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)

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)
BOOT_CFG04 SAI1_RXD4(GPIO4_IO06)
BOOT_CFG05 SAI1_RXD5(GPIO4_IO07)
BOOT_CFG06 SAI1_RXD6(GPIO4_IO08)
BOOT_CFG07 SAI1_RXD7(GPIO4_IO09)
BOOT_CFG08 SAI1_TXD0(GPIO4_IO12)
BOOT_CFG09 SAI1_TXD1(GPIO4_IO13)
BOOT_CFG10 SAI1_TXD2(GPIO4_IO14)
BOOT_CFG11 SAI1_TXD3(GPIO4_IO15)
BOOT_CFG12 SAI1_TXD4(GPIO4_IO16)
BOOT_CFG13 SAI1_TXD5(GPIO4_IO17)
BOOT_CFG14 SAI1_TXD6(GPIO4_IO18)
BOOT_CFG15 SAI1_TXD7(GPIO4_IO19)
BOOT_MODE0
BOOT_MODE1

Alternate Functions:
CAPTOUCH_RST
SW_BACK
SAI6_TXDO
SAI6_TXFS/RXFS
SW_HOME
SAI6_TXC/RXC
SAI6_RXDO

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_SDA
I2C2_SCL I2C2_SCL
CAPTOUCH_INT CAPTOUCH_INT
CAPTOUCH_RST SAI1_RXD3(GPIO4_IO05)

mipi_dsi.sch

MIPI CSI

CSI_P1_DP0 CSI_P1_DP0
CSI_P1_DN0 CSI_P1_DN0
CSI_P1_DP1 CSI_P1_DP1
CSI_P1_DN1 CSI_P1_DN1
DSI_P1_DP2 DSI_P1_DP2
CSI_P1_DN2 CSI_P1_DN2
CSI_P1_DP3 CSI_P1_DP3
CSI_P1_DN3 CSI_P1_DN3
CSI_P1_CKP CSI_P1_CKP
CSI_P1_CKN 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
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)
PCM_SYNC/I2S_FSC SAI1_RXD6(GPIO4_IO08)
PCM_IN/I2S_IN SAI1_RXD5(GPIO4_IO07)
PCM_OUT/I2S_OUT SAI1_TXD5(GPIO4_IO17)

SAI6_TXC/RXC
SAI6_TXFS/RXFS
SAI6_TXDO
SAI6_RXDO

wwan_m2.sch

Audio

HP_DET GPIO3_IO20
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_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
I2C2_SDA
I2C2_SCL
uSD_CLK
uSD_CMD
uSD_DATA0
uSD_DATA1
uSD_DATA2
uSD_DATA3

WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_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 GPIO5_IO04 (was PWM2)

haptic.sch

TODO:
GNSS
MIPI CSI/DSI
Smartcard?

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	uSD_DATA3	
	A49	A50	uSD_DATA2	
	A51	A52	uSD_DATA1	
CSI_P1_DP0	A53	A54	uSD_DATA0	
CSI_P1_DN0	A55	A56	WIFI_WAKE	
	A57	A58	uSD_CMD	
CSI_P1_CKP	A59	A60	uSD_CD_B	
CSI_P1_CKN	A61	A62		
	A63	A64	uSD_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	
	GND	GND		

IMX8M-SOM

J101B

	B1	B2	WIFI_DISABLE
	B3	B4	GPIO3_IO09
	B5	B6	
	B7	B8	GPIO3_IO08
	B9	B10	
	B11	B12	
	B13	B14	
	B15	B16	PWR_FLAG 3V3_OUT
	B17	B18	
	B19	B20	ENET_2V5
	B21	B22	
	B23	B24	PWR_FLAG NVCC_SD2
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	
	GND	GND	

IMX8M-SOM

5V_SOM
C101 22uF
C102 22uF
C103 100nF
GND
C104 100nF
C105 22uF
C106 22uF
GND

J101C

HDMI_CEC	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	
	GND	GND	

IMX8M-SOM

3V3_OUT
R106 10k

SAI2_TXD
HAPTIC
SAI1_RXD5(GPIO4_IO07)
SAI1_TXD0(GPIO4_IO12)
ONOFF
I2C2_SDA
SAI1_TXD1(GPIO4_IO13)
SYS_RST
I2C1_SCL
I2C1_SDA
SAI1_TXD3(GPIO4_IO15)
SAI1_TXD4(GPIO4_IO16)
SAI1_TXD7(GPIO4_IO19)
UART3_TXD
BT_DISABLE
SAI1_TXD5(GPIO4_IO17)
POR_B
UART1_RXD
SAI1_TXD2(GPIO4_IO14)
SAI1_TXD6(GPIO4_IO18)
ECSPI1_MISO
UART4_CTS
UART3_RXD
ECSPI1_MOSI
UART4_RTS
UART1_TXD
USB2_VBUS
USB2_ID
USB1_VBUS
USB1_ID

SAI1_RXD7(GPIO4_IO09)
I2C2_SCL
MIC_SEL
UART4_TXD
ECSPI1_SCLK
ECSPI1_SS0
UART4_RXD
USB2_DN
USB2_DP
USB1_RXN
USB1_RXP
USB1_TXN
USB1_TXP
USB1_DN
USB1_DP

3V3_OUT
R101 10k
R102 10k
R105 10k

TODO:
Bring I2C level shifter to top schematic since used in WLAN M.2, DSI, & CSI

