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
battery.sch

Power
VBAT_REG
I2C1_SDA
I2C1_SCL
TCPC_INT
EN_SRC
EN_SNK
ONOFF
5V_SOM
5V_P
3V3
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)

Audio
HP_DET
MIC_SEL
SAI2_RXD
SAI2_TXD
SAI2_TXFS
SAI2_TXC
SAI2_MCLK
I2C1_SDA
I2C1_SCL
audio.sch

HP_DET GPIO3_IO20
MIC_SEL GPIO5_IO05 (was PWM1)

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

Alternate Functions:
CAPTOUCH_RST
SW_BACK
SAI6_TXD0
SAI6_TXFS/RXFS
SW_HOME
SAI6_TXC/RXC
SAI6_RXD0

RTC
I2C1_SDA
I2C1_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
sd.sch

MIPI
DSI_DP0
DSI_DN0
DSI_DP1
DSI_DN1
DSI_DP2
DSI_DN2
DSI_DP3
DSI_DN3
DSI_CKP
DSI_CKN
DSI_BL_PWM
CAPTOUCH_INT
CAPTOUCH_RST SAI1_RXD3(GPIO4_IO05)
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
I2C1_SDA
I2C1_SCL
mipi.sch

Buttons & LED
SW_BACK SAI1_RXD4(GPIO4_IO06)
SW_VOLDN BTN1
SW_VOLUP BTN2
SW_HOME SAI1_TXD1(GPIO4_IO13)
ONOFF
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_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

WLAN+BT M.2
USB_WLAN_DP
USB_WLAN_DM
UART4_TXD
UART4_RXD
UART4_RTS
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
SAI5_TX_BCLK
SAI5_TX_SYNC
SAI5_RXD
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
SMARTCARD_DP
SMARTCARD_DM
SDCD
uSD_CLK
uSD_CMD
uSD_DATA0
uSD_DATA1
uSD_DATA2
uSD_DATA3
SRST
SD2_RST
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

Smart Card
SMARTCARD_DP
SMARTCARD_DM
smartcard.sch

Haptic Motor
HAPTIC GPIO5_IO04 (was PWM2)
haptic.sch

TODO:
GNSS
MIPI CSI/DSI

J101A
A1 A2
A3 A4 ENET_TXC
A5 A6
A7 A8 ENET_TD0
A9 A10 ENET_TD1
A11 A12 ENET_TD2
A13 A14 ENET_TD3
A15 A16
A17 A18 ENET_TX_CTL
A19 A20
A21 A22 ENET_RD0
A23 A24 ENET_RD1
A25 A26 ENET_RD2
A27 A28 ENET_RD3
A29 A30
CSI_P1_DP3 A31 A32 ENET_RX_CTL
CSI_P1_DN3 A33 A34
A35 A36 ENET_RXC
CSI_P1_DP1 A37 A38
CSI_P1_DN1 A39 A40 ENET_MDIO
A41 A42 ENET_MDC
DSI_P1_DP2 A43 A44
CSI_P1_DN2 A45 A46 SD2_RST
A47 A48 WIFI_DATA3
A49 A50 WIFI_DATA2
A51 A52 WIFI_DATA1
CSI_P1_DP0 A53 A54 WIFI_DATA0
CSI_P1_DN0 A55 A56 WIFI_WAKE
A57 A58 WIFI_CMD
CSI_P1_CKP A59 A60 uSD_CD_B
CSI_P1_CKN A61 A62
A63 A64 WIFI_CLK
TCPC_INT A65 A66
A67 A68
A69 A70
A71 A72 WWAN_DISABLE
A73 A74 USB1_SS_SEL
A75 A76
A77 A78 BT_HOST_WAKE
A79 A80 CAPTOUCH_INT
IMX8M-SOM
GND GND

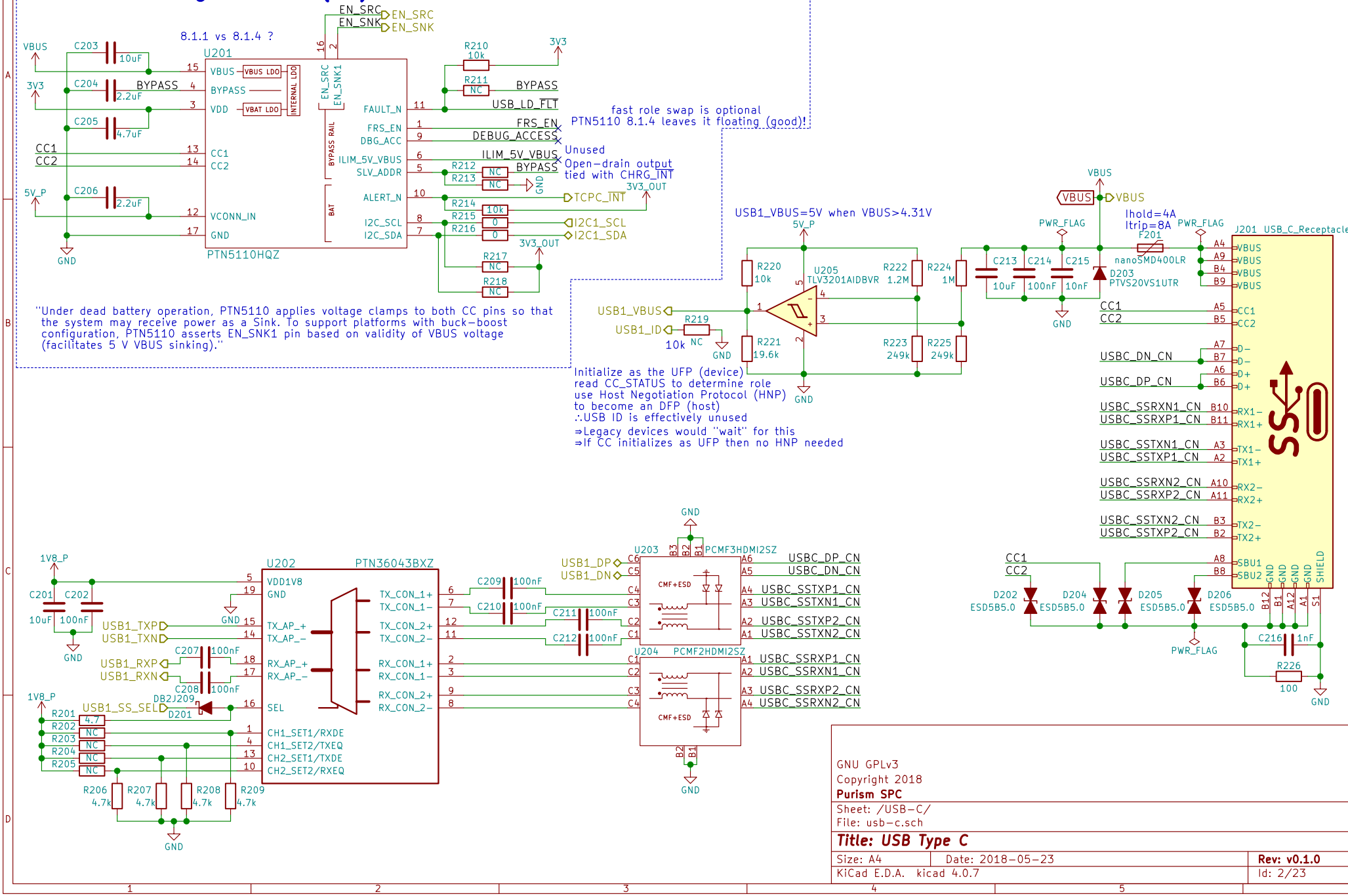
J101B
B1 B2 WIFI_DISABLE
B3 B4 GPIO3_IO09
B5 B6
B7 B8 GPIO3_IO08
B9 B10
B11 B12
B13 B14
B15 B16
B17 B18 PWR_FLAG 3V3_OUT
B19 B20
B21 B22 ENET_2V5 PWR_FLAG NVCC_SD2
B23 B24
DSI_DP2 B25 B26
DSI_DN2 B27 B28
B29 B30
DSI_DP0 B31 B32
DSI_DN0 B33 B34
B35 B36
DSI_CKN B37 B38
DSI_CKP B39 B40
B41 B42
DSI_DP1 B43 B44
DSI_DN1 B45 B46
B47 B48
DSI_DP3 B49 B50
DSI_DN3 B51 B52
B53 B54
B55 B56
B57 B58
B59 B60
B61 B62
B63 B64
B65 B66
B67 B68
B69 B70
B71 B72
B73 B74
B75 B76
B77 B78
B79 B80
IMX8M-SOM
GND GND
5V_SOM
C101 22uF
C102 22uF
C103 100nF
GND
5V_SOM
C104 100nF
C105 22uF
C106 22uF
GND

