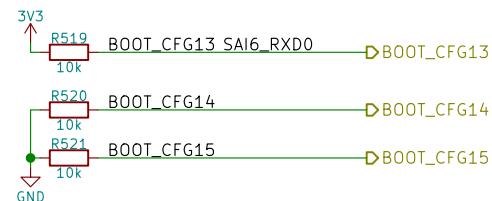
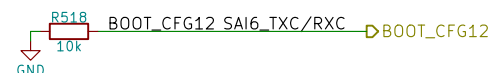
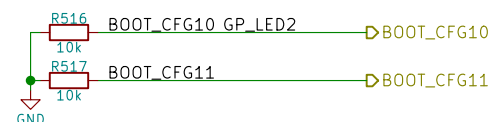
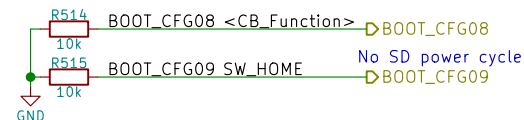
Rev: v0.1.0
Id: 4/24



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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Sheet: /Boot Config/
File: boot.sch

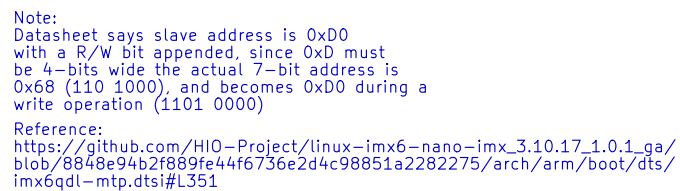
Title: Boot Configuration

Size: A4 Date: 2018-06-01

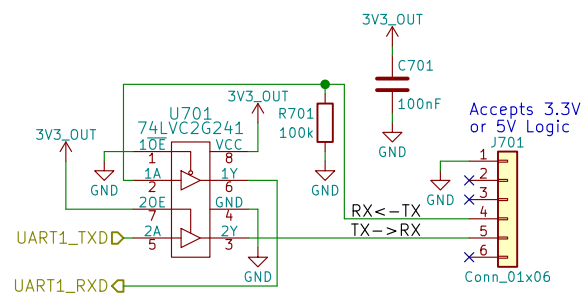
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 5/24



Id: 6/24



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Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

Size: A4 Date: 2018-06-01

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 7/24



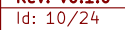
GNU GPLv3
Copyright 2018
Purism SPC
Sheet: /JTAG/
File: jtag.sch

