## USB-C

- VBUS
- USB1_VBUS
- USB1_ID
- USB1_SS_SEL
- USB1_DP
- USB1_DN
- USB1_TXP
- USB1_TXN
- USB1_RXP
- USB1_RXN
- TCPC_INT
- I2C1_SDA
- I2C1_SCL
- EN_SNK
- EN_SRC

usb-c.sch

## Battery

- VBUS
- VBAT_REG
- I2C1_SDA
- I2C1_SCL
- CHRG_INT
- EN_SRC
- EN_SNK
- ONOFF

battery.sch

## Power

- VBAT_REG
- +5V
- 3V3_P
- 1V8_P
- PWR_EN
- SD2_RST
- SWIRE
- AVDD_EN

power.sch

PWR_EN TODO!!!

## Boot Config

- BOOT_CFG00 — SAI1_RXD0(GPIO4_IO02)
- BOOT_CFG01 — SAI1_RXD1(GPIO4_IO03)
- BOOT_CFG02 — SAI1_RXD2(GPIO4_IO04)
- BOOT_CFG03 — SAI1_RXD3(GPIO4_IO05) CAPTOUCH_RST
- BOOT_CFG04 — SAI1_RXD4(GPIO4_IO06) SW_BACK
- BOOT_CFG05 — SAI1_RXD5(GPIO4_IO07) SAI6_TXD0
- BOOT_CFG06 — SAI1_RXD6(GPIO4_IO08) SAI6_TXFS/RXFS
- BOOT_CFG07 — SAI1_RXD7(GPIO4_IO09)
- BOOT_CFG08 — SAI1_TXD0(GPIO4_IO12)
- BOOT_CFG09 — SAI1_TXD1(GPIO4_IO13) SW_HOME
- BOOT_CFG10 — SAI1_TXD2(GPIO4_IO14)
- BOOT_CFG11 — SAI1_TXD3(GPIO4_IO15)
- BOOT_CFG12 — SAI1_TXD4(GPIO4_IO16) SAI6_TXC/RXC
- BOOT_CFG13 — SAI1_TXD5(GPIO4_IO17) SAI6_RXD0
- BOOT_CFG14 — SAI1_TXD6(GPIO4_IO18)
- BOOT_CFG15 — SAI1_TXD7(GPIO4_IO19)
- BOOT_MODE0
- BOOT_MODE1

boot.sch

## RTC

- I2C2_SDA
- I2C2_SCL

rtc.sch

## UART Debug

- UART1_TXD
- UART1_RXD

uart.sch

## JTAG

- JTAG_TMS
- JTAG_TCK
- JTAG_TDO
- JTAG_TDI
- POR_B
- JTAG_TRST

jtag.sch

## uSD Card

- CONN_SD2_DATA1 — uSD_DATA1
- CONN_SD2_DATA0 — uSD_DATA0
- CONN_SD2_CMD — uSD_CMD
- CONN_SD2_DATA3 — uSD_DATA3
- CONN_SD2_DATA2 — uSD_DATA2
- CONN_SD2_CLK — uSD_CLK
- CONN_SD2_CD_B — uSD_CD_B

sd.sch

## USB Hub

- USB2_DP
- USB2_DN
- USB2_ID
- USB_WWAN_DP
- USB_WWAN_DM
- USB_WLAN_DP
- USB_WLAN_DM
- I2C2_SDA
- I2C2_SCL

usb_hub.sch

## MIPI DSI

- D0_P — DSI_DP0
- D0_N — DSI_DN0
- D1_P — DSI_DP1
- D1_N — DSI_DN1
- D2_P — DSI_DP2
- D2_N — DSI_DN2
- D3_P — DSI_DP3
- D3_N — DSI_DN3
- CLK_P — DSI_CKP
- CLK_N — DSI_CKN
- RESX — DSI_BL_PWM
- AVDD_END — AVDD_EN
- SWIRE
- I2C2_SDA
- I2C2_SCL
- CAPTOUCH_INT
- CAPTOUCH_RST — SAI1_RXD3(GPIO4_IO05)

mipi_dsi.sch

## Buttons & LED

- SW_BACK — SAI1_RXD4(GPIO4_IO06) used to be:
- SW_VOLDN — BTN1 SAI1_TXD3(GPIO4_IO15)
- SW_VOLUP — BTN2 SAI1_TXD6(GPIO4_IO18)
- SW_HOME — SAI1_TXD1(GPIO4_IO13)
- ONOFF
- SYS_RST
- GP_LED1 — GPIO1_IO13 SAI1_RXD1(GPIO4_IO03)

buttons_led.sch

## WWAN M.2

- CONFIG — SAI5_RXC(GPIO3_IO20)
- WoWWAN — GPIO3_IO08
- W_DISABLE1 — WWAN_DISABLE GPIO3_IO04
- RESET — GPIO3_IO09
- UART_TX/LED — UART3_RXD
- UART_RX/DPR — UART3_TXD
- USB_D+ — USB_WWAN_DP
- USB_D- — USB_WWAN_DM
- PCM_CLK/I2S_SCK — SAI1_TXD4(GPIO4_IO16) SAI6_TXC/RXC!!
- PCM_SYNC/I2S_FSC — SAI1_RXD6(GPIO4_IO08) SAI6_TXFS/RXFS!!
- PCM_IN/I2S_IN — SAI1_RXD5(GPIO4_IO07) SAI6_TXD0!!
- PCM_OUT/I2S_OUT — SAI1_TXD5(GPIO4_IO17) SAI6_RXD0!!

wwan_m2.sch

## Audio

- HP_DET
- MIC_SEL
- SAI2_RXD
- SAI2_TXD
- SAI2_TXFS
- SAI2_TXC
- SAI2_MCLK
- I2C1_SDA
- I2C1_SCL

audio.sch

## WLAN+BT M.2

- USB_WLAN_DP
- USB_WLAN_DN
- BT_UART_TXD — UART4_TXD
- BT_UART_RXD — UART4_RXD
- BT_UART_RTS — UART4_RTS
- BT_UART_CTS — UART4_CTS
- BT_HOST_WAKE
- WIFI_DISABLE
- BT_DISABLE
- WIFI_CLK
- WIFI_CMD
- WIFI_DATA0
- WIFI_DATA1
- WIFI_DATA2
- WIFI_DATA3
- WIFI_RST — SD2_RST
- WIFI_WAKE
- I2C2_SDA
- I2C2_SCL
- BT_PCM_SYNC — M2_PCM_CLK
- BT_PCM_CLK — M2_PCM_SYNC
- BT_PCM_IN — M2_PCM_IN
- BT_PCM_OUT — M2_PCM_OUT

TODO: assign a SAI bus

wifi_bt_m2.sch

## SDIO DEMUX

- SD2_SEL
- SD2_CLK
- SD2_CMD
- SD2_DATA0
- SD2_DATA1
- SD2_DATA2
- SD2_DATA3
- uSD_CLK
- uSD_CMD
- uSD_DATA0
- uSD_DATA1
- uSD_DATA2
- uSD_DATA3
- WIFI_CLK
- WIFI_CMD
- WIFI_DATA0
- WIFI_DATA1
- WIFI_DATA2
- WIFI_DATA3

sdio_demux.sch

## Ethernet

- ENET_2V5
- CLKO_25MHz
- ENET_TXC
- ENET_TD0
- ENET_TD1
- ENET_TD2
- ENET_TD3
- ENET_TX_CTL
- ENET_RXC
- ENET_RD0
- ENET_RD1
- ENET_RD2
- ENET_RD3
- ENET_RX_CTL
- ENET_MDC
- ENET_MDIO
- ENET_RST
- ENET_WoL
- ENET_INT

ethernet.sch

TODO: need a vibration motor?

