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
3V3_P
1V8_P
PWR_EN — TODO!!!
SD2_RST
SWIRE
AVDD_EN

power.sch

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

TODO:
need a vibration motor?

Audio

HP_DET
MIC_SEL
SAI2_RXD
SAI2_TXD
SAI2_TXFS
SAI2_TXC
SAI2_MCLK
I2C1_SDA
I2C1_SCL

audio.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_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: SAI1_TXD3(GPIO4_IO15)
SW_VOLDN — BTN1 SAI1_TXD6(GPIO4_IO18)
SW_VOLUP — BTN2
SW_HOME — SAI1_TXD1(GPIO4_IO13)
ONOFF
SYS_RST
GP_LED1 — GPIO1_IO13 SAI1_RXD1(GPIO4_IO03)

buttons_led.sch

WWAN M.2

CONFIG0 — 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

WLAN+BT M.2

USB_WLAN_DP
USB_WLAN_DM
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

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

TODO:
GNSS
NOR Flash
9-axis
Sensors
MIPI DSI/CSI

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	
	A31	A32	ENET_RX_CTL
	A33	A34	
	A35	A36	ENET_RXC
	A37	A38	
	A39	A40	ENET_MDIO
	A41	A42	ENET_MDC
ENET_RST	A43	A44	
	A45	A46	SD2_RST
	A47	A48	SD2_DATA3
	A49	A50	SD2_DATA2
	A51	A52	SD2_DATA1
	A53	A54	SD2_DATA0
	A55	A56	WIFI_WAKE
	A57	A58	SD2_CMD
	A59	A60	uSD_CD_B
	A61	A62	
TCPC_INT	A63	A64	SD2_CLK
	A65	A66	
	A67	A68	
	A69	A70	
	A71	A72	WWAN_DISABLE
	A73	A74	USB1_SS_SEL
	A75	A76	
	A77	A78	BT_HOST_WAKE
GND	A79	A80	CAPTOUCH_INT

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	
	B21	B22	ENET_2V5
	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	
GND	B79	B80	

+5V — C101 22uF, C102 22uF, C103 0.1uF — GND
IMX8M-SOM
GND
+5V — C104 0.1uF, C105 22uF, C106 22uF — GND

J101C

	C1	C2	HDMI_HPD
	C3	C4	
	C5	C6	HDMI_AUXN
	C7	C8	HDMI_AUXP
	C9	C10	
	C11	C12	HDMI_TXP1
	C13	C14	HDMI_TXN1
	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	
	C35	C36	
	C37	C38	
	C39	C40	
PWR_EN	C41	C42	ENET_WoL
	C43	C44	SAI1_RXD1(GPIO4_IO03)
	C45	C46	
	C47	C48	ENET_INT
	C49	C50	
	C51	C52	
SAI5_RXC(GPIO3_IO20)	C53	C54	
	C55	C56	
	C57	C58	
SAI1_RXD0(GPIO4_IO02)	C59	C60	
	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

J101D

3V3_OUT — R102 10k — SAI1_RXD7(GPIO4_IO09) — I2C2_SCL

SAI2_TXD	D1	D2	
	D3	D4	
	D5	D6	
SAI1_RXD5(GPIO4_IO07)	D7	D8	
	D9	D10	
SAI1_TXD0(GPIO4_IO12)	D11	D12	
ONOFF	D13	D14	
I2C2_SDA	D15	D16	
	D17	D18	
SAI1_TXD1(GPIO4_IO13)	D19	D20	
SYS_RST	D21	D22	UART4_TXD
I2C1_SCL	D23	D24	
I2C1_SDA	D25	D26	
SAI1_TXD3(GPIO4_IO15)	D27	D28	
SAI1_TXD4(GPIO4_IO16)	D29	D30	
	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	
	D51	D52	
UART4_CTS	D53	D54	
UART3_RXD	D55	D56	USB2_DN
	D57	D58	USB2_DP
	D59	D60	
	D61	D62	
	D63	D64	USB1_RXN
	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	

