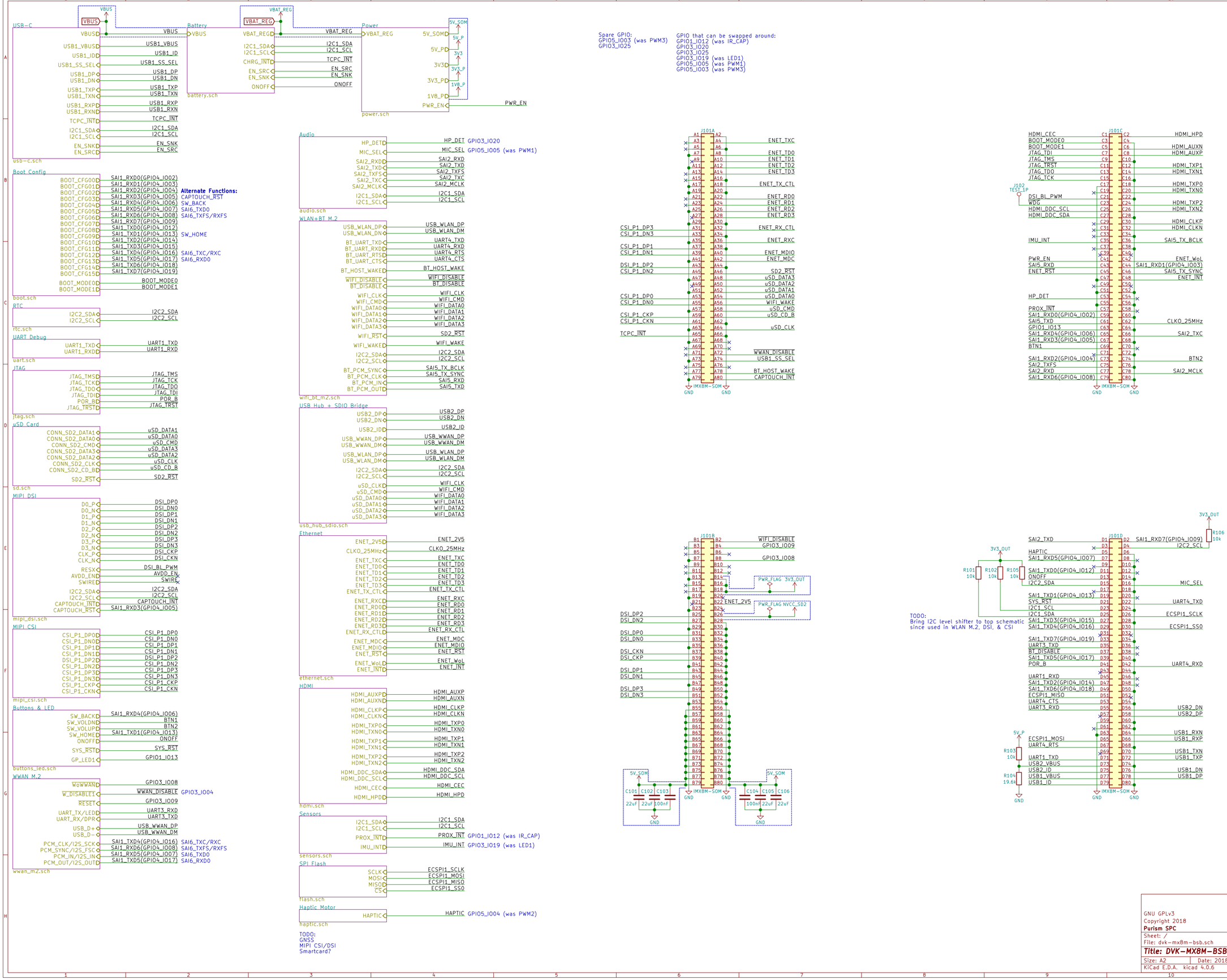
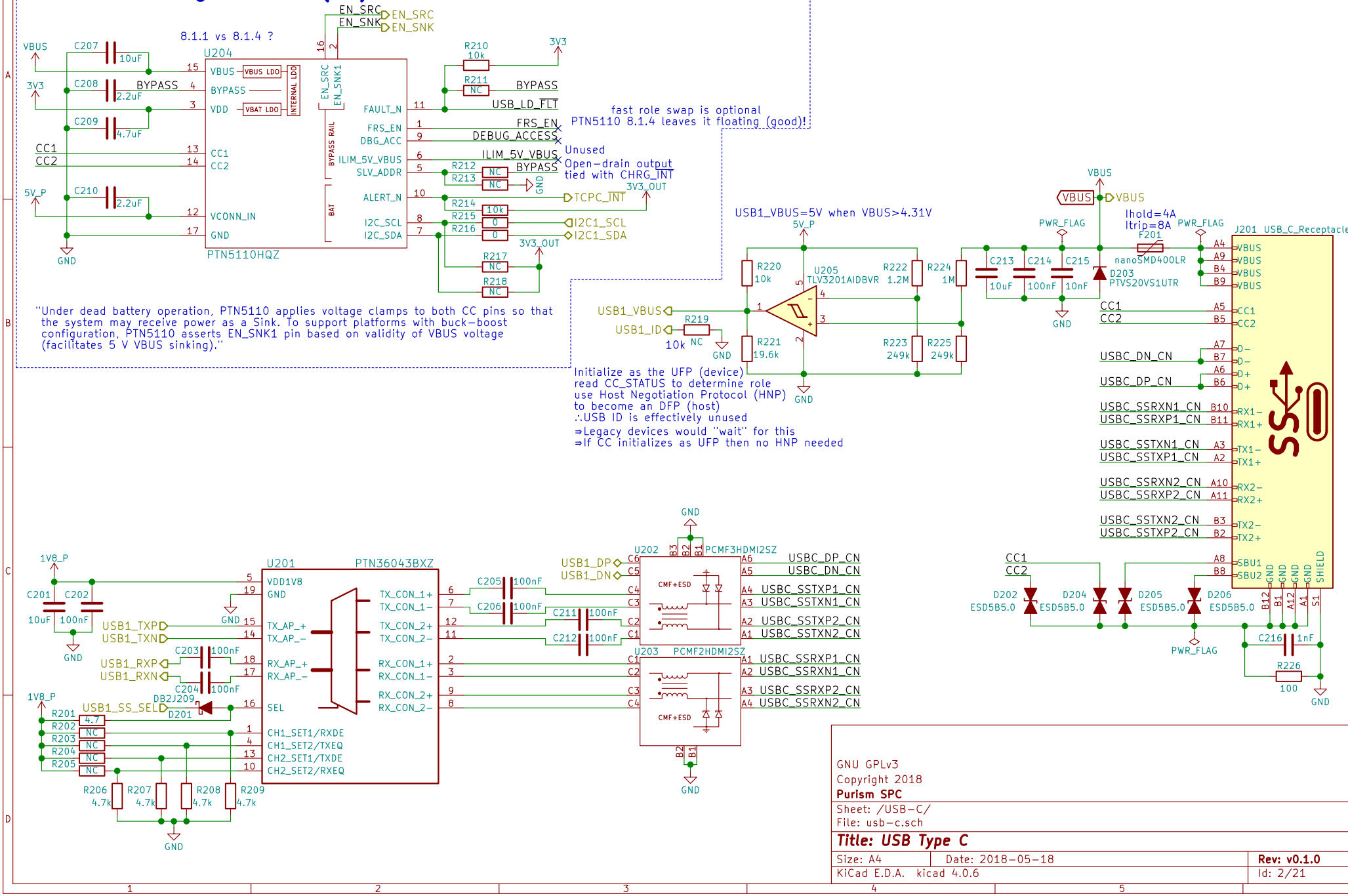