## J101A

| | | | |
|---|---|---|---|
| | | ENET_TXC | A4 |
| | | ENET_TD0 | A8 |
| | | ENET_TD1 | A10 |
| | | ENET_TD2 | A12 |
| | | ENET_TD3 | A14 |
| | | ENET_TX_CTL | A18 |
| | | ENET_RD0 | A22 |
| | | ENET_RD1 | A24 |
| | | ENET_RD2 | A26 |
| | | ENET_RD3 | A28 |
| | | ENET_RX_CTL | A32 |
| | | ENET_RXC | A36 |
| | | ENET_MDIO | A40 |
| | | ENET_MDC | A42 |
| ENET_RST | A43 | SD2_RST | A46 |
| | | SD2_DATA3 | A48 |
| | | SD2_DATA2 | A50 |
| | | SD2_DATA1 | A52 |
| | | SD2_DATA0 | A54 |
| | | WIFI_WAKE | A56 |
| | | SD2_CMD | A58 |
| | | uSD_CD_B | A60 |
| TCPC_INT | A63 | SD2_CLK | A64 |
| | | WWAN_DISABLE | A72 |
| | | USB1_SS_SEL | A74 |
| | | BT_HOST_WAKE | A78 |
| | | CAPTOUCH_INT | A80 |

IMX8M-SOM — GND — GND

## J101B

| | | | |
|---|---|---|---|
| | | WIFI_DISABLE | B2 |
| | | GPIO3_IO09 | B4 |
| | | GPIO3_IO08 | B8 |
| | | ENET_2V5 | B22 |
| DSI_DP2 | B27 | | |
| DSI_DN2 | B28 | | |
| DSI_DP0 | B31 | | |
| DSI_DN0 | B33 | | |
| DSI_CKN | B37 | | |
| DSI_CKP | B39 | | |
| DSI_DP1 | B43 | | |
| DSI_DN1 | B45 | | |
| DSI_DP3 | B49 | | |
| DSI_DN3 | B51 | | |

PWR_FLAG 3V3_OUT

PWR_FLAG NVCC_SD2

+5V — C101 C102 C103 22uF 22uF 0.1uF — GND

+5V — C104 C105 C106 0.1uF 22uF 22uF — GND

IMX8M-SOM — GND — GND

## J101C

| | | | |
|---|---|---|---|
| BOOT_MODE0 | C3 | | |
| BOOT_MODE1 | C5 | | |
| JTAG_TDI | C7 | | |
| JTAG_TMS | C9 | | |
| JTAG_TRST | C11 | SAI1_TXC | C12 |
| JTAG_TDO | C13 | | |
| JTAG_TCK | C15 | | |
| | | ENET_WoL | C42 |
| PWR_EN | C41 | SAI1_RXD1(GPIO4_IO03) | C44 |
| | | ENET_INT | C48 |
| SAI5_RXC(GPIO3_IO20) | C53 | | |
| SAI1_RXD0(GPIO4_IO02) | C59 | | |
| | | CLKO_25MHz | C62 |
| GPIO1_IO13 | C63 | | |
| SAI1_RXD4(GPIO4_IO06) | C65 | SAI2_TXC | C66 |
| SAI1_RXD3(GPIO4_IO05) | C67 | | |
| BTN1 | C69 | | |
| SAI1_RXD2(GPIO4_IO04) | C73 | BTN2 | C74 |
| SAI2_TXFS | C75 | | |
| SAI2_RXD | C77 | SAI2_MCLK | C78 |
| SAI1_RXD6(GPIO4_IO08) | C79 | | |

J102 TEST_1P

- DSI_BL_PWM
- WDG

IMX8M-SOM — GND — GND

## J101D

| | | | |
|---|---|---|---|
| SAI2_TXD | D1 | SAI1_RXD7(GPIO4_IO09) | D2 |
| | | I2C2_SCL | D4 |
| SAI1_RXD5(GPIO4_IO07) | D7 | | |
| SAI1_TXD0(GPIO4_IO12) | D11 | | |
| ONOFF | D13 | | |
| I2C2_SDA | D15 | | |
| SAI1_TXD1(GPIO4_IO13) | D19 | | |
| SYS_RST | D21 | UART4_TXD | D22 |
| I2C1_SCL | D23 | | |
| I2C1_SDA | D25 | | |
| SAI1_TXD3(GPIO4_IO15) | D27 | | |
| SAI1_TXD4(GPIO4_IO16) | D29 | | |
| SAI1_TXD7(GPIO4_IO19) | D33 | | |
| UART3_TXD | D35 | | |
| BT_DISABLE | D37 | | |
| SAI1_TXD5(GPIO4_IO17) | D39 | | |
| POR_B | D41 | UART4_RXD | D42 |
| UART1_RXD | D45 | | |
| SAI1_TXD2(GPIO4_IO14) | D47 | | |
| SAI1_TXD6(GPIO4_IO18) | D49 | | |
| UART4_CTS | D53 | | |
| UART3_RXD | D55 | USB2_DN | D56 |
| | | USB2_DP | D58 |
| | | USB1_RXN | D64 |
| | | USB1_RXP | D66 |
| UART4_RTS | D67 | | |
| | | USB1_TXN | D70 |
| UART1_TXD | D71 | USB1_TXP | D72 |
| TODO!!! USB2_VBUS | D73 | | |
| USB2_VBUS=3.3V??? USB2_ID | D75 | USB1_DN | D76 |
| USB1_VBUS | D77 | USB1_DP | D78 |
| USB1_ID | D79 | | |