J101C
C1 C2 HDMI_HPD
BOOT_MODE0 C3 C4
BOOT_MODE1 C5 C6 HDMI_AUXN
JTAG_TDI C7 C8 HDMI_AUXP
JTAG_TMS C9 C10
JTAG_TRST C11 C12 HDMI_TXP1
JTAG_TDO C13 C14 HDMI_TXN1
JTAG_TCK C15 C16
C17 C18 HDMI_TXP0
J102 TEST_1P C19 C20 HDMI_TXN0
DSI_BL_PWM C21 C22
WDG C23 C24 HDMI_TXP2
HDMI_DDC_SCL C25 C26 HDMI_TXN2
HDMI_DDC_SDA C27 C28
C29 C30 HDMI_CLKP
C31 C32 HDMI_CLKN
C33 C34
IMU_INT C35 C36 SAI5_TX_BCLK
C37 C38
C39 C40
PWR_EN C41 C42 ENET_WoL
SAI5_RXD C43 C44 SAI1_RXD1(GPIO4_IO03)
ENET_RST C45 C46 SAI5_TX_SYNC
C47 C48 ENET_INT
C49 C50
C51 C52
HP_DET C53 C54
C55 C56
PROX_INT C57 C58
SAI1_RXD0(GPIO4_IO02) C59 C60
SAI5_TXD C61 C62 CLKO_25MHz
GPIO1_IO13 C63 C64
SAI1_RXD4(GPIO4_IO06) C65 C66 SAI2_TXC
SAI1_RXD3(GPIO4_IO05) C67 C68
BTN1 C69 C70
C71 C72
SAI1_RXD2(GPIO4_IO04) C73 C74 BTN2
SAI2_TXFS C75 C76
SAI2_RXD C77 C78 SAI2_MCLK
SAI1_RXD6(GPIO4_IO08) C79 C80
IMX8M-SOM
GND GND

3V3_OUT
R101 10k
R102 10k
R105 10k
R106 10k
J101D
SAI2_TXD D1 D2 SAI1_RXD7(GPIO4_IO09)
D3 D4 I2C2_SCL
HAPTIC D5 D6
SAI1_RXD5(GPIO4_IO07) D7 D8
D9 D10
SAI1_TXD0(GPIO4_IO12) D11 D12
ONOFF D13 D14
I2C2_SDA D15 D16 MIC_SEL
D17 D18
SAI1_TXD1(GPIO4_IO13) D19 D20
SYS_RST D21 D22 UART4_TXD
I2C1_SCL D23 D24
I2C1_SDA D25 D26 ECSPI1_SCLK
SAI1_TXD3(GPIO4_IO15) D27 D28
SAI1_TXD4(GPIO4_IO16) D29 D30 ECSPI1_SS0
D31 D32
SAI1_TXD7(GPIO4_IO19) D33 D34
UART3_TXD D35 D36
BT_DISABLE D37 D38
SAI1_TXD5(GPIO4_IO17) D39 D40
POR_B D41 D42 UART4_RXD
D43 D44
UART1_RXD D45 D46
SAI1_TXD2(GPIO4_IO14) D47 D48
SAI1_TXD6(GPIO4_IO18) D49 D50
ECSPI1_MISO D51 D52
UART4_CTS D53 D54
UART3_RXD D55 D56 USB2_DN
D57 D58 USB2_DP
D59 D60
D61 D62
D63 D64 USB1_RXN
ECSPI1_MOSI D65 D66 USB1_RXP
UART4_RTS D67 D68
D69 D70 USB1_TXN
UART1_TXD D71 D72 USB1_TXP
USB2_VBUS D73 D74
USB2_ID D75 D76 USB1_DN
USB1_VBUS D77 D78 USB1_DP
USB1_ID D79 D80
IMX8M-SOM
GND GND
5V_P
R103 10k
R104 19.6k
GND

Purism SPC
Sheet: /
File: dvk-mx8m-bsb.sch
Title: DVK-MX8M-BSB
Size: A2 | Date: 2018-05-23 | Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7 | Id: 1/23

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



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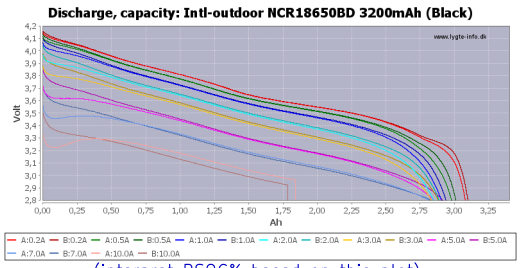
Purism SPC

Sheet: /USB-C/		
File: usb-c.sch		
Title: USB Type C		
Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 2/23

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

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

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)

TODO:
Keystone 1042 footprint???

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)

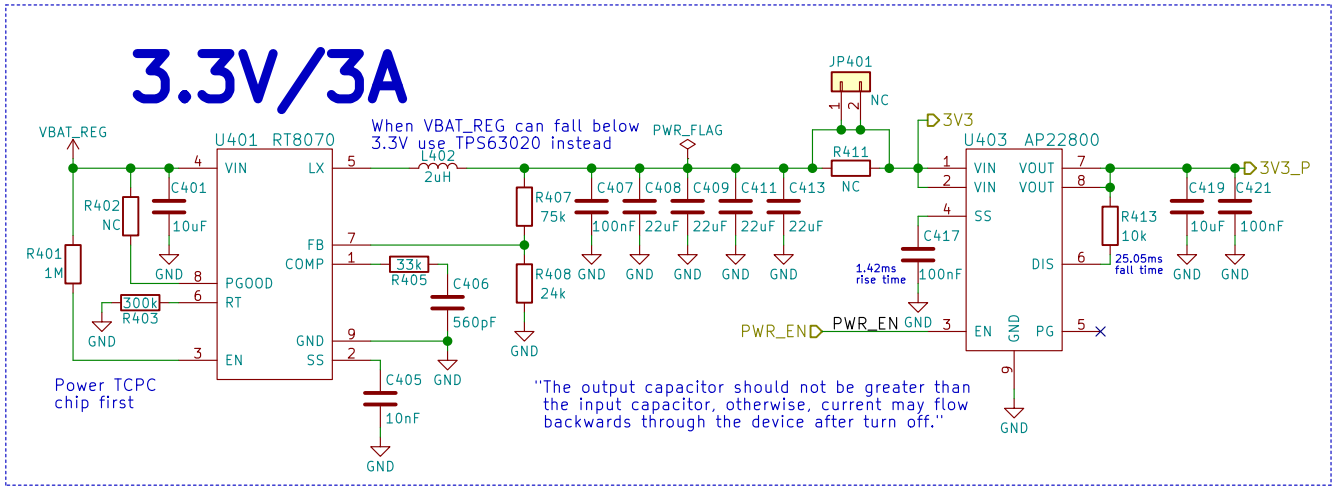
BC1.2 is not mandated by PD spec
ICO used to determine max current
Also negotiated from CC pins (I2C)