USB-C
VBUS
USB1_VBUS
USB1_ID
USB1_SS_SEL
USB1_DP
USB1_DN
USB1_TXP
USB1_TXN
USB1_RXP
USB1_RXN
TCPC_INT
I2C1_SDA
I2C1_SCL
EN_SNK
EN_SRC
usb-c.sch
Battery
battery.sch
Power
5V_SOM
5V_P
3V3
3V3_P
3V3_P
1V8_P
PWR_EN
power.sch
Spare GPIO:
GPIO5_IO03 (was PWM3)
GPIO3_IO25
GPIO that can be swapped around:
GPIO1_IO12 (was IR_CAP)
GPIO3_IO20
GPIO3_IO25
GPIO3_IO19 (was LED1)
GPIO5_IO05 (was PWM1)
GPIO5_IO03 (was PWM3)
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
Alternate Functions:
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
SD2_RST
sd.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_EN AVDD_EN
SWIRE SWIRE
I2C2_SDA
I2C2_SCL
CAPTOUCH_INT
CAPTOUCH_RST SAI1_RXD3(GPIO4_IO05)
mipi_dsi.sch
MIPI CSI
CSI_P1_DP0
CSI_P1_DN0
CSI_P1_DP1
CSI_P1_DN1
DSI_P1_DP2
CSI_P1_DN2
CSI_P1_DP3
CSI_P1_DN3
CSI_P1_CKP
CSI_P1_CKN
mipi_csi.sch
Buttons & LED
SW_BACK SAI1_RXD4(GPIO4_IO06)
SW_VOLDN BTN1
SW_VOLUP BTN2
SW_HOME SAI1_TXD1(GPIO4_IO13)
ONOFF ONOFF
SYS_RST SYS_RST
GP_LED1 GPIO1_IO13
buttons_led.sch
WWAN_M.2
WoWWAN GPIO3_IO08
W_DISABLE1 WWAN_DISABLE GPIO3_IO04
RESET GPIO3_IO09
UART_TX/LED UART3_TXD
UART_RX/DPR
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 HP_DET GPIO3_IO20
MIC_SEL MIC_SEL GPIO5_IO05 (was PWM1)
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
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
SD2_RST
WIFI_WAKE
I2C2_SDA
I2C2_SCL
BT_PCM_SYNC SAI5_TX_BCLK
BT_PCM_CLK SAI5_TX_SYNC
BT_PCM_IN SAI5_RXD
BT_PCM_OUT SAI5_TXD
wifi_bt_m2.sch
USB Hub + SDIO Bridge
USB2_DP
USB2_DN
USB2_ID
USB_WWAN_DP
USB_WWAN_DM
USB_WLAN_DP
USB_WLAN_DM
I2C2_SDA
I2C2_SCL
uSD_CLK
uSD_CMD
uSD_DATA0
uSD_DATA1
uSD_DATA2
uSD_DATA3
usb_hub_sdio.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
HDMI
HDMI_AUXP
HDMI_AUXN
HDMI_CLKP
HDMI_CLKN
HDMI_TXP0
HDMI_TXN0
HDMI_TXP1
HDMI_TXN1
HDMI_TXP2
HDMI_TXN2
HDMI_DDC_SDA
HDMI_DDC_SCL
HDMI_CEC
HDMI_HPD
hdmi.sch
Sensors
I2C1_SDA
I2C1_SCL
PROX_INT GPIO1_IO12 (was IR_CAP)
IMU_INT GPIO3_IO19 (was LED1)
sensors.sch
SPI Flash
SCLK ECSPI1_SCLK
MOSI ECSPI1_MOSI
MISO ECSPI1_MISO
CS ECSPI1_SS0
flash.sch
Haptic Motor
HAPTIC HAPTIC GPIO5_IO04 (was PWM2)
haptic.sch
TODO:
GNSS
MIPI CSI/DSI
Smartcard?
J101A
ENET_TXC
ENET_TD0
ENET_TD1
ENET_TD2
ENET_TD3
ENET_TX_CTL
ENET_RD0
ENET_RD1
ENET_RD2
ENET_RD3
ENET_RX_CTL
ENET_RXC
ENET_MDIO
ENET_MDC
SD2_RST
uSD_DATA3
uSD_DATA2
uSD_DATA1
uSD_DATA0
uSD_CMD
uSD_CD_B
uSD_CLK
WWAN_DISABLE
USB1_SS_SEL
BT_HOST_WAKE
CAPTOUCH_INT
IMX8M-SOM
GND
J101B
WIFI_DISABLE
GPIO3_IO09
GPIO3_IO08
PWR_FLAG 3V3_OUT
ENET_2V5
PWR_FLAG NVCC_SD2
DSI_DP2
DSI_DN2
DSI_DP0
DSI_DN0
DSI_CKN
DSI_CKP
DSI_DP1
DSI_DN1
DSI_DP3
DSI_DN3
5V_SOM
C101 22uF
C102 22uF
C103 100nF
C104 100nF
C105 22uF
C106 22uF
J101C
HDMI_HPD
HDMI_AUXN
HDMI_AUXP
HDMI_TXP1
HDMI_TXN1
HDMI_TXP0
HDMI_TXN0
SAI5_TX_BCLK
ENET_WoL
SAI1_RXD1(GPIO4_IO03)
SAI5_TX_SYNC
ENET_INT
HP_DET
PROX_INT
CLKO_25MHz
SAI2_TXC
USB2_DN
USB2_DP
USB1_RXN
USB1_RXP
USB1_TXN
USB1_TXP
USB1_DN
USB1_DP
BTN2
SAI2_MCLK
J102
TEST_1P
J101D
3V3_OUT
R101 10k
R102 10k
R105 10k
R106 10k
SAI2_TXD
SAI1_RXD7(GPIO4_IO09)
I2C2_SCL
HAPTIC
SAI1_RXD5(GPIO4_IO07)
SAI1_TXD0(GPIO4_IO12)
ONOFF
I2C2_SDA
MIC_SEL
SAI1_TXD1(GPIO4_IO13)
SYS_RST
UART4_TXD
I2C1_SCL
I2C1_SDA
ECSPI1_SCLK
SAI1_TXD3(GPIO4_IO15)
SAI1_TXD4(GPIO4_IO16)
ECSPI1_SS0
SAI1_TXD7(GPIO4_IO19)
UART3_TXD
BT_DISABLE
SAI1_TXD5(GPIO4_IO17)
POR_B
UART4_RXD
UART1_RXD
SAI1_TXD2(GPIO4_IO14)
SAI1_TXD6(GPIO4_IO18)
ECSPI1_MISO
UART4_CTS
UART3_RXD
USB2_DN
USB2_DP
5V_P
R103 10k
R104 19.6k
ECSPI1_MOSI
UART4_RTS
UART1_TXD
USB2_VBUS
USB2_ID
USB1_VBUS
USB1_ID
USB1_RXN
USB1_RXP
USB1_TXN
USB1_TXP
USB1_DN
USB1_DP
TODO:
Bring I2C level shifter to top schematic since used in WLAN M.2, DSI, & CSI
GNU GPLv3
Copyright 2018
Purism SPC
Sheet: /
File: dvk-mx8m-bsb.sch
Title: DVK-MX8M-BSB
Size: A2
Date: 2018-05-18
Rev: v0.1.0
KiCad E.D.A. kicad 4.0.6
Id: 1/21

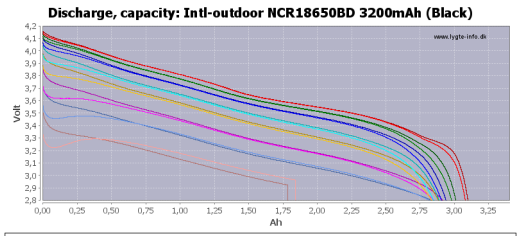
# USB-C Config Channel (CC) and PD Role Controller






| | | |
|---|---|---|
| Sheet: /USB-C/ | | |
| File: usb-c.sch | | |
| ***Title: USB Type C*** | | |
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.6 | | Id: 2/21 |

# 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

~110uF

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

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/sluuba2b/sluuba2b.pdf

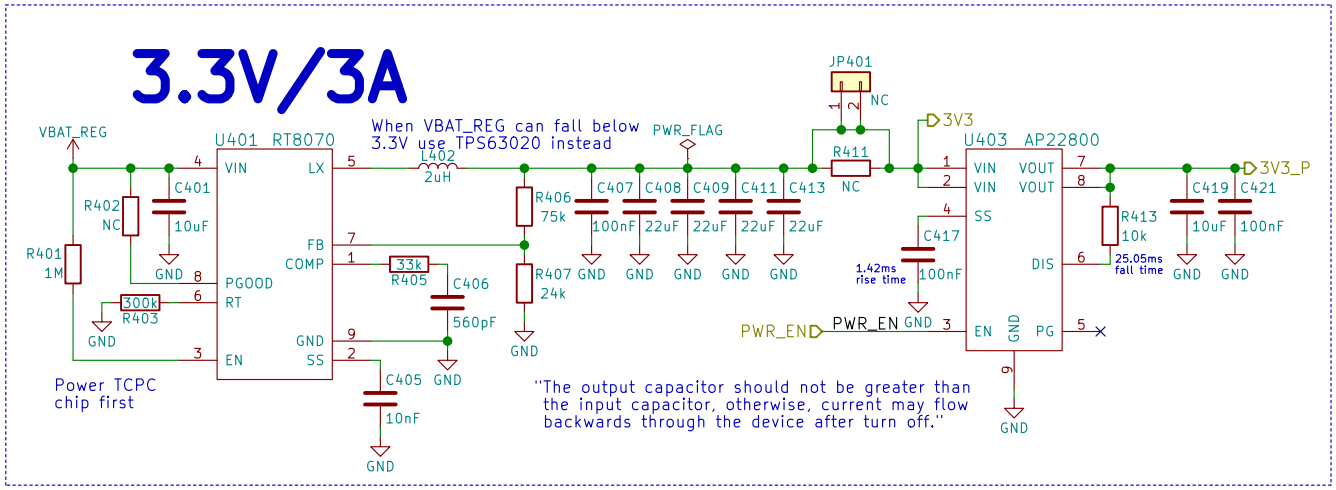
may want to include BQ29705 protection as in:
http://www.ti.com/lit/ug/tiducl1/tiducl1.pdf
schematic: http://www.ti.com/lit/df/tidrp70/tidrp70.pdf
(PTC may be good enough)