3V3_OUT

R102 10k

3V3_OUT

R103 10k — R104 10k — R101 10k

IMX8M-SOM — GND — GND

GNU GPLv3
Copyright 2018

**Purism SPC**

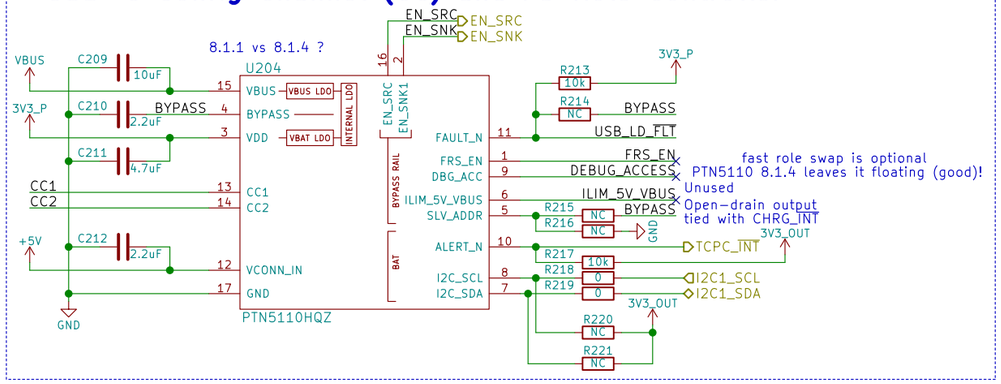
Sheet: /
File: dvk-mx8m-bsb.sch

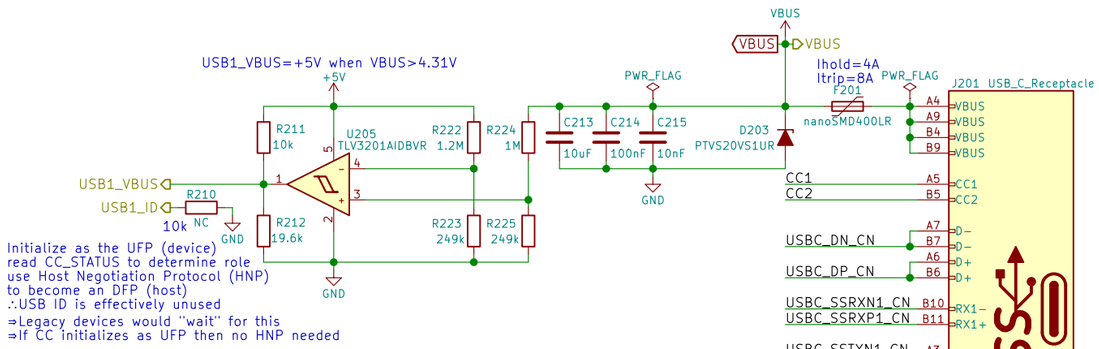
**Title: DVK-MX8M-BSB**

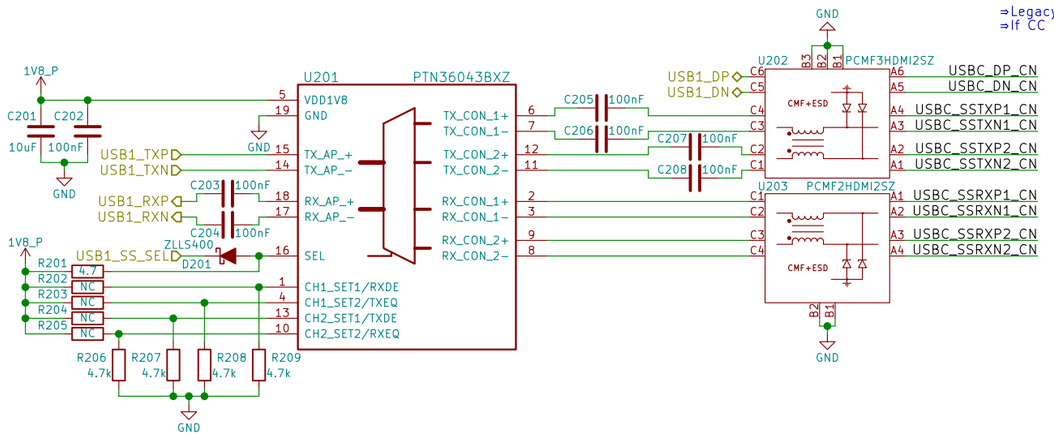
| Size: A2 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 1/17 |

"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)."

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



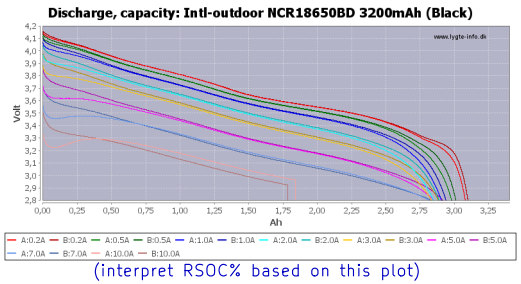




GNU GPLv3
Copyright 2018
**Purism SPC**

| | | |
|---|---|---|
| Sheet: /USB-C/ | | |
| File: usb-c.sch | | |
| ***Title: USB Type C*** | | |
| Size: A3 | Date: 2018-05-02 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.7 | | Id: 2/17 |

# Battery Charge Controller




(interpret RSOC% based on this plot)

use AUTO_DPDM_EN
to auto-detect IINLIM

1.658≤ILIM≤2.063
ILIM(nom)≅1.859
3.9≤VIN≤14

U301 BQ25896

I(Lsat)=7A

3.5~4.25V

Default LOW:
adapter source

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)

BC1.2 is not mandated by PD spec
ICO used to determine max current
Also negotiated from CC pins (I2C)

Ihold=3.5A
Itrip=6.3A
Ttrip(max)=5s@8A

VBAT(DPL)=2.15~2.5V

NCR18650BD 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!!!

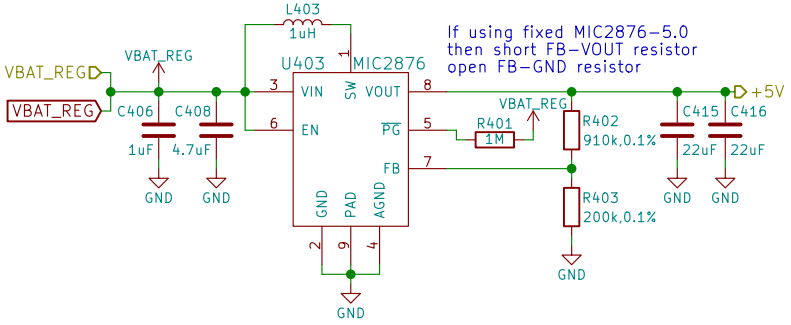
reference design: http://www.ti.com/lit/ug/sluuba2b/sluuba2b.pdf

may want to include BQ29705 protection as in:
http://www.ti.com/lit/ug/tiducl1/tiducl1.pdf
schematic: http://www.ti.com/lit/df/tidrp70/tidrp70.pdf
(PTC may be good enough)

GNU GPLv3
Copyright 2018
**Purism SPC**

| | | |
|---|---|---|
| Sheet: /Battery/ | | |
| File: battery.sch | | |
| ***Title: Battery*** | | |
| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.7 | | Id: 3/17 |

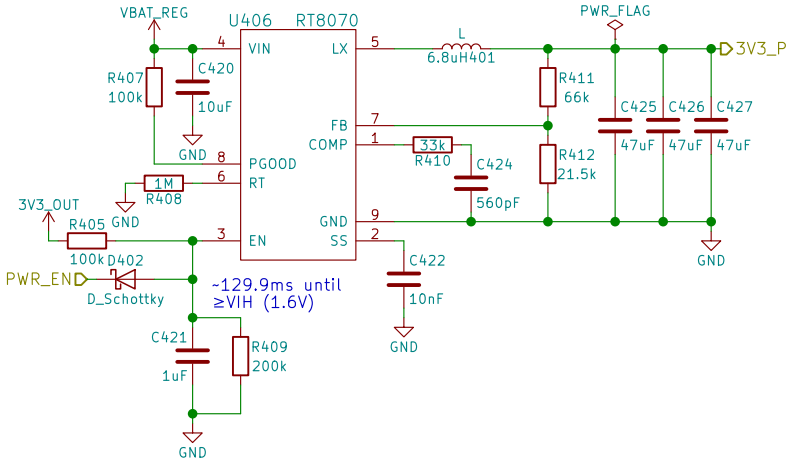
# 5.0V/3.8A



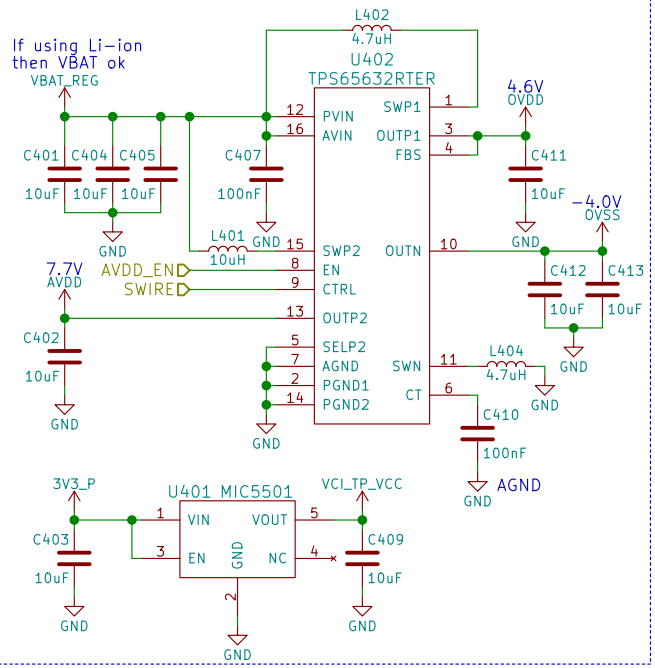

Cheaper, more efficient, smaller, and simpler than RT6150A
Explicitly mentions USB/smartphone application

# 3.3V/3A

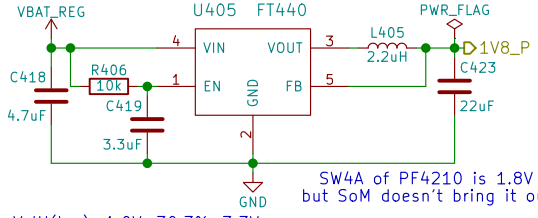
When VBAT can fall below
3.3V use TPS63020 instead!




