

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

8.1.1 vs 8.1.4 ?

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)."

fast role swap is optional
PTN5110 8.1.4 leaves it floating..(good)!

Unused
Open-drain output
tied with CHRG_INT
3V3_OUT

Read: 0xA5
Write: 0xA4

7-Bit Slave Address: 0x52
(1010 010x)

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

USB1_VBUS=5V when VBUS>4.31V

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

Title: USB Type C

Size: A4 Date: 2018-05-31
KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
Id: 2/24

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Id: 2/24



(interpret RSOC% based on this plot)

Drawing ~333.33mA, or consuming <1.2W, should give close to 10 hours going from 100% to 0% charge

VBAT_REG VBAT_REG

D301 LED_ALT D302 LED_ALT

R301 2.2k R302 2.2k

R303 10k R304 10k R305 191

Open-drain output tied with TCPC_INT
 If enough I/O is available then separate CHRG_INT & TCPC_INT

This disables charging but maybe not VBUS->VOUT
 if PTN5110HQ's FAULT_STATUS[6]=1 (Force Off VBUS bit) then set EN_HIz=1
 EN_HIz may be auto-set when in hiccup

Reading PTN5110HQ's CC_STATUS and POWER_STATUS registers will tell TCPM (i.MX8M) when to set EN_HIz

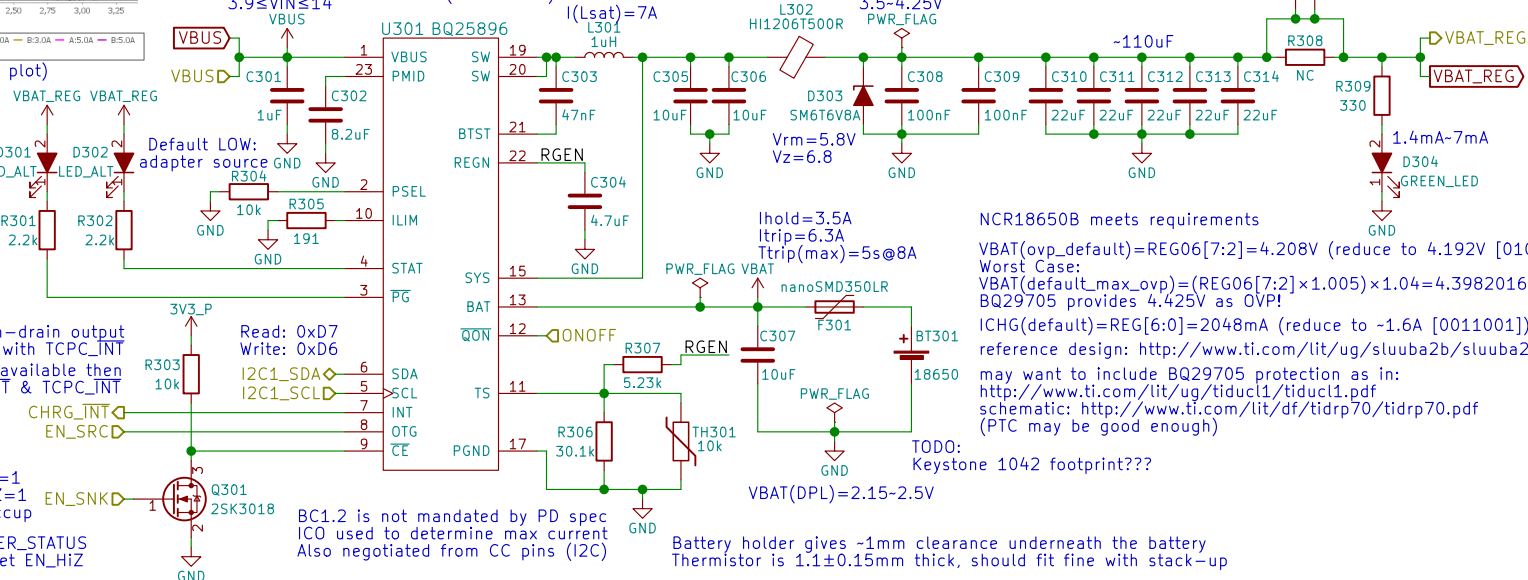
Also, reading PTN5110HQ's CC_STATUS and POWER_STATUS registers will tell TCPM (i.MX8M) when to set OTG_CONFIG=1 (this will also happen when PTN5110HQ sets EN_SRC HIGH)

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)

TODO: Keystone 1042 footprint???