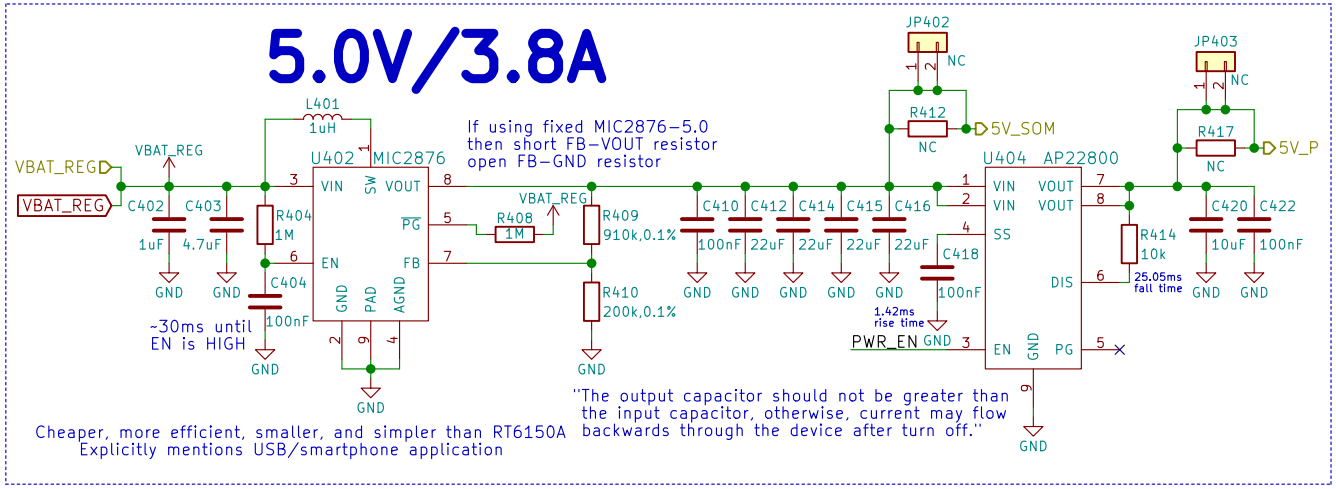
Battery holder gives ~1mm clearance underneath the battery
Thermistor is 1.1±0.15mm thick, should fit fine with stack-up

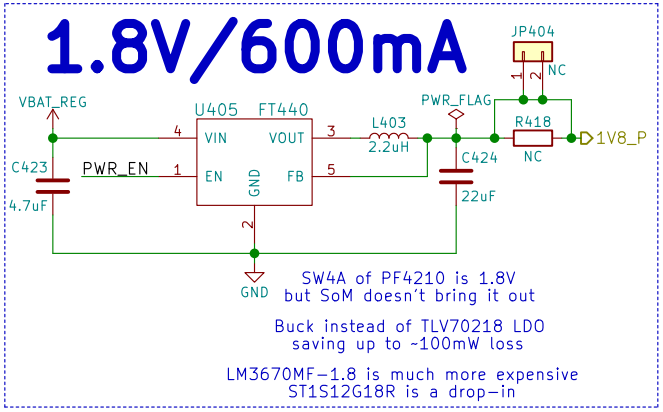
Battery holder seems to fit up to ~68.88mm long batteries
need to test 18650 protected cells which are ~69.35mm long



| | | |
|---|---|---|
| Sheet: /Battery/ | | |
| File: battery.sch | | |
| ***Title: Battery*** | | |
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.6 | | Id: 3/21 |




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



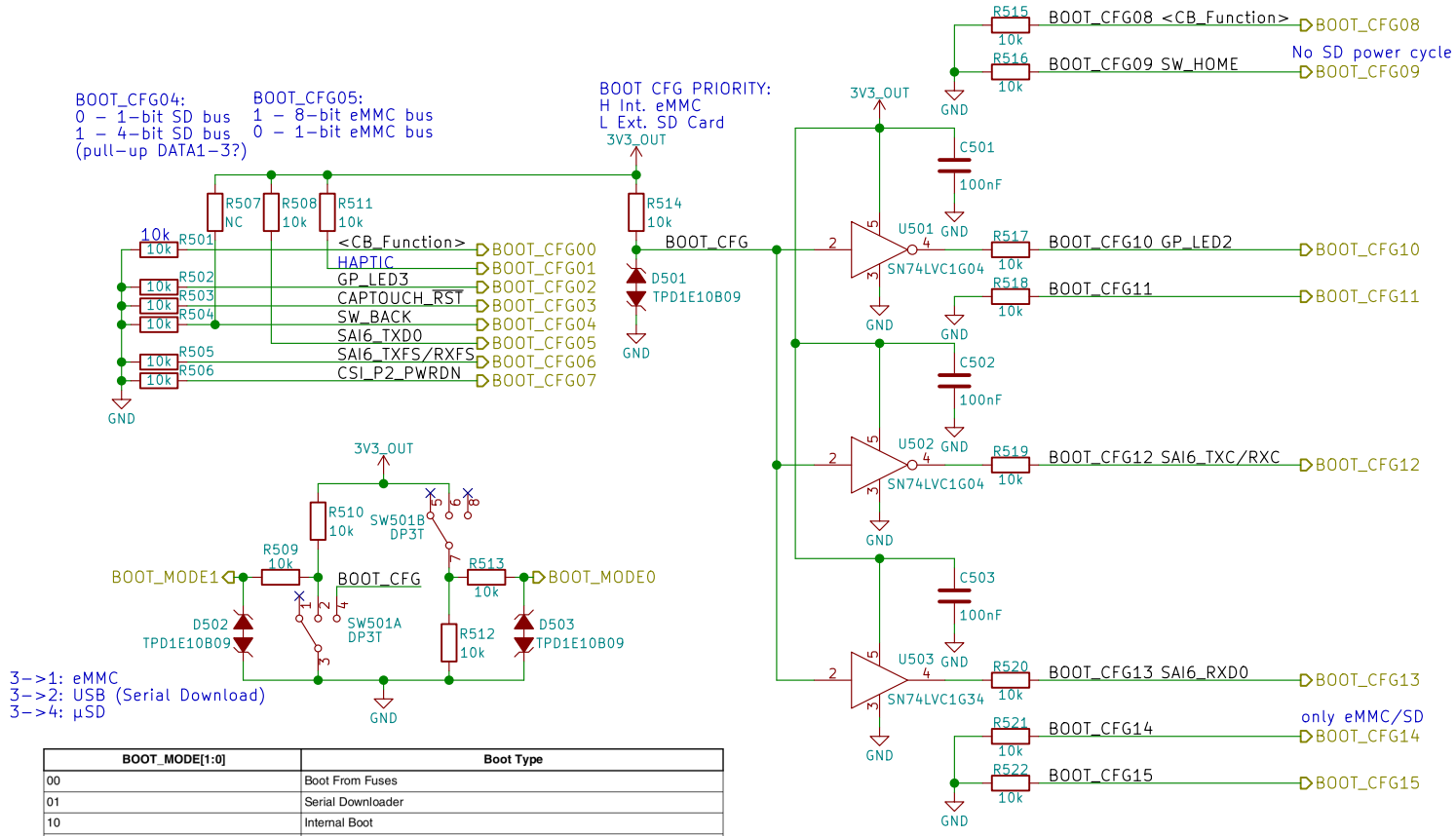
Sheet: /Power/
File: power.sch

***Title: Power***

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 4/21 |

| 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 |



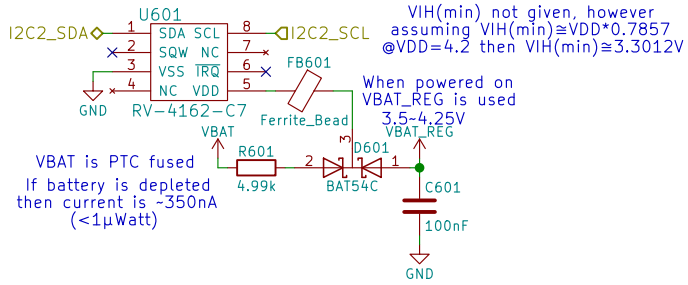

| BOOT_MODE[1:0] | Boot Type |
|---|---|
| 00 | Boot From Fuses |
| 01 | Serial Downloader |
| 10 | Internal Boot |
| 11 | Reserved |