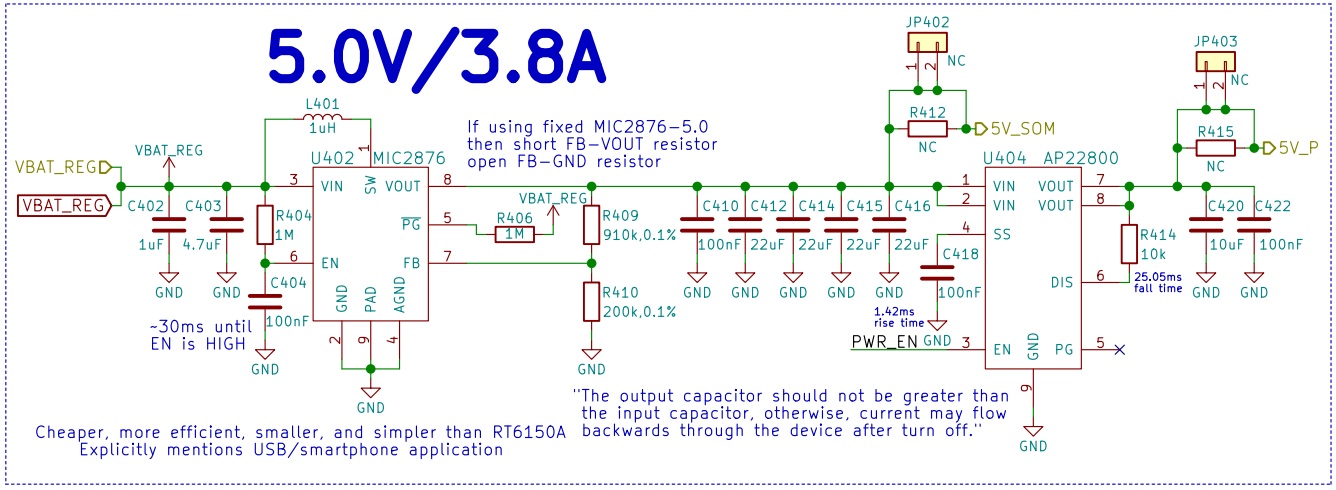
Battery holder gives ~1mm clearance underneath the battery
Thermistor is 1.1±0.15mm thick, should fit fine with stack-up

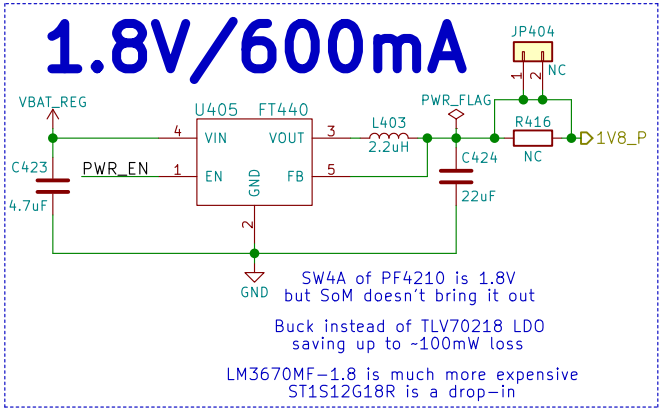
Battery holder seems to fit up to ~68.88mm long batteries
need to test 18650 protected cells which are ~69.35mm long

VBAT(DPL)=2.15~2.5V

Sheet: /Battery/		
File: battery.sch		
Title: Battery		
Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 3/23







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

Sheet: /Power/
File: power.sch

Title: Power

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 4/23

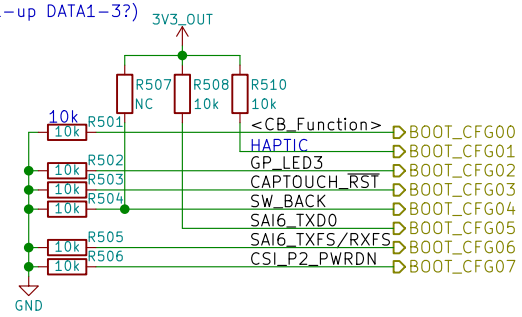
Only eMMC

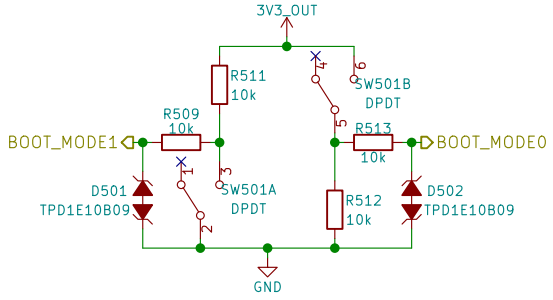
BOOT_CFG[14:12]	Boot device
001	SD/eSD
010	MMC/eMMC
011	NAND

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

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

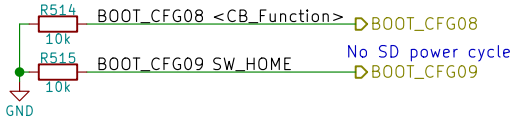
BOOT_CFG05:
1 – 8-bit eMMC bus
0 – 1-bit eMMC bus

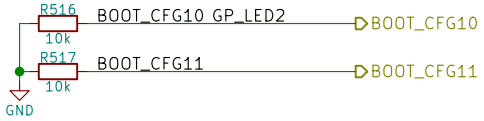


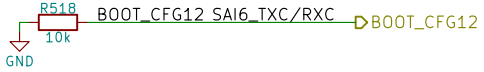


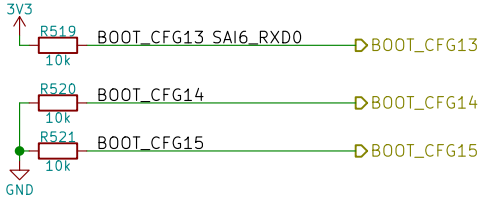
2->1: eMMC
2->3: USB (Serial Downloader)

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





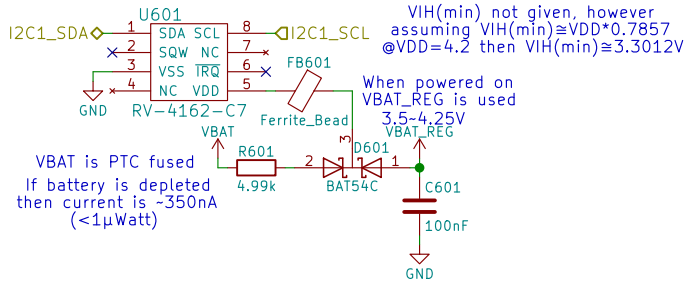




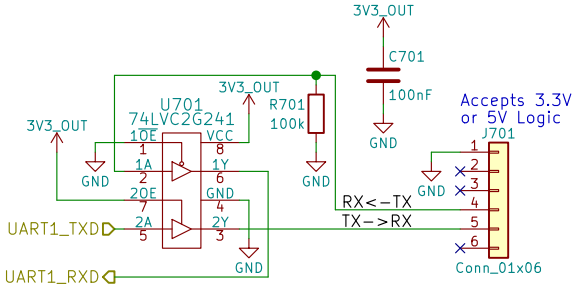
Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 5/23



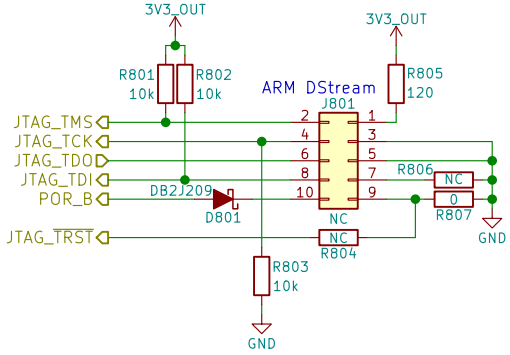
Sheet: /RTC/		
File: rtc.sch		
Title: RTC		
Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 6/23



Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

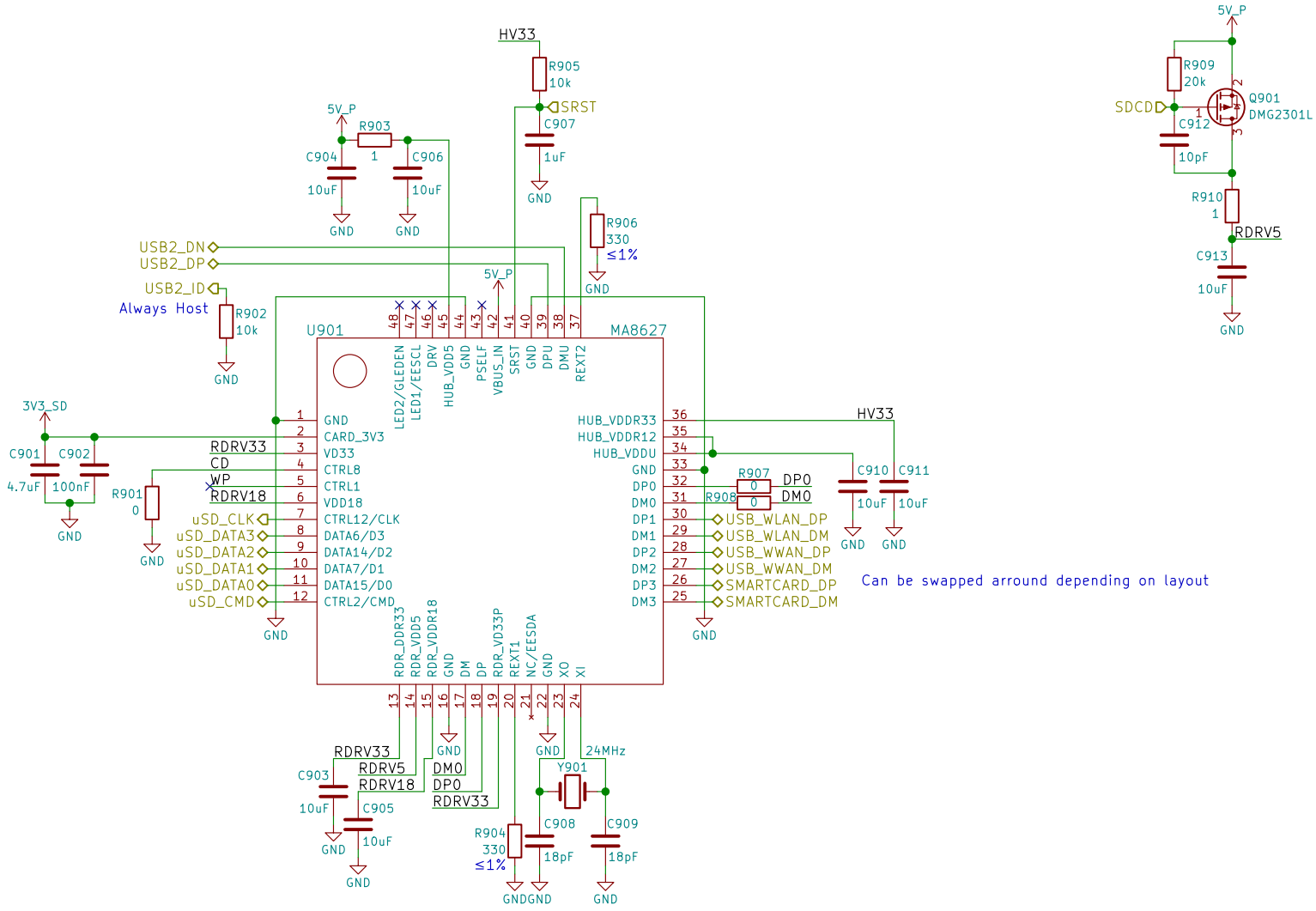
Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 7/23



Sheet: /JTAG/
File: jtag.sch

Title: JTAG

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 8/23



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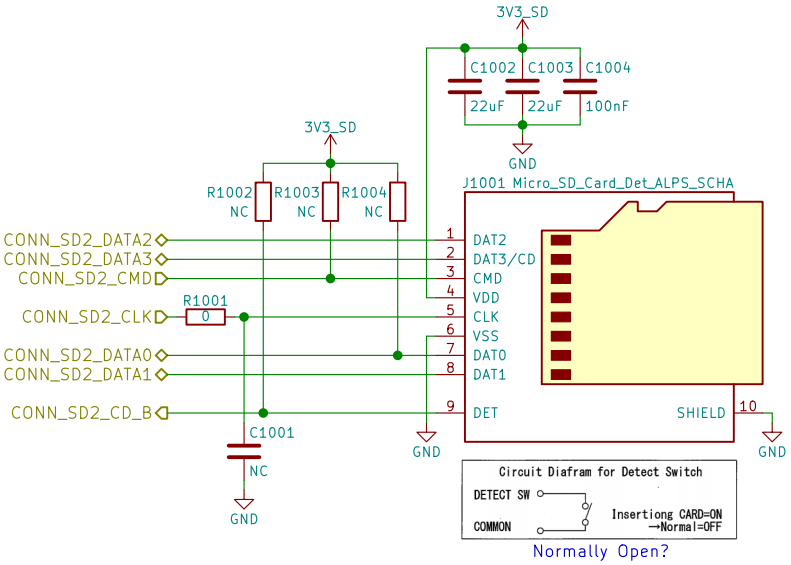
Purism SPC

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

Title:

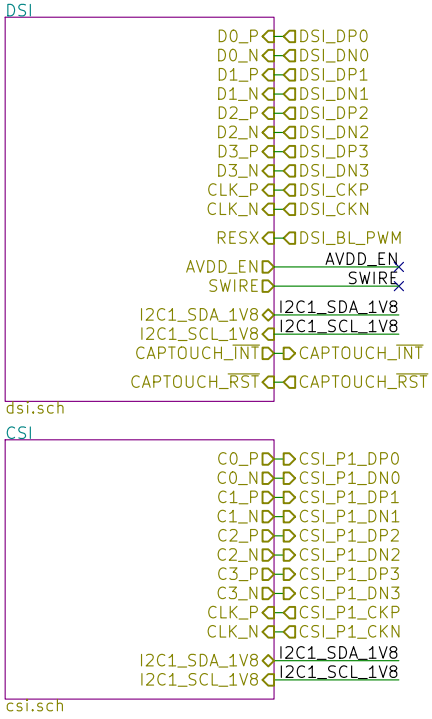
Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 9/23

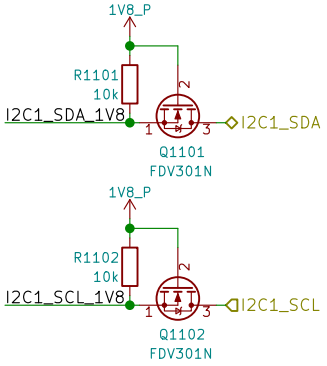


Sheet: /uSD Card/
File: sd.sch

Title: uSD Card

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 10/23



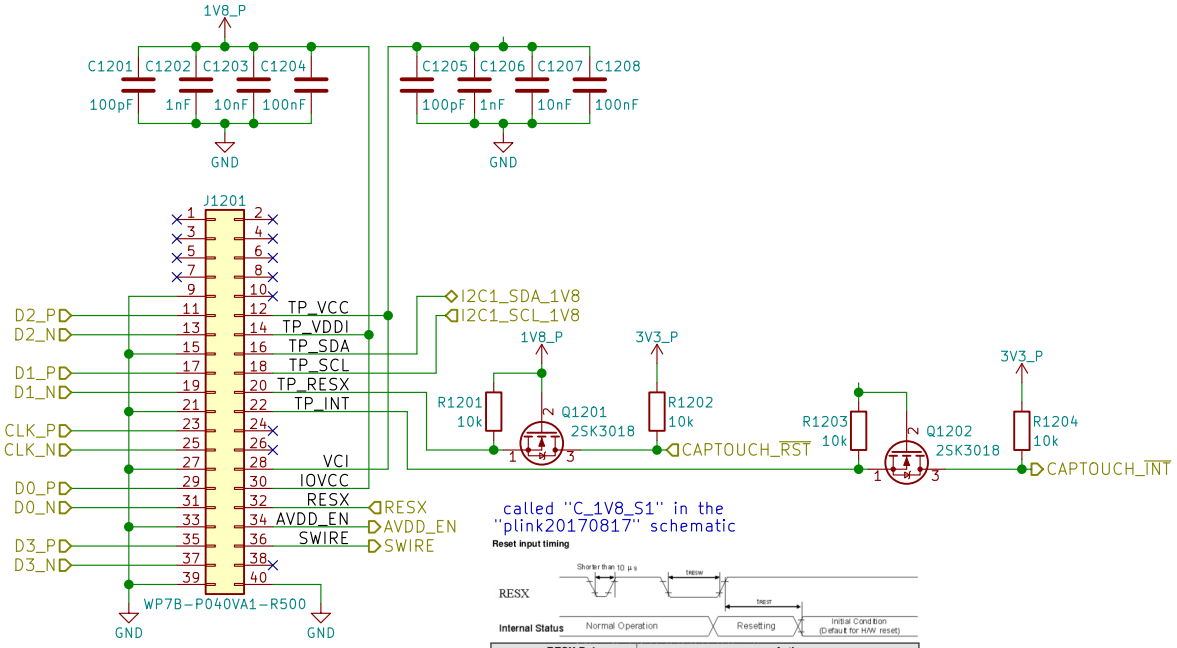


Sheet: /MIPI/
File: mipi.sch

Title:

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 11/23

TODO:
ensure power sequence is satisfied
based on the 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

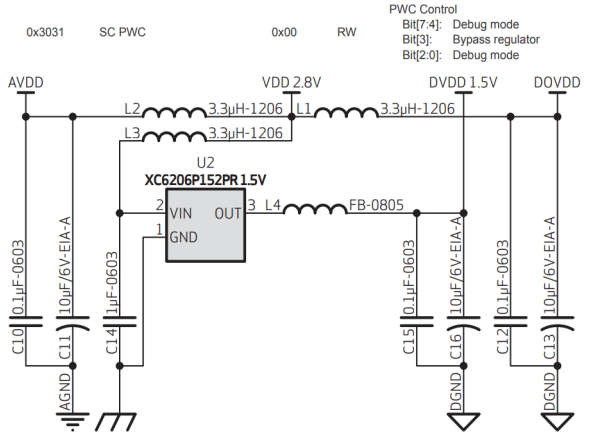
TODO: low power state signal??