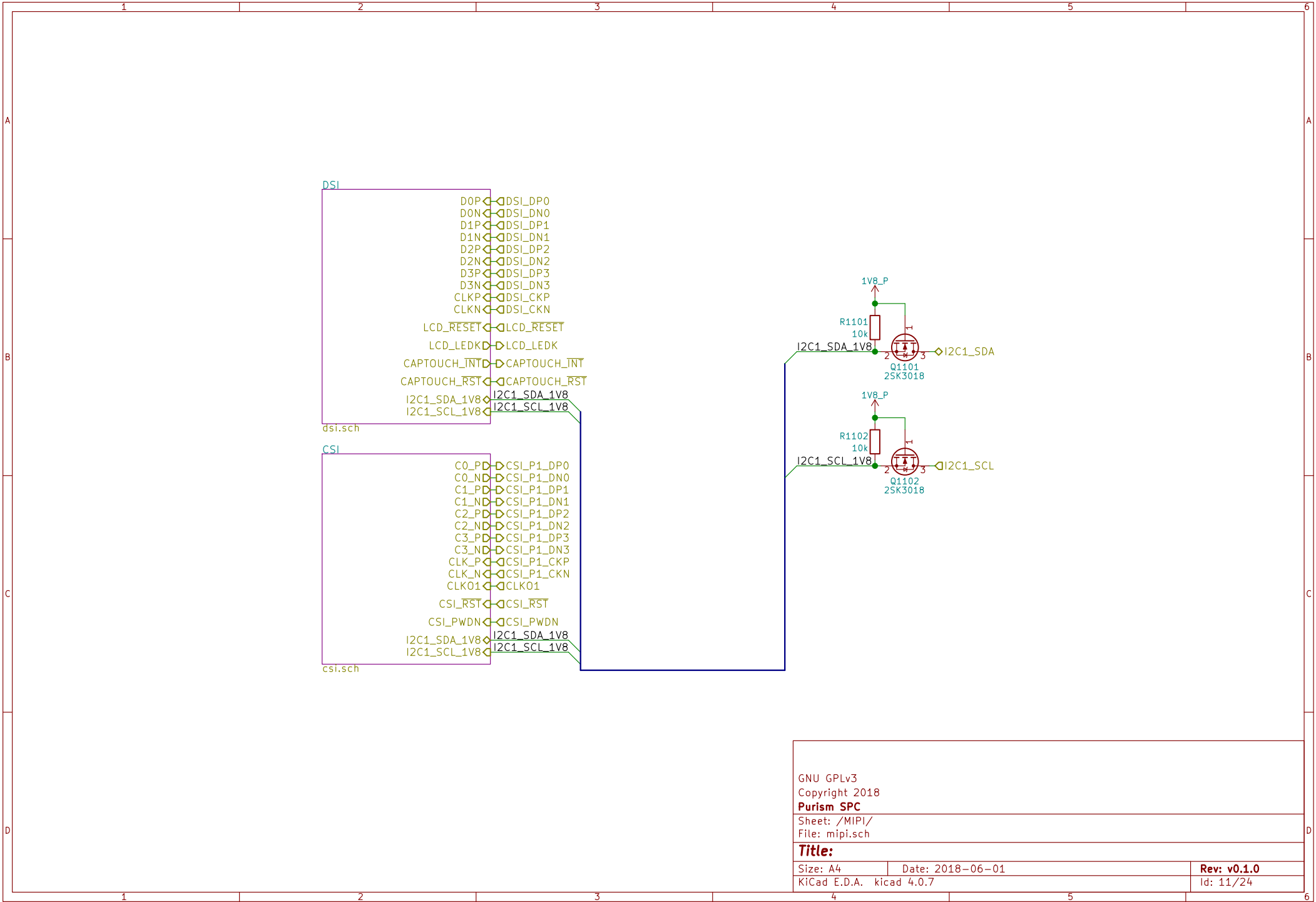
Title: JTAG

Size: A4 Date: 2018-06-01
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 8/24

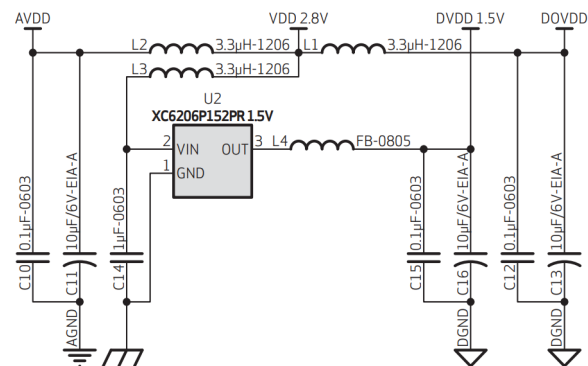
Id: 9/24





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:

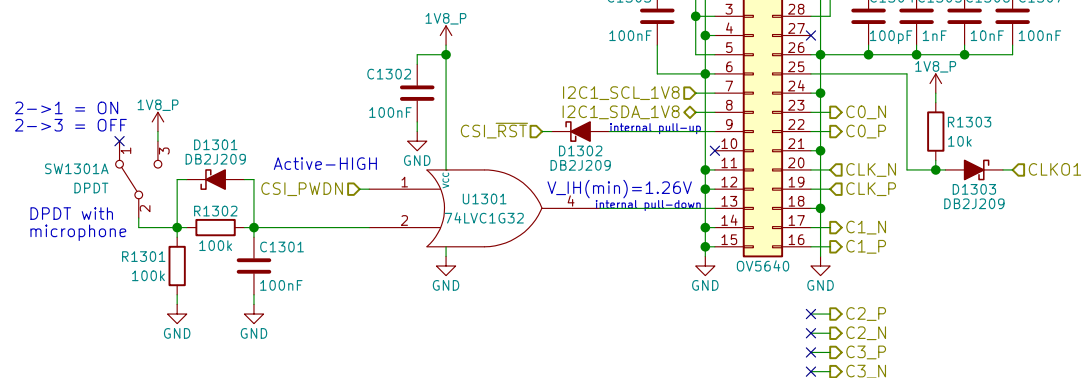
1. when DOVDD and AVDD are turned ON, make sure DOVDD becomes stable before AVDD becomes stable
2. PWDN is active high with an asynchronized design (does not need clock)
3. PWDN pin tied to digital ground if it is not controlled.
4. if PWDN pin is controlled as below, for PWDN to go low, power must first 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 AVDD off to PWDN
 $t_2 \geq 5$ ms, delay from PWDN high to RESETB pull up, 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



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

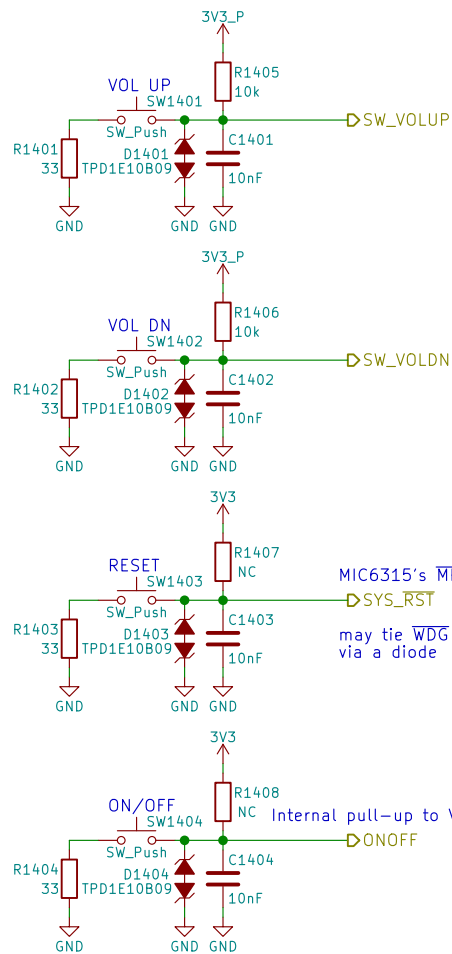
Title:

Size: A4 Date: 2018-06-01

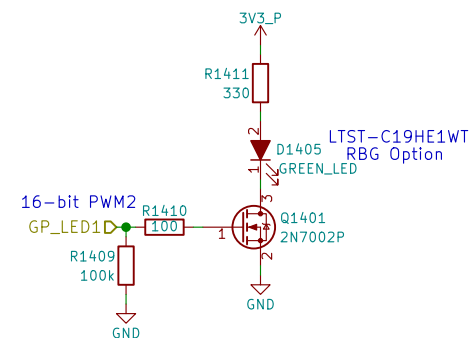
KiCad E.D.A. kicad 4.0.7

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

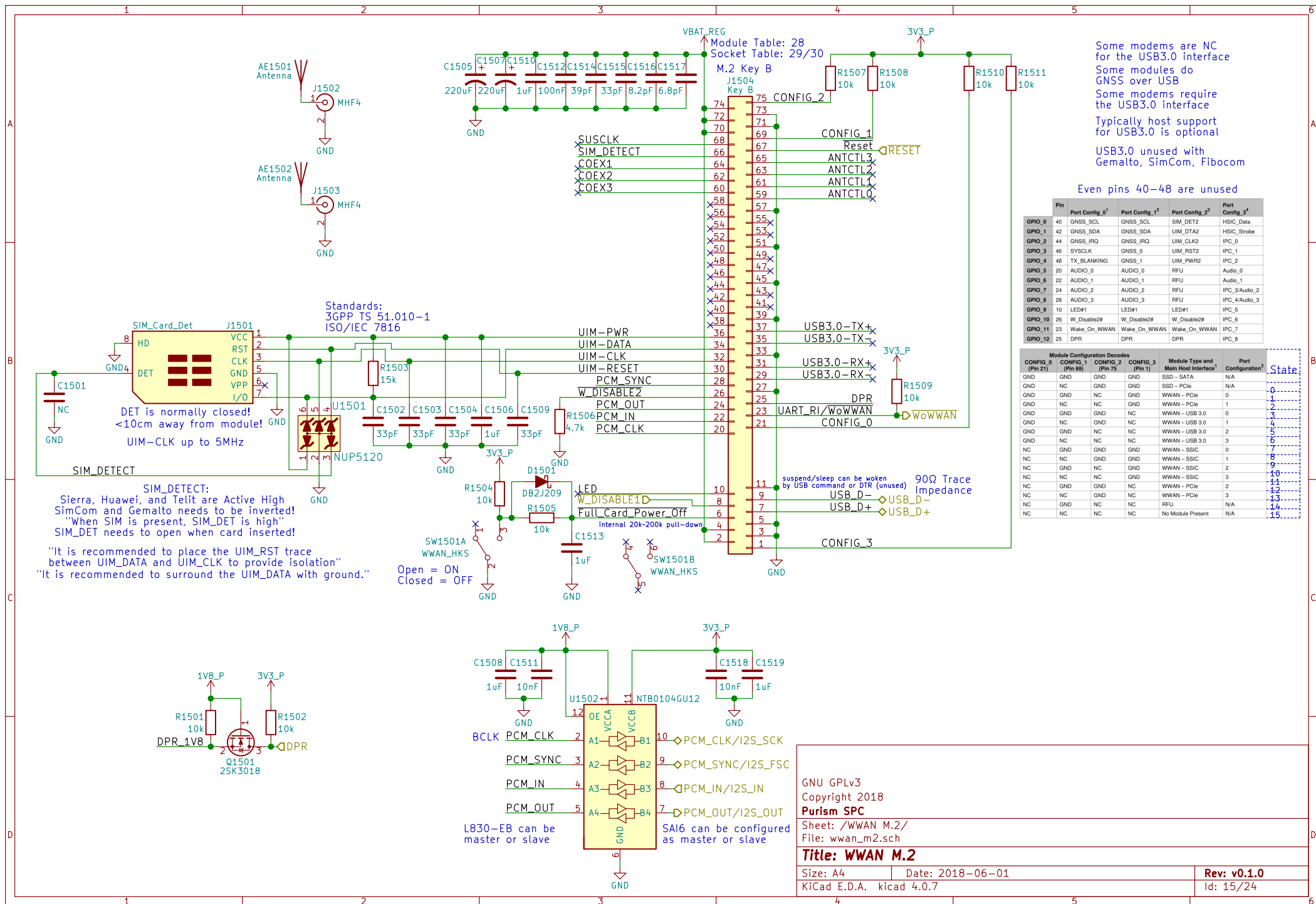
Title: Buttons & LED

Size: A4 Date: 2018-06-01

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 14/24



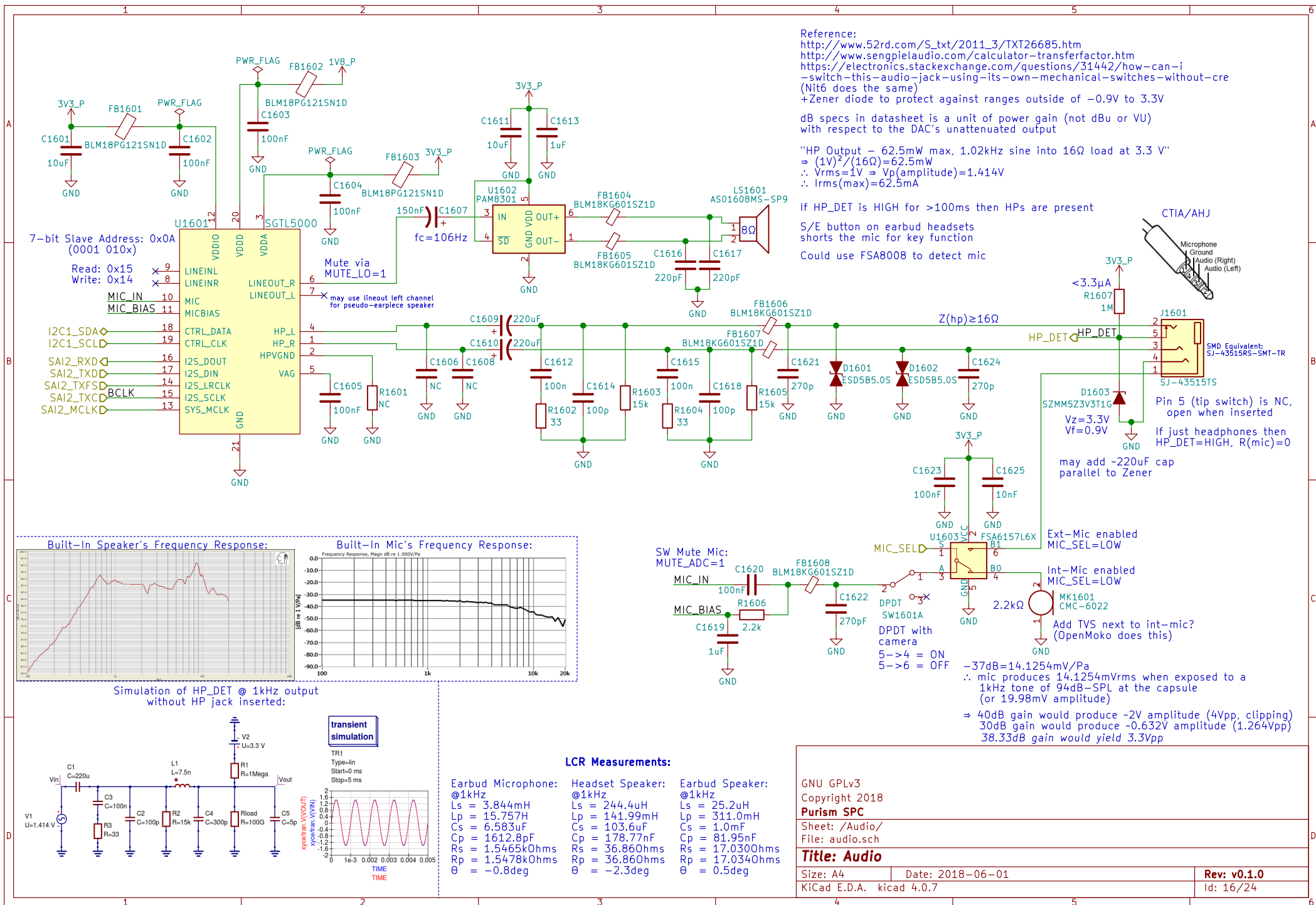
Some modems are NC for the USB3.0 interface
Some modules do GNSS over USB
Some modems require the USB3.0 interface
Typically host support for USB3.0 is optional
USB3.0 unused with Gemalto, SimCom, Fibocom

Even pins 40-48 are unused