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

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Sheet: /Battery/

File: battery.sch

Title: Battery

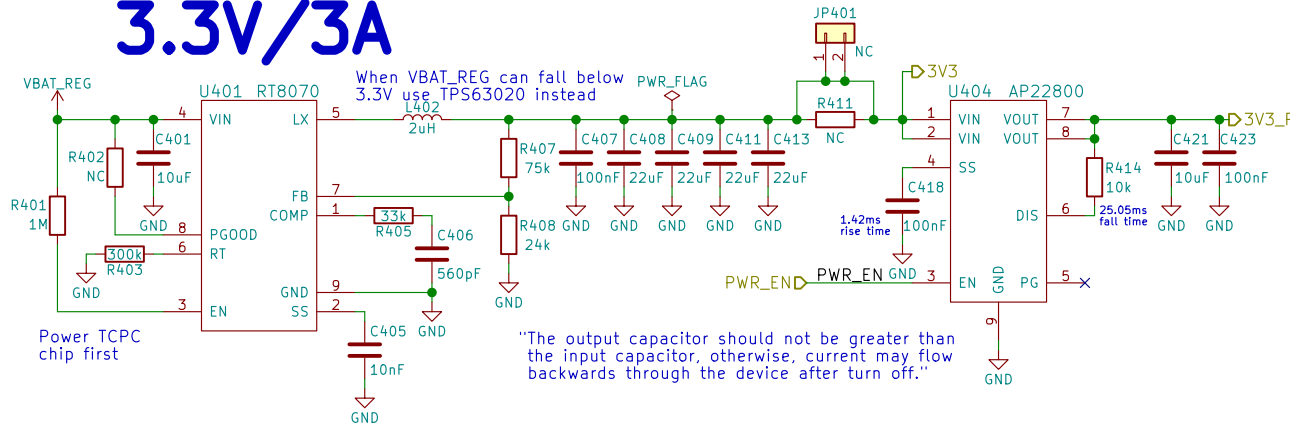
Size: A4 Date: 2018-05-31

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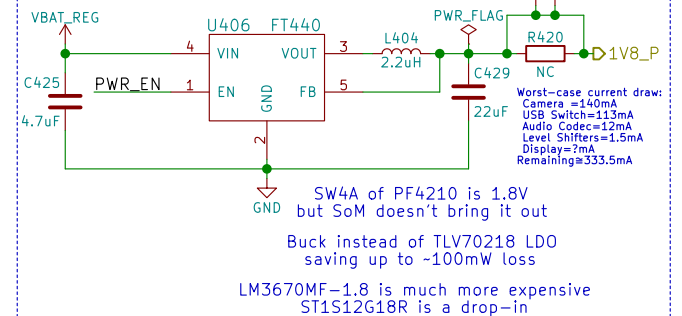
Rev: v0.1.0