5V_P
R103 10k
R104 19.6k
GND

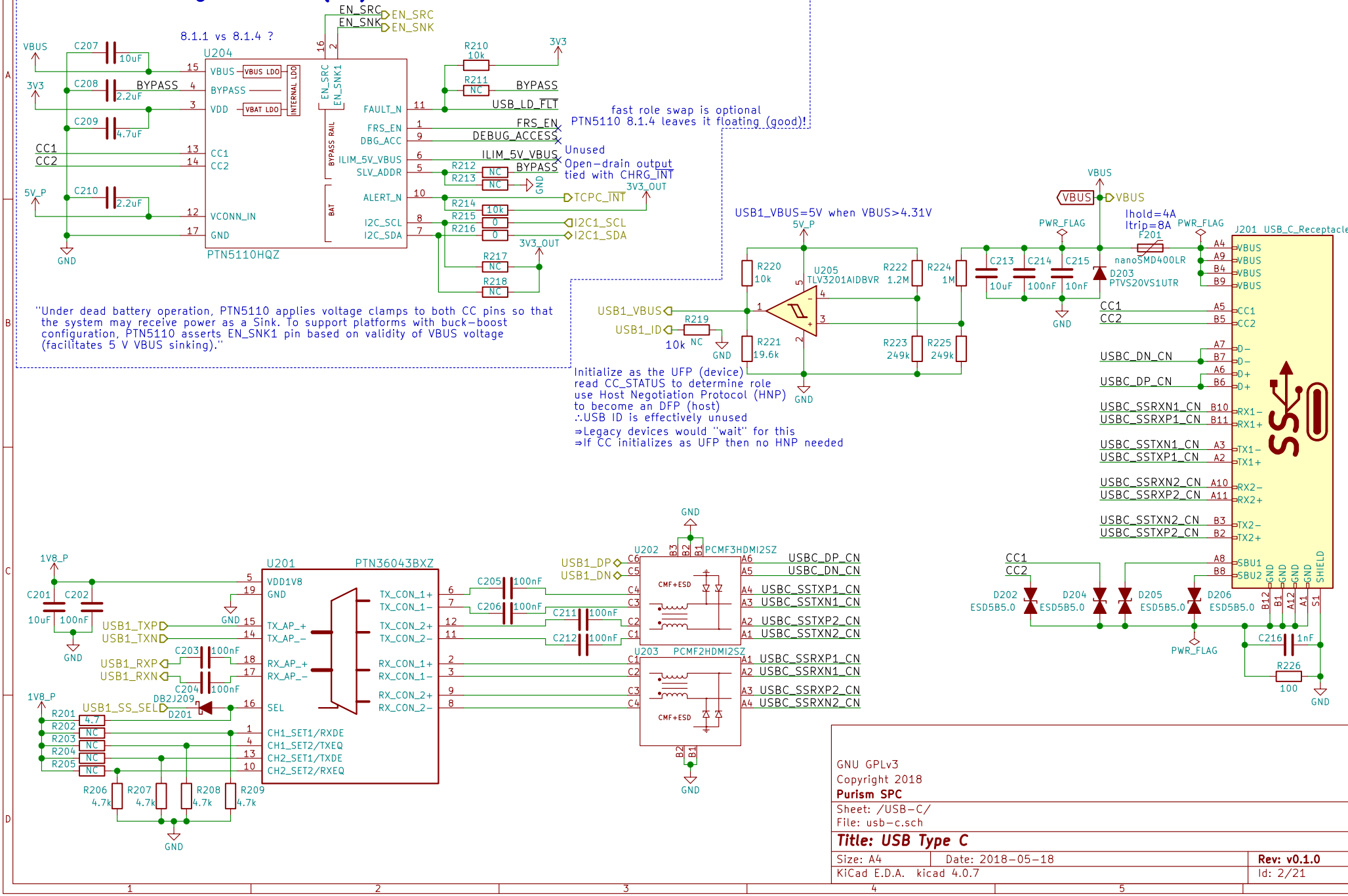
IMX8M-SOM
GND GND

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

Title: DVK-MX8M-BSB

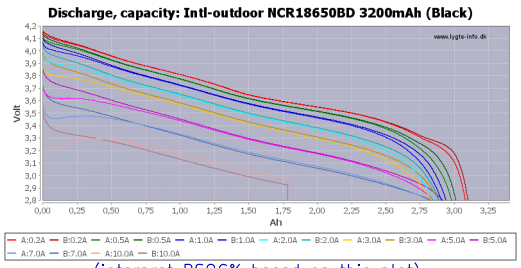
Size: A2	Date: 2018-05-18	Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7		Id: 1/21

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
KiCad E.D.A. kicad 4.0.7	**Rev: v0.1.0**
	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

RGEN

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

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)

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!!!

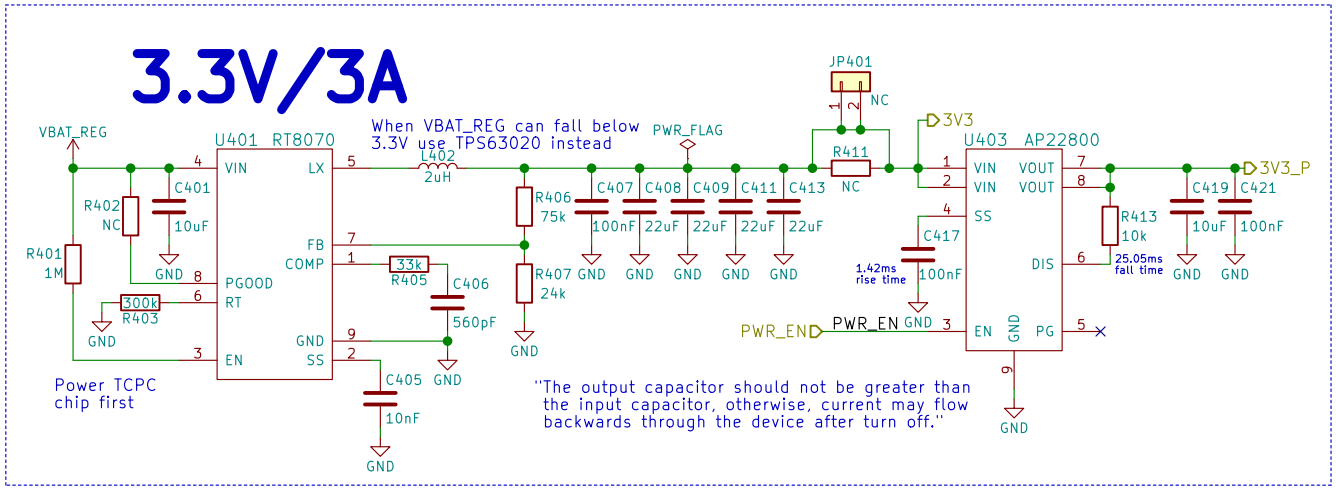
reference design: http://www.ti.com/lit/ug/sluuba2b/sluuba2b.pdf

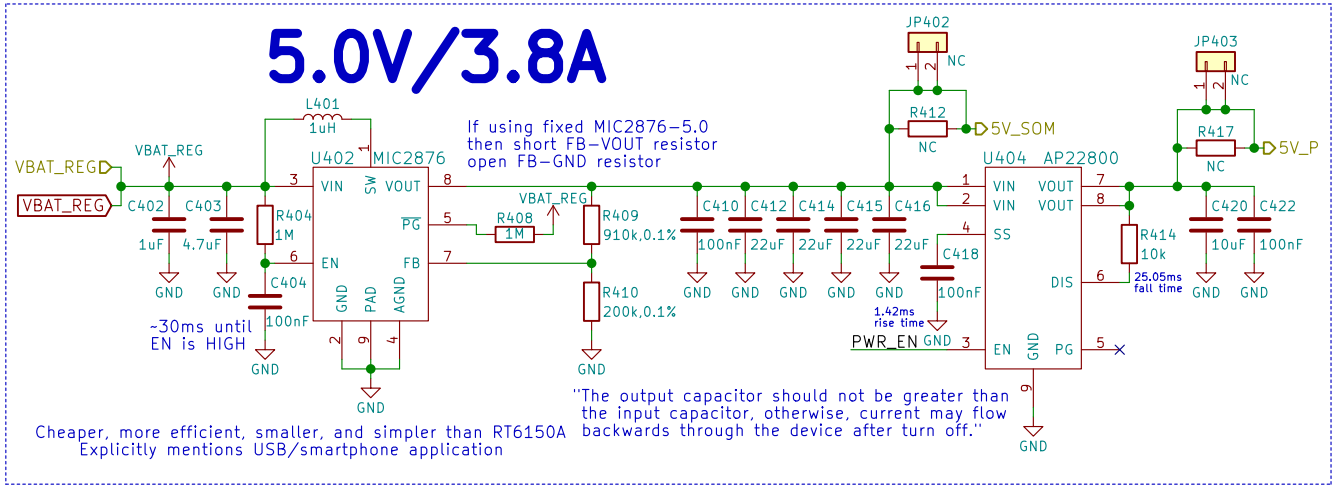
may want to include BQ29705 protection as in:
http://www.ti.com/lit/ug/tiducl1/tiducl1.pdf
schematic: http://www.ti.com/lit/df/tidrp70/tidrp70.pdf
(PTC may be good enough)