	Pin	Port Config_0 ¹	Port Config_1 ²	Port Config_2 ³	Port Config_3 ⁴
GPIO_0	40	GNSS_SCL	GNSS_SCL	SIM_DET2	HSIC_Data
GPIO_1	42	GNSS_SDA	GNSS_SDA	UIM_DTA2	HSIC_Strobe
GPIO_2	44	GNSS_IRQ	GNSS_IRQ	UIM_CLK2	IPC_0
GPIO_3	46	SYSClk	GNSS_0	UIM_RST2	IPC_1
GPIO_4	48	TX_BLANKING	GNSS_1	UIM_PWR2	IPC_2
GPIO_5	20	AUDIO_0	AUDIO_0	RFU	Audio_0
GPIO_6	22	AUDIO_1	AUDIO_1	RFU	Audio_1
GPIO_7	24	AUDIO_2	AUDIO_2	RFU	IPC_3/Audio_2
GPIO_8	28	AUDIO_3	AUDIO_3	RFU	IPC_4/Audio_3
GPIO_9	10	LED#1	LED#1	LED#1	IPC_5
GPIO_10	26	W_Disable2#	W_Disable2#	W_Disable2#	IPC_6
GPIO_11	23	Wake_On_WWAN	Wake_On_WWAN	Wake_On_WWAN	IPC_7
GPIO_12	25	DPR	DPR	DPR	IPC_8