# AMOLED POWER




# 1.8V/600mA

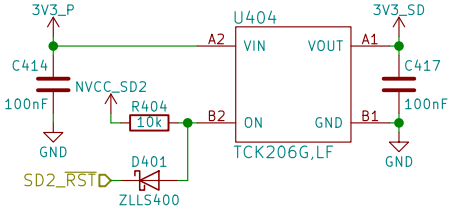



SW4A of PF4210 is 1.8V
but SoM doesn't bring it out

V_IH(typ)=1.0V≅30.3%×3.3V
t(0-30.3%)≈0.361RC
⇒0.361RC≈10ms
∴ R=10k
C=2.77uF≅3.3uF

Buck instead of TLV70218 LDO
saving up to ~100mW loss
LM3670MF-1.8 is much more expensive
ST1S12G18R is a drop-in

# SD POWER

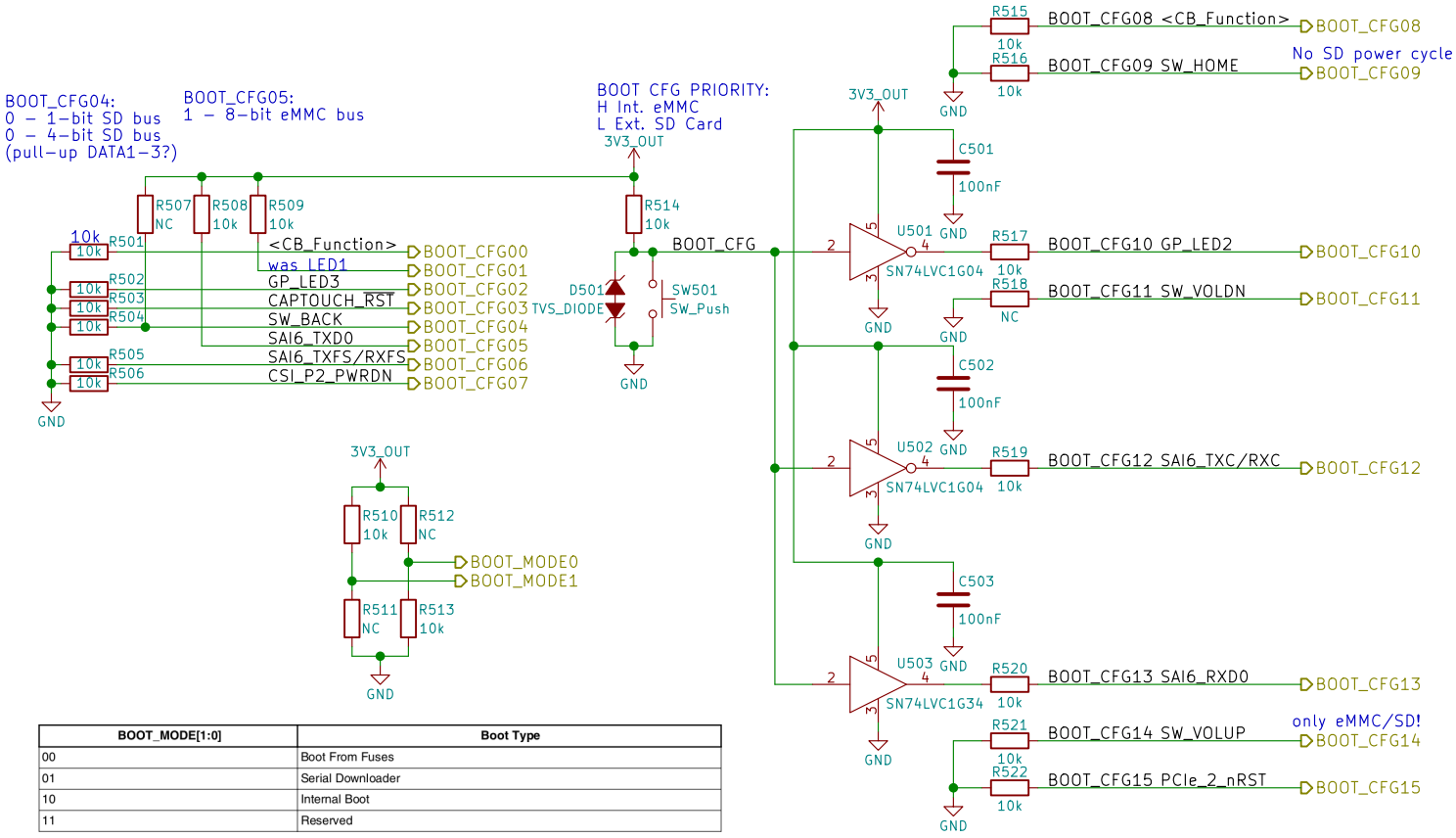



GNU GPLv3
Copyright 2018
**Purism SPC**

| | | |
|---|---|---|
| Sheet: /Power/ | | |
| File: power.sch | | |
| ***Title: Power*** | | |
| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.7 | | Id: 4/17 |

| 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<br>01 - USDHC-2<br>10 - USDHC-3<br>else - reserved |



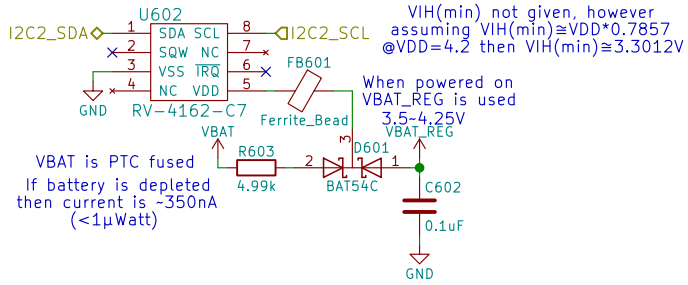

| BOOT_MODE[1:0] | Boot Type |
|---|---|
| 00 | Boot From Fuses |
| 01 | Serial Downloader |
| 10 | Internal Boot |
| 11 | Reserved |

GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /Boot Config/
File: boot.sch

**Title: Boot Configuration**

| Size: A4 | Date: 2018–05–02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 5/17 |

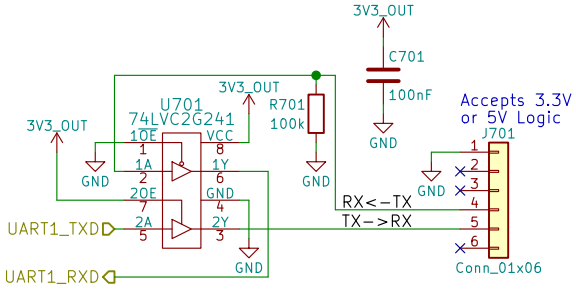



GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /RTC/
File: rtc.sch

***Title: RTC***

| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 6/17 |

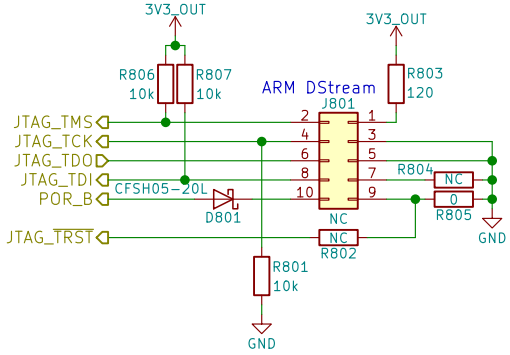



GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /UART Debug/
File: uart.sch