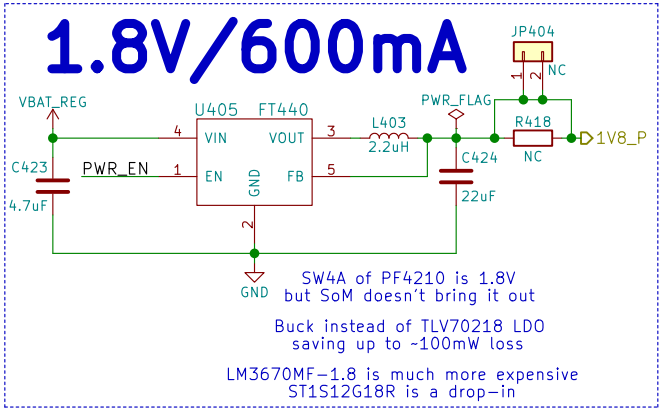
Battery holder gives ~1mm clearance underneath the battery
Thermistor is 1.1±0.15mm thick, should fit fine with stack-up

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 4.0.7		Id: 3/21







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

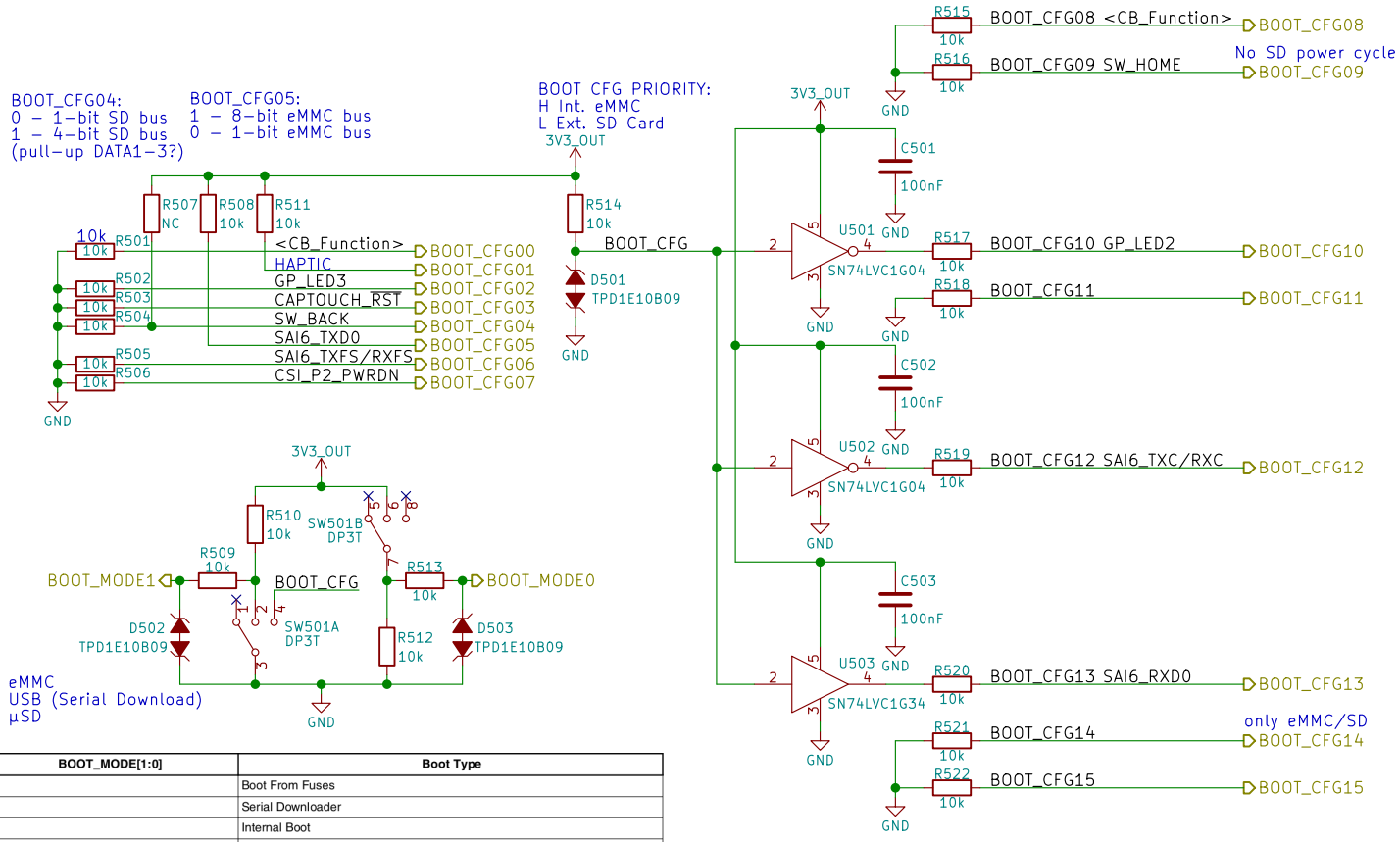
Sheet: /Power/
File: power.sch

Title: Power

Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		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 01 - USDHC-2 10 - USDHC-3 else - reserved

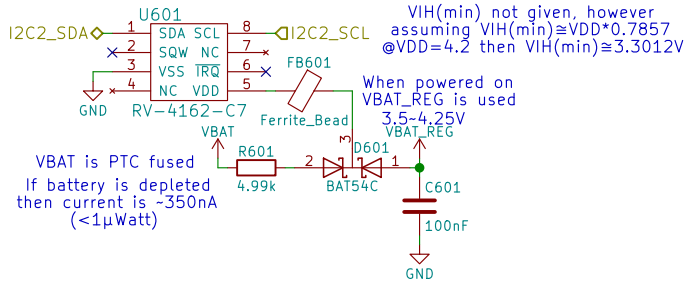


BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

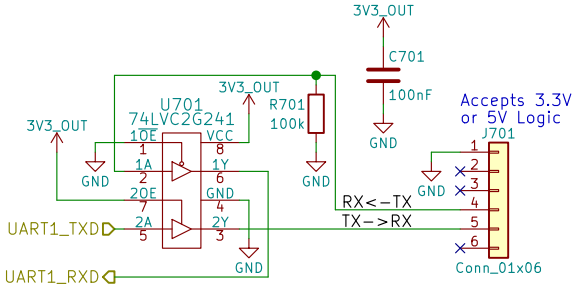
Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

Size: A4	Date: 2018–05–18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 5/21



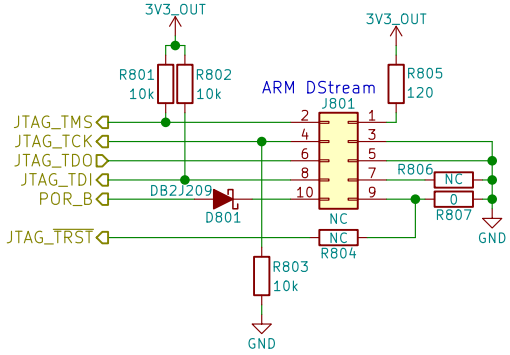
Sheet: /RTC/		
File: rtc.sch		
Title: RTC		
Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 6/21



Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

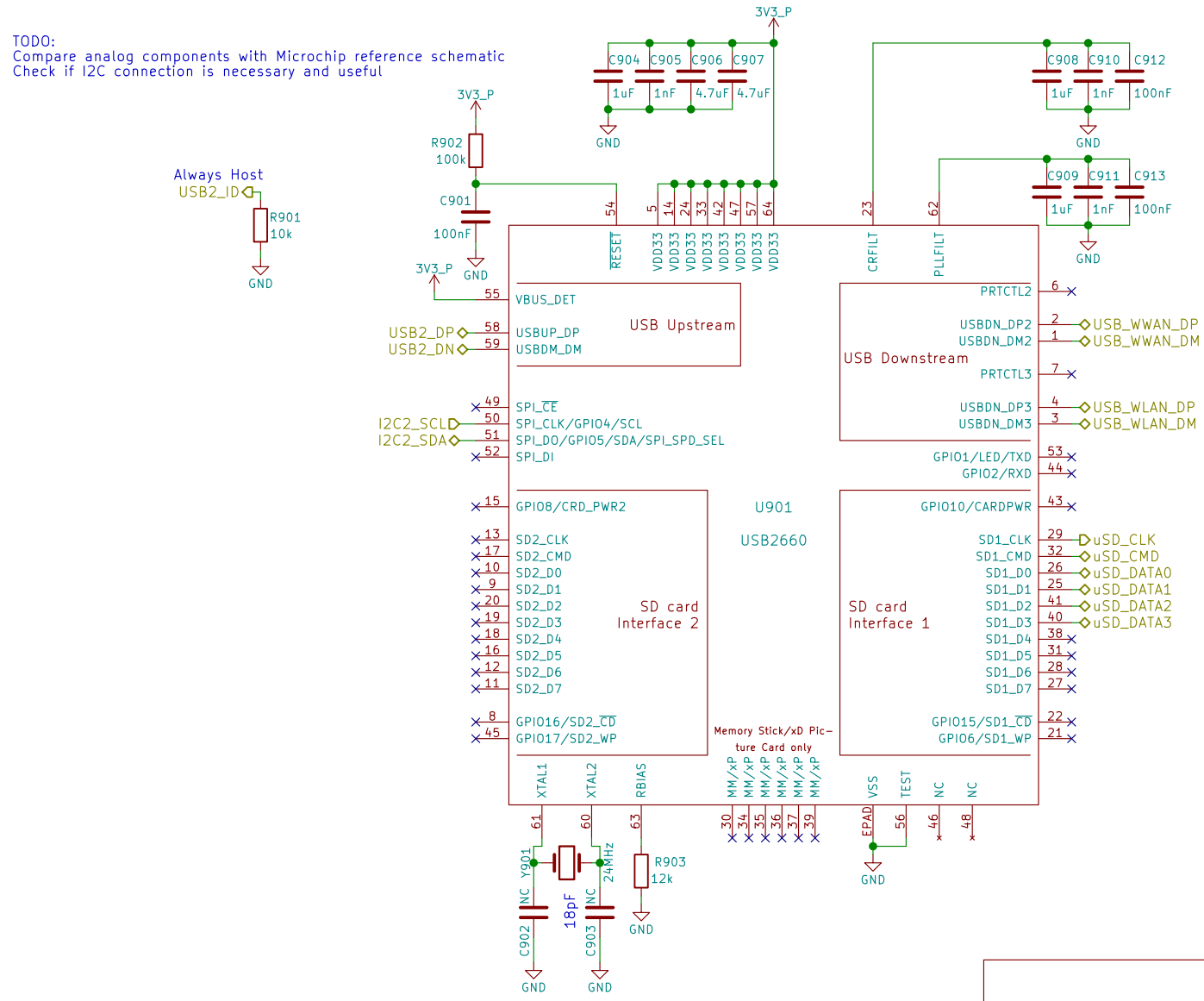
Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 7/21



Sheet: /JTAG/
File: jtag.sch

Title: JTAG

Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 8/21

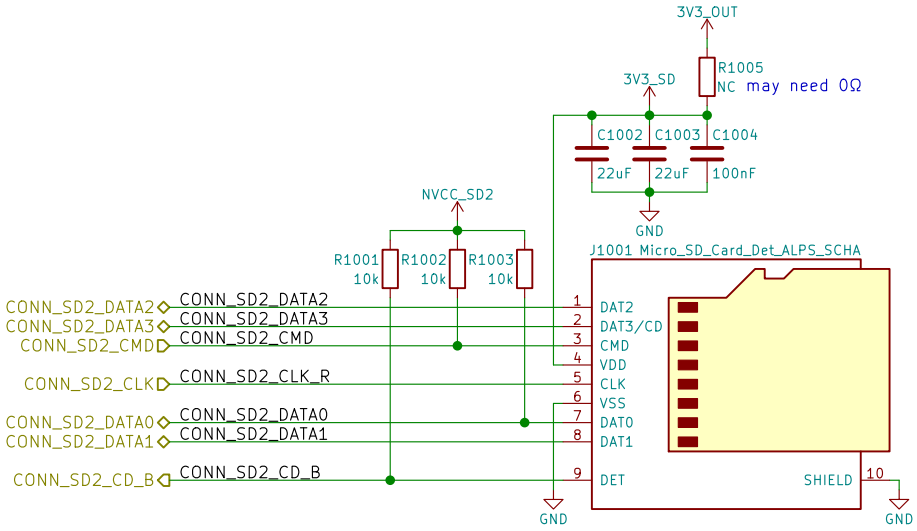


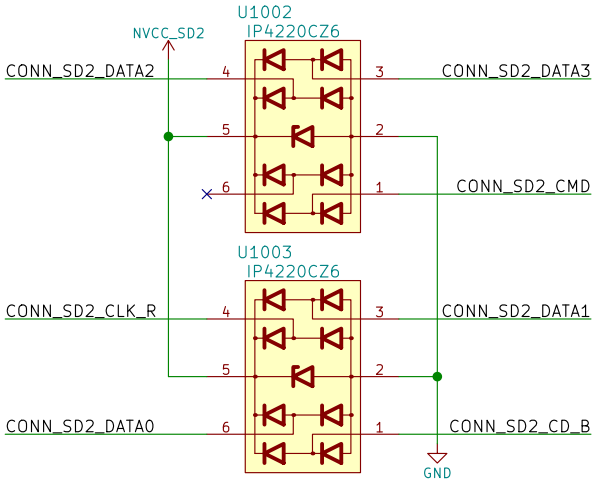
GNU GPLv3
Copyright 2018
Purism SPC

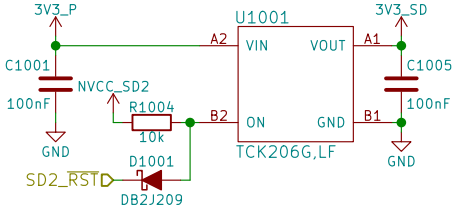
Sheet: /USB Hub + SDIO Bridge/
File: usb_hub_sdio.sch

Title:

Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 9/21





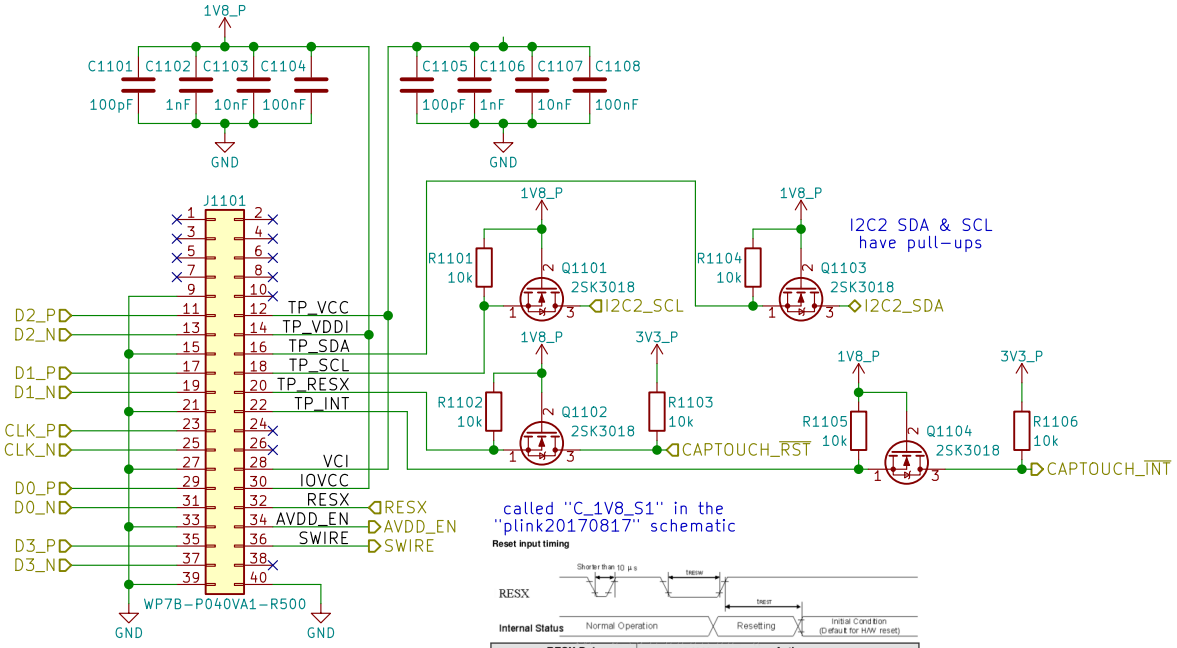


Sheet: /uSD Card/
File: sd.sch

Title: uSD Card

Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 10/21

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



called "C_1V8_S1" in the
"plink20170817" schematic

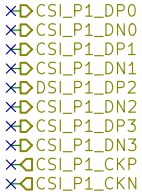
RESX Puise	Action
Shorter than 5µs	Invalid Reset
Longer than 10µs	Valid Reset
Between 5µs and 10µs	Reset Initialization Precedure

TODO: low power state signal??

Sheet: /MIPI DSI/
File: mipi_dsi.sch

Title: MIPI DSI

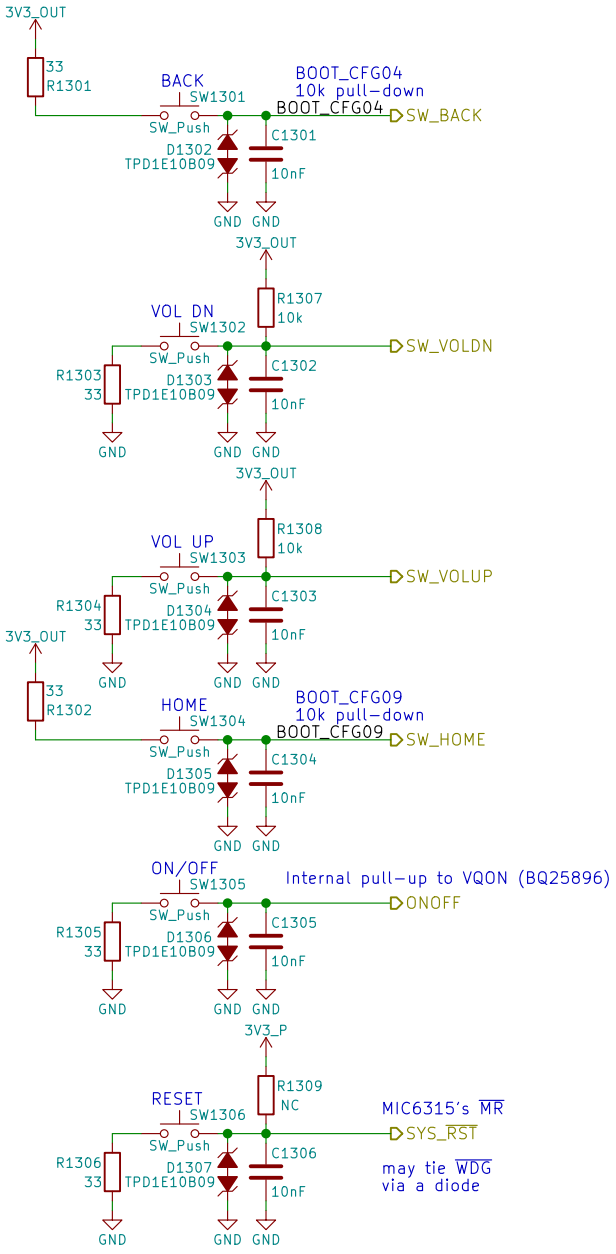
Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 11/21



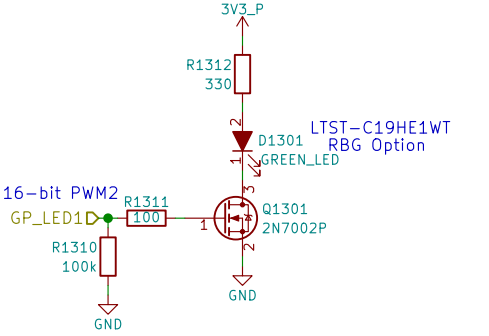
Sheet: /MIPI CSI/
File: mipi_csi.sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 4.0.7		Id: 12/21