CONFIG_0 (Pin 21)	CONFIG_1 (Pin 69)	CONFIG_2 (Pin 75)	CONFIG_3 (Pin 1)	Module Type and Main Host Interface ¹	Port Configuration ²	State
GND	GND	GND	GND	SSD - SATA	N/A	0
GND	NC	GND	GND	SSD - PCIe	N/A	1
GND	GND	NC	GND	WWAN - PCIe	0	2
GND	NC	NC	GND	WWAN - PCIe	1	3
GND	GND	GND	NC	WWAN - USB 3.0	0	4
GND	NC	GND	NC	WWAN - USB 3.0	1	5
GND	GND	NC	NC	WWAN - USB 3.0	2	6
GND	NC	NC	NC	WWAN - USB 3.0	3	7
NC	GND	GND	GND	WWAN - SSIC	0	8
NC	NC	GND	GND	WWAN - SSIC	1	9
NC	GND	NC	GND	WWAN - SSIC	2	10
NC	NC	NC	GND	WWAN - SSIC	3	11
NC	GND	GND	NC	WWAN - PCIe	2	12
NC	NC	GND	NC	WWAN - PCIe	3	13
NC	GND	NC	NC	RFU	N/A	14
NC	NC	NC	NC	No Module Present	N/A	15

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Purism SPC
Sheet: /WWAN M.2/
File: wwan_m2.sch
Title: WWAN M.2
Size: A4 Date: 2018-06-01
KiCad E.D.A. kicad 4.0.7
Rev: v0.1.0
Id: 15/24



RGMII 10/100/1000 Ethernet

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

Title: Ethernet

Size: A4	Date: 2018-06-01	Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7		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

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

BT_UART_RXD

BT_UART_TXD

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

BT_UART_RTS

BT_UART_CTS

Module: Table 23
Socket: Table 46

M.2 Key E

3V3_P

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Module: Table 23
Socket: Table 46

M.2 Key E

3V3_P

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Module: Table 23
Socket: Table 46

M.2 Key E

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Module: Table 23
Socket: Table 46

M.2 Key E

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Module: Table 23
Socket: Table 46

M.2 Key E

3V3_P

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Module: Table 23
Socket: Table 46

M.2 Key E

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Module: Table 23
Socket: Table 46

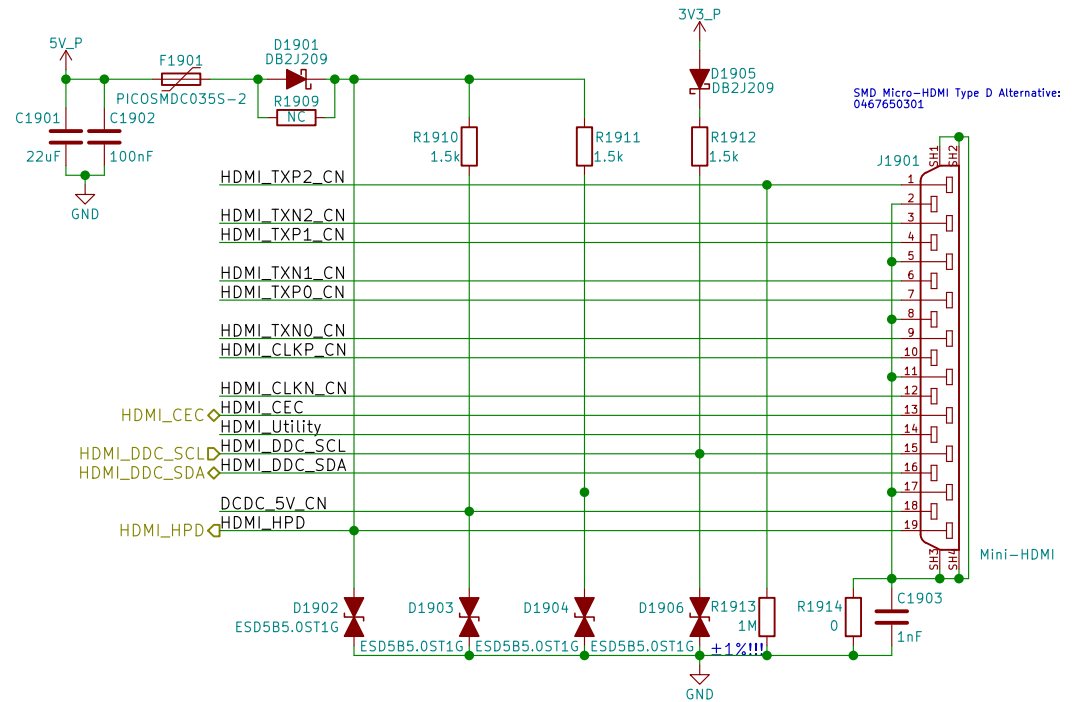
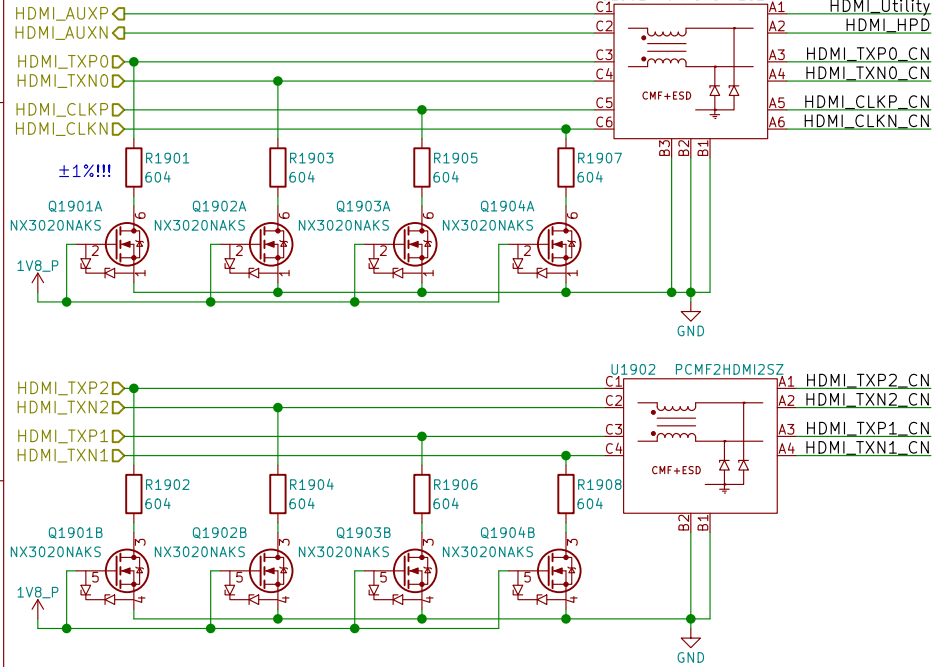
M.2 Key E