Sheet: /Boot Config/
File: boot.sch

***Title: Boot Configuration***

| Size: A4 | Date: 2018–05–18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 5/21 |

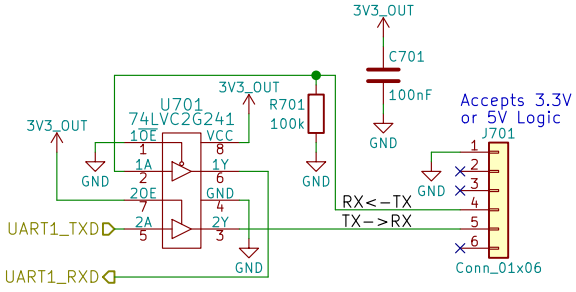





Sheet: /RTC/
File: rtc.sch

***Title: RTC***

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 6/21 |

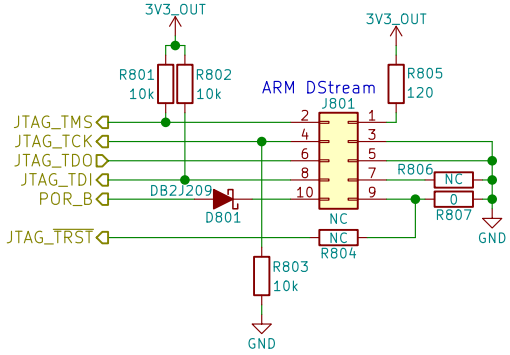





Sheet: /UART Debug/
File: uart.sch

***Title: UART Debug***

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 7/21 |

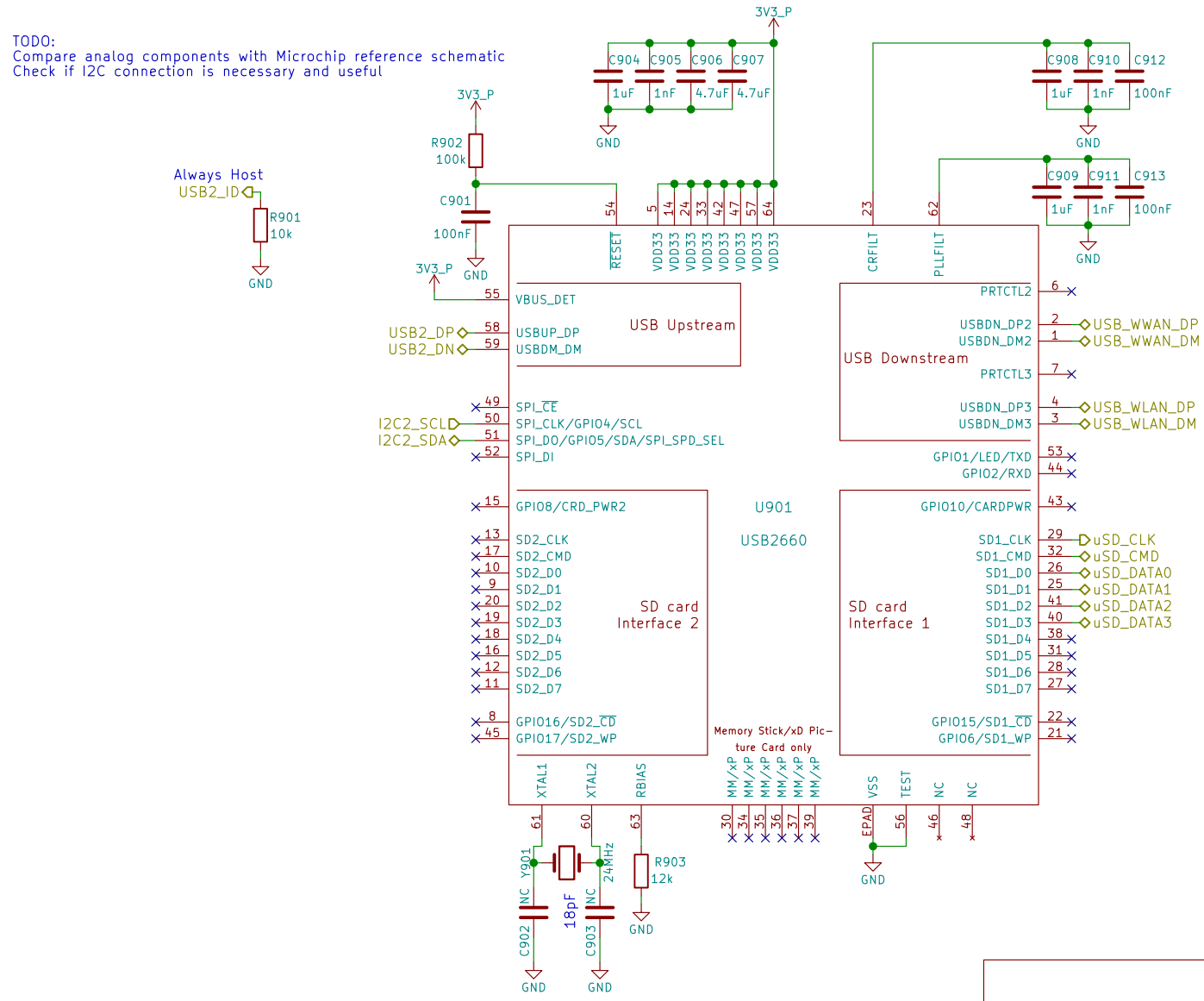


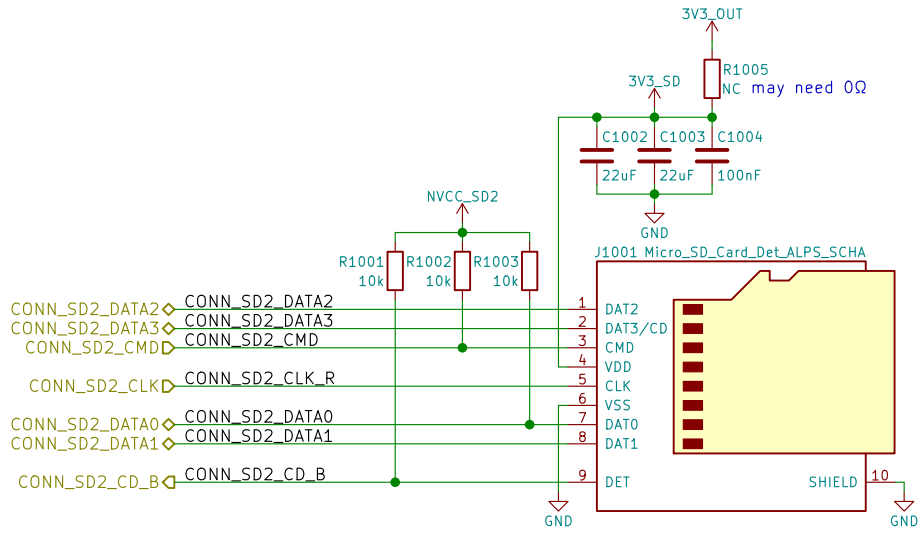


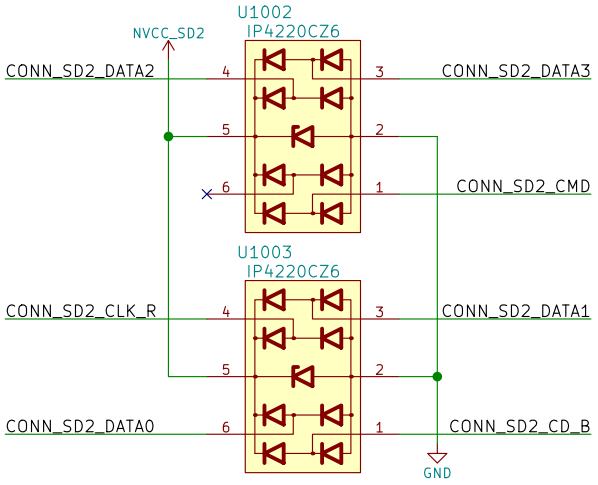

Sheet: /JTAG/
File: jtag.sch

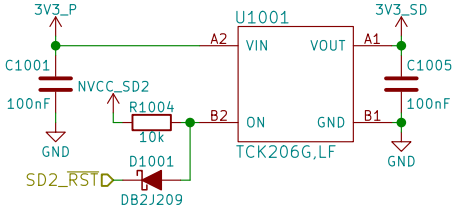
***Title: JTAG***

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 8/21 |


TODO:
Compare analog components with Microchip reference schematic
Check if I2C connection is necessary and useful
3V3_P
C904 C905 C906 C907
1uF 1nF 4.7uF 4.7uF
GND
C908 C910 C912
1uF 1nF 100nF
C909 C911 C913
R902
100k
C901
100nF
Always Host
USB2_ID
R901
10k
54 5 14 24 33 42 47 57 64
RESET VDD33
23 62
CRFILT PLLFILT
55 VBUS_DET
USB Upstream
58 USBUP_DP
59 USBDM_DM
USB2_DP
USB2_DN
6 PRTCTL2
2 USBDN_DP2
1 USBDN_DM2
USB_WWAN_DP
USB_WWAN_DM
USB Downstream
7 PRTCTL3
4 USBDN_DP3
3 USBDN_DM3
USB_WLAN_DP
USB_WLAN_DM
49 SPI_CE
50 SPI_CLK/GPIO4/SCL
51 SPI_DO/GPIO5/SDA/SPI_SPD_SEL
52 SPI_DI
I2C2_SCL
I2C2_SDA
53 GPIO1/LED/TXD
44 GPIO2/RXD
15 GPIO8/CRD_PWR2
13 SD2_CLK
17 SD2_CMD
10 SD2_D0
9 SD2_D1
20 SD2_D2
19 SD2_D3
18 SD2_D4