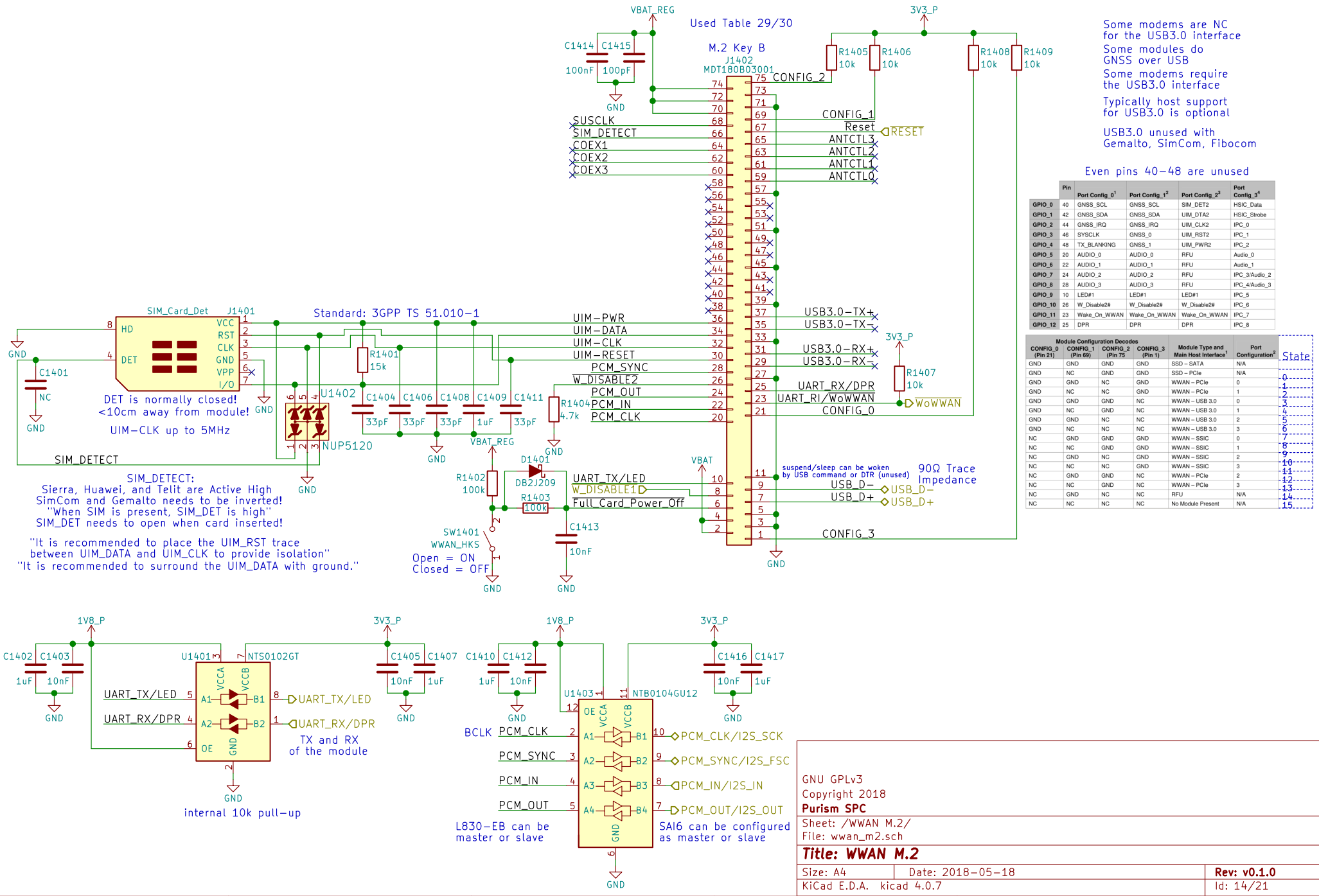
Use PWM2_PWMSAR to set the compare value (duty cycle)
Use PWM2_PWMCR[15:4] to set the PRESCALER (frequency)
Use PWM2_PWMPR to set the top of the counter (frequency)



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 4.0.7		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

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

CTIA/AHJ

Microphone
Ground
Audio (Right)
Audio (Left)

U1501 SGTL5000

Mute via MUTE_LO=1

may use lineout left channel for pseudo-earpiece speaker

U1502 PAM8301

LS1501 AS01608MS-SP9

DLW21SN900SQ2L

FL1501

FL1502

fc=106Hz

Z(hp)≥16Ω

<3.3µA

J1501

SMD Equivalent: SJ-43515RS-SMT-TR

SJ-43515TS

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

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

D1503 SZMM5Z3V3T1G

Vz=3.3V
Vf=0.9V

may add ~220uF cap parallel to Zener

D1501 ESD5B5.0S

D1502 ESD5B5.0S

U1503 FSA6157L6X

Ext-Mic enabled
MIC_SEL=LOW

Int-Mic enabled
MIC_SEL=LOW

SW Mute Mic:
MUTE_ADC=1

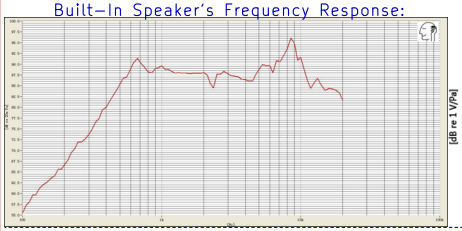
SW1501A SW_DPST_x2

TODO:
DPST with camera!

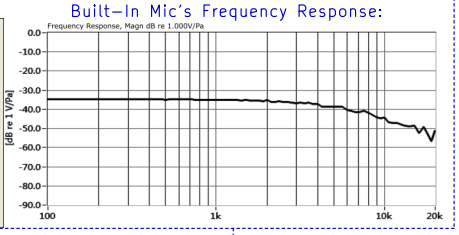
MK1501 CMC-6022

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

Built-In Speaker's Frequency Response:



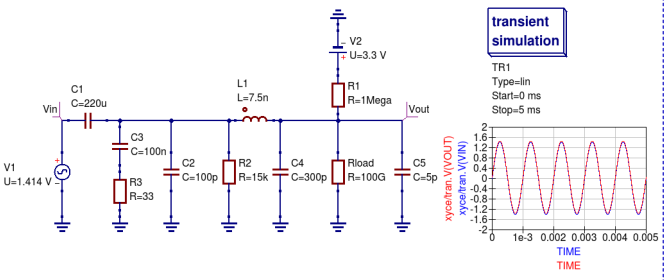
Built-In Mic's Frequency Response:



−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

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

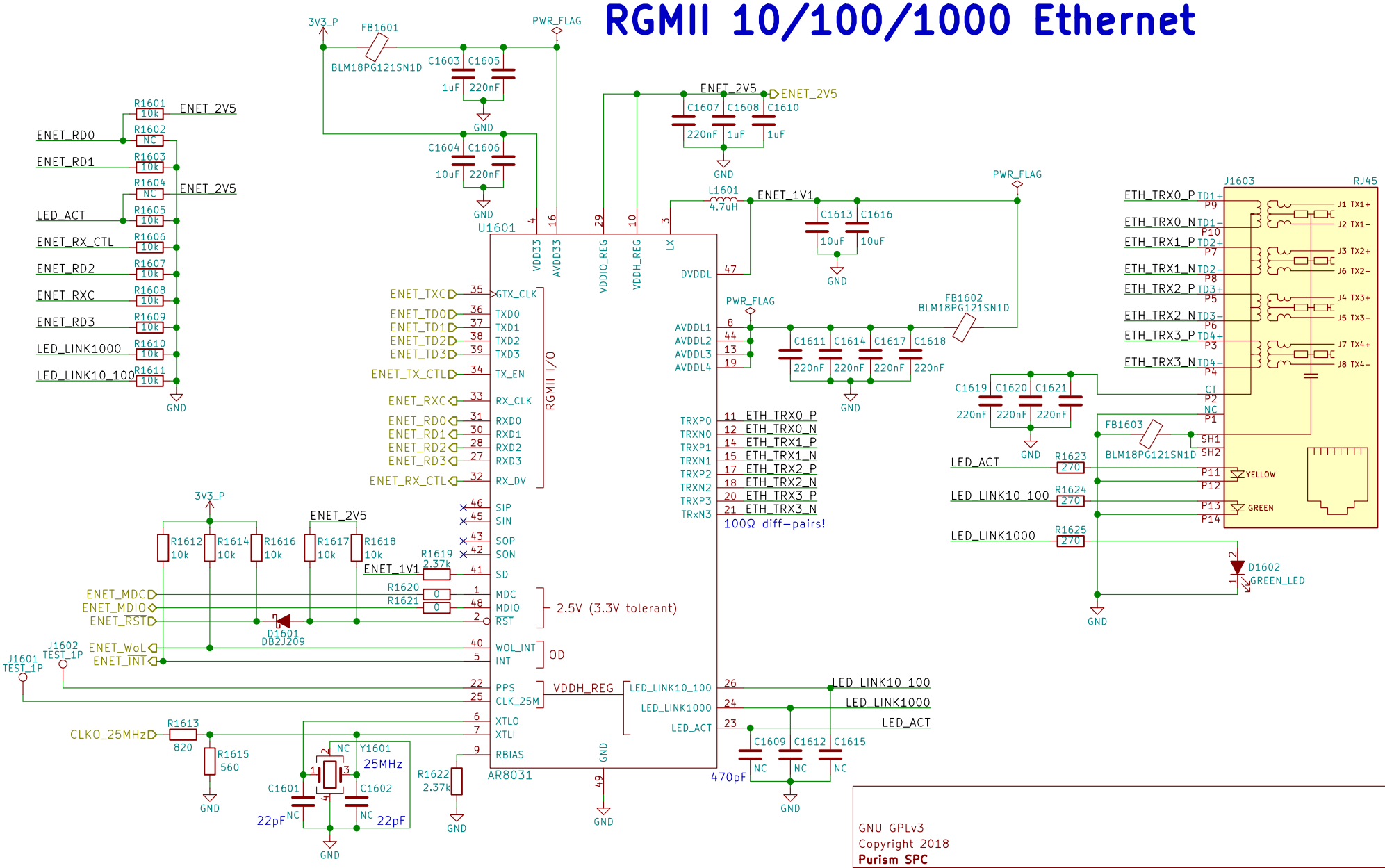
Purism SPC

Sheet: /Audio/
File: audio.sch

Title: Audio

Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 15/21

RGMII 10/100/1000 Ethernet



GNU GPLv3
Copyright 2018
Purism SPC

Sheet: /Ethernet/
File: ethernet.sch

Title: Ethernet

Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		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

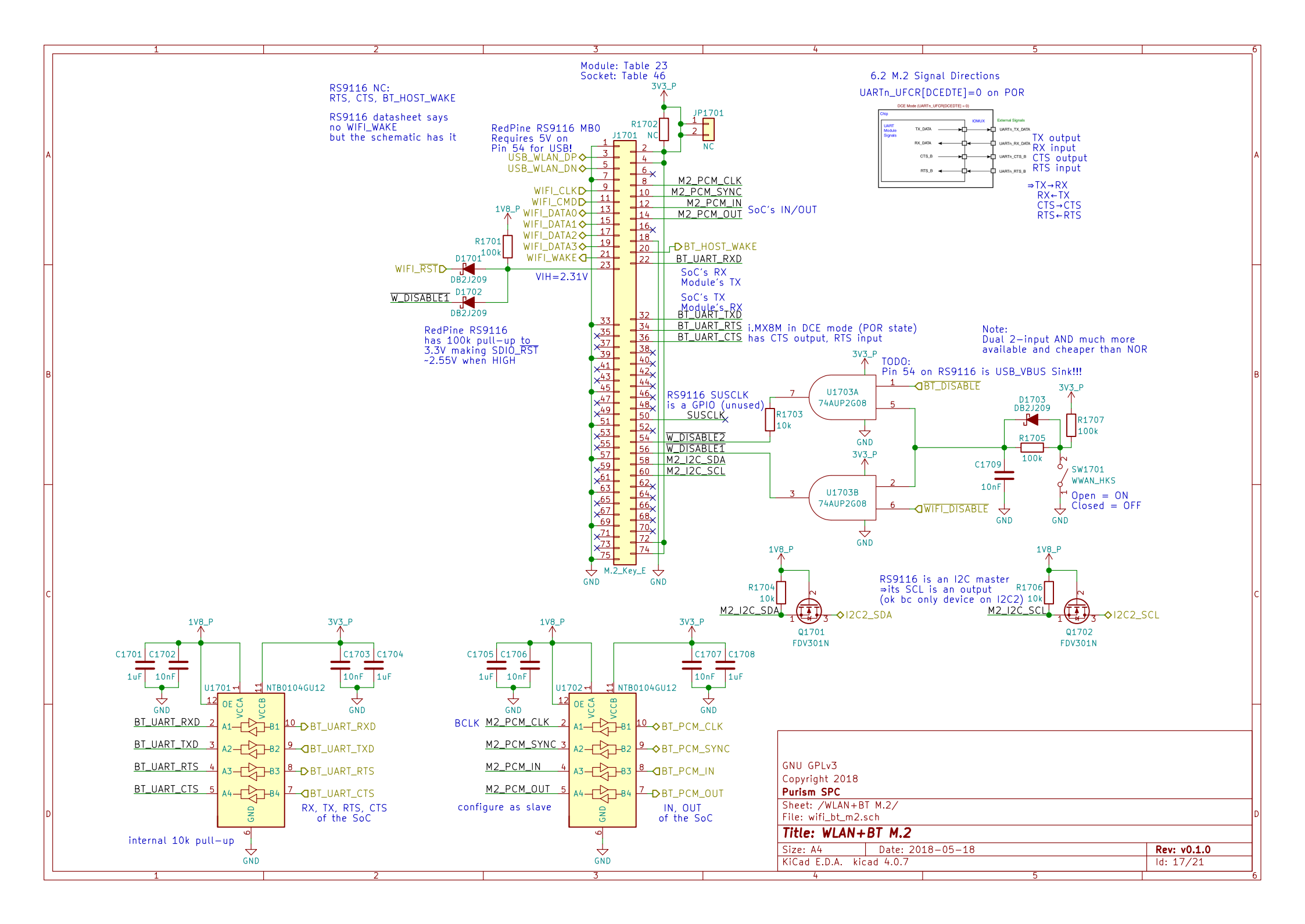
RS9116 is an I2C master
⇒its SCL is an output
(ok bc only device on I2C2)