3V3_OUT — R103 10k, R104 10k, R101 10k
+5V — R105 10k, R106 19.6k — GND
IMX8M-SOM
GND
GND

Purism SPC

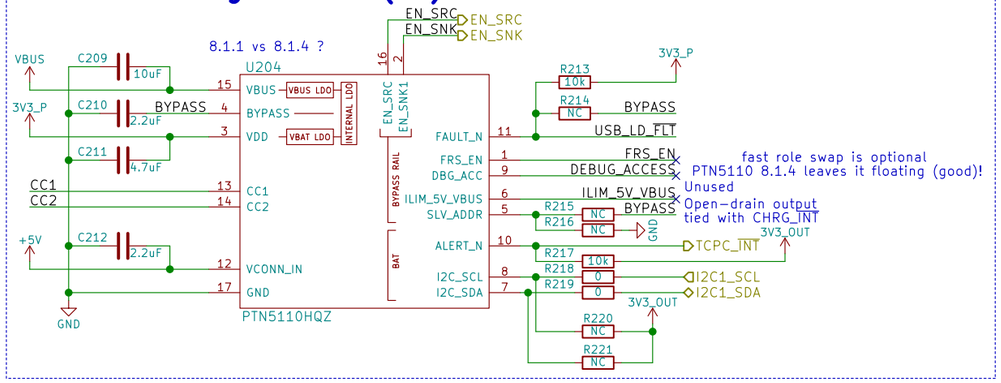
Sheet: /
File: dvk-mx8m-bsb.sch

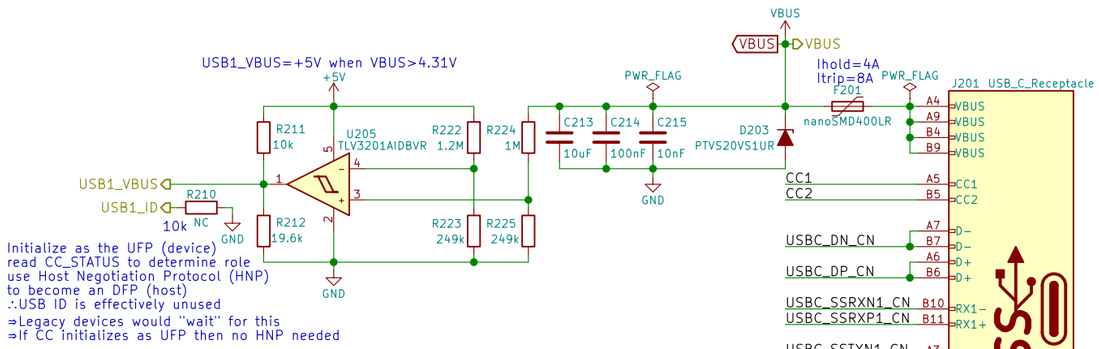
Title: DVK-MX8M-BSB

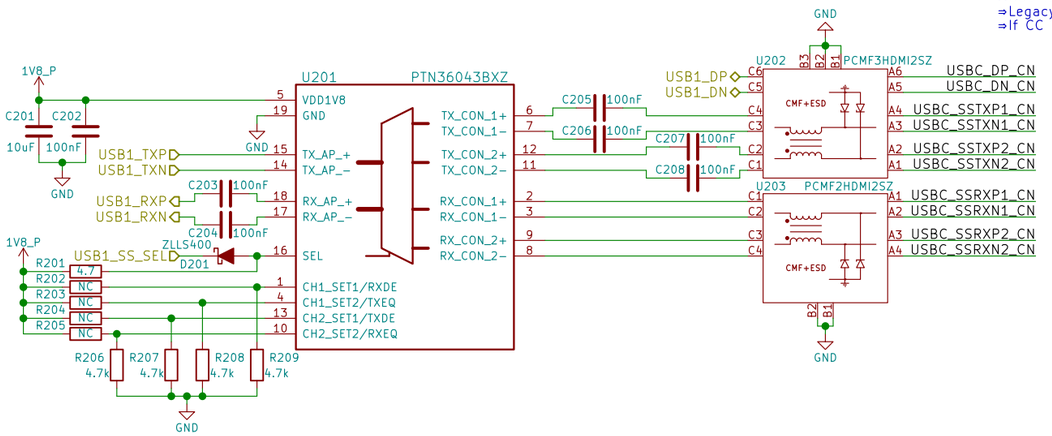
Size: A2	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 1/18

"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

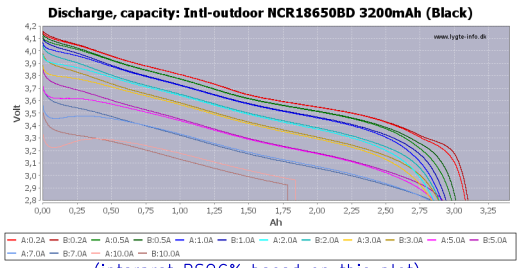






Sheet: /USB-C/		
File: usb-c.sch		
Title: USB Type C		
Size: A3	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 2/18

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

NCR18650BD is recommended

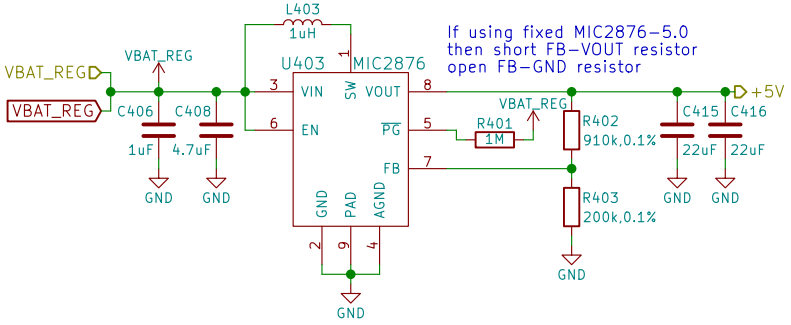
VBAT(nom)=REG06[7:2]
VBAT(default_max_ovp)=(REG06[7:2]×1.005)×1.04=4.3982016V
REG06[7:2]=010111⇒VBAT(max_ovp)=4.3814784
BQ29705 provides 4.425V as OVP!!!

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)

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: 3/18

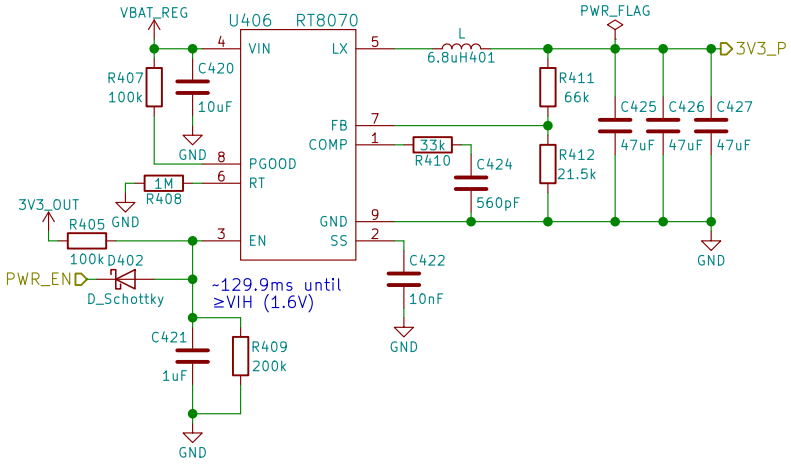
5.0V/3.8A



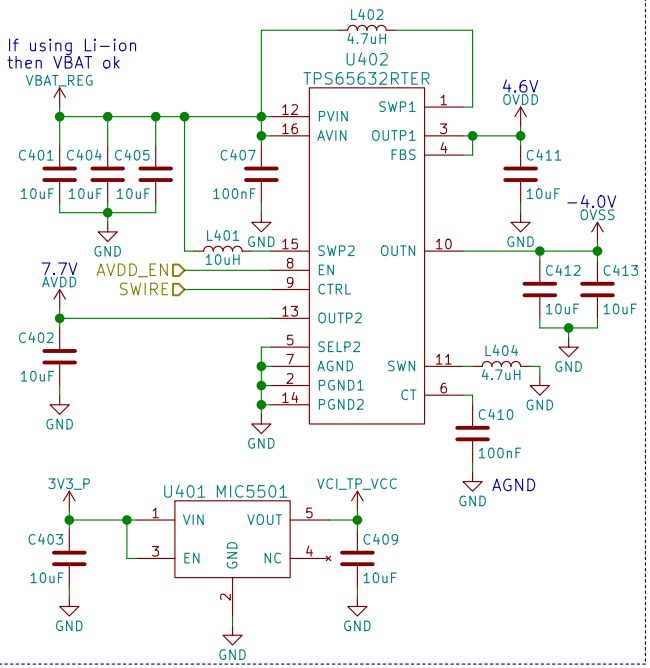
Cheaper, more efficient, smaller, and simpler than RT6150A
Explicitly mentions USB/smartphone application

3.3V/3A

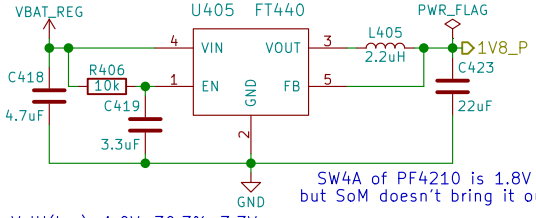
When VBAT can fall below
3.3V use TPS63020 instead!