Id: 3/24

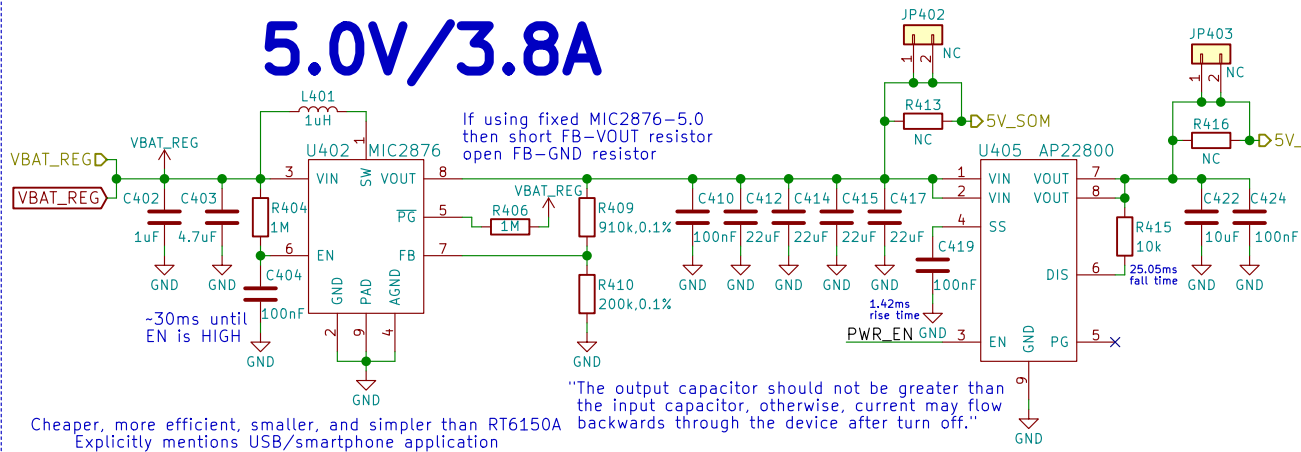
3.3V/3A



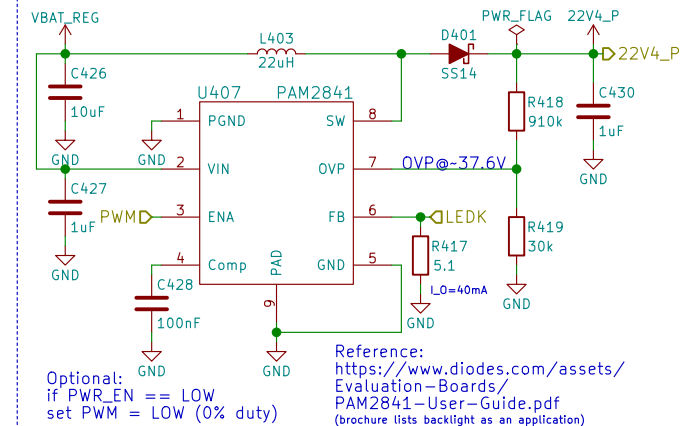
1.8V/600mA



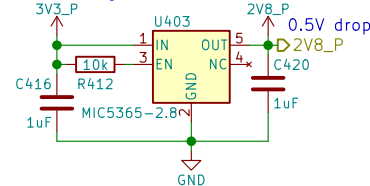
5.0V/3.8A



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

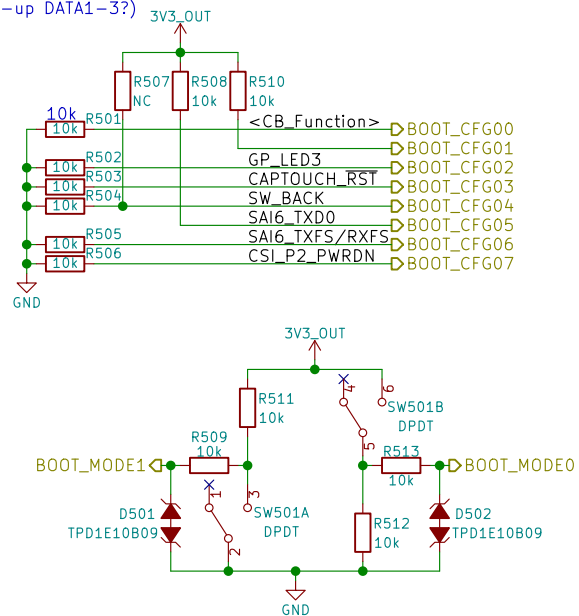
Size: A4 Date: 2018-05-31

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Rev: v0.1.0

Id: 4/24

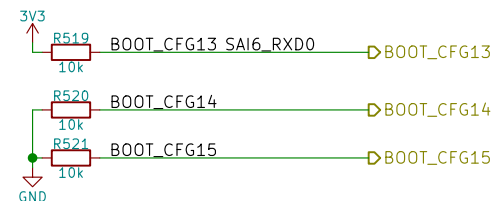
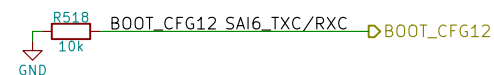
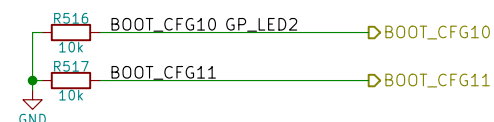
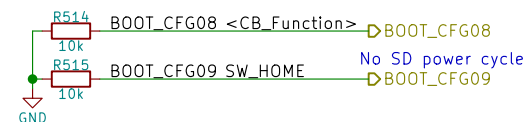
BOOT_CFG04:	BOOT_CFG05:
0 - 1-bit SD bus	1 - 8-bit eMMC bus
1 - 4-bit SD bus	0 - 1-bit eMMC bus
(pull-up DATA1-3?)	



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

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

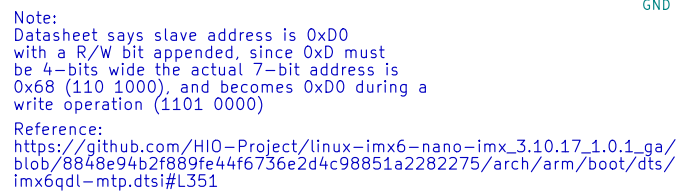
Title: Boot Configuration

Size: A4	Date: 2018-05-31
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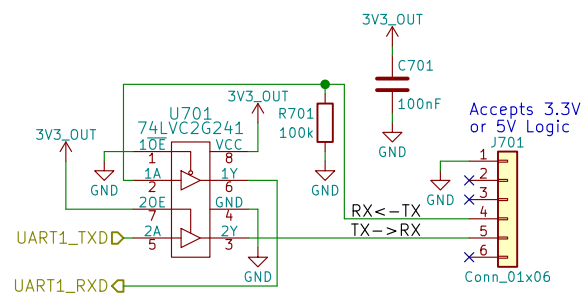
SIZE: A1	DATE:
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Rev: v0.1.0

Id: 5/24



Id: 6/24



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Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