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

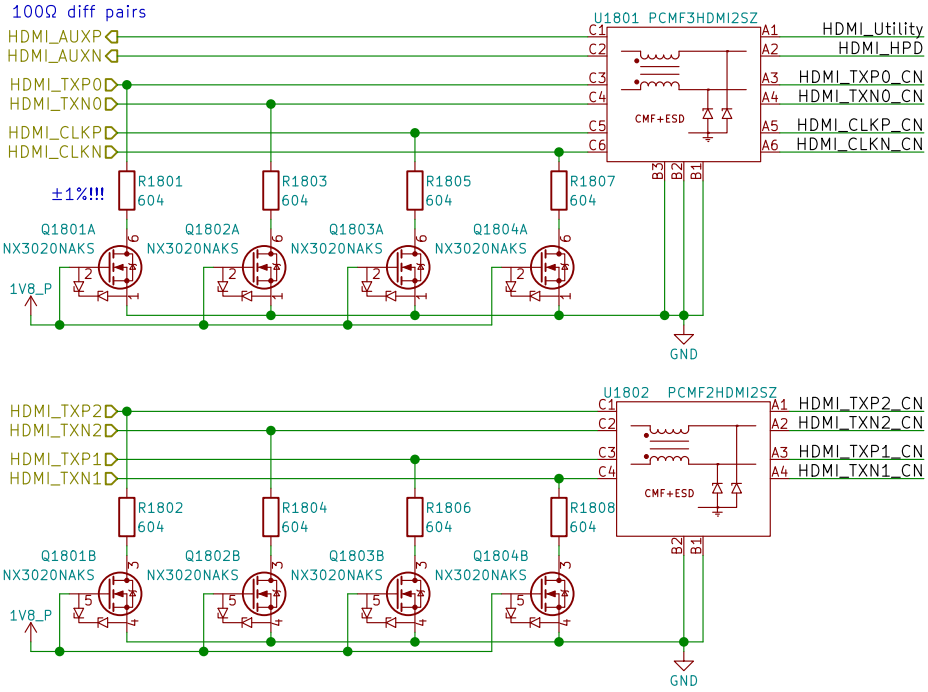
Title: WLAN+BT M.2

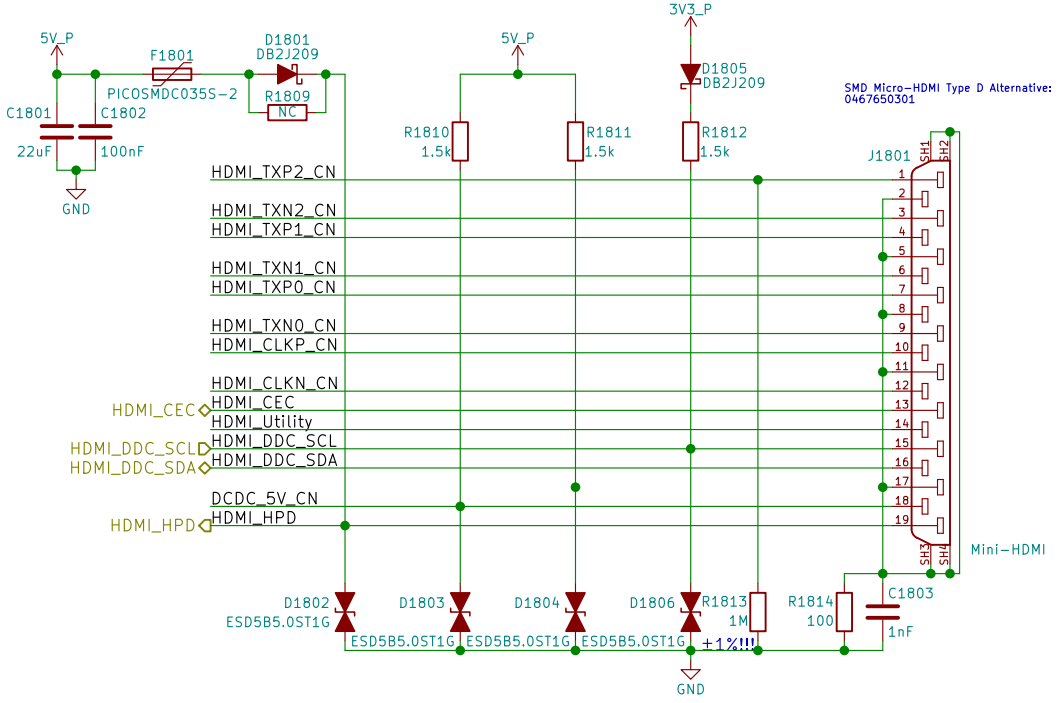
Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 17/21

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



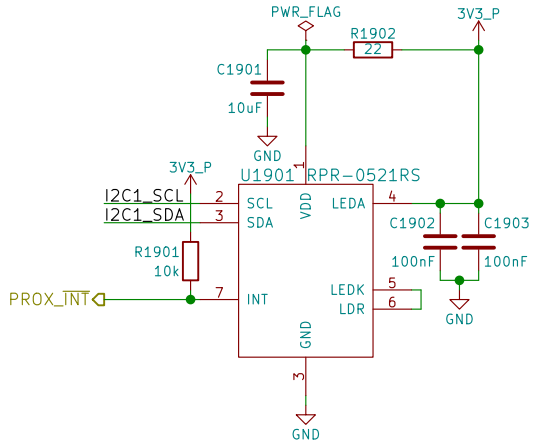


Sheet: /HDMI/
File: hdmi.sch

Title: HDMI

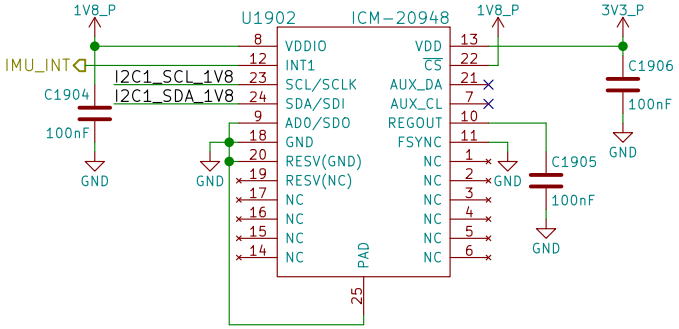
Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 18/21

Proximity & Ambient Light



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

9-Axis IMU



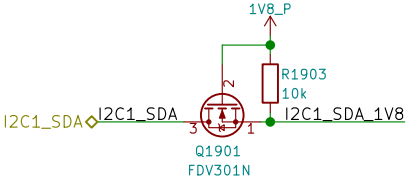
Reference:
https://store.invensense.com/datasheets/invensense/AN-IVS-0001EVB-00%20v1%202.pdf

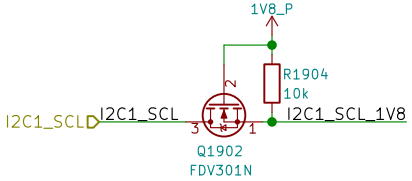
AD0 sets the slave address's LSB (110100X)

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

"FSYNC - Connect to GND if unused"

I2C's VIH=1.8V





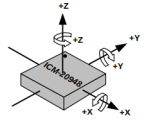


Figure 12. Orientation of Axes of Sensitivity and Polarity of Rotation

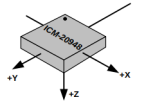
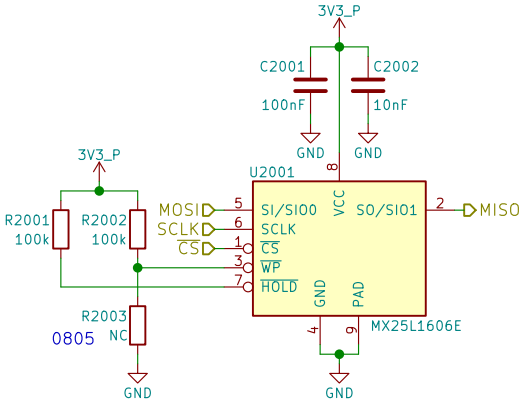


Figure 13. Orientation of Axes of Sensitivity for Magnetometer

Sheet: /Sensors/		
File: sensors.sch		
Title: Sensors		
Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 19/21



Sheet: /SPI Flash/
File: flash.sch

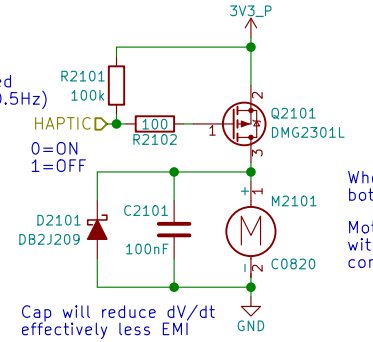
Title: SPI NOR Flash

Size: A4	Date: 2018-05-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		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 4.0.7		Id: 21/21