16 SD2_D5
12 SD2_D6
11 SD2_D7
SD card Interface 2
8 GPIO16/SD2_CD
45 GPIO17/SD2_WP
U901
USB2660
43 GPIO10/CARDPWR
29 SD1_CLK
32 SD1_CMD
26 SD1_D0
25 SD1_D1
41 SD1_D2
40 SD1_D3
38 SD1_D4
31 SD1_D5
28 SD1_D6
27 SD1_D7
SD card Interface 1
uSD_CLK
uSD_CMD
uSD_DATA0
uSD_DATA1
uSD_DATA2
uSD_DATA3
22 GPIO15/SD1_CD
21 GPIO6/SD1_WP
Memory Stick/xD Pic-ture Card only
MM/xP
30 34 35 36 37 39
XTAL1 XTAL2 RBIAS
61 60 63
EPAD VSS TEST NC NC
56 46 48
Y901
24MHz
18pF
NC
C902 C903
R903
12k
GND
GNU GPLv3
Copyright 2018
Purism SPC
Sheet: /USB Hub + SDIO Bridge/
File: usb_hub_sdio.sch
Title:
Size: A4
Date: 2018-05-18
Rev: v0.1.0
KiCad E.D.A. kicad 4.0.6
Id: 9/21



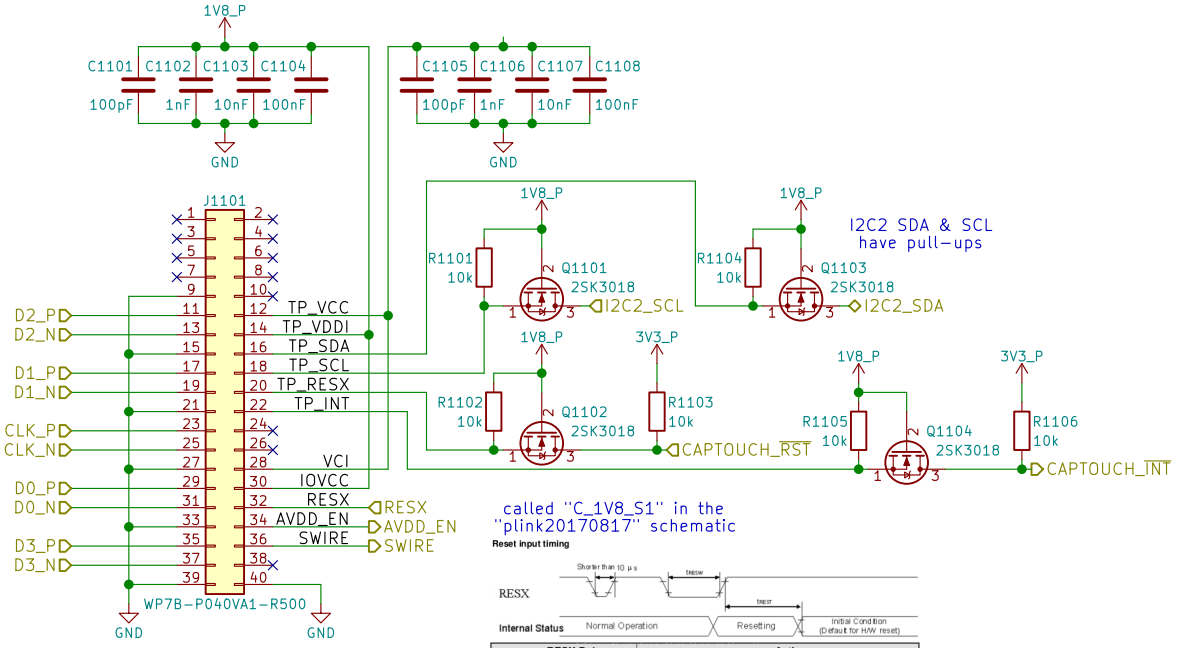



Sheet: /uSD Card/
File: sd.sch

***Title: uSD Card***

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 10/21 |

TODO:
ensure power sequence is satisfied
based on the display used




called "C_1V8_S1" in the
"plink20170817" schematic




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

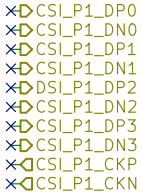
TODO: low power state signal??



Sheet: /MIPI DSI/
File: mipi_dsi.sch

**Title: MIPI DSI**

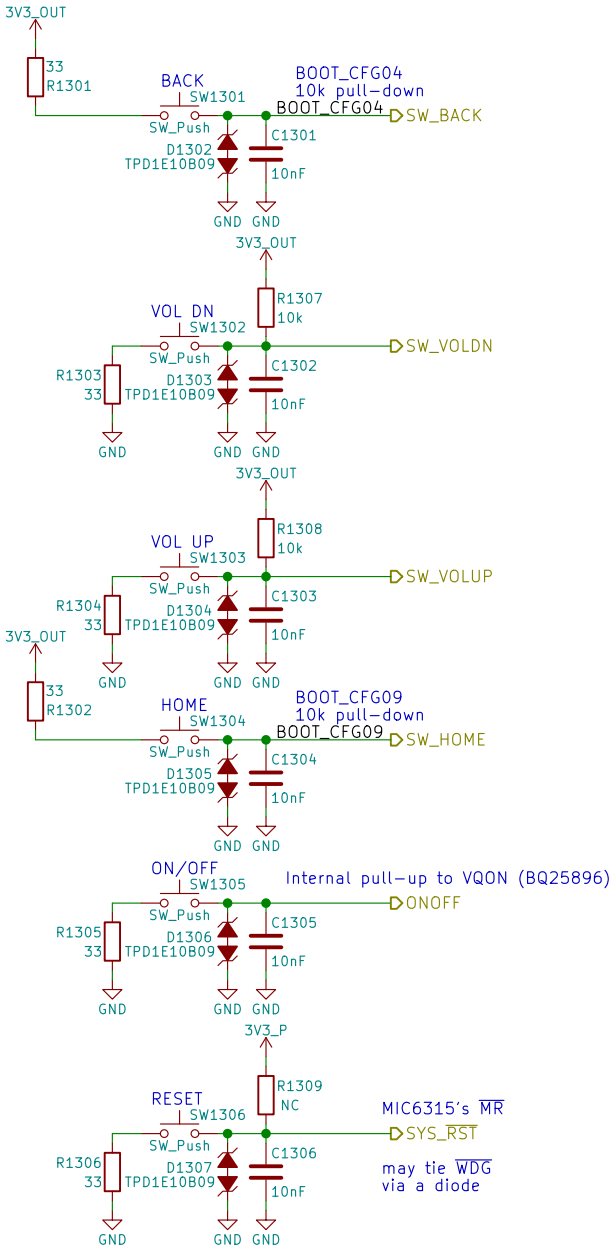
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 11/21 |



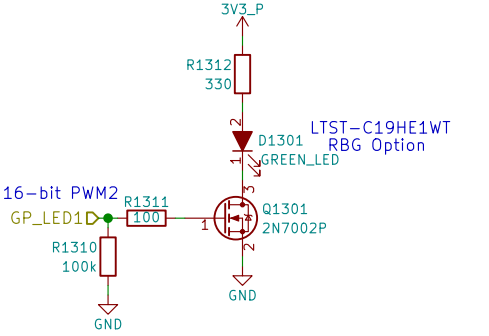

Sheet: /MIPI CSI/
File: mipi_csi.sch

**Title:**

| Size: A4 | Date: | **Rev:** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 12/21 |




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)