***Title: UART Debug***

| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 7/17 |

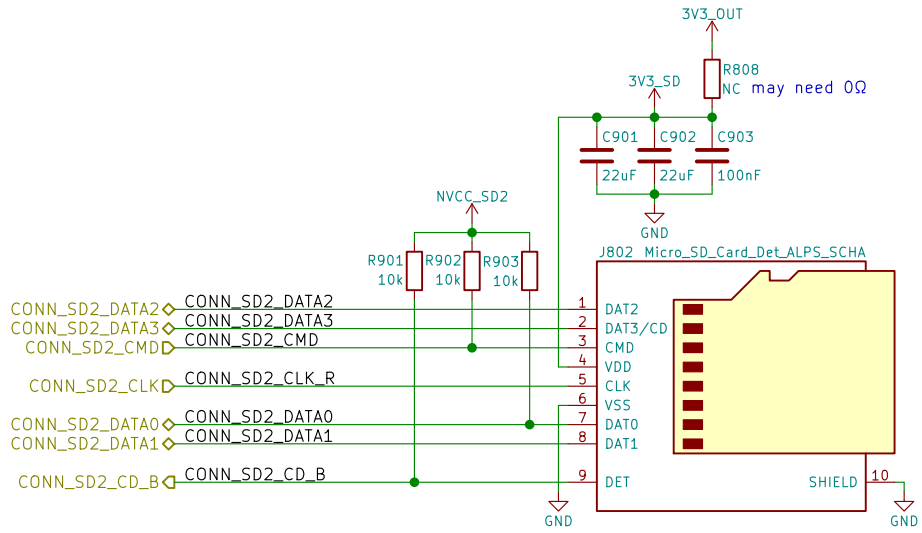


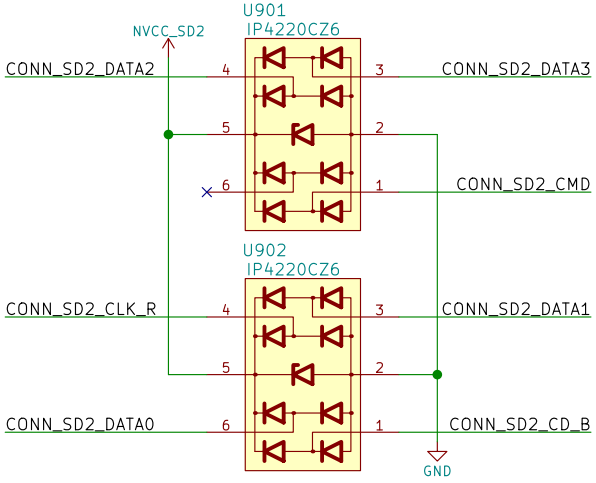

GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /JTAG/
File: jtag.sch

***Title: JTAG***

| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 8/17 |



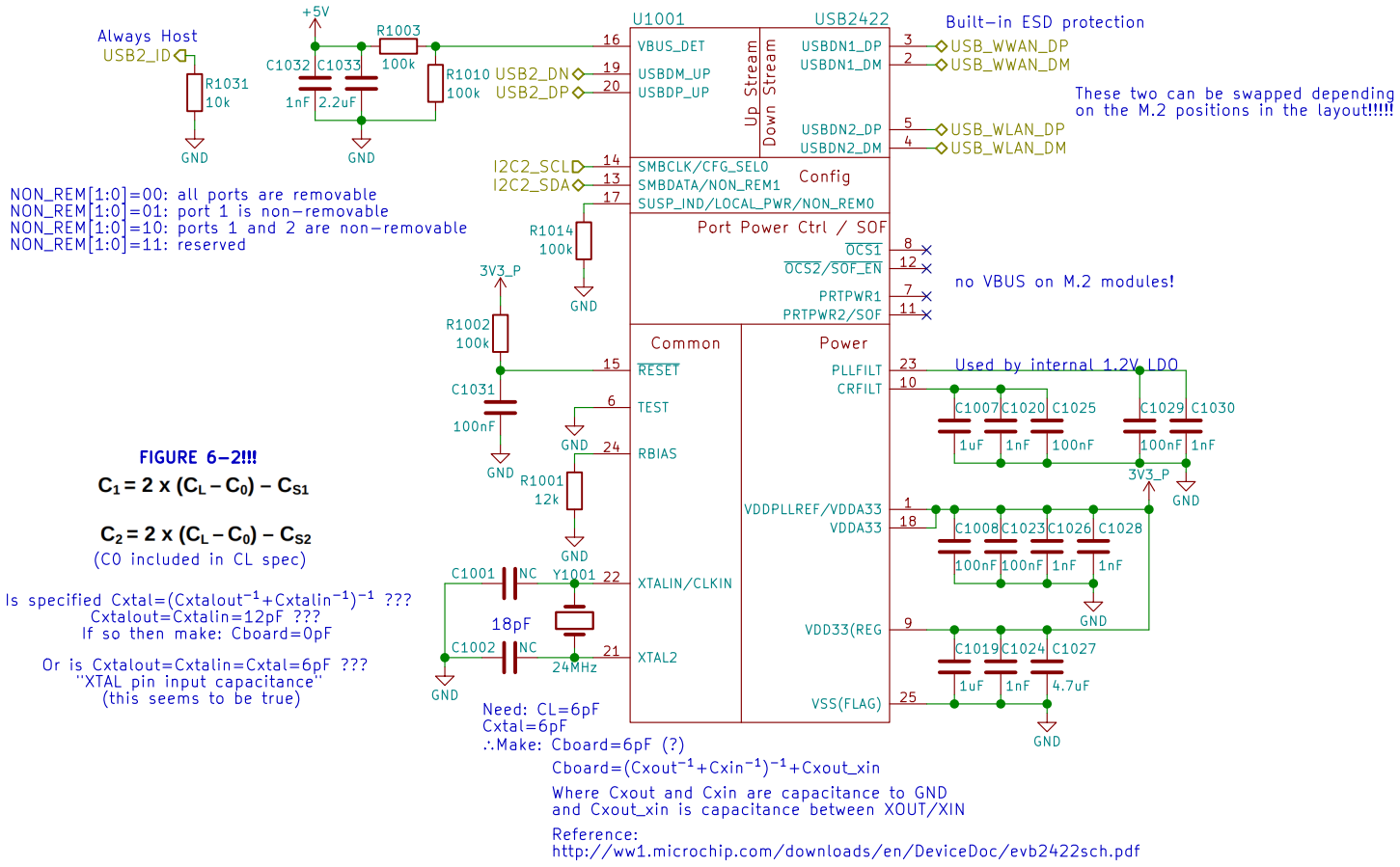




GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /uSD Card/
File: sd.sch

***Title: uSD Card***

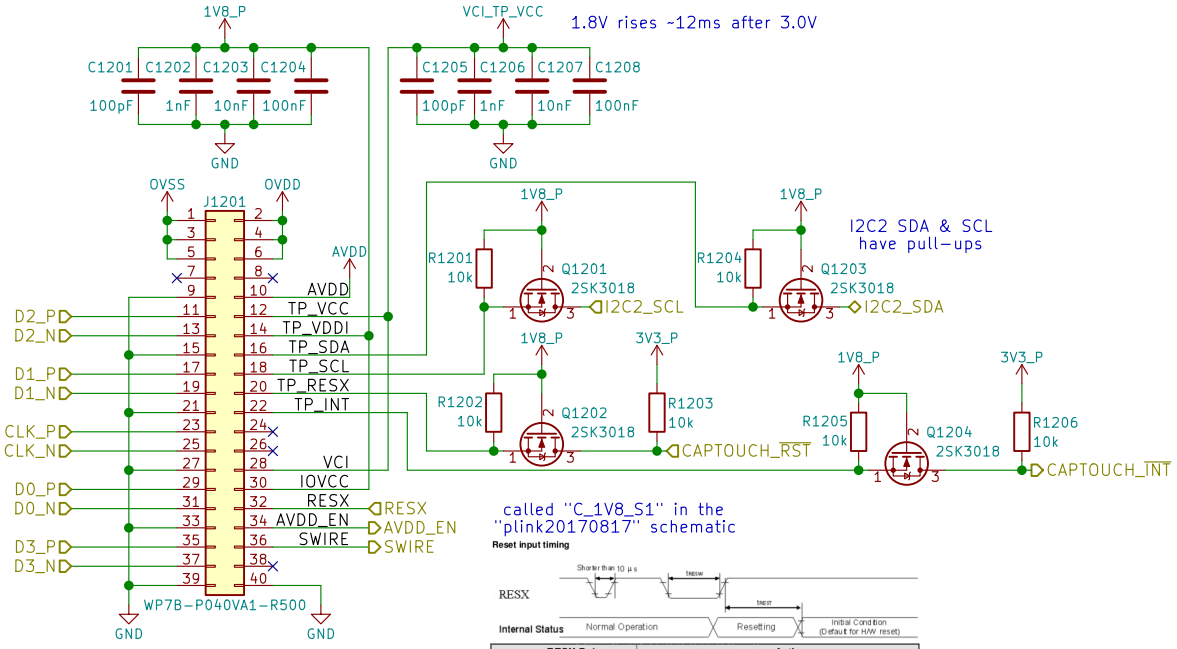
| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 9/17 |