AMOLED POWER



1.8V/600mA

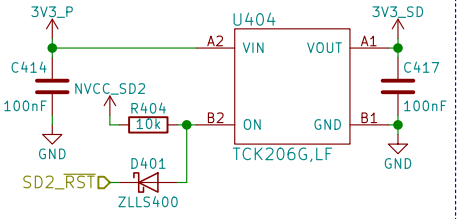


SW4A of PF4210 is 1.8V
but SoM doesn't bring it out

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

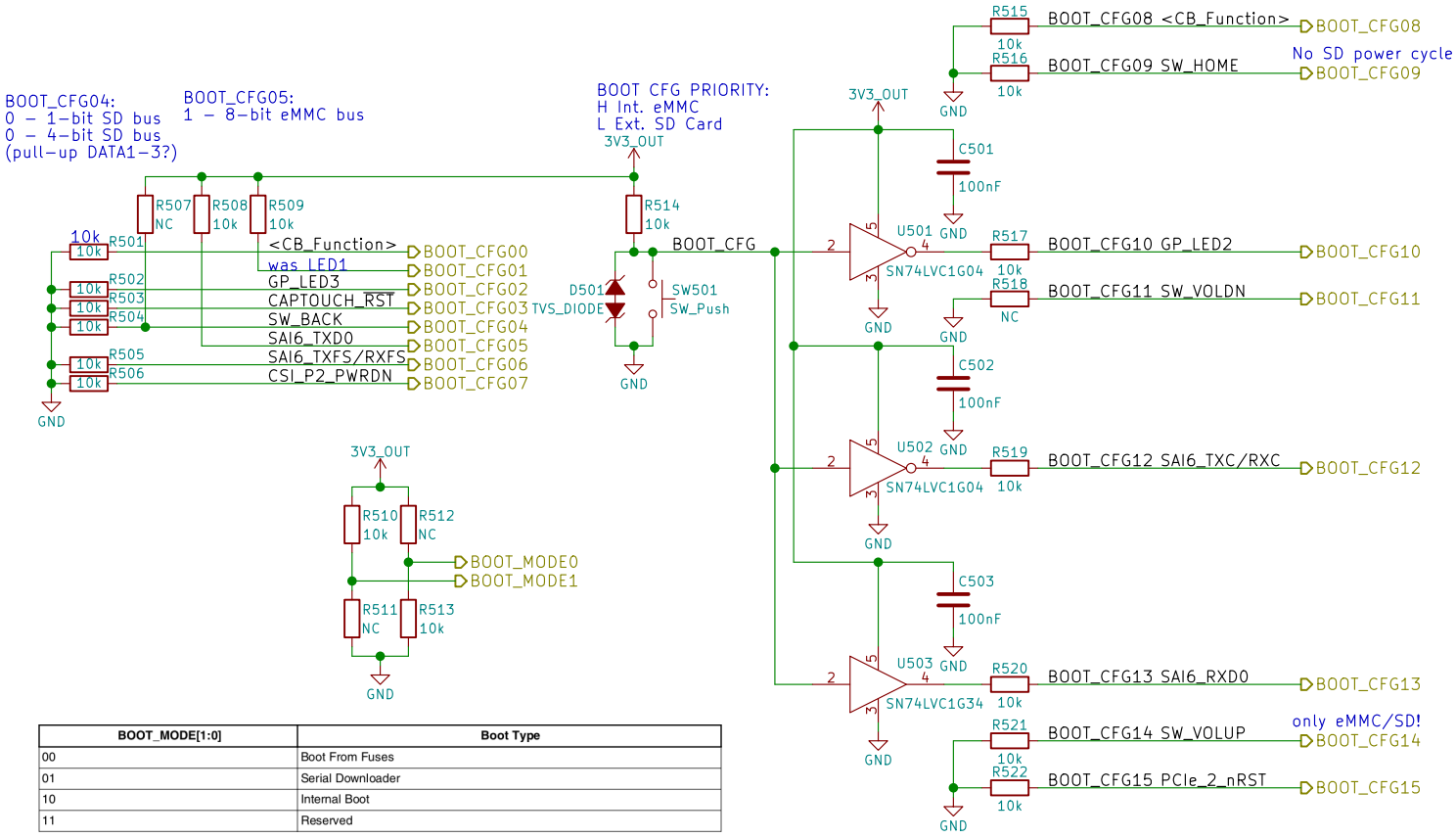


TODO:
add parallel 0.1uF bulk caps!
& spread all over the power plane

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: 4/18

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

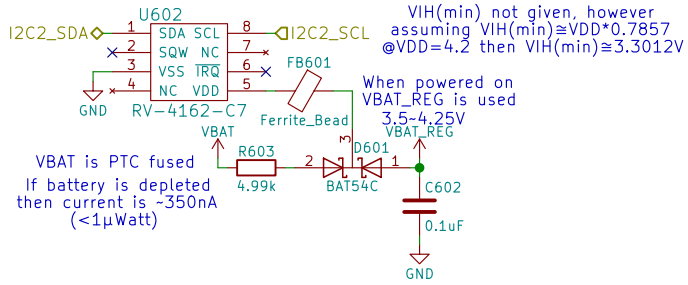


BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

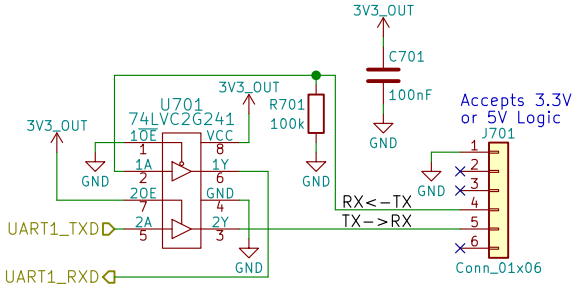
Size: A4	Date: 2018–05–02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 5/18



Sheet: /RTC/
File: rtc.sch

Title: RTC

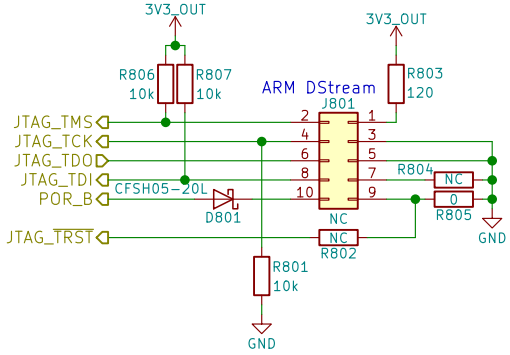
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 6/18



Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

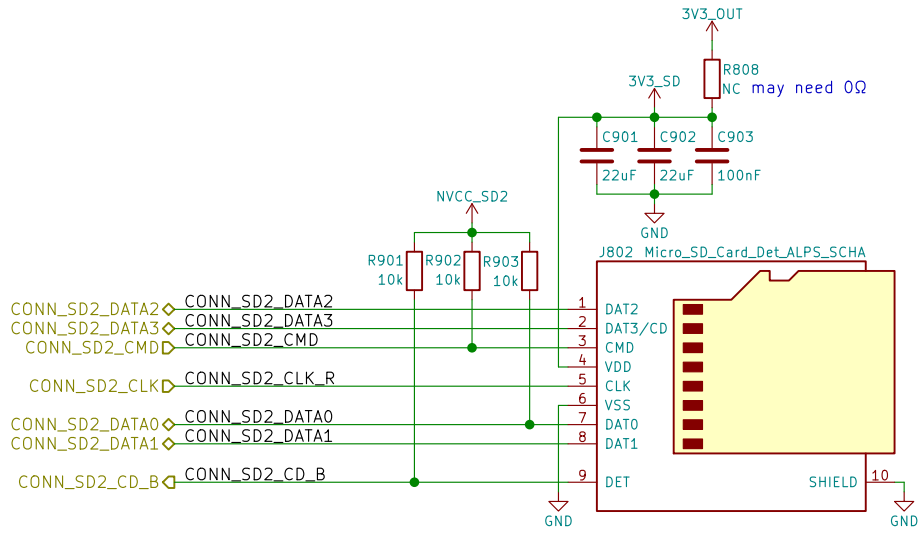
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 7/18