Size: A4 Date: 2018-05-31

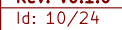
KiCad E.D.A. kicad 4.0.7

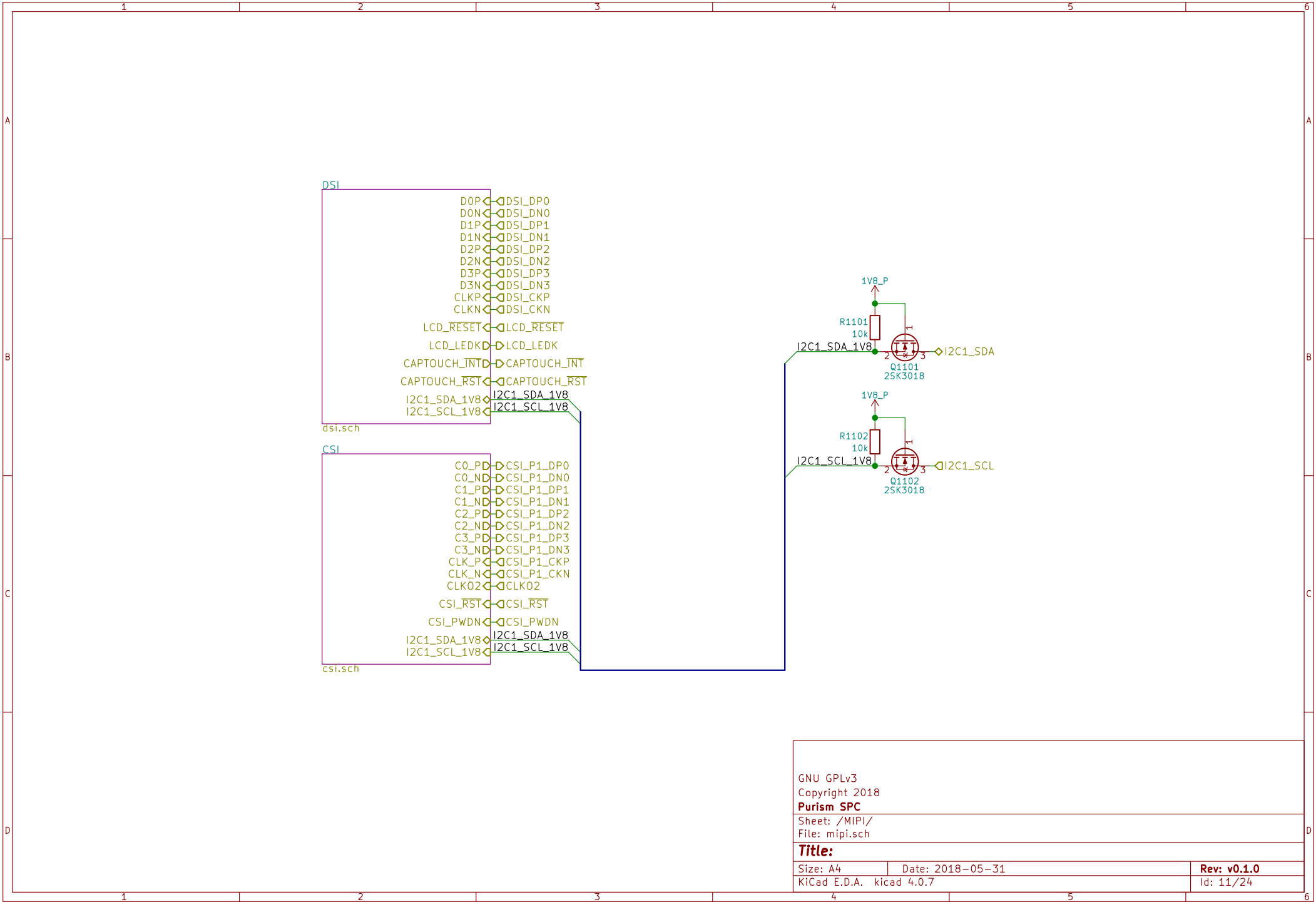
Rev: v0.1.0

Id: 7/24

Id: 8/24

Id: 9/24





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Sheet: /MIPI/
File: mipi.sch

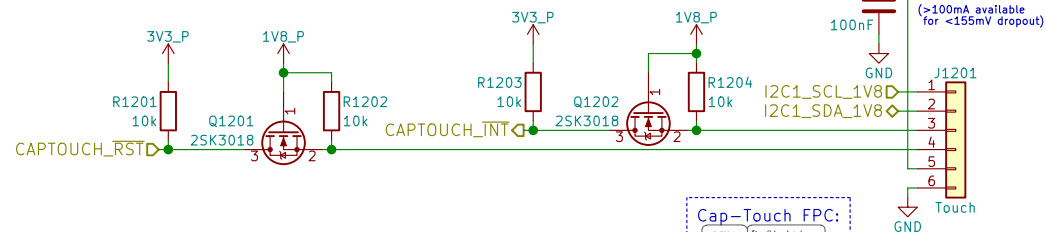
Title:

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

Date: 2018-05-31

Rev: v0.1.0

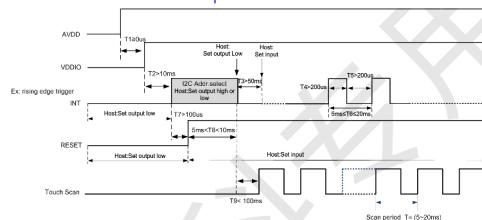
Id: 11/24



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:

7-bit Address	8-bit Write Address	8-bit Read Address
0x5D	0xBA	0xBB
0x14	0x28	0x29

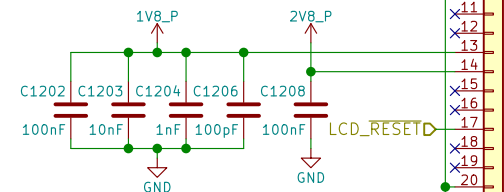
Every time you power on or reset, you need to use the INT pin to set the I2C address:



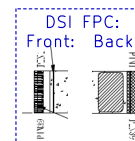
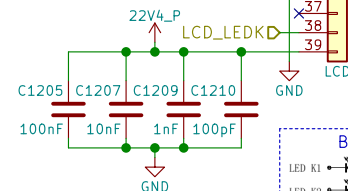
Pin#	Definition
1	SCL
2	SDA
3	INT
4	RESET
5	VDD2, R5
6	GND

TODO:
Verify if INT and RESET are active-LOW

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



100Ω Differential Impedance



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

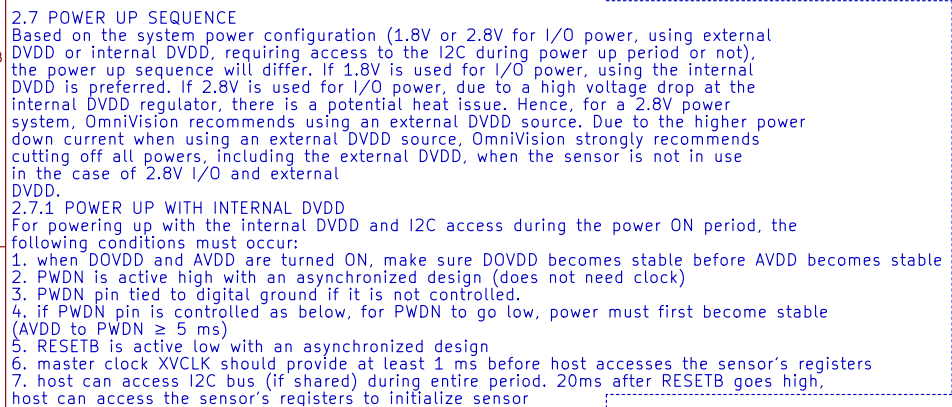
Title: MIPI DSI

Size: A4 Date: 2018-05-31

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 12/24



The diagram shows the timing relationships for power on and power off. The top signal is 'power on' (high) and 'power off' (low). The signals are: DOVDD, AVDD, PWDN, RESETB, XVCLK, and SCCB. Key timing parameters are labeled: t_0 (DOVDD to AVDD delay), t_1 (RESETB to PWDN delay), t_2 (AVDD to PWDN delay), t_3 (PWN to RESETB delay), t_4 (RESETB pulse width), t_5 (DOVDD to AVDD delay), t_6 (AVDD to PWDN delay), and $t_{\text{off}} = 0\text{ms}$ (AVDD to PWDN delay).