GNU GPLv3
Copyright 2018
**Purism SPC**

| | | |
|---|---|---|
| Sheet: /USB Hub/ | | |
| File: usb_hub.sch | | |
| ***Title:*** | | |
| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.7 | | Id: 10/17 |

Using H546DLB01.1 pin assignment may need
to be changed depending on display used




called "C_1V8_S1" in the
"plink20170817" schematic

**Reset input timing**




| RESX Puise | Action |
|---|---|
| Shorter than 5µs | Invalid Reset |
| Longer than 10µs | Valid Reset |
| Between 5µs and 10µs | Reset Initialization Precedure |

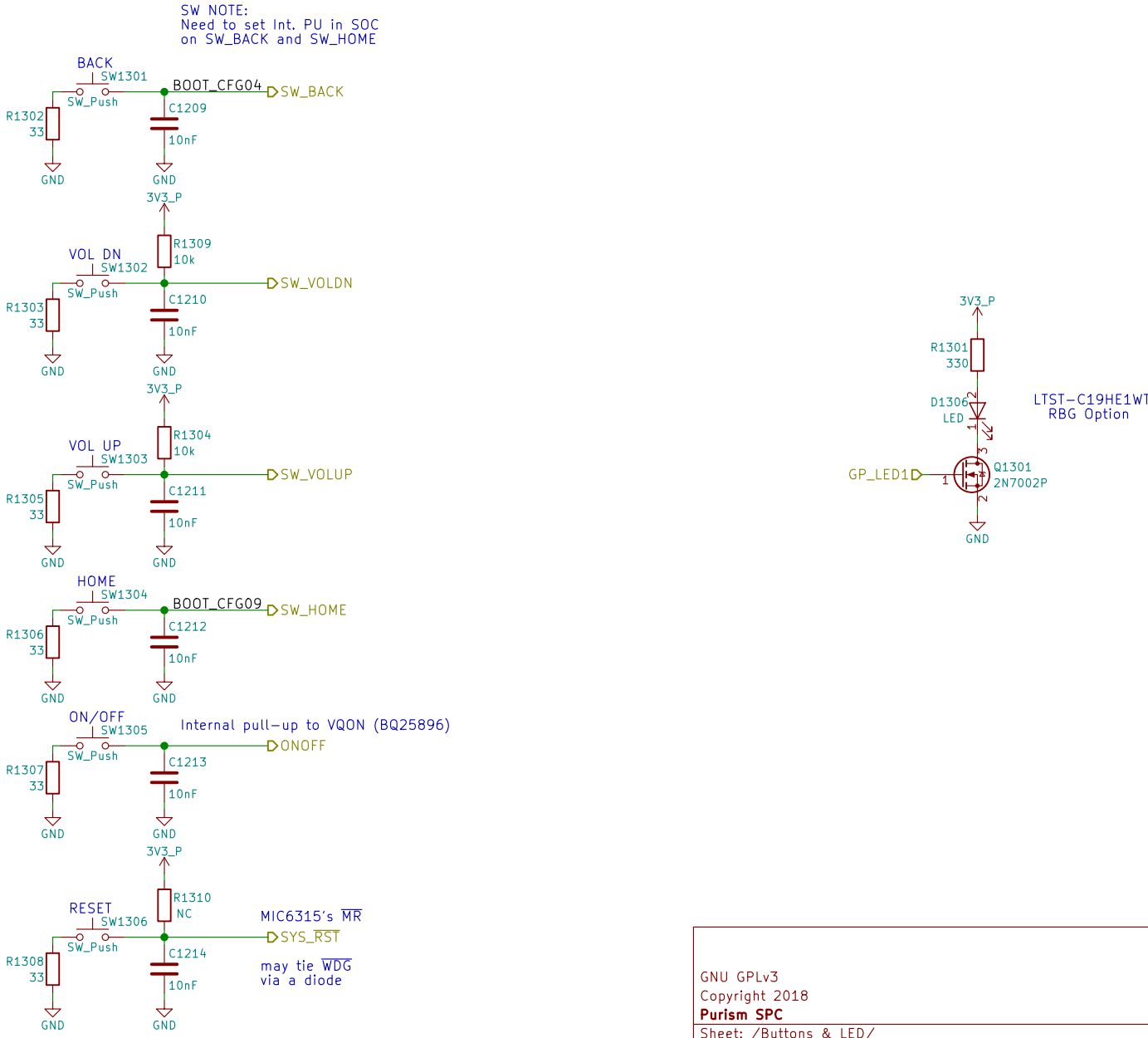
TODO: low power state signal??

GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /MIPI DSI/
File: mipi_dsi.sch