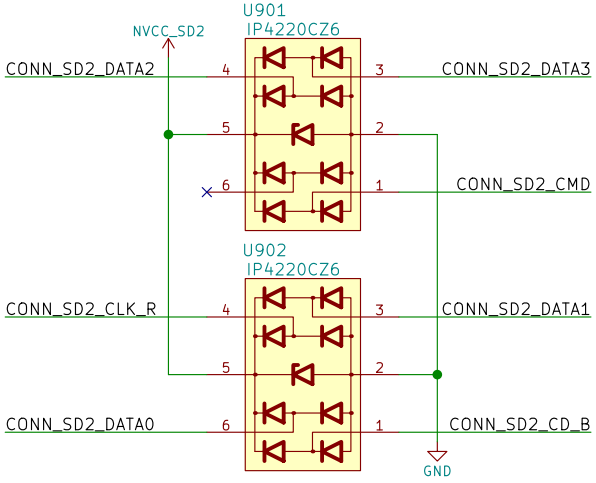


Sheet: /JTAG/
File: jtag.sch

Title: JTAG

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 8/18

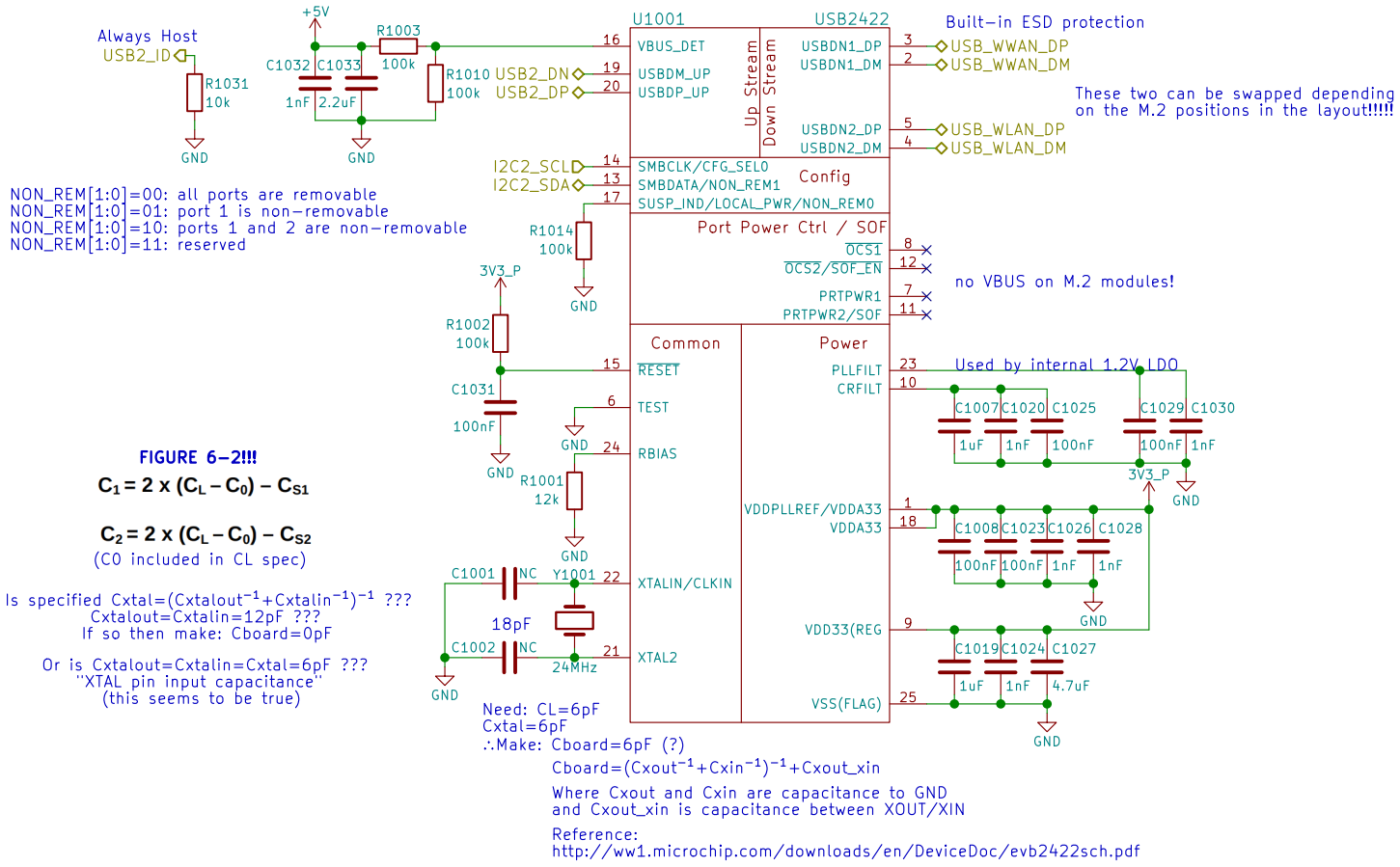




Sheet: /uSD Card/
File: sd.sch

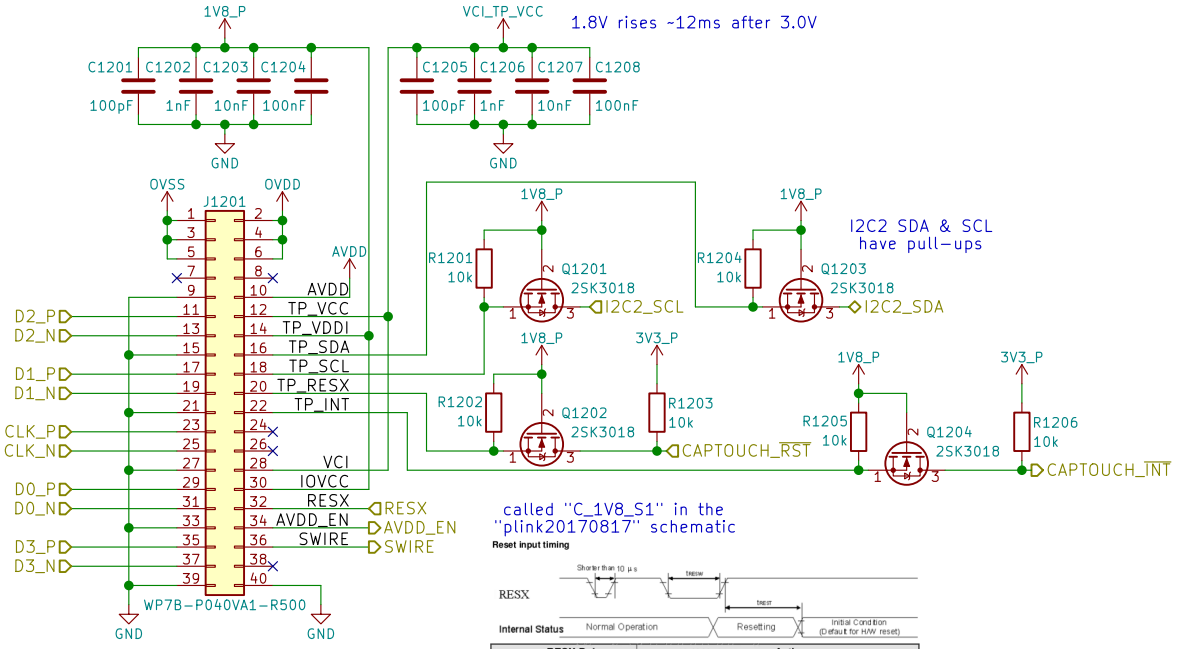
Title: uSD Card

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 9/18