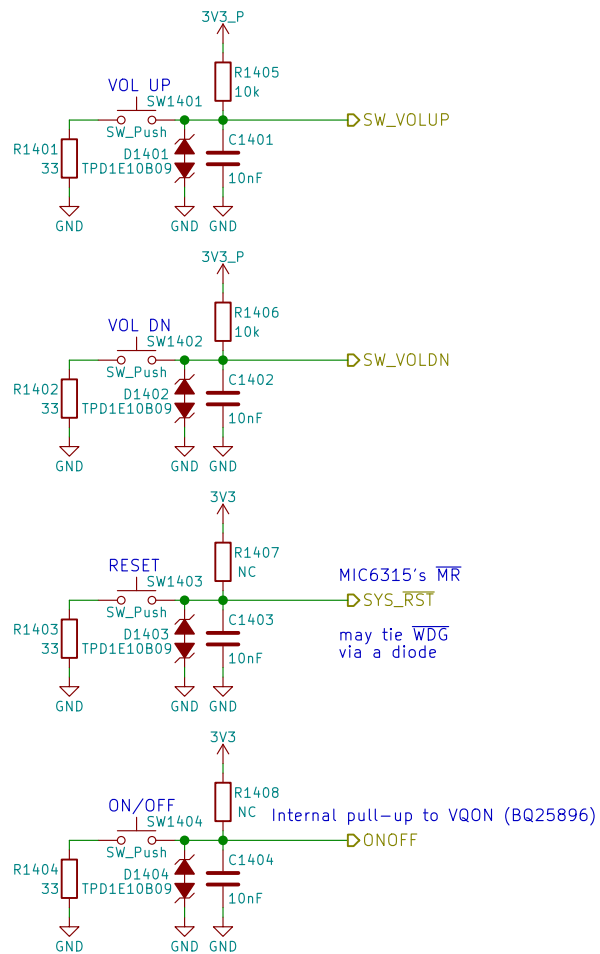
5640_DS_2.2



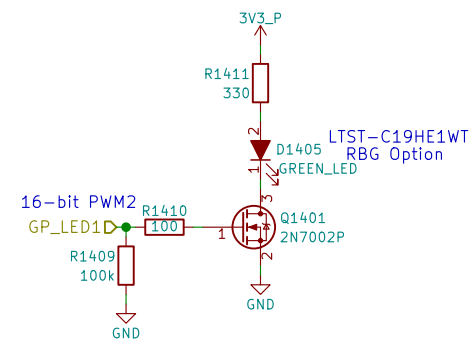
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 Sheet: /MIPI/CSI/
 File: csi.sch

Title:

Size: A4	Date: 2018-05-31	Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7		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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Sheet: /Buttons & LED/
File: buttons_led.sch