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

Title: MIPI DSI

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 12/23

Using Internal DVDD 1.5V Regulator:



2.7 POWER UP SEQUENCE

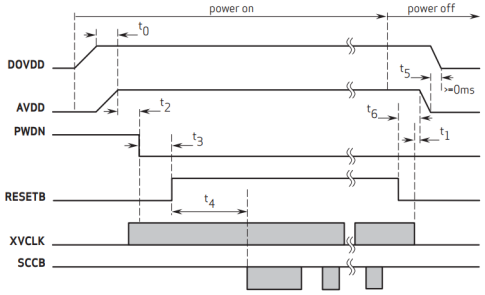
Based on the system power configuration (1.8V or 2.8V for I/O power, using external DVDD or internal DVDD, requiring access to the I2C during power up period or not), the power up sequence will differ. If 1.8V is used for I/O power, using the internal DVDD is preferred. If 2.8V is used for I/O power, 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 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

S640_DS_2_2

C0_P
C0_N
C1_P
C1_N
C2_P
C2_N
C3_P
C3_N
CLK_P
CLK_N

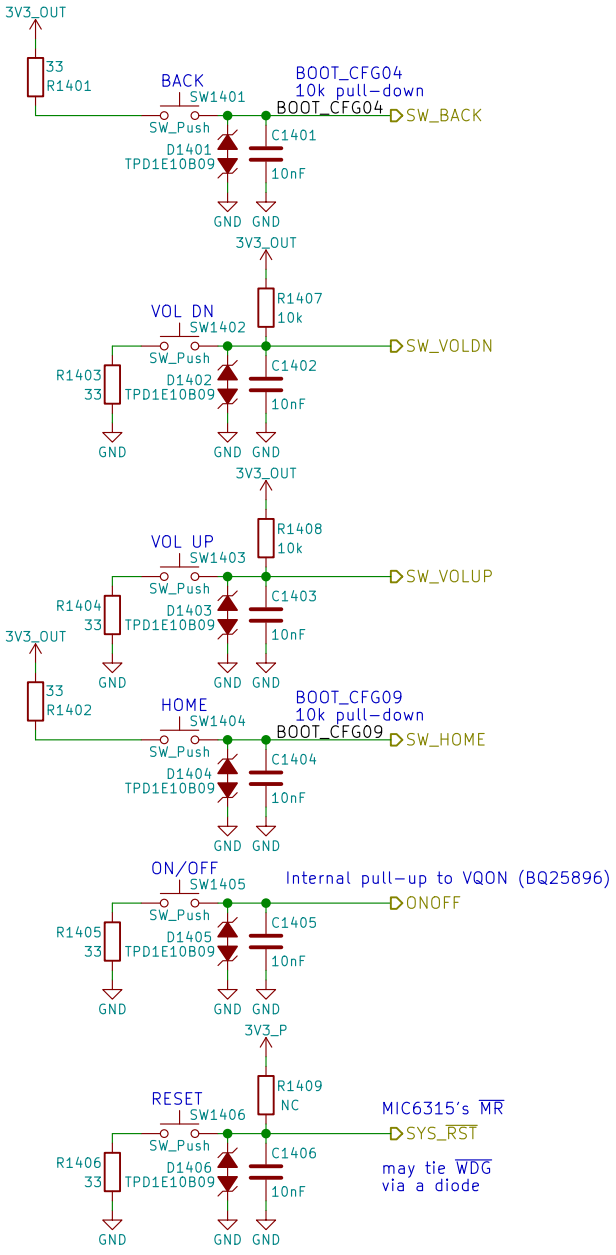
I2C1_SDA_1V8
I2C1_SCL_1V8

Purism SPC

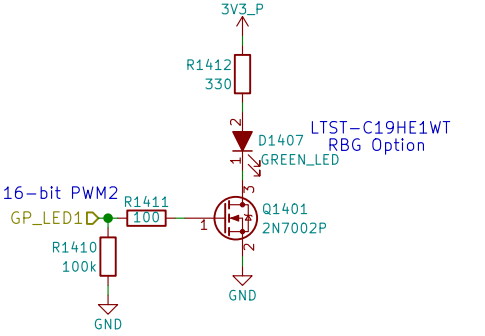
Sheet: /MIPI/CSI/
File: csi.sch

Title:

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 13/23



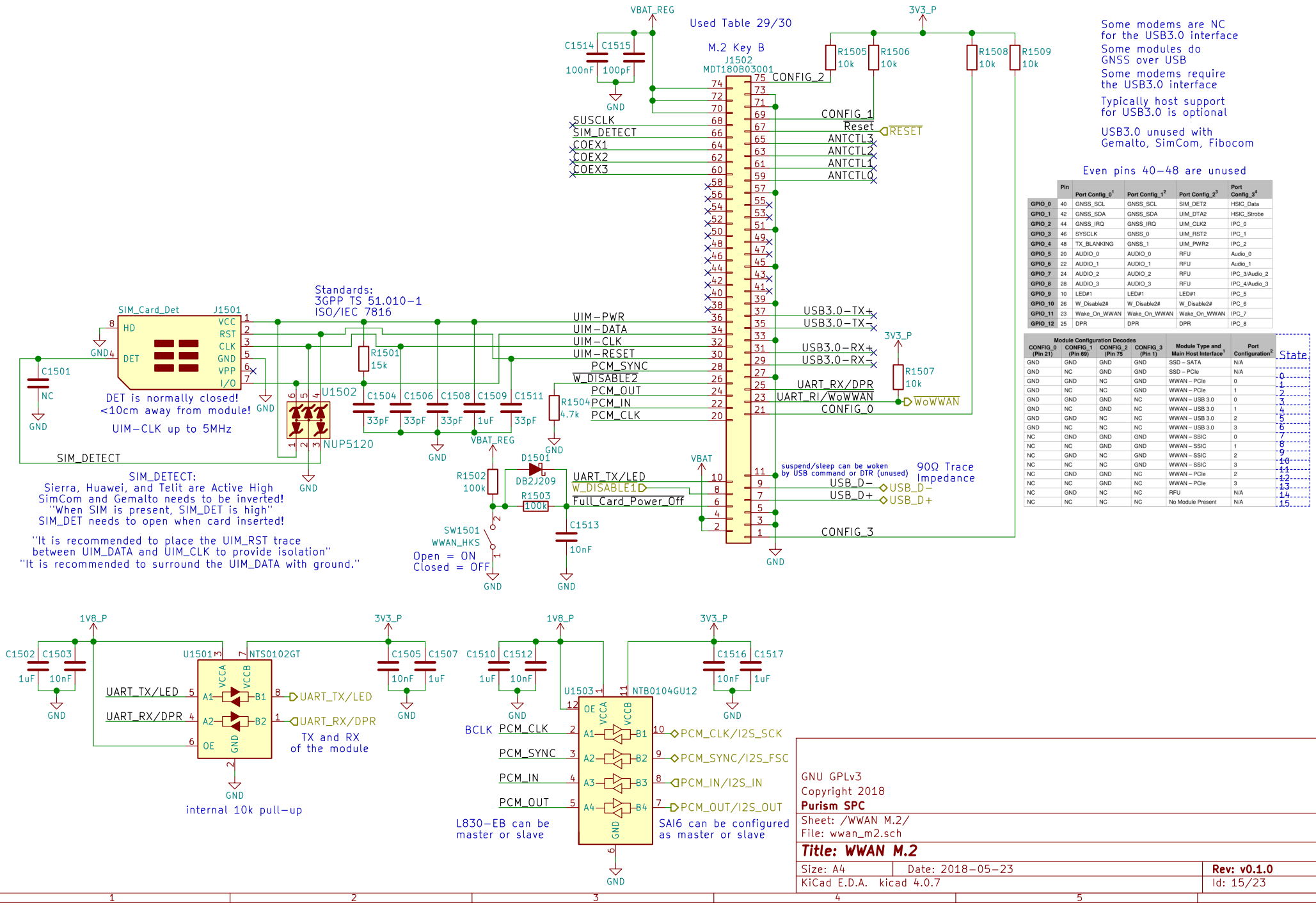
Use PWM2_PWMSAR to set the compare value (duty cycle)
Use PWM2_PWMCR[15:4] to set the PRESCALER (frequency)
Use PWM2_PWMPR to set the top of the counter (frequency)