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: 10/18

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



called "C_1V8_S1" in the
"plink20170817" schematic

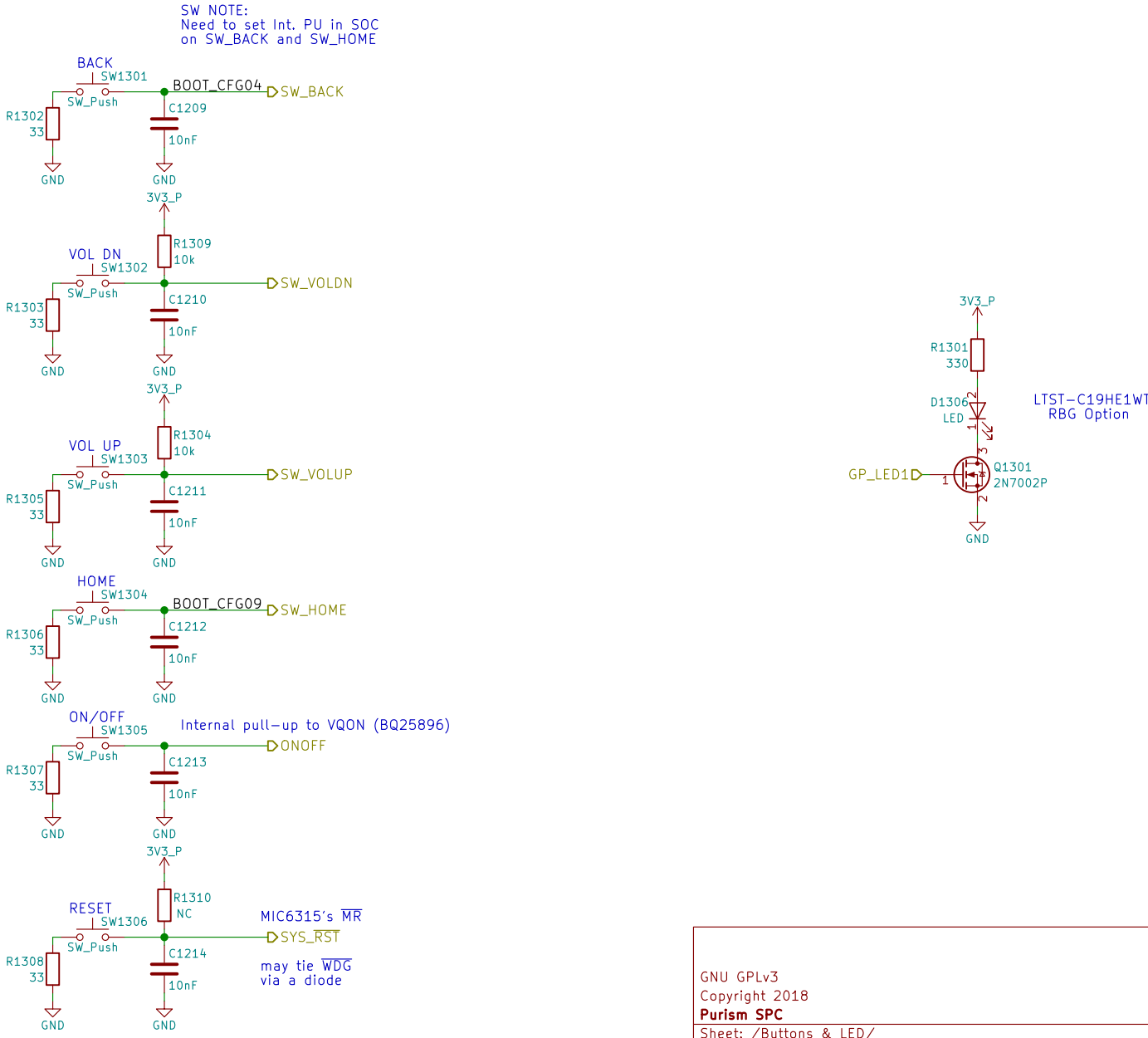
RESX Puise	Action
Shorter than 5µs	Invalid Reset
Longer than 10µs	Valid Reset
Between 5µs and 10µs	Reset Initialization Precedure

TODO: low power state signal??