**Title: MIPI DSI**

| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 11/17 |

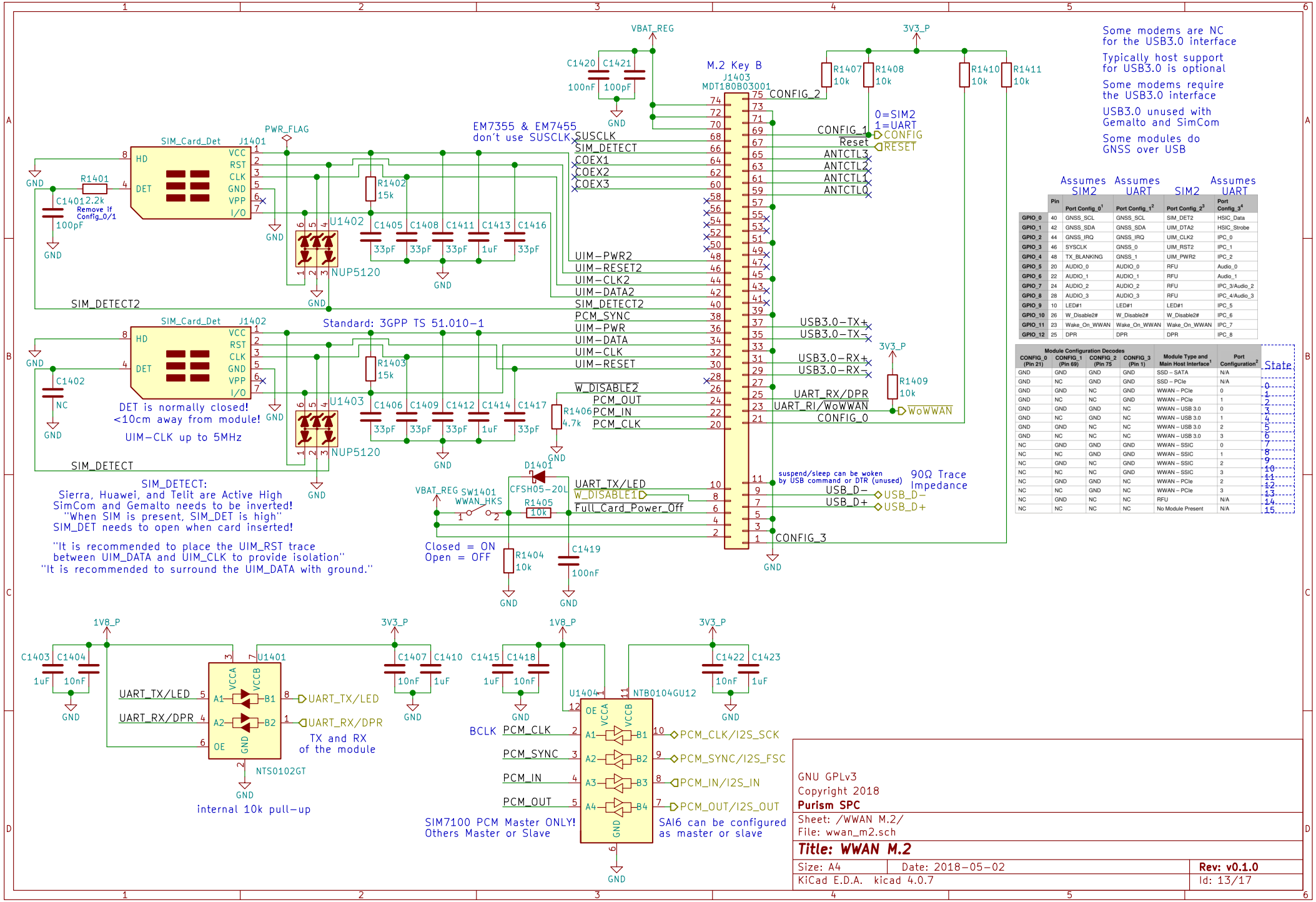



GNU GPLv3
Copyright 2018
**Purism SPC**

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

***Title: Buttons & LED***

| | | |
|---|---|---|
| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.7 | | Id: 12/17 |




Assumes SIM2 / Assumes UART / Assumes SIM2 / Assumes UART

| | 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 |

| Module Configuration Decodes | | | | | | |
|---|---|---|---|---|---|---|
| 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 | |
| GND | NC | GND | GND | SSD – PCIe | N/A | |
| GND | GND | NC | GND | WWAN – PCIe | 0 | 0 |
| GND | NC | NC | GND | WWAN – PCIe | 1 | 1 |
| GND | GND | GND | NC | WWAN – USB 3.0 | 0 | 2 |
| GND | NC | GND | NC | WWAN – USB 3.0 | 1 | 3 |
| GND | GND | NC | NC | WWAN – USB 3.0 | 2 | 4 |
| GND | NC | NC | NC | WWAN – USB 3.0 | 3 | 5 |
| NC | GND | GND | GND | WWAN – SSIC | 0 | 6 |
| NC | NC | GND | GND | WWAN – SSIC | 1 | 7 |
| NC | GND | NC | GND | WWAN – SSIC | 2 | 8 |
| NC | NC | NC | GND | WWAN – SSIC | 3 | 9 |
| NC | GND | GND | NC | WWAN – PCIe | 2 | 10 |
| NC | NC | GND | NC | WWAN – PCIe | 3 | 11 |
| NC | GND | NC | NC | RFU | N/A | 12 |
| NC | NC | NC | NC | No Module Present | N/A | 13 |
| | | | | | | 14 |
| | | | | | | 15 |

GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /WWAN M.2/
File: wwan_m2.sch

**Title: WWAN M.2**

Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7 | Id: 13/17

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-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"
⇒ $(1V)^2/(16Ω)=62.5mW$
∴ Vrms=1V ⇒ Vp(amplitude)=1.414V
∴ Irms(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

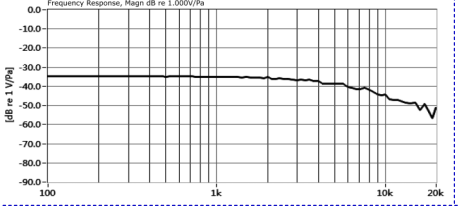
Could use FSA8008 to detect mic

U1501 SGTL5000
Mute via MUTE_LO=1
may use lineout left channel for pseudo-earpiece speaker
fc=106Hz
U1406 PAM8301
LS1401 AS01608MS-SP9
FL1401 DLW21SN900SQ2L
FL1501 DLW21SN900SQ2L
Z(hp)≥16Ω
CTIA/AHJ
Microphone
Ground
Audio (Right)
Audio (Left)
J1404 SJ-43515TS
Pin 5 (tip switch) is NC, open when inserted
If just headphones then HP_DET=HIGH, R(mic)=0
<3.3µA
D1402 SZMM5Z3V3T1G
Vz=3.3V
Vf=0.9V
may add ~220uF cap parallel to Zener
D1501 ESD5B5.0S
D1502 ESD5B5.0S

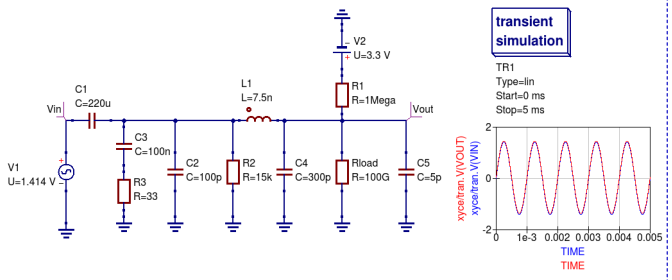
SW Mute Mic:
MUTE_ADC=1
U1405 FSA6157L6X
MIC_SEL SW1402A SW_DPST_x2
Ext-Mic enabled
MIC_SEL=LOW
Add TVS next to int-mic?
(OpenMoko does this)
MK1401 CMC-6022
Int-Mic enabled
MIC_SEL=LOW
TODO:
DPST with camera!

−37dB=14.1254mV/Pa
∴ mic produces 14.1254mVrms when exposed to a 1kHz tone of 94dB-SPL at the capsule (or 19.98mV amplitude)

Built-In Mic's Frequency Response:




Simulation of 1kHz output
without HP jack inserted:




**LCR Measurements:**

earbud microphone:
@1kHz
Ls = 3.844mH
Lp = 15.757H
Cs = 6.583uF
Cp = 1612.8pF
Rs = 1.5465kOhms
Rp = 1.5478kOhms
θ = −0.8deg

headset speaker:
@1kHz
Ls = 244.4uH
Lp = 141.99mH
Cs = 103.6uF
Cp = 178.77nF
Rs = 36.860hms
Rp = 36.860hms
θ = −2.3deg

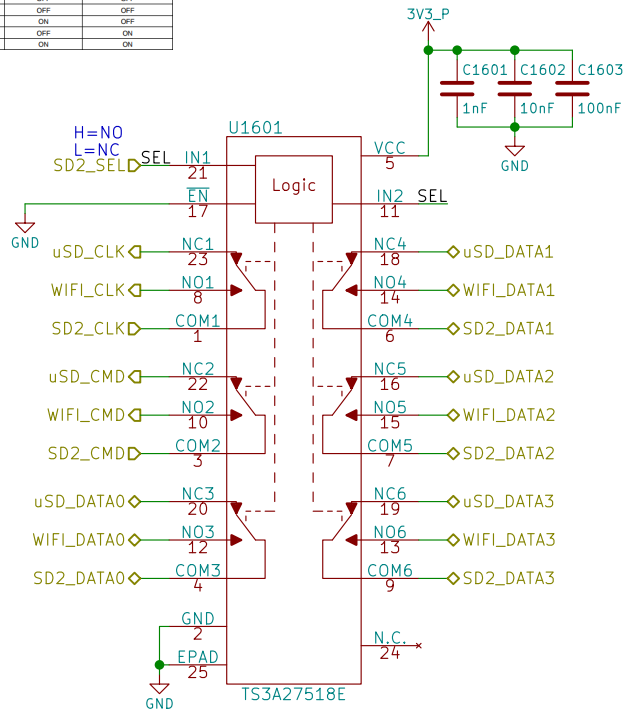
headphone speaker:
@1kHz
Ls = 25.2uH
Lp = 311.0mH
Cs = 1.0mF
Cp = 81.95nF
Rs = 17.0300hms
Rp = 17.0340hms
θ = 0.5deg

GNU GPLv3
Copyright 2018
**Purism SPC**

| | | |
|---|---|---|
| Sheet: /Audio/ | | |
| File: audio.sch | | |
| ***Title: Audio*** | | |
| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.7 | | Id: 14/17 |