3V3_P

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

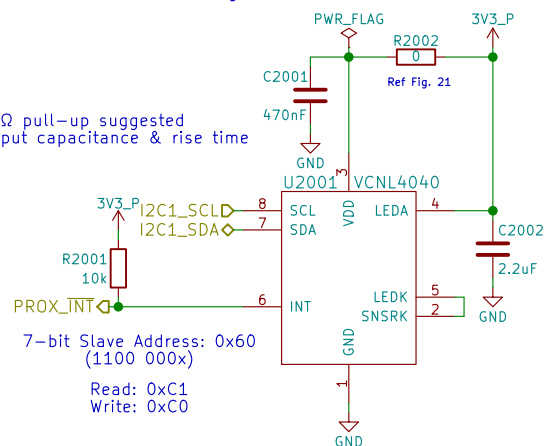
Size: A4
KiCad E.D.A. kicad 4.0.7

Date: 2018-06-01

Rev: v0.1.0
Id: 19/24

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/vcni4040sensorboardfiles.pdf>

9-Axis IMU

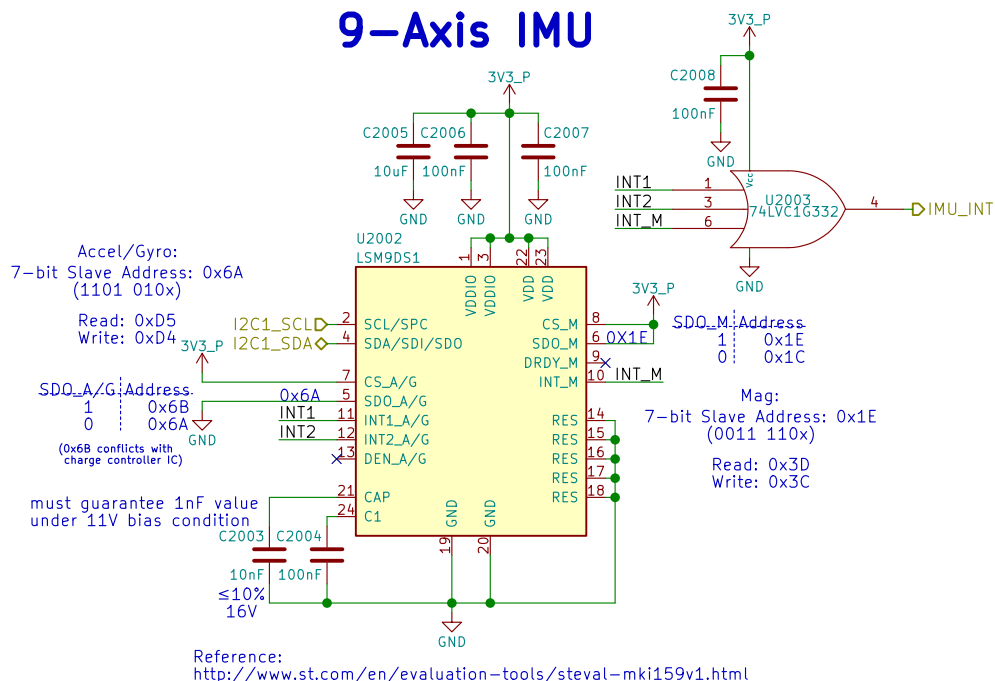


Table 19. Accelerometer and gyroscope SAD+Read/Write patterns				
Command	SAD[6:1]	SAD[0] = SA0	R/W	SAD+R/W
Read	110101	0	1	11010101 (D5h)
Write	110101	0	0	11010100 (D4h)
Read	110101	1	1	11010111 (D7h)
Write	110101	1	0	11010110 (D6h)