Sheet: /MIPI DSI/
File: mipi_dsi.sch

Title: MIPI DSI

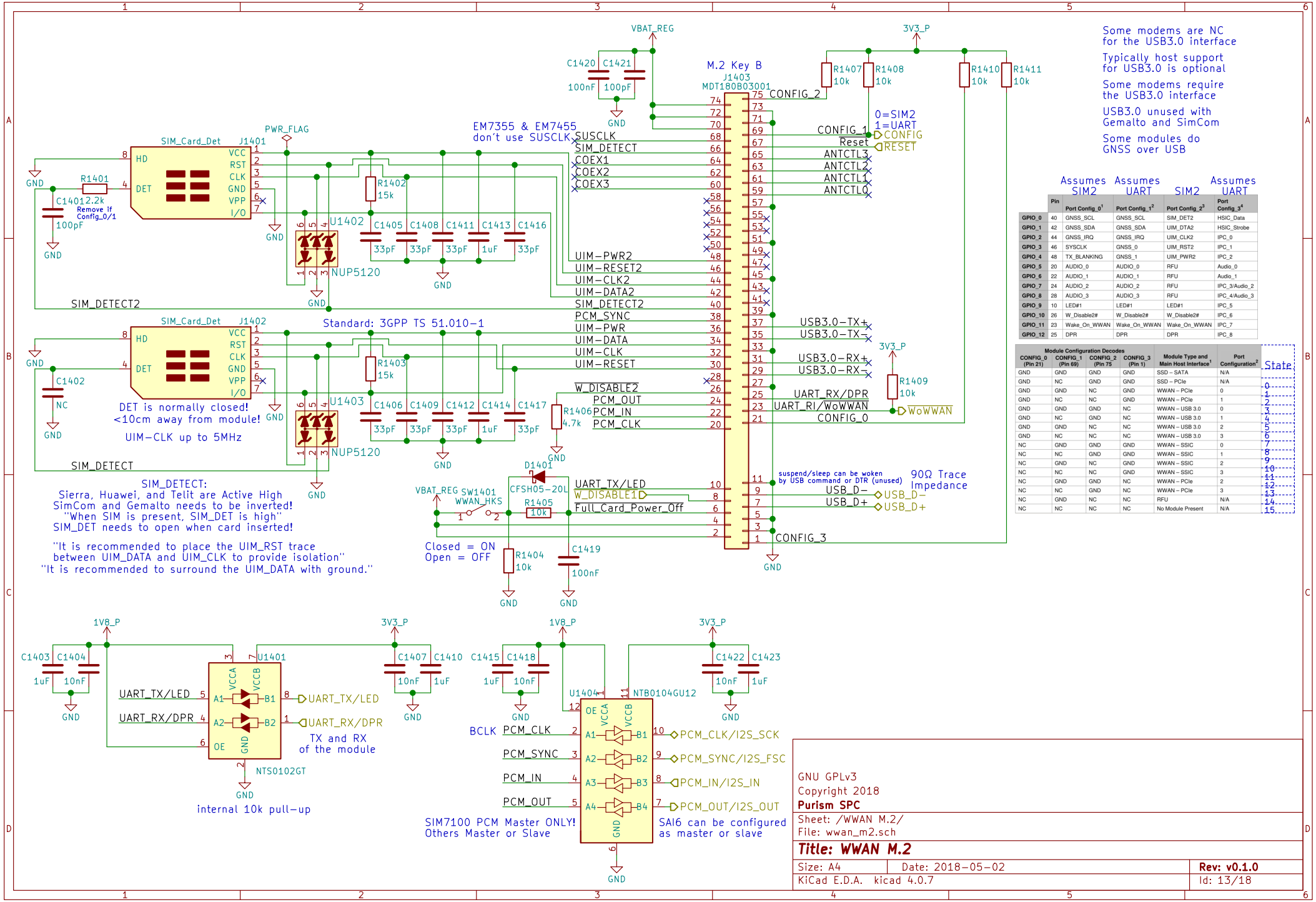
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 11/18



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: 12/18



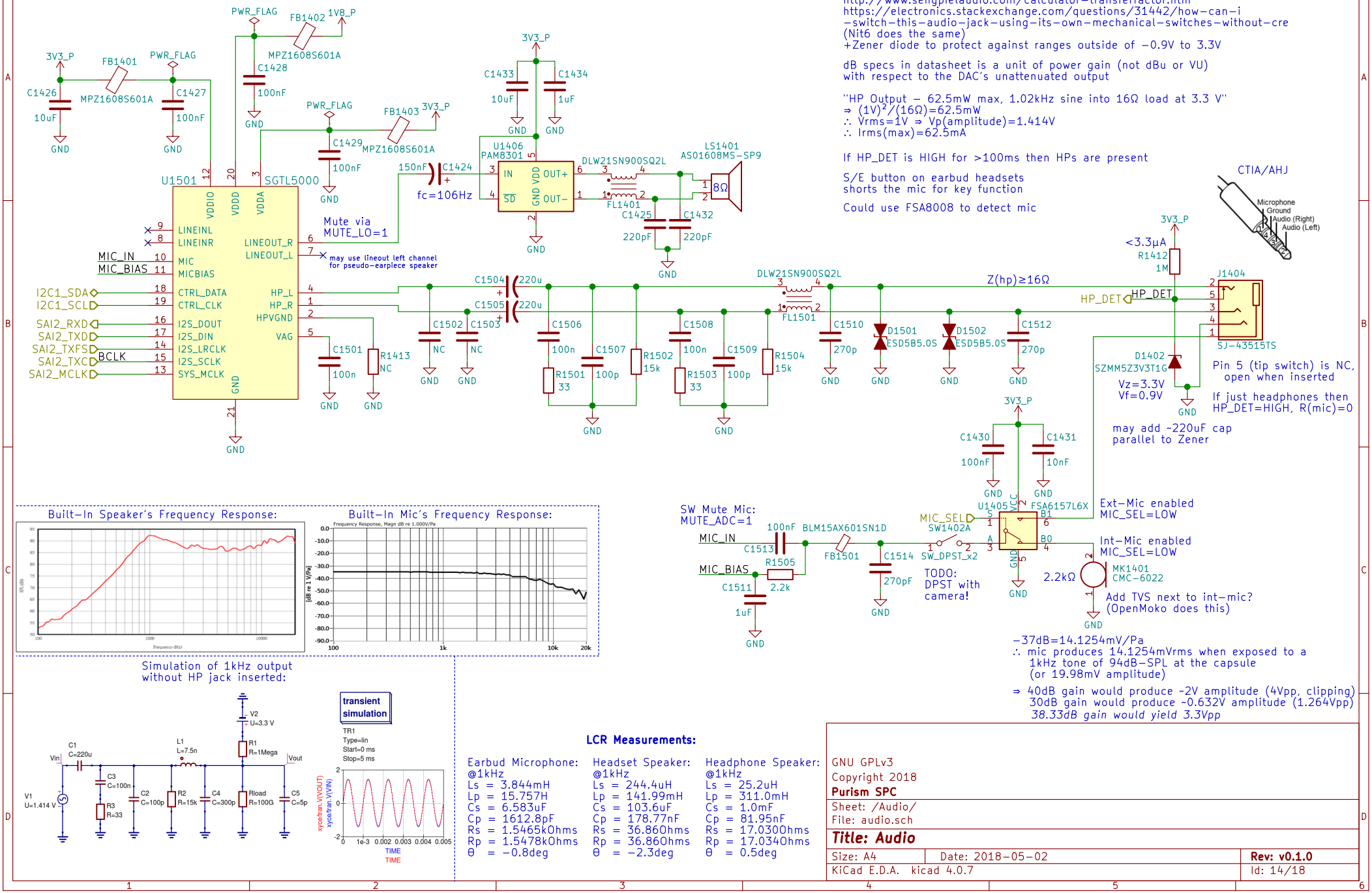
	Pin	Port Config_0[1]	Port Config_1[2]	Port Config_2[3]	Port Config_3[4]
			Assumes SIM2	Assumes UART	Assumes SIM2	Assumes UART
GPIO_0	40	GNSS_SCL	GNSS_SCL	SIM_DET2	HSIC_Data
GPIO_1	42	GNSS_SDA	GNSS_SDA	UIM_DTA2	HSIC_Strobe
GPIO_2	44	GNSS_IRQ	GNSS_IRQ	UIM_CLK2	IPC_0
GPIO_3	46	SYSCLK	GNSS_0	UIM_RST2	IPC_1
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