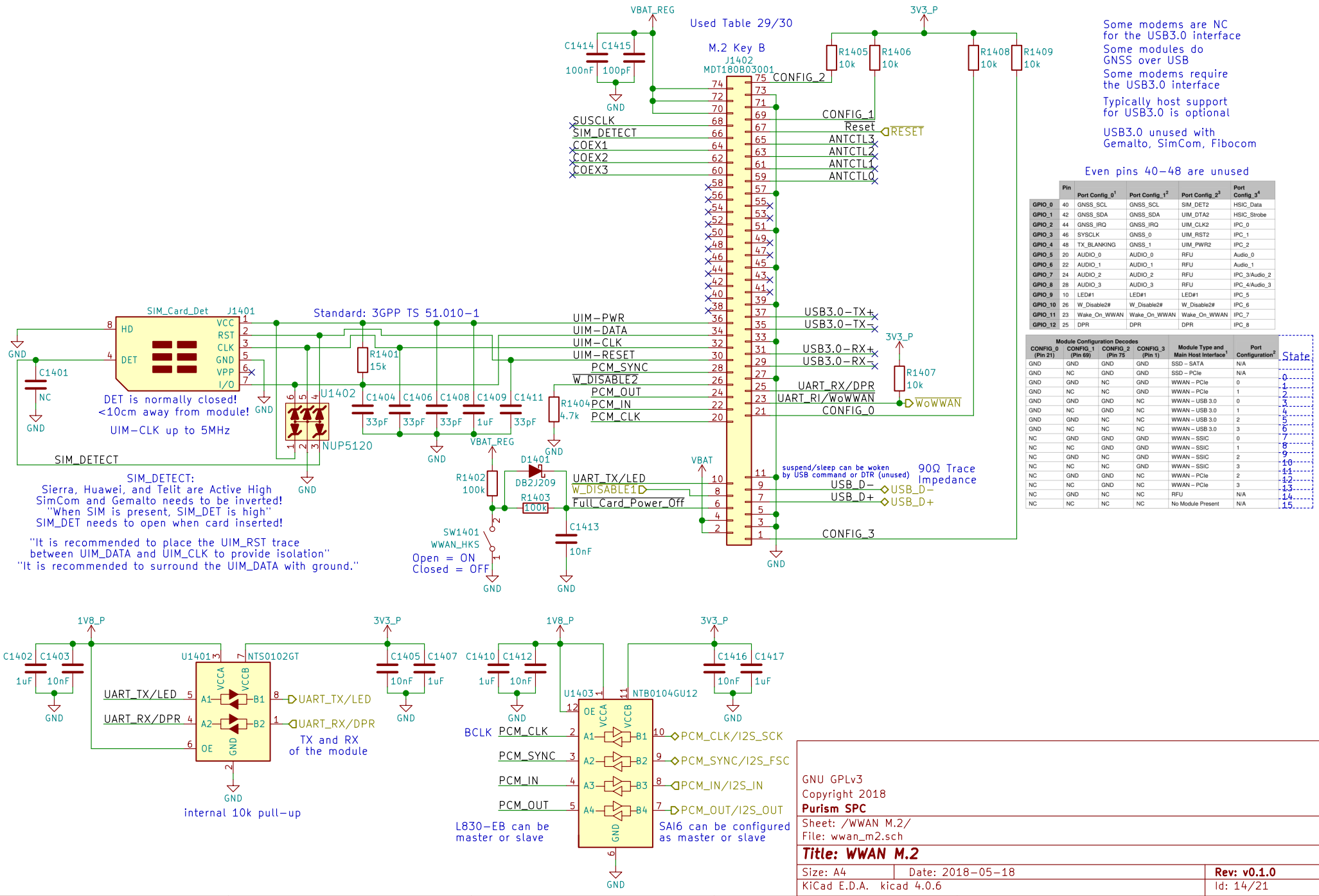





Sheet: /Buttons & LED/
File: buttons_led.sch

***Title: Buttons & LED***

| | | |
|---|---|---|
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.6 | | Id: 13/21 |




| | 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 | | | | | | State |
|---|---|---|---|---|---|---|
| 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] | |
| 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 |



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

**Title: WWAN M.2**

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 14/21 |

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

U1502 PAM8301

LS1501 AS01608MS-SP9

CTIA/AHJ

Microphone
Ground
Audio (Right)
Audio (Left)

<3.3µA

Z(hp)≥16Ω

SMD Equivalent: SJ-43515RS-SMT-TR

Pin 5 (tip switch) is NC, open when inserted

If just headphones then HP_DET=HIGH, R(mic)=0

may add ~220uF cap parallel to Zener

Vz=3.3V
Vf=0.9V

SW Mute Mic:
MUTE_ADC=1

U1503 FSA6157L6X

Ext-Mic enabled
MIC_SEL=LOW

Int-Mic enabled
MIC_SEL=LOW

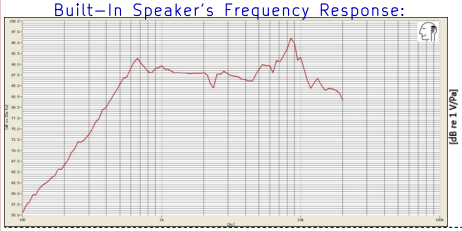
TODO:
DPST with camera!

Add TVS next to int-mic?
(OpenMoko does this)

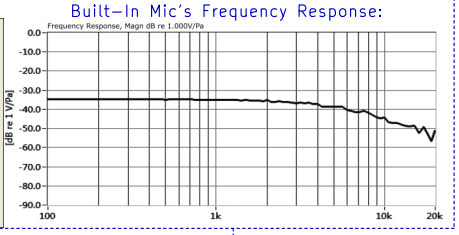
−37dB=14.1254mV/Pa
∴ mic produces 14.1254mVrms when exposed to a 1kHz tone of 94dB-SPL at the capsule (or 19.98mV amplitude)

⇒ 40dB gain would produce ~2V amplitude (4Vpp, clipping)
30dB gain would produce ~0.632V amplitude (1.264Vpp)
*38.33dB gain would yield 3.3Vpp*

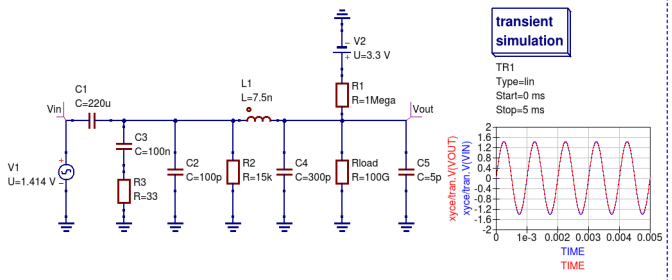
Built-In Speaker's Frequency Response:



Built-In Mic's Frequency Response:




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



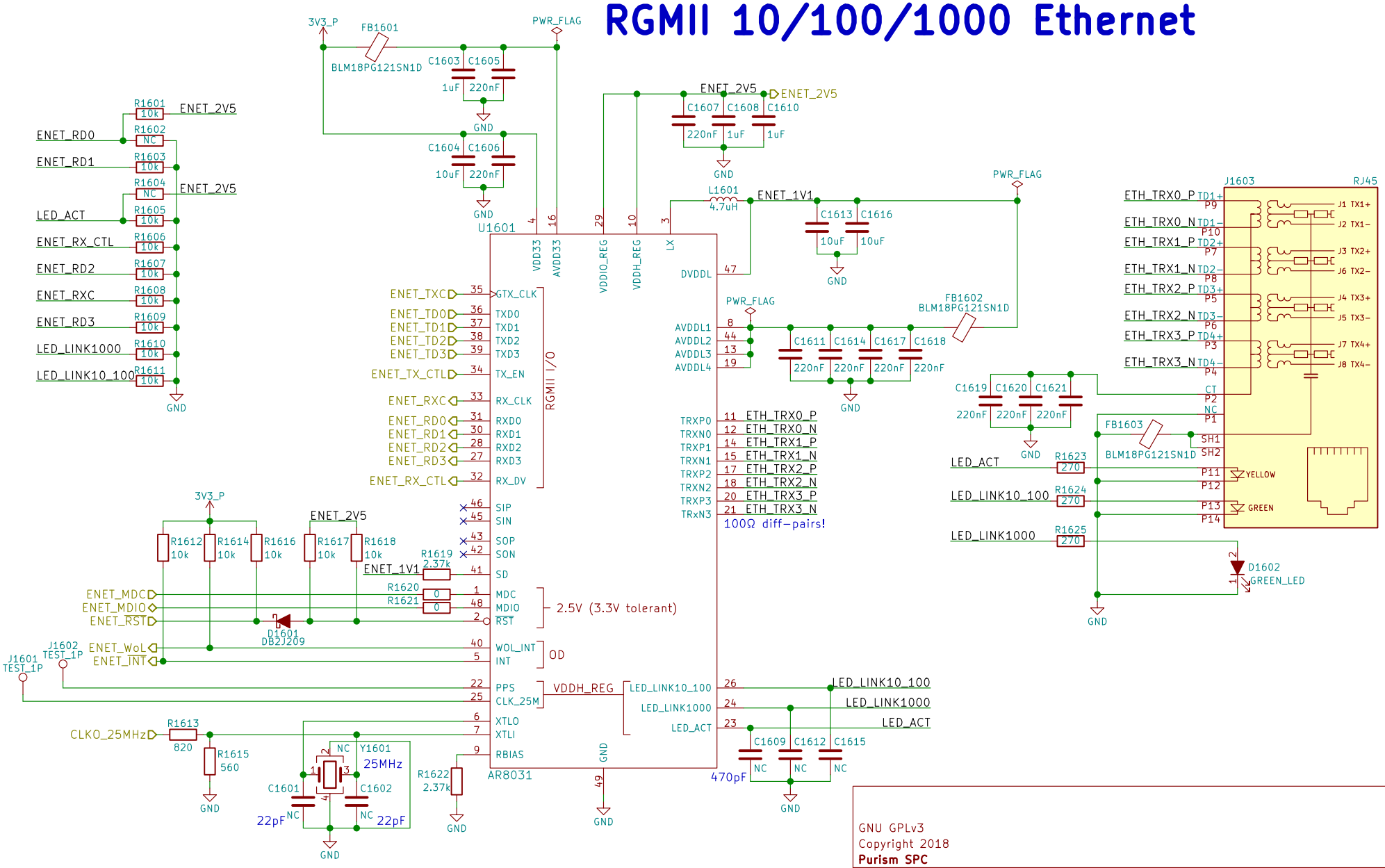

**LCR Measurements:**

| Earbud Microphone: @1kHz | Headset Speaker: @1kHz | Earbud Speaker: @1kHz |
|---|---|---|
| Ls = 3.844mH | Ls = 244.4uH | Ls = 25.2uH |
| Lp = 15.757H | Lp = 141.99mH | Lp = 311.0mH |
| Cs = 6.583uF | Cs = 103.6uF | Cs = 1.0mF |
| Cp = 1612.8pF | Cp = 178.77nF | Cp = 81.95nF |
| Rs = 1.5465kOhms | Rs = 36.860hms | Rs = 17.0300hms |
| Rp = 1.5478kOhms | Rp = 36.860hms | Rp = 17.0340hms |
| θ = −0.8deg | θ = −2.3deg | θ = 0.5deg |



| | | |
|---|---|---|
| Sheet: /Audio/ | | |
| File: audio.sch | | |
| ***Title: Audio*** | | |
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.6 | | Id: 15/21 |

# RGMII 10/100/1000 Ethernet






| | | |
|---|---|---|
| Sheet: /Ethernet/ | | |
| File: ethernet.sch | | |
| ***Title: Ethernet*** | | |
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.6 | | Id: 16/21 |

Module: Table 23
Socket: Table 46

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!

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

VIH=2.31V

SoC's IN/OUT

SoC's RX
Module's TX

SoC's TX
Module's RX

i.MX8M in DCE mode (POR state)
has CTS output, RTS input

6.2 M.2 Signal Directions

UARTn_UFCR[DCEDTE]=0 on POR

TX output
RX input
CTS output
RTS input

⇒TX→RX
RX←TX
CTS→CTS
RTS←RTS

Note:
Dual 2-input AND much more
available and cheaper than NOR

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

RS9116 SUSCLK
is a GPIO (unused)

SW1701
WWAN_HKS
Open = ON
Closed = OFF

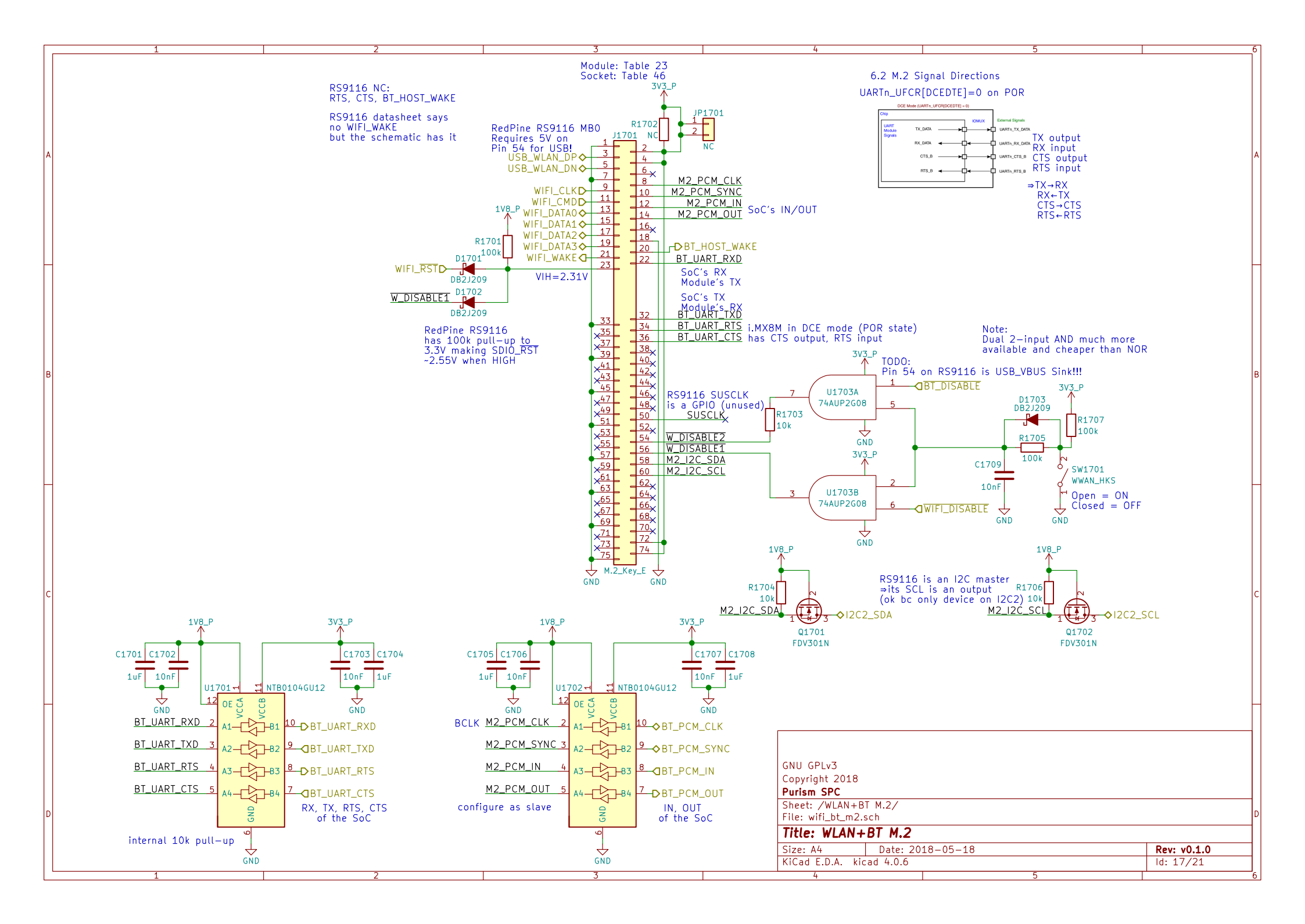
RS9116 is an I2C master
⇒its SCL is an output
(ok bc only device on I2C2)

internal 10k pull-up

RX, TX, RTS, CTS
of the SoC

configure as slave

IN, OUT
of the SoC



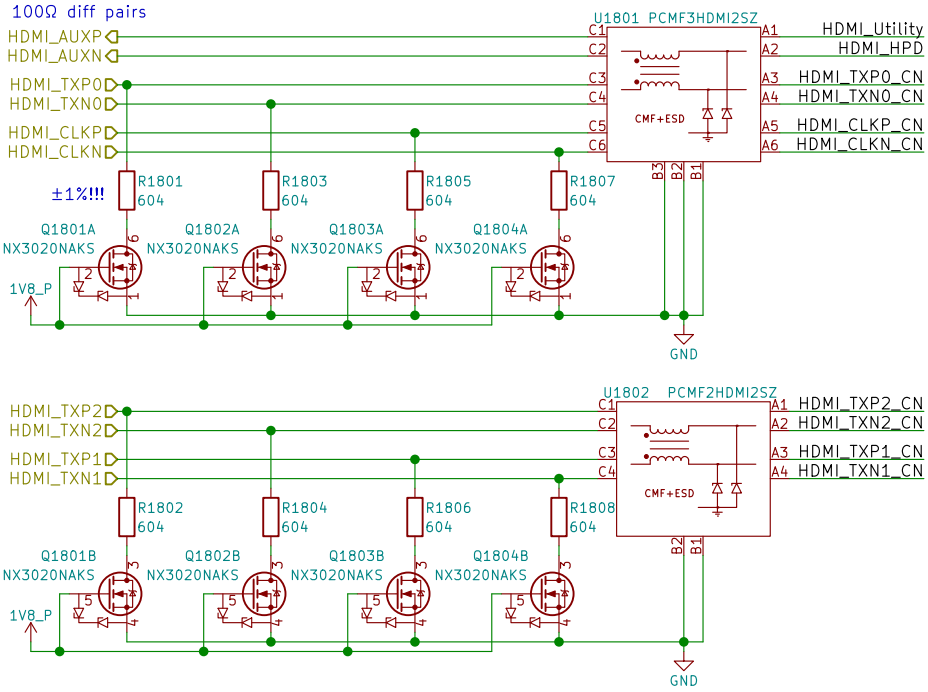



| | | |
|---|---|---|
| Sheet: /WLAN+BT M.2/ | | |
| File: wifi_bt_m2.sch | | |
| ***Title: WLAN+BT M.2*** | | |
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.6 | | Id: 17/21 |