Can swap around signals in the layout:

| EN | IN1 | IN2 | NC1/2/3 TO COM1/2/3, COM1/2/3 TO NC1/2/3 | NC4/5/6 TO COM4/5/6, COM4/5/6 TO NC4/5/6 | NO1/2/3 TO COM1/2/3, COM1/2/3 TO NO1/2/3 | NO4/5/6 TO COM4/5/6, COM4/5/6 TO NO4/5/6 |
|---|---|---|---|---|---|---|
| H | X | X | OFF | OFF | OFF | OFF |
| L | L | L | ON | ON | OFF | OFF |
| L | H | L | OFF | OFF | ON | OFF |
| L | L | H | ON | OFF | OFF | ON |
| L | H | H | OFF | OFF | ON | ON |



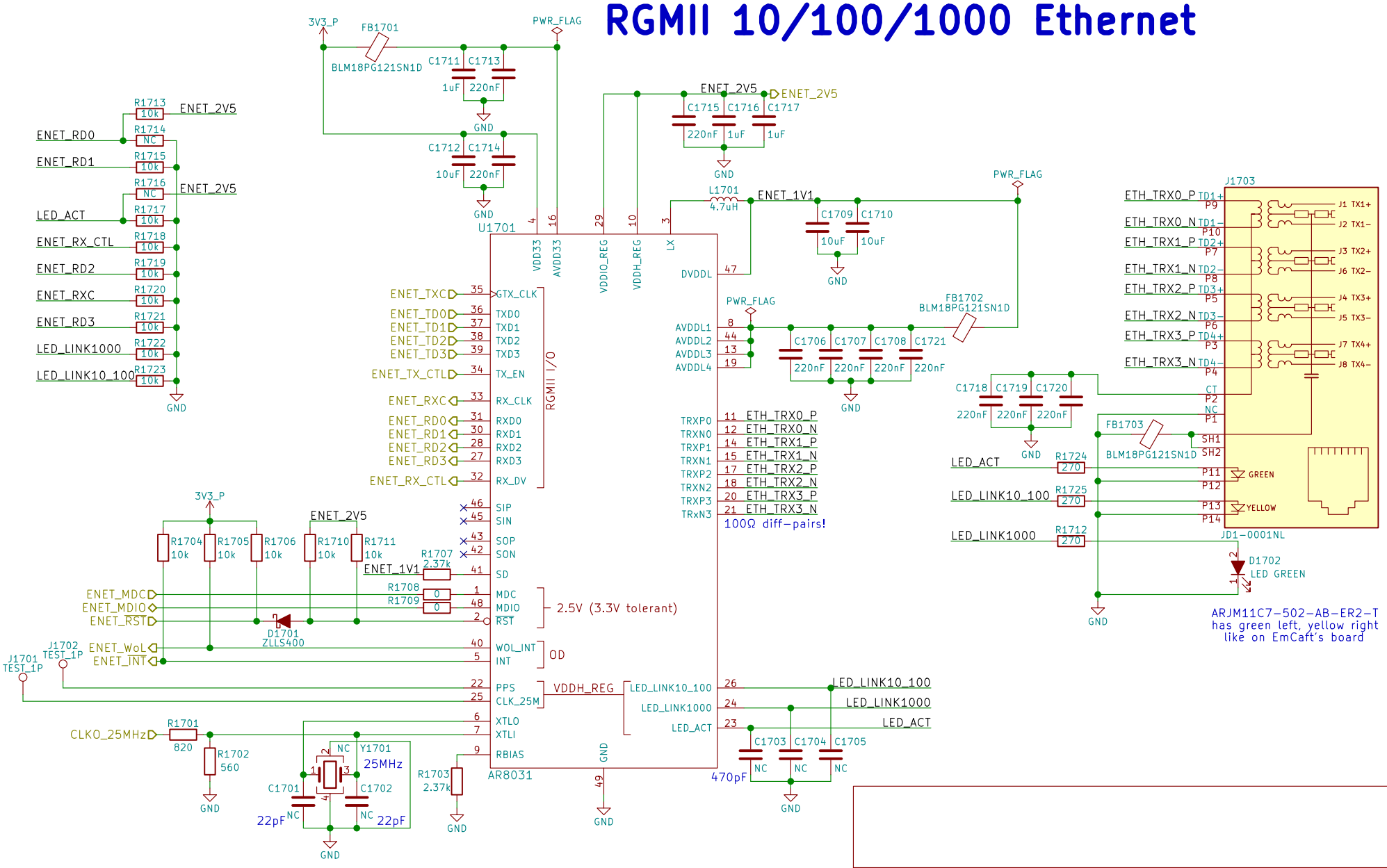

GNU GPLv3
Copyright 2018
**Purism SPC**

Sheet: /SDIO DEMUX/
File: sdio_demux.sch

***Title: SDIO Demultiplexer***

| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 15/17 |

# RGMII 10/100/1000 Ethernet



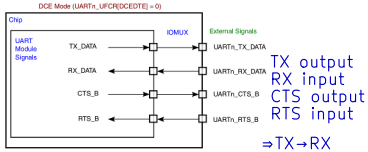

| | | |
|---|---|---|
| Sheet: /Ethernet/ | | |
| File: ethernet.sch | | |
| **Title:** | | |
| Size: A4 | Date: | **Rev:** |
| KiCad E.D.A. kicad 4.0.7 | | Id: 16/17 |

6.2 M.2 Signal Directions

RS9116 NC:
RTS, CTS, BT_HOST_WAKE, WIFI_WAKE

Module: Table 23
Socket: Table 46

UARTn_UFCR[DCEDTE]=0 on POR




TX output
RX input
CTS output
RTS input

⇒TX→RX
RX←TX
CTS→CTS
RTS←RTS

RedPine RS9116 MB0
Requires +5V for USB!

J1502

M.2_Key_E

3V3_P
1V8_P
GND

USB_WLAN_DP
USB_WLAN_DN
WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE
WIFI_RST
W_DISABLE1

R1506 10k
D1503 ZLLS400
D1504 ZLLS400

M2_PCM_CLK
M2_PCM_SYNC
M2_PCM_IN
M2_PCM_OUT
BT_HOST_WAKE
BT_UART_RXD
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS
W_DISABLE2
W_DISABLE1
M2_I2C_SDA
M2_I2C_SCL

SoC's RX
Module's TX

SoC's TX
Module's RX

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK

i.MX8M in DCE mode has
CTS output, RTS input

U1502A 74AUP2G00
U1502B 74AUP2G00

BT_DISABLE
WIFI_DISABLE

D1505 CFSH05-20L
Closed = ON (*_DISABLE HIGH)
Open = OFF

SW1501 WWAN_HKS
R1508 10k
R1510 10k
C1515 100nF

R1507 10k
R1509 10k
M2_I2C_SDA
M2_I2C_SCL
I2C2_SDA
I2C2_SCL
Q1501 FDV301N
Q1502 FDV301N

TODO!!!
verify if translators
with PWR_EN is needed!

RS9116's I2C is part of its
IO_VDD_1 domain
which is 3.0-3.6V!
TODO!!!

RS9116 has SCL as output
⇒master?
(only device on I2C2 bus)

TODO:
M.2 spec defines
UART&PCM 1.8V!
but RS9116 is 3.3V!!

C1722 C1723 1uF 10nF
C1724 C1725 10nF 1uF

U1702 NTB0104GU12

BT_UART_RXD
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

RX, TX, RTS, CTS
of the SoC

internal 10k pull-up

C1520 C1521 1uF 10nF
C1522 C1523 10nF 1uF

U1504 NTB0104GU12

BCLK
M2_PCM_CLK
M2_PCM_SYNC
M2_PCM_IN
M2_PCM_OUT

BT_PCM_CLK
BT_PCM_SYNC
BT_PCM_IN
BT_PCM_OUT

configure as slave

GNU GPLv3
Copyright 2018
**Purism SPC**

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

**Title: WLAN+BT M.2**

| Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.7 | | Id: 17/17 |