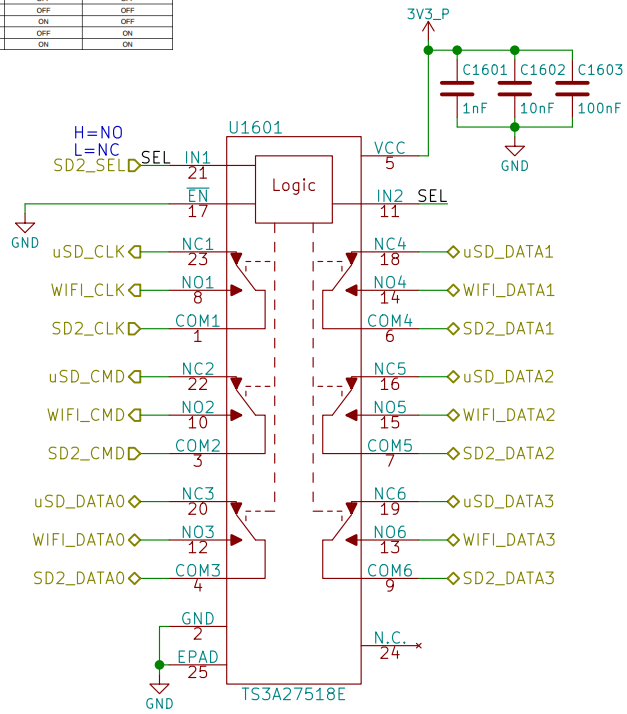
Title: WWAN M.2

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 13/18


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
U1406
PAM8301
LS1401
AS01608MS-SP9
8Ω
DLW21SN900SQ2L
FL1401
fc=106Hz
Z(hp)≥16Ω
<3.3µA
HP_DET
J1404
SJ-43515TS
Pin 5 (tip switch) is NC,
open when inserted
If just headphones then
HP_DET=HIGH, R(mic)=0
D1402
SZMM5Z3V3T1G
Vz=3.3V
Vf=0.9V
may add ~220uF cap
parallel to Zener
D1501
D1502
ESD5B5.0S
Built-In Speaker's Frequency Response:
Built-In Mic's Frequency Response:
Frequency Response, Magn dB re 1.000V/Pa
SW Mute Mic:
MUTE_ADC=1
U1405
FSA6157L6X
MIC_SEL
SW1402A
SW_DPST_x2
Ext-Mic enabled
MIC_SEL=LOW
Int-Mic enabled
MIC_SEL=LOW
TODO:
DPST with
camera!
MK1401
CMC-6022
2.2kΩ
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
Simulation of 1kHz output
without HP jack inserted:
transient
simulation
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: 14/18

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

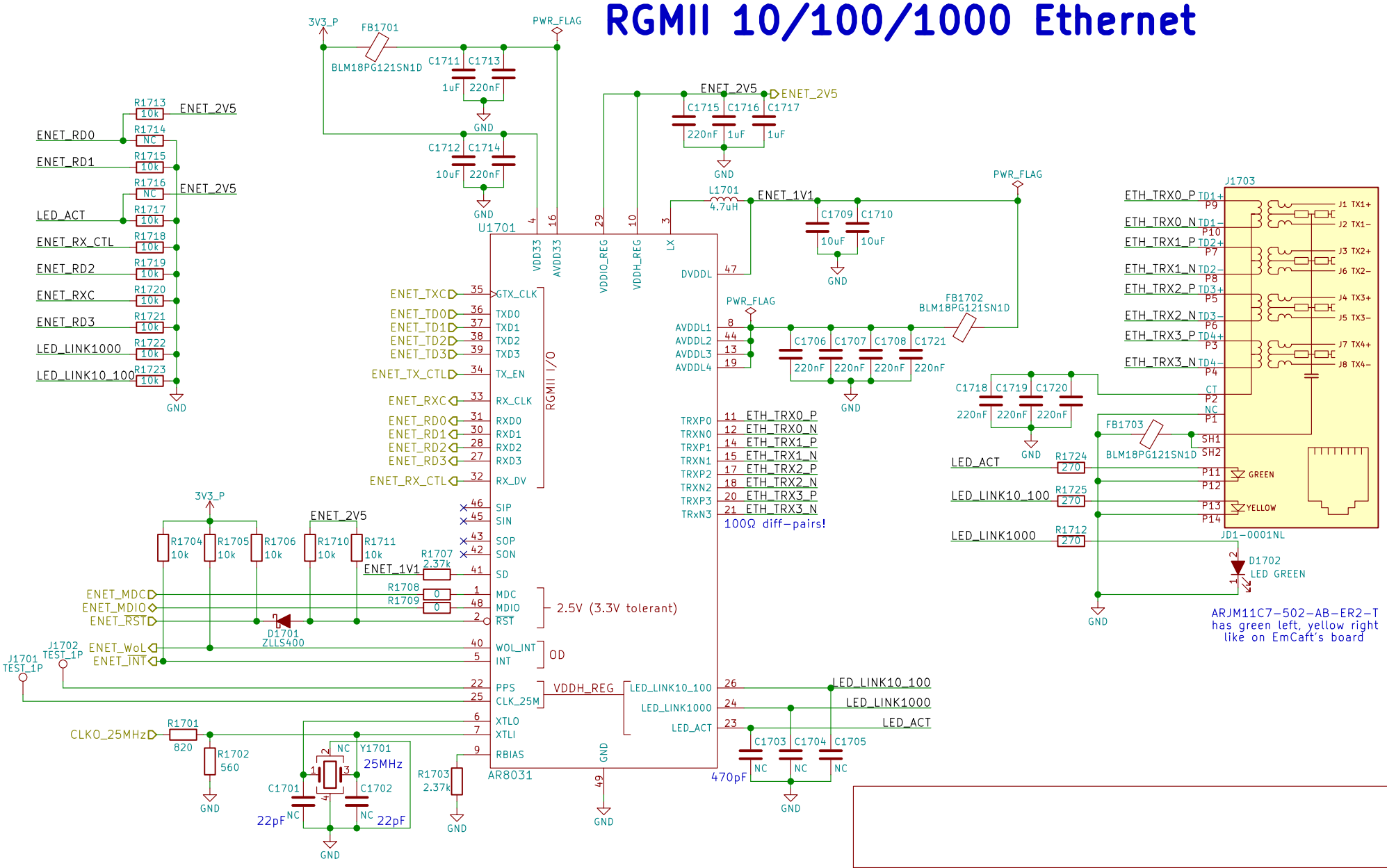


Sheet: /SDIO DEMUX/
File: sdio_demux.sch

Title: SDIO Demultiplexer

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 15/18

RGMII 10/100/1000 Ethernet



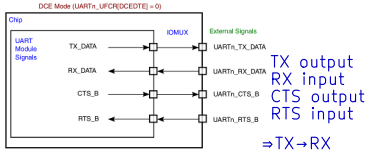
Sheet: /Ethernet/		
File: ethernet.sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 4.0.7		Id: 16/18

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

3V3_P

USB_WLAN_DP
USB_WLAN_DN

M2_PCM_CLK
M2_PCM_SYNC
M2_PCM_IN
M2_PCM_OUT

WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE

1V8_P

R1506
10k

BT_HOST_WAKE
BT_UART_RXD

SoC's RX
Module's TX

SoC's TX
Module's RX

D1503
ZLLS400

WIFI_RST

D1504
ZLLS400

W_DISABLE1

BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

RS9116 SUSCLK
is a GPIO (unused)

SUSCLK
W_DISABLE2
W_DISABLE1
M2_I2C_SDA
M2_I2C_SCL

M.2_Key_E

GND

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

Pin 54 on RS9116 is USB_VBUS Sink!!!