HD3SS460 can be used for DP over USB-C

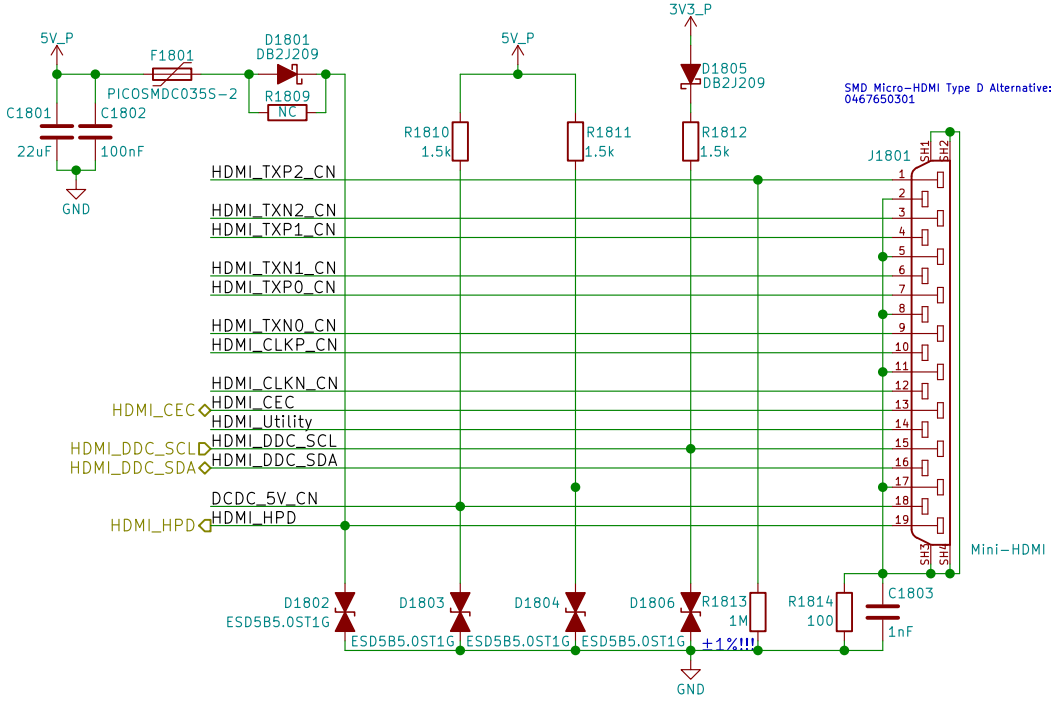
Layout Note:
May need swap some signals
due to micro-HDMI pinout diff
depending on pin location/routing

100Ω diff pairs









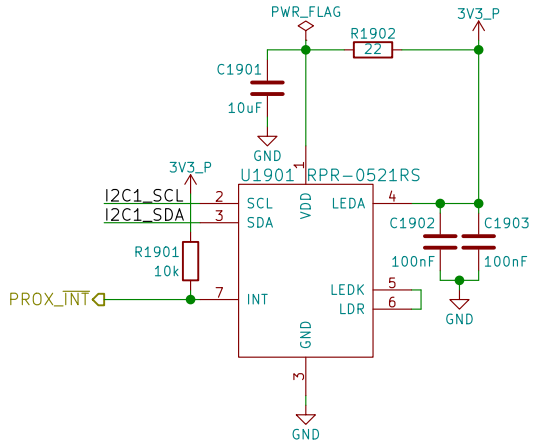



Sheet: /HDMI/
File: hdmi.sch

***Title: HDMI***

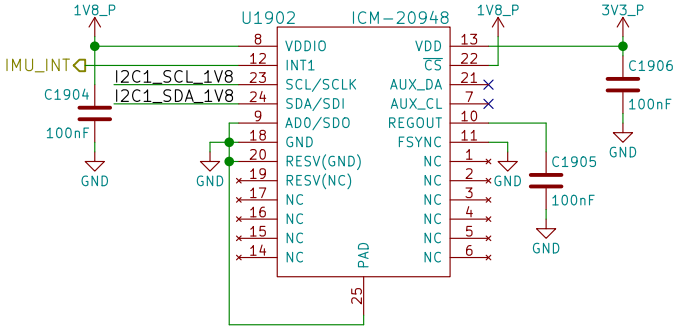
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 18/21 |

# Proximity & Ambient Light




Reference:
http://www.rohm.com/web/global/sensor-shield-support/ps-als-sensor

# 9-Axis IMU



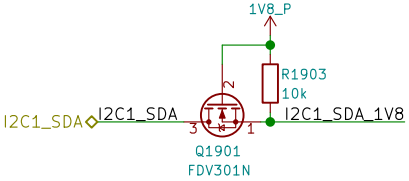

Reference:
https://store.invensense.com/datasheets/invensense/AN-IVS-0001EVB-00%20v1%202.pdf

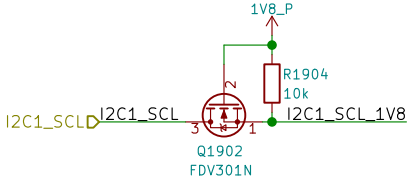
AD0 sets the slave address's LSB (110100X)

INT1_ACTL sets if IMU_INT
is active-high or active-low

"FSYNC - Connect to GND if unused"

I2C's VIH=1.8V



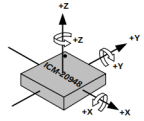




Figure 12. Orientation of Axes of Sensitivity and Polarity of Rotation

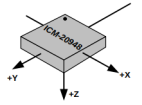


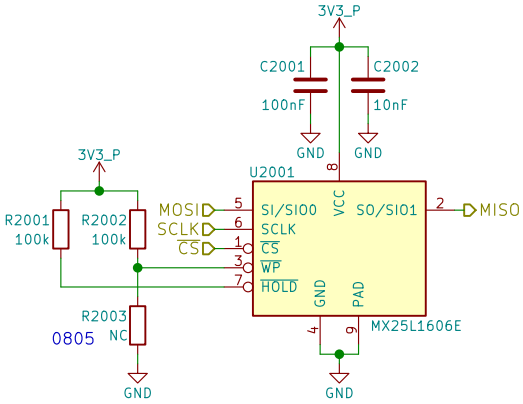

Figure 13. Orientation of Axes of Sensitivity for Magnetometer



Sheet: /Sensors/
File: sensors.sch

***Title: Sensors***

| | | |
|---|---|---|
| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
| KiCad E.D.A. kicad 4.0.6 | | Id: 19/21 |






Sheet: /SPI Flash/
File: flash.sch

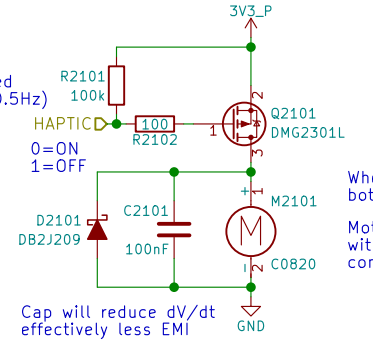
***Title: SPI NOR Flash***

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 20/21 |

PWM pins occupied:
GPIO1_IO01 – DSI (DSI_BL_PWM??)
GPIO1_IO13 – LED
GPIO1_IO14 – Ethernet (CLKO_25MHz)
GPIO1_IO15 – 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)!

Cap will reduce dV/dt
effectively less EMI

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



Sheet: /Haptic Motor/
File: haptic.sch

**Title: Haptic/Vibration Motor**

| Size: A4 | Date: 2018-05-18 | **Rev: v0.1.0** |
|---|---|---|
| KiCad E.D.A. kicad 4.0.6 | | Id: 21/21 |