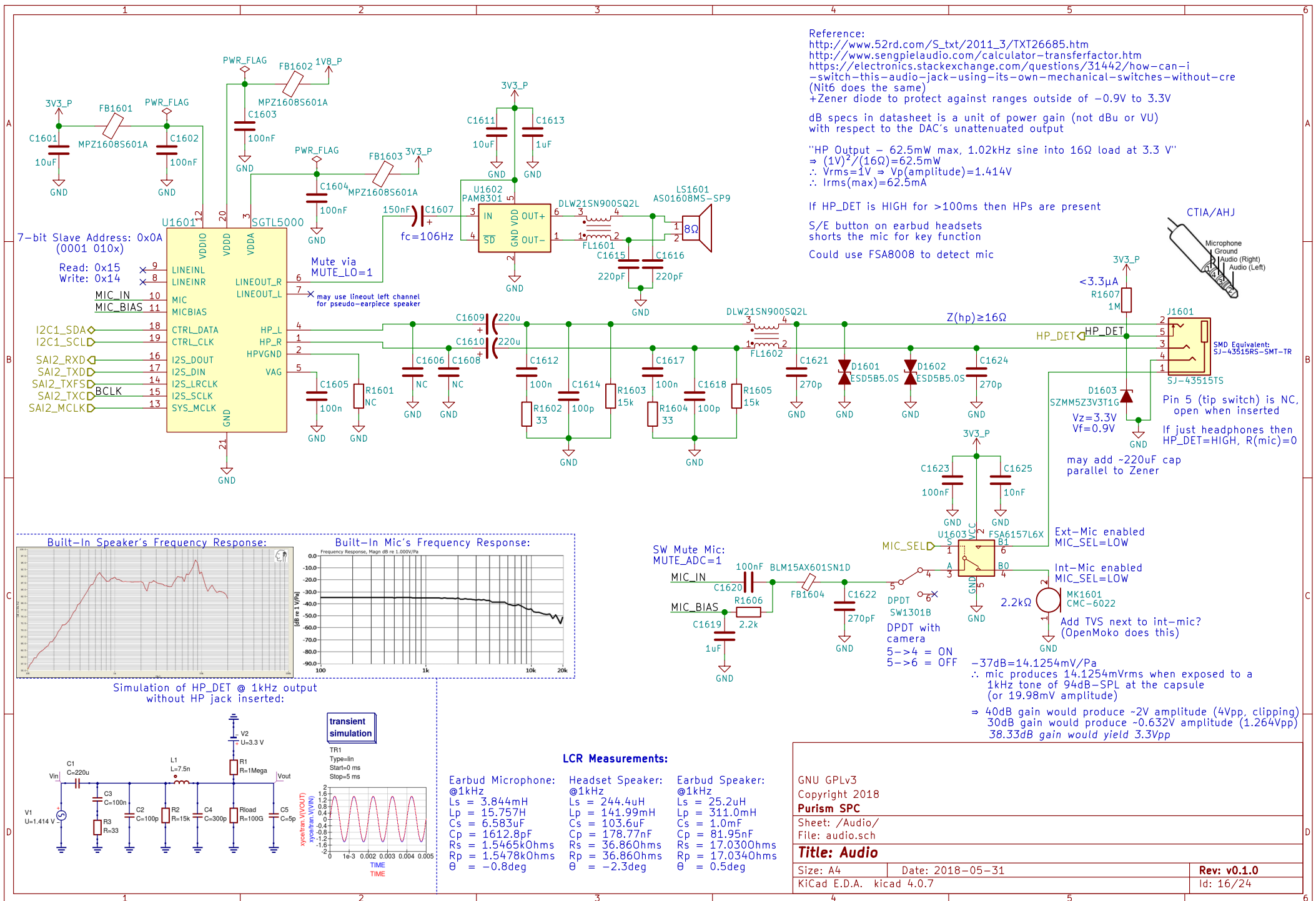
Title: Buttons & LED

Size: A4 Date: 2018-05-31

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 14/24



RGMII 10/100/1000 Ethernet

The schematic diagram illustrates the RGMII 10/100/1000 Ethernet interface circuit. The central component is the AR8031 chip, which is connected to various power supply rails and signal lines. The power supply section includes a 3V3_P input, a 2.5V (3.3V tolerant) output, and a 1V1 output. The signal section includes ENET_2V5, ENET_1V1, and ENET_2V5 inputs. The output section includes ETH_TRX0_P, ETH_TRX0_N, ETH_TRX1_P, ETH_TRX1_N, ETH_TRX2_P, ETH_TRX2_N, ETH_TRX3_P, and ETH_TRX3_N. The circuit also includes a 25MHz clock source (CLKO_25MHz) and a 2.5V (3.3V tolerant) output. The RJ45 connector is connected to the output lines and includes a transformer and a green LED (D1702).

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Sheet: /Ethernet/
File: ethernet.sch

Title: Ethernet

Size: A4	Date: 2018-05-31	Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7		Id: 17/24

Rev: v0.1.0
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

1V8_P
WIFI_RST
W_DISABLE1

VIH=2.31V

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

Module: Table 23
Socket: Table 46

3V3_P

J1801

NC

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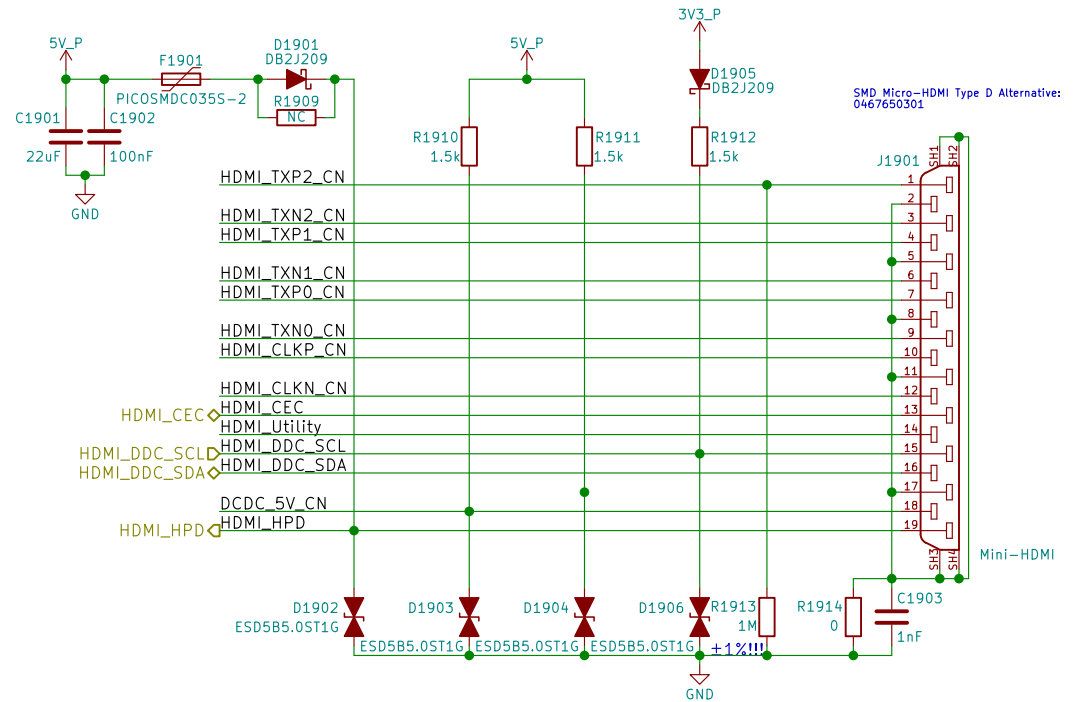
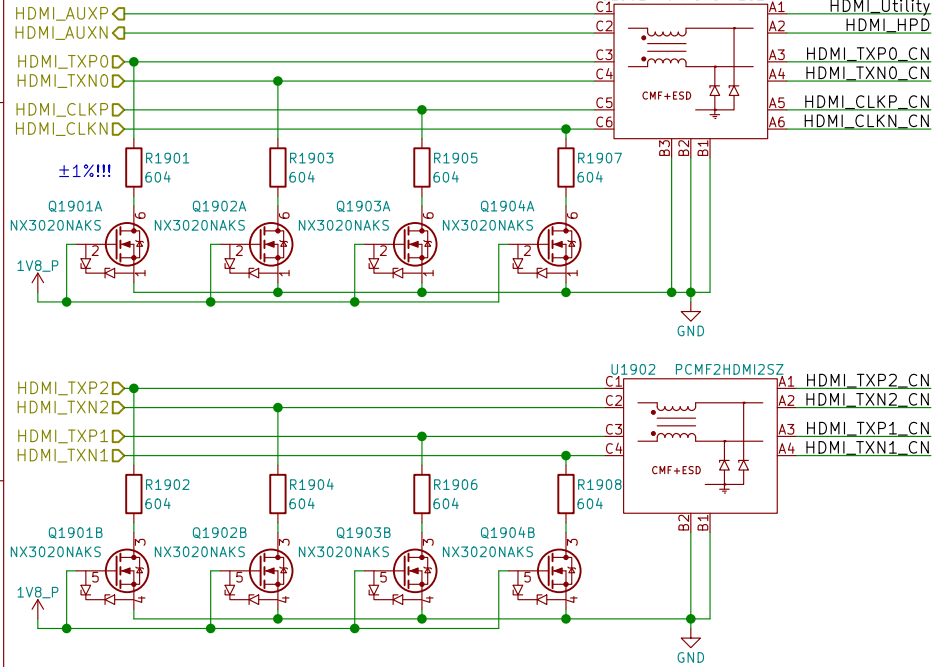
316