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

Title: Buttons & LED

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 14/23



	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: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 15/23

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

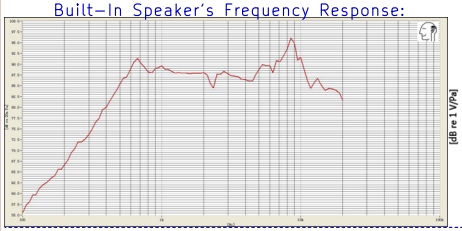
U1601 SGTL5000
Mute via MUTE_LO=1
may use lineout left channel for pseudo-earpiece speaker
U1602 PAM8301
LS1601 AS01608MS-SP9
DLW21SN900SQ2L
FL1601
FL1602
J1601
SMD Equivalent: SJ-43515RS-SMT-TR
SJ-43515TS
CTIA/AHJ
Microphone
Ground
Audio (Right)
Audio (Left)
Pin 5 (tip switch) is NC, open when inserted
If just headphones then HP_DET=HIGH, R(mic)=0
D1603 SZMM5Z3V3T1G
Vz=3.3V
Vf=0.9V
may add ~220uF cap parallel to Zener
Z(hp)≥16Ω
<3.3µA

SW Mute Mic:
MUTE_ADC=1
U1603 FSA6157L6X
MIC_SEL
SW1601A SW_DPST_x2
TODO: DPST with camera!
Ext-Mic enabled
MIC_SEL=LOW
Int-Mic enabled
MIC_SEL=LOW
MK1601 CMC-6022
Add TVS next to int-mic? (OpenMoko does this)

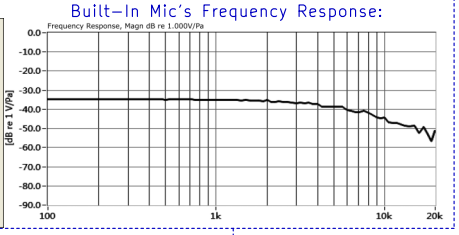
−37dB=14.1254mV/Pa
∴ mic produces 14.1254mVrms when exposed to a 1kHz tone of 94dB-SPL at the capsule (or 19.98mV amplitude)

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

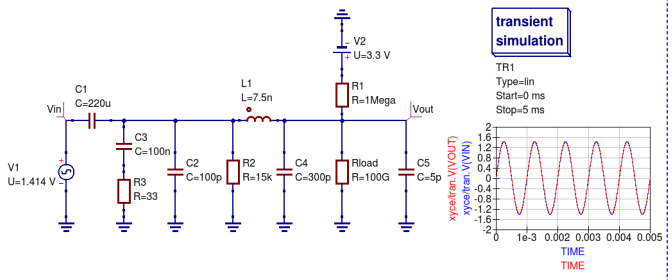
Built-In Speaker's Frequency Response:



Built-In Mic's Frequency Response:



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



LCR Measurements:

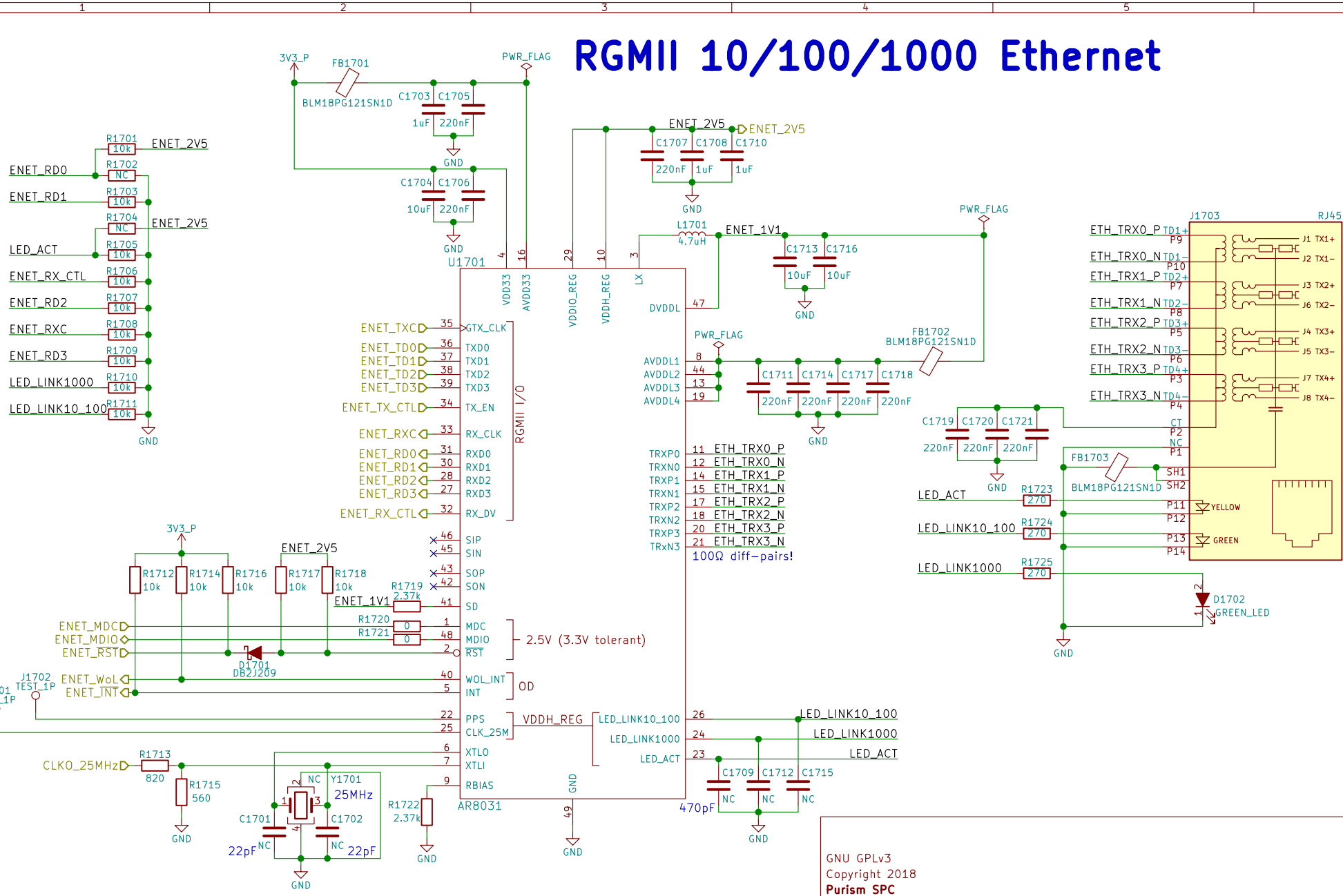
Earbud Microphone: @1kHz	Headset Speaker: @1kHz	Earbud Speaker: @1kHz
Ls = 3.844mH	Ls = 244.4uH	Ls = 25.2uH
Lp = 15.757H	Lp = 141.99mH	Lp = 311.0mH
Cs = 6.583uF	Cs = 103.6uF	Cs = 1.0mF
Cp = 1612.8pF	Cp = 178.77nF	Cp = 81.95nF
Rs = 1.5465kOhms	Rs = 36.860hms	Rs = 17.0300hms
Rp = 1.5478kOhms	Rp = 36.860hms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