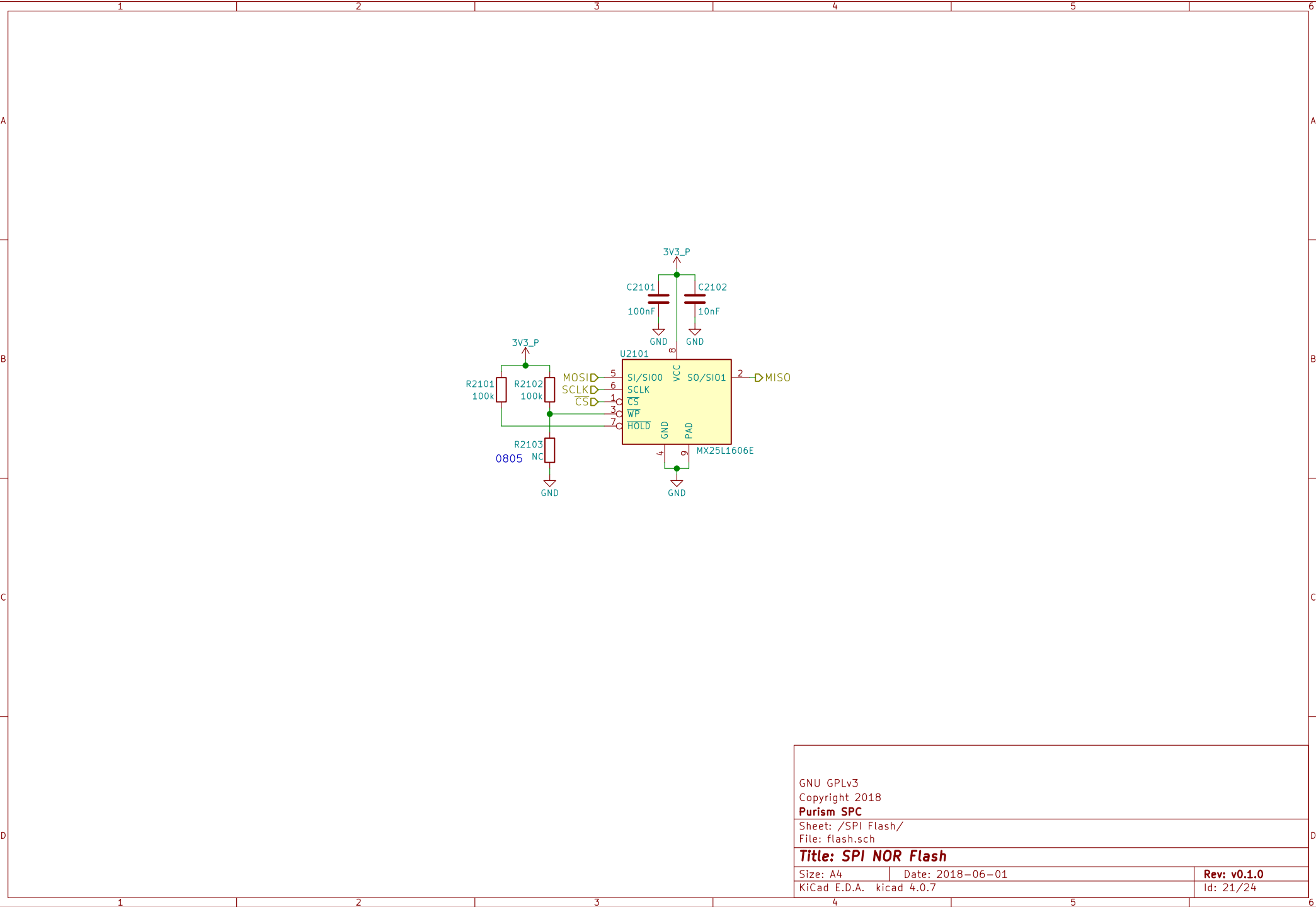
Table 20. Magnetic sensor SAD+Read/Write patterns					
Command	SAD[6:2]	SAD[1] = SDO/SA1	SAD[0]	R/W	SAD+R/W
Read	00111	0	0	1	00111001 (39h)
Write	00111	0	0	0	00111000 (38h)
Read	00111	1	0	1	00111101 (3Dh)
Write	00111	1	0	0	00111100 (3Ch)

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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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Purism SPC