317

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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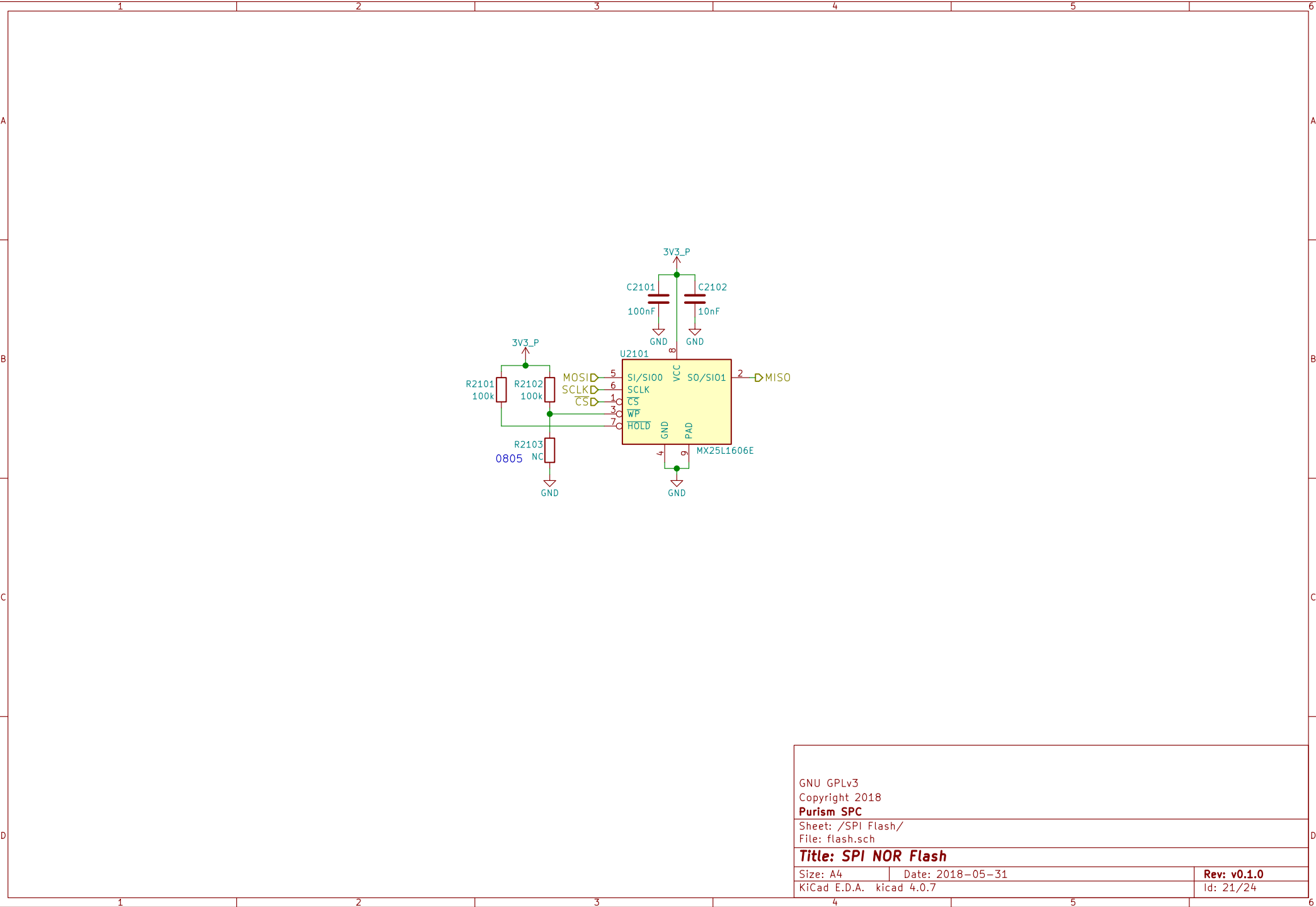
Sheet: /HDMI/
File: hdmi.sch