Purism SPC

Sheet: /Audio/
File: audio.sch

Title: Audio

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 16/23


RGMII 10/100/1000 Ethernet
3V3_P
FB1701
BLM18PG121SN1D
PWR_FLAG
C1703 C1705
1uF 220nF
C1704 C1706
10uF 220nF
GND
ENET_2V5
C1707 C1708 C1710
220nF 1uF 1uF
L1701
4.7uH
ENET_1V1
C1713 C1716
10uF 10uF
FB1702
BLM18PG121SN1D
C1711 C1714 C1717 C1718
220nF 220nF 220nF 220nF
U1701
AR8031
VDD33
AVDD33
VDDIO_REG
VDDH_REG
LX
DVDDL
AVDDL1
AVDDL2
AVDDL3
AVDDL4
RGMII I/O
GTX_CLK
TXD0
TXD1
TXD2
TXD3
TX_EN
RX_CLK
RXD0
RXD1
RXD2
RXD3
RX_DV
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
TRXP0
TRXN0
TRXP1
TRXN1
TRXP2
TRXN2
TRXP3
TRXN3
ETH_TRX0_P
ETH_TRX0_N
ETH_TRX1_P
ETH_TRX1_N
ETH_TRX2_P
ETH_TRX2_N
ETH_TRX3_P
ETH_TRX3_N
100Ω diff-pairs!
SIP
SIN
SOP
SON
SD
MDC
MDIO
RST
2.5V (3.3V tolerant)
WOL_INT
INT
OD
PPS
CLK_25M
XTLO
XTLI
RBIAS
R1719 2.37k
R1720 0
R1721 0
R1722 2.37k
R1723 270
R1724 270
R1725 270
LED_ACT
LED_LINK10_100
LED_LINK1000
VDDH_REG
470pF
C1709 C1712 C1715
NC NC NC
R1701 10k ENET_2V5
R1702 NC ENET_RD0
R1703 10k ENET_RD1
R1704 NC ENET_2V5
R1705 10k LED_ACT
R1706 10k ENET_RX_CTL
R1707 10k ENET_RD2
R1708 10k ENET_RXC
R1709 10k ENET_RD3
R1710 10k LED_LINK1000
R1711 10k LED_LINK10_100
R1712 10k
R1714 10k
R1716 10k
R1717 10k
R1718 10k
D1701
DB2J209
J1701
TEST_1P
J1702
TEST_1P
ENET_WoL
ENET_INT
ENET_MDC
ENET_MDIO
ENET_RST
CLKO_25MHz
R1713 820
R1715 560
Y1701
25MHz
C1701 22pF NC
C1702 NC 22pF
J1703
RJ45
ETH_TRX0_P TD1+ P9 J1 TX1+
ETH_TRX0_N TD1- P10 J2 TX1-
ETH_TRX1_P TD2+ P7 J3 TX2+
ETH_TRX1_N TD2- P8 J6 TX2-
ETH_TRX2_P TD3+ P5 J4 TX3+
ETH_TRX2_N TD3- P6 J5 TX3-
ETH_TRX3_P TD4+ P3 J7 TX4+
ETH_TRX3_N TD4- P4 J8 TX4-
CT P2
NC P1
SH1
SH2
P11
P12
P13
P14
YELLOW
GREEN
C1719 C1720 C1721
220nF 220nF 220nF
FB1703
BLM18PG121SN1D
D1702
GREEN_LED
GND
GNU GPLv3
Copyright 2018
Purism SPC
Sheet: /Ethernet/
File: ethernet.sch
Title: Ethernet
Size: A4
Date: 2018-05-23
Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7
Id: 17/23

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)

Open = ON
Closed = OFF

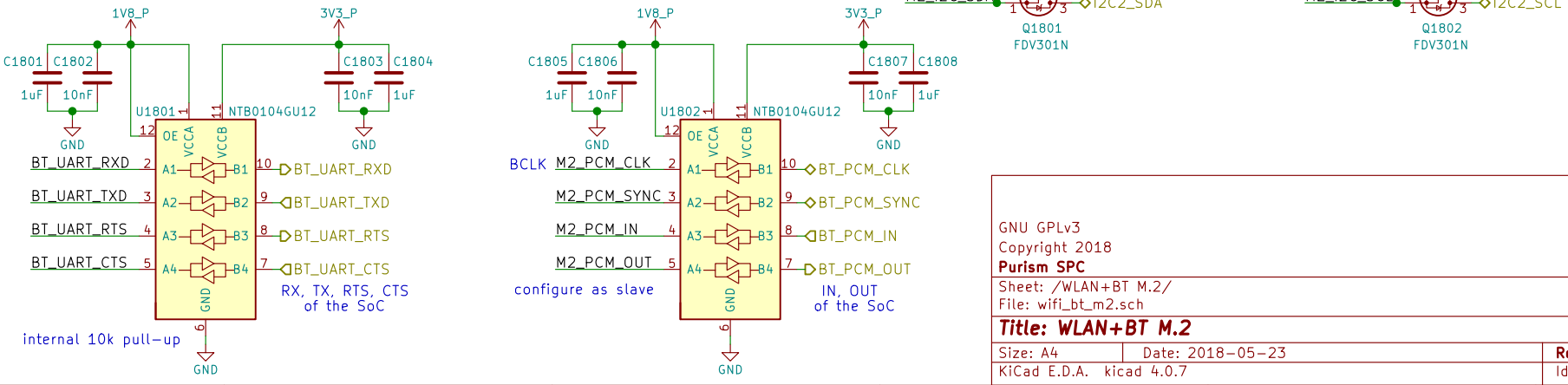
RS9116 is an I2C master
⇒its SCL is an output
(ok bc only device on I2C2)