Sheet: /SPI Flash/

File: flash.sch

Title: SPI NOR Flash

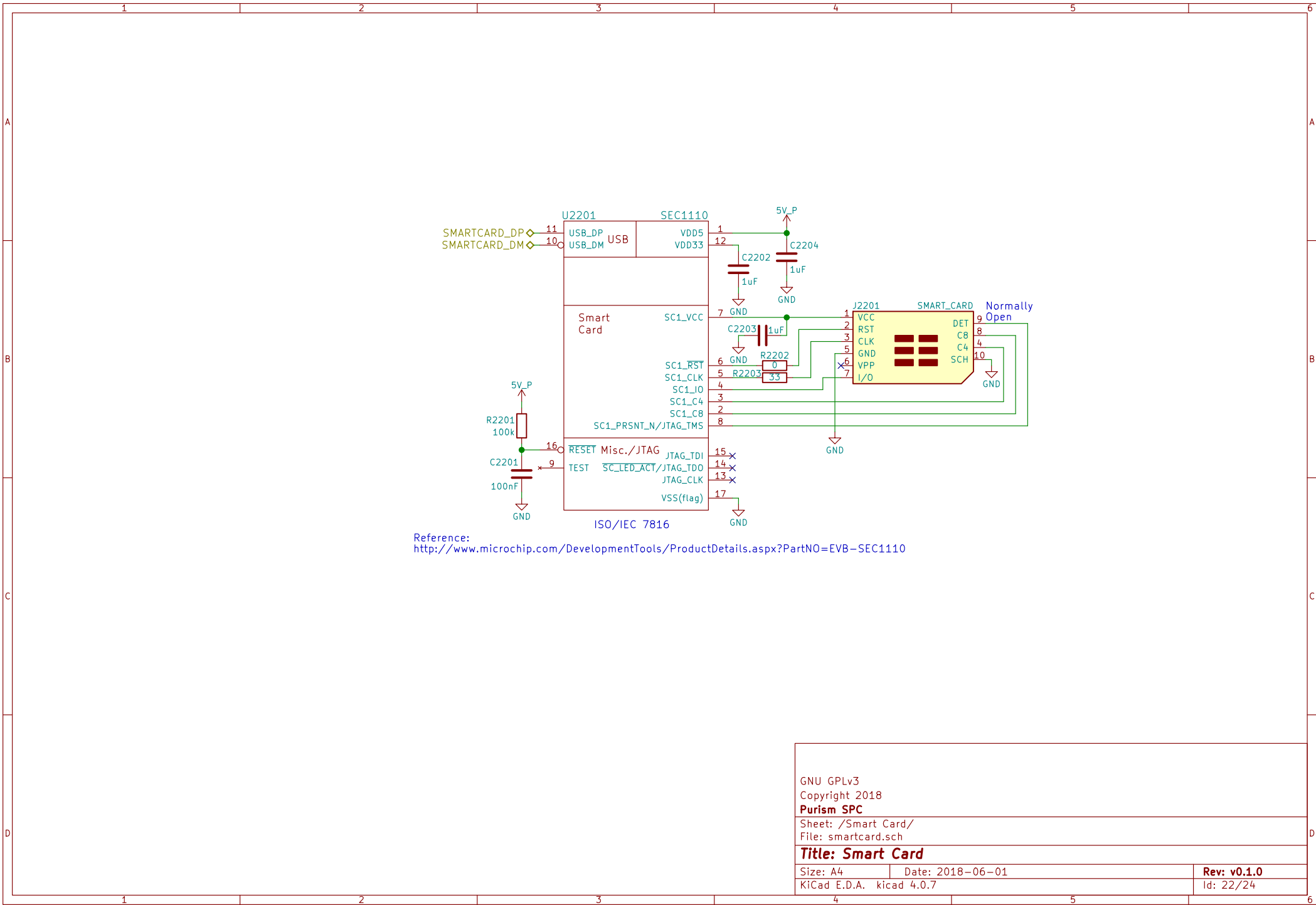
Size: A4

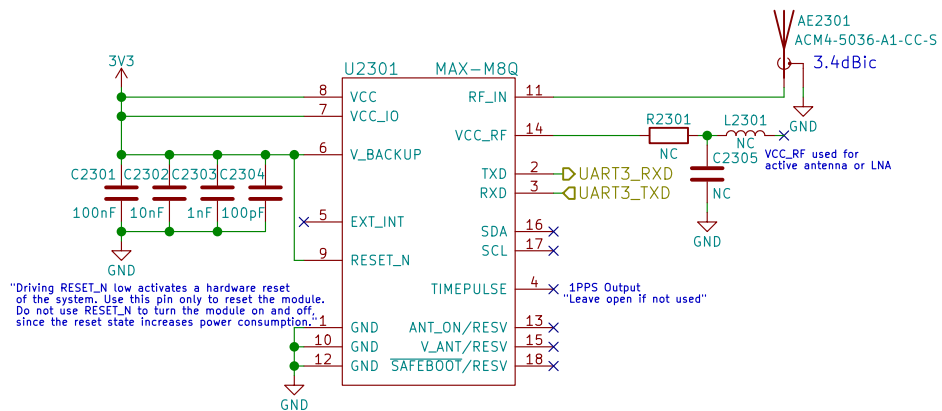
Date: 2018-06-01

Rev: v0.1.0

KiCad E.D.A. kicad 4.0.7

Id: 21/24





Reference:
https://www.u-blox.com/sites/default/files/MAX-8-M8-FW3_HardwareIntegrationManual_15030059.pdf

GNU GPLv3
 Copyright 2018

Purism SPC

Sheet: /GNSS/
 File: gnss.sch

Title: GNSS

Size: A4 Date: 2018-06-01

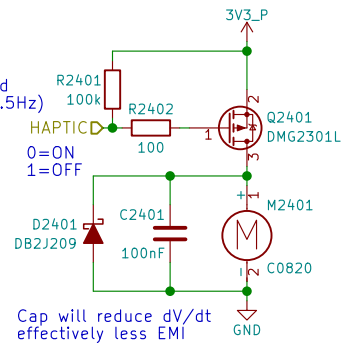
KiCad E.D.A. kicad 4.0.7

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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Purism SPC

Sheet: /Haptic Motor/
 File: haptic.sch

Title: Haptic/Vibration Motor

Size: A4 Date: 2018-06-01

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 24/24