Title: HDMI

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

Date: 2018-05-31

Rev: v0.1.0
Id: 19/24



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Sheet: /SPI Flash/

File: flash.sch

Title: SPI NOR Flash

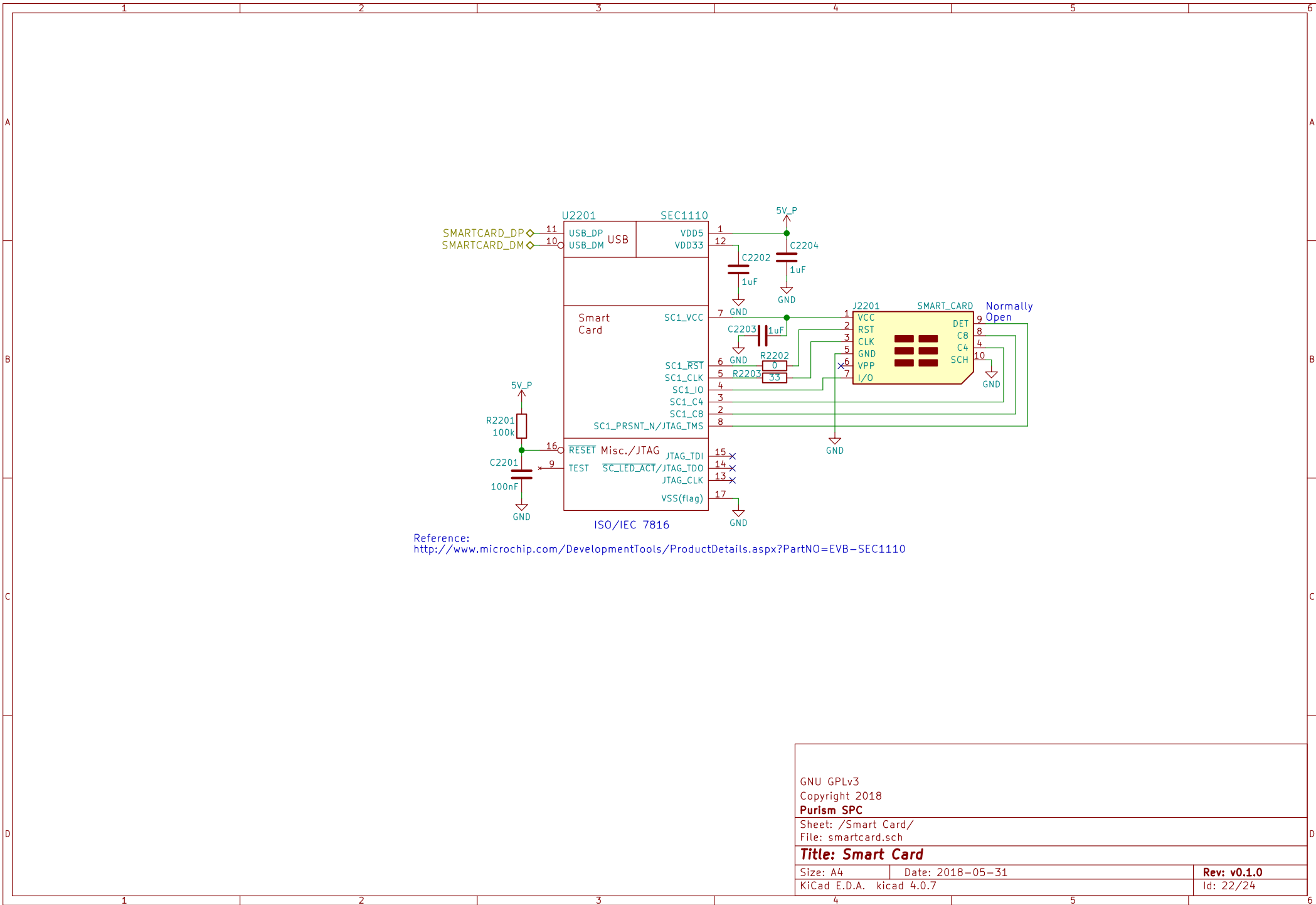
Size: A4

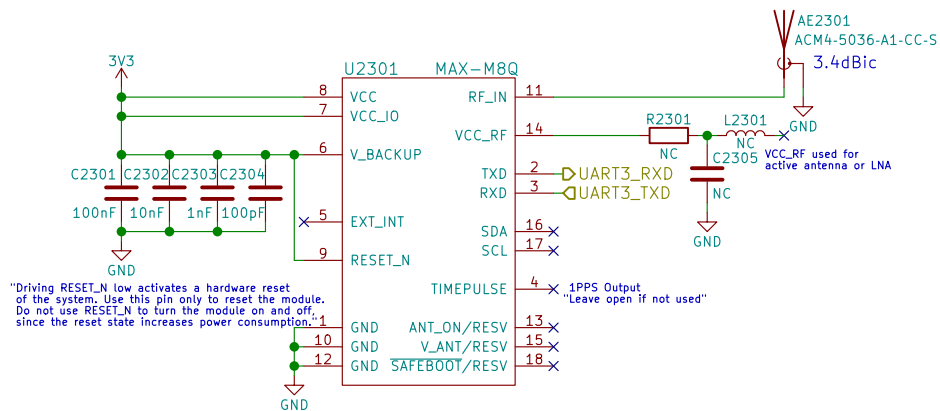
Date: 2018-05-31

Rev: v0.1.0

KiCad E.D.A. kicad 4.0.7

Id: 21/24





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Purism SPC

Sheet: /GNSS/
 File: gnss.sch

Title: GNSS

Size: A4 Date: 2018-05-31

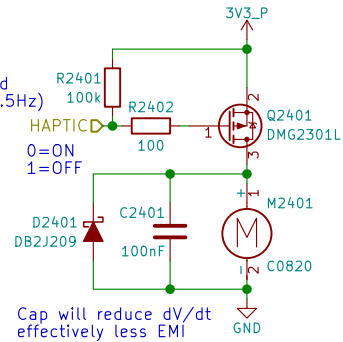
KiCad E.D.A. kicad 4.0.7

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)!

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: 2018-05-31

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 24/24