U1502A
74AUP2G00

U1502B
74AUP2G00

BT_DISABLE
WIFI_DISABLE

D1505
CFSH05-20L

Closed = ON (*_DISABLE HIGH)
Open = OFF

SW1501
WWAN_HKS

R1508
10k

C1515
100nF

R1510
10k

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

U1702
NTB0104GU12

C1722 C1723
1uF 10nF

C1724 C1725
10nF 1uF

OE VCCA VCCB GND
A1 A2 A3 A4
B1 B2 B3 B4

BT_UART_RXD
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

RX, TX, RTS, CTS
of the SoC

internal 10k pull-up

U1504
NTB0104GU12

C1520 C1521
1uF 10nF

C1522 C1523
10nF 1uF

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

R1507
10k

M2_I2C_SDA

I2C2_SDA

Q1501
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!!!

R1509
10k

M2_I2C_SCL

I2C2_SCL

Q1502
FDV301N

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

Purism SPC

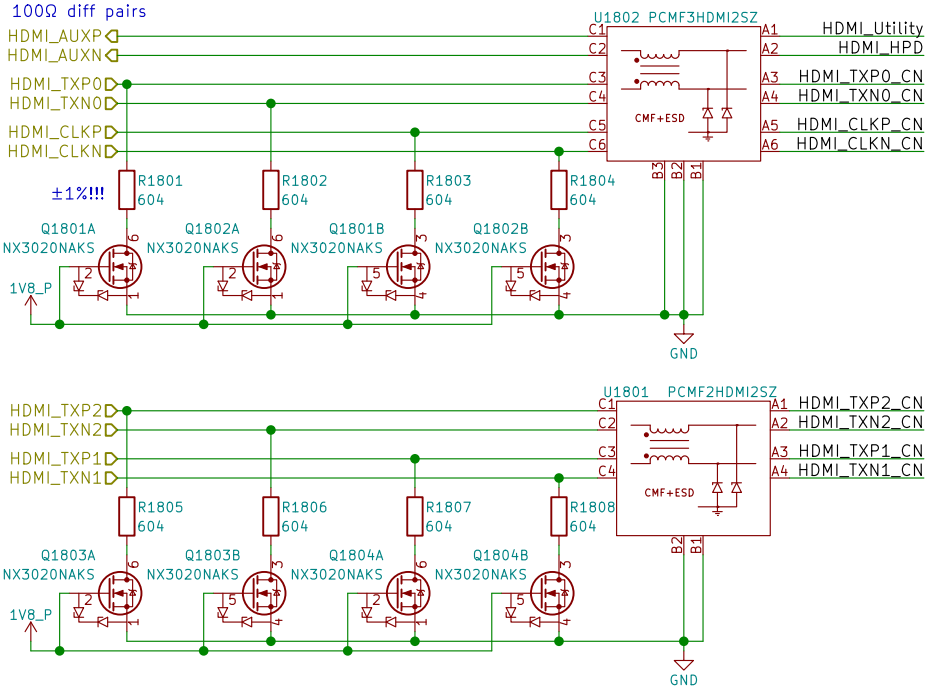
Sheet: /WLAN+BT M.2/
File: wifi_bt_m2.sch

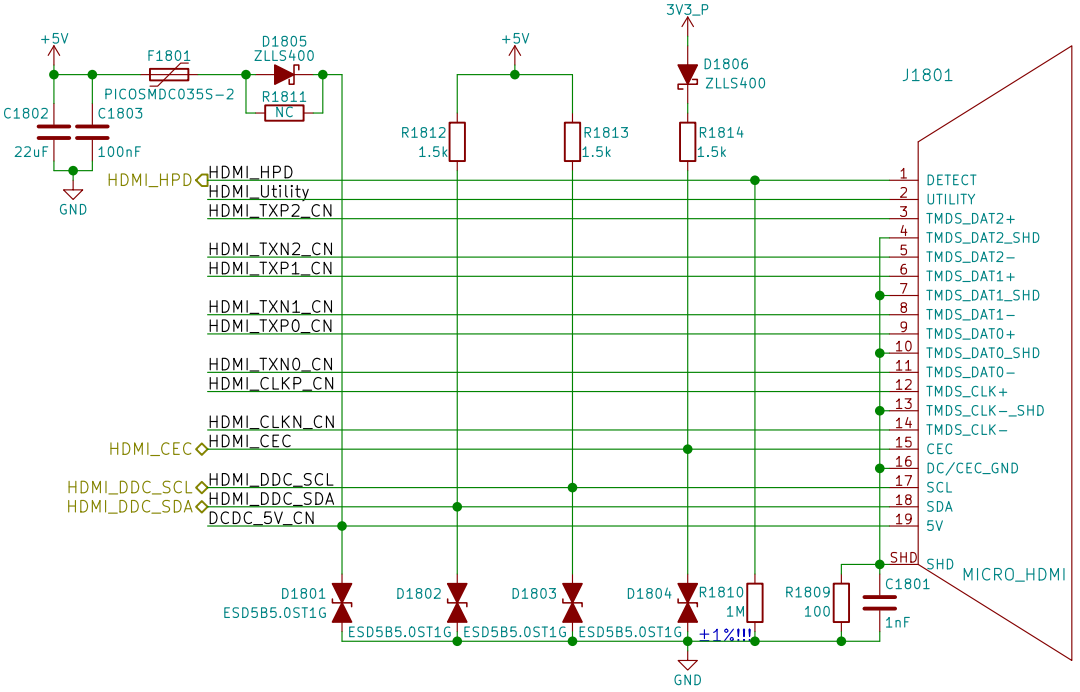
Title: WLAN+BT M.2

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 17/18

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





Micro-HDMI to Standard-HDMI

Table 4-19 Type D-to-Type A Cable Wire Assignment

Type D pin	Signal Name	Wire	Type A pin
1	Hot Plug Detect	C	19
2	Utility	C	14
3	TMDS Data2+	A	1
4	TMDS Data2 Shield	B	2
5	TMDS Data2-	A	3
6	TMDS Data1+	A	4
7	TMDS Data1 Shield	B	5
8	TMDS Data1-	A	6
9	TMDS Data0+	A	7
10	TMDS Data0 Shield	B	8
11	TMDS Data0-	A	9
12	TMDS Clock+	A	10
13	TMDS Clock Shield	B	11
14	TMDS Clock-	A	12
15	CEC	C	13
16	DDC/CEC Ground	D	17
17	SCL	C	15
18	SDA	C	16
19	+5V Power	5V	18

Sheet: /HDMI/
File: hdmi.sch

Title:

Size: A4 | Date: | **Rev:**
KiCad E.D.A. kicad 4.0.7 | Id: 18/18