internal 10k pull-up

RX, TX, RTS, CTS
of the SoC

configure as slave

IN, OUT
of the SoC

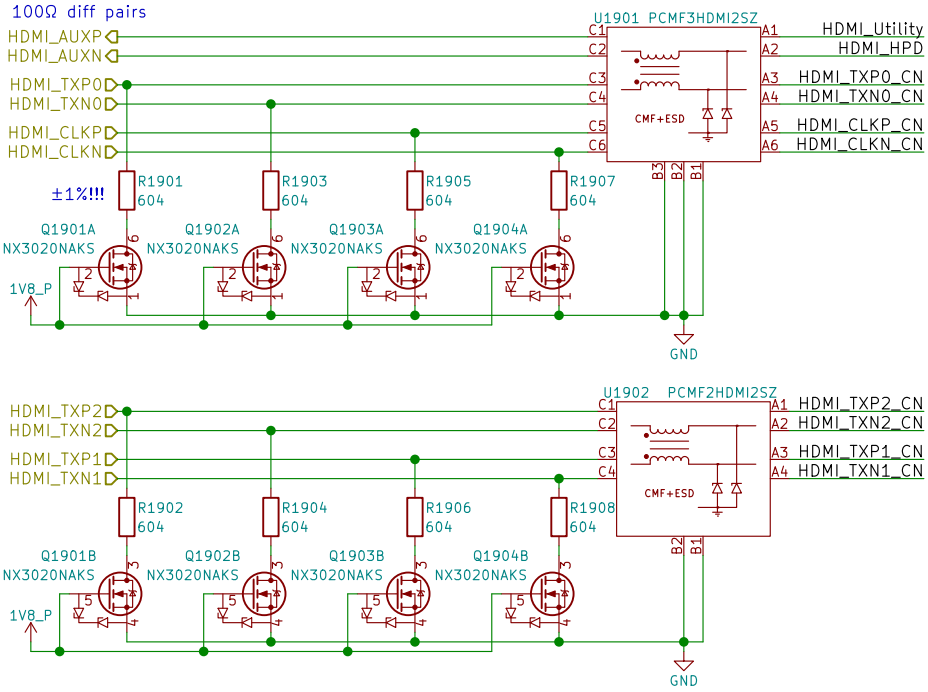


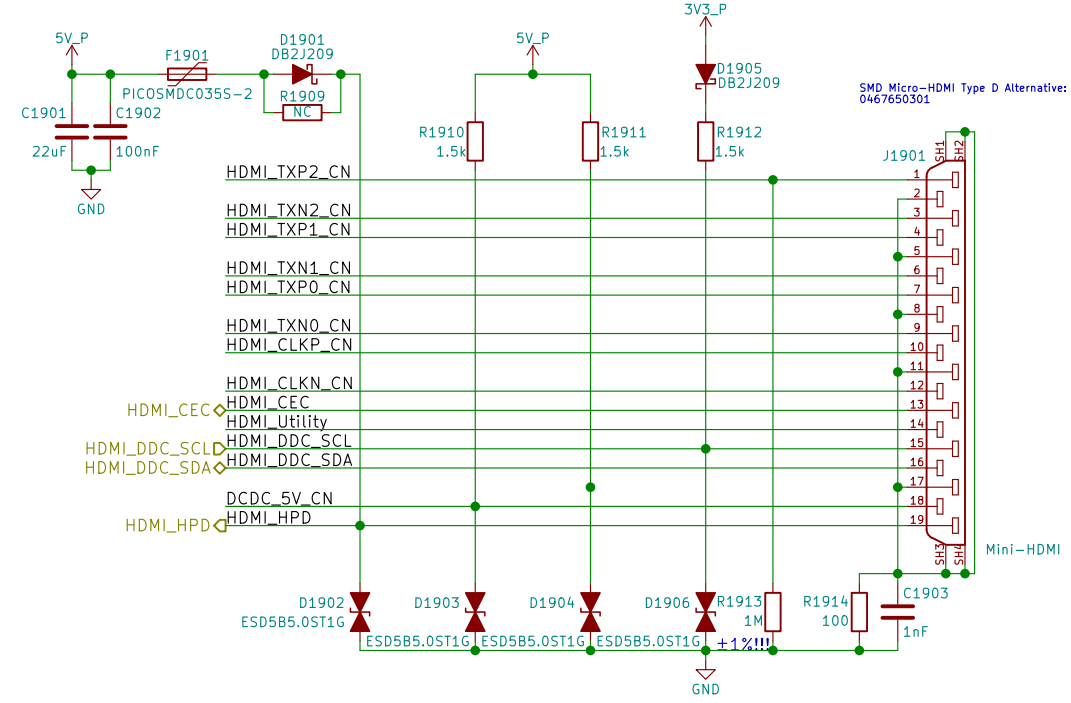
Sheet: /WLAN+BT M.2/		
File: wifi_bt_m2.sch		
Title: WLAN+BT M.2		
Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 18/23

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



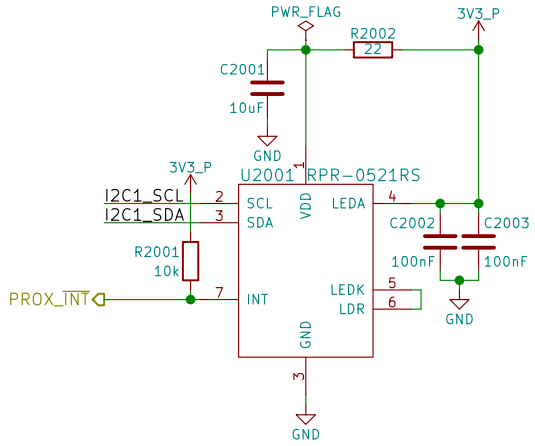


Sheet: /HDMI/
File: hdmi.sch

Title: HDMI

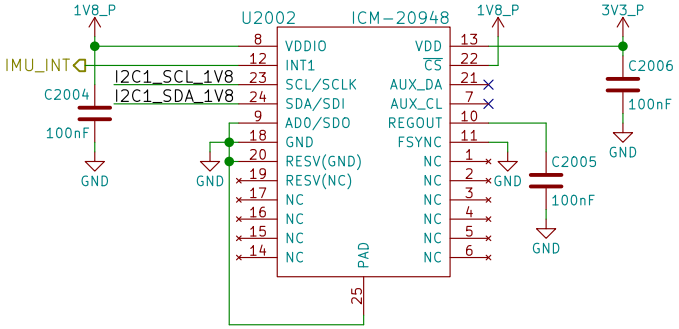
Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 19/23

Proximity & Ambient Light



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

9-Axis IMU



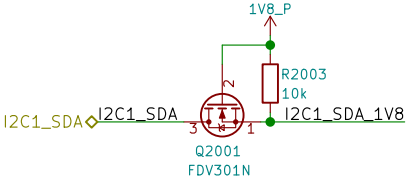
Reference:
https://store.invensense.com/datasheets/invensense/AN-IVS-0001EVB-00%20v1%202.pdf

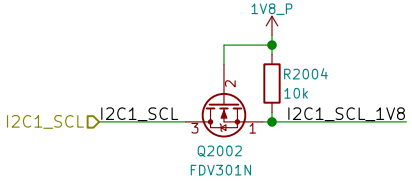
AD0 sets the slave address's LSB (110100X)

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

"FSYNC - Connect to GND if unused"

I2C's VIH=1.8V





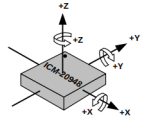


Figure 12. Orientation of Axes of Sensitivity and Polarity of Rotation

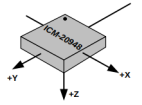
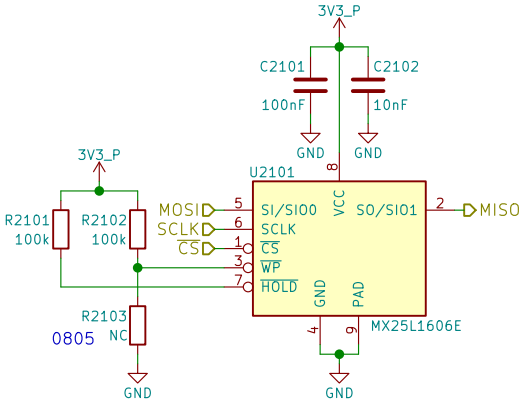


Figure 13. Orientation of Axes of Sensitivity for Magnetometer

Sheet: /Sensors/
File: sensors.sch

Title: Sensors

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 20/23



Sheet: /SPI Flash/
File: flash.sch

Title: SPI NOR Flash

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
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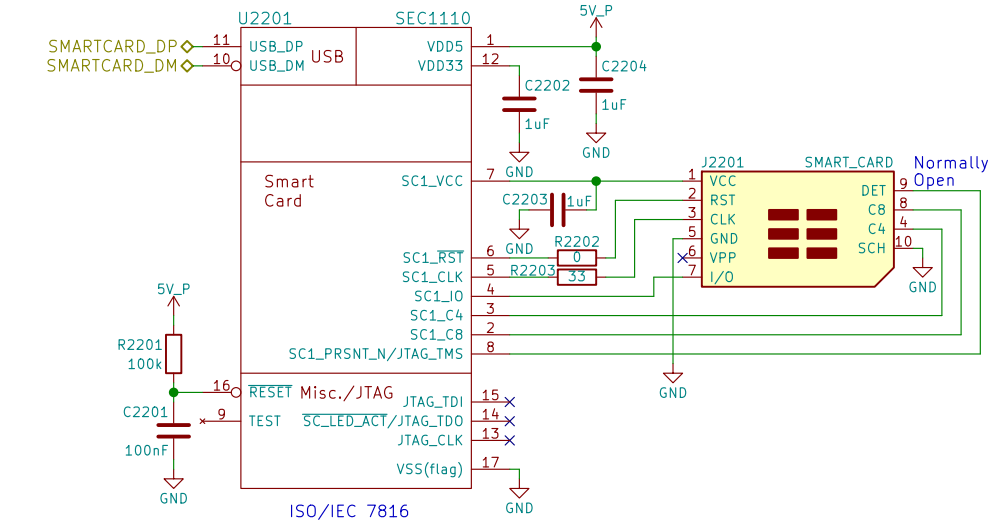

Reference:
http://www.microchip.com/DevelopmentTools/ProductDetails.aspx?PartNO=EVB-SEC1110

Sheet: /Smart Card/
File: smartcard.sch

Title: Smart Card

Size: A4	Date: 2018-05-23	**Rev: v0.1.0**
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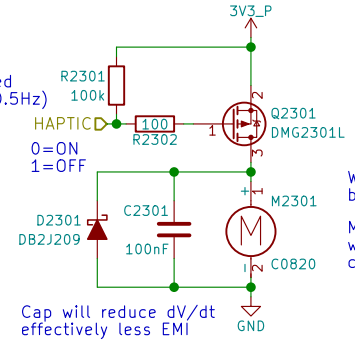
PWM pins occupied:
GPIO1_IO01 – DSI (DSI_BL_PWM??)
GPIO1_IO13 – LED
GPIO1_IO14 – Ethernet (CLKO_25MHz)
GPIO1_IO15 – CSI (CLKO2)

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: 2018-05-23	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 23/23